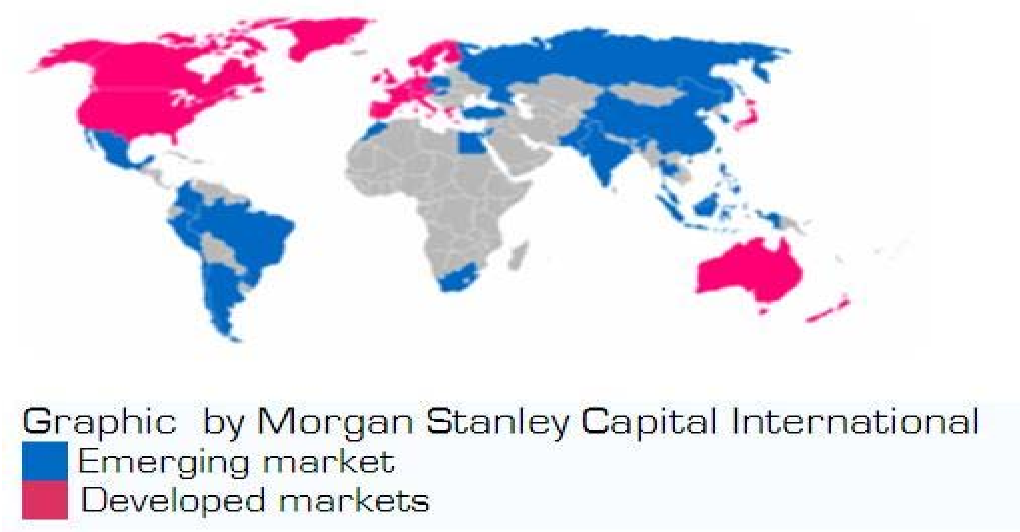
University of Piraeus
Department of Banking & Financial Management

MSc Program in Banking & Financial Management

Thesis: "The relationship between real stock returns and real economic activity. "



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Piraeus 2009

To my parents Michael and Marilena,

my brother Komninos and

my friends Akis, Nikos and Panagiotis.

Aknowledgement:

This work would not have been possible without the support, encouragement and patience of Assistant Professor Christina Christou, under whose supervision I chose this topic and began the thesis. She has been abundantly helpful and understanding and I cannot thank her enough.

TABLE OF CONTENTS:

CHAPTER I: Introduction and Literature Review

I.i: Introduction.

In recent years, and especially during the last two decades, a lot of research has been made on stock returns and the relationship with their volatility, on stock market volatility and how it responds in connection with macroeconomic variables and their volatility, and on the relationship between output growth, and its volatility. Researchers have tried to interrelate the above factors and draw some useful conclusions about the past and policies of the future, regarding mostly investments and portfolio management.

However, we must add that these researches had been made mostly for developed countries, and there have been only a few studies about developing countries. Needless to say, the possibility of developing countries accumulating funds and gathering investments from around the world in their emerging stock markets, is important enough to deserve our research. Another reason why we also focus on emerging markets is that the absence of market liquidity, in addition to their vulnerable financial structure has leaded to unsuccessful predictors of economic growth. Moreover, the high levels of volatility of stock returns make the explanation of data more difficult for emerging markets than for advanced ones.

Finally, by including emerging markets in our sample we can address the relationship, in mean and volatility, between real stock returns and real economic activity, for which we use industrial production as our proxy, in a larger sample and work on a wider scale. No research has ever been made before that had the length of our sample **(38 countries)** combined with the methodology we use (see chapter IV) and especially in **Matlab application**.

In this section (chapters I and II) we will present the literature review that supports our work and the theoretical and empirical basis of it. The remainder of our work includes the analysis of the data we collected (chapter III), the methodology of Cheung & Ng and Hong which is based on the estimation of the Cross Correlation Function for the squared standardized residuals, that are obtained from the estimation of the GARCH model (chapter IV), the presentation our empirical results and the discussion of them (chapter V). At last we conclude on our research.

I.ii: Predictability of stock returns and stock returns' volatility.

A number of important papers have focused on stock returns and their volatility. A good first example is the work done by **Richard T. Bailie and Ramon P. DeGennaro (1990)**. They used daily and monthly data from January 1970 to December 1987 and investigated on stock returns and their volatility, but through portfolios that had been already used for investment strategy around the world. They were motivated from past researches and from models that had tested the relationship between stock returns and their conditional variance or standard deviation in a portfolio, and wanted to see if the previously found positive relation between stock returns volatility and risk existed. We can say that they questioned the use of variance to model risk, in order to asses some ambiguous results of the past (mostly that of Pindyck, 1970, who attributed the decline in stock returns on high volatility, and that of Poterba and Summers, 1986, who argued that the increase in volatility was not high enough to cause decline), and form fully the relation between stock returns and their volatility in a portfolio. So, they used GARCH in the mean model with a conditional students t density to jointly estimate the mean and variance processes, and they also included delays in payments or action regarding buying and selling stocks, in or out of the portfolios. They found that controlling for excess kurtosis by use of the student t density is important and that the models showed very little evidence of statistical importance and significant relationship between a stock portfolio's returns and its own volatility. That means that their findings were compatible with their beliefs, that the use of variance to model risk is inappropriate and more parameters are needed.

Then **Gregory R. Duffee (1995)** focused on the statistical relation that individual firms' stock return volatility rises after stock prices fall. He tried to check this relationship not only in a firm-level but also in an aggregate one. His basis were previous researches that explained the above relation, and two theories. The first was proposed by Black(1976) and Christie(1982) who stressed that the leverage effect posits that a firm's stock price decline raises the firm's financial leverage, resulting in an increase in the volatility of equity. The second was the time-varying risk premia explanation which argues that a forecasted increase in return volatility results in an increase in required expected future stock returns and therefore an immediate stock price decline **(Pindyck 1984; French, Schwert, and Stambaugh, 1987)**. But Duffee proposed a new approach of the negative relation between current stock returns and changes in future stock return volatility at the firm and the aggregate level. He used monthly stock returns and estimates of the standard deviation of monthly stock returns from 2494 U.S. firms from January 1977 to December 1991. His findings backed the relation that individual firms' stock return volatility rises after stock prices fall, due to a positive contemporaneous relation between firm stock returns and firm stock return volatility. He also found that this relation holds regardless of being a small firm or a firm with little financial leverage. In addition, smaller firms exhibit a greater contemporaneous relation between returns and volatility than larger firms do. However he was surprised to find that this contemporaneous relation is reversed regarding the aggregate level. So he decided to explore the reasons behind this last conclusion. One possible solution he gave was that a common factor is negatively skewed, while idiosyncratic factors are positively skewed. Moreover, there might be multiple common factors, some of which are negatively skewed and influence the returns on large firms, while others are positively skewed and influence the returns on small firms.

The relation between stock returns and their volatility had also been studied by **Mougoue and Whyte (1996)**, as far as the German and the French equity markets are concerned. They followed the literature of **Poon and Taylor (1992)** and the one of **Baillie and DeGennaro (1990)**, as we did above. Using daily data for the German and French equity stock markets from December 1979 to July 1991, they collected 3023 observations, covering the 61.2% of the German indices and the 56.3% of the French equity market. In their empirical study, they used the GARCH model proposed by **Bollersev (1986)**. They expected to find a negative relationship between stock returns and their volatility, and the model proved them right. But their contribution to the existing literature had been the fact that they had taken the crash of 1987 in account and showed that this crash had affected the mean-variance relationship between these countries, not to say that it improved the model's fit. Final results and conclusion showed that the stock returns are significantly affected in both countries by any kind of delay, as Baillie and DeGennaro had already said, but volatility is importantly affected by delays only in France, summing up that structural approach is of great importance when studying an equity market.

Most researchers have focused on two sources of predictability of stock returns. It is either the available information at any decisive moment or what exist in the volatility of stock returns. In the 1970s, it was the random walk hypothesis that dominated the world but evidence had shown that stock returns are associated with other economic factors and to some extend predictable. **Marquering and Verbeek (2004)**, tried to find the economic value of jointly predicting stock returns and volatility. They used monthly frequency data that covered the period January 1966 to December 1992 from the S&P 500 index. They obtained the stock returns and the measures of volatility. For estimation they used their findings in a simple linear model, estimated recursively, including variables that have some economic rationale or based on out-of-sample evidence, such as dividend yields, company earnings, interest rates, industrial production and inflation, and produced out-of-sample forecasts for the returns of the S&P 500 index and its volatility. Their conclusions mostly stress that the predictability of returns is larger and easier when volatility is high. Forecasting with high volatility may lead to important conclusions concerning any investment strategy.

But it is not only volatility that can be important for stock returns. **Mark Flannery and Aris Protopapadakis (2002)**, used a specified GARCH model to detect macroeconomic factors that influence stock returns through their conditional variance. So they identified as a potential risk factor any macroeconomic variable that either affects stock returns or increases the market's volatility. Among the macrovariables were CPI, PPI, balance of trade, real GNP and **industrial production**. They also mentioned that existing literature finds that in volatility macroeconomic variables to follow stock markets announcements and not the other way around. In addition, **Pesaran and Timmermann (1995)**, investigated the predictive ability of economic factors for stock returns, taking business cycle into account. This factors were the one-month treasury bill, the twelve-month discount bond rate, the inflation rate, the **industrial production** and the monetary series. The data including stock returns and their volatility, came from the S&P 500 index from January 1954 to December 1992. Their findings help them drew the conclusions that predictability is different depending on volatility. During high volatile periods, the advantage of predicting stock returns through economic factors can be more easily exploited.

Moreover, **Beaulie, Cosset and Essadam (2005)**, investigated on the relationship between stock returns' volatility and political risk, in the case of Canada. We must stress that political risk is mostly present in emerging countries, due to their little reliability in financial information, but it is a risk that can be diversified, and investors rarely require a risk premium. The most common factors that indicate political risk are the asset structure and the foreign involvement. The data covers the period January 1990 to December 1996 and includes any release and stock returns. The findings confirm a relation that political risk affects the stock returns volatility but this relation mainly exists in domestic boundaries and not internationally. Finally, it is not bizarre that unwilling political risk news have a more significant impact on stock returns volatility than willing political news have.

Previously, **in 1990, Ali F. Darrat** used monthly data from January 1972 to February 1987 for stock returns from the Toronto stock exchange market 300, monthly average change in percentage for monetary policy and measured the fiscal policy by the change in cyclically-adjusted budget deficits, in order to find the relationship between stock returns, money and fiscal deficits. After having used the FPE/multivariate Granger-causality modeling technique, he found that stock returns reflect all information on monetary policy and that fiscal deficits make stock returns not constant, which is against market efficiency.

I. iii: Variables and macro-variables that cause stock market volatility to change over time.

One of the most important papers about stock market volatility was written by **G. William Schwert (1989)**. He tried to give an answer to why stock market volatility changes over time. His heritage had been the work of **Officer (1973)**, who relates stock market volatility with macroeconomic variables, **Black (1976) and Christie (1982)** that argue that financial leverage explains the change in stock market volatility and the work of all the above we said that relates the change in stock market volatility with the changes in expected stock returns. Schwert collected his data on a monthly basis from 1857 to 1987 (S&P 500 index). His first step was to reject the hypothesis of constant variance because he had found estimates of standard deviation that varied from two to twenty percent. His goal was to relate stock market volatility to the time-varying volatility of a variety of macroeconomic variables, including inflation, money growth and **industrial production**. The explanations of his ancestors were not good enough to explain why stock market volatility changes over time. So he thought that any change which causes uncertainty in the future macroeconomic conditions, would probably cause a proportional change in the stock return volatility. His idea was that if macroeconomic variables included information about expected cash flows or future discount rates, they might help explain why stock return volatility changes over time.

His second step was to study the relations between stock market volatility and macroeconomic volatility. Starting with the volatility of inflation and money growth, he found that none of them has a strong relation with the volatility of asset returns. On the other hand, he stressed that the **volatility of real economic activity happens to be an important determinant of stock return volatility**. Thus, there is some evidence that macroeconomic volatility reveals some information about future stock return volatility and therefore evidence that **financial volatility can help us predict macroeconomic volatility**. In his third step he had to study the volatility and the level of economic activity, due to the fact that stock market volatility is strongly related with the general health of the economy. An explanation lies in that it is caused by financial leverage. Stock prices are the leading indicators before and after recessions, so they fall during recessions. This means that leverage increases during recessions and thus causes an increase in the volatility of leveraged stocks. At last, he also had to take the trading volume into account. He found that in general, high volatility comes together with high trading volume but the regressions he used were unable to specify if this is due to trading noise or known information.

When Schwert came to draw his final conclusions, he found that many of the economic series were more volatile during the 1929-1939 Great Depression. He restated that operating leverage is increasing during recessions, especially in the case of asset returns. **He found weak evidence that macroeconomic volatility can help in prediction of stock return volatility, but stronger evidence that financial asset volatility can help predict future macroeconomic volatility**. The effect of financial leverage was found to affect the stock return volatility (when stock prices fall-stock volatility increases) but explain only a portion of the stock market volatility change over time. Last, but not least, the number of trading days in a month were positively related to stock volatility.

Recently, in **2006, Beltratti and Morana** found the weakness in Schwert's work that it does not accurately counts for the persistence properties of volatility and ignores the downward bias affecting the estimates because of the existence of noisy volatility proxies. Moreover, long memory can be another explanation why long range dependence attributes to the persistence of the conditional variance. The majority of the authors have suggested that both long memory and structural change characterizes the structure of financial returns volatility. Beltratti and Morana improved on Schwert's methodology and estimation construction by taking under consideration extended non-linear estimators and by allowing for long memory and structural breaks. Their findings propose that process estimating volatility is characterized by long memory and structural breaks. In addition, they have agreed with **Schwert (1989,1990) and Flannery and Protopapadakis (2002)** that causality direction is stronger from macroeconomic volatility to stock market volatility, due to the contribution of macroeconomic volatility to persistent and non-persistent stock market volatility fluctuations, while stock market volatility fluctuations are associated with idiosyncratic financial shocks.

Speaking of predictability, we must refer to **Mankiw, Romer and Shapiro (1991)**, who based their research of stock market predictability and volatility on the null hypothesis that the market is efficient, and developed a testing procedure of Monte Carlo simulation. They used a "naive forecast" in order to test the forecastibility, and they investigated whether aggregate stock returns exhibit excess volatility or predictable movements over one year horizons (or more). What they found was that, in contrast to the predictions of market efficiency, the difference between the current level of stock prices and a "naive forecast" based on current dividends is not orthogonal. But when it comes to horizons of five years or more, the "naive forecast" outperforms the market price as a predictor of the exact future price. Finally they found that the null hypothesis is strongly rejected when we speak of excess returns rather than simple.

Similar was the purpose of the paper of **King, Sentana and Wadhwani (1994)** that tried to identify the factors that are responsible for changes over time in stock market volatility. They intended not only to test the covariances between international stock markets but also to check on capital market integration. They used data from sixteen national stock markets and a multivariate factor model in which the volatility of returns was induced by changing volatility in the factors used in the model. Unfortunately they found that only a small proportion of the covariances between national stock markets and their time-variation can be attributed to macroeconomic "observable" variables. These results were accompanied by the finding that global stock markets are not integrated. However, **Alan Sutherland**

(1996), tried to study whether financial market integration leads to greater volatility of economic variables. Simulation experiments showed that when financial market integration rises, the volatility of a number of variables increases when the shocks originate from the money market, but the volatility of a number of variables decreases when shocks originate from the demand or supply market. Yet the general idea remains that with the exception of monetary shocks, increasing financial market integration tends to decrease short-run volatility.

Hamilton and Lin (1996), stepped on the road that Schwert did and tested the stock market volatility in association with business cycles. In their paper they investigated the joint time series behavior of monthly stock returns and growth in industrial production, finding that stock returns are characterized by long periods of high volatility, whereas real output growth is determined by changes in the mean associated with economic recessions. They used a bivariate model in which they hypothesized the existence of a single latent variable, the state of real economic activity. This variable determines both the mean of industrial production and the stock returns volatility. This way they had achieved a better model from the past ones. By studying this bivariate model, they have concluded that economic recessions is the factor that accounts for at least sixty percent of the stock return high volatility. In addition to the above literature, came the paper of **Shiu-Sheng Chen (2008)**. He stressed that macroeconomic variables, such as yield curve spreads and inflation rates, can be used to predict market recessions more accurately than stock returns. In order to cum up with this conclusion he used monthly returns on the S&P 500 price index from February 1957 to December 2007, and parametric as well as non-parametric approaches and considered both in- and out-of-sample tests of the variables' predicting ability.

So, after strong evidence existed that stock market volatility had a business cycle pattern, higher volatility during recessions than during expansions, **Corradi, Distaso and Mele (2005)** introduced a no-arbitrage model in which stock market volatility is related to macroeconomic variables (**industrial production** and inflation) and unobservable factors. The "no-arbitrage" restrictions was an innovation. They wanted to explore whether macroeconomic factors help investors to choose the risk-premium they want in order to hedge against the risk of stock market volatility. Their sample data included the consumer price index and that of industrial production for the United States, observed monthly from January 1950 to December 2006. They also used the S&P Compounded index and the VIX index, noting that data for the VIX follows January 1990. The model finally predicted that stock market returns are procyclical, stock market volatility is countercyclical and volatility risk-premia are countercyclical.

Large contribution to the existing literature gave the paper of **Diebold and Yilmaz (2008)**, who correctly stressed that links between asset market volatility and volatility of underlying real economic fundamentals remain unexplored. They decided to provide an investigation regarding this matter in a broad cross section of nearly 40 countries. They used data on real GDP and PCE (Personal Consumption Expenditure) and their source was the World Bank's WDI (World Development Indicators). Fundamental volatility was measured by calculating the standard deviation of GDP and stock market volatility was measured fashionly. For the latter they used data from the major stock index series from the IMF's International Financial Statistics. The selection of countries and the availability of their data was more complicated so they had to make three groups. All groups had data of four time series for each country including real GDP, real consumption expenditures, stock market returns and inflation. The first group was composed of industrial countries with all four variables from 1960 onward. The second group was composed of developing countries, meaning that it also had less available data and the third group was composed of the transition economies and some African and Asian developing countries. In their findings they had come up with a clear link between macroeconomic fundamentals and stock market volatilities, with volatile fundamentals translating into volatile stock markets. Finally, **Hassler (1999)**, used the Hamilton regime switching model to bivariate stock market data for the case of Sweden and a sample period of January 1970 to August 1995, and attributed the increased volatility of the Swedish stock market to increased sensitivity worldwide and not to domestic sensitivity due to world news.

I. iv: The relationship between output growth and stock returns' volatility.

In his remarkable work, **G. William Schwert (1990)**, also tried to analyze the relationship between stock returns and economic activity for the period 1889 – 1988. He used the end-of-month stock returns for this period and as a value-weighted average the industrial production growth rates of 13 industrial products. So for this period he found a **strong positive relation between real stock returns and future production growth rates**, even when variables that proxy for time-varying expected returns are included in the regressions.

But the landmark belongs to the research of **Fabio Canova and Gianni De Nicolo (1995)**. They focused on analyzing the relationship between stock returns and real activity, under the prism of equilibrium, taking into consideration the business cycles of many countries where multiple sources of shocks might occur and multiple channels of domestic and international transmission. A three-country world (United States, Europe and Rest of the World) was used, referring to three consumption goods and each "region" is specializing in one good. Monetary policy had been abstracted due to its non-cyclical effects. The model employed two types of disturbances (government and technology) and two sources of international interdependencies. The data collected was quarterly stock returns and GNP growth rates from 1970 to 1991, and suggested that the association between stock returns and growth rates of production was as strong in Europe as in the United States. However, there are important cross-country and cross-continent differences. Though the European stock returns explain both the European and the U.S. growth rates, the U.S. stock returns are only significant for the European ones. In addition, the European GNP growth can explain the European stock returns, whereas the U.S. GNP growth is insignificant in both continents. The exact opposite happens with dividend yields.

The purpose of their paper was to answer to what types of shocks can move asset returns and real activity, to which channels of domestic transmission are significant in relating financial markets with real activity and to what type of international linkages are necessary to explain the relationship between asset returns and real activity that exists in data. They managed to demonstrate that their model can produce the association between domestic stock returns and real activity we see in the data, but when it comes to unleverd equities, the bondage depends on the source of disturbance of the business cycle. This difference shrinks with levered equities. As far as the shocks are concerned, when the disturbance comes from the government expenditure there is a strong relation between real GNP and stock returns, because these disturbances have a positive effect on dividend payments. But when the shock is technological, the relation is much weaker because dividend yields are less related to real GNP.

The volatility of real GDP was the main theme of **Hamori**'s paper **(2000)**, as he studied whether real GDP's volatility display any asymmetry or not. He used quarterly data of real GDP seasonally adjusted from the first quarter of 1960 to the fourth quarter of 1996, for the U.S., the U.K. and Japan. The application of three ARCH-type models with the maximum likelihood method (GARCH, T-GARCH and E-GARCH) provided the results with the best fit. Asymmetry was not found between real GDP growth rates and their volatility in the three countries, suggesting that it is possible to understand the volatility if we pay more attention to growth expectations.

Rodriguez, Restoy and Pena (2002), had tested whether output growth can explain the volatility and predictability of stock returns. They used a general asset pricing model in equilibrium and obtained evidence from eight OECD countries using both annually and quarterly data. The results were the expected, that volatility of stock returns can be explained much more easier than their predictability, based on output growth. The variables that had been used as capable of predicting stock returns were the growth rate of output, the short term interest rate and the lagged returns.

On the one hand, growth and volatility have a negative correlation within countries. On the other hand, they have a positive correlation across sectors, especially in OECD countries **(Imbs 2007)**. Due to the fact that volatile sectors command high investment rates, they grow fast. However, in the aggregate, it is of no significance whether they correlate positively. Macroeconomic volatility estimators can partly explain the positive sectoral correlation, but not the negative. Jean Imbs used data from 1970 to 1992 and from 47 countries to drew these conclusions. As a result, in the investment strategy, risk and return can be positively correlated.

Stock volatility may be affected by political uncertainty and, therefore, reduce output growth. Bittlingmayer (1998), represented political uncertainty as an exogenous factor that causes volatility and tested the case of Germany for 1880 – 1940, using simple regression models. He found that increases in volatility were followed by decreases in output growth and concluded that politics matter due to the fact that causation runs from political uncertainty to stock prices and output growth.

I. v: The correlation of stock returns and growth rate in advanced and emerging markets.

A very important paper, which many analysts use as basis in this sector, had been made by **Mauro (2003)**. He studied the correlation between lagged stock returns and output growth in emerging and advanced countries. He studied the strength of this relationship also by comparing emerging to advanced economies not only in an empirical but also in a theoretical extend. Mauro used annual data for nearly 22 years for 8 emerging countries and 17 advanced countries. He used a depended variable model and his findings stated a positive correlation between stock returns and output growth in all countries apart from India and significantly positive in 5 out of 8 emerging markets and 10 out of 17 advanced countries. This results suggest that the **relationship between real stock returns and real economic growth is solid** enough in a number of countries and different kind of economies and development paces.

It has been of general acceptance that a major fraction of the changes in the growth rates of real economic activity is correlated with changes in stock returns in the US and the G-7 countries, from 1950 to 1990. According to **Binswanger (2000)**, this relationship had undergone a breakdown as far as the US are concerned, during the 1980's. **Binswanger (2004)** wanted to investigate this relationship on the other G-7 countries and on the aggregate European economy. The results from the OLS regressions, the vector error correlation model and the CUSUM test, suggested that the breakdown had also occurred in Japan and the aggregate European economy. Of course the timing was not similar for all countries. We have to note, though, that the relationship between stock returns and real activity is much stronger on aggregate level than on a national one. This conclusion goes together with that of Canova and DeNicolo (1995) above. Binswanger, finally, attributes this breakdown to the existence of speculating bubbles, as the most possible explanation.

Choi, Hauser and Kopecky (1999), also wanted to see if the stock market can predict real activity, as far as the G-7 counties are concerned. So they examined the relationship between industrial production growth rates and lagged stock returns, using not only in-sample forecast-evaluation models, but also out-of-sample forecast-evaluation procedure. The findings showed that in all G-7 countries, there is a stationary **linear relation between log levels of industrial production and real stock prices** in the in-sample co-integration analysis in all G-7 countries. There is also a significant evidence for real stock returns of a causality in the short run for the growth rate of industrial production in the U.S., U.K., Japan, Canada and Germany. In France, the causality exists only in quarterly frequency, and in Italy none. The out-of-sample tests showed that the value of stock market information depends on both the data periodicity and the length of the in-sample estimation period, in relation with the out-of-sample estimation period. At a monthly frequency, they had found evidence of an enhanced predictability of industrial production growth in Japan and the U.K. and perhaps the U.S. At a quarterly frequency, there is an improvement in the U.S., Canada and perhaps Germany.

In the last few decades, because of the decreases in government spending, the fall in inflation and the structural changes, studies on output volatility and business cycles had shown a decline in output volatility in developed countries. **Li and Kwok (2009)** examined the growth volatility of GDP, its components and the stock market of five East Asia countries (Japan, Singapore, South Korea, Hong Kong SAR and Chinese Taipei). These countries were chosen because they had been affected by the Asian financial crisis in 1997. In particular, they examined whether the output and stock market price volatility in one country can affect the others, whether there is any volatility spillover among them and to see how these countries react between each other in a cross-country and cross-variable correlation analysis. The results showed that these countries had maintained macroeconomic stability and that they can insert influences on each other as well as in the Asia region. Analytically, Japan had shown a decline in output volatility, and it is possible that any boost in the economy of Japan might increase the possibility of improvement in the Asian region. There was also a strong correlation between the stock markets of Japan, Hong Kong SAR and Singapore, which means that they can be the capital centres of Asia. Finally, the performance of GDP components shows that the countries are still closely connected and that they hardly influence each other through trade, consumption and investment.

The main theme that bothered **Enisan and Olufisayo (2009)** was the causal relationship between stock market development and economic growth, in the case of seven sub-Sahara Africa countries (Egypt, South Africa, Kenya, Morocco, Zimbabwe, Cote D'Ivoire and Nigeria). Using an autoregressive disturbed lag bounds test and a Granger causality test to make use of their data (1980-2004) for these seven countries, they had found that stock market and economic growth are co-integrated (in the long-run) only in Egypt and South Africa. In these two countries, stock market development causes economic growth. So we conclude that it is really difficult for stock markets to achieve the goal of promoting economic development in Africa.

The volatility in stock returns is higher in emerging stock markets than in developed ones. **Abugri (2008)**, tried to investigate on this fact by using a six variable vector autoregressive (VAR) model, and especially investigated if some important macroeconomic factors (exchange rates, interest rates, industrial production, money supply) are related to stock returns and their volatility and how. His sample was four Latin America countries, Argentina, Brazil, Chile and Mexico, and the data covered the period January 1986 to August 2001. The results showed that the international macroeconomic factors affect consistently and significantly the four markets, whereas the local macroeconomic factors have no standard impact on the markets.

The volatility of emerging stock markets (Argentina, Brazil, Chile, India, Korea, Malaysia, Mexico, Philippines, Taiwan and Thailand) in addition to Hong Kong Germany, Japan, the U.K. And the U.S.A., and during the period 1985 – 1995 was monitored by **Aggarwal, Inclan and Leal (1999)**. Their purpose was to determine whether changes in volatility and variance were due to local or global events that had occurred and whether these events had been social, political or economical. In order to make the identifications of the time and period of the shifts they had used an iterated cumulative sums of squares algorithm. They came to the conclusion that all changes in volatility had been results of local events, apart from the 1987 crisis. Events tended to be either social, political or economical that affected the market in various ways. As far as the relationship between investment and volatility in developing countries is concerned, **Aizenman and Marion (1999)**, had found a negative correlation between various volatility measures and private investment, but a positive one between concerning public investment.

The stock market volatility of emerging markets, alongside with time–varying risk–premia and persistence of shocks in volatility, had also been of **Choudry**'s interest (**1996**), in connection with the 1987 crash. The countries he had studied were Argentina, Greece, India, Mexico, Thailand and Zimbabwe. His base were monthly data from January 1976 to August 1994 and his investigation had been based on the mean GARCH model (GARCH-M). The conclusions were disappointing due to the fact that it came clear that the crash of 1987 had little to do with the changes that had undergone in any country. So, mostly local factors were responsible and this leads to failure of explaining not only a significant presence of tome-varying risk premium, but also fails to study the persistence of shocks in volatility because no common spot exists. These results provide evidence of an inverse relationship between stock returns and conditional variance. In addition to the above, **Billmeier and Massa (2009)**, found that market development in emerging countries of Middle East and Central Asia is positively correlated with institutions and remittances, as well as natural resources (oil prices for the resource-rich countries).

CHAPTER II: Theoretical and Empirical Background

II. i: The relationship among stock returns and output growth.

So far we have thoroughly mentioned the relationship between stock returns and output growth. **Morck, Schifer and Vishny (1990)** had made a survey in which they reviewed, more than effectively, five theories that need to be mentioned to accompany the above literature review. First, the five theories are separated in two groups. The theories that support the fact that stock price movements do not reflect changes in future fundamental variables and therefore cannot be predictive for output growth, and the theories that support the fact that stock returns can predict output growth.

In the first group we find the "passive informant" hypothesis, under which it is assumed that stock prices are linked with the present discounted value of all future dividends and dividend growth is linked with GDP growth. Taking that for granted, a correlation arises between present stock returns and next year's economic growth. However it is difficult for any country to predict the strength of this relationship. The first group also includes the "accurate active informant" hypothesis, under which, changes in stock prices provide information about future economic developments, thus relating stock price changes with fundamentals. In this hypothesis, market capitalization must be taken into account.

The "faulty active informant" hypothesis belongs to the latter group and is different from the "accurate active informant" hypothesis in that we are not sure whether stock price movements reflect fundamentals or not. In the second case they can be dangerously misleading. Market capitalization is also important here. The "financing" hypothesis says that when we have stock prices higher than the replacement cost of capital, businessmen tend to expand their investments in new physical capital. This theory is most likely to find application in developed financial markets. Finally, we have the "stock market pressure on managers" hypothesis, suggesting that changes in stock prices can affect investment even if they do not convey information or change financial costs. This implies that a stronger relationship between stock returns and output growth exists in countries that managers are less protected by their shareholders.

II. ii: The relationship between stock returns' volatility and macroeconomic, or growth volatility.

Apart from the work of Schwert (1989) we talked above in I.iii., **Dellas and Hess (2005)**, speculate the relationship between stock returns and the financial system, concluding that it can be either direct or indirect. The scenario of direct relationship refers mainly to the monitoring of managers and exertion of corporate control, but to liquidity as well. The more efficient the monitoring and the exertion of corporate control are, the less riskier any project is. This also means that the firm's stock becomes less volatile. But when it comes to liquidity, too low or too much of it, can cause trouble. We are not going to discuss thoroughly that lack of liquidity prevents any market from absorbing shocks because we referred to it above. However we will report that **Levine and Zervos (1998)** showed that liberalizations and increased liquidity tend to make a market vulnerable to shocks.

On the other hand, the indirect relationship separates in two ways in which financial development affects stock returns; through macroeconomic volatility and through production and trade structure. At first, any financial development tends to affect macroeconomic volatility not only by giving the chance to a market to absorb a crisis more efficiently **(Aghion et al. 1990)**, but also by managing more effectively asymmetric information that lower the credibility of the market **(Bernanke and Gertler 1990, Greenwald and Stiglitz 1993, Kiyotaki and Moore 1997, Bacchetta and Caminal 2000, Beck et al. 2001)**. Second comes the trade structure, in which advanced countries trade more than developing ones, thus becoming more open to international interdependence and financial uncertainty (increased volatility and stock return volatility). Last but not least, the production structure of a country must be capable of diversifying any risk that may be generated domestically. Otherwise the economy goes backwards and financial development is in danger. To sum up, financial development probably has a negative effect on stock market volatility.

But contrary to the above, **Rose and Spiegel (2009)**, found that proximity to financial centers has a positive correlation, and often statistically significant, with macroeconomic volatility. This means that counties that are close to international financial centers experience less volatile growth rates and stock returns and are more financially integrated than countries that are away from them.

In addition, absence of volatility spillovers may lead to the conclusion that the major factor of disturbance is changes in asset- or market-specific fundamentals and that one large shock will increase the volatility in that specific asset or market. On the contrary, existence of volatility spillover leads to the fact that one large shock increases volatilities not only in its own market or asset but also in other markets or assets as well.

II. iii: Empirical research background

Last, but not least, we should add that for the macroeconomic series, the Causality in Variance Tests Cheung & Ng and Hong, exhibit a relatively good empirical performance, without however taking into consideration an important property of volatility, the long memory. On the other hand, these statistics exhibit a good empirical performance for the financial series without however taking into consideration the long memory in volatility **(Sakkas 2009)**.

CHAPTER III: Data analysis

This section is briefly describing the data we collected. We used the application of datastream and found data on a monthly basis for 38 countries, concerning their equity index, consumer price index and industrial production index, as indicators of their growth. The breadth of the countries consists of the G7 countries and a lot of emerging and advanced markets from Europe, Asia, America, Africa and Oceania. In the tables (III.i and III.ii) below we will see an analytical view of our data and the time period for each country. But before that, we must explain that we took the datastream index for each country's equity index, so that we have a common point of reference between the countries.

Datastream calculates its own aggregate sector and market price indices, together with associated aggregations such as sector price/earnings ratio (PE) and dividend yield (DY).

Sector and market aggregations are weighted by market value and are calculated using a representative list of shares.

The index is calculated as follows:

I_0 = index value at base date = 100

$$I_t = I_{t-1} * \frac{\sum_{1}^{n}(P_t * N_t)}{\sum_{1}^{n}(P_{t-1} * N_t * f)}$$

Where:

I_t = index value at day t

I_{t-1} = index value on previous working day (of t)

P_t = unadjusted share price on day t

P_{t-1} = unadjusted share price on previous working day (of t)

N_t = number of shares in issue on day t

f = adjustment factor for a capital action occurring on day t

n = number of constituents in index

The summations are performed on the constituents as they exist on day t.

Source Table III. i : Equity index and industrial production sources for our data

COUNTRY	EQUITY INDEX SOURCE	DS mnemonic	INDUSTRIAL PRODUCTION SOURCE	DS mnemonic
Argentina	Datastream	TOTMKAR	FIEL	AGIPTOT.G
Austria	Datastream	TOTMKOE	STATISTICS AUSTRIA	OEIPTOT.H
Belgium	Datastream	TOTMKBG	INSTITUT NATIONAL DE STATISTIQUE	BGIPTOT.H
Brazil	Datastream	TOTMKBR	IBGE	BRIPTOT.G
Bulgaria	Datastream	TOTMKBL	NATIONAL STATISTICAL INSTITUTE (BULGARIA)	BLIPTOT.H
Canada	Datastream	TOTMKCN	CANSIM - STATISTICS CANADA	CNIPTOT.D
Chile	Datastream	TOTMKCL	BANCO CENTRAL DE CHILE	CLIPTOT.G
China	Datastream	TOTMKCH	NATIONAL BUREAU OF STATISTICS, CHINA	CHIPTOT.H
Colombia	Datastream	TOTMKCB	BANCO DE LA REPUBLICA	CBIPTOT.H
Cyprus	Datastream	TOTMKCP	CYPRUS, STATISTICAL SERVICES	CPIPTOT.H
Czech Republic	Datastream	TOTMKCZ	CZECH. STATISTICS OFFICE	CZIPTOT.G
Denmark	Datastream	TOTMKDK	DANMARKS STATISTIK	DKIPTOT.G
Finland	Datastream	TOTMKFN	STATISTICS FINLAND	FNIPTOT.G
France	Datastream	TOTMKFR	I.N.S.E.E.	FRIPTOT.G
Germany	Datastream	TOTMKBD	DEUTSCHE BUNDESBANK	BDIPTOT.G
Greece	Datastream	TOTMKGR	NATIONAL STATISTICAL SERVICE OF GREECE	GRIPTOT.H
Hungary	Datastream	TOTMKHN	HUNGARIAN CENTRAL STATISTICAL OFFICE (HCSO)	HNIPTOT.G
India	Datastream	TOTMKIN	Central Statistical Organisation, India	INIPTOT.H
Indonesia	Datastream	TOTMKID	BADAN PUSAT STATISTIK	IDIPTOT.H
Ireland	Datastream	TOTMKIR	CENTRAL STATISTICS OFFICE, IRELAND	IRIPTOT.G
Italy	Datastream	TOTMKIT	ISTITUTO NAZIONALE DI STATISTICA	ITIPTOT.G
Japan	Datastream	TOTMKJP	Ministry of Economy, Trade & Industry, Japan	JPIPTOT.G
Luxembourg	Datastream	TOTMKLX	STATEC	LXIPTOT.H
Malaysia	Datastream	TOTMKMY	DEPARTMENT OF STATISTICS, MALAYSIA	MYIPTOT.H
Mexico	Datastream	TOTMKMX	INEGI	MXIPTOT.G
Netherlands	Datastream	TOTMKNL	CENTRAAL BUREAU VOOR DE STATISTIEK	NLIPTOT.G
Norway	Datastream	TOTMKNW	STATISTICS NORWAY	NWIPTOT.G
Peru	Datastream	TOTMKPE	APOYO S.A.	PEIPTOT.H
Portugal	Datastream	TOTMKPT	NATIONAL STATISTICS OFFICE	PTIPTOT.H
Russia	Datastream	TOTMKRS	WIIW	RSIPTOT.H
Slovenja	Datastream	TOTMKSJ	STATISTICAL OFFICE OF RS	SJIPTOT.H
South Korea	Datastream	TOTMKKO	NATIONAL STATISTICAL OFFICE	KOIPTOT.G
Spain	Datastream	TOTMKES	MINISTERIO DE ECONOMIA Y HACIENDA	ESIPTOT.G
Sweden	Datastream	TOTMKSD	STATISTICS SWEDEN	SDIPTOT.G
Taiwan	Datastream	TOTMKTA	MOEA (MINISTRY OF ECONOMIC AFFAIRS)	TWIPTOT.G
Turkey	Datastream	TOTMKTK	State Institute of Statistics, Turkey	TKIPTOT.H
United Kingdom	Datastream	TOTMKUK	OFFICE FOR NATIONAL STATISTICS	UKIPTOT.G
United States	Datastream	TOTMKUS	FEDERAL RESERVE	USIPTOT.G

Source Table III. ii: Consumer price index source and time period of data for each country

COUNTRY	CPI SOURCE	DS mnemonic	TIME PERIOD
Argentina	INDEC	AGCONPRCF	Feb '88 – Feb '09
Austria	STATISTICS AUSTRIA	OECONPRCF	Feb '00 – Feb '09
Belgium	INSTITUT NATIONAL DE STATISTIQUE	BGCONPRCF	Feb '73 - Feb '09
Brazil	IBGE	BRCONPRCF	Aug '94 - Mar '09
Bulgaria	NATIONAL STATISTICAL INSTITUTE (BULGARIA)	BLCONPRCF	Nov '00 - Mar '09
Canada	CANSIM - STATISTICS CANADA	CNCONPRCE	Feb '97 – Feb '09
Chile	Instituto Nacional de Estadisticas, Chile	CLCONPRCF	Jan '91 - Mar '09
China	NATIONAL BUREAU OF STATISTICS, CHINA	CHCONPRCF	Oct '91 - Apr '09
Colombia	Dane (National Department of Statistics)	CBCONPRCF	Feb '92 - Feb '09
Cyprus	CYPRUS, STATISTICAL SERVICES	CPCONPRCF	Feb '99 - Jan '09
Czech Republic	CZECH. NATIONAL BANK	CZCONPRCF	Feb '00 - Dec '08
Denmark	DANMARKS STATISTIK	DKCONPRCF	Feb '85 - Mar '09
Finland	Thomson Financial & National Source	FNCONPRCF	Feb '05 - Mar '09
France	I.N.S.E.E.	FRCONPRCE	Feb '90 - Mar '09
Germany	DEUTSCHE BUNDESBANK	BDCONPRCE	Feb '73 - Mar '09
Greece	NATIONAL STATISTICAL SERVICE OF GREECE	GRCONPRCF	Feb '00 - Mar '09
Hungary	Main Economic Indicators, Copyright OECD	HNCONPRCF	Feb '93 - Feb '09
India	Thomson Financial & National Source	INCONPRCF	May '94 - Feb '09
Indonesia	BADAN PUSAT STATISTIK	IDCONPRCF	Feb '96 - Feb '09
Ireland	CENTRAL STATISTICS OFFICE, IRELAND	IRCONPRCF	Feb '80 - Feb '09
Italy	ISTITUTO NAZIONALE DI STATISTICA	ITCONPRCF	Feb '73 - Mar '09
Japan	STATISTICS BUREAU OF MIC	JPCONPRCE	Feb '85 - Mar '09
Luxembourg	STATEC	LXCONPRCF	Feb '96 - Feb '09
Malaysia	DEPARTMENT OF STATISTICS, MALAYSIA	MYCONPRCF	Feb '90 - Mar '09
Mexico	BANCO DE MEXICO	MXCONPRCF	Feb '03 - Feb '09
Netherlands	CENTRAAL BUREAU VOOR DE STATISTIEK	NLCONPRCF	Feb '73 - Feb '09
Norway	Thomson Financial & National Source	NWCONPRCE	Feb '90 - Mar '09
Peru	INEI	PECONPRCF	Feb '94 - Feb '09
Portugal	NATIONAL STATISTICS OFFICE	PTCONPRCF	Feb '00 - Mar '09
Russia	STATE STATISTICAL OFFICE (RUSSIA)	RSCONPRCF	Aug '94 - Mar '09
Slovenja	STATISTICAL OFFICE OF RS	SJCONPRCF	Feb '99 - Feb '09
South Korea	NATIONAL STATISTICAL OFFICE	KOCONPRCF	Oct '87 - Mar '09
Spain	INSTITUTO NACIONAL DE ESTADISTICA (INE)	ESCONPRCF	Apr '87 - Mar '09
Sweden	STATISTICS SWEDEN	SWCONPRCF	Feb '00 - Mar '09
Taiwan	DGBAS	TWCONPRCF	Feb '96 - Mar '09
Turkey	State Institute of Statistics, Turkey	TKCONPRCF	Feb '88 - Mar '09
United Kingdom	OFFICE FOR NATIONAL STATISTICS	UKCONPRCF	Feb '88 – Feb '09
United States	Bureau of Labor Statistics (US Dollar)	USCONPRCE	Feb '73 – Mar '09

CHAPTER IV: Methodology

IV. i: Cheung & Ng's Cross – Correlation Function

For our methodology we will use the **Cheung & Ng (1996)** and **Hong (2001)** methodology. The Cheung and Ng methodology, develops a test for causality in variance. We must stress that this procedure had been previously developed by Haugh (1976) and McLeod and Li (1983):

1. estimate univariate time-series models that allows for time variation in conditional mean and conditional variance

2. construct the resulting series of squared residuals standardized by conditional variance. We, then, use the **CCF (cross-correlation function)** of squared standardized residuals, in order to test the null hypothesis that there is no causality in variance. Cheung and Ng in their first step, used univariate ARMA models to result for their squared standardized innovations. In their second step, they estimated the CCF and searched for significance through the cross-correlation coefficients, in order to detect any possible volatility spillovers between the two time series studied. Furthermore, they tested the effect of causality in mean, if there is any, by using the standardized residuals, not their squares, as data for the CCF, on tests for causality in variance and the interaction between the tests for causality in mean and variance. It is important to stress here that any causation in mean does not necessarily assume causation in variance and vice versa.

The causation in the second moment can be analyzed as a following of the Granger causality in mean (Granger, Robins and Engle 1986). Let's consider two stationary and egordic time series, X_t and Y_t. Let I_t and J_t be two information sets defined by $I_t = \{X_{t-j}, j \geq 0\}$ and $J_t = \{X_{t-j}, Y_{t-j} \geq 0\}$. Y_t is said to cause X_{t+1} in variance if $E\{(X_{t+1} - \mu_{x,t+1})^2 \,|\, I_t\} \neq E\{(X_{t+1} - \mu_{x,t+1})^2 \,|\, J_t\}$, where $\mu_{x,t+1}$ is the mean of X_{t+1} conditioned on I_t. Feedback in variance occurs if X causes Y and Y causes X. There is instant causality in variance if $E\{(X_{t+1} - \mu_{x,t+1})^2 \,|\, J_t\} \neq E\{(X_{t+1} - \mu_{x,t+1})^2 \,|\, J_t + Y_{t+1}\}$.

As happens with the case of causality in mean, the concepts we defined in are general enough, so as not to be empirically testable. So we have to add further structure to make the general causality concept capable of practical use. For that we suppose $X_t = \mu_{x,t+1} + h_{x,t}^{0.5}\varepsilon_t$ and $Y_t = \mu_{y,t+1} + h_{x,t}^{0.5}\zeta_t$, where $\{\varepsilon_t\}$ and $\{\zeta_t\}$ are two independent white noise processes with mean that equals zero and variance that equals one. Their conditional means and variances are $\mu_{z,t} = \sum_{i=1}^{\infty}\Phi_{z,i}(\theta_{z,\mu})Z_{t-1}$, and $h_{z,t} = \phi_{z,0} + \sum_{i=1}^{\infty}\Phi_{z,i}(\theta_{z,h})\{(Z_{t-i} - \mu_{t-i})^2 - \phi_{z,0}\}$, respectively, where $\theta_{z,w}$ is a $p_{z,w}x1$ parameter vector; $W = \mu, h; \phi_{z,i}(\theta_{z,\mu})$ and $\phi_{z,i}(\theta_{z,h})$ are uniquely defined functions of $\theta_{z,\mu}$ and $\theta_{z,h}$ and $Z = X, Y$. Equation $\mu_{z,t} = \sum_{i=1}^{\infty}\Phi_{z,i}(\theta_{z,\mu})Z_{t-1}$ includes the time-series models as the common ARMA model equation $h_{z,t} = \phi_{z,0} + \sum_{i=1}^{\infty}\Phi_{z,i}(\theta_{z,h})\{(Z_{t-i} - \mu_{t-i})^2 - \phi_{z,0}\}$ represents the GARCH (generalized autoregressive conditional heteroskedastic) process (Robinson 1991). Estimation of these models help us obtain the squared standardized residuals.

Now, let U_t and V_t be the squares of standardized innovations, defined by

- $U_t = ((X_t - \mu_{x,t})^2 / h_{x,t}) = \varepsilon_t^2$,
- $V_t = ((Y_t - \mu_{y,t})^2 / h_{y,t}) = \zeta_t^2$;

and let $r_{uv}(k)$ be the sample cross-correlation at lag k, $r_{uv}(k) = c_{uv}(k)(c_{uu}(0)c_{vv}(0))^{-1/2}$, where $c_{uv}(k)$ is the k[th] lag sample cross covariance given by $c_{uv}(k) = T^{-1}\sum(U_t - \overline{U})(V_{t-k} - \overline{V})$, $k = 0, \pm1, \pm2, \ldots$, and $cuv(0)$ and $cvv(0)$ are the sample variances of U and V respectively, and since $\{U_t\}$ and $\{V_t\}$ are independent, their second moments' existence implies (Hannan 1970):

$$\begin{pmatrix} \sqrt{T}r_{uv}(k) \\ \sqrt{T}r_{uv}(k') \end{pmatrix} \sim AN\left[\begin{matrix} 0 \\ 0 \end{matrix}\right], \begin{pmatrix} 1 & 0 \\ 1 & 0 \end{pmatrix}, k \neq k'$$

So, as it happens with the test for causality in mean (Haugh 1976, Pierce and Haugh 1977), the CCF of squared standardized residuals can be useful in detecting causal relations and in identifying patterns of causation in the second moment. It is to our interest, that the CCF has certain advantages over some possible alternative tests in utility, as far as causality in variance is concerned. The CCF test is much more useful when the number of series in our investigation is large, and we expect long lags in the causation pattern. In addition, this test has a well-defined asymptomatic distribution and is asymptomatically robust to distributional assumptions.

But the CCF test, similar to the test of causality in mean, has some certain limitations. One of these, is that the CCF model is not designed to detect causation patterns that yield to zero cross-correlations. In spite of that, the appealing features of the approach make it very useful in practice. The sample residual cross-correlation has double usefulness:

1. It provides information on the interaction between time-series data and
2. helps construct a more complex multivariate model (Parzen 1969, Pierce 1977).

Since both U_t and V_t are unobservable, we have to use their estimators to test the hypothesis of no causality in variance. We use the cross-correlation coefficient $\hat{r}_{uv}(k)$ which is constructed from the consistent estimates of the conditional means and variances of X_t and Y_t in place of $r_{uv}(k)$. So $\hat{\theta} \equiv \{\hat{\theta}_{z,\mu}, \hat{\theta}_{z,h}, \hat{\phi}_{z,o}\}$ is the consistent estimator of the true parameter vector $\theta_z^0 \equiv \{\theta_{z,\mu}^0, \theta_{z,h}^0, \phi_{z,0}^0\}; Z = X, Y; \theta^0 = (\hat{\theta}_x^0, \hat{\theta}_y^0)$ and $\theta = (\theta_x, \theta_y)$. Then we define $\hat{r}_{uv}(k) = r_{uv}(k)\big|_{\theta=\hat{\theta}}$. The sample cross-covariance $\hat{c}_{uv}(k)$ and the sample variances $\hat{c}_{uu}(0)$ and $\hat{c}_{vv}(0)$ are defined in a similar way.

Taking into account the asymptomatic behaviour of $\hat{r}_{uv}(k)$, the null hypothesis of no causality could be tested by constructing a normal test statistic or a chi-square test statistic. In order to test for a causal relationship at a specific lag k, we have to compare $\sqrt{\mathrm{T}}(r_{uv}(k)$ with the standard normal distribution.

Otherwise, a chi-square test statistic, which is defined as $S = T\sum_{i=j}^{k}\hat{r}_{uv}(i)^2$, which has a chi-square distribution with (k - j + 1) degrees of freedom, can be used to test the hypothesis of no causality from lag *j* to lag *k*.

Any choice of *j* and *k*, depends on the specification of alternative hypotheses. When there is no existing information on the direction of causality, we may have to set *– j = k = m*. Parameter m should be large enough to include the largest nonzero lag that may appear in the pattern. But when a uni-directional causality pattern, for example, Y_t, does not cause X_t, is considered, we set *j = 1* and *k = m*.

The time-series model we talked about in the first stage should account for serial autocorrelation in the data with accuracy. The fitted model's adequacy and accuracy in explaining serial correlation in the first and second moments can be statistically determined by the Box-Pierce portamanteau statistics calculated from standardized residuals and their squares (Box and Jenkins 1976, McLeod and Li 1983). Now, third, suppose that the sample size of T is small. Then the chi-square statistic S can be changed to $S_M = T\sum_{i=j}^{k}\omega_i\hat{r}_{uv}(i)^2$ in order to attain a more accurate small-sample approximation of the χ^2 distribution, where $\omega_i = T/(T-|i|)$ or $(T+2)/(T-|i|)$ (Haugh 1976, McLeod and Li 1983). We must always have $S_M > S$.

Fourth, the statistic $S^* = T\sum_{k=-m}^{m-j}\left[\sum_{i=0}^{j}\hat{r}_{uv}(k+i)\right]^2$, $i = 0,1,2,...,m-1$, suggested by Koch and Yang (1986), can be used to detect certain cross-correlation patterns.

The CCF test may be affected because the existence of causality in mean violates the independence assumption. The model specification is the one that defines whether the causality in mean (variance) has any potential effect on the test for causality in variance (mean). Let's take a GARCH model for example. The conditional variance is driven by the squared innovations and as the causality in mean is associated with causality in the innovation term, it is likely that the former can have an effect on the size of the causality-in-variance test. However, its conditional mean does not necessarily depend on the second moment of the process. That is why the causality in variance may have a possible, though smaller, effect on the causality-in-mean test. On the other hand, the conditional mean of a GARCH-in-mean model is a function of the conditional variance. According to this scenario the causality in variance is likely to have a potential larger impact on the causality-in-mean test.

IV.ii: Hong's non – uniform weighting methodology

The Cheung & Ng test is a uniform weighting test because it gives equal weighting to each lag. **Yongmiao Hong (2001)**, proposed a class of asymptotic N(0,1) tests for volatility spillover between two time series that have conditional heteroskedasticity and may have infinite unconditional variances. These tests are based on a weighted sum of squared sample cross-correlations between two squared standardized residuals. Hong used all the sample cross-correlations and introduced a flexible weighting scheme for the sample cross-correlation at each lag. Typically, and opposed to Cheung and Ng's test, larger weights are given to lower order lags. But non-uniform weighting is expected to give more power against the alternatives whose cross-correlations decay to zero as the lag order increases.

Modeling two stationary time-series $\{Y_{1t}, Y_{2t}\}_{t=-\infty}^{\infty}$, causes our interest in their cross-dependence patterns, especially in various Granger causalities (Granger 1969, 1980). The Hong methodology focuses on Grager causalities between time-varying conditional variances of Y_{1t} and Y_{2t}, who may not exhibit unconditional variances. Now let us make a brief review of the concept of Granger causality, in order to help ourselves state the hypothesis. Let $I_{it}, i = 1, 2$, be the information set of time-series $\{Y_{1t}\}$ available at period *t*, and let $I_t = (I_{1t}, I_{2t})$. As Granger defines (1980), Y_{2t} is said to Granger-cause Y_{1t} with respect to I_{t-1} if $\Pr(Y_{1t} | I_{1t-1}) \neq \Pr(Y_{1t} | I_{t-1})$. Granger (1980) characterizes this equation as too general to be operational. A less general but more easily testable definition, in practice, is that Y_{2t} Granger-causes Y_{1t} in mean with respect to I_{t-1} if $E(Y_{1t} | I_{1t-1}) \neq E(Y_{1t} | I_{t-1}) \equiv \mu_{1t}^{0}$. Granger (1969) proposed a convenient regression-based test by assuming conditional heteroskedasticity for both Y_{1t} and Y_{2t}.

Granger also stated that it is natural to define the **"causality in variance"** as well, which can be tested as

$$H_0 : E\{(Y_{1t} - \mu_{1t}^{0})^2 | I_{1t-1}\} = E\{(Y_{1t} - \mu_{1t}^{0})^2 | I_{t-1}\} \equiv Var(Y_{1t} | I_{t-1})$$

versus the alternative hypothesis

$$H_A : E\{(Y_{1t} - \mu_{1t}^{0})^2 | I_{1t-1}\} \neq Var(Y_{1t} | I_{t-1}) .$$

Note that $E\{(Y_{1t}-\mu_{1t}^0)^2 \left| I_{1t-1}\right\} \neq Var(Y_{1t} \left| I_{t-1}\right.)$ because $\mu_{1t}^0 \neq E(Y_{1t} \left| I_{1t-1}\right.)$ in general, but we can write H_0 versus H_A equivalently as

$H_0 : E\{Var(Y_{1t} \left| I_{t-1}\right.) \left| I_{1t-1}\right. = Var(Y_{1t} \left| I_{t-1}\right.)$ versus $H_A : E\{Var(Y_{1t} \left| I_{t-1}\right.) \left| I_{1t-1}\right. \neq Var(Y_{1t} \left| I_{t-1}\right.)$.

We say that Y_{2t} Granger-cause Y_{1t} in variance with respect to I_{t-1} if H_0 holds, and Y_{2t} Granger-causes Y_{1t} in variance with respect to I_{t-1} if H_A holds. Feedback in variance occurs if Y_{1t} Granger-causes Y_{2t} in variance with respect to I_{t-1} and Y_{2t} Granger-causes Y_{1t} in variance with respect to I_{t-1}. There exists simultaneous causality in variance if $E\{(Y_{1t}-\mu_{1t}^0)^2 \left| I_{1t-1}\right\} \neq E\{(Y_{1t}-\mu_{1t}^0)^2 \left| I_{1t-1}, I_{2t}\right\}$. Note that causality in mean, if any, has been filtered out in defining H_0. This ensures that existence of causality in mean will not affect causality in variance.

As said before, no causality in mean and variance necessarily implies no general causality, but if causation is found in mean or variance , then the general causation has been found. From an econometric view, detecting causality in variance is very important when the test for causality in mean fails to reject the null hypothesis, due to the possibility that the general causality exists but there is no causality in mean. As far as finances and macroeconomics are concerned, causality in variance has its own interest, as it is directly related to volatility spillover across different assets or markets.

As the Hong methodology continues, we propose a test for H_0. Consider the disturbance processes $\varepsilon_{it} = Y_{it} - \mu_{it}^0, \quad i = 1, 2,$ where $\mu_{it}^0 = E(Y_{it} \left| I_{t-1}\right.)$. To test H_0, we specify $\varepsilon_{it} = \xi_{it}(h_{it}^0)^{1/2}$, where h_{it}^0 is a positive time-varying measurable function with respect to I_{it-1}, and $\{\xi_{it}\}$ is an innovation process with $E(\xi_{it} \left| I_{it-1}\right.) = 0$ and $E(\xi_{it}^2 \left| I_{it-1}\right.) = 1$. By construction, $E(\varepsilon_{it} \left| I_{it-1}\right.) = 0$ and $E(\varepsilon_{it}^2 \left| I_{it-1}\right.) = h_{it}^0$ is the univariate conditional variance of ε_{it}^2. In addition, because $E(\varepsilon_{it} \left| I_{it-1}\right.) = 0$ it follows that $E(\xi_{it} \left| I_{t-1}\right.) = 0$. This implies that neither ξ_{2t} Granger causes ξ_{1t} in mean with respect to I_{t-1} nor ξ_{1t} Granger-causes ξ_{2t} in mean with respect to I_{t-1}.

Now, the hypotheses contradiction can be written as $H_0 : Var(\xi_{it} \left| I_{1t-1}\right.) = Var(\xi_{1t} \left| I_{t-1}\right.)$ versus $H_A : Var(\xi_{it} \left| I_{1t-1}\right.) \neq Var(\xi_{1t} \left| I_{t-1}\right.)$. Thus, we can test H_0 by checking if ξ_{2t} Granger-cause ξ_{1t} in variance with respect I_{t-1}.

Although the squared innovations $\{\xi_{it}^2\}$ are unobservable, they can be estimated by using squared residuals standardized by their conditional variance estimators, respectively. So, we assume that the conditional mean is $\mu_{it}^0 = \mu_{it}(b_i^0)$, $i = 1, 2,$ for some finite dimensional parameter vector b_i^0, and the conditional variance h_{it}^0 follows a GARCH (p,q) process (Bollersev 1986)

$h_{it}^0 = \omega_i^0 + \sum_{j=1}^{q} a_{ij}^0 \varepsilon_{it-j}^2 + \sum_{j=1}^{q} \beta_{ij}^0 h_{it-j}^0$, where $\omega_i^0 > 0$ and a_{ij}^0 and β_{ij}^0 satisfy appropriate conditions to ensure the strict positivity of h_{it}^0 (Drost and Nijman 1993, Nelson and Cao 1992).

According to the vector stochastic process $\{Y_t\}_{t=1}^T$, where $Y_t = (Y_{1t,} Y_{2t})'$, $\hat{\theta}_i = (\hat{b}_i', \hat{\omega}_i, \hat{a}_i', \hat{\beta}_i')'$ is any $\sqrt{T}$-consistent estimator for $\theta_i^0 = (b_i^{0'}, \omega_i^0, a_i^{0'}, \beta_i^{0'})$, where $a_i^0 = (a_{1i}^o, ..., a_{qi}^0)'$ and $\beta_i^0 = (\beta_{1i}^0, ..., \beta_{pi}^0)'$. As an example, we permit $\hat{\theta}_i$ to be a quasi-maximum likelihood estimator (QMLE) of θ_i^0 (Bollersev and Wooldridge 1992, Lee and Hansen 1994, Lumsdaine 1996). Then we obtain the centered standardized residuals $\hat{u}_t \equiv u_t(\hat{\theta}_1) = \hat{\varepsilon}_{1t}^2 / \hat{h}_{1t} - 1$ and $\hat{u}_t \equiv u_t(\hat{\theta}_2) = \hat{\varepsilon}_{2t}^2 / \hat{h}_{2t} - 1$, where $\hat{\varepsilon}_{it} \equiv \varepsilon_{it}(\hat{\theta}_i)$, and $\hat{h}_{it} \equiv h_{it}(\hat{\theta}_i)$. $\varepsilon_{it}(\hat{\theta}_i)$ is the estimator of $\varepsilon_{it}(\theta_i) = Y_{it} - \mu_{it}(b_i)$, where $h_{it}(\theta_i) = \omega_i + \sum_{j=1}^{q} a_{ij} \varepsilon_{it-j}^2(\theta_i) + \sum_{j=1}^{p} \beta_{ij} h_{it-j}(\theta_i)$. Then, we are going to use these residuals as input for the CCF test.

The CCF test that Cheung and Ng (1996) proposed between $\hat{u}_t$ and $\hat{v}_t$, is defined as $\hat{\rho}_{uv}(j) = \{\hat{C}_{uu}(0)\hat{C}_{vv}(0)\}^{1/2} \hat{C}_{uv}(j)$, where the sample cross-covariance function

$$\hat{C}_{uv}(j) = \begin{cases} T^{-1} \sum_{t=j+1}^{T} \hat{u}_t \hat{v}_{t-j}, \ j \geq 0, \\ T^{-1} \sum_{t=-j+1}^{T} \hat{u}_{t+j} \hat{v}_{t,} \ j < 0, \end{cases}$$

and $\hat{C}_{uu}(0) = T^{-1} \sum_{t=1}^{T} \hat{u}_t^2$ and $\hat{C}_{vv}(0) = T^{-1} \sum_{t=1}^{T} \hat{v}_t^2$.

Cheung and Ng's statistic is based on the sum of the first M squared cross-correlations $S = T\sum_{j=1}^{M}\hat{\rho}_{uv}^{2}(j)$, which is asymptotically χ_M^2 under H_0. Cheung and Ng also proposed a modified test statistic $S* = T\sum_{j=1}^{M}\omega_j\hat{\rho}_{uv}^{2}(j)$, where $\omega_j = T/(T-j)$ or $\omega_j = (T+2)/(T-j)$. The introduction of ω_j gives better match between the moments of $S*$ and χ_M^2, and is expected to have better sizes in small samples (Ljung and Box 1978), without affecting the asymptotic power.

The key factor of volatility clustering is that a "present" high volatility tends to be followed by another "tomorrow" high volatility, and a "present" low volatility tends to be followed by a low volatility "tomorrow". Recent past volatility often has greater impact on current volatility than distant past volatility. Generally, this property carries over to volatility spillover between two assets or markets; the current volatility of an asset or market is more affected by the recent volatility of the other asset or market than by the remote past volatility of that asset or market. But Hong introduces the idea that the volatility transmission between two variables gradually weakens as the time distance between them increases.

Taking this into account these considerations, a class of new tests is suggested based on a generalized version of Cheung and Ng (1996) statistic, $T\sum_{j=1}^{T-1}k^2(j/M)\hat{\rho}_{uv}^{2}(j)$, where $k(\bullet)$ is a weighting function and M is a positive integer. Examples of $k(\bullet)$ include the Truncated, Bartlett, Daniell, Parzen, Quadratic-spectral (QS) and Tukey-Hanning kernels:

- **Truncated:**

$$k(z) = \begin{cases} 1, |z| \le 1, \\ 0, otherwise, \end{cases}$$

- **Bartlett:**

$$k(z) = \begin{cases} 1-|z|, |z| \le 1, \\ 0, otherwise, \end{cases}$$

- **Daniell:**

$$k(z) = \sin(\pi z)/\pi z, -\infty < z < \infty,$$

- **Parzen:**

$$k(z)=\begin{cases}1-6z^2+6|z|^3, |z|\le 0.5\\ 2(1-|z|)^3, 0.5<|z|\le 1,\\ 0, \quad \textit{otherwise,}\end{cases}$$

- **Q-S:**

$$k(z)=\frac{3}{\sqrt{5}(\pi z)^2}\{\sin(\pi z)/\pi z-\cos(\pi z)\}, -\infty<z<\infty$$

- **Tukey-Hanning**

$$k(z)=\begin{cases}\frac{1}{2}(1+\cos(\pi z)), |z|\le 1,\\ 0, \textit{otherwise.}\end{cases}$$

Here the Truncated, Bartlett, Parzen and Tukey-Hanning have compact support, $k(z)=0$ for $|z|>1$.

Our test statistic is an appropriately standardized version:

$$Q_1=\left\{T\sum_{j=1}^{T-1}k^2(j/M)\hat{\rho}_{uv}^2(j)-C_{1T}(k)\right\}/\{2D_{1T}(k)\}^{1/2},$$

where:

- $$C_{1T}(k)=\sum_{j=1}^{T-1}(1-j/T)k^2(j/M),$$
  $$D_{1T}(k)=\sum_{j=1}^{T-1}(1-j/T)\{1-(j+1)/T\}k^4(j/M).$$

Both $C_{1T}(k)$ and $D_{1T}(k)$ are approximately the mean and variance of our statistic. The factors $(1-j/T)$ and $(1-j/T)\{1-(j+1)/T\}$ are finite sample corrections. They are asymptotically negligible, but they give better matches to the mean and variance respectively.

We can also consider a modified alternate version

$$Q_1*=\left\{T\sum_{j=1}^{T-1}(1-j/T)^{-1}k^2(j/M)\hat{\rho}_{uv}^2(j)-C*_{1T}(k)\right\}/\{2D*_{1T}(k)\}^{1/2},$$

where

- $$C*_{1T}(k)=\sum_{j=1}^{T-1}k^2(j/M),$$
  $$D*_{1T}(k)=\sum_{j=1}^{T-1}\{1-(T-j)^{-1}\}k^4(j/M).$$

CHAPTER V: Presentation and discussion of empirical results.

V. i. a: Presentation of empirical results

In this section we are going to present the results we gathered by running the Cheung & Ng's and Hong's methodology in the **Matlab application**. We tested **38 countries for causality in mean and volatility between monthly real stock returns (r) and industrial production growth rate (i).** The direction of the causality is defined "r_i" from returns to industrial production growth rate and "i_r" from industrial production growth rate to returns. Every causal relationship is either followed by the letter "m", stands for "mean", or the letter "v", stands for "volatility". These symbolisms are always accompanied with an abbreviation code for each country, for example "AR" for Argentina (Table V.i).

We use real stock returns as the logarithm differences of stock indices, after we have divided every stock index observation with its monthly CPI index, for each country. As an output growth rate we use the logarithm differences of industrial production index.

For the Cheung and Ng's causality test we present the r-statistic and the S-statistics. For the Hong's test we present the Q-S kernel function, the Bartlett kernel function and the Truncated kernel function (for the kernel functions of Daniell, Parzen and Tukey-Hanning see Appendix).

Table V.i: Countries and abbreviations

COUNTRY	ABBREVIATION	COUNTRY	ABBREVIATION
Argentina	AR	Ireland	IR
Austria	OE	Italy	IT
Belgium	BG	Japan	JP
Brazil	BR	Luxembourg	LX
Bulgaria	BL	Malaysia	MY
Canada	CN	Mexico	MX
Chile	CL	Netherlands	NL
China	CH	Norway	NW
Colombia	CB	Peru	PE
Cyprus	CP	Portugal	PT
Czech Republic	CZ	Russia	RS
Denmark	DK	Slovenja	SJ
Finland	FN	South Korea	KO
France	FR	Spain	ES
Germany	BD	Sweden	SW
Greece	GR	Taiwan	TW
Hungary	HN	Turkey	TK
India	IN	United Kingdom	UK
Indonesia	ID	United States	US

According to the Cheung & Ng r-statistic and S-statistic results, **Argentina** presents causality from real stock returns to industrial production growth rate in mean and volatility, and from industrial production to real stock returns in volatility. The r-statistics, the S-statistics and their significance are high in all cases (Tables 1.1 and 1.2).

Table 1.1: Cheung & Ng's r- statistic for Argentina

CausalityTest of Cheung & Ng ARGENTINA				
Lags	**$rAR_{r\_i,m}$**	**$rAR_{i\_r,m}$**	**$rAR_{r\_i,v}$**	**$rAR_{i\_r,v}$**
1	2,558546**	0,460	-0,577	2,3975556**
2	0,627	0,324	1,581	-0,795
3	2,4244297**	1,426	0,641	-0,316
4	0,228	0,003	1,559	1,448
5	1,064	-0,635	0,517	-0,230
6	2,1620806**	0,630	0,718	0,659
7	0,077	0,098	2,3894341**	-0,238
8	-0,072	0,276	-0,934	-0,710
9	-1,598	-0,069	0,602	-0,822
10	2,6298506***	-0,300	-0,860	-0,081
11	-0,480	-0,690	0,148	0,434
12	0,350	1,211	-1,097	-1,097
13	-0,572	-0,118	0,829	0,174
14	-0,642	-1,612	3,6501939***	0,652
15	0,826	-0,293	-0,171	0,611
16	-1,007	1,619	1,305	0,179
17	-0,676	0,570	0,186	-0,155
18	-2,2446518**	-1,340	0,605	0,161
19	0,127	0,244	-0,292	-0,905
20	2,2713597**	-0,283	0,010	1,164
21	-1,522	-0,851	1,320	0,571
22	-1,387	-0,776	-1,269	0,797
23	-0,814	-1,072	0,885	0,753
24	-0,301	-0,147	-0,400	0,772
25	0,779	-0,944	-1,371	0,142
26	0,199	-0,904	-1,355	-0,641
27	0,581	-0,676	-0,131	0,340
28	-0,906	-0,669	0,365	-0,082
29	0,565	0,702	-0,052	-0,145
30	0,760	-0,128	1,6410773*	0,205

Note 1: The "r" at the beginning stands for Cheung and Ng's r- statistic. The subscript "r_i" defines the causality direction from returns to industrial production growth rate and the subscript "i_r" from industrial production growth rate to returns respectively. The letter "m"in the subscript stands for "mean", and the letter "v" stands for "volatility". These symbolisms are always accompanied with an abbreviation code for each country (see Table V.i). Ho: no causality in mean and in variance, H_1: causality in mean and variance. '*'indicates significance at the 10% level, '**' indicates significance at the 5% level, '***' indicates significance at the 1% level.

Table 1.2: Cheung & Ng's S- statistic for Argentina

Statistics Cheung&Ng	ARGENTINA
SARr_i,m	95,584***
SARi_r,m	-62,674251
SARr_i,v	159,05***
SARi_r,v	79,896***

Note 2: The "S" at the beginning stands for Cheung and Ng's r- statistic. The subscript "r_i" defines the causality direction from returns to industrial production growth rate and the subscript "i_r" from industrial production growth rate to returns respectively. The letter "m"in the subscript stands for "mean", and the letter "v" stands for "volatility". These symbolisms are always accompanied with an abbreviation code for each country (see Table V.i). Ho: no causality in mean and in variance, H_1: causality in mean and variance. '*'indicates significance at the 10% level, '**' indicates significance at the 5% level, '***' indicates significance at the 1% level.

The results of kernel functions of the Hong test in mean (Table 1.3) and volatility (Table 1.4), are compatible with those of Cheung & Ng. Moreover, the bandwidths are defined more precisely.

Table 1.3: Causality test of Hong in mean for Argentina, Kernel functions: Q-S (Quadratic), Bartlett and Truncated.

Causality Test of Hong						
PANEL A mean						
Bandwidth	QuadraticARr_i	BartlettARr_i	TruncatedARr_i	QuadraticARi_r	BartlettARi_r	TruncatedARi_r
1	3,9559475***	NaN	3,9479349***	-0,591	NaN	-0,558
2	3,8410149***	3,9479349***	2,4951669***	-0,654	-0,558	-0,842
3	3,7223025***	3,7275502***	4,0574892***	-0,706	-0,694	-0,258
4	3,7813633***	3,7710844***	3,1873188***	-0,657	-0,687	-0,576
5	3,8084725***	3,8626216***	2,90551***	-0,659	-0,656	-0,701
6	3,7967792***	3,8629651***	3,7423984***	-0,700	-0,658	-0,811
7	3,7535498***	3,8720229***	3,2087757***	-0,769	-0,679	-1,014
8	3,735478***	3,8914359***	2,7618964***	-0,856	-0,714	-1,178
9	3,7570312***	3,8840704***	2,9922919***	-0,953	-0,761	-1,344
10	3,7914132***	3,8618037***	4,2084279***	-1,047	-0,815	-1,477
11	3,8102581***	3,8625474***	3,8617319***	-1,124	-0,876	-1,517
12	3,8068311***	3,8878191***	3,5304785***	-1,183	-0,937	-1,347
13	3,7897331***	3,9154145***	3,27325***	-1,224	-0,994	-1,486
14	3,7690162***	3,9361612***	3,0567088***	-1,249	-1,046	-1,112
15	3,7508855***	3,9472857***	2,9102463***	-1,264	-1,090	-1,238
16	3,7389725***	3,9489732***	2,8376168***	-1,271	-1,126	-0,892
17	3,7348986***	3,9429798***	2,6736928***	-1,271	-1,154	-0,975
18	3,737633***	3,9305313***	3,3166027***	-1,268	-1,173	-0,799
19	3,7444926***	3,917151***	3,0809468***	-1,262	-1,187	-0,926
20	3,7525367***	3,9056389***	3,709422***	-1,258	-1,196	-1,043
21	3,7597821***	3,897678***	3,853412***	-1,256	-1,202	-1,051
22	3,7647715***	3,8958785***	3,9321946***	-1,256	-1,208	-1,079
23	3,7661896***	3,8994396***	3,8154222***	-1,257	-1,213	-1,020
24	3,7632715***	3,9066761***	3,6188423***	-1,258	-1,216	-1,135
25	3,7559966***	3,9153955***	3,5091318***	-1,261	-1,220	-1,116
26	3,744681***	3,9240992***	3,322237***	-1,263	-1,223	-1,108
27	3,7296719***	3,9317766***	3,1866699***	-1,265	-1,227	-1,152
28	3,7112894***	3,9376714***	3,1259318***	-1,268	-1,230	-1,197
29	3,6899074***	3,9416102***	2,9987801***	-1,271	-1,233	-1,233
30	3,6659913***	3,9435211***	2,912558***	-1,274	-1,237	-1,334

Note 3: The subscript "r_i" defines the causality direction from returns to industrial production growth rate and the subscript "i_r" from industrial production growth rate to returns respectively. The letter "m"in the subscript stands for "mean", and the letter "v" stands for "volatility". These symbolisms are always accompanied with an abbreviation code for each country (see Table V.i). Ho: no causality in mean and in variance, H_1: causality in mean and variance. '*'indicates significance at the 10% level, '**' indicates significance at the 5% level, '***' indicates significance at the 1% level.

Table 1.4: Causality test of Hong in volatility for Argentina, Kernel functions: Q-S (Quadratic), Bartlett and Truncated.

Causality Test of Hong						
PANEL B volatility						
Bandwidth	QuadraticARr_i	BartlettARr_i	TruncatedARr_i	QuadraticARi_r	BartlettARi_r	TruncatedARi_r
1	-0,404	NaN	-0,472	3,353085***	NaN	3,382461***
2	-0,294	-0,472	0,426	3,3096026***	3,382461***	2,2154342**
3	0,003	-0,197	0,111	2,8440929***	3,2201631***	1,4467956*
4	0,195	-0,037	0,615	2,4382672***	2,9101694***	1,6549928**
5	0,273	0,080	0,323	2,1414238**	2,6656337***	1,186
6	0,358	0,170	0,161	1,8850525**	2,4755613***	0,927
7	0,518	0,214	1,4408976*	1,6546824**	2,2997015**	0,611
8	0,649	0,283	1,3271064*	1,442538*	2,1324475**	0,455
9	0,724	0,384	1,109	1,253	1,9739266**	0,361
10	0,785	0,481	1,005	1,084	1,8278002**	0,125
11	0,866	0,563	0,756	0,932	1,6919888**	-0,048
12	0,969	0,627	0,779	0,791	1,5633547*	0,007
13	1,088	0,675	0,698	0,658	1,4438861*	-0,178
14	1,213	0,711	3,0975805***	0,533	1,3334654*	-0,273
15	1,3362845*	0,762	2,8274681***	0,417	1,230	-0,371
16	1,4525563*	0,839	2,8859366***	0,310	1,133	-0,525
17	1,5587056*	0,929	2,6464605***	0,212	1,040	-0,672
18	1,6534072**	1,023	2,4807806***	0,121	0,951	-0,810
19	1,7364482**	1,114	2,2785437**	0,037	0,865	-0,807
20	1,8086721**	1,200	2,0741888**	-0,043	0,782	-0,715
21	1,8711393**	1,278	2,163908**	-0,119	0,704	-0,794
22	1,924232**	1,3492136*	2,230798**	-0,191	0,629	-0,821
23	1,9690823**	1,4142957*	2,1681959**	-0,261	0,559	-0,856
24	2,0071153**	1,4741432*	2,0147575**	-0,329	0,493	-0,886
25	2,0390833**	1,5285055*	2,1267828**	-0,394	0,431	-1,001
26	2,0654692**	1,5779225*	2,2298066**	-0,458	0,371	-1,054
27	2,0869103**	1,6236413*	2,0673566**	-0,519	0,314	-1,148
28	2,1040141**	1,6658388**	1,9281804**	-0,578	0,259	-1,255
29	2,1172021**	1,7040851**	1,7762733**	-0,635	0,205	-1,356
30	2,1268215**	1,7381669**	2,002865**	-0,691	0,153	-1,451

Note 4: The subscript "r_i" defines the causality direction from returns to industrial production growth rate and the subscript "i_r" from industrial production growth rate to returns respectively. The letter "m"in the subscript stands for "mean", and the letter "v" stands for "volatility". These symbolisms are always accompanied with an abbreviation code for each country (see Table V.i). Ho: no causality in mean and in variance, H_1: causality in mean and variance. '*'indicates significance at the 10% level, '**' indicates significance at the 5% level, '***' indicates significance at the 1% level.

In the case of **Austria** causality is detected only in mean, from real stock returns to industrial production. This conclusion is obtained from the Cheung & Ng test (Tables 2.1 and 2.2).

Table 2.1: Cheung & Ng's r- statistic for Austria

CausalityTest of Cheung & Ng AUSTRIA				
Lags	$rOE_{r\_i,m}$	$rOE_{i\_r,m}$	$rOE_{r\_i,v}$	$rOE_{i\_r,v}$
1	-1,488	-1,273	-0,728	-0,783
2	0,315	0,802	-0,754	-0,513
3	0,030	0,581	-0,455	-0,599
4	1,388	-0,467	0,458	-0,062
5	1,521	1,632	-0,357	-0,507
6	0,629	0,153	-0,566	-0,737
7	2,1470929**	1,311	0,112	0,088
8	-0,569	-0,041	0,491	-0,482
9	0,317	-0,666	-0,365	-0,929
10	0,022	0,188	-0,122	0,329
11	-0,522	-1,068	-0,020	0,488
12	0,202	-0,204	-0,211	-1,020
13	-0,462	-0,804	0,060	-0,214
14	0,006	0,241	-0,336	-0,806
15	-0,315	0,240	-0,032	-0,936
16	-0,198	-0,177	0,114	-0,589
17	1,7335756*	0,888	0,341	1,264
18	0,361	0,105	-0,033	0,129
19	1,7177831*	1,130	0,032	-0,412
20	-0,414	-0,511	-0,044	-0,074
21	0,239	-0,627	0,032	-0,293
22	0,449	0,353	0,097	0,152
23	-1,214	-1,366	-0,285	-1,110
24	-0,574	-0,201	0,097	0,332
25	-0,915	-0,789	-0,173	-0,148
26	-0,394	-0,399	-0,228	-0,598
27	-0,846	-0,335	-0,184	-0,051
28	0,186	-0,323	0,163	-0,849
29	0,880	0,417	0,251	0,169
30	0,764	0,048	-0,144	0,325

Note: see note 1 at table 1.1

Table 2.2: Cheung & Ng's S- statistic for Austria

Statistics Cheung&Ng AUSTRIA	
SOEr_i,m	52,136***
SOEi_r,m	-12,11728
SOEr_i,v	-27,427774
SOEi_r,v	-83,05859

Note: see note 2 at table 1.2

But only the Truncated kernel function of the Hong test detects possibility of causality in mean from real stock returns to growth, in the seventh bandwidth (Table 2.3). In the field of volatility the two tests agree, and no causality is detected at all (Table 2.4).

Table 2.3: Causality test of Hong in mean for Austria, Kernel functions: Q-S (Quadratic), Bartlett and Truncated.

Causality Test of Hong						
PANEL A mean						
Bandwidth	QuadraticOEr_i	BartlettOEr_i	TruncatedOEr_i	QuadraticOEi_r	BartlettOEi_r	TruncatedOEi_r
1	0,832	NaN	0,878	0,429	NaN	0,452
2	0,775	0,878	0,174	0,402	0,452	0,148
3	0,442	0,698	-0,263	0,252	0,379	-0,144
4	0,250	0,473	0,121	0,072	0,267	-0,396
5	0,206	0,333	0,552	-0,011	0,143	0,203
6	0,283	0,298	0,342	-0,029	0,077	-0,090
7	0,405	0,302	1,3423571*	-0,037	0,049	0,134
8	0,520	0,349	1,104	-0,054	0,035	-0,116
9	0,602	0,425	0,843	-0,080	0,027	-0,227
10	0,641	0,496	0,589	-0,114	0,013	-0,423
11	0,639	0,548	0,422	-0,156	-0,008	-0,351
12	0,612	0,582	0,221	-0,207	-0,032	-0,522
13	0,569	0,599	0,073	-0,263	-0,060	-0,554
14	0,522	0,603	-0,107	-0,322	-0,089	-0,702
15	0,476	0,594	-0,255	-0,382	-0,120	-0,841
16	0,433	0,577	-0,405	-0,441	-0,154	-0,976
17	0,394	0,551	0,011	-0,497	-0,190	-0,962
18	0,357	0,524	-0,118	-0,550	-0,228	-1,091
19	0,323	0,497	0,265	-0,600	-0,266	-0,986
20	0,291	0,472	0,146	-0,647	-0,304	-1,063
21	0,261	0,451	0,014	-0,692	-0,341	-1,114
22	0,234	0,432	-0,087	-0,735	-0,378	-1,207
23	0,209	0,414	0,028	-0,776	-0,413	-1,008
24	0,186	0,396	-0,046	-0,816	-0,447	-1,112
25	0,164	0,379	-0,034	-0,855	-0,479	-1,119
26	0,144	0,363	-0,130	-0,893	-0,510	-1,198
27	0,126	0,348	-0,134	-0,931	-0,540	-1,282
28	0,109	0,333	-0,242	-0,969	-0,568	-1,364
29	0,092	0,318	-0,232	-1,007	-0,596	-1,432
30	0,077	0,303	-0,251	-1,044	-0,624	-1,524

Note: see note 3 at table 1.3

Table 2.4: Causality test of Hong in volatility for Austria, Kernel functions: Q-S (Quadratic), Bartlett and Truncated.

Causality Test of Hong PANEL B volatility Bandwidth	QuadraticOEr_i	BartlettOEr_i	TruncatedOEr_i	QuadraticOEi_r	BartlettOEi_r	TruncatedOEi_r
1	-0,359	NaN	-0,330	-0,312	NaN	-0,271
2	-0,379	-0,330	-0,445	-0,355	-0,271	-0,558
3	-0,492	-0,392	-0,684	-0,521	-0,388	-0,714
4	-0,630	-0,476	-0,869	-0,682	-0,500	-0,970
5	-0,769	-0,569	-1,051	-0,824	-0,608	-1,099
6	-0,898	-0,663	-1,150	-0,946	-0,713	-1,127
7	-1,018	-0,753	-1,327	-1,052	-0,804	-1,307
8	-1,131	-0,838	-1,426	-1,142	-0,885	-1,410
9	-1,238	-0,920	-1,545	-1,222	-0,961	-1,347
10	-1,341	-0,998	-1,684	-1,293	-1,029	-1,473
11	-1,441	-1,072	-1,817	-1,354	-1,089	-1,560
12	-1,537	-1,145	-1,932	-1,403	-1,145	-1,466
13	-1,630	-1,216	-2,049	-1,447	-1,196	-1,590
14	-1,719	-1,285	-2,138	-1,480	-1,241	-1,583
15	-1,806	-1,353	-2,246	-1,510	-1,283	-1,532
16	-1,889	-1,419	-2,346	-1,537	-1,321	-1,586
17	-1,971	-1,483	-2,423	-1,561	-1,355	-1,400
18	-2,049	-1,545	-2,519	-1,583	-1,384	-1,517
19	-2,125	-1,606	-2,611	-1,607	-1,410	-1,599
20	-2,199	-1,665	-2,700	-1,631	-1,433	-1,708
21	-2,270	-1,723	-2,787	-1,656	-1,455	-1,798
22	-2,340	-1,780	-2,869	-1,681	-1,477	-1,895
23	-2,407	-1,835	-2,937	-1,704	-1,499	-1,785
24	-2,473	-1,889	-3,014	-1,726	-1,521	-1,864
25	-2,537	-1,942	-3,087	-1,746	-1,541	-1,954
26	-2,599	-1,994	-3,154	-1,765	-1,562	-1,988
27	-2,659	-2,044	-3,222	-1,783	-1,583	-2,076
28	-2,718	-2,094	-3,290	-1,802	-1,603	-2,049
29	-2,775	-2,142	-3,350	-1,821	-1,624	-2,129
30	-2,830	-2,190	-3,416	-1,842	-1,644	-2,195

Note: see note 4 at table 1.4

We find that **Belgium** is detected for bidirectional causality in mean and causality in volatility from real stock returns to economic growth, through the Cheung & Ng r-statistic. (Table 3.1).

Table 3.1: Cheung & Ng's r- statistic for Belgium

CausalityTest of Cheung & Ng BELGIUM				
Lags	$rBG_{r\_i,m}$	$rBG_{i\_r,m}$	$rBG_{r\_i,v}$	$rBG_{i\_r,v}$
1	2,1683485**	-0,066	1,071	-1,234
2	1,475	0,766	0,436	-0,635
3	-1,324	0,842	4,3530623***	-1,130
4	0,531	1,388	0,717	-0,533
5	-1,081	0,498	-0,518	-1,332
6	-0,370	-1,466	0,162	-0,080
7	1,455	-1,7819617*	0,116	-0,543
8	2,3032248**	-0,721	0,071	0,657
9	0,973	-2,1572858**	-0,720	-0,937
10	1,7290076*	1,224	-0,544	0,368
11	1,133	0,995	0,161	-0,667
12	1,078	-0,350	-0,453	-0,280
13	2,4203024**	0,088	0,267	-0,488
14	1,7434336*	0,196	2,6578242***	-0,109
15	-0,294	0,767	-0,062	-0,896
16	0,631	1,007	-0,850	-0,863
17	-0,979	-0,436	-0,085	-0,200
18	-0,103	-0,993	-0,568	0,533
19	1,081	-2,5136002**	-1,376	-1,381
20	1,6658772*	-1,408	-0,612	1,033
21	0,893	-2,2602463**	-0,645	0,085
22	1,421	0,396	0,309	-0,313
23	0,747	0,422	0,025	0,375
24	0,422	-0,853	0,123	0,479
25	1,8005572*	-0,682	0,041	-0,474
26	0,643	-0,286	-0,333	0,524
27	-1,469	0,605	0,941	0,000
28	0,057	1,089	1,7303297*	-0,156
29	-1,6615315*	-1,011	1,7414877*	0,448
30	-0,625	-0,932	-0,487	-0,154

Note: see note 1 at table 1.1

On the contrary, Cheung & Ng results of S-statistic find no bidirectional causality in mean, and signify as very strong the causality from real stock returns to industrial production in mean and volatility (Table 3.2).

Table 3.2: Cheung & Ng's S- statistic for Belgium

Statistics Cheung&Ng BELGIUM	
SBGr_i,m	384,20***
SBGi_r,m	-158,85126
SBGr_i,v	155,4***
SBGi_r,v	-160,21625

Note: see note 2 at table 1.2

These results are compatible with those of the kernel functions of the Hong test in mean (Table 3.3),

Table 3.3: Causality test of Hong in mean for Belgium, Kernel functions: Q-S (Quadratic), Bartlett and Truncated.

Causality Test of Hong						
PANEL A mean						
Bandwidth	QuadraticBGr_i	BartlettBGr_i	TruncatedBGr_i	QuadraticBGi_r	BartlettBGi_r	TruncatedBGi_r
1	3,9559475***	NaN	3,9479349***	-0,591	NaN	-0,558
2	3,8410149***	3,9479349***	2,4951669***	-0,654	-0,558	-0,842
3	3,7223025***	3,7275502***	4,0574892***	-0,706	-0,694	-0,258
4	3,7813633***	3,7710844***	3,1873188***	-0,657	-0,687	-0,576
5	3,8084725***	3,8626216***	2,90551***	-0,659	-0,656	-0,701
6	3,7967792***	3,8629651***	3,7423984***	-0,700	-0,658	-0,811
7	3,7535498***	3,8720229***	3,2087757***	-0,769	-0,679	-1,014
8	3,735478***	3,8914359***	2,7618964***	-0,856	-0,714	-1,178
9	3,7570312***	3,8840704***	2,9922919***	-0,953	-0,761	-1,344
10	3,7914132***	3,8618037***	4,2084279***	-1,047	-0,815	-1,477
11	3,8102581***	3,8625474***	3,8617319***	-1,124	-0,876	-1,517
12	3,8068311***	3,8878191***	3,5304785***	-1,183	-0,937	-1,347
13	3,7897331***	3,9154145***	3,27325***	-1,224	-0,994	-1,486
14	3,7690162***	3,9361612***	3,0567088***	-1,249	-1,046	-1,112
15	3,7508855***	3,9472857***	2,9102463***	-1,264	-1,090	-1,238
16	3,7389725***	3,9489732***	2,8376168***	-1,271	-1,126	-0,892
17	3,7348986***	3,9429798***	2,6736928***	-1,271	-1,154	-0,975
18	3,737633***	3,9305313***	3,3166027***	-1,268	-1,173	-0,799
19	3,7444926***	3,917151***	3,0809468***	-1,262	-1,187	-0,926
20	3,7525367***	3,9056389***	3,709422***	-1,258	-1,196	-1,043
21	3,7597821***	3,897678***	3,853412***	-1,256	-1,202	-1,051
22	3,7647715***	3,8958785***	3,9321946***	-1,256	-1,208	-1,079
23	3,7661896***	3,8994396***	3,8154222***	-1,257	-1,213	-1,020
24	3,7632715***	3,9066761***	3,6188423***	-1,258	-1,216	-1,135
25	3,7559966***	3,9153955***	3,5091318***	-1,261	-1,220	-1,116
26	3,744681***	3,9240992***	3,322237***	-1,263	-1,223	-1,108
27	3,7296719***	3,9317766***	3,1866699***	-1,265	-1,227	-1,152
28	3,7112894***	3,9376714***	3,1259318***	-1,268	-1,230	-1,197
29	3,6899074***	3,9416102***	2,9987801***	-1,271	-1,233	-1,233
30	3,6659913***	3,9435211***	2,912558***	-1,274	-1,237	-1,334

Note: see note 3 at table 1.3

but incompatible with the results on volatility, where the Hong test gives evidence of bidirectional causality (Table 3.4), while the r-statistics and the S-statistics do not back this conclusion. A possible explanation could be the weighted lags of the kernel functions or the structural breaks and the long memory of volatility.

Table 3.4: Causality test of Hong in volatility for Belgium, Kernel functions: Q-S (Quadratic), Bartlett and Truncated.

Causality Test of Hong						
PANEL B volatility						
Bandwidth	QuadraticBGr_i	BartlettBGr_i	TruncatedBGr_i	QuadraticBGi_r	BartlettBGi_r	TruncatedBGi_r
1	-0,404	NaN	-0,472	3,353085***	NaN	3,382461***
2	-0,294	-0,472	0,426	3,3096026***	3,382461***	2,2154342**
3	0,003	-0,197	0,111	2,8440929***	3,2201631***	1,4467956*
4	0,195	-0,037	0,615	2,4382672***	2,9101694***	1,6549928**
5	0,273	0,080	0,323	2,1414238**	2,6656337***	1,186
6	0,358	0,170	0,161	1,8850525**	2,4755613***	0,927
7	0,518	0,214	1,4408976*	1,6546824**	2,2997015**	0,611
8	0,649	0,283	1,3271064*	1,442538*	2,1324475**	0,455
9	0,724	0,384	1,109	1,253	1,9739266**	0,361
10	0,785	0,481	1,005	1,084	1,8278002**	0,125
11	0,866	0,563	0,756	0,932	1,6919888**	-0,048
12	0,969	0,627	0,779	0,791	1,5633547*	0,007
13	1,088	0,675	0,698	0,658	1,4438861*	-0,178
14	1,213	0,711	3,0975805***	0,533	1,3334654*	-0,273
15	1,3362845*	0,762	2,8274681***	0,417	1,230	-0,371
16	1,4525563*	0,839	2,8859366***	0,310	1,133	-0,525
17	1,5587056*	0,929	2,6464605***	0,212	1,040	-0,672
18	1,6534072**	1,023	2,4807806***	0,121	0,951	-0,810
19	1,7364482**	1,114	2,2785437**	0,037	0,865	-0,807
20	1,8086721**	1,200	2,0741888**	-0,043	0,782	-0,715
21	1,8711393**	1,278	2,163908**	-0,119	0,704	-0,794
22	1,924232**	1,3492136*	2,230798**	-0,191	0,629	-0,821
23	1,9690823**	1,4142957*	2,1681959**	-0,261	0,559	-0,856
24	2,0071153**	1,4741432*	2,0147575**	-0,329	0,493	-0,886
25	2,0390833**	1,5285055*	2,1267828**	-0,394	0,431	-1,001
26	2,0654692**	1,5779225*	2,2298066**	-0,458	0,371	-1,054
27	2,0869103**	1,6236413*	2,0673566**	-0,519	0,314	-1,148
28	2,1040141**	1,6658388**	1,9281804**	-0,578	0,259	-1,255
29	2,1172021**	1,7040851**	1,7762733**	-0,635	0,205	-1,356
30	2,1268215**	1,7381669**	2,002865**	-0,691	0,153	-1,451

Note: see note 4 at table 1.4

The r-statistics of **Brazil** provide us with evidence of causality in all fields, the most direct being in mean, from stock returns to industrial production, and the highest being in volatility, in the reverse direction (Table 4.1).

Table 4.1: Cheung & Ng's r- statistic for Brazil

CausalityTest of Cheung & Ng BRAZIL				
Lags	**$rBR_{r\_i,m}$**	**$rBR_{i\_r,m}$**	**$rBR_{r\_i,v}$**	**$rBR_{i\_r,v}$**
1	1,449	0,297	0,593	0,292
2	1,7255868*	-0,601	0,782	-0,071
3	2,7067332***	0,494	0,769	-0,798
4	1,9686631**	-1,8924987*	2,6604356***	-0,354
5	0,466	-0,032	-0,555	0,108
6	0,420	0,345	-0,677	0,393
7	0,487	0,186	-0,210	-0,295
8	-1,592	-0,433	0,134	-0,715
9	-0,707	-0,431	-0,114	0,317
10	0,877	1,817263*	-0,452	1,6604379*
11	1,406	-0,023	-0,102	0,074
12	-0,397	-1,8943662*	-0,687	0,354
13	-0,015	-0,121	1,272	-0,622
14	0,308	-0,397	0,120	-0,247
15	-0,878	-1,007	-0,334	0,968
16	-0,648	-1,088	0,314	0,494
17	0,016	0,807	-0,489	0,368
18	-1,635	-0,195	0,170	-0,778
19	-0,872	-0,913	-0,215	-0,187
20	1,278	0,564	-0,405	-0,309
21	-1,554	0,392	0,064	-0,261
22	-0,331	-0,525	0,190	-0,220
23	-1,120	-0,164	-0,361	-0,709
24	-0,093	-1,095	0,103	-0,542
25	0,294	-0,152	-0,025	-0,519
26	1,047	-2,1901277**	-0,459	1,239
27	-0,425	0,017	0,625	-0,580
28	0,320	1,382	-0,141	-0,033
29	-1,059	0,020	0,185	-0,126
30	-0,961	1,8403085*	0,643	5,6804385***

Note: see note 1 at table 1.1

Although no causality is found in mean, the S-statistics confirm the weak bidirectional causality in volatility (Table 4.2).

Table 4.2: Cheung & Ng's S- statistic for Brazil

Statistics Cheung&Ng BRAZIL	
SBRr_i,m	32,955192
SBRi_r,m	-66,247765
SBRr_i,v	44,9801**
SBRi_r,v	60,596***

Note: see note 2 at table 1.2

As far as the Hong test is concerned, we came up with the direct causality in mean from stock returns to industrial production growth (Table 4.3), but causality in volatility is detected only by the Truncated kernel function and is really weak on both directions (Table 4.4).

Table 4.3: Causality test of Hong in mean for Brazil, Kernel functions: Q-S (Quadratic), Bartlett and Truncated.

Causality Test of Hong						
PANEL A mean						
Bandwidth	QuadraticBRr_i	BartlettBRr_i	TruncatedBRr_i	QuadraticBRi_r	BartlettBRi_r	TruncatedBRi_r
1	0,937	NaN	0,788	-0,674	NaN	-0,646
2	1,020	0,788	1,5644475*	-0,691	-0,646	-0,776
3	1,790788**	1,108	3,9080384***	-0,832	-0,736	-0,941
4	2,7719833***	1,7480416**	4,436687***	-0,756	-0,822	0,119
5	3,3709123***	2,4245225***	3,7364375***	-0,612	-0,778	-0,206
6	3,6195538***	2,9110372***	3,1876261***	-0,535	-0,683	-0,439
7	3,6793135***	3,2003445***	2,7614609***	-0,538	-0,622	-0,661
8	3,6559779***	3,352809***	2,9974918***	-0,566	-0,595	-0,818
9	3,6014021***	3,4338414***	2,7251536***	-0,586	-0,596	-0,959
10	3,528802***	3,4768528***	2,5526855***	-0,591	-0,614	-0,366
11	3,4384031***	3,4908717***	2,6713273***	-0,584	-0,630	-0,557
12	3,33334***	3,4889224***	2,4004792***	-0,565	-0,638	0,029
13	3,2217742***	3,4764712***	2,1234366**	-0,539	-0,635	-0,158
14	3,1133116***	3,4523927***	1,8888216**	-0,511	-0,623	-0,304
15	3,0126182***	3,4173679***	1,8024386**	-0,489	-0,608	-0,275
16	2,9199811***	3,3741352***	1,6591911**	-0,477	-0,594	-0,216
17	2,8343618***	3,3253065***	1,4507422*	-0,474	-0,579	-0,256
18	2,7542998***	3,2717803***	1,7277467**	-0,476	-0,565	-0,401
19	2,679788***	3,2169212***	1,6637986**	-0,480	-0,553	-0,402
20	2,6113248***	3,1635289***	1,7523763**	-0,483	-0,543	-0,489
21	2,5489671***	3,1123519***	1,9684749**	-0,484	-0,534	-0,598
22	2,4921439***	3,0650582***	1,8052262**	-0,483	-0,529	-0,683
23	2,4397638***	3,0215341***	1,8318441**	-0,479	-0,526	-0,804
24	2,3905351***	2,9809021***	1,6655095**	-0,474	-0,526	-0,737
25	2,3433664***	2,942478***	1,5186942*	-0,469	-0,528	-0,852
26	2,2974744**	2,9051928***	1,530349*	-0,462	-0,532	-0,244
27	2,2523035**	2,8688173***	1,4076089*	-0,454	-0,536	-0,366
28	2,2075149**	2,8332322***	1,279	-0,445	-0,539	-0,204
29	2,1630161**	2,7979807***	1,3013233*	-0,435	-0,540	-0,321
30	2,1189183**	2,7630793***	1,2965846*	-0,423	-0,540	0,046

Note: see note 3 at table 1.3

Table 4.4: Causality test of Hong in volatility for Brazil, Kernel functions: Q-S (Quadratic), Bartlett and Truncated.

Causality Test of Hong						
PANEL B volatility						
Bandwidth	QuadraticBRr_i	BartlettBRr_i	TruncatedBRr_i	QuadraticBRi_r	BartlettBRi_r	TruncatedBRi_r
1	-0,462	NaN	-0,458	-0,698	NaN	-0,648
2	-0,454	-0,458	-0,516	-0,755	-0,648	-0,957
3	-0,552	-0,510	-0,584	-0,923	-0,800	-0,927
4	-0,237	-0,554	1,6870596**	-1,027	-0,899	-1,112
5	0,197	-0,347	1,2993449*	-1,124	-0,974	-1,307
6	0,497	-0,043	1,040	-1,234	-1,050	-1,436
7	0,648	0,194	0,714	-1,342	-1,128	-1,573
8	0,686	0,355	0,429	-1,419	-1,205	-1,590
9	0,659	0,452	0,178	-1,480	-1,277	-1,710
10	0,597	0,502	-0,002	-1,505	-1,343	-1,207
11	0,519	0,519	-0,207	-1,543	-1,394	-1,360
12	0,435	0,512	-0,296	-1,578	-1,429	-1,478
13	0,349	0,489	-0,144	-1,585	-1,458	-1,534
14	0,260	0,459	-0,318	-1,581	-1,483	-1,653
15	0,172	0,426	-0,462	-1,590	-1,508	-1,597
16	0,083	0,389	-0,600	-1,616	-1,531	-1,675
17	-0,006	0,349	-0,704	-1,650	-1,553	-1,768
18	-0,094	0,307	-0,839	-1,686	-1,575	-1,775
19	-0,182	0,262	-0,965	-1,717	-1,597	-1,881
20	-0,268	0,215	-1,065	-1,744	-1,619	-1,972
21	-0,353	0,167	-1,187	-1,767	-1,642	-2,064
22	-0,437	0,118	-1,299	-1,787	-1,665	-2,156
23	-0,519	0,067	-1,391	-1,800	-1,689	-2,173
24	-0,599	0,016	-1,499	-1,805	-1,714	-2,222
25	-0,678	-0,035	-1,604	-1,799	-1,740	-2,274
26	-0,755	-0,087	-1,674	-1,777	-1,765	-2,134
27	-0,830	-0,139	-1,715	-1,739	-1,791	-2,175
28	-0,904	-0,191	-1,809	-1,683	-1,815	-2,265
29	-0,975	-0,242	-1,898	-1,609	-1,839	-2,350
30	-1,046	-0,293	-1,931	-1,516	-1,862	2,142741**

Note: see note 4 at table 1.4

The r-statistics of Cheung & Ng show weak causality for **Bulgaria** in mean on both directions and somewhat stronger causality in volatility from industrial production to stock returns, including a very significant price at lag 15 (Table 5.1),

Table 5.1: Cheung & Ng's r- statistic for Bulgaria

CausalityTest of Cheung & Ng BULGARIA				
Lags	rBLr_i,m	rBLi_r,m	rBLr_i,v	rBLi_r,v
1	1,8640504*	1,070	-0,012	1,915491*
2	1,329	2,1309292**	0,155	1,204
3	0,271	0,771	0,571	1,7464502*
4	1,7972223*	0,711	0,260	2,0666493**
5	1,262	-0,438	0,887	-1,003
6	0,701	0,736	1,323	1,9573532*
7	0,259	0,680	0,045	-1,035
8	0,753	0,111	-0,363	-0,194
9	1,8056655*	0,395	0,183	-0,540
10	1,156	-0,298	-0,012	0,674
11	1,365	1,343	-0,400	0,162
12	-0,528	-0,921	0,402	1,547
13	0,598	1,076	0,034	0,913
14	-0,049	-0,091	-0,613	-0,128
15	-1,483	-0,316	0,282	4,1048939***
16	0,484	-0,546	0,620	-0,390
17	0,244	-0,367	1,111	0,452
18	-0,608	-0,286	0,232	-0,348
19	-0,151	-0,336	-0,084	-0,419
20	-0,245	0,465	-0,467	0,386
21	0,273	-0,444	0,006	-0,540
22	0,701	-0,041	-0,127	-0,204
23	-0,749	0,323	-0,448	-0,958
24	-1,062	-0,672	-1,173	0,453
25	0,263	0,165	-0,062	-0,664
26	-0,333	-0,793	-1,180	-0,273
27	-0,807	-0,086	-0,142	0,533
28	0,511	-1,9740178**	0,427	-0,685
29	0,204	-0,138	-0,014	-0,642
30	-0,357	0,074	0,351	-0,419

Note: see note 1 at table 1.1

but in the S-statistic of Cheung & Ng, rather significant causality is found in mean from real stock returns to economic activity and in volatility with the alternative direction (Table 5.2).

Table 5.2: Cheung & Ng's S- statistic for Bulgaria

Statistics Cheung&Ng BULGARIA	
SBLr_i,m	95,168***
SBLi_r,m	23,136202
SBLr_i,v	16,837346
SBLi_r,v	90,731***

Note: see note 2 at table 1.2

The kernel functions of Hong, ascertain for immediate, but not too strong, causality in mean from real stock returns to industrial production and very weak causal relation from industrial production to stock returns (Table 5.3),

Table 5.3: Causality test of Hong in mean for Bulgaria, Kernel functions: Q-S (Quadratic), Bartlett and Truncated.

Causality Test of Hong						
PANEL A mean						
Bandwidth	QuadraticBLr_i	BartlettBLr_i	TruncatedBLr_i	QuadraticBLi_r	BartlettBLi_r	TruncatedBLi_r
1	1,8138531**	NaN	1,7833748**	0,264	NaN	0,111
2	1,8626768**	1,7833748**	1,668055**	0,494	0,111	1,8949832**
3	1,7842865**	1,8679652**	0,993	1,180	0,728	1,3975245*
4	1,6933189**	1,7874066**	1,6917077**	1,3614875*	1,108	1,051
5	1,7164585**	1,7417108**	1,7313035**	1,3083133*	1,246	0,696
6	1,7016493**	1,75954**	1,4536636*	1,188	1,265	0,519
7	1,6566993**	1,776258**	1,111	1,035	1,227	0,351
8	1,622957*	1,7674526**	0,952	0,871	1,166	0,092
9	1,6026169*	1,7363024**	1,4875368*	0,722	1,090	-0,101
10	1,5914592*	1,7078586**	1,5217035*	0,594	1,006	-0,290
11	1,5862138*	1,6931882**	1,679563**	0,485	0,917	-0,070
12	1,5807559*	1,6892282**	1,4843493*	0,392	0,831	-0,074
13	1,5704892*	1,6904804**	1,3249054*	0,311	0,755	-0,011
14	1,5530453*	1,6905136**	1,107	0,236	0,689	-0,186
15	1,52848*	1,6860881**	1,3437889*	0,163	0,629	-0,330
16	1,4976011*	1,6793152**	1,190	0,090	0,573	-0,426
17	1,4609543*	1,6718459**	1,015	0,016	0,519	-0,548
18	1,4194355*	1,6619026**	0,908	-0,056	0,467	-0,672
19	1,3745429*	1,6488636**	0,746	-0,128	0,415	-0,784
20	1,327647*	1,6325532*	0,600	-0,197	0,364	-0,872
21	1,279	1,6128003*	0,464	-0,263	0,314	-0,958
22	1,230	1,5897322*	0,406	-0,325	0,263	-1,075
23	1,179	1,5638952*	0,364	-0,384	0,213	-1,169
24	1,126	1,5360701*	0,418	-0,438	0,163	-1,202
25	1,073	1,5072131*	0,301	-0,489	0,114	-1,302
26	1,020	1,4777605*	0,195	-0,537	0,065	-1,302
27	0,967	1,4475739*	0,180	-0,581	0,018	-1,399
28	0,914	1,4168448*	0,105	-0,623	-0,029	-0,885
29	0,863	1,3857953*	0,000	-0,662	-0,074	-0,982
30	0,812	1,3543885*	-0,088	-0,698	-0,116	-1,077

Note: see note 3 at table 1.3

but the strong causality in variance from industrial production growth rate to real stock returns is undisputed (Table 5.4).

Table 5.4: Causality test of Hong in volatility for Bulgaria, Kernel functions: Q-S (Quadratic), Bartlett and Truncated.

Causality Test of Hong						
PANEL B						
Bandwidth	QuadraticBLr_i	BartlettBLr_i	TruncatedBLr_i	QuadraticBLi_r	BartlettBLi_r	TruncatedBLi_r
1	-0,761	NaN	-0,711	1,9751116**	NaN	1,9282782**
2	-0,814	-0,711	-0,994	1,9863257**	1,9282782**	1,613377*
3	-0,986	-0,857	-1,085	2,0533501**	1,9545446**	2,2006992**
4	-1,126	-0,972	-1,270	2,3274861**	2,0463195**	3,1308524***
5	-1,202	-1,069	-1,194	2,6279713***	2,2565924**	2,8371699***
6	-1,220	-1,143	-0,848	2,8790833***	2,4659789***	3,4818929***
7	-1,229	-1,177	-1,049	3,0729735***	2,6537357***	3,2848986***
8	-1,247	-1,189	-1,193	3,1773341***	2,8225023***	2,8600126***
9	-1,281	-1,202	-1,348	3,1726583***	2,9471124***	2,5603019***
10	-1,331	-1,221	-1,499	3,1176208***	3,025562***	2,3397228***
11	-1,387	-1,246	-1,603	3,0723743***	3,067297***	2,0489892**
12	-1,446	-1,277	-1,699	3,0640316***	3,0802126***	2,3121637**
13	-1,504	-1,313	-1,825	3,0951014***	3,0769643***	2,2307735**
14	-1,563	-1,351	-1,866	3,1555295***	3,0667894***	1,9914723**
15	-1,621	-1,391	-1,965	3,2337146***	3,0497725***	5,1686188***
16	-1,677	-1,431	-1,999	3,3192275***	3,0546309***	4,9040318***
17	-1,730	-1,472	-1,869	3,4035694***	3,0944658***	4,6712054***
18	-1,780	-1,511	-1,967	3,4817235***	3,152358***	4,440966***
19	-1,828	-1,548	-2,069	3,5511353***	3,2179408***	4,2373237***
20	-1,872	-1,584	-2,129	3,6104663***	3,28489***	4,0431465***
21	-1,913	-1,619	-2,225	3,6592409***	3,3494583***	3,8870995***
22	-1,953	-1,653	-2,315	3,6976658***	3,409584***	3,6981764***
23	-1,990	-1,687	-2,371	3,7263216***	3,4640994***	3,670262***
24	-2,025	-1,720	-2,226	3,7459058***	3,51287***	3,527422***
25	-2,060	-1,753	-2,313	3,7571364***	3,5561022***	3,4321039***
26	-2,093	-1,784	-2,170	3,7607605***	3,5938681***	3,2833357***
27	-2,125	-1,814	-2,252	3,7575728***	3,6263222***	3,1759787***
28	-2,156	-1,842	-2,305	3,7484014***	3,6536548***	3,1043907***
29	-2,186	-1,868	-2,386	3,7340631***	3,6762885***	3,0289866***
30	-2,216	-1,894	-2,445	3,7153148***	3,6946847***	2,921374***

Note: see note 4 at table 1.4

The **Canadian** market results, indicate that causality is bidirectional in mean (Tables 6.1, 6.2 and 6.3). However we find differences in volatility causal relations. The r-statistic of Cheung & Ng, indicates causality in volatility from industrial production to stock returns, mainly through the big r-statistic in lag 10 (Table 6.1).

Table 6.1: Cheung & Ng’s r- statistic for Canada

CausalityTest of Cheung & Ng CANADA				
Lags	$rCN_{r\_i,m}$	$rCN_{i\_r,m}$	$rCN_{r\_i,v}$	$rCN_{i\_r,v}$
1	2,1626062**	2,5692953**	-0,175	0,026
2	2,9724022***	1,290	0,449	0,917
3	1,7853769*	1,125	0,195	1,8879621*
4	0,701	1,147	0,349	-0,246
5	0,709	0,202	-0,017	-0,359
6	0,254	-1,201	0,225	0,647
7	-0,650	2,008945**	0,227	-0,359
8	0,561	-0,369	0,199	-0,091
9	0,471	0,478	0,414	-0,189
10	0,103	0,894	0,792	3,7074987***
11	-0,997	0,516	-0,177	-0,570
12	-1,468	1,096	0,399	-0,797
13	-1,290	-0,006	0,672	0,442
14	0,461	-0,190	0,551	-0,657
15	-0,624	1,075	0,547	0,135
16	-0,272	-0,497	0,085	-0,095
17	-0,080	0,760	0,128	-0,364
18	-0,653	-0,085	0,343	-0,581
19	-0,030	-0,156	0,142	-0,398
20	0,078	-1,105	-0,116	-0,329
21	-0,344	0,099	0,142	-0,493
22	0,157	-0,344	-0,287	0,046
23	0,422	0,433	-0,003	-0,394
24	-1,305	0,137	-0,141	-0,815
25	1,005	-0,083	-0,024	0,964
26	-0,829	-1,213	0,712	-0,504
27	0,636	-0,421	0,115	-0,209
28	0,641	-0,013	-0,039	0,182
29	0,686	-0,073	1,023	-0,215
30	-0,296	1,230	-0,197	0,052

Note: see note 1 at table 1.1

In a different aspect of things, the S-statistic of Cheung &Ng indicates causality of high significance in volatility, from stock returns to industrial production (Table 6.2).

Table 6.2: Cheung & Ng’s S- statistic for Canada

Statistics Cheung&Ng CANADA	
SCNr_i,m	59,832***
SCNi_r,m	112,05***
SCNr_i,v	77,830***
SCNi_r,v	15,956066

Note: see note 2 at table 1.2

Table 6.3: Causality test of Hong in mean for Canada, Kernel functions: Q-S (Quadratic), Bartlett and Truncated.

Causality Test of Hong						
PANEL A mean						
Bandwidth	QuadraticCNr_i	BartlettCNr_i	TruncatedCNr_i	QuadraticCNi_r	BartlettCNi_r	TruncatedCNi_r
1	2,99327***	NaN	2,6320573***	4,0325179***	NaN	4,0070548***
2	3,4536803***	2,6320573***	5,8470137***	4,0373072***	4,0070548***	3,186799***
3	4,9602862***	3,9152361***	5,7080939***	3,8187777***	4,0064586***	2,7302742***
4	5,5156815***	4,8244568***	4,7869379***	3,5340909***	3,8641961***	2,4967125***
5	5,5208801***	5,2499919***	4,1468083***	3,2251419***	3,704159***	1,9413463**
6	5,3113318***	5,3880778***	3,5334855***	3,0124103***	3,5301538***	1,9223583**
7	5,0161095***	5,373078***	3,136973***	2,8766106***	3,3598561***	2,636631***
8	4,6946788***	5,2776682***	2,7814813***	2,774488***	3,2419542***	2,2657682**
9	4,3867943***	5,142644***	2,4563574***	2,6812609***	3,1650369***	1,9699048**
10	4,1142528***	4,9880182***	2,1239135**	2,5889481***	3,0966132***	1,8447173**
11	3,8811758***	4,8236536***	2,047923**	2,4931232***	3,029281***	1,6184311*
12	3,6786544***	4,6584708***	2,2333004**	2,394535***	2,9611076***	1,6158807*
13	3,4994174***	4,5032239***	2,3093213**	2,2963378**	2,8931145***	1,3698476*
14	3,3367722***	4,3636059***	2,0951912**	2,199655**	2,8254207***	1,151
15	3,1854066***	4,2372176***	1,9330711**	2,1038608**	2,7559684***	1,166
16	3,0415444***	4,1199747***	1,7247519**	2,0080418**	2,6861357***	1,012
17	2,9036289***	4,0092208***	1,5185564*	1,9120872**	2,617132***	0,930
18	2,7717854***	3,9028628***	1,4006612*	1,8165386**	2,5489493***	0,751
19	2,6463876***	3,800061***	1,217	1,7220046**	2,4813887***	0,586
20	2,5274727***	3,7002873***	1,044	1,6294576*	2,4138662***	0,635
21	2,4146875***	3,6028436***	0,899	1,5396966*	2,3471642***	0,480
22	2,3077979**	3,5073958***	0,746	1,4532018*	2,2817755**	0,351
23	2,2069207**	3,4137529***	0,626	1,3702833*	2,2172584**	0,239
24	2,11224**	3,3218354***	0,752	1,291191*	2,1534617**	0,106
25	2,0237068**	3,2325196***	0,768	1,216	2,090253**	-0,023
26	1,9410224**	3,146766***	0,736	1,145	2,0274748**	0,077
27	1,8637935**	3,0646929***	0,663	1,077	1,9657034**	-0,021
28	1,7916575**	2,9860665***	0,594	1,014	1,9054022**	-0,140
29	1,7243066**	2,9105657***	0,538	0,953	1,8463191**	-0,255
30	1,6614498**	2,8379436***	0,429	0,895	1,7882118**	-0,147

Note: see note 3 at table 1.3

Finally, the Truncated kernel function of Hong represents the results of Cheung & Ng r-statistic for causality in volatility (Table 6.4).

Table 6.4: Causality test of Hong in volatility for Canada, Kernel functions: Q-S (Quadratic), Bartlett and Truncated.

Causality Test of Hong						
PANEL B volatility						
Bandwidth	QuadraticCNr_i	BartlettCNr_i	TruncatedCNr_i	QuadraticCNi_r	BartlettCNi_r	TruncatedCNi_r
1	-0,734	NaN	-0,688	-0,695	NaN	-0,709
2	-0,774	-0,688	-0,886	-0,719	-0,709	-0,577
3	-0,942	-0,803	-1,117	-0,498	-0,713	0,602
4	-1,099	-0,921	-1,278	-0,196	-0,501	0,194
5	-1,241	-1,031	-1,460	-0,029	-0,295	-0,097
6	-1,374	-1,133	-1,607	-0,029	-0,191	-0,249
7	-1,498	-1,230	-1,741	-0,124	-0,151	-0,458
8	-1,610	-1,321	-1,869	-0,157	-0,150	-0,672
9	-1,709	-1,408	-1,956	-0,094	-0,175	-0,857
10	-1,797	-1,489	-1,933	0,035	-0,217	2,1755658**
11	-1,877	-1,563	-2,049	0,190	-0,209	1,9484658**
12	-1,947	-1,630	-2,131	0,345	-0,133	1,8121641**
13	-2,011	-1,692	-2,149	0,483	-0,030	1,5998503*
14	-2,073	-1,751	-2,198	0,595	0,078	1,4531894*
15	-2,133	-1,804	-2,247	0,681	0,183	1,239
16	-2,192	-1,855	-2,350	0,744	0,277	1,038
17	-2,249	-1,902	-2,447	0,785	0,360	0,874
18	-2,306	-1,948	-2,522	0,809	0,429	0,756
19	-2,362	-1,993	-2,612	0,819	0,487	0,615
20	-2,418	-2,037	-2,700	0,818	0,535	0,473
21	-2,473	-2,080	-2,784	0,806	0,572	0,361
22	-2,528	-2,122	-2,856	0,784	0,601	0,216
23	-2,581	-2,164	-2,939	0,756	0,622	0,102
24	-2,634	-2,206	-3,017	0,723	0,636	0,073
25	-2,686	-2,247	-3,095	0,686	0,645	0,089
26	-2,736	-2,288	-3,094	0,646	0,649	0,001
27	-2,785	-2,328	-3,168	0,602	0,649	-0,115
28	-2,832	-2,368	-3,242	0,556	0,645	-0,228
29	-2,877	-2,407	-3,161	0,508	0,639	-0,335
30	-2,921	-2,445	-3,229	0,458	0,630	-0,445

Note: see note 4 at table 1.4

The results of **Chile** could be characterized as ambiguous. The Cheung & Ng test gives a high r-statistic of important significance for causality in mean and volatility, in both directions (Table 7.1). The highest prices are detected in the middle lags of causality in volatility, from industrial production to stock returns.

Table 7.1: Cheung & Ng's r- statistic for Chile

CausalityTest of Cheung & Ng CHILE				
Lags	**$rCL_{r\_i,m}$**	**$rCL_{i\_r,m}$**	**$rCL_{r\_i,v}$**	**$rCL_{i\_r,v}$**
1	1,6960323*	0,030	0,123	-0,992
2	0,732	-0,082	0,321	1,218
3	2,0992677**	0,249	0,296	0,393
4	2,3430638**	1,541	0,615	0,931
5	0,382	-0,873	-0,419	0,125
6	1,041	-0,159	-0,186	-0,324
7	1,7954386*	0,823	0,020	-0,966
8	1,612	-1,359	0,706	2,2406445**
9	0,867	-1,312	-0,665	0,252
10	1,235	-0,265	0,651	1,268
11	-0,652	-0,011	0,295	-0,808
12	1,8215288*	-0,987	0,873	-0,466
13	0,840	-0,937	0,524	-0,540
14	-0,168	-0,502	0,435	-0,893
15	-0,083	0,543	0,400	-0,744
16	0,240	-0,937	-0,465	4,4188156***
17	0,939	0,901	1,414	-1,6685928*
18	-0,331	2,4311172**	-0,484	5,2616972***
19	-0,740	-0,487	0,396	-0,494
20	-0,882	-0,644	-0,943	0,769
21	-0,405	0,881	0,458	-0,111
22	-2,1727054**	-0,186	0,546	0,150
23	0,134	-0,259	0,024	-0,211
24	0,672	-0,595	-0,455	-0,757
25	0,034	1,037	0,201	-0,472
26	0,076	2,7457513***	2,1709969**	-0,544
27	-1,318	1,392	0,891	0,320
28	0,057	-0,500	2,9445668***	-0,554
29	0,381	0,134	-0,348	-0,012
30	-0,420	-0,160	-0,687	-0,039

Note: see note 1 at table 1.1

The S-statistic of Cheung & Ng results fail to signify as strong the causality in mean from industrial production to stock returns (Table 7.2). The same is true for the kernel functions of the Hong test (Table 7.3), as no causality in mean with this direction is detected.

Table 7.2: Cheung & Ng's S- statistic for Chile

Statistics Cheung&Ng CHILE	
SCLr_i,m	174,99***
SCLi_r,m	36,274987
SCLr_i,v	142,50***
SCLi_r,v	99,692***

Note: see note 2 at table 1.2

Table 7.3: Causality test of Hong in mean for Chile, Kernel functions: Q-S (Quadratic), Bartlett and Truncated.

Causality Test of Hong						
PANEL A mean						
Bandwidth	QuadraticCLr_i	BartlettCLr_i	TruncatedCLr_i	QuadraticCLi_r	BartlettCLi_r	TruncatedCLi_r
1	1,3589914*	NaN	1,3393097*	-0,755	NaN	-0,708
2	1,3092272*	1,3393097*	0,719	-0,799	-0,708	-0,998
3	1,3164164*	1,221	2,0012212**	-1,009	-0,857	-1,199
4	1,8202211**	1,3336631*	3,3531234***	-1,036	-0,994	-0,542
5	2,2433866**	1,6746251**	2,7389083***	-0,975	-1,026	-0,554
6	2,5307801***	2,0005667**	2,5388846***	-0,930	-0,994	-0,786
7	2,7309135***	2,2219568**	2,9714477***	-0,889	-0,965	-0,808
8	2,8708233***	2,3892802***	3,2044654***	-0,843	-0,951	-0,532
9	2,9725072***	2,5370208***	2,9780292***	-0,793	-0,936	-0,319
10	3,0539415***	2,662911***	2,9631448***	-0,767	-0,911	-0,506
11	3,1114547***	2,7648056***	2,7166933***	-0,758	-0,882	-0,692
12	3,1398251***	2,8441309***	3,1073788***	-0,751	-0,860	-0,658
13	3,1402911***	2,909416***	2,9448527***	-0,742	-0,844	-0,647
14	3,1234027***	2,9663709***	2,6663646***	-0,735	-0,832	-0,759
15	3,096038***	3,0117011***	2,4064167***	-0,728	-0,824	-0,856
16	3,0601762***	3,0436328***	2,1752776**	-0,719	-0,820	-0,839
17	3,0167191***	3,0623455***	2,1081305**	-0,707	-0,820	-0,836
18	2,9670567***	3,0699533***	1,9124977**	-0,692	-0,821	0,057
19	2,9130101***	3,068372***	1,803493**	-0,672	-0,819	-0,059
20	2,8565785***	3,0588998***	1,7401824**	-0,647	-0,809	-0,140
21	2,8002085***	3,0432883***	1,5818298*	-0,619	-0,796	-0,158
22	2,7458237***	3,0226114***	2,1582896**	-0,588	-0,780	-0,293
23	2,6943595***	3,000428***	1,9788114**	-0,554	-0,765	-0,416
24	2,6461088***	2,9789745***	1,8743993**	-0,519	-0,750	-0,491
25	2,6012232***	2,9573597***	1,7076534**	-0,483	-0,736	-0,453
26	2,5598481***	2,9350188***	1,5488622*	-0,447	-0,724	0,540
27	2,5220352***	2,9114176***	1,6489865**	-0,413	-0,711	0,686
28	2,487747***	2,8869578***	1,4985938*	-0,380	-0,692	0,586
29	2,4568325***	2,8619529***	1,3740675*	-0,350	-0,671	0,457
30	2,4290407***	2,836101***	1,259	-0,323	-0,647	0,334

Note: see note 3 at table 1.3

Another difference that comes up, in volatility this time, is that it is found non-bidirectional from the Hong test results, in contrast with r-statistics and S-statistics results, and that causality is detected in the last bandwidths (Table 7.4).

Table 7.4: Causality test of Hong in volatility for Chile, Kernel functions: Q-S (Quadratic), Bartlett and Truncated.

Causality Test of Hong						
PANEL B volatility						
Bandwidth	QuadraticCLr_i	BartlettCLr_i	TruncatedCLr_i	QuadraticCLi_r	BartlettCLi_r	TruncatedCLi_r
1	-0,748	NaN	-0,698	0,006	NaN	-0,007
2	-0,793	-0,698	-0,943	0,046	-0,007	0,244
3	-0,977	-0,831	-1,143	0,080	0,078	-0,144
4	-1,117	-0,955	-1,208	0,029	0,075	-0,166
5	-1,231	-1,056	-1,341	-0,087	0,031	-0,458
6	-1,337	-1,141	-1,503	-0,196	-0,029	-0,674
7	-1,436	-1,219	-1,658	-0,261	-0,106	-0,635
8	-1,524	-1,296	-1,674	-0,196	-0,183	0,442
9	-1,593	-1,369	-1,706	-0,099	-0,218	0,202
10	-1,661	-1,434	-1,745	-0,070	-0,214	0,342
11	-1,726	-1,492	-1,857	-0,088	-0,195	0,262
12	-1,779	-1,546	-1,821	-0,080	-0,167	0,098
13	-1,819	-1,595	-1,889	0,003	-0,141	-0,038
14	-1,855	-1,639	-1,971	0,178	-0,120	-0,064
15	-1,891	-1,681	-2,055	0,435	-0,105	-0,133
16	-1,929	-1,721	-2,125	0,751	-0,094	3,2993137***
17	-1,967	-1,760	-1,874	1,105	-0,060	3,5421971***
18	-2,004	-1,796	-1,944	1,4770639*	0,013	8,1249357***
19	-2,035	-1,828	-2,026	1,8487852**	0,141	7,8130995***
20	-2,060	-1,857	-1,982	2,2077533**	0,326	7,5806493***
21	-2,076	-1,884	-2,052	2,5471218***	0,544	7,2704161***
22	-2,084	-1,909	-2,106	2,8633603***	0,779	6,9804031***
23	-2,085	-1,932	-2,204	3,1539407***	1,020	6,7103548***
24	-2,078	-1,955	-2,268	3,4173379***	1,258	6,5361984***
25	-2,065	-1,978	-2,354	3,6533651***	1,490313*	6,3196905***
26	-2,045	-2,001	-1,747	3,8630875***	1,713411**	6,125266***
27	-2,020	-2,021	-1,730	4,0483599***	1,9256621**	5,9124875***
28	-1,990	-2,038	-0,585	4,2113927***	2,1260712**	5,7389036***
29	-1,956	-2,050	-0,681	4,3545172***	2,3142126**	5,5302362***
30	-1,920	-2,054	-0,726	4,4799676***	2,4900079***	5,330567***

Note: see note 4 at table 1.4

The results from **China** reveal that no causality of great significance is detected in the Cheung & Ng r-statistic (Table 8.1). But the S-statistic provides results with high causality in volatility, from stock returns to economic growth (Table 8.2).

Table 8.1: Cheung & Ng's r- statistic for China

CausalityTest of Cheung & Ng CHINA				
Lags	**$rCH_{r\_i,m}$**	**$rCH_{i\_r,m}$**	**$rCH_{r\_i,v}$**	**$rCH_{i\_r,v}$**
1	-0,696	0,572	1,205	-0,986
2	0,512	1,285	0,941	-0,167
3	0,513	-0,185	0,077	-0,382
4	1,396	-0,939	0,246	0,765
5	-0,338	0,394	0,629	-0,482
6	0,640	-0,317	0,113	2,0417825**
7	-0,127	0,167	0,093	-1,9041921*
8	0,189	0,826	-0,736	1,302
9	-0,560	-1,342	-0,554	1,479
10	0,454	0,440	0,133	-0,936
11	0,012	-0,455	-0,526	0,893
12	0,540	0,560	0,587	-0,432
13	-1,060	-0,564	1,415	-1,086
14	0,022	-2,1833575**	0,759	-0,543
15	-0,701	-0,431	-0,034	0,472
16	-0,423	-0,647	-0,029	0,353
17	-0,898	-1,111	-0,536	1,429
18	-1,575	-0,135	1,9083104*	-0,515
19	0,473	-0,770	2,2807502**	0,376
20	2,0003075**	0,409	2,1171298**	-1,619
21	-0,915	0,506	-0,303	-0,682
22	-1,581	0,930	0,124	1,036
23	-1,094	-0,594	0,096	0,138
24	-0,744	-0,574	-0,905	-0,311
25	0,790	-0,798	0,083	-1,144
26	1,151	0,168	-0,734	0,214
27	1,258	-1,103	1,265	-0,988
28	0,211	-0,453	0,775	1,546
29	0,352	-1,215	-0,340	0,075
30	1,212	0,338	0,199	-1,027

Note: see note 1 at table 1.1

Table 8.2: Cheung & Ng's S- statistic for China

Statistics Cheung&Ng CHINA	
SCHr_i,m	14,694199
SCHi_r,m	-104,92056
SCHr_i,v	141,50***
SCHi_r,v	-14,850467

Note: see note 2 at table 1.2

Furthermore, the non-high significance of the results of the Cheung & Ng test, becomes non-existent by the "strict" kernel functions of the Hong test, probably due to the weighed lags, the bandwidths, and the structural breaks or the long memory of volatility (Tables 8.3 and 8.4).

Table 8.3: Causality test of Hong in mean for China, Kernel functions: Q-S (Quadratic), Bartlett and Truncated.

Causality Test of Hong						
PANEL A mean						
Bandwidth	QuadraticCHr_i	BartlettCHr_i	TruncatedCHr_i	QuadraticCHi_r	BartlettCHi_r	TruncatedCHi_r
1	-0,401	NaN	-0,364	-0,456	NaN	-0,476
2	-0,434	-0,364	-0,625	-0,402	-0,476	-0,004
3	-0,611	-0,479	-0,810	-0,298	-0,348	-0,396
4	-0,665	-0,593	-0,357	-0,324	-0,311	-0,379
5	-0,668	-0,631	-0,597	-0,389	-0,328	-0,604
6	-0,691	-0,637	-0,712	-0,498	-0,363	-0,809
7	-0,739	-0,651	-0,920	-0,591	-0,416	-1,007
8	-0,811	-0,677	-1,100	-0,673	-0,482	-1,016
9	-0,887	-0,716	-1,195	-0,750	-0,551	-0,756
10	-0,963	-0,763	-1,309	-0,813	-0,608	-0,894
11	-1,040	-0,814	-1,459	-0,858	-0,654	-1,017
12	-1,120	-0,868	-1,538	-0,886	-0,695	-1,109
13	-1,199	-0,924	-1,444	-0,899	-0,735	-1,194
14	-1,266	-0,977	-1,578	-0,901	-0,774	-0,401
15	-1,316	-1,028	-1,611	-0,898	-0,804	-0,530
16	-1,351	-1,077	-1,701	-0,893	-0,821	-0,607
17	-1,373	-1,124	-1,675	-0,891	-0,831	-0,534
18	-1,385	-1,169	-1,358	-0,892	-0,837	-0,677
19	-1,388	-1,210	-1,442	-0,895	-0,841	-0,715
20	-1,383	-1,245	-0,892	-0,900	-0,843	-0,821
21	-1,370	-1,273	-0,883	-0,906	-0,845	-0,909
22	-1,350	-1,293	-0,609	-0,912	-0,848	-0,895
23	-1,326	-1,306	-0,549	-0,918	-0,852	-0,962
24	-1,296	-1,313	-0,590	-0,925	-0,857	-1,029
25	-1,264	-1,314	-0,619	-0,933	-0,863	-1,048
26	-1,230	-1,312	-0,542	-0,942	-0,870	-1,156
27	-1,195	-1,307	-0,429	-0,953	-0,877	-1,087
28	-1,161	-1,300	-0,541	-0,965	-0,886	-1,165
29	-1,127	-1,290	-0,637	-0,979	-0,895	-1,061
30	-1,095	-1,279	-0,543	-0,993	-0,904	-1,150

Note: see note 3 at table 1.3

Table 8.4: Causality test of Hong in volatility for China, Kernel functions: Q-S (Quadratic), Bartlett and Truncated.

Causality Test of Hong						
PANEL B volatility						
Bandwidth	QuadraticCHr_i	BartlettCHr_i	TruncatedCHr_i	QuadraticCHi_r	BartlettCHi_r	TruncatedCHi_r
1	0,307	NaN	0,325	-0,066	NaN	-0,016
2	0,302	0,325	0,178	-0,120	-0,016	-0,498
3	0,177	0,298	-0,259	-0,363	-0,182	-0,754
4	-0,033	0,196	-0,555	-0,555	-0,353	-0,796
5	-0,235	0,058	-0,684	-0,668	-0,485	-0,953
6	-0,416	-0,076	-0,908	-0,614	-0,590	0,072
7	-0,573	-0,200	-1,104	-0,440	-0,623	0,796
8	-0,721	-0,319	-1,142	-0,225	-0,567	0,936
9	-0,835	-0,429	-1,236	-0,012	-0,461	1,185
10	-0,932	-0,529	-1,390	0,169	-0,334	1,111
11	-1,028	-0,620	-1,476	0,312	-0,206	1,030
12	-1,117	-0,706	-1,542	0,419	-0,086	0,831
13	-1,192	-0,786	-1,267	0,494	0,018	0,851
14	-1,245	-0,857	-1,293	0,548	0,107	0,698
15	-1,274	-0,917	-1,428	0,587	0,183	0,543
16	-1,281	-0,970	-1,556	0,614	0,244	0,380
17	-1,269	-1,019	-1,626	0,629	0,293	0,575
18	-1,242	-1,065	-1,103	0,637	0,332	0,448
19	-1,206	-1,105	-0,337	0,638	0,364	0,307
20	-1,165	-1,134	0,273	0,634	0,389	0,590
21	-1,122	-1,146	0,136	0,627	0,410	0,508
22	-1,080	-1,145	-0,006	0,618	0,428	0,528
23	-1,038	-1,136	-0,143	0,608	0,444	0,383
24	-0,998	-1,122	-0,149	0,597	0,457	0,256
25	-0,961	-1,105	-0,277	0,586	0,467	0,319
26	-0,926	-1,086	-0,320	0,576	0,475	0,191
27	-0,895	-1,067	-0,205	0,566	0,480	0,206
28	-0,867	-1,047	-0,239	0,558	0,484	0,426
29	-0,842	-1,028	-0,339	0,551	0,486	0,300
30	-0,821	-1,008	-0,447	0,546	0,488	0,326

Note: see note 4 at table 1.4

Colombia is one of the countries that bidirectional causality in mean and volatility is detected (Tables 9.1, 9.3 and 9.4). The results of r-statistic speak for themselves (Table 9.1).

Table 9.1: Cheung & Ng's r- statistic for Colombia

CausalityTest of Cheung & Ng COLOMBIA				
Lags	$rCB_{r\_i,m}$	$rCB_{i\_r,m}$	$rCB_{r\_i,v}$	$rCB_{i\_r,v}$
1	0,478	-1,574	1,8896464*	-0,849
2	-0,051	1,8110235*	0,052	2,5187584**
3	1,6665647*	1,418	0,932	0,230
4	1,277	-0,394	-0,563	-1,089
5	-0,277	1,575	-0,274	1,107
6	0,524	-0,480	-1,318	0,212
7	2,2801191**	-0,829	-1,193	1,259
8	0,796	-0,229	-0,665	-0,375
9	2,5080915**	0,330	-0,450	-2,1203364**
10	2,5829012***	-1,066	0,235	0,329
11	-1,181	-0,880	-0,102	0,822
12	0,403	-0,235	-0,915	-1,157
13	0,457	-1,458	0,300	0,715
14	0,156	1,477	0,570	1,099
15	1,148	1,7877171*	-1,084	-0,659
16	0,208	0,633	-1,177	0,050
17	-1,059	1,074	-0,293	0,504
18	-0,227	1,7296953*	0,002	-0,135
19	1,089	-0,231	0,696	-0,264
20	0,409	1,222	-0,630	-0,845
21	2,1309339**	1,429	2,4370061**	-1,392
22	1,328	0,875	1,170	0,819
23	-1,7374034*	-0,757	0,199	-0,047
24	-0,043	0,514	-1,356	-0,804
25	-1,052	-1,059	0,496	1,278
26	-0,041	0,880	-0,086	0,757
27	0,829	0,218	-0,353	1,040
28	-0,541	-0,384	0,282	0,528
29	0,006	0,526	0,144	0,028
30	-0,778	-0,394	-0,159	-0,377

Note: see note 1 at table 1.1

The S-statistic, though, fails to support our findings as no bidirectional causality is detected in volatility (Table 9.2).

Table 9.2: Cheung & Ng's S- statistic for Colombia

Statistics Cheung&Ng COLOMBIA	
SCBr_i,m	190,30***
SCBi_r,m	107,79***
SCBr_i,v	-16,573677
SCBi_r,v	43,50895*

Note: see note 2 at table 1.2

In accordance with the results on our r-statistic, the kernel functions of the Hong test designate bidirectional causality in mean and variance (Tables 9.3 and 9.4). In the case of mean, causality is generated in the middle bandwidths (Table 9.3).

Table 9.3: Causality test of Hong in mean for Colombia, Kernel functions: Q-S (Quadratic), Bartlett and Truncated.

Causality Test of Hong						
PANEL A mean						
Bandwidth	QuadraticCBr_i	BartlettCBr_i	TruncatedCBr_i	QuadraticCBi_r	BartlettCBi_r	TruncatedCBi_r
1	-0,571	NaN	-0,546	1,164	NaN	1,056
2	-0,641	-0,546	-0,886	1,2868457*	1,056	1,9049057**
3	-0,663	-0,701	0,016	1,7327917**	1,420849*	1,9824877**
4	-0,420	-0,652	0,247	1,8725447**	1,6946497**	1,4249799*
5	-0,245	-0,506	-0,068	1,8969723**	1,8052722**	1,7616339**
6	-0,150	-0,391	-0,267	1,8610439**	1,8513743**	1,3941095*
7	-0,019	-0,330	0,909	1,7883033**	1,8706258**	1,218
8	0,209	-0,257	0,768	1,6841868**	1,8593131**	0,909
9	0,502	-0,158	2,0181206**	1,5639616*	1,8241897**	0,654
10	0,817	-0,032	3,2368268***	1,4457545*	1,7694754**	0,665
11	1,112	0,144	3,1924634***	1,3437949*	1,7054586**	0,597
12	1,3626383*	0,352	2,8995449***	1,265	1,6399645*	0,386
13	1,5590159*	0,561	2,6447199***	1,205	1,5734018*	0,614
14	1,7152343**	0,754	2,3765051***	1,166	1,5096087*	0,839
15	1,8405768**	0,925	2,3762045***	1,146	1,454535*	1,245
16	1,9399104**	1,074	2,1441075**	1,142	1,412246*	1,112
17	2,0190652**	1,203	2,1219564**	1,147	1,3813211*	1,124
18	2,0851009**	1,3142841*	1,916612**	1,159	1,3577496*	1,4591259*
19	2,1428515**	1,4089219*	1,9177443**	1,172	1,3417953*	1,278
20	2,1936303**	1,4892744*	1,7511488**	1,185	1,3321685*	1,3472491*
21	2,2373604**	1,5572697*	2,308578**	1,199	1,3265557*	1,505034*
22	2,2739221**	1,6171223*	2,4005092***	1,211	1,3249091*	1,4539381*
23	2,3033339**	1,672812**	2,688084***	1,221	1,3265599*	1,3762031*
24	2,3258894**	1,7260607**	2,5024951***	1,228	1,3300833*	1,255
25	2,3421562***	1,7770832**	2,4926355***	1,231	1,3342332*	1,270
26	2,3529264***	1,8251349**	2,3208607**	1,231	1,3384513*	1,234
27	2,3590774***	1,8697991**	2,2569121**	1,227	1,3425995*	1,094
28	2,3613746***	1,9107096**	2,1397434**	1,220	1,346151*	0,974
29	2,3604143***	1,947816**	1,9860969**	1,211	1,3485291*	0,877
30	2,3567035***	1,980935**	1,9229818**	1,199	1,3494442*	0,767

Note: see note 3 at table 1.3

In volatility, causality is obviously detected in the earlier bandwidths (Table 9.4).

Table 9.4: Causality test of Hong in volatility for Colombia, Kernel functions: Q-S (Quadratic), Bartlett and Truncated.

Causality Test of Hong						
PANEL B volatility						
Bandwidth	QuadraticCBr_i	BartlettCBr_i	TruncatedCBr_i	QuadraticCBi_r	BartlettCBi_r	TruncatedCBi_r
1	1,785137**	NaN	1,8363222**	0,036	NaN	-0,195
2	1,7037926**	1,8363222**	0,803	0,388	-0,195	2,5679731***
3	1,3253227*	1,6114354*	0,610	1,4231277*	0,737	1,7171776**
4	1,014	1,3783149*	0,292	1,7459139**	1,2991222*	1,5656431*
5	0,756	1,185	-0,028	1,8039362**	1,5293491*	1,485355*
6	0,590	1,006	0,201	1,7427022**	1,6339081*	1,087
7	0,487	0,861	0,313	1,6701482**	1,6656015**	1,180
8	0,403	0,761	0,161	1,6146864*	1,6603728**	0,897
9	0,318	0,686	-0,030	1,5799732*	1,6366123*	1,7087683**
10	0,239	0,621	-0,234	1,5598622*	1,620415*	1,4318866*
11	0,162	0,557	-0,429	1,5465092*	1,6184722*	1,3103323*
12	0,082	0,492	-0,433	1,5319488*	1,6173749*	1,3435183*
13	-0,001	0,427	-0,589	1,509268*	1,6156143*	1,209
14	-0,082	0,364	-0,688	1,4765223*	1,6123336*	1,224
15	-0,152	0,301	-0,617	1,4374519*	1,6071089*	1,093
16	-0,207	0,240	-0,512	1,3944833*	1,599838*	0,891
17	-0,249	0,184	-0,647	1,3488277*	1,5889178*	0,749
18	-0,282	0,133	-0,789	1,301371*	1,5735766*	0,574
19	-0,308	0,084	-0,841	1,253	1,5537246*	0,418
20	-0,327	0,036	-0,906	1,205	1,5294225*	0,378
21	-0,342	-0,009	-0,056	1,158	1,5015584*	0,543
22	-0,352	-0,049	0,023	1,113	1,4722751*	0,498
23	-0,358	-0,081	-0,110	1,068	1,4429524*	0,350
24	-0,363	-0,106	0,042	1,025	1,4133139*	0,309
25	-0,367	-0,126	-0,053	0,982	1,3832044*	0,420
26	-0,371	-0,142	-0,180	0,940	1,3533676*	0,370
27	-0,376	-0,155	-0,285	0,898	1,3242771*	0,397
28	-0,381	-0,166	-0,392	0,856	1,2960226*	0,308
29	-0,387	-0,176	-0,504	0,814	1,269	0,183
30	-0,394	-0,186	-0,612	0,774	1,241	0,082

Note: see note 4 at table 1.4

Strong evidence of real stock returns volatility to be helpful in forecasting industrial production growth rate volatility, is given by the interpretation of the results of **Cyprus** (Tables 10.1, 10.2, 10.3 and 10.4). The r-statistic results of the Cheung & Ng test, detect causal relations in mean and on both directions, but they seem to be of little significance (Table 10.1), or no significance (Table 10.2).

Table 10.1: Cheung & Ng's r- statistic for Cyprus

Causality Test of Cheung & Ng CYPRUS				
Lags	rCPr_i,m	rCPi_r,m	rCPr_i,v	rCPi_r,v
1	0,795	2,238**	2,987***	0,754
2	0,256	0,209	-0,154	0,184
3	0,000	0,179	2,699***	0,903
4	0,248	0,574	-0,332	0,556
5	1,675*	1,153	0,387	0,259
6	1,101	0,868	-0,172	0,696
7	0,520	1,131	1,737*	0,241
8	0,726	-0,549	-0,757	-0,178
9	-0,040	-0,807	2,047**	-0,299
10	0,227	-0,540	-0,325	0,279
11	1,966**	-1,267	0,019	-0,036
12	-0,578	-0,821	-0,092	0,274
13	-0,029	0,759	-0,151	-0,076
14	0,098	-0,765	-0,698	-0,170
15	-1,413	-0,814	-0,353	-0,024
16	-1,220	-1,097	-0,466	-0,421
17	-0,164	-0,301	-0,646	-0,109
18	-0,746	0,358	0,884	0,343
19	0,292	-0,398	0,883	-0,233
20	0,095	-0,568	-0,675	-0,118
21	-1,126	-0,550	-0,475	-0,088
22	-0,829	-1,352	0,652	-0,118
23	1,179	-0,919	-0,471	-0,335
24	-0,055	-1,006	-0,544	-0,161
25	0,874	0,418	4,025***	-0,280
26	-0,012	-0,797	-0,211	-0,108
27	-0,736	-0,170	0,037	-0,485
28	-0,661	-0,851	1,178	0,186
29	0,281	-0,204	-0,247	-0,015
30	0,299	-0,278	0,211	0,164

Note: see note 1 at table 1.1

Table 10.2: Cheung & Ng's S- statistic for Cyprus

Statistics Cheung&Ng CYPRUS	
SCPr_i,m	28,527576
SCPi_r,m	-58,165625
SCPr_i,v	96,964***
SCPi_r,v	14,021782

Note: see note 2 at table 1.2

Strong causality in mean, but only in the first three bandwidths is found in the kernel functions, with direction from industrial production growth rate to real stock returns (Table 10.3).

Table 10.3: Causality test of Hong in mean for Cyprus, Kernel functions: Q-S (Quadratic), Bartlett and Truncated.

Causality Test of Hong						
PANEL A mean						
Bandwidth	$QuadraticCP_{r\_i}$	$BartlettCP_{r\_i}$	$TruncatedCP_{r\_i}$	$QuadraticCP_{i\_r}$	$BartlettCP_{i\_r}$	$TruncatedCP_{i\_r}$
1	-0,306	NaN	-0,256	2,836***	NaN	2,894***
2	-0,360	-0,256	-0,649	2,752***	2,894***	1,580*
3	-0,582	-0,408	-0,939	2,229**	2,646***	0,905
4	-0,791	-0,569	-1,144	1,731**	2,296**	0,560
5	-0,838	-0,716	-0,416	1,387*	1,980**	0,630
6	-0,791	-0,784	-0,297	1,168	1,736**	0,524
7	-0,751	-0,781	-0,460	1,012	1,553*	0,589
8	-0,723	-0,759	-0,534	0,892	1,414*	0,393
9	-0,703	-0,739	-0,732	0,791	1,303*	0,310
10	-0,686	-0,729	-0,899	0,709	1,207	0,153
11	-0,666	-0,730	-0,174	0,644	1,120	0,314
12	-0,644	-0,728	-0,285	0,588	1,044	0,261
13	-0,626	-0,717	-0,458	0,536	0,979	0,193
14	-0,611	-0,704	-0,617	0,486	0,921	0,133
15	-0,597	-0,693	-0,365	0,438	0,869	0,095
16	-0,584	-0,684	-0,224	0,392	0,821	0,168
17	-0,572	-0,673	-0,369	0,350	0,778	0,026
18	-0,562	-0,661	-0,406	0,309	0,738	-0,100
19	-0,556	-0,650	-0,526	0,272	0,700	-0,213
20	-0,553	-0,641	-0,654	0,236	0,663	-0,290
21	-0,554	-0,634	-0,553	0,203	0,627	-0,367
22	-0,557	-0,629	-0,555	0,171	0,590	-0,174
23	-0,562	-0,625	-0,435	0,140	0,555	-0,153
24	-0,568	-0,621	-0,551	0,110	0,522	-0,104
25	-0,575	-0,618	-0,536	0,080	0,491	-0,193
26	-0,582	-0,616	-0,645	0,050	0,463	-0,202
27	-0,590	-0,614	-0,662	0,020	0,436	-0,307
28	-0,597	-0,613	-0,694	-0,010	0,410	-0,297
29	-0,604	-0,613	-0,780	-0,039	0,385	-0,394
30	-0,611	-0,614	-0,861	-0,068	0,361	-0,481

Note: see note 3 at table 1.3

As mentioned before, very strong causality is detected for Cyprus in volatility from stock returns to industrial production growth rate. The relation starts from the first bandwidths and lasts till the last (Table 10.4).

Table 10.4: Causality test of Hong in volatility for Cyprus, Kernel functions: Q-S (Quadratic), Bartlett and Truncated.

Causality Test Of Hong						
PANEL B volatility						
Bandwidth	QuadraticCP_{r_i}	BartlettCP_{r_i}	TruncatedCP_{r_i}	QuadraticCP_{i_r}	BartlettCP_{i_r}	TruncatedCP_{i_r}
1	5,720***	NaN	5,721***	-0,34817804	NaN	-0,30143096
2	5,550***	5,721***	3,584***	-0,407	-0,301	-0,697
3	5,294***	5,388***	5,613***	-0,587	-0,457	-0,634
4	5,377***	5,398***	4,585***	-0,691	-0,560	-0,788
5	5,266***	5,498***	3,868***	-0,789	-0,630	-0,997
6	5,037***	5,471***	3,282***	-0,885	-0,701	-1,050
7	4,829***	5,357***	3,657***	-0,984	-0,771	-1,220
8	4,678***	5,228***	3,357***	-1,084	-0,838	-1,380
9	4,555***	5,109***	4,025***	-1,183	-0,906	-1,511
10	4,434***	5,014***	3,658***	-1,282	-0,974	-1,636
11	4,323***	4,942***	3,312***	-1,379	-1,042	-1,770
12	4,219***	4,874***	3,005***	-1,474	-1,110	-1,879
13	4,106***	4,804***	2,732***	-1,565	-1,177	-1,997
14	3,981***	4,729***	2,580***	-1,653	-1,243	-2,104
15	3,850***	4,650***	2,370***	-1,738	-1,308	-2,211
16	3,718***	4,568***	2,196	-1,821	-1,371	-2,279
17	3,591***	4,483***	2,074	-1,900	-1,433	-2,377
18	3,474***	4,399***	2,032**	-1,976	-1,494	-2,450
19	3,375***	4,314***	1,996**	-2,049	-1,553	-2,533
20	3,296***	4,232***	1,906**	-2,120	-1,610	-2,620
21	3,238***	4,151***	1,783**	-2,188	-1,666	-2,705
22	3,198***	4,072***	1,702**	-2,254	-1,720	-2,786
23	3,174***	3,996***	1,592**	-2,318	-1,773	-2,848
24	3,161***	3,921***	1,502**	-2,380	-1,825	-2,923
25	3,157***	3,848***	4,121***	-2,440	-1,875	-2,987
26	3,159***	3,785***	3,965***	-2,498	-1,925	-3,060
27	3,165***	3,737***	3,811***	-2,554	-1,973	-3,094
28	3,174***	3,700***	3,892***	-2,609	-2,020	-3,159
29	3,185***	3,673***	3,760***	-2,663	-2,066	-3,229
30	3,198***	3,652***	3,632***	-2,714	-2,110	-3,293

Note: see note 4 at table 1.4

For the **Czech Republic**, the r-statistics indicate late causality in mean from stock returns to output growth, and strong causality in volatility on both directions, which is accompanied with high prices and strong significance. It could be bidirectional causality in volatility (Table 11.1).

Table 11.1: Cheung & Ng's r- statistic for Czech Republic

CausalityTest of Cheung & Ng CZECH REPUBLIC				
Lags	$rCZ_{r\_i,m}$	$rCZ_{i\_r,m}$	$rCZ_{r\_i,v}$	$rCZ_{i\_r,v}$
1	1,140	0,041	2,9600563***	1,393
2	1,506	1,064	-0,937	-0,910
3	0,471	-0,597	-0,011	-0,877
4	1,363	0,496	-0,305	-0,108
5	0,422	-0,178	-0,823	-0,046
6	1,206	-0,489	-0,592	2,6939623***
7	1,011	0,607	-0,738	-0,451
8	1,069	-0,670	-0,117	0,860
9	1,128	-0,334	1,107	-0,181
10	1,226	-0,128	-0,313	-1,068
11	0,669	0,002	-0,134	-0,517
12	0,520	-0,490	-0,166	0,306
13	-1,516	0,183	0,268	-0,166
14	0,806	-0,576	-0,655	-0,545
15	0,722	0,353	-0,091	-0,227
16	0,345	0,215	-0,007	-0,086
17	0,396	0,830	-0,491	0,353
18	0,493	-0,072	-0,101	0,172
19	-0,002	-0,560	-0,776	0,505
20	-0,829	-0,426	0,122	0,256
21	1,615	-0,660	0,506	-1,051
22	-0,651	0,035	2,8566512***	-0,412
23	-0,194	0,359	-0,505	-0,968
24	0,279	0,045	-0,487	-0,594
25	0,245	-0,289	-0,540	-0,856
26	0,699	-0,136	-0,370	0,129
27	-0,836	-0,720	0,335	2,2046492**
28	2,1316131**	-1,236	3,1866855***	0,331
29	1,118	-0,704	0,299	0,521
30	-0,826	0,075	-0,993	-0,252

Note: see note 1 at table 1.1

It is to our surprise, however, that the S-statistics of Cheung & Ng claim that causality exists only in mean and not in volatility. The causality is, at least, directed from stock returns to output growth (Table 11.2).

Table 11.2: Cheung & Ng's S- statistic for Czech Republic

Statistics Cheung&Ng CZECH RP.	
SCZr_i,m	162,65***
SCZi_r,m	-40,951776
SCZr_i,v	25,60511
SCZi_r,v	4,2309775

Note: see note 2 at table 1.2

The kernel functions of the Hong test, find no causality in mean whatsoever (Table 11.3) and this is closer to the r-statistic results.

Table 11.3: Causality test of Hong in mean for Czech Republic, Kernel functions: Q-S (Quadratic), Bartlett and Truncated.

Causality Test of Hong						
PANEL A mean						
Bandwidth	QuadraticCZr_i	BartlettCZr_i	TruncatedCZr_i	QuadraticCZi_r	BartlettCZi_r	TruncatedCZi_r
1	0,273	NaN	0,221	-0,710	NaN	-0,709
2	0,365	0,221	0,813	-0,691	-0,709	-0,427
3	0,547	0,438	0,353	-0,644	-0,662	-0,607
4	0,582	0,520	0,633	-0,681	-0,647	-0,789
5	0,573	0,551	0,316	-0,775	-0,674	-1,010
6	0,551	0,561	0,442	-0,880	-0,728	-1,138
7	0,541	0,556	0,436	-0,979	-0,794	-1,217
8	0,533	0,551	0,467	-1,073	-0,861	-1,268
9	0,534	0,548	0,530	-1,163	-0,925	-1,401
10	0,542	0,548	0,647	-1,251	-0,986	-1,547
11	0,549	0,553	0,518	-1,339	-1,046	-1,686
12	0,554	0,559	0,364	-1,424	-1,106	-1,763
13	0,556	0,562	0,650	-1,504	-1,166	-1,880
14	0,555	0,565	0,585	-1,578	-1,225	-1,931
15	0,546	0,570	0,501	-1,647	-1,283	-2,020
16	0,530	0,574	0,346	-1,714	-1,339	-2,121
17	0,508	0,576	0,209	-1,779	-1,394	-2,096
18	0,485	0,575	0,096	-1,843	-1,447	-2,199
19	0,461	0,570	-0,054	-1,905	-1,498	-2,242
20	0,437	0,561	-0,075	-1,965	-1,547	-2,308
21	0,415	0,548	0,238	-2,021	-1,595	-2,327
22	0,393	0,535	0,171	-2,074	-1,640	-2,419
23	0,373	0,523	0,043	-2,123	-1,684	-2,487
24	0,355	0,510	-0,072	-2,168	-1,727	-2,574
25	0,339	0,497	-0,184	-2,210	-1,769	-2,645
26	0,326	0,483	-0,224	-2,247	-1,810	-2,724
27	0,316	0,467	-0,229	-2,282	-1,850	-2,723
28	0,308	0,451	0,363	-2,313	-1,889	-2,566
29	0,303	0,436	0,438	-2,341	-1,927	-2,570
30	0,299	0,424	0,428	-2,367	-1,963	-2,648

Note: see note 3 at table 1.3

The case of bidirectional causality in volatility does not stand for the case of Hong test, as only causality from stock returns to output growth is detected (Table 11.4).

Table 11.4: Causality test of Hong in volatility for Czech Republic, Kernel functions: Q-S (Quadratic), Bartlett and Truncated.

Causality Test of Hong						
PANEL B volatility						
Bandwidth	QuadraticCZr_i	BartlettCZr_i	TruncatedCZr_i	QuadraticCZi_r	BartlettCZi_r	TruncatedCZi_r
1	5,5463709***	NaN	5,5741287***	0,670	NaN	0,681
2	5,4904902***	5,5741287***	3,908248***	0,658	0,681	0,406
3	4,8821578***	5,3929158***	2,8002066***	0,569	0,635	0,249
4	4,1606751***	4,976297***	2,1205233**	0,379	0,561	-0,129
5	3,5694***	4,537941***	1,8156651**	0,257	0,461	-0,427
6	3,0985743***	4,1486957***	1,4877829*	0,314	0,339	1,5020126*
7	2,7256081***	3,8148958***	1,276	0,438	0,319	1,194
8	2,4180024***	3,5266967***	0,960	0,554	0,388	1,073
9	2,1583074**	3,2725613***	0,987	0,641	0,470	0,798
10	1,9387599**	3,0493178***	0,749	0,691	0,539	0,816
11	1,740885**	2,8528596***	0,519	0,710	0,593	0,639
12	1,558445*	2,6746602***	0,311	0,705	0,634	0,442
13	1,3884802*	2,5098105***	0,131	0,678	0,660	0,247
14	1,228	2,3555683***	0,037	0,633	0,673	0,123
15	1,075	2,2109864**	-0,133	0,575	0,674	-0,041
16	0,932	2,07505**	-0,293	0,508	0,666	-0,202
17	0,803	1,9462445**	-0,398	0,437	0,649	-0,332
18	0,691	1,8238171**	-0,540	0,365	0,626	-0,471
19	0,597	1,7071605**	-0,567	0,295	0,597	-0,562
20	0,521	1,5961144*	-0,696	0,228	0,564	-0,682
21	0,463	1,4904298*	-0,777	0,166	0,527	-0,617
22	0,421	1,3895466*	0,487	0,109	0,489	-0,712
23	0,393	1,2986197*	0,391	0,057	0,449	-0,674
24	0,376	1,221	0,296	0,010	0,410	-0,732
25	0,368	1,153	0,216	-0,033	0,371	-0,726
26	0,367	1,092	0,114	-0,072	0,332	-0,833
27	0,371	1,038	0,013	-0,107	0,294	-0,175
28	0,379	0,989	1,4734783*	-0,139	0,258	-0,270
29	0,390	0,947	1,3577857*	-0,169	0,227	-0,337
30	0,402	0,914	1,3826874*	-0,197	0,197	-0,432

Note: see note 4 at table 1.4

The **Danish** results report on strong causality in mean, from real stock returns to industrial production growth rate, according to the r-statistics of Cheung & Ng. In addition, we find a very high r-statistic in volatility from industrial production to stock returns that suggests causality in the first lag (Table 12.1).

Table 12.1: Cheung & Ng's r- statistic for Denmark

CausalityTest of Cheung & Ng DENMARK				
Lags	$rDK_{r\_i,m}$	$rDK_{i\_r,m}$	$rDK_{r\_i,v}$	$rDK_{i\_r,v}$
1	-0,497	1,6899803*	-0,660	5,3191088***
2	1,6679572*	0,952	0,533	-0,289
3	1,070	-0,748	0,940	-0,132
4	2,0579483**	-0,718	-0,274	-0,147
5	2,6534943***	-0,186	-0,652	-0,549
6	0,360	0,759	-0,147	0,569
7	0,537	-0,043	-0,560	-0,609
8	1,414	-0,947	1,6547632*	0,560
9	0,071	-1,8653382*	-0,236	0,518
10	0,907	1,039	-0,524	0,852
11	1,067	0,192	1,230	-1,074
12	0,627	-0,836	-0,664	0,100
13	1,282	-0,712	0,011	-1,413
14	0,264	-0,321	-0,376	0,263
15	1,519	-0,102	0,323	1,631
16	-0,163	0,344	-0,635	-0,593
17	0,328	1,308	1,166	0,630
18	-0,781	-0,492	-0,362	-0,477
19	-0,815	-0,270	-0,661	-1,313
20	1,6901893*	-0,039	0,212	-1,076
21	-0,851	-1,171	-0,568	0,960
22	-0,140	1,573	0,470	-0,158
23	-0,738	-1,351	-0,796	-0,967
24	0,710	-1,067	-0,084	0,192
25	0,118	-0,124	-0,137	0,359
26	-0,668	-0,684	-0,276	-0,818
27	-1,416	-0,809	-0,280	-0,485
28	-0,226	0,209	-0,040	-0,125
29	0,638	-0,378	0,283	-0,201
30	-0,117	0,750	-0,037	0,454

Note: see note 1 at table 1.1

In agreement with the above come the S-statistic results that account for powerful causality in mean, from stock returns to industrial production growth rate (Table 12.2).

Table 12.2: Cheung & Ng's S- statistic for Denmark

Statistics Cheung&Ng DENMARK	
SDKr_i,m	213,99***
SDKi_r,m	-68,928031
SDKr_i,v	-19,383744
SDKi_r,v	33,413299

Note: see note 2 at table 1.2

The kernel functions of the Hong test assure us for the detection of causality in mean, with direction from real stock returns to industrial production (Table 12.3).

Table 12.3: Causality test of Hong in mean for Denmark, Kernel functions: Q-S (Quadratic), Bartlett and Truncated.

Causality Test of Hong						
PANEL A mean						
Bandwidth	QuadraticDKr_i	BartlettDKr_i	TruncatedDKr_i	QuadraticDKi_r	BartlettDKi_r	TruncatedDKi_r
1	-0,436	NaN	-0,533	1,3086877*	NaN	1,3216904*
2	-0,311	-0,533	0,523	1,2926226*	1,3216904*	0,893
3	0,117	-0,208	0,492	1,119	1,268	0,553
4	0,525	0,041	1,5877674*	0,899	1,147	0,312
5	1,110	0,302	3,3617919***	0,692	1,013	-0,024
6	1,6140517*	0,691	2,8255414***	0,479	0,874	-0,140
7	1,9676391**	1,088	2,4339009***	0,308	0,739	-0,394
8	2,1827419**	1,3967325*	2,5420663***	0,200	0,611	-0,389
9	2,3031091**	1,6302162*	2,1692856**	0,136	0,493	0,236
10	2,3640133***	1,804917**	2,0289151**	0,098	0,405	0,250
11	2,3819412***	1,9299665**	1,9761285**	0,073	0,350	0,037
12	2,3736525***	2,0195583**	1,7770582**	0,046	0,311	-0,019
13	2,3484886***	2,0821971**	1,8490279**	0,010	0,279	-0,108
14	2,3135195**	2,1255317**	1,6134904*	-0,029	0,250	-0,269
15	2,2737928**	2,1541714**	1,8168575**	-0,069	0,222	-0,437
16	2,2305626**	2,1726823**	1,5947897*	-0,108	0,193	-0,574
17	2,1843789**	2,1840691**	1,4020819*	-0,145	0,161	-0,422
18	2,1366935**	2,1876535**	1,308431*	-0,178	0,129	-0,531
19	2,0885592**	2,1842028**	1,230	-0,210	0,097	-0,663
20	2,0405462**	2,1750968**	1,5176659*	-0,239	0,065	-0,800
21	1,9926955**	2,1633464**	1,4510575*	-0,266	0,033	-0,711
22	1,9451033**	2,1509456**	1,278	-0,291	0,000	-0,452
23	1,8981002**	2,1372681**	1,194	-0,315	-0,031	-0,303
24	1,85182**	2,1218808**	1,109	-0,338	-0,058	-0,264
25	1,8061221**	2,1048463**	0,955	-0,358	-0,082	-0,392
26	1,7609163**	2,0860157**	0,870	-0,377	-0,103	-0,450
27	1,7163822**	2,0653334**	1,013	-0,395	-0,123	-0,478
28	1,6727723**	2,0436385**	0,876	-0,412	-0,141	-0,591
29	1,630161*	2,021399**	0,794	-0,428	-0,158	-0,687
30	1,5884432*	1,9984191**	0,662	-0,442	-0,175	-0,723

Note: see note 3 at table 1.3

The high r-statistic of Cheung & Ng of volatility from output growth to stock returns (Table 12.1), is interpreted as a strong causal relation by the Hong test, that exists in all bandwidths (Table 12.4).

Table 12.4: Causality test of Hong in volatility for Denmark, Kernel functions: Q-S (Quadratic), Bartlett and Truncated.

Causality Test of Hong						
PANEL B volatility						
Bandwidth	QuadraticDKr_i	BartlettDKr_i	TruncatedDKr_i	QuadraticDKi_r	BartlettDKi_r	TruncatedDKi_r
1	-0,434	NaN	-0,399	19,311462***	NaN	19,403643***
2	-0,478	-0,399	-0,639	19,070236***	19,403643***	13,286801***
3	-0,593	-0,509	-0,566	16,996035***	18,671397***	10,467423***
4	-0,666	-0,574	-0,817	14,83941***	17,320798***	8,7365245***
5	-0,762	-0,631	-0,910	13,115954***	16,026626***	7,6101348***
6	-0,859	-0,694	-1,113	11,765597***	14,896356***	6,7677244***
7	-0,932	-0,762	-1,212	10,690817***	13,926135***	6,1128101***
8	-0,972	-0,831	-0,686	9,8112341***	13,090263***	5,5607978***
9	-0,994	-0,880	-0,867	9,0811299***	12,363298***	5,0837743***
10	-1,009	-0,909	-0,982	8,4699036***	11,723945***	4,7770079***
11	-1,024	-0,933	-0,818	7,9536014***	11,157822***	4,6047111***
12	-1,044	-0,951	-0,892	7,512726***	10,655967***	4,2182008***
13	-1,067	-0,964	-1,051	7,1337622***	10,207223***	4,2695871***
14	-1,093	-0,976	-1,172	6,8055898***	9,8048887***	3,9501719***
15	-1,121	-0,991	-1,293	6,5180041***	9,4428965***	4,1451495***
16	-1,152	-1,008	-1,353	6,2632467***	9,1170046***	3,9127054***
17	-1,184	-1,028	-1,241	6,0361228***	8,8234792***	3,7063721***
18	-1,219	-1,049	-1,347	5,8320773***	8,5558794***	3,4859149***
19	-1,256	-1,070	-1,397	5,646687***	8,309399***	3,5320684***
20	-1,295	-1,091	-1,510	5,475912***	8,0817607***	3,4862782***
21	-1,335	-1,112	-1,573	5,3162939***	7,8717437***	3,407555***
22	-1,377	-1,135	-1,650	5,1650213***	7,677421***	3,1939818***
23	-1,421	-1,158	-1,661	5,0208816***	7,4963647***	3,1319929***
24	-1,466	-1,182	-1,766	4,8823815***	7,3266874***	2,9387213***
25	-1,511	-1,207	-1,866	4,7489537***	7,1668967***	2,7683034***
26	-1,558	-1,232	-1,955	4,6190248***	7,0153925***	2,684585***
27	-1,605	-1,258	-2,040	4,4925156***	6,8712209***	2,5432065***
28	-1,653	-1,285	-2,134	4,3697658***	6,7336416***	2,3769723***
29	-1,702	-1,312	-2,214	4,2505433***	6,601788***	2,2208382**
30	-1,751	-1,340	-2,303	4,1351918***	6,4748997***	2,0933167**

Note: see note 4 at table 1.4

The **Finnish** market indicates for causality in mean and variance, as it is shown through its r-statistic prices. The results are not extremely high but they are detected in the first ten lags (Table 13.1). The highest price is once again found in volatility.

Table 13.1: Cheung & Ng's r- statistic for Finland

CausalityTest of Cheung & Ng FINLAND				
Lags	**$rFN_{r\_i,m}$**	**$rFN_{i\_r,m}$**	**$rFN_{r\_i,v}$**	**$rFN_{i\_r,v}$**
1	1,509	0,280	0,986	1,172
2	2,1421654**	-0,399	-0,166	-0,315
3	0,538	2,0111049**	0,137	3,6744941***
4	1,359	1,447	1,252	-0,251
5	1,058	-0,233	-0,663	1,8804574*
6	-0,122	0,478	2,0549734**	1,570
7	1,483	-0,299	0,155	0,119
8	-0,330	-0,281	0,226	-0,068
9	0,521	0,527	0,429	2,0397466**
10	1,138	-0,346	-0,234	-0,050
11	1,131	-1,9191882*	-0,290	-0,506
12	-0,125	1,9241022*	-0,029	0,172
13	0,432	-0,145	-0,017	-0,481
14	-0,546	0,324	-0,518	-0,574
15	0,222	0,278	-0,481	-0,193
16	-0,333	-0,795	0,687	-0,437
17	-0,328	0,083	-0,315	-0,436
18	-0,334	1,011	-0,402	-0,719
19	-0,904	-0,408	-0,481	-0,488
20	0,168	-0,205	-0,153	-0,413
21	-0,145	-0,601	-0,704	-0,661
22	-0,344	-0,721	-0,254	-0,535
23	-0,111	1,178	-0,722	-0,347
24	0,525	-0,687	-0,547	-0,457
25	-0,255	-1,500	0,112	-0,258
26	-0,420	1,116	-0,614	0,441
27	-0,646	-0,837	-0,159	0,023
28	0,291	-1,385	-0,465	-0,466
29	0,222	-0,131	-0,589	-0,213
30	0,532	-1,135	-0,329	-0,728

Note: see note 1 at table 1.1

But the S-statistic confirms causality in the case of mean from stock returns to industrial production (Table 13.2).

Table 13.2: Cheung & Ng's S- statistic for Finland

Statistics Cheung&Ng FINLAND	
SFNr_i,m	58,880***
SFNi_r,m	-9,685622
SFNr_i,v	-13,070889
SFNi_r,v	15,57387

Note: see note 2 at table 1.2

The same is true in mean for the kernel functions of the Hong test (Table 13.3).

Table 13.3: Causality test of Hong in mean for Finland, Kernel functions: Q-S (Quadratic), Bartlett and Truncated.

Causality Test of Hong						
PANEL A mean						
Bandwidth	QuadraticFNr_i	BartlettFNr_i	TruncatedFNr_i	QuadraticFNi_r	BartlettFNi_r	TruncatedFNi_r
1	1,106	NaN	0,946	-0,663	NaN	-0,657
2	1,3427094*	0,946	2,565681***	-0,729	-0,657	-0,887
3	1,9565447**	1,5609706*	1,837356**	-0,616	-0,780	0,602
4	2,1302371**	1,8879216**	1,9562969**	-0,173	-0,607	0,969
5	2,1440988**	2,0183071**	1,8430616**	0,140	-0,314	0,588
6	2,1041661**	2,0839635**	1,4291364*	0,304	-0,084	0,339
7	2,0378439**	2,0962738**	1,7298712**	0,327	0,058	0,091
8	1,9654864**	2,0874678**	1,4327155*	0,285	0,134	-0,125
9	1,8968602**	2,0714573**	1,220	0,245	0,166	-0,263
10	1,8299768**	2,0425189**	1,2961803*	0,227	0,169	-0,425
11	1,7621006**	2,0073958**	1,3715261*	0,231	0,153	0,300
12	1,6918589**	1,9736103**	1,152	0,253	0,137	0,987
13	1,6193277*	1,9403411**	0,991	0,281	0,140	0,793
14	1,5451522*	1,9047009**	0,872	0,304	0,159	0,635
15	1,4699978*	1,8664311**	0,709	0,320	0,183	0,484
16	1,3944315*	1,8255589**	0,572	0,332	0,206	0,464
17	1,3189437*	1,7821505**	0,445	0,342	0,228	0,318
18	1,244	1,7366107**	0,329	0,350	0,246	0,391
19	1,170	1,6893945**	0,364	0,358	0,261	0,293
20	1,097	1,6416724**	0,244	0,367	0,274	0,177
21	1,026	1,5941606*	0,130	0,375	0,284	0,131
22	0,958	1,5467051*	0,042	0,384	0,291	0,122
23	0,891	1,4993319*	-0,060	0,395	0,296	0,285
24	0,826	1,4521*	-0,106	0,407	0,299	0,273
25	0,764	1,4051805*	-0,188	0,421	0,302	0,603
26	0,705	1,3587444*	-0,244	0,438	0,305	0,743
27	0,648	1,3128794*	-0,250	0,459	0,310	0,782
28	0,593	1,268	-0,315	0,482	0,316	1,053
29	0,541	1,224	-0,381	0,508	0,324	0,972
30	0,491	1,180	-0,401	0,537	0,334	1,131

Note: see note 3 at table 1.3

The results of volatility from the kernel functions of the Hong test complete the high r-statistic that is presented in the Cheung & Ng test, by detecting causality from industrial production to stock returns (Table 13.4).

Table 13.4: Causality test of Hong in volatility for Finland, Kernel functions: Q-S (Quadratic), Bartlett and Truncated.

Causality Test of Hong						
PANEL B volatility						
Bandwidth	QuadraticFNr_i	BartlettFNr_i	TruncatedFNr_i	QuadraticFNi_r	BartlettFNi_r	TruncatedFNi_r
1	-0,050	NaN	-0,002	0,370	NaN	0,294
2	-0,098	-0,002	-0,487	0,204	0,294	-0,237
3	-0,354	-0,167	-0,798	0,970	0,134	5,2899005***
4	-0,519	-0,345	-0,443	2,3541535***	0,954	4,3242156***
5	-0,535	-0,445	-0,552	3,3514996***	1,9014777**	4,8459204***
6	-0,437	-0,493	0,574	3,9528989***	2,5931096***	5,0053741***
7	-0,324	-0,469	0,299	4,3041158***	3,1232373***	4,4557521***
8	-0,239	-0,399	0,071	4,5126792***	3,512335***	4,0006809***
9	-0,195	-0,335	-0,093	4,6306685***	3,7782138***	4,7534561***
10	-0,185	-0,287	-0,270	4,6850241***	3,9756429***	4,3790264***
11	-0,199	-0,256	-0,423	4,6919237***	4,1328358***	4,1177715***
12	-0,231	-0,240	-0,582	4,6643603***	4,2504615***	3,8358125***
13	-0,273	-0,237	-0,728	4,6131717***	4,3338297***	3,6342405***
14	-0,321	-0,245	-0,800	4,5465133***	4,3889011***	3,4803037***
15	-0,373	-0,260	-0,873	4,4701509***	4,4218075***	3,2784753***
16	-0,426	-0,281	-0,885	4,388105***	4,437105***	3,1311674***
17	-0,479	-0,304	-0,975	4,303197***	4,4383003***	2,9995129***
18	-0,530	-0,330	-1,045	4,217424***	4,4285024***	2,9541598***
19	-0,578	-0,357	-1,094	4,1322049***	4,4105711***	2,8590186***
20	-0,625	-0,385	-1,183	4,0485448***	4,3867221***	2,760596***
21	-0,669	-0,414	-1,164	3,9671471***	4,3583116***	2,7299141***
22	-0,710	-0,443	-1,234	3,8884922***	4,3266068***	2,6762501***
23	-0,749	-0,472	-1,202	3,8128931***	4,2926856***	2,5964318***
24	-0,786	-0,500	-1,212	3,7405373***	4,2571659***	2,5439524***
25	-0,820	-0,527	-1,278	3,6715175***	4,2205126***	2,4698198***
26	-0,853	-0,554	-1,264	3,6058548***	4,1830892***	2,4301934***
27	-0,884	-0,580	-1,317	3,5435176***	4,1452012***	2,3577597***
28	-0,912	-0,604	-1,327	3,4844354***	4,1070799***	2,337205***
29	-0,939	-0,628	-1,305	3,4285101***	4,0689383***	2,2880638**
30	-0,965	-0,652	-1,327	3,3756243***	4,0309775***	2,3449665***

Note: see note 4 at table 1.4

In the **French** results we can see that bidirectional causality in mean is imminent, due to the r-statistic prices and the significance we find in the first lags. This could also be true for volatility but the value of prices and significance is not as strong as in mean (Table 14.1).

Table 14.1: Cheung & Ng's r- statistic for France

CausalityTest of Cheung & Ng FRANCE				
Lags	**$rFR_{r\_i,m}$**	**$rFR_{i\_r,m}$**	**$rFR_{r\_i,v}$**	**$rFR_{i\_r,v}$**
1	1,307	0,570	1,080	0,768
2	1,6526351*	2,0188423**	-0,529	0,763
3	2,9340603***	-0,872	2,2397362**	0,226
4	0,622	2,7507642***	0,729	-1,119
5	1,135	1,6928761*	0,037	2,2871855**
6	0,509	-1,317	0,045	-0,282
7	0,180	-0,310	0,747	-0,916
8	0,804	0,321	0,244	-0,939
9	1,7439467*	-0,444	0,270	-0,236
10	2,929376***	1,372	0,224	-0,258
11	0,151	-0,907	-0,580	1,342
12	-0,356	0,256	-0,810	1,7818036*
13	-0,798	0,814	-0,917	0,483
14	0,465	-1,375	0,013	0,351
15	0,630	1,327	-0,627	-0,206
16	0,484	-1,163	-0,033	-0,045
17	-0,165	0,365	-0,077	-1,008
18	-0,342	-0,554	-0,090	1,271
19	-1,248	-0,463	-1,338	0,487
20	-0,451	-0,602	-1,138	-1,202
21	0,422	-0,563	-0,814	1,172
22	-0,109	0,521	-0,395	-0,306
23	0,876	0,844	0,371	-0,895
24	-0,018	-0,882	-0,702	-0,855
25	-1,048	1,7985048*	0,368	0,443
26	-0,514	0,562	-1,300	0,027
27	-0,218	0,219	-1,151	2,0669628**
28	1,095	-1,320	0,217	0,124
29	-0,329	-0,374	-0,552	-0,118
30	-0,619	0,848	-0,734	-1,282

Note: see note 1 at table 1.1

The S-statistic also detects bidirectional causality in mean, while in variance causality is significant only from economic activity to stock returns (Table 14.2).

Table 14.2: Cheung & Ng's S- statistic for France

Statistics Cheung&Ng FRANCE	
SFRr_i,m	177,85***
SFRi_r,m	77,88***
SFRr_i,v	-77,132034
SFRi_r,v	58,25***

Note: see note 2 at table 1.2

Bidirectional strong causality in mean is also confirmed through kernel functions of the Hong test results (Table 14.3).

Table 14.3: Causality test of Hong in mean for France, Kernel functions: Q-S (Quadratic), Bartlett and Truncated.

Causality Test of Hong						
PANEL A mean						
Bandwidth	QuadraticFRr_i	BartlettFRr_i	TruncatedFRr_i	QuadraticFRi_r	BartlettFRi_r	TruncatedFRi_r
1	0,648	NaN	0,507	-0,321	NaN	-0,477
2	0,693	0,507	1,237	-0,092	-0,477	1,217
3	1,5527314*	0,792	4,1577212***	0,537	0,069	0,902
4	2,4826181***	1,5102867*	3,3954213***	1,158	0,437	3,1417892***
5	3,0042804***	2,1571802**	3,1428727***	1,8280279**	0,860	3,4223992***
6	3,1553205***	2,5567885***	2,6653229***	2,322821**	1,3394349*	3,3544312***
7	3,1334994***	2,7869176***	2,2176206**	2,6183261***	1,7491748**	2,8744427***
8	3,108248***	2,898762***	1,9976213**	2,7676283***	2,0575295**	2,4744757***
9	3,123541***	2,9362879***	2,3898987***	2,8166545***	2,2688914**	2,1537539**
10	3,1644806***	2,9442708***	4,0227495***	2,8069287***	2,4042981***	2,2601141**
11	3,2093734***	2,9774592***	3,6401624***	2,7721835***	2,491041***	2,131496**
12	3,2440531***	3,0400877***	3,3200288***	2,7285065***	2,5478408***	1,8595896**
13	3,2616298***	3,105307***	3,1345858***	2,6797704***	2,5803458***	1,7338244**
14	3,2615847***	3,1630735***	2,885855***	2,6246755***	2,5932435***	1,8607508**
15	3,2458679***	3,209767***	2,6923428***	2,5649396***	2,5942579***	1,9584227**
16	3,2159065***	3,2441967***	2,4845557***	2,5032281***	2,5900101***	1,9782931**
17	3,1732034***	3,2667292***	2,255007**	2,4406875***	2,583493***	1,7816671**
18	3,1206203***	3,2779174***	2,0561389**	2,3778756***	2,5744334***	1,6282598*
19	3,0607904***	3,2786528***	2,1146162**	2,3152254**	2,5617376***	1,4689374*
20	2,9954478***	3,2715161***	1,9478489**	2,2538887**	2,5451083***	1,3435004*
21	2,9264217***	3,2585108***	1,7865585**	2,1952646**	2,5246532***	1,218
22	2,8551787***	3,2400977***	1,6075313*	2,1399817**	2,5007224***	1,092
23	2,7824269***	3,2166877***	1,5550442*	2,0876693**	2,473647***	1,041
24	2,709018***	3,1891158***	1,3888417*	2,0373067**	2,4440239***	1,004
25	2,6359474***	3,1580858***	1,3950621*	1,987912**	2,4126279***	1,3373677*
26	2,5638507***	3,1243605***	1,279	1,9391053**	2,3812914***	1,230
27	2,4929244***	3,0886712***	1,137	1,8908955**	2,3510479***	1,089
28	2,4231095***	3,0511595***	1,165	1,8432952**	2,3212828**	1,195
29	2,354337***	3,0123398***	1,039	1,7962156**	2,2921115**	1,074
30	2,2866455**	2,9726409***	0,957	1,7495667**	2,2636462**	1,037

Note: see note 3 at table 1.3

On the other hand, no causality is detected in volatility with the exception of the third lag on the Truncated kernel function from stock returns to output growth (Table 14.4).

Table 14.4: Causality test of Hong in volatility for France, Kernel functions: Q-S (Quadratic), Bartlett and Truncated.

Causality Test of Hong						
PANEL B volatility						
Bandwidth	QuadraticFRr_i	BartlettFRr_i	TruncatedFRr_i	QuadraticFRi_r	BartlettFRi_r	TruncatedFRi_r
1	0,122	NaN	0,122	-0,309	NaN	-0,289
2	0,043	0,122	-0,272	-0,330	-0,289	-0,410
3	0,174	-0,004	1,4416006*	-0,440	-0,351	-0,722
4	0,550	0,197	1,090	-0,520	-0,447	-0,530
5	0,723	0,456	0,663	-0,377	-0,517	0,892
6	0,742	0,602	0,322	-0,163	-0,450	0,554
7	0,678	0,658	0,187	-0,003	-0,317	0,479
8	0,567	0,661	-0,056	0,092	-0,199	0,428
9	0,443	0,634	-0,267	0,158	-0,102	0,186
10	0,320	0,587	-0,462	0,204	-0,031	-0,027
11	0,199	0,526	-0,576	0,234	0,015	0,161
12	0,082	0,458	-0,614	0,255	0,045	0,624
13	-0,030	0,387	-0,612	0,264	0,075	0,458
14	-0,133	0,317	-0,774	0,264	0,105	0,282
15	-0,229	0,250	-0,852	0,258	0,132	0,105
16	-0,317	0,184	-0,998	0,252	0,153	-0,069
17	-0,399	0,120	-1,134	0,243	0,166	-0,050
18	-0,476	0,056	-1,264	0,231	0,173	0,072
19	-0,546	-0,008	-1,084	0,218	0,176	-0,044
20	-0,609	-0,069	-0,994	0,203	0,177	0,046
21	-0,666	-0,127	-1,012	0,187	0,177	0,121
22	-0,718	-0,180	-1,110	0,171	0,176	-0,010
23	-0,765	-0,230	-1,206	0,156	0,174	-0,025
24	-0,808	-0,277	-1,245	0,142	0,171	-0,049
25	-0,848	-0,323	-1,336	0,130	0,168	-0,152
26	-0,886	-0,366	-1,194	0,120	0,164	-0,280
27	-0,921	-0,408	-1,109	0,112	0,158	0,219
28	-0,954	-0,447	-1,210	0,105	0,152	0,093
29	-0,985	-0,484	-1,271	0,099	0,148	-0,029
30	-1,016	-0,518	-1,298	0,095	0,143	0,080

Note: see note 4 at table 1.4

Going on with the results of **Germany**, we present a strong causal relationship in mean, from real returns to industrial production growth rate, that stems from both the Cheung & Ng and the Hong test (Tables 15.1, 15.2 and 15.3). The r-statistic also detects weak causality in mean from industrial production growth rate to real stock returns (Table 15.1).

Table 15.1: Cheung & Ng's r- statistic for Germany

CausalityTest of Cheung & Ng GERMANY				
Lags	$rBD_{r\_i,m}$	$rBD_{i\_r,m}$	$rBD_{r\_i,v}$	$rBD_{i\_r,v}$
1	1,235	0,798	0,318	-0,545
2	1,8242617*	1,370	-0,577	-0,210
3	2,816772***	0,742	0,637	-0,128
4	1,011	0,190	0,041	0,098
5	0,928	1,053	-0,080	-0,332
6	2,9411278***	-0,425	-0,536	-0,301
7	0,348	-2,4231783**	-0,317	1,8342257*
8	2,170212**	-0,122	-0,159	-0,792
9	1,008	-1,367	0,589	-0,673
10	2,8527232***	1,7464076*	-0,308	1,583
11	0,811	-0,721	-0,372	-0,715
12	1,7615992*	-0,555	0,014	0,302
13	0,872	-0,084	0,687	-0,783
14	-0,897	-0,003	-0,409	-0,429
15	0,150	0,111	0,122	-0,068
16	0,145	-0,419	-0,667	0,131
17	-0,189	-1,473	0,198	-0,265
18	0,124	-0,515	1,287	-0,623
19	0,404	-1,9872932**	-0,066	1,7618139*
20	-0,860	1,233	-0,527	-0,620
21	0,333	-0,159	-0,827	-0,469
22	0,125	-0,526	-0,419	-0,364
23	0,523	0,783	-0,652	0,802
24	-0,095	-0,270	-0,900	0,031
25	0,030	0,139	-0,101	-0,381
26	-1,560	-0,990	-0,617	-0,478
27	-0,805	-0,882	-0,481	0,499
28	-0,954	-0,696	-0,626	-0,172
29	1,9476627*	-1,6676739*	0,361	-0,387
30	-0,380	-2,1495225**	-0,264	-0,307

Note: see note 1 at table 1.1

Table 15.2 highlights the causality in mean from stock returns to industrial production,

Table 15.2: Cheung & Ng's S- statistic for Germany

Statistics Cheung&Ng GERMANY	
SBDr_i,m	387,97***
SBDi_r,m	-193,13501
SBDr_i,v	-96,614081
SBDi_r,v	-41,512152

Note: see note 2 at table 1.2

and we confirm a strong causal relation in mean from stock returns to output growth, via the results of the kernel functions of table 15.3 below.

Table 15.3: Causality test of Hong in mean for Germany, Kernel functions: Q-S (Quadratic), Bartlett and Truncated.

Causality Test of Hong						
PANEL A mean						
Bandwidth	QuadraticBDr_i	BartlettBDr_i	TruncatedBDr_i	QuadraticBDi_r	BartlettBDi_r	TruncatedBDi_r
1	0,543	NaN	0,375	-0,222	NaN	-0,256
2	0,643	0,375	1,437231*	-0,166	-0,256	0,261
3	1,6034738*	0,765	4,0249663***	0,008	-0,097	0,031
4	2,5217165***	1,5079476*	3,5012416***	0,011	-0,012	-0,313
5	3,1057951***	2,1606248**	3,0944721***	-0,072	-0,022	-0,242
6	3,5551177***	2,5656134***	5,0611187***	-0,095	-0,060	-0,456
7	3,9196511***	2,9177843***	4,4580788***	-0,044	-0,104	0,898
8	4,2477166***	3,2492887***	5,1179106***	0,063	-0,100	0,596
9	4,5590312***	3,5384098***	4,8397193***	0,198	-0,050	0,775
10	4,844709***	3,7917403***	6,2203809***	0,324	0,012	1,206
11	5,0868893***	4,0316349***	5,8690794***	0,413	0,087	1,053
12	5,2828752***	4,2655262***	6,0678464***	0,473	0,167	0,871
13	5,4312215***	4,4817297***	5,794705***	0,515	0,241	0,646
14	5,5338773***	4,6770937***	5,5589731***	0,542	0,303	0,437
15	5,593945***	4,8472903***	5,2011853***	0,561	0,352	0,245
16	5,6159526***	4,9909331***	4,8718786***	0,571	0,388	0,095
17	5,6049769***	5,1080576***	4,5697209***	0,577	0,411	0,304
18	5,5670043***	5,2004019***	4,2852858***	0,579	0,426	0,178
19	5,5092412***	5,2703634***	4,0441237***	0,579	0,436	0,671
20	5,4384656***	5,3206241***	3,9117069***	0,576	0,444	0,746
21	5,3600695***	5,3543329***	3,6886929***	0,570	0,454	0,583
22	5,278161***	5,374096***	3,463357***	0,562	0,464	0,465
23	5,1954895***	5,3816255***	3,289044***	0,552	0,473	0,405
24	5,1133582***	5,3785812***	3,0843862***	0,541	0,481	0,267
25	5,0323744***	5,3664181***	2,8882268***	0,531	0,487	0,127
26	4,9531551***	5,3462739***	3,0494449***	0,523	0,490	0,131
27	4,8762185***	5,3202434***	2,9551946***	0,517	0,491	0,106
28	4,8019072***	5,2901916***	2,9018284***	0,514	0,490	0,042
29	4,7304319***	5,2569604***	3,2441209***	0,514	0,488	0,293
30	4,6618674***	5,2222995***	3,0879536***	0,517	0,484	0,783

Note: see note 3 at table 1.3

The kernel functions of the Hong test do not detect any kind of causality in volatility (Table 15.4).

Table 15.4: Causality test of Hong in volatility for Germany, Kernel functions: Q-S (Quadratic), Bartlett and Truncated.

Causality Test of Hong						
PANEL B volatility						
Bandwidth	QuadraticBDr_i	BartlettBDr_i	TruncatedBDr_i	QuadraticBDi_r	BartlettBDi_r	TruncatedBDi_r
1	-0,674	NaN	-0,636	-0,550	NaN	-0,497
2	-0,709	-0,636	-0,783	-0,603	-0,497	-0,830
3	-0,829	-0,731	-0,881	-0,820	-0,646	-1,079
4	-0,946	-0,811	-1,116	-1,001	-0,795	-1,285
5	-1,073	-0,893	-1,313	-1,173	-0,931	-1,431
6	-1,196	-0,982	-1,403	-1,275	-1,052	-1,569
7	-1,312	-1,069	-1,539	-1,305	-1,160	-0,811
8	-1,418	-1,152	-1,683	-1,287	-1,225	-0,849
9	-1,516	-1,232	-1,740	-1,249	-1,246	-0,927
10	-1,608	-1,307	-1,853	-1,176	-1,250	-0,533
11	-1,699	-1,379	-1,949	-1,136	-1,240	-0,609
12	-1,779	-1,447	-2,070	-1,124	-1,219	-0,767
13	-1,853	-1,513	-2,091	-1,069	-1,196	-0,809
14	-1,929	-1,576	-2,171	-1,030	-1,175	-0,931
15	-2,001	-1,635	-2,277	-1,053	-1,159	-1,080
16	-2,061	-1,693	-2,301	-1,102	-1,148	-1,217
17	-2,108	-1,748	-2,396	-1,121	-1,143	-1,338
18	-2,145	-1,801	-2,212	-1,085	-1,143	-1,399
19	-2,180	-1,851	-2,314	-1,009	-1,149	-1,007
20	-2,216	-1,897	-2,368	-0,929	-1,156	-1,075
21	-2,257	-1,940	-2,356	-0,875	-1,162	-1,166
22	-2,302	-1,981	-2,424	-0,867	-1,168	-1,267
23	-2,349	-2,019	-2,453	-0,909	-1,174	-1,287
24	-2,398	-2,055	-2,424	-0,992	-1,182	-1,402
25	-2,444	-2,090	-2,514	-1,100	-1,191	-1,491
26	-2,485	-2,123	-2,548	-1,216	-1,201	-1,566
27	-2,521	-2,154	-2,603	-1,321	-1,212	-1,635
28	-2,549	-2,185	-2,634	-1,402	-1,225	-1,733
29	-2,571	-2,214	-2,701	-1,446	-1,239	-1,812
30	-2,585	-2,243	-2,774	-1,446	-1,254	-1,895

Note: see note 4 at table 1.4

Our country exhibits good r-statistics of the Cheung & Ng test that stand for causality in mean from stock returns to industrial production rate and stronger causality in volatility with the same direction (Table 16.1).

Table 16.1: Cheung & Ng's r- statistic for Greece

Causality Test Of Cheung and Ng GREECE				
Lags	**$rGR_{r\_i,m}$**	**$rGR_{i\_r,m}$**	**$rGR_{r\_i,v}$**	**$rGR_{i\_r,v}$**
1	-0,154	1,936	1,066	0,013
2	-0,152	0,444	1,563	0,934
3	-0,327	-0,962	0,517	0,787
4	-0,665	-0,571	-0,449	-0,278
5	2,214**	0,490	-0,237	0,766
6	0,457	0,024	2,075**	0,444
7	-0,073	1,225	1,523	0,342
8	0,827	-1,433	0,457	-0,315
9	-0,737	-1,038	-0,837	0,303
10	1,285	-0,459	-0,096	-0,219
11	2,473**	-1,513	-0,146	0,607
12	0,354	-0,063	-0,996	1,172
13	-0,478	0,952	-1,029	-0,466
14	-0,366	-0,499	0,546	-0,219
15	-1,794*	-1,644*	1,395	0,528
16	-1,360	-1,004	-0,626	-0,607
17	1,032	-0,287	0,017	0,236
18	-1,401	0,032	-0,063	-0,280
19	-0,941	1,399	3,066***	-0,367
20	-0,388	-0,867	0,056	-0,531
21	-1,140	0,028	-0,598	0,138
22	0,498	-0,815	-0,234	-0,023
23	2,622***	-0,544	-0,468	-0,807
24	0,311	-0,081	3,796***	-0,310
25	0,320	1,843*	-0,362	-0,164
26	-0,262	-0,758	0,242	-0,121
27	-1,040	-1,510	0,690	-0,047
28	-0,672	-0,921	0,352	0,073
29	1,550	-0,072	-0,128	0,171
30	-0,839	-0,840	-0,337	0,282

Note: see note 1 at table 1.1

Causality in variance is absolutely confirmed by the S-statistic results (Table 16.2)

Table 16.2: Cheung & Ng's S- statistic for Greece

Statistics Cheung&Ng GREECE	
SGRr_i,m	12,08
SGRi_r,m	-78,76
SGRr_i,v	107,023***
SGRi_r,v	20,32

Note: see note 2 at table 1.2

The Hong test in mean disagrees with the r-statistics of Cheung & Ng. Causality of low significance is found in the later bandwidths with direction from stock returns to industrial production, and little significance is given in the first bandwidths of the causal relation from industrial production to stock returns (Table 16.3).

Table 16.3: Causality test of Hong in mean for Greece, Kernel functions: Q-S (Quadratic), Bartlett and Truncated.

Causality Test of Hong						
PANEL A mean						
Bandwidth	QuadraticGR$_{r_i}$	BartlettGR$_{r_i}$	TruncatedGR$_{r_i}$	QuadraticGR$_{i_r}$	BartlettGR$_{i_r}$	TruncatedGR$_{i_r}$
1	-0,740	NaN	-0,693	1,933**	NaN	1,976**
2	-0,795	-0,693	-0,981	1,8622**	1,976**	1,004
3	-0,973	-0,840	-1,166	1,513	1,781**	0,804
4	-1,098	-0,972	-1,204	1,227	1,569	0,468
5	-0,983	-1,073	0,209	0,962	1,384	0,187
6	-0,804	-1,046	-0,029	0,739	1,212	-0,111
7	-0,687	-0,941	-0,287	0,589	1,048	0,053
8	-0,588	-0,847	-0,333	0,497	0,906	0,345
9	-0,492	-0,776	-0,408	0,441	0,801	0,366
10	-0,391	-0,723	-0,214	0,403	0,729	0,184
11	-0,282	-0,681	0,977	0,382	0,673	0,491
12	-0,173	-0,624	0,773	0,373	0,631	0,279
13	-0,069	-0,549	0,609	0,369	0,599	0,274
14	0,030	-0,473	0,439	0,367	0,573	0,139
15	0,127	-0,402	0,893	0,368	0,549	0,499
16	0,223	-0,335	1,060	0,368	0,530	0,514
17	0,314	-0,266	1,074	0,367	0,517	0,358
18	0,402	-0,198	1,255	0,364	0,507	0,197
19	0,486	-0,131	1,238	0,361	0,498	0,395
20	0,566	-0,064	1,096	0,357	0,489	0,375
21	0,641	-0,001	1,159	0,354	0,482	0,229
22	0,714	0,059	1,045	0,354	0,476	0,202
23	0,783	0,115	2,036**	0,355	0,469	0,116
24	0,848	0,171	1,891**	0,358	0,462	-0,012
25	0,911	0,228	1,754**	0,363	0,454	0,410
26	0,971	0,285	1,619	0,370	0,446	0,374
27	1,027	0,341	1,648**	0,379	0,439	0,608
28	1,081	0,394	1,581	0,389	0,435	0,615
29	1,131	0,444	1,815**	0,401	0,432	0,496
30	1,179	0,493	1,790**	0,413	0,430	0,487

Note: see note 3 at table 1.3

Stronger causality in volatility is detected only in the last five bandwidths of the Truncated kernel function (Table 16.4), in contrast with the high r-statistics we found above (Table 16.1).

Table 16.4: Causality test of Hong in volatility for Greece, Kernel functions: Q-S (Quadratic), Bartlett and Truncated.

Causality Test of Hong						
PANEL B volatility						
Bandwidth	QuadraticGR$_{r_i}$	BartlettGR$_{r_i}$	TruncatedGR$_{r_i}$	QuadraticGR$_{i_r}$	BartlettGR$_{i_r}$	TruncatedGR$_{i_r}$
1	0,163	NaN	0,105	-0,721	NaN	-0,711
2	0,262	0,105	0,822	-0,722	-0,711	-0,560
3	0,512	0,357	0,380	-0,705	-0,709	-0,606
4	0,472	0,470	0,055	-0,740	-0,704	-0,850
5	0,365	0,458	-0,244	-0,806	-0,731	-0,883
6	0,373	0,388	0,790	-0,880	-0,773	-1,034
7	0,445	0,358	1,124	-0,967	-0,819	-1,189
8	0,522	0,392	0,870	-1,063	-0,871	-1,334
9	0,576	0,447	0,773	-1,155	-0,928	-1,468
10	0,607	0,498	0,525	-1,240	-0,988	-1,603
11	0,621	0,536	0,306	-1,314	-1,049	-1,655
12	0,620	0,559	0,319	-1,381	-1,110	-1,484
13	0,605	0,569	0,348	-1,444	-1,167	-1,572
14	0,586	0,573	0,222	-1,503	-1,217	-1,689
15	0,572	0,571	0,435	-1,559	-1,263	-1,754
16	0,571	0,567	0,336	-1,612	-1,307	-1,799
17	0,584	0,563	0,171	-1,664	-1,348	-1,901
18	0,613	0,557	0,017	-1,715	-1,389	-1,994
19	0,656	0,547	1,572*	-1,766	-1,428	-2,074
20	0,711	0,544	1,400*	-1,817	-1,467	-2,124
21	0,776	0,551	1,298*	-1,867	-1,506	-2,218
22	0,849	0,564	1,152	-1,918	-1,543	-2,312
23	0,930	0,581	1,041	-1,968	-1,581	-2,293
24	1,015	0,598	3,285***	-2,018	-1,618	-2,367
25	1,103	0,624	3,136***	-2,067	-1,654	-2,449
26	1,194	0,661	2,983***	-2,115	-1,690	-2,531
27	1,285*	0,706	2,904***	-2,162	-1,726	-2,613
28	1,376*	0,756	2,774***	-2,207	-1,761	-2,692
29	1,466*	0,808	2,634***	-2,251	-1,795	-2,765
30	1,553*	0,861	2,515**	-2,293	-1,830	-2,828

Note: see note 4 at table 1.4

Studying the results of **Hungary**, we should refer to the remarkable r-statistic result of the Cheung & Ng test in volatility, from stock returns to industrial production in the second lag (Table 17.1). This probably stands for a strong relationship of causality.

Table 17.1: Cheung & Ng's r- statistic for Hungary

CausalityTest of Cheung & Ng HUNGARY				
Lags	$rHN_{r\_i,m}$	$rHN_{i\_r,m}$	$rHN_{r\_i,v}$	$rHN_{i\_r,v}$
1	0,941	-0,394	1,156	0,226
2	2,2822764**	-0,810	5,4793489***	0,047
3	1,290	0,535	0,491	-0,005
4	1,629	0,393	-0,983	0,509
5	1,537	-0,691	0,077	-0,029
6	1,8722336*	-0,206	1,6549307*	-0,276
7	0,200	0,497	-0,553	-0,375
8	1,7447366*	0,659	0,067	0,412
9	2,4988903**	1,201	0,199	0,191
10	0,102	-0,927	-0,392	-0,183
11	-0,094	-0,220	0,706	-0,161
12	0,610	-0,706	-0,245	0,287
13	-0,529	-2,0353651**	0,956	-0,031
14	0,450	-0,885	0,770	-0,252
15	0,138	-1,465	2,2445191**	-0,040
16	0,681	-0,824	-0,330	-0,649
17	1,352	-0,207	-0,026	-0,323
18	0,328	2,2061748**	-0,661	2,7000121***
19	-0,161	0,368	0,138	-0,607
20	-0,817	-1,018	-0,345	0,862
21	-0,106	0,196	0,040	-0,402
22	-1,571	-1,6655227*	-0,001	0,613
23	0,350	-1,7769866*	0,284	-0,417
24	1,216	-0,813	-0,585	-0,422
25	1,050	-0,346	1,314	-0,262
26	0,399	-0,186	-0,292	0,094
27	0,919	-0,325	-0,159	-0,358
28	-0,882	-1,590	0,560	0,244
29	0,470	-0,149	0,503	-0,326
30	1,7210019*	0,668	3,0268939***	0,152

Note: see note 1 at table 1.1

Our observation from the r-statistics is confirmed by the S-statistics, that also mark the causality in mean from equity returns to output growth (Table 17.2).

Table 17.2: Cheung & Ng's S- statistic for Hungary

Statistics Cheung&Ng HUNGARY	
SHNr_i,m	272,57***
SHNi_r,m	-146,08062
SHNr_i,v	203,07***
SHNi_r,v	16,403701

Note: see note 2 at table 1.2

The kernel functions assert that causality is strong from real stock returns to industrial production growth rate in mean (Table 17.3) and in volatility respectively (Table 17.4).

Table 17.3: Causality test of Hong in mean for Hungary, Kernel functions: Q-S (Quadratic), Bartlett and Truncated.

Causality Test of Hong						
PANEL A mean						
Bandwidth	QuadraticHNr_i	BartlettHNr_i	TruncatedHNr_i	QuadraticHNi_r	BartlettHNi_r	TruncatedHNi_r
1	0,124	NaN	-0,078	-0,622	NaN	-0,598
2	0,397	-0,078	2,0763596**	-0,635	-0,598	-0,592
3	1,3185455*	0,654	1,9804925**	-0,698	-0,638	-0,774
4	1,8088281**	1,194	2,3215119**	-0,795	-0,691	-0,968
5	2,1572422**	1,5408674*	2,5286315***	-0,892	-0,761	-1,028
6	2,3868539***	1,8031249**	3,0620391***	-0,993	-0,831	-1,214
7	2,5893518***	2,032237**	2,589595***	-1,078	-0,900	-1,323
8	2,7936124***	2,2187283**	2,9639611***	-1,149	-0,970	-1,375
9	2,9732391***	2,366572***	4,0854294***	-1,205	-1,036	-1,181
10	3,1129735***	2,5200741***	3,6696744***	-1,240	-1,091	-1,144
11	3,2070905***	2,677119***	3,3021208***	-1,251	-1,133	-1,291
12	3,2592133***	2,8134663***	3,050046***	-1,243	-1,168	-1,333
13	3,2769157***	2,9232221***	2,8050904***	-1,220	-1,199	-0,629
14	3,2670098***	3,0073391***	2,5672983***	-1,182	-1,218	-0,636
15	3,2367237***	3,0682842***	2,3144153**	-1,133	-1,224	-0,382
16	3,191049***	3,1087214***	2,1628169**	-1,077	-1,219	-0,416
17	3,1347026***	3,1319158***	2,2689142**	-1,015	-1,205	-0,561
18	3,07254***	3,1430443***	2,0705187**	-0,948	-1,188	0,149
19	3,0086752***	3,145301***	1,8705645**	-0,879	-1,165	0,014
20	2,9452932***	3,1392726***	1,7897155**	-0,808	-1,135	0,037
21	2,8829475***	3,1262233***	1,6070098*	-0,738	-1,103	-0,103
22	2,8218226***	3,1072517***	1,8283423**	-0,671	-1,069	0,202
23	2,7622736***	3,0845269***	1,6735182**	-0,608	-1,034	0,557
24	2,7047151***	3,0596542***	1,7360496**	-0,550	-0,996	0,513
25	2,6495049***	3,0332272***	1,7407894**	-0,498	-0,956	0,390
26	2,5967251***	3,0061948***	1,6062081*	-0,452	-0,915	0,260
27	2,5460264***	2,9786355***	1,578312*	-0,412	-0,875	0,145
28	2,49677***	2,9505314***	1,5430622*	-0,377	-0,836	0,385
29	2,4483374***	2,9221344***	1,4307505*	-0,348	-0,799	0,261
30	2,4003471***	2,8934277***	1,7082519**	-0,323	-0,762	0,201

Note: see note 3 at table 1.3

Table 17.4: Causality test of Hong in volatility for Hungary, Kernel functions: Q-S (Quadratic), Bartlett and Truncated.

Causality Test of Hong						
PANEL B volatility						
Bandwidth	QuadraticHNr_i	BartlettHNr_i	TruncatedHNr_i	QuadraticHNi_r	BartlettHNi_r	TruncatedHNi_r
1	1,5279261*	NaN	0,244	-0,728	NaN	-0,673
2	3,3978693***	0,244	14,85264***	-0,780	-0,673	-0,976
3	9,2039714***	5,2597699***	11,853589***	-0,993	-0,823	-1,206
4	11,227806***	8,5422702***	10,289807***	-1,162	-0,968	-1,306
5	11,5863***	10,015694***	8,9176745***	-1,304	-1,087	-1,485
6	11,385958***	10,634371***	8,6866152***	-1,425	-1,190	-1,622
7	10,998507***	10,863069***	7,885336***	-1,540	-1,284	-1,731
8	10,54273***	10,902809***	7,1523072***	-1,641	-1,372	-1,825
9	10,059323***	10,825891***	6,5409896***	-1,726	-1,452	-1,948
10	9,5883496***	10,676986***	6,0399211***	-1,815	-1,527	-2,064
11	9,1492717***	10,485402***	5,677828***	-1,913	-1,599	-2,176
12	8,7576214***	10,27114***	5,2660862***	-2,009	-1,668	-2,270
13	8,4118971***	10,045928***	5,0708022***	-2,093	-1,735	-2,376
14	8,1035582***	9,8179892***	4,8350482***	-2,161	-1,799	-2,466
15	7,8249978***	9,593216***	5,4736107***	-2,209	-1,862	-2,565
16	7,5703769***	9,3818724***	5,1656646***	-2,240	-1,923	-2,582
17	7,3341049***	9,1879042***	4,8619894***	-2,257	-1,982	-2,657
18	7,1116415***	9,006251***	4,6567892***	-2,264	-2,038	-1,463
19	6,8994189***	8,834087***	4,3948573***	-2,265	-2,084	-1,518
20	6,6979901***	8,6695712***	4,166334***	-2,262	-2,117	-1,509
21	6,5061946***	8,5111889***	3,9323636***	-2,258	-2,139	-1,596
22	6,3251224***	8,3579134***	3,7113274***	-2,255	-2,154	-1,645
23	6,1559777***	8,2089653***	3,5148693***	-2,252	-2,164	-1,724
24	5,9996628***	8,0638586***	3,3692142***	-2,252	-2,171	-1,800
25	5,8559662***	7,9224372***	3,4427336***	-2,254	-2,176	-1,890
26	5,7237428***	7,7853841***	3,2699344***	-2,258	-2,180	-1,985
27	5,6030437***	7,6529835***	3,0961911***	-2,266	-2,184	-2,061
28	5,4945029***	7,5246635***	2,9718455***	-2,277	-2,188	-2,144
29	5,3973708***	7,4000672***	2,8444898***	-2,290	-2,193	-2,218
30	5,3095896***	7,2789829***	3,9826389***	-2,306	-2,198	-2,302

Note: see note 4 at table 1.4

The Cheung & Ng tables for r-statistic and S-statistic (Tables 18.1 and 18.2), both agree that causality in variance from industrial activity to stock returns is significant enough for **India**. The Hong test in volatility (Table 18.4) adds up to the above. The r-statistic also detects signs of causality in mean from economic activity to stock returns and in volatility with reverse direction (Table 18.1).

Table 18.1: Cheung & Ng's r- statistic for India

CausalityTest of Cheung & Ng INDIA				
Lags	$rIN_{r\_i,m}$	$rIN_{i\_r,m}$	$rIN_{r\_i,v}$	$rIN_{i\_r,v}$
1	-0,680	1,296	0,044	0,802
2	-0,215	1,608	-0,632	0,765
3	0,101	-0,499	-1,415	-0,197
4	-0,604	0,176	0,480	-0,600
5	-0,908	-0,616	-0,349	-0,155
6	0,388	-0,024	1,9984368**	2,1267648**
7	-0,664	0,412	-1,497	0,238
8	0,633	-1,073	-0,368	-1,538
9	-0,839	-1,154	0,955	-1,234
10	1,122	-0,652	1,227	-0,553
11	0,770	-0,006	-1,405	3,4320307***
12	0,723	-0,100	-0,914	0,851
13	0,315	0,835	-0,685	-1,210
14	-0,820	2,2482811**	-0,453	-0,519
15	-0,377	-1,104	-1,059	1,143
16	-0,959	-0,240	-0,286	1,364
17	0,301	-0,063	0,461	0,204
18	0,135	0,011	-0,254	-1,118
19	-0,723	-1,131	-1,047	3,4769054***
20	0,352	0,025	-0,935	-0,374
21	-0,174	0,112	-0,241	0,375
22	1,077	-0,411	-0,689	-0,280
23	0,414	-1,590	-0,643	0,567
24	0,499	1,8140331*	-0,622	0,019
25	-0,101	1,130	-0,643	0,342
26	-1,364	1,315	0,914	-0,852
27	-0,562	-0,125	-1,088	1,6414362*
28	-0,263	-0,379	-0,203	-0,446
29	-0,322	-1,187	-0,782	-0,397
30	0,754	-0,555	0,240	0,243

Note: see note 1 at table 1.1

Table 18.2: Cheung & Ng's S- statistic for India

Statistics Cheung&Ng INDIA	
SINr_i,m	-26,550798
SINi_r,m	0,97609829
SINr_i,v	-127,0692
SINi_r,v	104,27***

Note: see note 2 at table 1.2

The results of the kernel functions imply no causality of any direction in mean (Table 18.3),

Table 18.3: Causality test of Hong in mean for India, Kernel functions: Q-S (Quadratic), Bartlett and Truncated.

Causality Test of Hong						
PANEL A mean						
Bandwidth	QuadraticINr_i	BartlettINr_i	TruncatedINr_i	QuadraticINi_r	BartlettINi_r	TruncatedINi_r
1	-0,432	NaN	-0,379	0,547	NaN	0,488
2	-0,484	-0,379	-0,746	0,647	0,488	1,154
3	-0,711	-0,531	-1,013	0,871	0,750	0,641
4	-0,895	-0,687	-1,101	0,800	0,852	0,216
5	-1,007	-0,816	-1,035	0,631	0,814	0,003
6	-1,094	-0,908	-1,188	0,428	0,724	-0,283
7	-1,166	-0,978	-1,246	0,266	0,615	-0,479
8	-1,220	-1,040	-1,311	0,132	0,498	-0,399
9	-1,260	-1,094	-1,300	0,007	0,389	-0,284
10	-1,291	-1,142	-1,164	-0,097	0,298	-0,391
11	-1,316	-1,180	-1,189	-0,169	0,221	-0,581
12	-1,337	-1,210	-1,229	-0,213	0,153	-0,754
13	-1,359	-1,234	-1,354	-0,241	0,087	-0,774
14	-1,384	-1,256	-1,358	-0,264	0,023	0,070
15	-1,411	-1,277	-1,464	-0,282	-0,028	0,126
16	-1,440	-1,298	-1,420	-0,297	-0,062	-0,036
17	-1,469	-1,318	-1,529	-0,309	-0,086	-0,198
18	-1,500	-1,338	-1,645	-0,316	-0,104	-0,352
19	-1,533	-1,359	-1,670	-0,320	-0,119	-0,277
20	-1,565	-1,380	-1,761	-0,320	-0,134	-0,420
21	-1,597	-1,402	-1,864	-0,316	-0,147	-0,554
22	-1,628	-1,425	-1,781	-0,311	-0,161	-0,658
23	-1,659	-1,448	-1,858	-0,303	-0,176	-0,383
24	-1,690	-1,471	-1,920	-0,295	-0,191	0,002
25	-1,720	-1,494	-2,016	-0,287	-0,203	0,066
26	-1,749	-1,518	-1,832	-0,280	-0,212	0,196
27	-1,778	-1,541	-1,882	-0,274	-0,217	0,070
28	-1,806	-1,563	-1,966	-0,269	-0,219	-0,033
29	-1,833	-1,584	-2,043	-0,266	-0,220	0,050
30	-1,859	-1,605	-2,052	-0,263	-0,220	-0,025

Note: see note 3 at table 1.3

but those of volatility are in favour of causality from industrial production growth rate to real stock returns (Table 18.4).

Table 18.4: Causality test of Hong in volatility for India, Kernel functions: Q-S (Quadratic), Bartlett and Truncated.

Causality Test of Hong						
PANEL B volatility						
Bandwidth	QuadraticINr_i	BartlettINr_i	TruncatedINr_i	QuadraticINi_r	BartlettINi_r	TruncatedINi_r
1	-0,725	NaN	-0,708	-0,276	NaN	-0,250
2	-0,764	-0,708	-0,800	-0,291	-0,250	-0,381
3	-0,733	-0,789	-0,232	-0,405	-0,313	-0,703
4	-0,642	-0,740	-0,470	-0,566	-0,412	-0,833
5	-0,590	-0,678	-0,696	-0,666	-0,518	-1,052
6	-0,472	-0,660	0,259	-0,629	-0,620	0,089
7	-0,335	-0,618	0,594	-0,572	-0,654	-0,165
8	-0,206	-0,529	0,347	-0,477	-0,632	0,210
9	-0,087	-0,431	0,320	-0,297	-0,589	0,340
10	0,016	-0,344	0,436	-0,072	-0,529	0,176
11	0,100	-0,268	0,648	0,159	-0,467	2,5752475***
12	0,166	-0,196	0,603	0,382	-0,371	2,4301596***
13	0,213	-0,128	0,488	0,602	-0,234	2,4534419***
14	0,242	-0,067	0,331	0,815	-0,080	2,2434377**
15	0,259	-0,016	0,361	1,021	0,074	2,250572**
16	0,265	0,026	0,197	1,217	0,221	2,3647903***
17	0,261	0,061	0,068	1,4034341*	0,361	2,1458507**
18	0,248	0,088	-0,081	1,5786838*	0,491	2,1557139**
19	0,231	0,107	-0,042	1,7409677**	0,611	4,0447104***
20	0,210	0,120	-0,042	1,8886047**	0,730	3,8297006***
21	0,185	0,129	-0,176	2,0210398**	0,856	3,6279578***
22	0,157	0,134	-0,236	2,1389082**	0,982	3,4277772***
23	0,127	0,135	-0,303	2,2434538**	1,104	3,2772152***
24	0,098	0,133	-0,371	2,335613***	1,221	3,0847779***
25	0,068	0,128	-0,431	2,4158097***	1,3299063*	2,9196305***
26	0,038	0,121	-0,426	2,4843897***	1,4309914*	2,8545177***
27	0,008	0,112	-0,367	2,5418911***	1,5241006*	3,0869929***
28	-0,023	0,102	-0,478	2,5889921***	1,6105183*	2,9484205***
29	-0,055	0,090	-0,502	2,626435***	1,6910834**	2,8100668***
30	-0,086	0,078	-0,603	2,6550513***	1,7656276**	2,663443***

Note: see note 4 at table 1.4

Focusing on the results of **Indonesia**, causality by the r-statistic is presented in mean and volatility, in both directions (Table 19.1), with stronger being that of volatility. The most prevailing cases, though, seem to be those of causality in mean from stock returns to economic activity, according to the r-statistic of Cheung & Ng (Table 19.1) and the kernel functions of the Hong test (Table 19.3), and of causality in volatility with the reverse direction, backed up from both the r-statistic(Table 19.1) and the Hong test (Table 19.4).

Table 19.1: Cheung & Ng's r- statistic for Indonesia

CausalityTest of Cheung & Ng INDONESIA				
Lags	$rID_{r\_i,m}$	$rID_{i\_r,m}$	$rID_{r\_i,v}$	$rID_{i\_r,v}$
1	0,754	0,048	0,285	2,9375984***
2	2,1634336**	-1,091	0,294	-0,780
3	1,495	-0,331	-0,420	-0,797
4	1,594	-0,237	-0,207	0,110
5	1,6865153*	-1,544	1,621	-1,080
6	0,934	0,408	0,186	-0,788
7	-0,049	1,9636735**	0,359	1,812005*
8	0,804	0,336	1,110	0,490
9	-0,052	0,331	-1,011	0,039
10	0,106	-0,006	-1,151	-0,095
11	0,192	0,749	1,098	-0,815
12	0,295	-1,638	-1,010	0,620
13	0,044	-0,658	0,816	-0,102
14	0,706	-0,849	2,7925633***	-1,113
15	0,605	-0,328	-0,149	-0,305
16	1,490	-0,882	0,182	0,520
17	0,956	-1,216	-0,600	-0,731
18	-0,237	0,848	-0,156	-1,617
19	-0,266	0,990	-1,088	0,622
20	1,051	1,253	-0,270	-0,656
21	-0,140	1,9437014*	0,827	0,266
22	-1,077	0,088	-0,424	-0,586
23	-1,365	0,598	0,485	-0,507
24	-0,229	0,425	-0,539	2,1076312**
25	-0,486	0,191	-1,028	0,402
26	-0,592	0,135	0,784	-0,568
27	-0,044	0,859	0,106	-0,761
28	1,446	1,242	0,066	0,061
29	0,600	0,431	0,520	-0,182
30	0,112	1,294	-0,187	1,014

Note: see note 1 at table 1.1

In a partially different conclusion, the Cheung & Ng S-statistic confirms the causality in mean from stock returns to industrial production, but presents the causal relation in mean as bidirectional (Table 19.2). No causality is detected in volatility.

Table 19.2: Cheung & Ng's S- statistic for Indonesia

Statistics Cheung&Ng INDONESIA	
SIDr_i,m	156,58***
SIDi_r,m	67,06***
SIDr_i,v	38,104554
SIDi_r,v	-5,5702478

Note: see note 2 at table 1.2

Table 19.3: Causality test of Hong in mean for Indonesia, Kernel functions: Q-S (Quadratic), Bartlett and Truncated.

Causality Test of Hong						
PANEL A mean						
Bandwidth	QuadraticIDr_i	BartlettIDr_i	TruncatedIDr_i	QuadraticIDi_r	BartlettIDi_r	TruncatedIDi_r
1	-0,122	NaN	-0,304	-0,706	NaN	-0,708
2	0,113	-0,304	1,6547731**	-0,686	-0,708	-0,399
3	0,980	0,345	1,8762816**	-0,634	-0,652	-0,688
4	1,5214534*	0,881	2,1945921**	-0,687	-0,648	-0,929
5	1,8937285**	1,255	2,5760711***	-0,724	-0,701	-0,376
6	2,1118618**	1,5537289*	2,3328835***	-0,670	-0,724	-0,580
7	2,2042738**	1,7824374**	1,9046698**	-0,580	-0,721	0,260
8	2,2097905**	1,9320202**	1,7092714**	-0,506	-0,685	0,028
9	2,1485866**	2,0183662**	1,3872232*	-0,447	-0,626	-0,177
10	2,0467964**	2,0587413**	1,105	-0,398	-0,572	-0,386
11	1,9240409**	2,0637039**	0,859	-0,365	-0,532	-0,452
12	1,7939969**	2,0425194**	0,646	-0,348	-0,507	-0,058
13	1,6653278**	2,0025415**	0,434	-0,338	-0,486	-0,155
14	1,5432181*	1,9490663**	0,338	-0,327	-0,465	-0,188
15	1,429264*	1,8868155**	0,224	-0,312	-0,446	-0,336
16	1,3236955*	1,8195928**	0,465	-0,296	-0,430	-0,349
17	1,226	1,7523671**	0,457	-0,281	-0,419	-0,232
18	1,137	1,6885701**	0,298	-0,268	-0,409	-0,256
19	1,055	1,6275829*	0,151	-0,257	-0,401	-0,233
20	0,979	1,5681713*	0,187	-0,247	-0,393	-0,109
21	0,909	1,5105055*	0,042	-0,236	-0,386	0,378
22	0,844	1,4546299*	0,090	-0,225	-0,376	0,231
23	0,784	1,4005849*	0,250	-0,213	-0,363	0,147
24	0,729	1,3494938*	0,120	-0,200	-0,348	0,040
25	0,678	1,3014026*	0,025	-0,186	-0,334	-0,085
26	0,630	1,255	-0,049	-0,172	-0,321	-0,208
27	0,585	1,211	-0,172	-0,156	-0,309	-0,218
28	0,543	1,168	0,018	-0,140	-0,299	-0,108
29	0,504	1,127	-0,049	-0,123	-0,290	-0,198
30	0,466	1,087	-0,162	-0,107	-0,282	-0,071

Note: see note 3 at table 1.3

Table 19.4: Causality test of Hong in volatility for Indonesia, Kernel functions: Q-S (Quadratic), Bartlett and Truncated.

Causality Test of Hong						
PANEL B volatility						
Bandwidth	QuadraticIDr_i	BartlettIDr_i	TruncatedIDr_i	QuadraticIDi_r	BartlettIDi_r	TruncatedIDi_r
1	-0,699	NaN	-0,652	5,428296***	NaN	5,4613094***
2	-0,750	-0,652	-0,919	5,3494124***	5,4613094***	3,6852604***
3	-0,922	-0,788	-1,086	4,7437191***	5,2352751***	2,8779429***
4	-1,068	-0,911	-1,280	4,0927074***	4,8382542***	2,1553527**
5	-1,086	-1,021	-0,608	3,5515454***	4,4379311***	2,0012697**
6	-1,077	-1,065	-0,831	3,1841933***	4,0873182***	1,7344483**
7	-1,048	-1,065	-0,999	2,9318749***	3,7948364***	2,2577683**
8	-1,031	-1,067	-0,863	2,7395988***	3,5728253***	1,9383363**
9	-1,018	-1,069	-0,795	2,5720301***	3,4064127***	1,6056498*
10	-0,991	-1,067	-0,663	2,4136395***	3,2630214***	1,3146562*
11	-0,937	-1,059	-0,570	2,2646962**	3,129117***	1,202
12	-0,862	-1,045	-0,525	2,1260423**	3,0020081***	1,041
13	-0,777	-1,027	-0,555	1,9941154**	2,8816069***	0,819
14	-0,688	-1,008	0,849	1,8686464**	2,7660702***	0,861
15	-0,602	-0,974	0,655	1,7525628**	2,656234***	0,680
16	-0,520	-0,923	0,476	1,6484106**	2,552457***	0,546
17	-0,446	-0,865	0,369	1,5559116*	2,4532734***	0,469
18	-0,383	-0,806	0,209	1,4733097*	2,3583532***	0,772
19	-0,332	-0,750	0,261	1,3991834*	2,2700092**	0,672
20	-0,290	-0,698	0,122	1,331886*	2,1891691**	0,585
21	-0,258	-0,649	0,092	1,270	2,1142203**	0,443
22	-0,234	-0,605	-0,018	1,213	2,0437655**	0,353
23	-0,216	-0,566	-0,114	1,161	1,976764**	0,254
24	-0,206	-0,531	-0,197	1,113	1,9125971**	0,827
25	-0,200	-0,501	-0,155	1,069	1,8530809**	0,712
26	-0,200	-0,474	-0,183	1,028	1,7992472**	0,626
27	-0,202	-0,451	-0,300	0,990	1,7497694**	0,583
28	-0,207	-0,431	-0,414	0,954	1,7038276**	0,457
29	-0,213	-0,415	-0,484	0,920	1,6606675**	0,340
30	-0,220	-0,401	-0,586	0,888	1,6195238*	0,372

Note: see note 4 at table 1.4

For **Ireland**, higher r-statistic is detected in volatility from stock returns to industrial production, but in the twenty-first lag (Table 20.1). Moreover, good results are obtained in causality in mean from stock returns to industrial production.

<u>Table 20.1: Cheung & Ng's r- statistic for Ireland</u>

Causality Test of Cheung & Ng IRELAND				
Lags	**rIRr_i,m**	**rIRi_r,m**	**rIRr_i,v**	**rIRi_r,v**
1	0,638	-1,224	-0,031	-0,751
2	0,570	-1,092	1,147	-1,418
3	0,991	1,088	-1,464	-1,352
4	-0,287	0,173	0,493	-0,728
5	0,361	0,974	-1,206	-0,250
6	1,554	-0,447	-0,315	-0,890
7	0,165	-1,614	-0,963	0,702
8	-1,114	-0,398	-0,817	-0,556
9	-0,053	-0,180	-1,166	0,073
10	0,437	-1,020	0,639	1,9575385*
11	1,733379*	0,728	0,079	-0,681
12	0,912	0,634	-0,249	-0,738
13	-1,164	-0,162	-0,639	-0,616
14	-0,666	1,6688258*	-0,022	0,782
15	0,833	0,155	-0,340	-0,106
16	0,658	0,526	-0,786	-0,469
17	2,0512811**	0,158	-0,401	0,300
18	0,446	-0,821	-0,389	1,013
19	0,001	-0,506	0,180	0,226
20	0,371	-0,635	1,455	1,181
21	0,304	0,032	3,7471266***	-0,550
22	0,510	0,230	0,794	0,524
23	0,638	-0,213	-0,880	-0,641
24	-0,852	-1,010	-0,049	-0,639
25	0,066	0,080	0,051	-0,499
26	0,245	-0,615	-0,045	-1,273
27	1,9215329*	-0,530	0,248	-0,278
28	-0,956	-0,702	-0,736	-0,249
29	0,647	1,129	-0,272	-0,330
30	-0,115	-0,004	-1,145	-0,496

Note: see note 1 at table 1.1

The S-statistic of Cheung & Ng only assures for causality in mean, strictly from real stock returns to industrial production growth rate (Table 20.2).

Table 20.2: Cheung & Ng's S- statistic for Ireland

Statistics Cheung&Ng IRELAND	
SIRr_i,m	188,49***
SIRi_r,m	-62,468011
SIRr_i,v	-53,387754
SIRi_r,v	-116,9425

Note: see note 2 at table 1.2

Albeit, the kernel functions of the Hong test, find causality neither in mean nor volatility (Tables 20.3 and 20.4).

Table 20.3: Causality test of Hong in mean for Ireland, Kernel functions: Q-S (Quadratic), Bartlett and Truncated.

Causality Test of Hong						
PANEL A mean						
Bandwidth	QuadraticIRr_i	BartlettIRr_i	TruncatedIRr_i	QuadraticIRi_r	BartlettIRi_r	Truncatedi_r
1	-0,450	NaN	-0,419	0,36247461	NaN	0,356
2	-0,490	-0,419	-0,633	0,36536671	0,356	0,352
3	-0,582	-0,521	-0,521	0,38735986	0,379	0,368
4	-0,652	-0,573	-0,775	0,34077556	0,395	-0,023
5	-0,724	-0,619	-0,967	0,23965856	0,364	-0,031
6	-0,744	-0,682	-0,464	0,1601358	0,309	-0,257
7	-0,758	-0,719	-0,688	0,10961472	0,247	0,204
8	-0,766	-0,734	-0,577	0,064798695	0,202	-0,016
9	-0,765	-0,743	-0,777	0,01854319	0,175	-0,241
10	-0,764	-0,750	-0,915	-0,028471302	0,147	-0,212
11	-0,757	-0,763	-0,430	-0,072359961	0,117	-0,297
12	-0,738	-0,771	-0,439	-0,11266685	0,087	-0,401
13	-0,711	-0,771	-0,342	-0,15141044	0,056	-0,573
14	-0,683	-0,765	-0,429	-0,19035661	0,023	-0,198
15	-0,656	-0,755	-0,464	-0,22919059	-0,008	-0,366
16	-0,630	-0,745	-0,543	-0,26875982	-0,035	-0,477
17	-0,607	-0,736	0,050	-0,31038841	-0,061	-0,626
18	-0,588	-0,724	-0,079	-0,35449712	-0,087	-0,655
19	-0,572	-0,707	-0,234	-0,40099659	-0,113	-0,753
20	-0,559	-0,689	-0,360	-0,44969988	-0,141	-0,823
21	-0,550	-0,673	-0,486	-0,50001452	-0,168	-0,953
22	-0,547	-0,659	-0,580	-0,55092951	-0,197	-1,070
23	-0,549	-0,647	-0,648	-0,60140696	-0,227	-1,184
24	-0,555	-0,638	-0,665	-0,65072868	-0,258	-1,146
25	-0,564	-0,632	-0,788	-0,69856627	-0,290	-1,259
26	-0,574	-0,628	-0,898	-0,74477426	-0,323	-1,315
27	-0,584	-0,627	-0,485	-0,78927628	-0,355	-1,382
28	-0,592	-0,627	-0,476	-0,8321514	-0,389	-1,418
29	-0,598	-0,627	-0,536	-0,87355925	-0,422	-1,344
30	-0,601	-0,626	-0,649	-0,91362677	-0,455	-1,447

Note: see note 3 at table 1.3

Table 20.4: Causality test of Hong in volatility for Ireland, Kernel functions: Q-S (Quadratic), Bartlett and Truncated.

Causality Test of Hong						
PANEL B volatility						
Bandwidth	QuadraticIRr_i	BartlettIRr_i	TruncatedIRr_i	QuadraticIRi_r	BartlettIRi_r	TruncatedIRi_r
1	-0,684	NaN	-0,708	-0,25686629	NaN	-0,307
2	-0,670	-0,708	-0,339	-0,19583621	-0,307	0,295
3	-0,452	-0,631	0,197	0,095294891	-0,123	0,586
4	-0,264	-0,468	-0,094	0,26534872	0,073	0,346
5	-0,167	-0,346	0,066	0,29555718	0,195	0,015
6	-0,141	-0,270	-0,197	0,24790347	0,234	-0,041
7	-0,133	-0,224	-0,196	0,16194699	0,229	-0,170
8	-0,148	-0,204	-0,262	0,082536679	0,204	-0,328
9	-0,170	-0,197	-0,154	0,026697178	0,167	-0,541
10	-0,182	-0,195	-0,273	-0,010247294	0,120	0,139
11	-0,210	-0,196	-0,470	-0,040518107	0,081	0,024
12	-0,267	-0,203	-0,638	-0,066976536	0,057	-0,064
13	-0,344	-0,218	-0,724	-0,094907067	0,039	-0,177
14	-0,423	-0,240	-0,884	-0,12895576	0,024	-0,238
15	-0,489	-0,267	-1,012	-0,16760835	0,009	-0,406
16	-0,538	-0,299	-1,042	-0,20618258	-0,008	-0,526
17	-0,568	-0,335	-1,151	-0,24275375	-0,027	-0,663
18	-0,578	-0,372	-1,257	-0,27861227	-0,049	-0,630
19	-0,571	-0,412	-1,377	-0,31553475	-0,073	-0,764
20	-0,552	-0,453	-1,151	-0,3543291	-0,099	-0,670
21	-0,527	-0,493	0,979	-0,39517135	-0,125	-0,755
22	-0,498	-0,522	0,911	-0,43792331	-0,152	-0,842
23	-0,468	-0,533	0,870	-0,4821464	-0,178	-0,903
24	-0,436	-0,532	0,714	-0,5271321	-0,205	-0,963
25	-0,402	-0,521	0,566	-0,57205116	-0,232	-1,044
26	-0,367	-0,506	0,423	-0,61610572	-0,259	-0,923
27	-0,331	-0,488	0,295	-0,65863793	-0,286	-1,026
28	-0,296	-0,469	0,239	-0,69915458	-0,313	-1,128
29	-0,262	-0,449	0,120	-0,73730902	-0,340	-1,220
30	-0,231	-0,430	0,174	-0,77290958	-0,366	-1,291

Note: see note 4 at table 1.4

We have found **Italy** to be one of the countries that shows remarkable bidirectional causality in volatility (Tables 21.1, 21.2 and 21.4). Causality is also detected in the first lags in mean and volatility from stock returns to industrial production, as it is shown in the r-statistic results (Table 21.1).

Table 21.1: Cheung & Ng's r- statistic for Italy

CausalityTest of Cheung & Ng ITALY				
Lags	$rIT_{r\_i,m}$	$rIT_{i\_r,m}$	$rIT_{r\_i,v}$	$rIT_{i\_r,v}$
1	1,9730222**	0,320	1,9385981*	0,662
2	1,7731593*	1,325	2,9015932***	0,997
3	2,4486919**	-0,495	0,651	4,6083382***
4	0,901	-0,022	-0,646	-0,727
5	0,285	1,442	1,196	3,0396647***
6	-0,694	0,503	0,196	0,315
7	2,206041**	0,651	-0,476	-0,008
8	0,151	-1,048	0,424	0,182
9	0,867	-1,481	-1,201	-0,284
10	0,508	1,6547527*	-0,144	1,478
11	0,283	-0,057	0,181	0,423
12	1,040	-0,097	-0,255	0,192
13	-0,575	-0,254	-0,877	-0,373
14	-0,199	-0,462	0,408	0,877
15	0,560	0,918	-0,410	0,998
16	0,187	-1,226	0,197	0,610
17	0,223	-0,139	0,072	-0,931
18	-0,170	0,431	-0,258	1,130
19	-2,3934876**	-2,1562263**	-0,649	-0,367
20	1,354	-0,199	0,494	-0,745
21	-0,988	0,838	-1,097	-0,795
22	-0,814	-0,883	0,040	2,6676493***
23	0,178	0,280	0,628	2,1191949**
24	-0,175	-1,727699*	-0,218	-0,700
25	-0,786	0,274	0,580	-0,633
26	0,332	-0,296	1,347	-0,211
27	-0,563	0,441	-0,537	-0,688
28	-0,999	0,539	-0,868	-1,033
29	0,256	-0,072	-0,261	-1,105
30	-1,028	0,804	-0,621	0,515

Note: see note 1 at table 1.1

Bidirectional causality in volatility is more than accepted by the S-statistic and causality in mean from real returns to real economic activity is highly significant (Table 21.2).

Table 21.2: Cheung & Ng's S- statistic for Italy

Statistics Cheung&Ng ITALY	
SITr_i,m	127,97***
SITi_r,m	-4,045695
SITr_i,v	56,576***
SITi_r,v	252,35***

Note: see note 2 at table 1.2

Strong causality in mean from stock returns to economic growth is detected through the kernel functions of the Hong test for Italy (Table 21.3).

Table 21.3: Causality test of Hong in mean for Italy, Kernel functions: Q-S (Quadratic), Bartlett and Truncated.

Causality Test of Hong						
PANEL A mean						
Bandwidth	QuadraticITr_i	BartlettITr_i	TruncatedITr_i	QuadraticITi_r	BartlettITi_r	TruncatedITi_r
1	2,1879614**	NaN	2,0542609**	-0,609	NaN	-0,635
2	2,2649598**	2,0542609**	2,5335869***	-0,554	-0,635	-0,068
3	2,8628167***	2,3630245***	4,125359***	-0,388	-0,486	-0,363
4	3,3996131***	2,843453***	3,5134045***	-0,410	-0,413	-0,667
5	3,5439436***	3,2266558***	2,8569622***	-0,423	-0,433	-0,250
6	3,5479939***	3,4091628***	2,4640293***	-0,455	-0,450	-0,442
7	3,5190178***	3,4602002***	3,3324661***	-0,477	-0,454	-0,561
8	3,4609385***	3,4839986***	2,8784038***	-0,466	-0,465	-0,495
9	3,3925222***	3,5059482***	2,6627137***	-0,431	-0,478	-0,178
10	3,3095923***	3,5096391***	2,3659567***	-0,395	-0,483	0,230
11	3,2027096***	3,4948601***	2,0649232**	-0,369	-0,468	0,010
12	3,0768483***	3,462303***	2,0017949**	-0,355	-0,443	-0,191
13	2,9439929***	3,4172416***	1,7978029**	-0,352	-0,419	-0,364
14	2,8153006***	3,3641456***	1,5557038*	-0,356	-0,401	-0,496
15	2,6965068***	3,3039574***	1,3832403*	-0,360	-0,391	-0,503
16	2,5885018***	3,2379089***	1,173	-0,361	-0,386	-0,390
17	2,4899341***	3,1672298***	0,980	-0,359	-0,385	-0,544
18	2,4006828***	3,0926978***	0,795	-0,356	-0,386	-0,661
19	2,3196301**	3,0150917***	1,5679202*	-0,353	-0,391	-0,030
20	2,2448078**	2,9405355***	1,6724784**	-0,350	-0,394	-0,178
21	2,1748423**	2,8740439***	1,6380292*	-0,349	-0,394	-0,213
22	2,1088704**	2,8147735***	1,5578436*	-0,350	-0,393	-0,235
23	2,0466822**	2,7611811***	1,3864398*	-0,354	-0,392	-0,362
24	1,9881756**	2,7115596***	1,223	-0,361	-0,390	-0,051
25	1,9329309**	2,6643697***	1,152	-0,369	-0,388	-0,177
26	1,8800723**	2,6188425***	1,012	-0,378	-0,385	-0,296
27	1,8287357**	2,574478***	0,907	-0,387	-0,381	-0,395
28	1,7781851**	2,5308066***	0,901	-0,395	-0,379	-0,478
29	1,7279355**	2,4878359***	0,768	-0,402	-0,378	-0,596
30	1,6778758**	2,4454864***	0,773	-0,409	-0,377	-0,625

Note: see note 3 at table 1.3

Bidirectional causality in volatility for Italy is one of the most persuasive we will see in this thesis (Table 21.4).

Table 21.4: Causality test of Hong in volatility for Italy, Kernel functions: Q-S (Quadratic), Bartlett and Truncated.

Causality Test of Hong						
PANEL B volatility						
Bandwidth	QuadraticITr_i	BartlettITr_i	TruncatedITr_i	QuadraticITi_r	BartlettITi_r	TruncatedITi_r
1	2,2763768**	NaN	1,9588539**	-0,212	NaN	-0,397
2	2,7325458***	1,9588539**	5,1161791***	-0,378	-0,397	-0,282
3	4,0038419***	3,1784886***	3,9487908***	1,155	-0,386	8,082489***
4	4,2541427***	3,8703847***	3,2195713***	3,5341282***	1,090	6,8431218***
5	4,1411198***	4,0814599***	3,0238917***	5,3151023***	2,7001489***	8,7587202***
6	3,9001865***	4,105569***	2,4875274***	6,4088168***	3,9635086***	7,7466075***
7	3,6313726***	4,0457758***	2,1011838**	6,9838381***	4,9414932***	6,9147712***
8	3,3657016***	3,9357505***	1,7650259**	7,2387512***	5,6237311***	6,2359495***
9	3,115885***	3,7993751***	1,7765464**	7,2904759***	6,0781671***	5,6717503***
10	2,8834875***	3,6574084***	1,4705995*	7,2395782***	6,3683688***	5,6607977***
11	2,6670302***	3,5178213***	1,200	7,1247937***	6,5512037***	5,2316219***
12	2,4653405***	3,3789975***	0,962	6,9650893***	6,6623***	4,8208025***
13	2,2748201**	3,241117***	0,886	6,7797001***	6,7182078***	4,4713668***
14	2,0939609**	3,1064883***	0,700	6,584901***	6,7319575***	4,2756217***
15	1,9238278**	2,9764726***	0,529	6,3938812***	6,7150986***	4,1413646***
16	1,7625413**	2,8506482***	0,346	6,2118377***	6,6773694***	3,9079978***
17	1,6103709*	2,7285725***	0,168	6,0409847***	6,6248329***	3,779365***
18	1,4673487*	2,6097728***	0,012	5,8851689***	6,5616708***	3,731583***
19	1,3331466*	2,4939982***	-0,077	5,7472998***	6,4919374***	3,4999098***
20	1,207	2,3814808***	-0,191	5,626061***	6,417713***	3,3506452***
21	1,088	2,2724613**	-0,146	5,5184374***	6,3399377***	3,2233629***
22	0,976	2,1676069**	-0,290	5,4228302***	6,2598047***	4,1096314***
23	0,872	2,0670741**	-0,368	5,3384874***	6,1826015***	4,5624552***
24	0,774	1,9703808**	-0,494	5,2644367***	6,1139142***	4,4041523***
25	0,683	1,877165**	-0,573	5,1997365***	6,0535095***	4,2413692***
26	0,597	1,7870974**	-0,437	5,1433434***	5,9990149***	4,0357654***
27	0,516	1,7006893**	-0,520	5,0939636***	5,9485139***	3,8998858***
28	0,439	1,6181997*	-0,537	5,0500853***	5,9006599***	3,8525905***
29	0,367	1,5393417*	-0,646	5,0100807***	5,8548646***	3,8295193***
30	0,299	1,4637785*	-0,708	4,9726628***	5,8109456***	3,680522***

Note: see note 4 at table 1.4

The r-statistics of **Japan**, give away indications of bidirectional causality in mean and volatility, but not extremely strong even if they are detected in the first lags (Table 22.1).

Table 22.1: Cheung & Ng’s r- statistic for Japan

CausalityTest of Cheung & Ng JAPAN				
Lags	$rJP_{r\_i,m}$	$rJP_{i\_r,m}$	$rJP_{r\_i,v}$	$rJP_{i\_r,v}$
1	2,0766165**	-0,083	3,0454131***	1,016
2	1,8612605*	2,7059168***	1,329	2,3163235**
3	0,947	1,346	1,029	0,066
4	2,032293**	-0,056	0,457	-1,321
5	0,276	-0,502	1,323	1,327
6	-1,140	1,164	0,060	-0,255
7	1,096	-0,872	0,298	-0,371
8	1,701817*	-0,107	-0,311	-0,231
9	0,872	0,607	-0,464	-0,440
10	1,480	-0,308	1,439	0,492
11	1,7680567*	0,307	-0,194	-0,512
12	1,530	0,603	0,082	0,158
13	-0,404	0,163	-0,516	-0,869
14	-0,667	-1,441	1,199	2,215016**
15	0,687	-0,083	-0,488	2,1783898**
16	-0,628	-0,302	0,489	-1,415
17	0,191	0,015	-0,182	-0,132
18	0,727	0,183	-0,360	0,288
19	0,772	-0,763	-0,770	-0,853
20	0,008	-0,071	-0,647	-1,105
21	-0,128	-0,709	-0,173	-0,462
22	-0,760	-0,551	0,354	-0,202
23	-1,114	-0,371	-0,424	-0,868
24	0,020	-1,6980889*	-0,274	-0,481
25	0,391	-0,939	-0,633	-0,420
26	-0,419	0,199	1,039	-0,599
27	0,338	-0,283	-0,548	-1,287
28	-0,304	-0,976	0,887	-1,182
29	0,587	-0,698	1,329	0,181
30	1,135	-0,804	-0,109	0,531

Note: see note 1 at table 1.1

But no such indications are obtained from the S-statistics of Cheung & Ng that detect causality from real stock returns to industrial production in both mean and volatility (Table 22.2).

Table 22.2: Cheung & Ng’s S- statistic for Japan

Statistics Cheung&Ng JAPAN	
SJPr_i,m	254,30***
SJPi_r,m	-73,620616
SJPr_i,v	139,80***
SJPi_r,v	-37,830969

Note: see note 2 at table 1.2

The intuition of bidirectional causality in mean is more obvious by the kernel functions of the Hong test in mean (Table 22.3),

Table 22.3: Causality test of Hong in mean for Japan, Kernel functions: Q-S (Quadratic), Bartlett and Truncated.

Causality Test of Hong						
PANEL A mean						
Bandwidth	QuadraticJPr_i	BartlettJPr_i	TruncatedJPr_i	QuadraticJPi_r	BartlettJPi_r	TruncatedJPi_r
1	2,4692001***	NaN	2,3568074***	-0,418	NaN	-0,703
2	2,6197256***	2,3568074***	2,9135794***	-0,016	-0,703	2,6881585***
3	2,8734373***	2,7130005***	2,3448555***	1,3890644*	0,409	2,537559***
4	2,996054***	2,847536***	3,1574221***	1,9557373**	1,238	1,8502177**
5	3,042045***	2,9525121***	2,5388358***	2,0614365**	1,6427117**	1,4239422*
6	3,0290203***	3,0324583***	2,4152958***	2,0103249**	1,8036303**	1,4119098*
7	2,9839408***	3,0564974***	2,3012097**	1,906061**	1,8574216**	1,251
8	2,9480167***	3,0515521***	2,6457086***	1,7724464**	1,8647219**	0,928
9	2,9370919***	3,0438738***	2,4486932***	1,6211463*	1,8403278**	0,732
10	2,9480357***	3,0387996***	2,6066982***	1,4678529*	1,7931749**	0,497
11	2,9654334***	3,0347018***	2,9616512***	1,3233502*	1,7309763**	0,285
12	2,9789127***	3,0396003***	3,1297075***	1,187	1,6581638**	0,149
13	2,9833243***	3,0559852***	2,8527153***	1,059	1,5789825*	-0,043
14	2,9745927***	3,0765953***	2,6552094***	0,935	1,4960762*	0,177
15	2,9522836***	3,0940266***	2,4801799***	0,813	1,4146905*	-0,006
16	2,9181328***	3,1056035***	2,3051605**	0,699	1,3373628*	-0,161
17	2,8744802***	3,1104004***	2,0798329**	0,594	1,262	-0,324
18	2,8232683***	3,107888***	1,9541526**	0,495	1,189	-0,471
19	2,7658809***	3,0984119***	1,8483098**	0,402	1,116	-0,519
20	2,703515***	3,0831259***	1,6517288**	0,313	1,044	-0,659
21	2,6366679***	3,0625846***	1,4684252*	0,230	0,973	-0,712
22	2,565556***	3,0369619***	1,3827833*	0,153	0,904	-0,795
23	2,4905716***	3,0069977***	1,4042882*	0,082	0,836	-0,899
24	2,4129101***	2,9740921***	1,239	0,017	0,770	-0,585
25	2,3342634***	2,9389636***	1,103	-0,042	0,707	-0,579
26	2,2561456**	2,9016464***	0,976	-0,097	0,647	-0,695
27	2,1794868**	2,8623316***	0,846	-0,150	0,591	-0,802
28	2,104596**	2,8212112***	0,718	-0,200	0,537	-0,782
29	2,0314014**	2,7784529***	0,630	-0,249	0,486	-0,827
30	1,9596374**	2,7343107***	0,674	-0,296	0,437	-0,849

Note: see note 3 at table 1.3

and less obvious or strong by the results of the test in volatility (Table 22.4).

Table 22.4: Causality test of Hong in volatility for Japan, Kernel functions: Q-S (Quadratic), Bartlett and Truncated.

Causality Test of Hong						
PANEL B volatility						
Bandwidth	QuadraticJPr_i	BartlettJPr_i	TruncatedJPr_i	QuadraticJPi_r	BartlettJPi_r	TruncatedJPi_r
1	5,9049849***	NaN	5,8843272***	0,213	NaN	0,026
2	5,8928233***	5,8843272***	4,5576501***	0,502	0,026	2,2198839**
3	5,5043333***	5,8431992***	3,756163***	1,3062342*	0,779	1,4100015*
4	4,9414067***	5,580364***	2,9809722***	1,5534354*	1,209	1,49468*
5	4,4648464***	5,2540544***	2,9164221***	1,637292*	1,3901187*	1,5883107*
6	4,0469527***	4,9519504***	2,3814703***	1,6139364*	1,4977922*	1,185
7	3,6742549***	4,6832552***	1,9680166**	1,5478103*	1,5517748*	0,871
8	3,3457659***	4,4289267***	1,6214088*	1,4350268*	1,5555305*	0,583
9	3,0601167***	4,1868945***	1,3504783*	1,2804415*	1,5234383*	0,364
10	2,8098222***	3,9578423***	1,5360859*	1,120	1,4678364*	0,181
11	2,589062***	3,7506096***	1,266	0,985	1,3980905*	0,020
12	2,3930998***	3,5657029***	1,015	0,887	1,3202986*	-0,176
13	2,2180359**	3,3954062***	0,838	0,826	1,238	-0,209
14	2,0579416**	3,2361252***	0,904	0,795	1,153	0,567
15	1,9089715**	3,0885646***	0,741	0,783	1,079	1,263
16	1,7687459**	2,952393***	0,591	0,782	1,027	1,4182857*
17	1,6344787*	2,8251316***	0,413	0,785	0,997	1,215
18	1,5061369*	2,7048479***	0,263	0,789	0,981	1,035
19	1,3846554*	2,590125***	0,199	0,792	0,972	0,975
20	1,270	2,4805371***	0,110	0,794	0,968	0,999
21	1,163	2,3759422***	-0,037	0,796	0,967	0,862
22	1,061	2,2757029**	-0,161	0,798	0,966	0,705
23	0,964	2,1791307**	-0,272	0,798	0,966	0,666
24	0,873	2,0858105**	-0,394	0,796	0,964	0,549
25	0,786	1,995391**	-0,463	0,791	0,962	0,430
26	0,703	1,9077056**	-0,430	0,781	0,958	0,342
27	0,625	1,8230503**	-0,509	0,768	0,952	0,444
28	0,549	1,7415355**	-0,517	0,751	0,944	0,506
29	0,477	1,6630766**	-0,389	0,730	0,936	0,378
30	0,407	1,5880684*	-0,504	0,706	0,928	0,289

Note: see note 4 at table 1.4

Luxembourg exhibits r-statistic results of causality in mean on both directions but with the medium influence between the two time series, and causality in volatility from industrial production to stock returns with a high r-statistic in the fifteenth lag (Table 23.1).

Table 23.1: Cheung & Ng's r- statistic for Luxembourg

CausalityTest of Cheung & Ng LUXEMBOURG				
Lags	$rLX_{r\_i,m}$	$rLX_{i\_r,m}$	$rLX_{r\_i,v}$	$rLX_{i\_r,v}$
1	0,248	0,048	-0,449	-0,416
2	-0,433	1,152	0,109	0,723
3	0,521	0,154	-0,441	-0,292
4	1,487	-0,658	-0,391	-0,371
5	1,163	-1,576	-0,054	-0,450
6	-0,573	-2,098036**	-0,237	-0,388
7	-0,468	-1,360	-0,418	-0,273
8	-0,651	-1,286	1,559	-0,303
9	1,802421*	-0,586	0,509	-0,463
10	2,5834561***	0,870	0,334	-0,382
11	0,242	0,402	0,144	-0,385
12	0,929	-1,480	0,189	-0,142
13	-0,545	-0,507	-0,015	-0,061
14	1,173	-0,135	-0,310	-0,065
15	-0,113	3,4895415***	0,191	3,8674857***
16	0,728	-1,115	-0,258	-0,037
17	0,082	0,557	-0,258	0,293
18	-0,290	-0,448	-0,222	-0,053
19	-0,462	-1,598	-0,266	-0,029
20	1,503	0,708	0,518	-0,037
21	-0,324	1,929631*	0,375	0,647
22	0,753	0,487	-0,322	-0,350
23	-0,717	-1,8911768*	-0,367	0,952
24	0,538	0,164	-0,120	0,517
25	-0,532	-0,206	-0,414	-0,241
26	-0,256	2,2870322**	-0,334	0,498
27	0,425	1,7988448*	-0,039	1,9022645*
28	-0,191	-0,417	-0,402	0,010
29	-0,239	-1,600	-0,462	-0,495
30	-1,635	-1,002	1,006	0,143

Note: see note 1 at table 1.1

S-statistic results exhibit causality in mean from real stock returns to real economic activity and causality in volatility in reverse direction (Table 23.2).

Table 23.2: Cheung & Ng's S- statistic for Luxembourg

Statistics Cheung&Ng LUXEMBOURG	
SLXi_r,m	84,5851***
SLXr_i,m	-49,090581
SLXi_r,v	-10,235246
SLXr_i,v	52,364***

Note: see note 2 at table 1.2

The kernel functions, however, indicate late causality in mean with direction opposite to that of the S-statistic (Table 23.3).

Table 23.3: Causality test of Hong in mean for Luxembourg, Kernel functions: Q-S (Quadratic), Bartlett and Truncated.

Causality Test of Hong						
PANEL A mean						
Bandwidth	QuadraticLXr_i	BartlettLXr_i	TruncatedLXr_i	QuadraticLXi_r	BartlettLXi_r	TruncatedLXi_r
1	-0,702	NaN	-0,665	-0,697	NaN	-0,708
2	-0,737	-0,665	-0,877	-0,662	-0,708	-0,330
3	-0,894	-0,784	-1,012	-0,576	-0,628	-0,668
4	-0,902	-0,888	-0,434	-0,627	-0,615	-0,775
5	-0,778	-0,901	-0,265	-0,578	-0,653	-0,206
6	-0,713	-0,850	-0,430	-0,389	-0,655	0,830
7	-0,681	-0,794	-0,602	-0,130	-0,570	1,017
8	-0,614	-0,758	-0,700	0,108	-0,427	1,137
9	-0,500	-0,740	-0,099	0,276	-0,271	0,929
10	-0,358	-0,719	1,239	0,395	-0,127	0,843
11	-0,216	-0,661	0,992	0,496	-0,004	0,635
12	-0,087	-0,573	0,940	0,602	0,096	0,881
13	0,023	-0,476	0,778	0,718	0,179	0,713
14	0,112	-0,383	0,845	0,839	0,249	0,512
15	0,183	-0,295	0,647	0,960	0,306	2,6710288***
16	0,236	-0,216	0,559	1,081	0,369	2,6595026***
17	0,275	-0,146	0,383	1,201	0,452	2,482645***
18	0,300	-0,086	0,231	1,322107*	0,543	2,2989127**
19	0,314	-0,037	0,110	1,4435319*	0,635	2,5357358***
20	0,320	0,003	0,343	1,5640293*	0,726	2,4166144***
21	0,318	0,037	0,209	1,6825768**	0,815	2,8415936***
22	0,311	0,065	0,157	1,797435**	0,903	2,6839977***
23	0,299	0,089	0,100	1,9069439**	0,989	3,0695973***
24	0,282	0,108	0,011	2,0106839**	1,073	2,8861483***
25	0,261	0,123	-0,076	2,109009**	1,156	2,714039***
26	0,238	0,135	-0,191	2,2020379**	1,235	3,3387414***
27	0,213	0,143	-0,285	2,289404**	1,31137*	3,647905***
28	0,187	0,148	-0,397	2,3706978***	1,3880644*	3,4988476***
29	0,161	0,150	-0,502	2,4459285***	1,464283*	3,7035538***
30	0,134	0,148	-0,227	2,5156143***	1,5395068*	3,6816353***

Note: see note 3 at table 1.3

In the case of volatility, no causality is detected (Table 23.4).

Table 23.4: Causality test of Hong in volatility for Luxembourg, Kernel functions: Q-S (Quadratic), Bartlett and Truncated.

Causality Test of Hong						
PANEL B volatility						
Bandwidth	QuadraticLXr_i	BartlettLXr_i	TruncatedLXr_i	QuadraticLXi_r	BartlettLXi_r	TruncatedLXi_r
1	-0,619	NaN	-0,566	-0,617	NaN	-0,586
2	-0,672	-0,566	-0,895	-0,638	-0,586	-0,650
3	-0,879	-0,718	-1,060	-0,744	-0,649	-0,904
4	-1,034	-0,853	-1,217	-0,879	-0,732	-1,087
5	-1,181	-0,967	-1,404	-1,004	-0,826	-1,223
6	-1,314	-1,070	-1,554	-1,138	-0,918	-1,360
7	-1,401	-1,167	-1,658	-1,234	-1,005	-1,506
8	-1,453	-1,257	-1,172	-1,318	-1,088	-1,634
9	-1,490	-1,323	-1,275	-1,433	-1,168	-1,724
10	-1,523	-1,365	-1,405	-1,555	-1,244	-1,824
11	-1,561	-1,396	-1,546	-1,645	-1,317	-1,918
12	-1,605	-1,425	-1,675	-1,684	-1,386	-2,036
13	-1,653	-1,455	-1,803	-1,676	-1,452	-2,150
14	-1,706	-1,487	-1,905	-1,634	-1,516	-2,259
15	-1,761	-1,520	-2,014	-1,573	-1,579	0,533
16	-1,820	-1,556	-2,112	-1,500	-1,615	0,350
17	-1,880	-1,593	-2,206	-1,425	-1,613	0,195
18	-1,941	-1,632	-2,300	-1,348	-1,589	0,033
19	-2,002	-1,671	-2,386	-1,275	-1,553	-0,119
20	-2,063	-1,712	-2,436	-1,208	-1,512	-0,264
21	-2,123	-1,753	-2,505	-1,146	-1,469	-0,332
22	-2,181	-1,793	-2,579	-1,088	-1,427	-0,445
23	-2,239	-1,834	-2,645	-1,039	-1,386	-0,426
24	-2,294	-1,875	-2,729	-1,000	-1,348	-0,509
25	-2,349	-1,915	-2,786	-0,964	-1,312	-0,620
26	-2,402	-1,955	-2,851	-0,931	-1,280	-0,699
27	-2,454	-1,995	-2,930	-0,902	-1,250	-0,266
28	-2,505	-2,034	-2,984	-0,879	-1,223	-0,382
29	-2,555	-2,074	-3,029	-0,862	-1,196	-0,459
30	-2,604	-2,112	-2,958	-0,852	-1,170	-0,565

Note: see note 4 at table 1.4

Malaysia's results imply a possible causal relation in mean, from stock returns to industrial production and exhibit their highest r-statistic in mean with reverse direction (lag 15). A hint of causality is detected in volatility from returns to growth (Table 24.1).

Table 24.1: Cheung & Ng's r- statistic for Malaysia

CausalityTest of Cheung & Ng MALAYSIA				
Lags	$rMY_{r\_i,m}$	$rMY_{i\_r,m}$	$rMY_{r\_i,v}$	$rMY_{i\_r,v}$
1	1,397	-0,245	-0,643	0,567
2	1,476	-0,229	-0,479	1,068
3	0,970	-2,205549**	-0,210	0,519
4	2,2805956**	0,475	-0,310	0,714
5	0,971	1,124	-0,362	-0,895
6	1,7081719*	0,895	0,685	0,745
7	1,002	0,161	0,456	-0,621
8	1,453	-0,129	-0,299	-0,379
9	-0,120	-0,268	1,099	-0,374
10	1,145	0,108	1,987989**	-0,713
11	-0,244	-0,016	0,172	-0,868
12	-0,688	-1,468	-0,584	1,158
13	0,886	-0,309	-0,958	-0,928
14	0,099	-0,207	0,044	-0,087
15	-1,437	-2,5802326***	-0,830	-0,696
16	0,345	-0,121	-1,017	1,145
17	0,550	0,929	1,277	1,151
18	0,478	-0,214	-0,902	-0,574
19	-0,276	0,877	-0,069	1,583
20	-0,500	0,598	0,291	0,337
21	-1,418	0,861	-0,134	-0,739
22	-1,016	0,509	0,320	0,208
23	-1,244	-1,363	0,489	-0,524
24	-1,626	-1,110	-0,083	1,017
25	-0,934	-0,229	0,440	-0,449
26	-0,921	1,555	-0,427	-0,486
27	0,294	-1,247	-0,902	1,009
28	0,708	0,678	-0,869	-1,382
29	0,080	-0,108	-0,393	-1,249
30	0,941	-0,676	0,839	0,942

Note: see note 1 at table 1.1

The Cheung & Ng test of S-statistic finds causality only in mean from real stock returns to real economic activity (Table 24.2).

Table 24.2: Cheung & Ng's S- statistic for Malaysia

Statistics Cheung&Ng MALAYSIA	
SMYr_i,m	96,423***
SMYi_r,m	-59,962821
SMYr_i,v	-20,257868
SMYi_r,v	17,749922

Note: see note 2 at table 1.2

The Hong test adds weight for causality in mean from stock returns to industrial production (Table 24.3),

Table 24.3: Causality test of Hong in mean for Malaysia, Kernel functions: Q-S (Quadratic), Bartlett and Truncated.

Causality Test of Hong						
PANEL A mean						
Bandwidth	QuadraticMYr_i	BartlettMYr_i	TruncatedMYr_i	QuadraticMYi_r	BartlettMYi_r	TruncatedMYi_r
1	0,743	NaN	0,680	-0,675	NaN	-0,666
2	0,832	0,680	1,080	-0,762	-0,666	-0,945
3	0,990	0,864	0,865	-0,604	-0,808	0,827
4	1,242	0,956	2,2617178**	-0,205	-0,597	0,446
5	1,5387317*	1,136	2,0158384**	0,061	-0,328	0,492
6	1,7926795**	1,3512277*	2,4153387***	0,197	-0,143	0,399
7	1,9879275**	1,5422323*	2,2503895**	0,242	-0,014	0,113
8	2,1208107**	1,7059331**	2,4027897***	0,221	0,064	-0,136
9	2,1902107**	1,8410458**	2,0418777**	0,151	0,100	-0,343
10	2,2180145**	1,946759**	2,0229903**	0,061	0,104	-0,543
11	2,2178451**	2,0240112**	1,7373435**	-0,019	0,087	-0,728
12	2,1969931**	2,0773634**	1,5672844*	-0,077	0,053	-0,445
13	2,1540308**	2,1091195**	1,4769774*	-0,119	0,014	-0,600
14	2,0970749**	2,1243854**	1,245	-0,145	-0,024	-0,755
15	2,032226**	2,1261517**	1,4189797*	-0,163	-0,064	0,354
16	1,9651181**	2,1192255**	1,228	-0,173	-0,095	0,175
17	1,899828**	2,106889**	1,082	-0,177	-0,111	0,159
18	1,8381355**	2,0890687**	0,933	-0,176	-0,120	0,002
19	1,7801049**	2,0662295**	0,768	-0,172	-0,125	-0,023
20	1,7253647**	2,0387395**	0,640	-0,168	-0,127	-0,115
21	1,6738825**	2,0071071**	0,805	-0,162	-0,128	-0,139
22	1,6258683*	1,9733227**	0,808	-0,156	-0,130	-0,239
23	1,5814511*	1,939261**	0,893	-0,150	-0,131	-0,085
24	1,5405606*	1,905864**	1,144	-0,143	-0,133	-0,032
25	1,5028227*	1,8746181**	1,120	-0,137	-0,134	-0,157
26	1,467537*	1,8461171**	1,096	-0,131	-0,135	0,071
27	1,4338884*	1,8198887**	0,962	-0,125	-0,135	0,168
28	1,4012756*	1,7952444**	0,893	-0,121	-0,134	0,105
29	1,3694828*	1,7715544**	0,757	-0,117	-0,131	-0,018
30	1,3386288*	1,7483413**	0,748	-0,114	-0,129	-0,075

Note: see note 3 at table 1.3

whereas no causality is detected in volatility by the kernel functions (Table 24.4).

Table 24.4: Causality test of Hong in volatility for Malaysia, Kernel functions: Q-S (Quadratic), Bartlett and Truncated.

Causality Test of Hong						
PANEL B volatility						
Bandwidth	QuadraticMYr_i	BartlettMYr_i	TruncatedMYr_i	QuadraticMYi_r	BartlettMYi_r	TruncatedMYi_r
1	-0,460	NaN	-0,415	-0,480	NaN	-0,479
2	-0,500	-0,415	-0,678	-0,462	-0,479	-0,264
3	-0,685	-0,534	-0,944	-0,440	-0,439	-0,512
4	-0,868	-0,664	-1,137	-0,495	-0,444	-0,613
5	-1,010	-0,789	-1,291	-0,555	-0,483	-0,607
6	-1,142	-0,903	-1,329	-0,605	-0,523	-0,678
7	-1,259	-1,002	-1,441	-0,667	-0,559	-0,788
8	-1,325	-1,087	-1,575	-0,736	-0,594	-0,948
9	-1,349	-1,165	-1,428	-0,798	-0,634	-1,094
10	-1,351	-1,232	-0,669	-0,858	-0,679	-1,143
11	-1,342	-1,272	-0,841	-0,913	-0,726	-1,136
12	-1,325	-1,286	-0,935	-0,959	-0,772	-1,006
13	-1,303	-1,290	-0,905	-0,995	-0,813	-0,985
14	-1,282	-1,289	-1,057	-1,021	-0,848	-1,133
15	-1,262	-1,286	-1,070	-1,040	-0,879	-1,183
16	-1,246	-1,284	-1,018	-1,055	-0,908	-1,077
17	-1,236	-1,281	-0,863	-1,068	-0,935	-0,975
18	-1,234	-1,277	-0,859	-1,077	-0,958	-1,053
19	-1,237	-1,272	-0,992	-1,083	-0,978	-0,755
20	-1,244	-1,266	-1,107	-1,086	-0,994	-0,870
21	-1,253	-1,261	-1,227	-1,089	-1,006	-0,909
22	-1,266	-1,258	-1,328	-1,092	-1,016	-1,027
23	-1,282	-1,257	-1,405	-1,096	-1,024	-1,104
24	-1,301	-1,259	-1,514	-1,100	-1,033	-1,061
25	-1,322	-1,263	-1,591	-1,104	-1,041	-1,145
26	-1,344	-1,270	-1,667	-1,108	-1,049	-1,221
27	-1,368	-1,279	-1,649	-1,112	-1,058	-1,181
28	-1,393	-1,289	-1,640	-1,115	-1,067	-1,013
29	-1,418	-1,301	-1,716	-1,116	-1,075	-0,900
30	-1,445	-1,313	-1,713	-1,115	-1,082	-0,883

Note: see note 4 at table 1.4

We believe that the case of **Mexico** exhibits good bidirectional causality in mean, which is also detected in the first three lags. However, the highest r-statistic is detected in volatility once again (Table 25.1).

Table 25.1: Cheung & Ng's r- statistic for Mexico

CausalityTest of Cheung & Ng MEXICO				
Lags	$rMX_{r\_i,m}$	$rMX_{i\_r,m}$	$rMX_{r\_i,v}$	$rMX_{i\_r,v}$
1	0,723	2,2144259**	0,909	0,426
2	2,1497753**	-0,354	-0,733	-0,507
3	2,1296402**	1,9341184*	-0,396	0,712
4	1,010	0,914	-0,011	-1,296
5	0,772	0,081	-0,699	-0,261
6	1,8137134*	0,079	0,249	0,184
7	-0,189	0,494	-0,931	0,358
8	0,488	0,897	-0,483	-0,789
9	-0,333	-0,343	0,078	-0,057
10	2,4153774**	-1,8764898*	-0,356	3,174332***
11	0,086	3,0379766***	-0,106	0,534
12	0,782	1,200	-0,715	-0,716
13	-0,211	-0,780	0,604	-0,769
14	1,523	-0,186	0,062	0,245
15	-0,262	0,968	0,146	0,858
16	0,685	-0,267	-0,080	-1,050
17	-0,503	-0,095	-0,345	-0,420
18	-0,948	0,410	1,182	-0,854
19	-0,144	-1,217	-0,405	-0,743
20	0,093	0,326	-0,554	-0,580
21	-0,329	-0,707	-0,486	-0,053
22	-0,567	0,838	0,575	-0,048
23	-1,086	-1,354	-0,232	-1,507
24	0,238	-0,313	-0,758	0,585
25	-0,382	0,428	-0,759	-0,957
26	-0,496	0,594	0,226	-0,729
27	0,258	-1,601	0,047	1,9990794**
28	-0,185	0,689	0,074	-0,098
29	0,896	-0,034	-0,042	0,940
30	-0,567	-0,648	-0,292	-0,689

Note: see note 1 at table 1.1

Bidirectional causality in mean is the one and strong conclusion that comes from table 25.2.

Table 25.2: Cheung & Ng's S- statistic for Mexico

Statistics Cheung&Ng MEXICO	
SMXr_i,m	84,2315***
SMXi_r,m	45,5111**
SMXr_i,v	-35,132405
SMXi_r,v	-17,512605

Note: see note 2 at table 1.2

The Cheung & Ng and the kernel functions of the Hong test really agree to the existence of bidirectional causality in mean, for Mexico (Tables 25.1, 25.2 and 25.3).

Table 25.3: Causality test of Hong in mean for Mexico, Kernel functions: Q-S (Quadratic), Bartlett and Truncated.

Causality Test of Hong						
PANEL A mean						
Bandwidth	QuadraticMXr_i	BartlettMXr_i	TruncatedMXr_i	QuadraticMXi_r	BartlettMXi_r	TruncatedMXi_r
1	-0,137	NaN	-0,335	2,8076093***	NaN	2,8281875***
2	0,078	-0,335	1,6374687*	2,7037583***	2,8281875***	1,5782658*
3	1,128	0,314	2,8582111***	2,468166***	2,5974999***	2,4736677***
4	1,8494907**	1,024	2,5204504***	2,4565243***	2,5333791***	2,1171199**
5	2,2301678**	1,5342407*	2,1587539**	2,3782554***	2,5468237***	1,599906*
6	2,4179373***	1,8337133**	2,7089002***	2,2359537**	2,5099072***	1,193
7	2,485786***	2,0380191**	2,2786921**	2,0152871**	2,4244277***	0,924
8	2,5113688***	2,1868361**	1,9718141**	1,8270226**	2,312512**	0,848
9	2,5237368***	2,2778616**	1,6775166**	1,737093**	2,1942225**	0,612
10	2,5347573***	2,3230657**	2,813031***	1,7389973**	2,0769425**	1,232
11	2,5440682***	2,3601352***	2,5048899***	1,7991266**	1,9764216**	3,1419981***
12	2,5473003***	2,4030254***	2,3652481***	1,8866924**	1,9299287**	3,1663608***
13	2,5443774***	2,440768***	2,1195738**	1,9810504**	1,9390408**	3,0180675***
14	2,5357962***	2,4694965***	2,3777737***	2,0681983**	1,9771186**	2,7659548***
15	2,520352***	2,4919485***	2,1645865**	2,1411273**	2,0265554**	2,7213372***
16	2,4970488***	2,5100677***	2,0487095**	2,1998685**	2,0785775**	2,5119067***
17	2,4660735***	2,5224226***	1,9014364**	2,2472903**	2,1286368**	2,3061296**
18	2,4284425***	2,5289373***	1,8897536**	2,285629**	2,1732625**	2,1453485**
19	2,3855547***	2,5304589***	1,7175227**	2,3158832**	2,2109937**	2,2440304**
20	2,3389219***	2,5275513***	1,5537557*	2,3385206***	2,2428571**	2,0889592**
21	2,2899775**	2,5200166***	1,4176815*	2,3540748***	2,2697014**	2,0154545**
22	2,2399359**	2,5080483***	1,3280025*	2,3633227***	2,2915046**	1,9848488**
23	2,1897227**	2,492202***	1,3960833*	2,3672177***	2,3088944**	2,1590245**
24	2,1399753**	2,4736843***	1,270	2,3667689***	2,3232925**	2,0298268**
25	2,0910872**	2,4532452***	1,166	2,3629487***	2,3353918***	1,9224971**
26	2,0432719**	2,4309321***	1,084	2,3566423***	2,3448826***	1,8501428**
27	1,9966226**	2,4069461***	0,977	2,3486276***	2,3517691***	2,1552314**
28	1,9511623**	2,3814579***	0,870	2,3395707***	2,3571659***	2,1091783**
29	1,906878**	2,3545606***	0,895	2,3300304***	2,3619433***	1,9894572**
30	1,8637434**	2,3266391**	0,843	2,3204649**	2,3658075***	1,9437496**

Note: see note 3 at table 1.3

In contrast, no causality is detected in volatility, at all (Table 25.4).

Table 25.4: Causality test of Hong in volatility for Mexico, Kernel functions: Q-S (Quadratic), Bartlett and Truncated.

Causality Test of Hong						
PANEL B volatility						
Bandwidth	QuadraticMXr_i	BartlettMXr_i	TruncatedMXr_i	QuadraticMXi_r	BartlettMXi_r	TruncatedMXi_r
1	-0,146	NaN	-0,115	-0,615	NaN	-0,581
2	-0,171	-0,115	-0,305	-0,648	-0,581	-0,782
3	-0,310	-0,188	-0,590	-0,787	-0,690	-0,834
4	-0,483	-0,291	-0,863	-0,800	-0,772	-0,455
5	-0,647	-0,409	-0,924	-0,760	-0,786	-0,696
6	-0,777	-0,520	-1,110	-0,788	-0,779	-0,910
7	-0,883	-0,619	-1,045	-0,863	-0,791	-1,069
8	-0,977	-0,705	-1,160	-0,879	-0,819	-1,078
9	-1,063	-0,777	-1,323	-0,819	-0,855	-1,245
10	-1,145	-0,843	-1,443	-0,713	-0,895	1,065
11	-1,223	-0,907	-1,582	-0,586	-0,892	0,893
12	-1,300	-0,970	-1,598	-0,450	-0,837	0,791
13	-1,373	-1,030	-1,645	-0,320	-0,761	0,717
14	-1,443	-1,087	-1,767	-0,213	-0,678	0,539
15	-1,509	-1,142	-1,878	-0,125	-0,598	0,515
16	-1,569	-1,194	-1,988	-0,051	-0,523	0,570
17	-1,626	-1,246	-2,069	0,017	-0,454	0,443
18	-1,677	-1,297	-1,899	0,077	-0,391	0,432
19	-1,725	-1,345	-1,970	0,129	-0,334	0,391
20	-1,770	-1,390	-2,011	0,171	-0,284	0,315
21	-1,812	-1,433	-2,063	0,204	-0,239	0,182
22	-1,852	-1,473	-2,096	0,228	-0,199	0,056
23	-1,891	-1,511	-2,176	0,247	-0,166	0,342
24	-1,929	-1,547	-2,162	0,264	-0,136	0,283
25	-1,966	-1,582	-2,146	0,281	-0,110	0,328
26	-2,003	-1,615	-2,220	0,301	-0,086	0,309
27	-2,039	-1,647	-2,300	0,324	-0,063	0,883
28	-2,074	-1,677	-2,377	0,353	-0,042	0,776
29	-2,109	-1,706	-2,452	0,387	-0,019	0,819
30	-2,144	-1,735	-2,510	0,427	0,003	0,797

Note: see note 4 at table 1.4

In the **Netherlands**, the Cheung & Ng r-statistic justifies strong causality in mean from stock returns to industrial activity and direct, but weak, causality in variance in the reverse direction (Table 26.1).

Table 26.1: Cheung & Ng's r- statistic for Netherlands

Causality Test of Cheung & Ng NETHERLANDS				
Lags	rNLr_i,m	rNLi_r,m	rNLr_i,v	rNLi_r,v
1	0,401	0,025	-0,748	1,880242*
2	-0,552	0,635	-0,366	-0,344
3	1,518	-0,580	-0,943	-1,097
4	3,1581684***	1,640285*	0,237	0,310
5	1,7176267*	-0,636	2,5250266**	-0,563
6	-1,150	-0,488	0,786	1,8418492*
7	0,398	0,513	0,037	1,7056606*
8	0,531	1,205	0,309	-0,015
9	1,286	0,762	-1,018	-1,017
10	-0,571	-0,924	-0,773	0,333
11	0,568	-2,304	0,701	-0,086
12	0,668	-1,213	-0,964	-0,110
13	1,178	-2,487	0,743	-1,094
14	-1,541	1,539	-0,064	0,043
15	-1,589	-0,328	-0,706	-0,856
16	1,333	0,949	-0,359	1,108
17	-0,075	-0,903	1,267	0,554
18	0,352	0,269	-0,193	2,3487773**
19	-0,568	-0,680	0,670	0,535
20	-0,675	0,359	0,296	1,094
21	0,810	0,922	-0,660	-0,363
22	-0,398	-0,889	-1,011	1,026
23	1,164	-1,034	-0,450	-0,153
24	-0,117	-1,317	-0,213	0,155
25	1,159	-1,887	-0,882	-0,388
26	1,047	-0,173	-0,950	0,021
27	-0,321	-1,051	-0,235	-1,124
28	0,116	-0,333	-0,085	-1,632
29	0,182	-0,051	-0,158	-0,147
30	2,0817815**	0,208	1,894	0,056

Note: see note 1 at table 1.1

The S-statistic results add credit to those of the r-statistic in that they coincide. Strong causality is detected in mean from stock returns to industrial production and wicker causality is detected in volatility from production to stock returns (Table 26.2).

Table 26.2: Cheung & Ng's S- statistic for Netherlands

Statistics Cheung&Ng NETHERLANDS	
SNLr_i,m	152,2599***
SNLi_r,m	-103,71
SNLr_i,v	-16,29
SNLi_r,v	49,928956**

Note: see note 2 at table 1.2

The kernel functions of the Hong test exhibit causality in mean from stock returns to growth, especially through bandwidths 9-21 (Table 26.3).

Table 26.3: Causality test of Hong in mean for Netherlands, Kernel functions: Q-S (Quadratic), Bartlett and Truncated.

Causality Test of Hong						
PANEL A mean						
Bandwidth	QuadraticNLr_i	BartlettNLr_i	TruncatedNLr_i	QuadraticNLi_r	BartlettNLi_r	TruncatedNLi_r
1	-0,58495374	NaN	-0,59455703	-0,73522501	NaN	-0,70892404
2	-0,59931147	-0,59455703	-0,7676852	-0,75391865	-0,70892404	-0,7985951
3	-0,61944202	-0,69533829	-0,079853768	-0,86583033	-0,78915586	-0,92133387
4	0,05863384	-0,64288982	3,1738856***	-0,81252648	-0,86040286	-0,18208898
5	0,97721277	-0,19696458	3,4888535***	-0,70971282	-0,83666692	-0,34555632
6	1,6822135**	0,4151402	3,3016998***	-0,63359402	-0,77047988	-0,53078269
7	2,1488326**	0,95272918	2,8474257***	-0,60631727	-0,72417744	-0,68349552
8	2,4253334***	1,3657*	2,4998934***	-0,60986832	-0,70289838	-0,51162269
9	2,5615598***	1,6637427**	2,5382779***	-0,59630572	-0,69214517	-0,57258353
10	2,6181772***	1,8802773**	2,2738772**	-0,53466593	-0,68428256	-0,56406488
11	2,6353236***	2,038898**	2,0400214**	-0,42043218	-0,67927463	0,43410054
12	2,6348685***	2,1510122**	1,8575399**	-0,27287764	-0,65966509	0,53383201
13	2,6277352***	2,2270144**	1,8870447**	-0,11740063	-0,61894006	1,5982513
14	2,6156777***	2,2776917**	2,1157848**	0,033735197	-0,55474482	1,835125
15	2,5991125***	2,3141887**	2,3629102***	0,17553091	-0,46663157	1,6248817
16	2,5776643***	2,3449583***	2,4598553***	0,3042385	-0,36699667	1,5788332
17	2,5507397***	2,3737966***	2,2325549**	0,4181687	-0,26522387	1,522683
18	2,5197292***	2,3996422***	2,0413538**	0,51845606	-0,16560665	1,3400131
19	2,4862578***	2,4202829***	1,8968357**	0,6068572	-0,071373688	1,2360589
20	2,4510232***	2,4350723***	1,7840147**	0,68467425	0,015521194	1,082318
21	2,414186***	2,4442211***	1,7116902**	0,75326329	0,094287682	1,0570173
22	2,3759132***	2,4483795***	1,5634611*	0,81395792	0,16506651	1,0246738
23	2,3367021***	2,4479687***	1,6143987*	0,86784115	0,2286876	1,0397314
24	2,2973759**	2,4438705***	1,4546177*	0,91569366	0,28605078	1,1605118
25	2,2588297**	2,4367176***	1,5075125*	0,95792961	0,33845238	1,5606134*
26	2,2217652**	2,4270327***	1,522898*	0,99469723	0,38812811	1,4130593*
27	2,1865574**	2,4157454***	1,3908384*	1,0261312	0,43586648	1,4324804*
28	2,1532526**	2,4030315***	1,2510651	1,0525316	0,48123126	1,3064374*
29	2,1216443**	2,3886511***	1,1196266	1,0743762	0,52400661	1,1697682
30	2,0913769**	2,3724649***	1,6097652*	1,0922347	0,56371547	1,0440643

Note: see note 3 at table 1.3

Causality in volatility from industrial production to stock returns is also detected by the Hong test but apart from the weakness of it, it shows that it does not exist after the fourth bandwidth (Table 26.4).

Table 26.4: Causality test of Hong in volatility for Netherlands, Kernel functions: Q-S (Quadratic), Bartlett and Truncated.

Causality Test of Hong						
PANEL B volatility						
Bandwidth	QuadraticNLr_i	BartlettNLr_i	TruncatedNLr_i	QuadraticNLi_r	BartlettNLi_r	TruncatedNLi_r
1	-0,34547996	NaN	-0,3102129	1,7731173**	Nan	1,8150149**
2	-0,40652668	-0,3102129	-0,65220721	1,6963966**	1,8150149**	0,84769342
3	-0,53190924	-0,44885861	-0,57211028	1,3771579*	1,6110415*	0,78712744
4	-0,62024126	-0,53536995	-0,82800785	1,102283	1,4173483*	0,36743116
5	-0,44514985	-0,60514173	1,0068959	0,88042693	1,2501208	0,1190505
6	-0,20600985	-0,54011913	0,82049939	0,80527858	1,0874097	0,82958762
7	-0,024046896	-0,38176325	0,49975522	0,81422652	0,9816202	1,3087029
8	0,09462181	-0,23735599	0,24868549	0,84807144	0,95151389	0,98337215
9	0,16170683	-0,13081868	0,25853059	0,87322332	0,95560796	0,95298072
10	0,19514233	-0,055014937	0,16760611	0,87341356	0,96531823	0,7154042
11	0,20292915	-0,000503451	0,062910494	0,84352525	0,97164119	0,47937627
12	0,19120843	0,036960228	0,061827478	0,79754517	0,96838	0,26598937
13	0,16837982	0,062047853	-0,015376024	0,75290862	0,95421556	0,314326
14	0,14051787	0,078180281	-0,19519643	0,71729655	0,93279735	0,12313911
15	0,10968533	0,085871329	-0,26732003	0,69090216	0,90654524	0,086478963
16	0,075016528	0,085999863	-0,40374412	0,67104653	0,87631995	0,14603769
17	0,034892231	0,079778657	-0,2623791	0,65383978	0,84473322	0,035751384
18	-0,009696012	0,069699267	-0,40653002	0,63678839	0,81277782	0,86023468
19	-0,056786254	0,057279641	-0,47150624	0,61952947	0,78581643	0,7373415
20	-0,10472263	0,042409311	-0,59425217	0,6031533	0,76663442	0,77654101
21	-0,15186846	0,025211311	-0,65317637	0,5891417	0,75280611	0,63845144
22	-0,19669811	0,005876264	-0,61336188	0,57843094	0,74254271	0,65797607
23	-0,23813801	-0,014734966	-0,70588126	0,57138889	0,73451916	0,51314613
24	-0,27564636	-0,036156248	-0,81919688	0,56807642	0,72776604	0,37493857
25	-0,30909758	-0,058580984	-0,81459021	0,56830584	0,72106198	0,26222773
26	-0,33863192	-0,081801139	-0,79070394	0,57164374	0,71367947	0,13148562
27	-0,36453325	-0,10525179	-0,89405487	0,57749309	0,705153	0,19517302
28	-0,38715206	-0,12883043	-1,0008521	0,58520975	0,69566841	0,46500522
29	-0,40686881	-0,15279108	-1,1015251	0,59418897	0,68639582	0,34337726
30	-0,42407917	-0,17730199	-0,68672158	0,60391095	0,6777227	0,22346308

Note: see note 4 at table 1.4

Norway exhibits causality in all cases of the r-statistic results and despite the fact that detection comes in the first ten lags, the price of the r-statistic and its significance are very low (Table 27.1).

Table 27.1: Cheung & Ng's r- statistic for Norway

CausalityTest of Cheung & Ng NORWAY				
Lags	$rNW_{r\_i,m}$	$rNW_{i\_r,m}$	$rNW_{r\_i,v}$	$rNW_{i\_r,v}$
1	-0,169	-0,198	-0,132	-0,358
2	1,304	1,257	-0,185	1,6958076*
3	0,985	1,309	-0,009	1,460
4	0,314	1,359	-1,334	-0,834
5	1,211	-0,191	1,7855662*	-0,337
6	0,871	0,619	0,101	-0,933
7	1,9479641*	0,201	0,273	0,335
8	-0,135	0,688	-0,343	-0,790
9	0,423	-1,8906673*	-0,883	0,278
10	0,145	-1,210	1,254	-0,756
11	-0,175	-0,218	0,993	0,503
12	-0,427	0,627	0,110	0,012
13	-0,605	0,236	-0,626	0,172
14	-0,167	-0,399	0,352	-0,017
15	-1,060	0,698	-0,581	-0,269
16	-0,198	-0,172	-0,268	0,950
17	-1,212	-0,890	-0,346	0,330
18	0,151	0,491	-0,056	-0,374
19	-0,580	0,924	-0,751	-1,090
20	-0,608	-0,281	0,120	0,036
21	0,071	1,215	-0,885	-1,236
22	-0,373	1,069	-0,240	1,274
23	-0,092	-0,801	-0,579	-0,144
24	1,517	-0,372	0,830	0,622
25	-0,343	-0,288	-0,192	-0,774
26	-0,315	1,7654479*	1,080	0,336
27	-0,202	-1,078	0,564	-0,117
28	-1,066	-0,199	-0,624	-1,056
29	1,8663567*	1,236	-0,138	0,002
30	-0,221	-1,015	0,428	0,365

Note: see note 1 at table 1.1

The S-statistic results look alike because no high S-statistics are found. The significance of causality in mean from industrial production to stock returns does not turn things around (Table 27.2).

Table 27.2: Cheung & Ng's S- statistic for Norway

Statistics Cheung&Ng NORWAY	
SNWr_i,m	43,3649*
SNWi_r,m	68,116***
SNWr_i,v	-4,1950402
SNWi_r,v	-10,718193

Note: see note 2 at table 1.2

The kernel functions of the Hong test detect no causality in mean whatsoever (Table 27.3).

Table 27.3: Causality test of Hong in mean for Norway, Kernel functions: Q-S (Quadratic), Bartlett and Truncated.

Causality Test of Hong						
PANEL A mean						
Bandwidth	QuadraticNWr_i	BartlettNWr_i	TruncatedNWr_i	QuadraticNWi_r	BartlettNWi_r	TruncatedNWi_r
1	-0,657	NaN	-0,688	-0,646	NaN	-0,681
2	-0,610	-0,688	-0,130	-0,603	-0,681	-0,185
3	-0,398	-0,545	-0,113	-0,376	-0,559	0,148
4	-0,321	-0,423	-0,415	-0,138	-0,397	0,439
5	-0,321	-0,380	-0,215	0,009	-0,236	0,091
6	-0,279	-0,365	-0,260	0,023	-0,124	-0,091
7	-0,206	-0,352	0,529	-0,006	-0,070	-0,337
8	-0,142	-0,314	0,254	-0,024	-0,057	-0,442
9	-0,107	-0,256	0,051	-0,025	-0,070	0,214
10	-0,104	-0,207	-0,166	-0,021	-0,079	0,320
11	-0,126	-0,174	-0,361	-0,023	-0,072	0,107
12	-0,161	-0,158	-0,508	-0,033	-0,059	-0,014
13	-0,202	-0,155	-0,606	-0,051	-0,048	-0,193
14	-0,250	-0,163	-0,763	-0,077	-0,042	-0,339
15	-0,301	-0,180	-0,703	-0,110	-0,043	-0,414
16	-0,355	-0,202	-0,847	-0,147	-0,049	-0,567
17	-0,411	-0,227	-0,726	-0,187	-0,061	-0,575
18	-0,468	-0,254	-0,864	-0,227	-0,077	-0,679
19	-0,523	-0,282	-0,941	-0,266	-0,095	-0,673
20	-0,576	-0,310	-1,010	-0,303	-0,117	-0,796
21	-0,626	-0,340	-1,134	-0,338	-0,139	-0,687
22	-0,673	-0,370	-1,232	-0,368	-0,163	-0,634
23	-0,718	-0,401	-1,347	-0,395	-0,186	-0,662
24	-0,760	-0,433	-1,107	-0,418	-0,208	-0,765
25	-0,798	-0,465	-1,203	-0,436	-0,230	-0,873
26	-0,833	-0,497	-1,299	-0,450	-0,252	-0,529
27	-0,866	-0,527	-1,399	-0,461	-0,273	-0,480
28	-0,895	-0,558	-1,340	-0,470	-0,292	-0,592
29	-0,922	-0,588	-0,953	-0,478	-0,309	-0,491
30	-0,947	-0,616	-1,053	-0,485	-0,325	-0,462

Note: see note 3 at table 1.3

In the same wave length, no causality at all is detected by the results of the kernels for variance (Table 27.4).

Table 27.4: Causality test of Hong in volatility for Norway, Kernel functions: Q-S (Quadratic), Bartlett and Truncated.

Causality Test of Hong						
PANEL B volatility						
Bandwidth	QuadraticNWr_i	BartlettNWr_i	TruncatedNWr_i	QuadraticNWi_r	BartlettNWi_r	TruncatedNWi_r
1	-0,742	NaN	-0,696	-0,525	NaN	-0,617
2	-0,789	-0,696	-0,976	-0,407	-0,617	0,513
3	-0,988	-0,841	-1,206	0,111	-0,274	0,892
4	-1,057	-0,980	-0,761	0,420	0,063	0,672
5	-0,931	-1,039	0,027	0,518	0,279	0,325
6	-0,799	-0,986	-0,258	0,505	0,382	0,267
7	-0,721	-0,896	-0,483	0,442	0,420	0,014
8	-0,679	-0,827	-0,670	0,356	0,421	-0,074
9	-0,656	-0,785	-0,676	0,261	0,400	-0,283
10	-0,646	-0,762	-0,501	0,163	0,363	-0,357
11	-0,647	-0,747	-0,471	0,059	0,318	-0,495
12	-0,659	-0,732	-0,649	-0,046	0,268	-0,674
13	-0,681	-0,722	-0,737	-0,151	0,213	-0,834
14	-0,711	-0,716	-0,871	-0,258	0,155	-0,990
15	-0,750	-0,717	-0,957	-0,355	0,094	-1,122
16	-0,794	-0,723	-1,086	-0,440	0,030	-1,093
17	-0,842	-0,733	-1,200	-0,519	-0,033	-1,209
18	-0,891	-0,748	-1,329	-0,595	-0,096	-1,314
19	-0,940	-0,767	-1,356	-0,667	-0,158	-1,235
20	-0,987	-0,790	-1,474	-0,733	-0,218	-1,358
21	-1,035	-0,815	-1,462	-0,790	-0,275	-1,228
22	-1,083	-0,841	-1,566	-0,839	-0,330	-1,087
23	-1,131	-0,869	-1,623	-0,880	-0,381	-1,203
24	-1,179	-0,898	-1,624	-0,915	-0,428	-1,258
25	-1,228	-0,928	-1,723	-0,948	-0,473	-1,279
26	-1,275	-0,957	-1,652	-0,983	-0,514	-1,371
27	-1,322	-0,987	-1,707	-1,022	-0,554	-1,474
28	-1,366	-1,017	-1,749	-1,065	-0,592	-1,417
29	-1,409	-1,046	-1,843	-1,111	-0,629	-1,518
30	-1,449	-1,074	-1,911	-1,160	-0,665	-1,598

Note: see note 4 at table 1.4

The **Peruvian** results of Cheung & Ng r-statistics exhibit direct and strong causality in mean, from stock returns to production rate. We also detect some high r-statistics in volatility, but in the last lags (Table 28.1).

Table 28.1: Cheung & Ng's r- statistic for Peru

CausalityTest of Cheung & Ng PERU				
Lags	$rPE_{r\_i,m}$	$rPE_{i\_r,m}$	$rPE_{r\_i,v}$	$rPE_{i\_r,v}$
1	2,3201659**	-0,795	-0,069	-0,033
2	0,249	0,208	-0,983	0,030
3	3,8981711***	-0,186	-0,481	-0,648
4	0,748	0,426	-0,493	0,505
5	1,368	-0,252	-0,413	0,343
6	1,440	0,498	-0,836	0,132
7	-0,858	-0,556	-0,055	1,259
8	0,077	-0,077	-0,961	0,373
9	-0,612	1,070	-1,146	-0,483
10	0,386	0,850	-0,281	0,464
11	0,847	1,111	-0,472	-0,587
12	0,184	-0,718	0,054	-0,482
13	1,826598*	-0,366	1,377	-0,908
14	0,340	-1,544	-1,071	1,603
15	0,608	-0,543	2,3478362**	-0,935
16	-0,221	-0,732	-0,007	0,322
17	0,066	-0,912	-1,340	3,0095094***
18	-2,2064362**	1,269	0,632	0,947
19	-0,001	-0,075	1,151	-1,202
20	0,371	0,328	-1,060	-0,342
21	-2,6788933***	0,621	-0,174	-1,7225309*
22	-0,688	-1,363	0,234	1,569
23	0,091	0,575	-0,192	-0,377
24	-0,009	0,509	1,154	-0,169
25	0,651	-0,619	1,180	-0,523
26	1,098	-0,091	-0,334	-1,314
27	-0,001	0,501	-0,117	-0,673
28	-0,825	-0,598	-0,033	-0,614
29	0,100	0,336	-0,008	-0,205
30	-0,940	0,990	0,777	0,593

Note: see note 1 at table 1.1

Strong causality in mean with the same direction is confirmed by the S-statistic results (Table 28.2).

Table 28.2: Cheung & Ng's S- statistic for Peru

Statistics Cheung&Ng PERU	
SPEr_i,m	102,6230***
SPEi_r,m	-1,7731983
SPEr_i,v	-20,414594
SPEi_r,v	-0,88762672

Note: see note 2 at table 1.2

The Hong test kernel functions stress direct and very strong causality in mean, from stock returns to industrial production growth rate (Table 28.3).

Table 28.3: Causality test of Hong in mean for Peru, Kernel functions: Q-S (Quadratic), Bartlett and Truncated.

Causality Test of Hong						
PANEL A mean						
Bandwidth	QuadraticPEr_i	BartlettPEr_i	TruncatedPEr_i	QuadraticPEi_r	BartlettPEi_r	TruncatedPEi_r
1	3,2066848***	NaN	3,1292204***	-0,313	NaN	-0,259
2	3,003952***	3,1292204***	1,7501115**	-0,366	-0,259	-0,662
3	3,5661217***	2,8763959***	7,3163297***	-0,605	-0,415	-0,935
4	4,8193272***	3,6051087***	6,2036062***	-0,812	-0,577	-1,098
5	5,5841453***	4,4915633***	5,854047***	-0,977	-0,718	-1,278
6	5,9553187***	5,0729724***	5,6860346***	-1,119	-0,842	-1,382
7	6,0753832***	5,4480086***	5,2175611***	-1,239	-0,951	-1,462
8	6,0303532***	5,6827096***	4,6501511***	-1,332	-1,047	-1,616
9	5,9061272***	5,8101775***	4,2567756***	-1,403	-1,134	-1,480
10	5,7477363***	5,8596999***	3,8656621***	-1,452	-1,210	-1,460
11	5,5703954***	5,8550542***	3,6472274***	-1,482	-1,271	-1,330
12	5,3831408***	5,8143206***	3,3108194***	-1,501	-1,320	-1,366
13	5,1992834***	5,7492196***	3,6825928***	-1,512	-1,357	-1,479
14	5,0280967***	5,6741036***	3,3992915***	-1,515	-1,389	-1,140
15	4,8747336***	5,5969008***	3,1884909***	-1,512	-1,413	-1,224
16	4,7408426***	5,5167859***	2,9356144***	-1,503	-1,431	-1,258
17	4,6255479***	5,4337108***	2,6929726***	-1,492	-1,443	-1,238
18	4,5262928***	5,3475893***	3,3242693***	-1,485	-1,453	-1,081
19	4,4404286***	5,2640301***	3,090859***	-1,482	-1,460	-1,209
20	4,3653069***	5,1861959***	2,8948323***	-1,482	-1,464	-1,313
21	4,2985763***	5,1117254***	3,8693946***	-1,484	-1,467	-1,367
22	4,2380993***	5,0445789***	3,7260154***	-1,487	-1,470	-1,182
23	4,1816643***	4,9871911***	3,5178471***	-1,490	-1,473	-1,245
24	4,1273331***	4,9364289***	3,3190132***	-1,493	-1,475	-1,317
25	4,0739447***	4,8898362***	3,1946122***	-1,497	-1,477	-1,367
26	4,0211116***	4,8459157***	3,1939954***	-1,500	-1,479	-1,472
27	3,9688223***	4,8041666***	3,0177034***	-1,504	-1,482	-1,537
28	3,9170899***	4,7640433***	2,9480009***	-1,508	-1,485	-1,585
29	3,8658398***	4,7249561***	2,786196***	-1,513	-1,489	-1,666
30	3,8149534***	4,6864942***	2,7544514***	-1,517	-1,495	-1,622

Note: see note 3 at table 1.3

On the other hand, no causality is detected in the fields of volatility (Table 28.4).

Table 28.4: Causality test of Hong in volatility for Peru, Kernel functions: Q-S (Quadratic), Bartlett and Truncated.

Causality Test of Hong						
PANEL B volatility						
Bandwidth	QuadraticPEr_i	BartlettPEr_i	TruncatedPEr_i	QuadraticPEi_r	BartlettPEi_r	TruncatedPEi_r
1	-0,715	NaN	-0,706	-0,760	NaN	-0,709
2	-0,706	-0,706	-0,511	-0,815	-0,709	-1,002
3	-0,700	-0,689	-0,730	-0,993	-0,859	-1,053
4	-0,767	-0,703	-0,898	-1,103	-0,970	-1,175
5	-0,854	-0,750	-1,064	-1,210	-1,054	-1,329
6	-0,951	-0,813	-1,052	-1,290	-1,130	-1,497
7	-1,016	-0,874	-1,239	-1,346	-1,205	-1,217
8	-1,064	-0,932	-1,170	-1,383	-1,264	-1,351
9	-1,116	-0,986	-1,016	-1,420	-1,307	-1,451
10	-1,166	-1,028	-1,166	-1,466	-1,345	-1,549
11	-1,198	-1,061	-1,273	-1,512	-1,381	-1,612
12	-1,210	-1,092	-1,420	-1,546	-1,416	-1,696
13	-1,200	-1,123	-1,167	-1,555	-1,451	-1,654
14	-1,171	-1,152	-1,082	-1,538	-1,485	-1,269
15	-1,130	-1,175	-0,160	-1,497	-1,513	-1,236
16	-1,085	-1,184	-0,324	-1,434	-1,532	-1,350
17	-1,038	-1,180	-0,151	-1,356	-1,545	0,174
18	-0,991	-1,166	-0,234	-1,268	-1,545	0,172
19	-0,944	-1,145	-0,151	-1,175	-1,527	0,266
20	-0,899	-1,121	-0,106	-1,081	-1,497	0,131
21	-0,856	-1,094	-0,243	-0,989	-1,458	0,477
22	-0,819	-1,066	-0,369	-0,900	-1,414	0,729
23	-0,788	-1,039	-0,493	-0,817	-1,364	0,601
24	-0,765	-1,014	-0,409	-0,738	-1,310	0,462
25	-0,748	-0,990	-0,317	-0,666	-1,255	0,366
26	-0,737	-0,968	-0,422	-0,600	-1,200	0,495
27	-0,731	-0,947	-0,538	-0,541	-1,147	0,431
28	-0,730	-0,928	-0,651	-0,488	-1,095	0,359
29	-0,731	-0,911	-0,760	-0,441	-1,044	0,242
30	-0,735	-0,896	-0,780	-0,399	-0,996	0,172

Note: see note 4 at table 1.4

Our findings for **Portugal**, plead for no causality at all, neither in mean nor volatility (Table 29.2, 29.3 and 29.4). Exceptions are the r-statistics of Cheung & Ng, which are of medium significance (Table 29.1).

Table 29.1: Cheung & Ng's r- statistic for Portugal

CausalityTest of Cheung & Ng PORTUGAL				
Lags	$rPT_{r\_i,m}$	$rPT_{i\_r,m}$	$rPT_{r\_i,v}$	$rPT_{i\_r,v}$
1	0,237	0,576	-0,253	0,281
2	1,109	0,002	-0,516	0,555
3	0,964	-0,179	0,502	0,028
4	-1,428	0,716	0,710	2,0359996**
5	1,7218148*	-0,943	0,032	-0,283
6	0,532	0,010	1,593	-0,080
7	-0,316	1,7131177*	0,146	2,0392481**
8	0,327	-2,3583791**	-0,364	-0,086
9	0,042	0,992	-0,527	0,167
10	-1,029	-0,199	-0,456	-0,266
11	-0,296	0,236	1,583	-0,468
12	0,808	-0,983	-0,695	-0,746
13	-0,969	0,821	-0,204	-0,078
14	0,062	0,150	-0,536	0,781
15	0,424	0,093	0,027	-0,428
16	0,080	-0,702	-0,500	-0,580
17	-0,437	-0,756	-0,614	-0,434
18	0,700	0,241	-0,341	-0,732
19	-1,423	0,976	-0,401	-0,157
20	-0,985	-1,606	-0,097	0,357
21	1,201	0,065	0,046	-0,599
22	-0,661	0,119	-0,601	1,060
23	-1,416	-0,137	0,124	-0,568
24	-0,013	-0,107	-0,807	0,506
25	0,069	0,993	-0,732	-0,345
26	0,360	-0,597	0,353	0,501
27	-0,663	0,447	0,189	-0,632
28	0,043	0,163	0,203	-0,434
29	-0,512	1,023	-0,662	-0,219
30	0,763	0,458	0,074	0,534

Note: see note 1 at table 1.1

Table 29.2: Cheung & Ng's S- statistic for Portugal

Statistics Cheung&Ng PORTUGAL	
SPTr_i,m	-7,41
SPTi_r,m	12,85
SPTr_i,v	-26,66
SPTi_r,v	16,74

Note: see note 2 at table 1.2

Table 29.3: Causality test of Hong in mean for Portugal, Kernel functions: Q-S (Quadratic), Bartlett and Truncated.

Causality Test of Hong						
PANEL A mean						
Bandwidth	QuadraticPTr_i	BartlettPTr_i	TruncatedPTr_i	QuadraticPTi_r	BartlettPTi_r	TruncatedPTi_r
1	-0,654	NaN	-0,670	-0,525	NaN	-0,473
2	-0,629	-0,670	-0,350	-0,578	-0,473	-0,836
3	-0,520	-0,607	-0,306	-0,804	-0,630	-1,079
4	-0,378	-0,542	0,125	-0,941	-0,784	-1,103
5	-0,157	-0,452	0,769	-1,056	-0,902	-1,012
6	0,021	-0,311	0,507	-1,097	-0,979	-1,211
7	0,116	-0,168	0,238	-1,012	-1,037	-0,570
8	0,141	-0,065	0,009	-0,860	-1,064	0,678
9	0,131	-0,003	-0,219	-0,688	-1,022	0,659
10	0,103	0,027	-0,173	-0,533	-0,929	0,422
11	0,060	0,036	-0,350	-0,407	-0,824	0,213
12	0,005	0,033	-0,388	-0,314	-0,726	0,221
13	-0,059	0,020	-0,363	-0,250	-0,641	0,170
14	-0,124	0,002	-0,528	-0,207	-0,567	-0,009
15	-0,183	-0,019	-0,648	-0,178	-0,505	-0,177
16	-0,237	-0,043	-0,794	-0,158	-0,455	-0,242
17	-0,284	-0,072	-0,896	-0,147	-0,416	-0,287
18	-0,325	-0,103	-0,939	-0,145	-0,386	-0,423
19	-0,361	-0,137	-0,704	-0,151	-0,364	-0,392
20	-0,395	-0,171	-0,663	-0,162	-0,348	-0,074
21	-0,427	-0,202	-0,541	-0,179	-0,334	-0,211
22	-0,456	-0,230	-0,593	-0,199	-0,323	-0,340
23	-0,483	-0,256	-0,381	-0,220	-0,314	-0,463
24	-0,507	-0,278	-0,502	-0,243	-0,307	-0,581
25	-0,528	-0,298	-0,618	-0,266	-0,304	-0,537
26	-0,546	-0,316	-0,709	-0,288	-0,303	-0,594
27	-0,563	-0,333	-0,749	-0,309	-0,304	-0,673
28	-0,579	-0,349	-0,854	-0,329	-0,307	-0,775
29	-0,593	-0,365	-0,915	-0,348	-0,311	-0,718
30	-0,608	-0,382	-0,926	-0,365	-0,317	-0,787

Note: see note 3 at table 1.3

Table 29.4: Causality test of Hong in volatility for Portugal, Kernel functions: Q-S (Quadratic), Bartlett and Truncated.

Causality Test of Hong						
PANEL B volatility						
Bandwidth	QuadraticPTr_i	BartlettPTr_i	TruncatedPTr_i	QuadraticPTi_r	BartlettPTi_r	TruncatedPTi_r
1	-0,704	NaN	-0,665	-0,684	NaN	-0,654
2	-0,738	-0,665	-0,837	-0,701	-0,654	-0,808
3	-0,872	-0,770	-0,987	-0,871	-0,752	-1,069
4	-0,986	-0,865	-1,025	-0,776	-0,862	0,232
5	-1,058	-0,940	-1,233	-0,626	-0,816	-0,076
6	-1,068	-1,010	-0,649	-0,470	-0,700	-0,350
7	-1,076	-1,044	-0,858	-0,327	-0,618	0,580
8	-1,088	-1,051	-1,014	-0,221	-0,533	0,306
9	-1,097	-1,057	-1,118	-0,154	-0,439	0,070
10	-1,102	-1,068	-1,230	-0,125	-0,361	-0,130
11	-1,107	-1,085	-0,809	-0,122	-0,305	-0,277
12	-1,114	-1,098	-0,865	-0,130	-0,268	-0,336
13	-1,125	-1,104	-1,011	-0,158	-0,246	-0,507
14	-1,143	-1,108	-1,096	-0,205	-0,237	-0,542
15	-1,165	-1,113	-1,233	-0,257	-0,236	-0,659
16	-1,192	-1,121	-1,315	-0,301	-0,243	-0,738
17	-1,224	-1,131	-1,367	-0,335	-0,255	-0,841
18	-1,261	-1,143	-1,465	-0,367	-0,272	-0,873
19	-1,300	-1,158	-1,551	-0,403	-0,292	-0,996
20	-1,338	-1,174	-1,660	-0,448	-0,314	-1,094
21	-1,374	-1,193	-1,765	-0,504	-0,340	-1,148
22	-1,411	-1,214	-1,805	-0,567	-0,367	-1,067
23	-1,447	-1,236	-1,901	-0,633	-0,394	-1,123
24	-1,485	-1,260	-1,888	-0,699	-0,422	-1,188
25	-1,525	-1,284	-1,894	-0,757	-0,450	-1,273
26	-1,566	-1,309	-1,965	-0,807	-0,478	-1,332
27	-1,610	-1,334	-2,049	-0,844	-0,506	-1,366
28	-1,655	-1,360	-2,128	-0,868	-0,534	-1,431
29	-1,701	-1,385	-2,144	-0,877	-0,563	-1,516
30	-1,747	-1,411	-2,225	-0,874	-0,591	-1,561

Note: see note 4 at table 1.4

The results of the r-statistics for **Russia** are satisfying. Causality is detected in high numbers and significance, in both directions for mean. Especially strong causality is detected in the first lag in mean, from industrial production to stock returns. In volatility, strong causality, but indirect, is detected from returns to industrial production (Table 30.1).

Table 30.1: Cheung & Ng's r- statistic for Russia

CausalityTest of Cheung & Ng RUSSIA				
Lags	$rRS_{r\_i,m}$	$rRS_{i\_r,m}$	$rRS_{r\_i,v}$	$rRS_{i\_r,v}$
1	0,726	3,054259***	1,509	-0,537
2	0,574	0,154	0,427	1,9034236*
3	1,116	0,085	1,270	-0,599
4	-0,171	1,065	0,771	0,803
5	0,260	0,391	-0,782	-0,239
6	0,617	0,998	-0,550	-0,074
7	-0,747	0,833	-0,787	-0,689
8	0,832	0,327	-0,249	-0,624
9	1,162	-1,057	1,230	-1,108
10	0,021	-1,476	0,524	-0,774
11	-0,965	-0,352	-0,305	-0,120
12	-3,0145584***	-0,179	-0,036	-0,164
13	-0,704	1,421	-0,676	0,594
14	0,401	-0,329	-0,271	-0,311
15	-1,065	-0,112	-1,036	-0,096
16	-0,971	-0,933	0,496	-0,252
17	0,872	-0,768	-0,417	-0,570
18	-0,074	-0,883	-0,311	0,653
19	0,827	0,310	-0,933	-0,543
20	1,623	-0,575	3,8448059***	-0,709
21	-1,147	-0,646	-0,513	-0,657
22	-0,006	-0,237	-1,062	-0,575
23	0,209	-0,653	0,613	-0,114
24	-0,995	0,587	-0,542	0,243
25	-1,8004331*	1,114	-0,074	0,451
26	0,177	0,657	-0,765	0,001
27	0,106	0,721	1,421	-0,593
28	0,304	0,879	0,105	0,084
29	2,0378583**	0,661	-0,216	0,222
30	0,702	0,168	1,061	0,142

Note: see note 1 at table 1.1

The S-statistics of Cheung & Ng keep up with the r-statistics and detect causality in mean, from stock returns to growth and in reverse direction for volatility (Table 30.2).

Table 30.2: Cheung & Ng's S- statistic for Russia

Statistics Cheung&Ng RUSSIA	
SRSr_i,m	12,040012
SRSi_r,m	69,289***
SRSr_i,v	47,9969**
SRSi_r,v	-54,446087

Note: see note 2 at table 1.2

The Hong test kernel functions results in mean consort with the Cheung & Ng test results (Table 30.3).

Table 30.3: Causality test of Hong in mean for Russia, Kernel functions: Q-S (Quadratic), Bartlett and Truncated.

Causality Test of Hong						
PANEL A mean						
Bandwidth	QuadraticRSr_i	BartlettRSr_i	TruncatedRSr_i	QuadraticRSi_r	BartlettRSi_r	TruncatedRSi_r
1	-0,363	NaN	-0,333	5,8797093***	NaN	5,9438368***
2	-0,407	-0,333	-0,570	5,7698489***	5,9438368***	3,7269402***
3	-0,490	-0,437	-0,357	4,9436863***	5,601332***	2,6477263***
4	-0,528	-0,474	-0,651	4,1750787***	5,0606994***	2,3563361***
5	-0,618	-0,505	-0,876	3,605331***	4,5920145***	1,8493885**
6	-0,693	-0,561	-0,975	3,1688382***	4,2043012***	1,7023032**
7	-0,776	-0,628	-1,015	2,8238274***	3,8788602***	1,5073783*
8	-0,862	-0,692	-1,020	2,5529277***	3,606802***	1,196
9	-0,906	-0,750	-0,867	2,3383342***	3,3702741***	1,172
10	-0,892	-0,797	-1,043	2,1629653**	3,1624828***	1,4011822*
11	-0,836	-0,835	-0,999	2,0165796**	2,9874642***	1,160
12	-0,755	-0,869	0,774	1,8905069**	2,8392789***	0,923
13	-0,660	-0,873	0,658	1,7795835**	2,7067142***	1,113
14	-0,560	-0,843	0,485	1,6793705**	2,5884922***	0,915
15	-0,462	-0,796	0,512	1,5855758*	2,4831995***	0,714
16	-0,373	-0,742	0,504	1,4954431*	2,3859184***	0,686
17	-0,294	-0,686	0,464	1,4081643*	2,294915**	0,610
18	-0,223	-0,629	0,295	1,3241728*	2,2097573**	0,574
19	-0,160	-0,575	0,252	1,244	2,129891**	0,423
20	-0,101	-0,526	0,541	1,167	2,0543451**	0,320
21	-0,047	-0,479	0,601	1,094	1,9820438**	0,237
22	0,003	-0,433	0,447	1,025	1,9125117**	0,100
23	0,050	-0,390	0,308	0,958	1,8452162**	0,028
24	0,095	-0,349	0,322	0,894	1,7797935**	-0,054
25	0,137	-0,312	0,681	0,833	1,7161456**	0,006
26	0,176	-0,277	0,546	0,774	1,6545928**	-0,058
27	0,214	-0,243	0,414	0,716	1,5953575*	-0,105
28	0,249	-0,211	0,299	0,660	1,538257*	-0,114
29	0,283	-0,182	0,771	0,606	1,4832626*	-0,169
30	0,316	-0,154	0,713	0,552	1,4302955*	-0,280

Note: see note 3 at table 1.3

However, the Hong test detects no causality in volatility(Table 30.4), in contrast with the r-statistic and the S-statistic.

Table 30.4: Causality test of Hong in volatility for Russia, Kernel functions: Q-S (Quadratic), Bartlett and Truncated.

Causality Test of Hong						
PANEL B volatility						
Bandwidth	QuadraticRSr_i	BartlettRSr_i	TruncatedRSr_i	QuadraticRSi_r	BartlettRSi_r	TruncatedRSi_r
1	0,881	NaN	0,916	-0,394	NaN	-0,504
2	0,814	0,916	0,242	-0,216	-0,504	0,977
3	0,609	0,749	0,460	0,314	-0,032	0,541
4	0,509	0,646	0,262	0,464	0,257	0,351
5	0,421	0,586	0,119	0,427	0,365	0,020
6	0,314	0,526	-0,086	0,307	0,381	-0,265
7	0,219	0,460	-0,173	0,175	0,344	-0,379
8	0,118	0,392	-0,392	0,054	0,282	-0,500
9	0,040	0,321	-0,232	-0,051	0,211	-0,404
10	-0,024	0,256	-0,375	-0,148	0,143	-0,463
11	-0,100	0,197	-0,545	-0,240	0,081	-0,647
12	-0,192	0,141	-0,720	-0,332	0,023	-0,813
13	-0,288	0,084	-0,790	-0,422	-0,034	-0,900
14	-0,371	0,027	-0,930	-0,511	-0,092	-1,033
15	-0,432	-0,030	-0,870	-0,595	-0,150	-1,174
16	-0,468	-0,086	-0,968	-0,675	-0,208	-1,297
17	-0,480	-0,140	-1,073	-0,753	-0,267	-1,366
18	-0,472	-0,192	-1,187	-0,828	-0,325	-1,414
19	-0,449	-0,243	-1,161	-0,902	-0,383	-1,483
20	-0,414	-0,292	1,219	-0,973	-0,439	-1,514
21	-0,371	-0,328	1,093	-1,042	-0,494	-1,555
22	-0,323	-0,343	1,114	-1,109	-0,547	-1,611
23	-0,271	-0,343	1,016	-1,174	-0,599	-1,716
24	-0,218	-0,333	0,910	-1,237	-0,649	-1,809
25	-0,166	-0,316	0,765	-1,298	-0,698	-1,878
26	-0,117	-0,296	0,713	-1,358	-0,746	-1,975
27	-0,070	-0,273	0,879	-1,417	-0,793	-2,016
28	-0,026	-0,248	0,746	-1,473	-0,839	-2,107
29	0,016	-0,222	0,623	-1,529	-0,885	-2,189
30	0,054	-0,196	0,658	-1,583	-0,930	-2,273

Note: see note 4 at table 1.4

For the country of **Slovenja**, the r-statistic implies bidirectional causality in mean, not to strong though. But in volatility the results are not persuasive (Table 31.1).

Table 31.1: Cheung & Ng's r- statistic for Slovenja

CausalityTest of Cheung & Ng SLOVENJA				
Lags	$rSJ_{r\_i,m}$	$rSJ_{i\_r,m}$	$rSJ_{r\_i,v}$	$rSJ_{i\_r,v}$
1	1,8634473*	0,575	0,526	0,385
2	1,9507705*	2,841064***	1,7357555*	-0,031
3	0,401	-0,543	-0,211	-0,117
4	-0,321	-0,563	0,687	-0,837
5	0,734	0,759	-1,601	0,162
6	0,858	0,493	1,012	0,305
7	0,037	0,815	1,232	-0,530
8	-0,299	-0,560	0,243	-1,365
9	0,976	-1,244	-0,259	0,012
10	2,9832837***	1,290	-0,529	0,434
11	0,179	0,135	0,195	-0,653
12	-0,606	-1,7539101*	-0,113	0,115
13	0,495	-0,404	1,234	-0,440
14	0,821	1,062	-0,998	-0,811
15	-0,766	-1,596	0,346	1,8724336*
16	-1,9697615**	-1,476	0,369	0,581
17	-0,275	-0,233	-0,186	-0,587
18	-0,564	0,267	0,881	-0,275
19	-0,732	-0,074	-0,414	-1,262
20	-1,085	-0,792	0,280	2,0150154**
21	0,649	-1,718549*	-0,108	0,498
22	0,584	1,154	0,239	-0,354
23	-0,371	-0,285	0,889	1,086
24	-1,606	-0,718	-1,150	0,861
25	-0,183	-0,299	0,394	-0,172
26	0,402	1,6849894*	-0,334	-0,714
27	-1,197	-0,428	-0,295	0,551
28	-1,7262643*	-0,463	-0,192	0,036
29	-0,249	-0,044	0,944	0,361
30	-0,237	1,475	0,719	-1,389

Note: see note 1 at table 1.1

On the contrary, the S-statistics detect causality existence only in volatility, from stock returns to industrial production (Table 31.2).

Table 31.2: Cheung & Ng's S- statistic for Slovenja

Statistics Cheung&Ng SLOVENJA	
SSJr_i,m	8,2138415
SSJi_r,m	-7,0767088
SSJr_i,v	57,2802***
SSJi_r,v	-2,7224822

Note: see note 2 at table 1.2

Kernel functions of the Hong test, keep up with the results of the r-statistics and assert causality in mean bidirectionally (Table 31.3).

Table 31.3: Causality test of Hong in mean for Slovenja, Kernel functions: Q-S (Quadratic), Bartlett and Truncated.

Causality Test of Hong						
PANEL A mean						
Bandwidth	QuadraticSJr_i	BartlettSJr_i	TruncatedSJr_i	QuadraticSJi_r	BartlettSJi_r	TruncatedSJi_r
1	1,8885277**	NaN	1,7761539**	-0,165	NaN	-0,474
2	2,0577282**	1,7761539**	2,6959282***	0,299	-0,474	3,2673451***
3	2,4081314***	2,2142622**	1,8710911**	1,7370102**	0,772	2,3952465***
4	2,2918358**	2,3759454***	1,3139596*	2,1947357**	1,5732206*	1,8473143**
5	2,0833171**	2,3264817**	1,044	2,2285084**	1,9016917**	1,5346301*
6	1,8297135**	2,2048325**	0,893	2,108147**	2,0163537**	1,196
7	1,577794*	2,0699256**	0,569	1,951033**	2,0283858**	1,035
8	1,4146953*	1,933072**	0,314	1,7995925**	1,989896**	0,810
9	1,3369994*	1,7946443**	0,304	1,6667941**	1,9265275**	0,921
10	1,3119487*	1,6623589**	2,1674136**	1,5639336*	1,8563456**	1,053
11	1,3197263*	1,5786835*	1,8778586**	1,490845*	1,7929268**	0,808
12	1,3463569*	1,5481997*	1,6902049**	1,4417317*	1,7349067**	1,248
13	1,3801328*	1,540969*	1,4956261*	1,4090534*	1,6856021**	1,052
14	1,4143198*	1,5425888*	1,4049729*	1,3873637*	1,6460437**	1,067
15	1,4456499*	1,5464571*	1,3063568*	1,3732614*	1,611964*	1,3626716*
16	1,4720028*	1,5498855*	1,8451758**	1,3640793*	1,585111*	1,5754294*
17	1,4921522*	1,556342*	1,6521444**	1,3581703*	1,5674713*	1,3853538*
18	1,5067723*	1,5668276*	1,5158772*	1,3543859*	1,5563575*	1,211
19	1,5171872*	1,577709*	1,427385*	1,3520669*	1,5476121*	1,035
20	1,5244092*	1,5873776*	1,4567818*	1,350786*	1,5387445*	0,977
21	1,5290738*	1,5957128*	1,3589996*	1,3499103*	1,528819*	1,3200364*
22	1,5316972*	1,6026309*	1,254	1,3487234*	1,5196113*	1,3811272*
23	1,5327234*	1,60758*	1,121	1,3468043*	1,5126932*	1,237
24	1,5324069*	1,6101257*	1,3897819*	1,3440893*	1,5072214*	1,170
25	1,530781*	1,6113291*	1,247	1,3406552*	1,5021673*	1,040
26	1,52777*	1,6118897*	1,131	1,3365376*	1,4968618*	1,3457391*
27	1,5233305*	1,6111971*	1,216	1,3317091*	1,4919428*	1,235
28	1,5175261*	1,6094673*	1,5355681*	1,3261442*	1,4878838*	1,134
29	1,5105164*	1,6079644*	1,4107954*	1,319871*	1,4839946*	1,005
30	1,5025036*	1,6070927*	1,2901643*	1,3129741*	1,4797346*	1,204

Note: see note 3 at table 1.3

Contrary to the S-statistics of Table 31.2, no causality is detected in the Hong test (Table 31.4).

Table 31.4: Causality test of Hong in volatility for Slovenja, Kernel functions: Q-S (Quadratic), Bartlett and Truncated.

Causality Test of Hong						
PANEL B volatility						
Bandwidth	QuadraticSJr_i	BartlettSJr_i	TruncatedSJr_i	QuadraticSJi_r	BartlettSJi_r	TruncatedSJi_r
1	-0,428	NaN	-0,512	-0,658	NaN	-0,604
2	-0,289	-0,512	0,671	-0,708	-0,604	-0,929
3	0,114	-0,143	0,163	-0,929	-0,757	-1,163
4	0,181	0,056	-0,036	-1,070	-0,904	-1,107
5	0,216	0,102	0,494	-1,180	-1,009	-1,298
6	0,276	0,137	0,477	-1,281	-1,090	-1,445
7	0,328	0,187	0,606	-1,343	-1,166	-1,527
8	0,344	0,238	0,343	-1,387	-1,238	-1,189
9	0,326	0,279	0,114	-1,427	-1,292	-1,354
10	0,288	0,302	-0,040	-1,462	-1,330	-1,461
11	0,240	0,307	-0,233	-1,496	-1,363	-1,507
12	0,187	0,297	-0,415	-1,529	-1,394	-1,641
13	0,132	0,276	-0,265	-1,554	-1,424	-1,728
14	0,074	0,248	-0,231	-1,567	-1,455	-1,717
15	0,014	0,220	-0,371	-1,566	-1,487	-1,143
16	-0,046	0,192	-0,498	-1,556	-1,511	-1,211
17	-0,105	0,162	-0,638	-1,539	-1,528	-1,274
18	-0,163	0,131	-0,633	-1,517	-1,539	-1,383
19	-0,219	0,098	-0,736	-1,494	-1,548	-1,214
20	-0,274	0,065	-0,850	-1,469	-1,554	-0,618
21	-0,329	0,031	-0,970	-1,445	-1,555	-0,702
22	-0,383	-0,005	-1,078	-1,419	-1,549	-0,803
23	-0,435	-0,041	-1,059	-1,394	-1,540	-0,724
24	-0,487	-0,077	-0,952	-1,368	-1,529	-0,718
25	-0,536	-0,113	-1,036	-1,341	-1,516	-0,825
26	-0,584	-0,148	-1,124	-1,315	-1,502	-0,853
27	-0,630	-0,183	-1,212	-1,287	-1,487	-0,911
28	-0,674	-0,217	-1,305	-1,260	-1,473	-1,013
29	-0,716	-0,251	-1,264	-1,232	-1,460	-1,092
30	-0,755	-0,284	-1,280	-1,205	-1,448	-0,897

Note: see note 4 at table 1.4

South Korean results indicate causality in mean and volatility, from real stock returns to industrial production growth rate, as it is retrieved from the r-statistics (Table 32.1). Weaker causality might exist in the other fields.

Table 32.1: Cheung & Ng's r- statistic for South Korea

CausalityTest of Cheung & Ng S. KOREA				
Lags	$rKO_{r\_i,m}$	$rKO_{i\_r,m}$	$rKO_{r\_i,v}$	$rKO_{i\_r,v}$
1	2,3160984**	0,267	3,0471412***	0,815
2	1,258	1,363	-0,103	0,471
3	0,755	0,303	-0,126	0,068
4	0,890	1,371	1,094	-0,852
5	0,735	-0,270	0,496	0,304
6	2,2351809**	0,355	0,153	-0,487
7	-0,452	-0,448	0,375	-0,796
8	0,791	-0,744	-0,836	1,316
9	0,558	-0,794	2,3443786**	1,6786893*
10	0,643	-0,427	0,026	1,438
11	-0,424	-1,050	-0,274	1,344
12	-0,678	-1,933561*	-0,302	0,658
13	-0,917	-0,750	-0,099	0,818
14	-0,174	-0,800	-0,512	-0,621
15	-0,132	-0,730	-0,737	0,694
16	-0,184	1,137	0,509	1,6729355*
17	-0,945	-2,2469914**	-1,309	-0,300
18	-0,749	-0,455	0,379	0,070
19	0,567	-0,064	0,347	1,171
20	-0,550	-0,378	0,701	0,658
21	1,082	-0,165	-0,198	0,357
22	-0,479	-0,522	-1,252	0,790
23	-0,541	0,080	-1,604	0,007
24	-0,178	0,329	-0,730	0,659
25	0,394	-0,275	-1,279	-0,918
26	-0,585	-0,400	0,050	-0,293
27	-1,385	1,9243017*	-1,282	0,245
28	1,196	0,930	-0,186	0,422
29	0,726	-0,354	0,084	1,489
30	-0,362	-1,157	-1,361	0,770

Note: see note 1 at table 1.1

But the conflict rises from the S-statistics of the Cheung & Ng test that detects causality in mean from stock returns to industrial production, and in volatility with reverse direction (Table 32.2).

Table 32.2: Cheung & Ng's S- statistic for South Korea

Statistics Cheung&Ng S. KOREA	
SKOr_i,m	86,8684***
SKOi_r,m	-94,844981
SKOr_i,v	-41,390965
SKOi_r,v	218,80***

Note: see note 2 at table 1.2

The kernel functions confirm causality in mean from stock returns to economic activity (Table 32.3), as both r-statistics and S-statistics do,

Table 32.3: Causality test of Hong in mean for South Korea, Kernel functions: Q-S (Quadratic), Bartlett and Truncated.

Causality Test of Hong						
PANEL A mean						
Bandwidth	QuadraticKOr_i	BartlettKOr_i	TruncatedKOr_i	QuadraticKOi_r	BartlettKOi_r	TruncatedKOi_r
1	3,1237488***	NaN	3,106844***	-0,625	NaN	-0,658
2	3,1379172***	3,106844***	2,498435***	-0,553	-0,658	-0,030
3	2,9466385***	3,1165617***	1,8714813**	-0,392	-0,489	-0,394
4	2,6011215***	2,9661521***	1,5551801*	-0,318	-0,414	-0,022
5	2,3400349***	2,7757559***	1,252	-0,299	-0,367	-0,311
6	2,2260262**	2,5886928***	2,3240119**	-0,321	-0,334	-0,533
7	2,1701072**	2,4790343***	1,9469166**	-0,387	-0,335	-0,705
8	2,1174053**	2,4318927***	1,737212**	-0,463	-0,361	-0,767
9	2,0536147**	2,3957716***	1,4835365*	-0,528	-0,399	-0,805
10	1,9773715**	2,3566664***	1,2848*	-0,582	-0,441	-0,943
11	1,8880094**	2,310529**	1,057	-0,620	-0,485	-0,870
12	1,787358**	2,257014**	0,911	-0,634	-0,529	-0,250
13	1,6835141**	2,1974392**	0,855	-0,626	-0,559	-0,319
14	1,5829309*	2,1349052**	0,647	-0,602	-0,576	-0,367
15	1,4833708*	2,0704584**	0,452	-0,572	-0,584	-0,433
16	1,3840546*	2,0035534**	0,273	-0,539	-0,589	-0,355
17	1,2847018*	1,9342673**	0,258	-0,510	-0,590	0,388
18	1,186	1,8640324**	0,187	-0,485	-0,584	0,252
19	1,089	1,7943738**	0,080	-0,466	-0,569	0,090
20	0,997	1,7256658**	-0,024	-0,450	-0,551	-0,041
21	0,910	1,6579382**	0,017	-0,437	-0,531	-0,184
22	0,829	1,5918669*	-0,092	-0,425	-0,513	-0,282
23	0,756	1,527805*	-0,186	-0,415	-0,497	-0,416
24	0,688	1,4654158*	-0,315	-0,406	-0,483	-0,530
25	0,625	1,404357*	-0,421	-0,400	-0,473	-0,643
26	0,568	1,3443279*	-0,495	-0,396	-0,466	-0,740
27	0,516	1,2852656*	-0,340	-0,396	-0,461	-0,323
28	0,470	1,228	-0,258	-0,399	-0,459	-0,322
29	0,430	1,173	-0,304	-0,404	-0,456	-0,424
30	0,395	1,121	-0,403	-0,412	-0,454	-0,355

Note: see note 3 at table 1.3

but in volatility the causality is detected in accordance with the r-statistics, from stock returns to industrial production growth rate (Table 32.4).

Table 32.4: Causality test of Hong in volatility for South Korea, Kernel functions: Q-S (Quadratic), Bartlett and Truncated.

Causality Test of Hong						
PANEL B volatility						
Bandwidth	QuadraticKOr_i	BartlettKOr_i	TruncatedKOr_i	QuadraticKOi_r	BartlettKOi_r	TruncatedKOi_r
1	5,8308834***	NaN	5,8956018***	-0,281	NaN	-0,236
2	5,7193358***	5,8956018***	3,682303***	-0,320	-0,236	-0,556
3	4,8945112***	5,5515064***	2,6115768***	-0,529	-0,362	-0,860
4	4,1352735***	5,0115139***	2,3423167***	-0,689	-0,507	-0,839
5	3,5751067***	4,5463942***	1,8635628**	-0,809	-0,622	-1,036
6	3,0900871***	4,1650764***	1,4249803*	-0,925	-0,715	-1,165
7	2,717251***	3,8318646***	1,096	-0,999	-0,801	-1,173
8	2,4643542***	3,533469***	0,958	-1,005	-0,877	-0,904
9	2,285195**	3,2683603***	1,9962054**	-0,961	-0,932	-0,408
10	2,1463814**	3,0630553***	1,6776415**	-0,895	-0,957	-0,135
11	2,0314383**	2,91349***	1,4098117*	-0,821	-0,951	0,057
12	1,9267752**	2,7914884***	1,172	-0,749	-0,923	-0,054
13	1,8235384**	2,6836851***	0,938	-0,679	-0,883	-0,109
14	1,7219479**	2,5832527***	0,773	-0,617	-0,841	-0,214
15	1,6249504*	2,4871145***	0,673	-0,565	-0,801	-0,294
16	1,5340069*	2,3946141***	0,528	-0,520	-0,766	0,055
17	1,447986*	2,3053511**	0,652	-0,483	-0,731	-0,096
18	1,3658964*	2,2205314**	0,499	-0,454	-0,698	-0,254
19	1,2900822*	2,1405484**	0,350	-0,435	-0,667	-0,173
20	1,221	2,0639377**	0,271	-0,426	-0,640	-0,249
21	1,158	1,9900602**	0,123	-0,424	-0,616	-0,372
22	1,099	1,9184194**	0,224	-0,427	-0,595	-0,410
23	1,044	1,849399**	0,477	-0,433	-0,577	-0,542
24	0,994	1,7847173**	0,411	-0,440	-0,563	-0,604
25	0,949	1,7248052**	0,513	-0,449	-0,552	-0,602
26	0,909	1,669365**	0,372	-0,459	-0,544	-0,711
27	0,875	1,6178556*	0,474	-0,470	-0,539	-0,819
28	0,844	1,5698285*	0,345	-0,482	-0,536	-0,907
29	0,816	1,5249173*	0,217	-0,495	-0,536	-0,707
30	0,790	1,482248*	0,347	-0,509	-0,538	-0,737

Note: see note 4 at table 1.4

The results of **Spain** are in favour of causality in both mean and volatility. The Cheung & Ng r-statistics present direct causality in mean bidirectionally. In volatility, causality is more imminent from stock returns to industrial production growth rate (Table 33.1).

Table 33.1: Cheung & Ng's r- statistic for Spain

CausalityTest of Cheung & Ng SPAIN				
Lags	$rES_{r\_i,m}$	$rES_{i\_r,m}$	$rES_{r\_i,v}$	$rES_{i\_r,v}$
1	2,0274929**	1,579	0,938	1,397
2	1,871558*	1,576	1,9842775**	0,669
3	0,081	1,8351117*	0,075	0,465
4	-0,073	-0,368	0,348	-0,369
5	1,275	1,388	0,258	0,801
6	0,399	0,219	-0,293	0,612
7	1,041	0,407	0,235	0,307
8	0,520	0,177	-0,456	-0,229
9	1,344	1,9441602*	-0,202	1,490
10	0,487	-1,016	0,994	-0,381
11	0,735	1,8285767*	-0,695	0,487
12	-0,077	-0,529	-0,967	0,388
13	-0,262	-0,077	-0,877	-1,063
14	0,142	-0,738	0,287	0,287
15	0,638	1,140	-0,046	-0,078
16	-0,920	-0,236	-0,164	-0,459
17	0,368	0,203	0,393	-0,383
18	-0,452	-0,929	0,413	2,0564985**
19	-0,750	-0,882	0,427	-1,248
20	-1,030	0,370	-0,780	2,1671818**
21	0,542	-0,447	-0,318	0,324
22	-0,625	0,656	0,345	-0,026
23	1,266	-0,573	0,084	0,034
24	0,384	0,145	0,620	-0,501
25	-0,375	0,330	-0,631	-0,924
26	-0,720	0,446	1,135	0,007
27	0,048	-0,514	0,169	0,212
28	-0,836	0,264	-0,304	0,153
29	-0,293	0,132	-0,085	2,0056707**
30	0,143	-0,283	-0,335	0,834

Note: see note 1 at table 1.1

The S-statistic results exhibit strong bidirectional causality in mean and weaker in volatility. However the S-statistic of volatility from industrial production to stock returns is the highest (table 33.2).

Table 33.2: Cheung & Ng's S- statistic for Spain

Statistics Cheung&Ng SPAIN	
SESr_i,m	112,07***
SESi_r,m	130,74***
SESr_i,v	40,7781*
SESi_r,v	144,33***

Note: see note 2 at table 1.2

The case of bidirectional causality in mean is confirmed by the results of the hong test's kernel functions (Table 33.3).

Table 33.3: Causality test of Hong in mean for Spain, Kernel functions: Q-S (Quadratic), Bartlett and Truncated.

Causality Test of Hong						
PANEL A mean						
Bandwidth	QuadraticESr_i	BartlettESr_i	TruncatedESr_i	QuadraticESi_r	BartlettESi_r	TruncatedESi_r
1	2,3105568**	NaN	2,2148834**	1,148	NaN	1,065
2	2,4519714***	2,2148834**	2,8338789***	1,209	1,065	1,5056779*
3	2,6852217***	2,5823048***	1,913485**	1,5902575*	1,2909456*	2,212232**
4	2,4834121***	2,6662721***	1,3099794*	1,8234173**	1,5688567*	1,6158293*
5	2,2243016**	2,5551278***	1,3803638*	1,9137374**	1,7427563**	1,7507292**
6	1,984795**	2,411668***	1,023	1,8743229**	1,8274915**	1,3288009*
7	1,7841754**	2,2733932**	0,979	1,7729139**	1,8602186**	1,013
8	1,6220453*	2,1424876**	0,739	1,6829859**	1,8455792**	0,710
9	1,4840957*	2,0207805**	0,900	1,625966*	1,7977353**	1,348152*
10	1,3587693*	1,9124976**	0,690	1,5925947*	1,7491258**	1,2974425*
11	1,239	1,8173689**	0,568	1,5729069*	1,7147009**	1,7608078**
12	1,123	1,7294559**	0,346	1,5558751*	1,6962208**	1,5475967*
13	1,009	1,6453654**	0,155	1,5350056*	1,6902979**	1,2990694*
14	0,897	1,5624813*	-0,031	1,5095474*	1,6862271**	1,176
15	0,789	1,4798183*	-0,131	1,4812699*	1,6796519**	1,205
16	0,688	1,39768*	-0,145	1,4497988*	1,6709783**	1,008
17	0,594	1,3175519*	-0,283	1,4132397*	1,6599122**	0,820
18	0,507	1,240	-0,401	1,3702943*	1,6449294**	0,787
19	0,425	1,164	-0,453	1,3213721*	1,626362*	0,742
20	0,348	1,091	-0,420	1,267	1,605339*	0,595
21	0,274	1,020	-0,512	1,209	1,582061*	0,465
22	0,202	0,952	-0,584	1,147	1,5563482*	0,379
23	0,134	0,887	-0,466	1,085	1,5284171*	0,281
24	0,068	0,825	-0,572	1,021	1,4985912*	0,141
25	0,004	0,766	-0,676	0,958	1,4669459*	0,019
26	-0,058	0,709	-0,720	0,896	1,4335035*	-0,084
27	-0,118	0,655	-0,837	0,834	1,3984318*	-0,174
28	-0,175	0,603	-0,851	0,774	1,3619713*	-0,288
29	-0,230	0,552	-0,950	0,715	1,324291*	-0,405
30	-0,282	0,502	-1,055	0,656	1,2854691*	-0,510

Note: see note 3 at table 1.3

Volatility kernel functions results (Table 33.4), though, are insignificant and opposing to those of Cheung & Ng.

Table 33.4: Causality test of Hong in volatility for Spain, Kernel functions: Q-S (Quadratic), Bartlett and Truncated.

Causality Test of Hong						
PANEL B volatility						
Bandwidth	QuadraticESr_i	BartlettESr_i	TruncatedESr_i	QuadraticESi_r	BartlettESi_r	TruncatedESi_r
1	0,036	NaN	-0,082	0,644	NaN	0,680
2	0,230	-0,082	1,4260558*	0,605	0,680	0,207
3	0,757	0,429	0,762	0,376	0,565	-0,149
4	0,813	0,702	0,352	0,125	0,406	-0,432
5	0,681	0,752	0,022	-0,070	0,244	-0,496
6	0,497	0,707	-0,241	-0,241	0,102	-0,630
7	0,299	0,620	-0,473	-0,382	-0,017	-0,823
8	0,111	0,514	-0,637	-0,495	-0,125	-1,005
9	-0,051	0,403	-0,824	-0,571	-0,227	-0,647
10	-0,189	0,292	-0,777	-0,634	-0,313	-0,802
11	-0,305	0,186	-0,846	-0,701	-0,381	-0,924
12	-0,406	0,090	-0,816	-0,772	-0,441	-1,055
13	-0,499	0,003	-0,822	-0,836	-0,496	-0,979
14	-0,586	-0,075	-0,962	-0,885	-0,547	-1,114
15	-0,669	-0,145	-1,108	-0,919	-0,594	-1,255
16	-0,748	-0,211	-1,242	-0,940	-0,640	-1,350
17	-0,823	-0,274	-1,346	-0,951	-0,684	-1,453
18	-0,896	-0,336	-1,442	-0,953	-0,729	-0,842
19	-0,968	-0,396	-1,532	-0,950	-0,769	-0,715
20	-1,037	-0,455	-1,549	-0,942	-0,801	-0,074
21	-1,105	-0,512	-1,646	-0,933	-0,823	-0,204
22	-1,170	-0,568	-1,737	-0,922	-0,835	-0,344
23	-1,232	-0,622	-1,842	-0,910	-0,841	-0,478
24	-1,293	-0,675	-1,887	-0,898	-0,844	-0,568
25	-1,351	-0,728	-1,927	-0,884	-0,844	-0,565
26	-1,407	-0,779	-1,837	-0,871	-0,844	-0,687
27	-1,462	-0,828	-1,931	-0,859	-0,843	-0,798
28	-1,514	-0,876	-2,013	-0,847	-0,842	-0,908
29	-1,565	-0,922	-2,105	-0,837	-0,842	-0,456
30	-1,614	-0,967	-2,180	-0,826	-0,842	-0,475

Note: see note 4 at table 1.4

Interpreting the **Swedish** results of Cheung & Ng, the r-statistics provide us with weak bidirectional causality in mean, a very strong r-statistic in volatility from stock returns to industrial production at lag 24 and weak causality in variance from industrial production to stock returns (Table 34.1).

Table 34.1: Cheung & Ng's r- statistic for Sweden

CausalityTest of Cheung & Ng SWEDEN				
Lags	$rSW_{r\_i,m}$	$rSW_{i\_r,m}$	$rSW_{r\_i,v}$	$rSW_{i\_r,v}$
1	0,582	0,251	-0,734	-1,295
2	1,6903552*	-0,519	-1,053	-0,753
3	-0,556	-0,340	0,143	-0,938
4	2,2855522**	1,9153803*	-1,045	-0,052
5	-0,340	1,7142518*	-0,778	0,800
6	-0,356	0,036	0,792	0,160
7	0,865	2,4136989**	-1,146	-0,465
8	-0,166	-1,300	-1,320	0,718
9	0,527	1,411	0,340	1,6792424*
10	-0,307	0,020	-0,303	1,6903429*
11	-0,540	-2,0472592**	-0,845	-0,210
12	0,445	-0,508	0,382	2,3971999**
13	0,683	-0,152	0,061	1,230
14	-1,072	0,837	1,177	-0,294
15	0,329	-0,229	0,594	0,266
16	-0,674	-0,033	-0,026	-0,022
17	0,567	-0,689	-0,143	0,401
18	-0,223	2,338977**	-0,328	1,338
19	-0,583	-1,426	-0,356	-0,697
20	-0,396	0,850	0,362	-0,315
21	0,822	0,603	-0,487	0,296
22	-0,374	-0,571	-1,075	0,272
23	0,648	2,1780667**	-0,730	0,523
24	-0,607	0,625	3,8435897***	-0,809
25	-0,744	-0,242	-1,023	0,103
26	0,636	-0,811	-1,436	0,669
27	-1,025	0,591	0,081	-1,005
28	-0,652	-0,223	-0,453	0,522
29	-0,243	-0,759	0,179	-0,028
30	0,516	-1,6798515*	-0,195	0,207

Note: see note 1 at table 1.1

The S-statistics are translated in medium causality in mean and volatility, from industrial production to stock returns (Table 34.2).

Table 34.2: Cheung & Ng's S- statistic for Sweden

Statistics Cheung&Ng SWEDEN	
SSWr_i,m	18,212074
SSWi_r,m	44,6347**
SSWr_i,v	-51,214052
SSWi_r,v	59,252***

Note: see note 2 at table 1.2

The above results are partially in accordance with the Hong test in mean, detecting causality from industrial production growth rate to real stock returns (Table 34.3),

Table 34.3: Causality test of Hong in mean for Sweden, Kernel functions: Q-S (Quadratic), Bartlett and Truncated.

Causality Test of Hong						
PANEL A mean						
Bandwidth	QuadraticSWr_i	BartlettSWr_i	TruncatedSWr_i	QuadraticSWi_r	BartlettSWi_r	TruncatedSWi_r
1	-0,379	NaN	-0,468	-0,692	NaN	-0,665
2	-0,231	-0,468	0,623	-0,719	-0,665	-0,835
3	0,119	-0,128	0,234	-0,869	-0,769	-1,043
4	0,470	0,070	1,751511**	-0,770	-0,875	0,076
5	0,770	0,307	1,2999632*	-0,523	-0,840	0,716
6	0,932	0,551	0,947	-0,207	-0,679	0,374
7	0,988	0,710	0,828	0,114	-0,508	1,7099929**
8	0,970	0,804	0,543	0,426	-0,320	1,8071302**
9	0,907	0,852	0,356	0,716	-0,108	1,9781165**
10	0,821	0,866	0,146	0,964	0,101	1,670652**
11	0,729	0,856	0,002	1,160	0,290	2,3458932***
12	0,634	0,829	-0,149	1,3082389*	0,462	2,11883**
13	0,540	0,791	-0,231	1,4186154*	0,623	1,8647898**
14	0,449	0,746	-0,167	1,504708*	0,764	1,7704422**
15	0,361	0,698	-0,312	1,5770449*	0,885	1,5582139*
16	0,277	0,650	-0,380	1,6408043**	0,986	1,351846*
17	0,197	0,601	-0,469	1,6978237**	1,069	1,248
18	0,120	0,552	-0,602	1,7493625**	1,136	2,067431**
19	0,046	0,504	-0,676	1,7966716**	1,194	2,2378522**
20	-0,025	0,455	-0,778	1,8405397**	1,251	2,1748876**
21	-0,093	0,406	-0,786	1,8812465**	1,306445*	2,0562991**
22	-0,159	0,357	-0,883	1,9188781**	1,3587198*	1,9387695**
23	-0,221	0,310	-0,929	1,9535444**	1,4069683*	2,5615269***
24	-0,279	0,263	-0,982	1,9854161**	1,4534174*	2,4559714***
25	-0,334	0,216	-1,002	2,0146964**	1,4995946*	2,3034581**
26	-0,384	0,171	-1,044	2,0415991**	1,5441385*	2,2532057**
27	-0,431	0,127	-0,983	2,066337**	1,5863085*	2,1587112**
28	-0,474	0,085	-1,020	2,0891135**	1,6257869*	2,0231077**
29	-0,513	0,044	-1,110	2,1101156**	1,6621887**	1,9733734**
30	-0,548	0,005	-1,166	2,1295085**	1,6953984**	2,2650214**

Note: see note 3 at table 1.3

but in aspect of volatility, no causality is detected (table 34.4).

Table 34.4: Causality test of Hong in volatility for Sweden, Kernel functions: Q-S (Quadratic), Bartlett and Truncated.

Causality Test of Hong						
PANEL B volatility						
Bandwidth	QuadraticSWr_i	BartlettSWr_i	TruncatedSWr_i	QuadraticSWi_r	BartlettSWi_r	TruncatedSWi_r
1	-0,325	NaN	-0,323	0,472	NaN	0,495
2	-0,305	-0,323	-0,163	0,438	0,495	0,143
3	-0,322	-0,291	-0,531	0,304	0,409	0,081
4	-0,380	-0,325	-0,412	0,159	0,326	-0,278
5	-0,436	-0,370	-0,482	0,023	0,232	-0,349
6	-0,467	-0,403	-0,534	-0,117	0,134	-0,595
7	-0,470	-0,432	-0,386	-0,251	0,038	-0,752
8	-0,456	-0,452	-0,141	-0,344	-0,057	-0,811
9	-0,459	-0,455	-0,330	-0,367	-0,148	-0,285
10	-0,472	-0,450	-0,506	-0,332	-0,217	0,202
11	-0,473	-0,449	-0,522	-0,259	-0,252	0,003
12	-0,474	-0,452	-0,661	-0,168	-0,265	1,087
13	-0,495	-0,459	-0,820	-0,074	-0,252	1,194
14	-0,535	-0,472	-0,682	0,016	-0,213	1,001
15	-0,587	-0,488	-0,758	0,096	-0,161	0,821
16	-0,640	-0,504	-0,899	0,163	-0,106	0,639
17	-0,686	-0,522	-1,028	0,218	-0,054	0,501
18	-0,718	-0,542	-1,134	0,261	-0,007	0,677
19	-0,735	-0,565	-1,231	0,294	0,035	0,609
20	-0,739	-0,589	-1,322	0,318	0,074	0,477
21	-0,728	-0,616	-1,391	0,333	0,109	0,350
22	-0,705	-0,644	-1,295	0,342	0,139	0,227
23	-0,672	-0,672	-1,309	0,344	0,164	0,145
24	-0,630	-0,700	1,089	0,341	0,185	0,131
25	-0,581	-0,720	1,130	0,333	0,202	0,013
26	-0,527	-0,725	1,3402964*	0,321	0,215	-0,028
27	-0,470	-0,719	1,213	0,306	0,224	0,025
28	-0,410	-0,704	1,124	0,288	0,231	-0,040
29	-0,349	-0,683	1,011	0,268	0,236	-0,145
30	-0,289	-0,657	0,904	0,248	0,239	-0,239

Note: see note 4 at table 1.4

Let us mention, however, that once again some significance is presented in the Truncated kernel function. This fact determines this kernel function somehow more sensitive than the others (Table 34.4).

The case of **Taiwan** is characterized by the Cheung & Ng r-statistics results for strong causality in mean, from real stock returns to real economic activity and causality in volatility, from real economic activity to real stock returns (Table 35.1).

Table 35.1: Cheung & Ng's r- statistic for Taiwan

CausalityTest of Cheung & Ng TAIWAN				
Lags	$rTW_{r\_i,m}$	$rTW_{i\_r,m}$	$rTW_{r\_i,v}$	$rTW_{i\_r,v}$
1	2,0356048**	0,057	0,476	-0,458
2	2,3382658**	0,532	-0,260	-1,444
3	0,421	1,7049666*	-1,6401877*	1,181
4	1,455	1,230	1,083	0,912
5	0,090	0,719	-0,154	-1,081
6	0,121	-1,474	0,202	0,542
7	0,101	-0,369	0,094	0,577
8	-0,730	0,254	0,382	2,9013282***
9	0,089	-0,266	-0,884	-1,132
10	-1,8947308*	-0,090	0,437	-0,714
11	1,335	-0,807	-0,188	-0,363
12	1,089	-0,767	-0,771	0,454
13	-0,350	0,342	-0,409	-0,634
14	-1,192	-0,136	-0,404	1,238
15	-1,023	0,870	2,4462853**	0,058
16	-1,001	-0,472	0,292	-0,079
17	-1,436	-0,258	-1,003	-0,607
18	0,740	0,385	-0,132	2,8422302***
19	-1,680069*	0,369	-1,031	-0,166
20	1,728344*	1,054	1,6908692*	-0,502
21	-0,902	-0,079	-0,677	-0,322
22	-0,363	0,118	-1,522	0,111
23	0,463	0,039	-0,667	-1,039
24	-0,782	0,391	-0,368	0,638
25	-0,440	0,420	-0,155	-0,034
26	-0,641	0,035	2,3615275**	1,7858505*
27	0,490	-1,602	-0,057	0,962
28	1,228	0,642	-0,055	0,220
29	1,181	-0,895	-0,577	0,827
30	-1,578	0,094	-1,007	-0,605

Note: see note 1 at table 1.1

The latter result is confirmed by the S-statistic table (35.2).

Table 35.2: Cheung & Ng's S- statistic for Taiwan

Statistics Cheung&Ng TAIWAN	
STWr_i,m	11,228041
STWi_r,m	25,647822
STWr_i,v	-30,992978
STWi_r,v	75,321***

Note: see note 2 at table 1.2

Causality is mean is also true for the kernel functions of the Hong test. It is stronger in the first bandwidths and goes weaker in the last (Table 35.3).

Table 35.3: Causality test of Hong in mean for Taiwan, Kernel functions: Q-S (Quadratic), Bartlett and Truncated.

Causality Test of Hong						
PANEL A mean						
Bandwidth	QuadraticTWr_i	BartlettTWr_i	TruncatedTWr_i	QuadraticTWi_r	BartlettTWi_r	TruncatedTWi_r
1	2,4380355***	NaN	2,2487579**	-0,719	NaN	-0,707
2	2,7162317***	2,2487579**	3,8639917***	-0,769	-0,707	-0,858
3	3,3431016***	2,9584311***	2,8316781***	-0,708	-0,808	0,096
4	3,4231902***	3,2826311***	2,871792***	-0,447	-0,708	0,277
5	3,3067237***	3,3706157***	2,2663443**	-0,234	-0,530	0,102
6	3,0877003***	3,359829***	1,7949796**	-0,080	-0,389	0,453
7	2,8242856***	3,2766592***	1,4071372*	0,002	-0,274	0,195
8	2,5822667***	3,1525147***	1,213	0,023	-0,180	-0,045
9	2,3934573***	3,0112667***	0,919	0,006	-0,120	-0,256
10	2,2497401**	2,864612***	1,4912245*	-0,037	-0,089	-0,459
11	2,1327019**	2,7322723***	1,6157572*	-0,096	-0,081	-0,502
12	2,0378844**	2,6262044***	1,608137*	-0,161	-0,090	-0,554
13	1,965768**	2,5411627***	1,3864433*	-0,229	-0,107	-0,698
14	1,9164278**	2,4690169***	1,4419064*	-0,300	-0,132	-0,853
15	1,8840675**	2,4056349***	1,4249899*	-0,373	-0,162	-0,855
16	1,8630124**	2,3500932***	1,4036196*	-0,446	-0,195	-0,958
17	1,8498112**	2,3008736**	1,5797194*	-0,517	-0,231	-1,083
18	1,8417132**	2,2581568**	1,4801141*	-0,587	-0,269	-1,187
19	1,8367822**	2,2212354**	1,7827958**	-0,655	-0,309	-1,288
20	1,833343**	2,1901973**	2,1023751**	-0,721	-0,350	-1,219
21	1,8305433**	2,1669433**	2,0496126**	-0,787	-0,391	-1,337
22	1,8282736**	2,1507757**	1,8903121**	-0,850	-0,432	-1,449
23	1,8265834**	2,1390638**	1,7525351**	-0,910	-0,473	-1,558
24	1,8254969**	2,1296405**	1,6842725**	-0,966	-0,515	-1,640
25	1,8249207**	2,1213163**	1,555608*	-1,018	-0,556	-1,715
26	1,824604**	2,1132822**	1,4659661*	-1,067	-0,598	-1,814
27	1,824186**	2,1049125**	1,3553163*	-1,112	-0,639	-1,526
28	1,8232324**	2,0958247**	1,4364422*	-1,155	-0,680	-1,564
29	1,8212428**	2,0862009**	1,5003399*	-1,196	-0,719	-1,544
30	1,8176834**	2,0765925**	1,7210863**	-1,235	-0,756	-1,638

Note: see note 3 at table 1.3

Our remark that the Truncated kernel function is more sensitive in detecting causality is once more observed in the case of Taiwan, where causality in volatility from industrial production to stock returns is detected (Table 35.4).

Table 35.4: Causality test of Hong in volatility for Taiwan, Kernel functions: Q-S (Quadratic), Bartlett and Truncated.

Causality Test of Hong						
PANEL B volatility						
Bandwidth	QuadraticTWr_i	BartlettTWr_i	TruncatedTWr_i	QuadraticTWi_r	BartlettTWi_r	TruncatedTWi_r
1	-0,574	NaN	-0,548	-0,505	NaN	-0,560
2	-0,640	-0,548	-0,854	-0,432	-0,560	0,160
3	-0,659	-0,691	0,010	-0,126	-0,353	0,303
4	-0,468	-0,641	0,080	0,073	-0,162	0,211
5	-0,349	-0,514	-0,233	0,145	-0,043	0,255
6	-0,342	-0,427	-0,486	0,152	0,031	0,036
7	-0,381	-0,393	-0,712	0,231	0,071	-0,138
8	-0,448	-0,397	-0,876	0,381	0,081	1,800378**
9	-0,534	-0,426	-0,867	0,555	0,132	1,7861974**
10	-0,626	-0,466	-0,999	0,701	0,238	1,601405*
11	-0,709	-0,510	-1,154	0,810	0,357	1,3546767*
12	-0,773	-0,558	-1,179	0,891	0,468	1,148
13	-0,819	-0,607	-1,290	0,952	0,563	1,001
14	-0,851	-0,657	-1,396	1,002	0,640	1,092
15	-0,868	-0,707	-0,372	1,042	0,704	0,885
16	-0,873	-0,748	-0,513	1,077	0,756	0,693
17	-0,866	-0,774	-0,478	1,108	0,796	0,579
18	-0,850	-0,791	-0,621	1,136	0,824	1,84666**
19	-0,827	-0,803	-0,574	1,160	0,853	1,6558211**
20	-0,797	-0,811	-0,223	1,181	0,885	1,5142313*
21	-0,763	-0,814	-0,286	1,198	0,919	1,356137*
22	-0,727	-0,812	-0,042	1,212	0,952	1,192
23	-0,690	-0,807	-0,106	1,224	0,981	1,206
24	-0,654	-0,798	-0,216	1,234	1,007	1,116
25	-0,620	-0,787	-0,338	1,241	1,031	0,967
26	-0,588	-0,775	0,390	1,245	1,051	1,3110656*
27	-0,559	-0,762	0,261	1,247	1,069	1,3061627*
28	-0,533	-0,745	0,137	1,245	1,086	1,173
29	-0,509	-0,727	0,065	1,240	1,102	1,138
30	-0,487	-0,708	0,094	1,231	1,116	1,060

Note: see note 4 at table 1.4

Turkey exhibits r-statistics with a form of medium strength bidirectional causality in mean and weak causality in volatility in both directions, due to the late lags (Table 36.1).

Table 36.1: Cheung & Ng's r- statistic for Turkey

CausalityTest of Cheung & Ng TURKEY				
Lags	**$rTK_{r\_i,m}$**	**$rTK_{i\_r,m}$**	**$rTK_{r\_i,v}$**	**$rTK_{i\_r,v}$**
1	-0,348	-0,392	1,140	-0,251
2	1,9562212*	-0,411	1,260	-0,814
3	1,513	0,766	0,071	-1,068
4	0,104	2,1854007**	-0,281	-0,574
5	1,550	-0,558	-0,013	1,007
6	-1,028	0,074	-0,737	-0,769
7	1,311	1,6782832*	-1,045	-0,459
8	2,4357762**	-0,396	-0,390	1,123
9	1,222	0,188	-1,155	-0,136
10	0,205	-0,407	-0,096	1,094
11	-1,160	-1,613	0,775	-0,623
12	-0,666	-1,592	0,579	-0,944
13	-1,295	-1,461	-1,7625599*	-0,372
14	0,077	0,351	0,379	-0,417
15	-1,293	1,108	1,218	-0,221
16	-0,192	1,226	-0,632	0,357
17	1,7560301*	-0,472	-0,042	0,168
18	-0,645	1,9366571*	1,410	-1,227
19	0,757	0,500	-0,880	0,303
20	0,999	-0,084	0,923	-0,322
21	0,294	-0,379	1,239	0,384
22	-1,9055363*	0,662	-0,584	-0,355
23	-1,029	-1,405	-1,252	0,624
24	-0,767	-0,872	1,110	0,655
25	-1,8845972*	0,106	-0,143	2,047267**
26	1,280	0,581	1,609	-0,058
27	-0,472	0,427	0,289	-0,070
28	1,9741635**	1,210	-0,184	-0,681
29	-0,277	0,237	1,043	0,241
30	-0,004	1,6517142*	-0,366	0,443

Note: see note 1 at table 1.1

The S-statistics assert for bidirectional causality in mean and causality in volatility, directed from stock returns to industrial production growth rate (Table 36.2).

Table 36.2: Cheung & Ng's S- statistic for Turkey

Statistics Cheung&Ng TURKEY	
STKr_i,m	71,24***
STKi_r,m	77,21***
STKr_i,v	53,524***
STKi_r,v	-14,055642

Note: see note 2 at table 1.2

No bidirectional causality in mean is found with the Hong test. The kernel functions only assure us for causality from stock returns to industrial production growth rate (Table 36.3).

Table 36.3: Causality test of Hong in mean for Turkey, Kernel functions: Q-S (Quadratic), Bartlett and Truncated.

Causality Test of Hong						
PANEL A mean						
Bandwidth	QuadraticTKr_i	BartlettTKr_i	TruncatedTKr_i	QuadraticTKi_r	BartlettTKi_r	TruncatedTKi_r
1	-0,484	NaN	-0,622	-0,628	NaN	-0,599
2	-0,311	-0,622	0,988	-0,658	-0,599	-0,839
3	0,426	-0,115	1,3445342*	-0,820	-0,723	-0,852
4	0,815	0,343	0,818	-0,643	-0,811	0,617
5	0,976	0,596	1,190	-0,399	-0,708	0,339
6	1,075	0,745	1,112	-0,187	-0,531	0,025
7	1,212	0,855	1,235	-0,051	-0,401	0,525
8	1,3754432*	0,939	2,4232446***	0,026	-0,295	0,285
9	1,5304933*	1,043	2,4166526***	0,075	-0,204	0,046
10	1,6601036**	1,173	2,0868404**	0,114	-0,138	-0,139
11	1,7616176**	1,2970687*	2,0787324**	0,153	-0,096	0,227
12	1,8422661**	1,4058645*	1,887218**	0,195	-0,066	0,550
13	1,9013438**	1,4978159*	1,9640096**	0,238	-0,035	0,769
14	1,9392286**	1,5748671*	1,7131935**	0,284	0,002	0,582
15	1,9609156**	1,6383226*	1,7963357**	0,331	0,042	0,618
16	1,9724694**	1,6898718**	1,5778612*	0,376	0,080	0,703
17	1,9804137**	1,7312594**	1,9169184**	0,417	0,116	0,557
18	1,9885809**	1,7658332**	1,7777108**	0,452	0,151	1,032
19	1,9980073**	1,7962321**	1,6741896**	0,480	0,185	0,892
20	2,0085446**	1,8217588**	1,647898**	0,501	0,220	0,720
21	2,0192504**	1,8427398**	1,4771996*	0,517	0,254	0,579
22	2,0294926**	1,8592114**	1,8760476**	0,528	0,284	0,492
23	2,0396114**	1,873154**	1,8616887**	0,537	0,310	0,647
24	2,0500647**	1,886499**	1,7780096**	0,545	0,334	0,613
25	2,0610823**	1,8988577**	2,1412899**	0,551	0,356	0,469
26	2,0727312**	1,9112383**	2,2127654**	0,557	0,375	0,379
27	2,084969**	1,9247844**	2,079021**	0,562	0,391	0,270
28	2,0975205**	1,9388823**	2,4726256***	0,566	0,405	0,347
29	2,109841**	1,9539412**	2,3215296**	0,569	0,416	0,226
30	2,121348**	1,9701742**	2,1657765**	0,571	0,425	0,477

Note: see note 3 at table 1.3

Finally, in the volatility section there is no causality detected (Table 36.4).

Table 36.4: Causality test of Hong in volatility for Turkey, Kernel functions: Q-S (Quadratic), Bartlett and Truncated.

Causality Test of Hong						
PANEL B volatility						
Bandwidth	QuadraticTKr_i	BartlettTKr_i	TruncatedTKr_i	QuadraticTKi_r	BartlettTKi_r	TruncatedTKi_r
1	0,229	NaN	0,216	-0,678	NaN	-0,664
2	0,270	0,216	0,454	-0,696	-0,664	-0,636
3	0,298	0,312	-0,034	-0,689	-0,701	-0,457
4	0,151	0,297	-0,353	-0,668	-0,687	-0,630
5	-0,043	0,204	-0,631	-0,663	-0,678	-0,554
6	-0,212	0,084	-0,704	-0,672	-0,678	-0,619
7	-0,339	-0,035	-0,620	-0,696	-0,680	-0,781
8	-0,444	-0,137	-0,789	-0,720	-0,690	-0,657
9	-0,529	-0,223	-0,656	-0,744	-0,703	-0,849
10	-0,594	-0,295	-0,841	-0,768	-0,718	-0,752
11	-0,641	-0,357	-0,881	-0,794	-0,734	-0,843
12	-0,674	-0,413	-0,975	-0,826	-0,750	-0,821
13	-0,697	-0,465	-0,501	-0,860	-0,766	-0,953
14	-0,713	-0,508	-0,639	-0,898	-0,782	-1,071
15	-0,725	-0,541	-0,515	-0,939	-0,800	-1,205
16	-0,730	-0,566	-0,598	-0,984	-0,821	-1,317
17	-0,729	-0,585	-0,747	-1,032	-0,845	-1,441
18	-0,725	-0,602	-0,542	-1,081	-0,872	-1,303
19	-0,717	-0,616	-0,554	-1,128	-0,901	-1,411
20	-0,707	-0,628	-0,551	-1,173	-0,929	-1,513
21	-0,696	-0,637	-0,438	-1,215	-0,958	-1,603
22	-0,685	-0,643	-0,519	-1,252	-0,987	-1,694
23	-0,674	-0,648	-0,405	-1,285	-1,017	-1,740
24	-0,664	-0,651	-0,346	-1,313	-1,048	-1,779
25	-0,657	-0,652	-0,471	-1,336	-1,079	-1,252
26	-0,652	-0,652	-0,213	-1,356	-1,108	-1,361
27	-0,648	-0,651	-0,325	-1,371	-1,134	-1,467
28	-0,644	-0,648	-0,441	-1,385	-1,158	-1,503
29	-0,641	-0,645	-0,405	-1,396	-1,181	-1,595
30	-0,639	-0,642	-0,501	-1,405	-1,203	-1,665

Note: see note 4 at table 1.4

The r-statistics of the **United Kingdom** expresses no causal relations in volatility, from industrial production growth rate to real stock returns. On the other hand, strong and direct causality is detected in mean on both directions. The results on volatility from stock returns to industrial production are rather disappointing (Table 37.1).

Table 37.1: Cheung & Ng's r- statistic for United Kingdom

CausalityTest of Cheung & Ng UNITED KINGDOM				
Lags	$rUK_{r\_i,m}$	$rUK_{i\_r,m}$	$rUK_{r\_i,v}$	$rUK_{i\_r,v}$
1	-0,397	3,0025593***	1,014	-0,536
2	2,1916034**	-0,861	-0,561	0,263
3	2,1699031**	0,523	1,400	0,470
4	1,443	1,7238198*	-0,422	-0,765
5	1,000	-0,652	-0,188	0,052
6	1,009	-0,519	0,405	-0,520
7	0,992	0,200	-0,042	0,166
8	0,303	0,329	1,7933184*	-0,086
9	1,441	1,533	0,938	-0,762
10	0,068	-0,491	-0,300	-0,046
11	0,948	0,129	0,449	-0,745
12	-0,726	1,6744731*	-0,073	0,274
13	1,337	-0,946	-0,379	-0,511
14	0,712	-1,049	0,191	-0,976
15	-1,217	1,346	0,810	0,424
16	1,594	1,103	-0,121	-1,004
17	0,440	-0,009	1,492	1,009
18	0,036	0,407	-0,150	-0,294
19	0,068	-1,7480343*	-0,220	-0,821
20	-0,409	0,440	-0,246	0,319
21	-0,624	-0,164	0,432	-0,578
22	0,850	0,073	-0,171	0,212
23	-0,111	0,168	-0,026	-0,395
24	0,257	0,307	0,715	-0,214
25	-0,859	-1,506	0,763	-0,406
26	0,748	0,204	-0,470	-0,893
27	-0,731	-0,224	0,380	-0,248
28	-0,043	-1,6443086*	0,266	-0,513
29	-0,164	0,948	0,029	-0,462
30	-0,804	0,690	-0,097	-0,240

Note: see note 1 at table 1.1

Bidirectional causality in mean is also exhibited in the S-statistics of Cheung & Ng, in addition with causality in volatility, from real stock returns to real economic activity (Table 37.2).

Table 37.2: Cheung & Ng's S- statistic for United Kingdom

Statistics Cheung&Ng UK	
SUKr_i,m	183,28***
SUKi_r,m	79,328***
SUKr_i,v	118,86***
SUKi_r,v	-122,24273

Note: see note 2 at table 1.2

We can confirm the existence of bidirectional causality in mean through the kernel function results (Table 37.3)

Table 37.3: Causality test of Hong in mean for United Kingdom, Kernel functions: Q-S (Quadratic), Bartlett and Truncated.

Causality Test of Hong						
PANEL A mean						
Bandwidth	QuadraticUKr_i	BartlettUKr_i	TruncatedUKr_i	QuadraticUKi_r	BartlettUKi_r	TruncatedUKi_r
1	-0,391	NaN	-0,597	5,6796107***	NaN	5,7043433***
2	-0,166	-0,597	1,4979473*	5,6221419***	5,7043433***	3,9148592***
3	0,925	0,079	2,7594801***	4,9722245***	5,4919202***	2,9081601***
4	1,7588095**	0,821	2,7875746***	4,4163092***	5,0660875***	3,2346314***
5	2,2145881**	1,395287*	2,5043949***	4,0382382***	4,7385651***	2,7208204***
6	2,4189649***	1,7744101**	2,3032766**	3,7056078***	4,4967442***	2,2815083**
7	2,4897441***	2,0125685**	2,1396171**	3,4059235***	4,2750175***	1,8628015**
8	2,4883791***	2,1604461**	1,7818492**	3,1365603***	4,0600244***	1,5266469*
9	2,4404207***	2,24373**	1,950914**	2,905708***	3,8502735***	1,776006**
10	2,3716682***	2,2888129**	1,6356188*	2,7106846***	3,6603466***	1,5235099*
11	2,2993749**	2,3100601**	1,5498333*	2,5495415***	3,4934586***	1,250
12	2,2314503**	2,3118804**	1,3974725*	2,4195016***	3,3400594***	1,5877121*
13	2,1696118**	2,3001186**	1,5150828*	2,3154518**	3,2030399***	1,5175231*
14	2,1120589**	2,2809979**	1,3776151*	2,2309685**	3,0844589***	1,4957763*
15	2,05665**	2,2581043**	1,4356001*	2,1597084**	2,9804324***	1,6127386*
16	2,0021143**	2,2330493**	1,6866124**	2,0967463**	2,8897248***	1,6157834*
17	1,9471519**	2,2098485**	1,5078515*	2,0379749**	2,8110883***	1,4045525*
18	1,8904108**	2,188934**	1,3074247*	1,9819602**	2,7409346***	1,235
19	1,8313719**	2,167684**	1,119	1,9282174**	2,6757656***	1,5653128*
20	1,7703922**	2,144503**	0,969	1,8758991**	2,6163586***	1,4085768*
21	1,7079453**	2,1187393**	0,862	1,824684**	2,5629794***	1,234
22	1,6445737**	2,0904458**	0,814	1,7753024**	2,5132965***	1,064
23	1,5809816*	2,0601658**	0,659	1,7285602**	2,4656469***	0,906
24	1,5178962*	2,0281189**	0,518	1,6843356**	2,4189493***	0,766
25	1,4559031*	1,9941781**	0,485	1,6421904**	2,3725601***	0,956
26	1,3952469*	1,9587025**	0,427	1,6018583*	2,3271809**	0,814
27	1,3357992*	1,92222**	0,368	1,5632766*	2,2832513**	0,679
28	1,277	1,8850525**	0,236	1,526476*	2,2401468**	0,925
29	1,220	1,8472482**	0,112	1,4914364*	2,1984304**	0,913
30	1,164	1,8086981**	0,078	1,458057*	2,1587689**	0,844

Note: see note 3 at table 1.3

along with the absence of causality in volatility (Table 37.4).

Table 37.4: Causality test of Hong in volatility for United Kingdom, Kernel functions: Q-S (Quadratic), Bartlett and Truncated.

Causality Test of Hong						
PANEL B volatility						
Bandwidth	QuadraticUKr_i	BartlettUKr_i	TruncatedUKr_i	QuadraticUKi_r	BartlettUKi_r	TruncatedUKi_r
1	-0,003	NaN	0,023	-0,554	NaN	-0,505
2	-0,056	0,023	-0,325	-0,604	-0,505	-0,823
3	-0,128	-0,095	0,134	-0,804	-0,649	-0,989
4	-0,110	-0,104	-0,172	-0,942	-0,780	-1,001
5	-0,169	-0,095	-0,457	-1,050	-0,875	-1,210
6	-0,277	-0,125	-0,656	-1,154	-0,956	-1,314
7	-0,359	-0,181	-0,873	-1,256	-1,033	-1,476
8	-0,404	-0,252	-0,244	-1,351	-1,107	-1,629
9	-0,435	-0,308	-0,251	-1,442	-1,181	-1,631
10	-0,469	-0,338	-0,438	-1,527	-1,251	-1,770
11	-0,509	-0,358	-0,583	-1,606	-1,318	-1,779
12	-0,553	-0,378	-0,758	-1,675	-1,380	-1,890
13	-0,599	-0,400	-0,892	-1,734	-1,439	-1,959
14	-0,648	-0,426	-1,039	-1,785	-1,494	-1,890
15	-0,697	-0,456	-1,059	-1,830	-1,546	-1,973
16	-0,746	-0,489	-1,196	-1,869	-1,594	-1,901
17	-0,796	-0,525	-0,932	-1,906	-1,638	-1,832
18	-0,846	-0,559	-1,065	-1,940	-1,677	-1,930
19	-0,897	-0,592	-1,187	-1,972	-1,712	-1,925
20	-0,948	-0,624	-1,301	-2,004	-1,744	-2,015
21	-1,000	-0,656	-1,390	-2,036	-1,774	-2,065
22	-1,053	-0,688	-1,501	-2,070	-1,803	-2,159
23	-1,105	-0,721	-1,611	-2,104	-1,830	-2,232
24	-1,158	-0,755	-1,640	-2,138	-1,857	-2,320
25	-1,211	-0,789	-1,658	-2,172	-1,884	-2,388
26	-1,264	-0,823	-1,728	-2,206	-1,911	-2,360
27	-1,316	-0,857	-1,807	-2,240	-1,937	-2,441
28	-1,368	-0,891	-1,894	-2,273	-1,964	-2,491
29	-1,420	-0,926	-1,988	-2,303	-1,990	-2,546
30	-1,471	-0,960	-2,079	-2,332	-2,016	-2,622

Note: see note 4 at table 1.4

To complete the presentation of our empirical results, we remark the indicia of the **United States of America**. The r-statistics imply very strong causality in mean, from real stock returns to industrial production growth rate and in volatility with reverse direction. Causality in the rest of the fields is either non-direct or of medium significance (Table 38.1).

Table 38.1: Cheung & Ng's r- statistic for United States of America

CausalityTest of Cheung & Ng USA				
Lags	$rUS_{r\_i,m}$	$rUS_{i\_r,m}$	$rUS_{r\_i,v}$	$rUS_{i\_r,v}$
1	1,552	0,733	-0,259	8,0575769***
2	5,4641207***	0,411	2,1616796**	0,923
3	2,8524516***	0,107	1,237	-0,047
4	1,6673887*	-0,834	1,269	-0,189
5	0,911	-0,057	-0,347	-0,589
6	2,8412373***	1,256	-0,361	0,239
7	1,306	0,316	-0,119	0,144
8	-0,213	1,524	-0,313	0,241
9	1,128	0,447	-0,279	0,283
10	2,3385329**	-1,130	0,204	-0,259
11	0,191	-0,801	0,741	-0,237
12	0,927	-0,359	-0,020	0,273
13	0,442	-0,538	0,025	-0,571
14	-0,575	-0,641	-0,447	-0,390
15	1,129	0,665	0,507	-0,881
16	-1,231	1,420	0,535	-0,811
17	1,046	-0,119	-0,251	-0,312
18	-0,227	1,119	0,426	-1,065
19	-1,251	-1,150	-0,793	-0,407
20	1,626	0,991	0,860	0,046
21	0,267	-0,151	-0,686	1,8391207*
22	-0,842	0,787	-0,455	-0,457
23	-0,508	0,593	-0,157	0,001
24	-0,858	-0,524	-0,392	0,116
25	-0,518	0,579	-0,571	-0,008
26	0,811	1,7470225*	-0,014	0,060
27	-0,655	0,406	-0,006	-0,853
28	-1,243	0,189	0,256	-0,033
29	0,485	0,965	-0,121	0,661
30	0,729	-0,780	-0,151	-0,292

Note: see note 1 at table 1.1

The Cheung & Ng S-statistic exhibits bidirectional causality in mean and volatility, with that of mean being stronger (table 38.2).

Table 38.2: Cheung & Ng's S- statistic for United States of America

Statistics Cheung&Ng USA	
SUSr_i,m	408,15***
SUSi_r,m	149,41***
SUSr_i,v	51,499***
SUSi_r,v	113,83***

Note: see note 2 at table 1.2

But the kernel functions assert causality in mean only from stock returns to industrial production (Table 38.3).

Table 38.3: Causality test of Hong in mean for United States of America, Kernel functions: Q-S (Quadratic), Bartlett and Truncated.

Causality Test of Hong						
PANEL A mean						
Bandwidth	QuadraticUSr_i	BartlettUSr_i	TruncatedUSr_i	QuadraticUSi_r	BartlettUSi_r	TruncatedUSi_r
1	2,3479092***	NaN	1,001	-0,373	NaN	-0,327
2	4,1394822***	1,001	15,206181***	-0,414	-0,327	-0,646
3	10,388353***	5,9389236***	15,363338***	-0,623	-0,459	-0,931
4	13,30859***	9,7010068***	13,957506***	-0,786	-0,604	-0,913
5	14,383887***	11,801298***	12,447752***	-0,902	-0,718	-1,131
6	14,742714***	12,902983***	13,441073***	-0,974	-0,811	-0,862
7	14,76632***	13,545189***	12,653347***	-1,003	-0,878	-1,038
8	14,63729***	13,961271***	11,613055***	-1,001	-0,925	-0,633
9	14,435771***	14,195337***	11,031612***	-0,985	-0,951	-0,783
10	14,190033***	14,295609***	11,496136***	-0,974	-0,962	-0,676
11	13,91657***	14,325746***	10,770846***	-0,971	-0,965	-0,717
12	13,628092***	14,3147***	10,300814***	-0,971	-0,963	-0,863
13	13,334932***	14,266309***	9,7535827***	-0,974	-0,962	-0,966
14	13,044507***	14,187423***	9,287068***	-0,981	-0,963	-1,039
15	12,763102***	14,08363***	9,0403266***	-0,988	-0,968	-1,102
16	12,494453***	13,962065***	8,8633787***	-0,994	-0,976	-0,878
17	12,237142***	13,829805***	8,6321345***	-1,000	-0,984	-1,019
18	11,988317***	13,691423***	8,2440573***	-1,005	-0,992	-0,941
19	11,747133***	13,548502***	8,1347182***	-1,011	-1,000	-0,856
20	11,513598***	13,402896***	8,2122819***	-1,017	-1,007	-0,831
21	11,288364***	13,258217***	7,8842633***	-1,025	-1,012	-0,959
22	11,072139***	13,115653***	7,6747519***	-1,033	-1,016	-0,989
23	10,865224***	12,974714***	7,4103765***	-1,041	-1,020	-1,059
24	10,667525***	12,835275***	7,2317886***	-1,051	-1,025	-1,138
25	10,478628***	12,697329***	6,995637***	-1,060	-1,031	-1,205
26	10,298069***	12,560928***	6,8273485***	-1,069	-1,037	-0,880
27	10,125468***	12,426109***	6,635984***	-1,078	-1,044	-0,974
28	9,9603594***	12,292994***	6,6085629***	-1,086	-1,049	-1,082
29	9,8023467***	12,162012***	6,4062948***	-1,094	-1,055	-1,064
30	9,6509743***	12,033404***	6,2525922***	-1,101	-1,060	-1,091

Note: see note 3 at table 1.3

The causality in volatility is found to be directed from real economic activity to stock returns by the Hong test (Table 38.4). The Truncated kernel function shows once again the sensitivity with which causality is detected.

Table 38.4: Causality test of Hong in volatility for United States of America, Kernel functions: Q-S (Quadratic), Bartlett and Truncated.

Causality Test of Hong						
PANEL B volatility						
Bandwidth	QuadraticUSr_i	BartlettUSr_i	TruncatedUSr_i	QuadraticUSi_r	BartlettUSi_r	TruncatedUSi_r
1	-0,492	NaN	-0,660	45,249666***	NaN	45,36102***
2	-0,252	-0,660	1,379763*	44,806491***	45,36102***	32,04049***
3	0,578	-0,008	1,3479483*	40,442036***	43,988019***	25,784589***
4	1,005	0,493	1,3890373*	35,763797***	41,144881***	22,016139***
5	1,150	0,791	0,967	31,990664***	38,369709***	19,510211***
6	1,133	0,954	0,635	29,01046***	35,928327***	17,56046***
7	1,031	1,017	0,326	26,616977***	33,817996***	16,016744***
8	0,890	1,018	0,082	24,649243***	31,985986***	14,766254***
9	0,736	0,980	-0,138	23,001847***	30,38257***	13,723381***
10	0,581	0,919	-0,343	21,595706***	28,967046***	12,828155***
11	0,428	0,844	-0,419	20,377613***	27,706839***	12,046751***
12	0,279	0,763	-0,604	19,320295***	26,576026***	11,36116***
13	0,136	0,678	-0,774	18,382124***	25,554086***	10,799891***
14	0,002	0,592	-0,895	17,540103***	24,625259***	10,262308***
15	-0,123	0,506	-0,997	16,789859***	23,776691***	9,8908724***
16	-0,241	0,420	-1,089	16,126521***	22,998453***	9,5328358***
17	-0,350	0,336	-1,215	15,537808***	22,282684***	9,1077705***
18	-0,452	0,254	-1,315	15,007189***	21,621505***	8,8914902***
19	-0,549	0,173	-1,335	14,519578***	21,008838***	8,5331037***
20	-0,640	0,095	-1,338	14,064425***	20,439454***	8,1724954***
21	-0,726	0,021	-1,384	13,635504***	19,907838***	8,3703344***
22	-0,810	-0,051	-1,468	13,230318***	19,411886***	8,0727619***
23	-0,891	-0,119	-1,578	12,847709***	18,949376***	7,7609383***
24	-0,970	-0,185	-1,664	12,487896***	18,51595***	7,4680038***
25	-1,046	-0,249	-1,722	12,151894***	18,107965***	7,1882977***
26	-1,121	-0,311	-1,825	11,840126***	17,722441***	6,9229298***
27	-1,194	-0,371	-1,925	11,55278***	17,356912***	6,7721012***
28	-1,264	-0,430	-2,013	11,289761***	17,009607***	6,5286906***
29	-1,332	-0,488	-2,106	11,050515***	16,678972***	6,355297***
30	-1,398	-0,544	-2,194	10,833439***	16,363541***	6,1425955***

Note: see note 4 at table 1.4

V. i. b: Centralized tables of empirical results.

In this section we are going to present the centralized tables we constructed for the S-statistic and the r-statistic of Cheung & Ng and the kernel functions (Q-S, Bartlett and Truncated) of the Hong test. Our tables include causal relations from real returns to real economic activity and vice versa, not only in mean but also in volatility. At the end of the chapter we will mention our thoughts and conclusions for our results.

Table S (p. 152), is a summary table of all the S-statistics we had retrieved from the Cheung & Ng test methodology through the Matlab application. All statistics are followed by their significance, if any.

Tables r_1 and r_2 (p. 153-4) are presenting the highest r-statistic of the Cheung & Ng test for every country in each of the two causality fields (mean and volatility), in both directions. The r-statistics are numbers followed by their significance, if any, and the number in parenthesis determines the lag in which causality is detected.

Finally, tables S1, S2, S3 and S4 (p. 155-158) illustrate the value of significance for the kernel functions of Quadratic-Spectral, Bartlett and Truncated, for every ten bandwidths, in mean and volatility in both directions.

Table S: Cheung & Ng's S- statistic centralized table.

CHEUNG & NG's S - statistic				
Causal relations				
COUNTRY	m, r→i	m, i→r	v, r→i	v, i→r
Argentina	95,58***	-62,67	159,05***	79,89***
Austria	52,13***	-12,12	-27,43	-83,06
Belgium	384,20***	-158,85	155,40***	-160,22
Brazil	32,96	-66,25	44,98**	60,59***
Bulgaria	95,17***	23,14	16,84	90,73***
Canada	59,83***	112,05***	77,83***	15,96
Chile	174,99***	36,27	142,50***	99,69***
China	14,69	-104,92	141,50***	-14,85
Colombia	190,30***	107,79***	-16,57	43,51*
Cyprus	28,53	-58,17	96,96***	14,02
Czech Republic	162,65***	-40,95	25,61	4,23
Denmark	213,99***	-68,93	-19,38	33,41
Finland	58,88***	-9,69	-13,07	15,57
France	177,85***	77,88***	-77,13	58,25***
Germany	387,97***	-193,14	-96,61	-41,51
Greece	12,08	-78,76	107,02***	20,32
Hungary	272,57***	-146,08	203,07***	16,40
India	-26,55	0,98	-127,07	104,27***
Indonesia	156,58***	67,06***	38,10	-5,57
Ireland	188,49***	-62,47	-53,39	-116,94
Italy	127,97***	-4,05	56,57***	252,35***
Japan	254,30***	-73,62	139,80***	-37,83
Luxembourg	84,58***	-49,09	-10,24	52,36***
Malaysia	96,42***	-59,96	-20,26	17,75
Mexico	84,23***	45,51**	-35,13	-17,51
Netherlands	152,26***	-103,71	-16,29	49,93**
Norway	43,36*	68,11***	-4,20	-10,72
Peru	102,62***	-1,77	-20,41	-0,89
Portugal	-7,41	12,85	-26,66	16,74
Russia	12,04	69,29***	47,99**	-54,45
Slovenja	8,21	-7,07	57,28***	-2,72
South Korea	86,87***	-94,84	-41,39	218,80***
Spain	112,07***	130,74***	40,78*	144,33***
Sweden	18,21	44,63**	-51,21	59,25***
Taiwan	11,23	25,65	-30,99	75,32***
Turkey	71,24***	77,21***	53,52***	-14,05
United Kingdom	183,28***	79,39***	118,86***	-122,24
United States	408,15***	149,41***	51,50***	113,83***

Note: The letter "m" stands for "mean" and the letter "v" stands for "volatility". The numbers are S-statistics. The direction of the causality is defined "r→i" from returns to industrial production growth rate and "i→r" from industrial production growth rate to returns. Ho: no causality in mean and in variance, H_1: causality in mean and variance. '*'indicates significance at the 10% level, '**' indicates significance at the 5% level, '***' indicates significance at the 1% level.

Table r_1: Cheung & Ng's r- statistic centralized table.

CHEUNG & NG's highest r - statistic				
	causality in mean		causality in volatility	
COUNTRY	r→i	i→r	r→i	i→r
Argentina	2,63*** (10)	1,62	3,65*** (14)	2,40** (1)
Austria	2,15** (7)	-1,37	-0,75	-1,11
Belgium	2,42** (13)	-2,15** (19)	4,35*** (3)	-1,38
Brazil	2,71*** (3)	-2,19** (26)	2,66*** (4)	5,68*** (30)
Bulgaria	1,86* (1)	2,13** (2)	1,32	4,10*** (15)
Canada	2,97*** (2)	2,57** (1)	1,02	3,71*** (10)
Chile	2,34** (4)	2,74*** (26)	2,94*** (28)	5,26*** (18)
China	2,00** (20)	-2,18** (14)	2,28** (19)	2,04** (6)
Colombia	2,58*** (10)	1,81* (2)	2,44** (21)	2,52** (2)
Cyprus	1,96** (11)	2,24** (1)	4,02*** (25)	0,9
Czech Republic	2,13** (28)	-1,23	3,18*** (28)	2,69*** (6)
Denmark	2,65*** (5)	-1,86* (9)	1,65* (8)	5,32*** (1)
Finland	2,14** (2)	2,01** (3)	2,05** (6)	3,67*** (3)
France	2,93*** (3)	2,75*** (4)	2,24** (3)	2,29** (5)
Germany	2,94*** (6)	-2,42** (7)	1,28	1,83* (7)
Greece	2,62*** (23)	1,84* (25)	3,79*** (24)	1,17
Hungary	2,50** (9)	2,20** (18)	5,48*** (2)	2,70*** (18)
India	-1,36	2,25** (14)	2,00** (6)	3,47*** (19)
Indonesia	2,16** (2)	1,96** (7)	2,79*** (14)	2,94*** (1)

Note: This table represents the highest r-statistic for every country in all causal relations. The direction of the causality is defined "r→i" from returns to industrial production growth rate and "i→r" from industrial production growth rate to returns. The numbers are r-statistics, while the numbers in parenthesis are the lags at which causality is detected. Ho: no causality in mean and in variance, H_1: causality in mean and variance. '*'indicates significance at the 10% level, '**' indicates significance at the 5% level, '***' indicates significance at the 1% level.

Table r_2: Cheung & Ng's r- statistic centralized table.

CHEUNG & NG's highest r - statistic				
	causality in mean		causality in volatility	
COUNTRY	r→i	i→r	r→i	i→r
Ireland	2,05** (17)	1,67* (14)	3,75*** (21)	1,96* (10)
Italy	2,45** (3)	-2,15** (19)	2,90*** (2)	4,61*** (3)
Japan	2,07** (1)	2,70*** (2)	3,04*** (1)	2,32** (2)
Luxembourg	2,58*** (10)	3,49*** (15)	1,56	3,87*** (15)
Malaysia	2,28** (4)	-2,58*** (15)	1,98** (10)	1,58
Mexico	2,41** (10)	3,04*** (11)	1,18	3,17*** (10)
Netherlands	3,16*** (4)	1,64* (4)	2,52** (5)	2,35** (18)
Norway	1,95* (10)	-1,89* (9)	1,78* (5)	1,69* (2)
Peru	3,90*** (3)	1,27	2,35** (15)	3,01*** (17)
Portugal	1,72* (5)	-2,36** (8)	1,59	2,04** (7)
Russia	-3,01*** (12)	3,05*** (1)	3,84*** (20)	1,90* (2)
Slovenja	2,98*** (10)	-1,75* (12)	1,73* (2)	2,01** (20)
South Korea	2,32** (1)	-2,25** (17)	3,05*** (1)	1,68* (9)
Spain	2,02** (1)	1,94* (9)	1,98** (2)	2,17** (20)
Sweden	2,28** (4)	2,41** (7)	3,84*** (24)	2,40** (12)
Taiwan	2,34** (2)	1,70* (3)	2,45** (15)	2,90*** (8)
Turkey	2,44** (8)	2,18** (4)	-1,76* (13)	2,05** (25)
United Kingdom	2,19** (2)	3,00*** (1)	1,79* (8)	1,01
United States	5,46*** (2)	1,75* (26)	2,16** (2)	8,06*** (1)

Note: This table represents the highest r-statistic for every country in all causal relations. The direction of the causality is defined "r→i" from returns to industrial production growth rate and "i→r" from industrial production growth rate to returns. The numbers are r-statistics, while the numbers in parenthesis are the lags at which causality is detected. Ho: no causality in mean and in variance, H_1: causality in mean and variance. '*'indicates significance at the 10% level, '**' indicates significance at the 5% level, '***' indicates significance at the 1% level.

Table S1: Statistical significance of kernel functions (Q-S, Bartlett and Truncated).

CAUSALITY TEST OF HONG									
KERNEL FUNCTIONS IN MEAN r→i									
COUNTRIES	Q-S m, r→i			Bartlett m, r→i			Truncated m, r→i		
	Bandwidth			Bandwidth			Bandwidth		
	1 - 10	11 - 20	21 - 30	1 - 10	11 - 20	21 - 30	1 - 10	11 - 20	21 - 30
Argentina	***	***	***	***	***	***	***	***	***
Austria							*		
Belgium	***	***	***	***	***	***	***	***	***
Brazil	***	***	***	***	***	***	***	***	**
Bulgaria	**	**		**	**	*	**	**	
Canada	***	***	**	***	***	***	***	**	
Chile	***	***	***	***	***	***	***	***	**
China									
Colombia		**	***		*	**	***	***	***
Cyprus									
Czech Republic									
Denmark	***	***	*	**	**	**	***	**	*
Finland	**	**		**	**	*	***	*	
France	***	***	***	***	***	***	***	***	**
Germany	***	***	***	***	***	***	***	***	***
Greece									**
Hungary	***	***	***	***	***	***	***	***	***
India									
Indonesia	**	**		**	**	*	***		
Ireland									
Italy	***	***	**	***	***	***	***	**	*
Japan	***	***	***	***	***	***	***	***	*
Luxembourg									
Malaysia	**	**	**	**	**	**	***	**	
Mexico	***	***	**	**	***	***	***	***	***
Netherlands	***	***	***	**	***	***	***	***	**
Norway									
Peru	***	***	***	***	***	***	***	***	***
Portugal									
Russia									
Slovenja	***	*	*	***	*	*	***	**	*
South Korea	***	**		***	**	*	***		
Spain	***			***	**		***		
Sweden							**		
Taiwan	***	**	**	***	***	**	***	**	**
Turkey	**	**	**		**	**	***	**	***
United Kingdom	***	**	**	**	**	**	***	*	
United States	***	***	***	***	***	***	***	***	***

Note: "Q-S" stands for Quadratic kernel function. The letter "m" stands for "mean" and the letter "v" stands for "volatility". The direction of the causality is defined "r→i" from returns to industrial production growth rate and "i→r" from industrial production growth rate to returns. Ho: no causality in mean and in variance, H_1: causality in mean and variance. '*'indicates significance at the 10% level, '**' indicates significance at the 5% level, '***' indicates significance at the 1% level.

Table S1: Statistical significance of kernel functions (Q-S, Bartlett and Truncated).

CAUSALITY TEST OF HONG									
KERNEL FUNCTIONS IN MEAN i→r									
COUNTRIES	Q-S m, i→r			Bartlett m, i→r			Truncated m, i→r		
	Bandwidth			Bandwidth			Bandwidth		
	1 - 10	11 - 20	21 - 30	1 - 10	11 - 20	21 - 30	1 - 10	11 - 20	21 - 30
Argentina									
Austria									
Belgium									
Brazil									
Bulgaria	*								
Canada									
Chile									
China									
Colombia	**	*		**	**	*	**	*	*
Cyprus	***			***			***		
Czech Republic									
Denmark									
Finland									
France	***	***	**	***	***	***	***	**	*
Germany									
Greece	**			**			**		
Hungary									
India									
Indonesia									
Ireland									
Italy									
Japan	**			**	**		***		
Luxembourg		*	***			*		***	***
Malaysia									
Mexico	***	***	***	***	**	***	***	***	**
Netherlands									
Norway									
Peru									
Portugal									
Russia	***	**		***	***	**	***		
Slovenja	**	*	*	**	**	*	***	*	*
South Korea									
Spain	**	*		**	**	*	**	**	
Sweden		**	**			**	**	***	***
Taiwan									
Turkey									
United Kingdom	***	***	**	***	***	***	***	**	
United States									

Note: "Q-S" stands for Quadratic kernel function. The letter "m" stands for "mean" and the letter "v" stands for "volatility". The direction of the causality is defined "r→i" from returns to industrial production growth rate and "i→r" from industrial production growth rate to returns. Ho: no causality in mean and in variance, H_1: causality in mean and variance. '*'indicates significance at the 10% level, '**' indicates significance at the 5% level, '***' indicates significance at the 1% level.

Table S3: Statistical significance of kernel functions (Q-S, Bartlett and Truncated).

CAUSALITY TEST OF HONG									
KERNEL FUNCTIONS IN VOLATILITY r→i									
COUNTRIES	Q-S v, r→i			Bartlett v, r→i			Truncated v, r→i		
	Bandwidth			Bandwidth			Bandwidth		
	1 - 10	11 - 20	21 - 30	1 - 10	11 - 20	21 - 30	1 - 10	11 - 20	21 - 30
Argentina		**	**			**	*	***	**
Austria									
Belgium		**	**			**		***	**
Brazil							**		
Bulgaria									
Canada									
Chile									
China									
Colombia	**			**			**		
Cyprus	***	***	***	***	***	***	***	***	***
Czech Republic	***	**		***	***	*			
Denmark									
Finland									
France							*		
Germany									
Greece								*	***
Hungary	***	***	***	***	***	***	***	***	***
India									
Indonesia									
Ireland									
Italy	***	***		***	***	**	***		
Japan	***	***		***	***	***	***		
Luxembourg									
Malaysia									
Mexico									
Netherlands									
Norway									
Peru									
Portugal									
Russia									
Slovenja	***	**		***	***	**	***	*	
South Korea									
Spain									
Sweden									*
Taiwan									
Turkey									
United Kingdom									
United States							*		

Note: “Q-S” stands for Quadratic kernel function. The letter “m” stands for “mean” and the letter “v” stands for “volatility”. The direction of the causality is defined “r→i” from returns to industrial production growth rate and “i→r” from industrial production growth rate to returns. Ho: no causality in mean and in variance, H_1: causality in mean and variance. ‘*’indicates significance at the 10% level, ‘**’ indicates significance at the 5% level, ‘***’ indicates significance at the 1% level.

Table S4: Statistical significance of kernel functions (Q-S, Bartlett and Truncated).

CAUSALITY TEST OF HONG									
KERNEL FUNCTIONS IN VOLATILITY i→r									
COUNTRIES	Q-S v, i→r			Bartlett v, i→r			Truncated v, i→r		
	Bandwidth			Bandwidth			Bandwidth		
	1 - 10	11 - 20	21 - 30	1 - 10	11 - 20	21 - 30	1 - 10	11 - 20	21 - 30
Argentina	***			***	**		***		
Austria									
Belgium	***			***	**		***		
Brazil									**
Bulgaria	***	***	***	***	***	***	***	***	***
Canada							**	**	
Chile		**	***			***		***	***
China									
Colombia	**	*		**	*	*	***	*	
Cyprus									
Czech Republic							*		
Denmark	***	***	***	***	***	***	***	***	***
Finland	***	***	***	***	***	***	***	***	***
France									
Germany									
Greece									
Hungary									
India		**	***			**		***	***
Indonesia	***	**		***	***	**	***		
Ireland									
Italy	***	***	***	***	***	***	***	***	***
Japan	*			*	*		**	*	
Luxembourg									
Malaysia									
Mexico									
Netherlands	**			**			**		
Norway									
Peru									
Portugal									
Russia									
Slovenja									
South Korea									
Spain									
Sweden									
Taiwan							**	**	*
Turkey									
United Kingdom									
United States	***	***	***	***	***	***	***	***	***

Note: "Q-S" stands for Quadratic kernel function. The letter "m" stands for "mean" and the letter "v" stands for "volatility". The direction of the causality is defined "r→i" from returns to industrial production growth rate and "i→r" from industrial production growth rate to returns. Ho: no causality in mean and in variance, H_1: causality in mean and variance. '*'indicates significance at the 10% level, '**' indicates significance at the 5% level, '***' indicates significance at the 1% level.

V. ii: Discussion and analysis on the empirical results.

After we have studied all the tables we had retrieved from running the Cheung & Ng and the Hong test applications, including the centralized tables we constructed above, we have some very useful remarks that we would like to point out. We are glad to find out that our results mainly agree with the theory and the existing literature. Anyone who craves for more details could find analytical evidence at the tables of this section and at the appendix.

Our first observation states the fact that nearly 68% of the countries of our sample present a strong causal relationship in mean, from real returns to industrial production growth rate. In general, stronger causality is more often found in mean (regardless of direction between real returns and industrial production growth rate) than in volatility. Thus, we understand that volatility is more noisy compared to mean. The methodology of Cheung & Ng and Hong is based on the estimation of the Cross Correlation Function for the squared standardized residuals, that are obtained from the estimation of the GARCH model. In addition, GARCH is a short memory process that does not take under consideration the structural breaks and the long memory of volatility. Shocks are far more easily detected in the “observable” mean than in the “estimated” volatility. Moreover, we should add that for the macroeconomic series, the Causality in Variance Tests Cheung & Ng and Hong, exhibit a relatively good empirical performance, without however taking into consideration an important property of volatility, the long memory. On the other hand, these statistics exhibit a good empirical performance for the financial series without however taking into consideration the long memory in volatility. These results are retrieved from Monte Carlo simulation. But in the Cheung & Ng test we observe higher r-statistics in causal relations of volatility. However, these r-statistics are commonly not detected in the first ten lags, somehow weakening their significance.

The direction of causality appears to include stronger causal relations when it is directed from real stock returns to industrial production growth rate. This is obviously true for causality in mean, whereas causality in volatility appears to be somewhat stronger from industrial production growth rate to real stock returns. Common sense believes that equity volatility shocks should be following macroeconomic volatility shocks. However, the existing literature, including ours, finds evidence that the opposite is true. The explanation lies to the fact that macroeconomic volatility contributes to persistent and non-persistent stock market volatility fluctuations, while stock market volatility fluctuations are mainly associated with idiosyncratic financial shocks.

By making a small segregation between the G7 countries and all the others, we conclude that in all G7 countries we detect causality in mean and in volatility, with the exception of Germany that only causality in mean is detected. However, we have to mention that the Hong test fails to detect causality in volatility for the United Kingdom, but we can probably attribute this complication to the existence of bandwidths (weighted lags), which make the kernel functions of the Hong test very strict in detecting causality in the first thirty bandwidths or the long memory of volatility. In separating our sample to emerging and developed countries, we should remark that they present equally strong causality in mean from real returns to real economic activity and equally weak causality in volatility with the same direction. But causality in mean and variance from industrial production growth rate to real returns, is strongerly detected in developed countries than in emerging. Further segregation could be made between European and non-European countries. As we will see below, we find that non-European countries that are detected for causality in mean and/or volatility outnumber the European countries. Credit for this observation mainly goes to North American countries, South American countries and Japan. We have also noted that in all South American countries causality in mean is detected, from real stock returns to real economic activity.

Should we try to declare the countries in which we detect strong bidirectional causality in both mean and variance among real stock returns and economic growth rate, we will come down to the cases of Colombia, Japan, Spain and United States of America. But even in these cases the results are not undisputed. Though all four countries have adequate results to reject the null hypothesis of no causality in mean and variance, Colombia does not have a significant S-statistic (Cheung & Ng test) in volatility from real returns to industrial production growth rate, Japan has no significant S-statistic (Cheung & Ng test) in mean and volatility from industrial production growth rate to real returns, Spain shows no causality in volatility in the kernel functions of the Hong test and finally the United States are found by the kernel functions of the Hong test to have non-bidirectional causality in mean and volatility.

Trying to group the countries in which we detect no causality in mean or volatility, the most prominent case seems to be that of Portugal. The only problem is the existence of the r-statistics (Cheung & Ng test), but they are not significant enough to show causality. The same group could include Norway, which shows no causality in the kernel functions of the Hong test, low r-statistics (Cheung & Ng test) and low S-statistics (Cheung & Ng test) of small significance. More ambiguous cases are these of China and Ireland which show no causality at the kernel functions of the Hong test, have low S-statistics(Cheung & Ng test), but present high r-statistics (Cheung & Ng test) mostly in the first lags. Again, we could attribute this conflict to the weighting methodology that the kernel functions of the Hong test use for their bandwidths, giving much more weight in the first lags, or the structural breaks and the long memory of volatility.

Finally, we will refer to the countries that bidirectional causality is detected either in mean or volatility. Colombia, France, Japan, Mexico, Spain and the United Kingdom are sure to have bidirectional causality in mean. Ambiguous for bidirectional causality in mean are the cases of Canada, Indonesia, Turkey and the United States of America due to the results of the kernel functions of the Hong test, and the case of Slovenja due to the results of the S-statistic of the Cheung & Ng test. Bidirectional causality in volatility is detected, for sure, in the cases of Argentina, Colombia, Italy and Japan, while ambiguous are the results on Brazil and the United States of America due to the results of the kernel functions of the Hong test.

CHAPTER VI: Concluding remarks.

We have studied the causal relationship between equity returns and real economic activity, in advanced and emerging economies. We have used a wide sample of 38 countries from all regions, and tested its country's causality in mean and volatility between its real stock returns and its industrial production growth rate. We accomplished that by using the Cheung & Ng and the Hong test methodology via the Matlab application. The methodology of Cheung & Ng and Hong is based on the estimation of the Cross Correlation Function for the squared standardized residuals, that are obtained from the estimation of the GARCH model. Before concluding on our results we should mention that we were satisfied to find that the existing theory, literature and empirical research of the past, agrees with our results and conclusions. This is important for us, because, as far as we know, no such work has been done before including our methodology combined with the width of our sample.

Stronger causality is more often found in mean than in volatility, because volatility is more noisy compared to mean. In addition, GARCH is a short memory process that does not account for the structural breaks and the long memory of volatility. Shocks are far more easily detected in the "observable" mean than in the "estimated" volatility. We should add that for the macroeconomic series, the Causality in Variance Tests Cheung & Ng and Hong, exhibit a relatively good empirical performance, without however taking into consideration an important property of volatility, the long memory. On the other hand, these statistics exhibit a good empirical performance for the financial series without however taking into consideration the long memory in volatility. The direction of causality appears to include stronger causal relations when it is directed from real stock returns to industrial production growth rate. This is true for causality in mean. On the contrary, causality in volatility appears to be somewhat stronger from industrial production growth rate to real stock returns. The explanation lies to the fact that macroeconomic volatility contributes to persistent and non-persistent stock market volatility fluctuations, while stock market volatility fluctuations are mainly associated with idiosyncratic financial shocks. Strong causal relations in mean and volatility are detected in the G7 countries. Developed and emerging countries present equally strong causality in mean from real returns to real economic activity and equally weak causality in volatility with the same direction. But the causality for mean and variance from industrial production growth rate to real returns, is strongerly detected in developed countries than in emerging. We also find that non-European countries that are detected for causality in mean and/or volatility outnumber the European countries. Finally, we note that in all South American countries causality in mean is detected, from real stock returns to real economic activity. In addition, absence of volatility spillovers may lead to the conclusion that the major factor of disturbance is changes in asset- or market-specific fundamentals and that one large shock will increase the volatility in that specific asset or market. On the contrary, existence of volatility spillover leads to the fact that one large shock increases volatilities not only in its own market or asset but also in other markets or assets as well.

We believe that our dissertation can be very useful in the fields of investment and portfolio management, especially in the case of emerging economies. However, further research is surely needed in order to test the causality in mean and variance for developed and emerging economies between real stock returns and other macroeconomic variable indeces. We are certain that a research based on a methodology that takes into consideration the structural breaks and the long memory of volatility could have a great impact on the existing literature and empirical analysis.

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APPENDIX

Appendix A – Kernel functions of the Hong test.

In this section we are going to present the kernel functions of Parzen, Tukey-Hanning and Daniell, of the Hong test.

Table A.C: Countries and abbreviations

COUNTRY	ABBREVIATION
Argentina	AR
Austria	OE
Belgium	BG
Brazil	BR
Bulgaria	BL
Canada	CN
Chile	CL
China	CH
Colombia	CB
Cyprus	CP
Czech Republic	CZ
Denmark	DK
Finland	FN
France	FR
Germany	BD
Greece	GR
Hungary	HN
India	IN
Indonesia	ID
Ireland	IR
Italy	IT
Japan	JP
Luxembourg	LX
Malaysia	MY
Mexico	MX
Netherlands	NL
Norway	NW
Peru	PE
Portugal	PT
Russia	RS
Slovenja	SJ
South Korea	KO
Spain	ES
Sweden	SW
Taiwan	TW
Turkey	TK
United Kingdom	UK
United States	US

Table A 1.1: Causality Test of Hong in mean for Argentina, Kernel functions: Parzen, Tukey – Hanning (Tu – Ha) and Daniell.

Causality Test of Hong						
PANEL A mean						
Bandwidth	ParzenARr_i	Tu-HaARr_i	DaniellARr_i	ParzenARi_r	Tu-HaARi_r	DaniellARi_r
1	NaN	3,9479349***	-0,783	NaN	NaN	-1,036
2	3,9479349***	3,8769051***	4,2975872***	-0,558	-0,558	-0,523
3	3,9397397***	3,6928367***	3,6920232***	-0,569	-0,624	-0,783
4	3,8749031***	3,7153435***	3,8754752***	-0,628	-0,712	-0,768
5	3,7769757***	3,7751916***	3,7795069***	-0,687	-0,692	-0,714
6	3,738129***	3,7887747***	3,8773483***	-0,703	-0,656	-0,703
7	3,7611257***	3,7866631***	3,9205684***	-0,688	-0,643	-0,711
8	3,7933994***	3,7853183***	3,8651502***	-0,669	-0,652	-0,729
9	3,8122533***	3,7773784***	3,7411297***	-0,659	-0,677	-0,749
10	3,8186132***	3,7605624***	3,6785131***	-0,661	-0,715	-0,785
11	3,8174772***	3,7449144***	3,7169043***	-0,672	-0,763	-0,877
12	3,8127962***	3,7393736***	3,8000532***	-0,691	-0,818	-0,958
13	3,807346***	3,7446222***	3,8580756***	-0,717	-0,877	-1,045
14	3,8016951***	3,7567851***	3,8751798***	-0,748	-0,936	-1,125
15	3,7962152***	3,7711107***	3,8677097***	-0,783	-0,994	-1,179
16	3,7916764***	3,7837479***	3,8434835***	-0,821	-1,048	-1,221
17	3,7887405***	3,7922554***	3,7965282***	-0,860	-1,097	-1,257
18	3,787943***	3,7954364***	3,7433216***	-0,901	-1,140	-1,293
19	3,7894669***	3,7934503***	3,6974912***	-0,941	-1,175	-1,319
20	3,7930386***	3,7873407***	3,6725***	-0,979	-1,204	-1,322
21	3,7980991***	3,7785793***	3,6587307***	-1,016	-1,226	-1,305
22	3,803599***	3,7688498***	3,6489748***	-1,051	-1,242	-1,287
23	3,8085933***	3,7596556***	3,6512405***	-1,083	-1,253	-1,275
24	3,8124764***	3,7520818***	3,6666047***	-1,112	-1,261	-1,269
25	3,8149296***	3,7467076***	3,6852708***	-1,138	-1,266	-1,265
26	3,8158903***	3,7436729***	3,7012425***	-1,161	-1,268	-1,262
27	3,8154585***	3,7427977***	3,7137751***	-1,181	-1,268	-1,260
28	3,8138479***	3,7436964***	3,7251831***	-1,198	-1,268	-1,263
29	3,811321***	3,7458896***	3,7361964***	-1,212	-1,266	-1,269
30	3,8081614***	3,9435211***	3,7455772***	-1,224	-1,265	-1,272

Note A: The subscript "r_i" defines the causality direction from returns to industrial production growth rate and the subscript "i_r" from industrial production growth rate to returns respectively. The letter "m"in the subscript stands for "mean", and the letter "v" stands for "volatility". These symbolisms are always accompanied with an abbreviation code for each country (see Table V.i). Ho: no causality in mean and in variance, H_1: causality in mean and variance. '*'indicates significance at the 10% level, '**' indicates significance at the 5% level, '***' indicates significance at the 1% level.

Table A.1.2: Causality Test of Hong in volatility for Argentina, Kernel functions: Parzen, Tukey – Hanning (Tu – Ha) and Daniell.

Causality Test of Hong						
PANEL B volatility						
Bandwidth	ParzenARr_i	Tu-HaARr_i	DaniellARr_i	ParzenARi_r	Tu-HaARi_r	DaniellARi_r
1	NaN	NaN	1,8596286**	NaN	NaN	-3,444
2	-0,472	-0,472	-0,483	3,382461***	3,382461***	3,2254593***
3	-0,453	-0,350	-0,056	3,3773781***	3,3336616***	3,1850087***
4	-0,340	-0,109	0,108	3,3262266***	3,0988594***	2,7298646***
5	-0,180	0,037	0,300	3,1781604***	2,7836495***	2,4109257***
6	-0,048	0,143	0,357	2,9735431***	2,5223265***	2,1729717**
7	0,048	0,223	0,243	2,7672099***	2,3154373**	1,9617805**
8	0,122	0,275	0,404	2,5833709***	2,1374428**	1,7895974**
9	0,183	0,327	0,655	2,4248195***	1,974445**	1,603748*
10	0,234	0,396	0,787	2,2844052**	1,8213346**	1,4261165*
11	0,281	0,476	0,790	2,155452**	1,6774995**	1,262
12	0,327	0,559	0,778	2,0346061**	1,5426239*	1,126
13	0,376	0,635	0,778	1,9201116**	1,4158002*	1,010
14	0,427	0,700	0,807	1,8110809**	1,2966319*	0,903
15	0,482	0,753	0,868	1,7069717**	1,185	0,789
16	0,536	0,801	0,943	1,6076025*	1,080	0,678
17	0,589	0,849	1,039	1,5128147*	0,982	0,566
18	0,639	0,904	1,139	1,4224462*	0,890	0,458
19	0,686	0,967	1,245	1,3362627*	0,802	0,365
20	0,731	1,037	1,3459387*	1,254	0,719	0,275
21	0,774	1,112	1,4277944*	1,175	0,639	0,191
22	0,817	1,190	1,5188231*	1,100	0,562	0,118
23	0,861	1,269	1,6055653*	1,028	0,489	0,052
24	0,905	1,3454748*	1,6713182**	0,959	0,418	-0,011
25	0,951	1,4195566*	1,7284586**	0,892	0,351	-0,071
26	0,998	1,4899884*	1,7855798**	0,828	0,287	-0,130
27	1,046	1,5562139*	1,8369977**	0,766	0,225	-0,190
28	1,097	1,6179858*	1,8796026**	0,707	0,167	-0,249
29	1,148	1,6752598**	1,9172929**	0,649	0,111	-0,307
30	1,200	1,7280845**	1,9546261**	0,594	0,057	-0,363

Note: see note A at table A.1.1

Table A 2.1: Causality Test of Hong in mean for Austria, Kernel functions: Parzen, Tukey – Hanning (Tu – Ha) and Daniell.

Causality Test of Hong						
PANEL A mean						
Bandwidth	ParzenOEr_i	Tu-HaOEr_i	DaniellOEr_i	ParzenOEi_r	Tu-HaOEi_r	DaniellOEi_r
1	NaN	NaN	-0,711	NaN	NaN	-1,419
2	0,878	0,878	0,881	0,452	0,452	0,451
3	0,866	0,802	0,811	0,447	0,422	0,380
4	0,794	0,606	0,464	0,418	0,336	0,238
5	0,662	0,398	0,317	0,360	0,222	0,060
6	0,517	0,264	0,152	0,284	0,108	-0,066
7	0,393	0,214	0,158	0,203	0,033	-0,090
8	0,307	0,216	0,206	0,131	-0,005	-0,098
9	0,260	0,256	0,298	0,074	-0,021	-0,103
10	0,244	0,323	0,424	0,034	-0,027	-0,114
11	0,254	0,401	0,547	0,009	-0,030	-0,139
12	0,281	0,476	0,616	-0,006	-0,037	-0,144
13	0,319	0,540	0,669	-0,015	-0,049	-0,160
14	0,363	0,588	0,674	-0,023	-0,066	-0,186
15	0,410	0,620	0,642	-0,030	-0,086	-0,218
16	0,456	0,637	0,599	-0,038	-0,111	-0,258
17	0,498	0,641	0,559	-0,047	-0,138	-0,305
18	0,533	0,634	0,522	-0,059	-0,167	-0,354
19	0,562	0,617	0,487	-0,072	-0,199	-0,404
20	0,584	0,593	0,454	-0,088	-0,233	-0,453
21	0,598	0,566	0,422	-0,105	-0,269	-0,499
22	0,606	0,536	0,393	-0,124	-0,305	-0,544
23	0,608	0,506	0,364	-0,144	-0,342	-0,588
24	0,606	0,476	0,335	-0,166	-0,379	-0,631
25	0,599	0,448	0,306	-0,188	-0,415	-0,671
26	0,589	0,421	0,279	-0,212	-0,451	-0,705
27	0,576	0,395	0,254	-0,236	-0,486	-0,735
28	0,561	0,371	0,231	-0,261	-0,520	-0,762
29	0,544	0,348	0,211	-0,286	-0,552	-0,788
30	0,526	0,326	0,193	-0,311	-0,584	-0,813

Note: see note A at table A.1.1

Table A.2.2: Causality Test of Hong in volatility for Austria, Kernel functions: Parzen, Tukey – Hanning (Tu – Ha) and Daniell.

Causality Test of Hong						
PANEL B volatility						
Bandwidth	ParzenOEr_i	Tu-HaOEr_i	DaniellOEr_i	ParzenOEi_r	Tu-HaOEi_r	DaniellOEi_r
1	NaN	NaN	-3,559	NaN	NaN	6,5001674***
2	-0,330	-0,330	-0,455	-0,271	-0,271	-0,351
3	-0,336	-0,361	-0,501	-0,280	-0,326	-0,483
4	-0,365	-0,424	-0,587	-0,332	-0,436	-0,573
5	-0,411	-0,503	-0,696	-0,409	-0,539	-0,684
6	-0,464	-0,589	-0,807	-0,486	-0,639	-0,786
7	-0,524	-0,677	-0,915	-0,561	-0,736	-0,897
8	-0,587	-0,763	-1,016	-0,634	-0,823	-0,988
9	-0,651	-0,844	-1,107	-0,703	-0,901	-1,031
10	-0,713	-0,923	-1,193	-0,769	-0,974	-1,097
11	-0,775	-0,997	-1,277	-0,831	-1,040	-1,165
12	-0,834	-1,069	-1,357	-0,889	-1,099	-1,230
13	-0,892	-1,138	-1,435	-0,943	-1,154	-1,248
14	-0,948	-1,206	-1,511	-0,993	-1,204	-1,349
15	-1,003	-1,271	-1,584	-1,040	-1,250	-1,355
16	-1,055	-1,335	-1,655	-1,084	-1,291	-1,373
17	-1,107	-1,398	-1,723	-1,125	-1,329	-1,421
18	-1,157	-1,460	-1,790	-1,163	-1,364	-1,447
19	-1,207	-1,520	-1,855	-1,199	-1,395	-1,453
20	-1,255	-1,579	-1,919	-1,233	-1,424	-1,453
21	-1,303	-1,636	-1,980	-1,264	-1,449	-1,450
22	-1,349	-1,693	-2,040	-1,294	-1,471	-1,447
23	-1,395	-1,748	-2,099	-1,321	-1,492	-1,451
24	-1,440	-1,802	-2,156	-1,347	-1,511	-1,466
25	-1,485	-1,855	-2,211	-1,370	-1,528	-1,490
26	-1,528	-1,906	-2,265	-1,393	-1,546	-1,517
27	-1,571	-1,957	-2,317	-1,413	-1,562	-1,539
28	-1,614	-2,007	-2,368	-1,433	-1,578	-1,551
29	-1,655	-2,056	-2,419	-1,451	-1,594	-1,552
30	-1,696	-2,104	-2,468	-1,468	-1,610	-1,545

Note: see note A at table A.1.1

Table A 3.1: Causality Test of Hong in mean for Belgium, Kernel functions: Parzen, Tukey – Hanning (Tu – Ha) and Daniell.

Causality Test of Hong						
PANEL A mean						
Bandwidth	ParzenBGr_i	Tu-HaBGr_i	DaniellBGr_i	ParzenBGi_r	Tu-HaBGi_r	DaniellBGi_r
1	NaN	NaN	-0,783	NaN	NaN	-1,036
2	3,9479349***	3,9479349***	4,2975872***	-0,558	-0,558	-0,523
3	3,9397397***	3,8769051***	3,6920232***	-0,569	-0,624	-0,783
4	3,8749031***	3,6928367***	3,8754752***	-0,628	-0,712	-0,768
5	3,7769757***	3,7153435***	3,7795069***	-0,687	-0,692	-0,714
6	3,738129***	3,7751916***	3,8773483***	-0,703	-0,656	-0,703
7	3,7611257***	3,7887747***	3,9205684***	-0,688	-0,643	-0,711
8	3,7933994***	3,7866631***	3,8651502***	-0,669	-0,652	-0,729
9	3,8122533***	3,7853183***	3,7411297***	-0,659	-0,677	-0,749
10	3,8186132***	3,7773784***	3,6785131***	-0,661	-0,715	-0,785
11	3,8174772***	3,7605624***	3,7169043***	-0,672	-0,763	-0,877
12	3,8127962***	3,7449144***	3,8000532***	-0,691	-0,818	-0,958
13	3,807346***	3,7393736***	3,8580756***	-0,717	-0,877	-1,045
14	3,8016951***	3,7446222***	3,8751798***	-0,748	-0,936	-1,125
15	3,7962152***	3,7567851***	3,8677097***	-0,783	-0,994	-1,179
16	3,7916764***	3,7711107***	3,8434835***	-0,821	-1,048	-1,221
17	3,7887405***	3,7837479***	3,7965282***	-0,860	-1,097	-1,257
18	3,787943***	3,7922554***	3,7433216***	-0,901	-1,140	-1,293
19	3,7894669***	3,7954364***	3,6974912***	-0,941	-1,175	-1,319
20	3,7930386***	3,7934503***	3,6725***	-0,979	-1,204	-1,322
21	3,7980991***	3,7873407***	3,6587307***	-1,016	-1,226	-1,305
22	3,803599***	3,7785793***	3,6489748***	-1,051	-1,242	-1,287
23	3,8085933***	3,7688498***	3,6512405***	-1,083	-1,253	-1,275
24	3,8124764***	3,7596556***	3,6666047***	-1,112	-1,261	-1,269
25	3,8149296***	3,7520818***	3,6852708***	-1,138	-1,266	-1,265
26	3,8158903***	3,7467076***	3,7012425***	-1,161	-1,268	-1,262
27	3,8154585***	3,7436729***	3,7137751***	-1,181	-1,268	-1,260
28	3,8138479***	3,7427977***	3,7251831***	-1,198	-1,268	-1,263
29	3,811321***	3,7436964***	3,7361964***	-1,212	-1,266	-1,269
30	3,8081614***	3,7458896***	3,7455772***	-1,224	-1,265	-1,272

Note: see note A at table A.1.1

Table A.3.2: Causality Test of Hong in volatility for Belgium, Kernel functions: Parzen, Tukey – Hanning (Tu – Ha) and Daniell.

Causality Test of Hong						
PANEL B volatility						
Bandwidth	ParzenBGr_i	Tu-HaBGr_i	DaniellBGr_i	ParzenBGi_r	Tu-HaBGi_r	DaniellBGi_r
1	NaN	NaN	1,8596286**	NaN	NaN	-3,444
2	-0,472	-0,472	-0,483	3,382461***	3,382461***	3,2254593***
3	-0,453	-0,350	-0,056	3,3773781***	3,3336616***	3,1850087***
4	-0,340	-0,109	0,108	3,3262266***	3,0988594***	2,7298646***
5	-0,180	0,037	0,300	3,1781604***	2,7836495***	2,4109257***
6	-0,048	0,143	0,357	2,9735431***	2,5223265***	2,1729717**
7	0,048	0,223	0,243	2,7672099***	2,3154373**	1,9617805**
8	0,122	0,275	0,404	2,5833709***	2,1374428**	1,7895974**
9	0,183	0,327	0,655	2,4248195***	1,974445**	1,603748*
10	0,234	0,396	0,787	2,2844052**	1,8213346**	1,4261165*
11	0,281	0,476	0,790	2,155452**	1,6774995**	1,262
12	0,327	0,559	0,778	2,0346061**	1,5426239*	1,126
13	0,376	0,635	0,778	1,9201116**	1,4158002*	1,010
14	0,427	0,700	0,807	1,8110809**	1,2966319*	0,903
15	0,482	0,753	0,868	1,7069717**	1,185	0,789
16	0,536	0,801	0,943	1,6076025*	1,080	0,678
17	0,589	0,849	1,039	1,5128147*	0,982	0,566
18	0,639	0,904	1,139	1,4224462*	0,890	0,458
19	0,686	0,967	1,245	1,3362627*	0,802	0,365
20	0,731	1,037	1,3459387*	1,254	0,719	0,275
21	0,774	1,112	1,4277944*	1,175	0,639	0,191
22	0,817	1,190	1,5188231*	1,100	0,562	0,118
23	0,861	1,269	1,6055653*	1,028	0,489	0,052
24	0,905	1,3454748*	1,6713182**	0,959	0,418	-0,011
25	0,951	1,4195566*	1,7284586**	0,892	0,351	-0,071
26	0,998	1,4899884*	1,7855798**	0,828	0,287	-0,130
27	1,046	1,5562139*	1,8369977**	0,766	0,225	-0,190
28	1,097	1,6179858*	1,8796026**	0,707	0,167	-0,249
29	1,148	1,6752598**	1,9172929**	0,649	0,111	-0,307
30	1,200	1,7280845**	1,9546261**	0,594	0,057	-0,363

Note: see note A at table A.1.1

Table A 4.1: Causality Test of Hong in mean for Brazil, Kernel functions: Parzen, Tukey – Hanning (Tu – Ha) and Daniell.

Causality Test of Hong						
PANEL A mean						
Bandwidth	ParzenBRr_i	Tu-HaBRr_i	DaniellBRr_i	ParzenBRi_r	Tu-HaBRi_r	DaniellBRi_r
1	NaN	NaN	0,508	NaN	NaN	-0,421
2	0,788	0,788	1,247	-0,646	-0,646	-0,761
3	0,813	0,939	1,209	-0,654	-0,692	-0,663
4	0,961	1,3316308*	1,7170879**	-0,696	-0,771	-0,882
5	1,246	1,947354**	2,5529773***	-0,754	-0,824	-0,856
6	1,6348451*	2,572634***	3,1697288***	-0,795	-0,782	-0,692
7	2,0772298**	3,0611322***	3,5004743***	-0,803	-0,693	-0,521
8	2,4968817***	3,3835284***	3,6382147***	-0,775	-0,612	-0,480
9	2,8526809***	3,5675079***	3,6489754***	-0,726	-0,559	-0,506
10	3,1303554***	3,656902***	3,6196631***	-0,672	-0,536	-0,539
11	3,3332434***	3,6878235***	3,603439***	-0,626	-0,536	-0,565
12	3,4734389***	3,68282***	3,5866485***	-0,592	-0,548	-0,591
13	3,5644073***	3,656394***	3,5647065***	-0,572	-0,565	-0,621
14	3,6184341***	3,6174988***	3,4939047***	-0,562	-0,579	-0,640
15	3,6454853***	3,5707034***	3,3964466***	-0,560	-0,586	-0,624
16	3,6533245***	3,5180987***	3,2971275***	-0,562	-0,587	-0,569
17	3,6475538***	3,4608445***	3,1996868***	-0,568	-0,583	-0,504
18	3,6318238***	3,3998479***	3,124718***	-0,574	-0,574	-0,457
19	3,6086092***	3,3358663***	3,0548594***	-0,579	-0,563	-0,430
20	3,5797123***	3,2698275***	2,9808789***	-0,582	-0,550	-0,423
21	3,5464531***	3,2028616***	2,9022006***	-0,583	-0,537	-0,425
22	3,5098403***	3,136095***	2,8213203***	-0,582	-0,524	-0,438
23	3,4706446***	3,0706171***	2,7436937***	-0,579	-0,512	-0,456
24	3,4294231***	3,0073342***	2,6760772***	-0,574	-0,501	-0,465
25	3,3866352***	2,9468679***	2,618996***	-0,568	-0,492	-0,464
26	3,3427193***	2,8895532***	2,5695559***	-0,561	-0,486	-0,460
27	3,298076***	2,8354584***	2,5271387***	-0,553	-0,481	-0,455
28	3,2530881***	2,7844749***	2,4919339***	-0,546	-0,478	-0,453
29	3,2080948***	2,7363914***	2,4621388***	-0,538	-0,477	-0,454
30	3,163403***	2,6909288***	2,4347616***	-0,531	-0,477	-0,457

Note: see note A at table A.1.1

Table A.4.2: Causality Test of Hong in volatility for Brazil, Kernel functions: Parzen, Tukey – Hanning (Tu – Ha) and Daniell.

Causality Test of Hong						
PANEL B volatility						
Bandwidth	ParzenBRr_i	Tu-HaBRr_i	DaniellBRr_i	ParzenBRi_r	Tu-HaBRi_r	DaniellBRi_r
1	NaN	NaN	-3,906	NaN	NaN	4,7521145***
2	-0,458	-0,458	-0,544	-0,648	-0,648	-0,734
3	-0,463	-0,485	-0,316	-0,661	-0,722	-0,872
4	-0,488	-0,529	-0,651	-0,729	-0,848	-0,941
5	-0,518	-0,520	-0,464	-0,818	-0,931	-1,092
6	-0,517	-0,329	-0,117	-0,890	-0,996	-1,069
7	-0,451	-0,047	0,201	-0,947	-1,061	-1,077
8	-0,317	0,217	0,436	-0,997	-1,128	-1,236
9	-0,140	0,422	0,562	-1,046	-1,196	-1,211
10	0,043	0,563	0,602	-1,095	-1,263	-1,456
11	0,209	0,648	0,592	-1,144	-1,327	-1,321
12	0,346	0,690	0,547	-1,194	-1,383	-1,258
13	0,454	0,698	0,491	-1,241	-1,429	-1,430
14	0,534	0,682	0,429	-1,287	-1,465	-1,549
15	0,590	0,650	0,361	-1,329	-1,493	-1,506
16	0,624	0,608	0,295	-1,367	-1,517	-1,387
17	0,641	0,560	0,229	-1,401	-1,537	-1,290
18	0,644	0,508	0,166	-1,432	-1,554	-1,268
19	0,637	0,454	0,100	-1,458	-1,570	-1,277
20	0,621	0,399	0,034	-1,481	-1,586	-1,305
21	0,599	0,344	-0,033	-1,502	-1,602	-1,301
22	0,571	0,288	-0,101	-1,519	-1,617	-1,286
23	0,540	0,232	-0,169	-1,535	-1,633	-1,269
24	0,507	0,176	-0,236	-1,550	-1,650	-1,241
25	0,471	0,120	-0,302	-1,564	-1,668	-1,228
26	0,435	0,064	-0,366	-1,578	-1,686	-1,244
27	0,397	0,009	-0,430	-1,591	-1,706	-1,274
28	0,358	-0,047	-0,492	-1,603	-1,726	-1,311
29	0,319	-0,102	-0,555	-1,616	-1,746	-1,363
30	0,280	-0,157	-0,618	-1,629	-1,767	-1,434

Note: see note A at table A.1.1

Table A 5.1: Causality Test of Hong in mean for Bulgaria, Kernel functions: Parzen, Tukey – Hanning (Tu – Ha) and Daniell.

Causality Test of Hong						
PANEL A mean						
Bandwidth	ParzenBLr_i	Tu-HaBLr_i	DaniellBLr_i	ParzenBLi_r	Tu-HaBLi_r	DaniellBLi_r
1	NaN	NaN	-0,542	NaN	NaN	-1,273
2	1,7833748**	1,7833748**	1,7269755**	0,111	0,111	0,041
3	1,79312**	1,8349508**	1,9534463**	0,156	0,392	0,658
4	1,8372337**	1,8531567**	1,7764673**	0,416	0,927	1,136
5	1,854885**	1,7639181**	1,6304391*	0,779	1,238	1,3118273*
6	1,8215459**	1,70393**	1,719646**	1,059	1,3570682*	1,2807753*
7	1,7724502**	1,6945902**	1,7419967**	1,228	1,3646679*	1,230
8	1,736733**	1,7033043**	1,6820547**	1,311272*	1,3143435*	1,162
9	1,7212756**	1,7045897**	1,6296334*	1,3362505*	1,237	1,022
10	1,7174404**	1,6901249**	1,5891191*	1,3238644*	1,146	0,886
11	1,716362**	1,6661552**	1,544683*	1,2877852*	1,049	0,760
12	1,7127979**	1,6418976**	1,5204584*	1,237	0,950	0,636
13	1,705062**	1,6228846*	1,5092498*	1,178	0,852	0,518
14	1,6937939**	1,6105309*	1,5130153*	1,113	0,759	0,436
15	1,6804535**	1,603395*	1,5158788*	1,046	0,673	0,368
16	1,6666965**	1,5990076*	1,5122154*	0,978	0,596	0,314
17	1,6537975**	1,5954721*	1,5086747*	0,911	0,526	0,269
18	1,6426079**	1,5917261*	1,5067204*	0,845	0,462	0,223
19	1,6334995*	1,5870153*	1,4976237*	0,782	0,404	0,177
20	1,6262434*	1,5807442*	1,4753781*	0,722	0,349	0,130
21	1,620407*	1,5724498*	1,4443014*	0,665	0,298	0,078
22	1,6155031*	1,561778*	1,4129058*	0,611	0,249	0,020
23	1,6110536*	1,5484879*	1,3859304*	0,560	0,201	-0,041
24	1,6065782*	1,5324742*	1,3624909*	0,512	0,155	-0,100
25	1,6016674*	1,5137805*	1,3387959*	0,466	0,109	-0,157
26	1,5960252*	1,4925951*	1,3113541*	0,423	0,063	-0,212
27	1,5894404*	1,4691955*	1,279	0,382	0,019	-0,266
28	1,5817842*	1,4438755*	1,241	0,342	-0,026	-0,319
29	1,5729873*	1,4169226*	1,200	0,304	-0,070	-0,370
30	1,5630425*	1,3886087*	1,157	0,267	-0,114	-0,418

Note: see note A at table A.1.1

Table A.5.2: Causality Test of Hong in volatility for Bulgaria, Kernel functions: Parzen, Tukey – Hanning (Tu – Ha) and Daniell.

Causality Test of Hong						
PANEL B						
Bandwidth	ParzenBLr_i	Tu-HaBLr_i	DaniellBLr_i	ParzenBLi_r	Tu-HaBLi_r	DaniellBLi_r
1	-0,761	NaN	-1,599	NaN	NaN	3,5805223***
2	-0,814	-0,711	-0,798	1,9282782**	1,9282782**	2,1192889**
3	-0,986	-0,857	-0,942	1,9340281**	1,9543305**	2,0670655**
4	-1,126	-0,972	-1,012	1,9583186**	1,9777238**	2,1376779**
5	-1,202	-1,069	-1,159	1,9876415**	2,0719864**	2,2473096**
6	-1,220	-1,143	-1,268	2,0414626**	2,2519675**	2,552229***
7	-1,229	-1,177	-1,293	2,137926**	2,4490785***	2,6678698***
8	-1,247	-1,189	-1,310	2,2622767**	2,6347593***	2,8873223***
9	-1,281	-1,202	-1,303	2,3996774***	2,8012597***	3,20525***
10	-1,331	-1,221	-1,285	2,5356602***	2,9382934***	3,3864915***
11	-1,387	-1,246	-1,304	2,6617491***	3,0397842***	3,3828677***
12	-1,446	-1,277	-1,338	2,7744139***	3,1059382***	3,2837431***
13	-1,504	-1,313	-1,377	2,8721991***	3,140628***	3,148184***
14	-1,563	-1,351	-1,413	2,9534843***	3,1502986***	3,0481075***
15	-1,621	-1,391	-1,451	3,0177262***	3,142053***	2,9835287***
16	-1,677	-1,431	-1,492	3,0655679***	3,1219869***	2,9577276***
17	-1,730	-1,472	-1,535	3,0985029***	3,0988808***	2,9785938***
18	-1,780	-1,511	-1,579	3,11884***	3,0823738***	3,0277712***
19	-1,828	-1,548	-1,624	3,1293642***	3,0784328***	3,0896789***
20	-1,872	-1,584	-1,669	3,13305***	3,0890507***	3,1598272***
21	-1,913	-1,619	-1,713	3,1327024***	3,1134327***	3,2347465***
22	-1,953	-1,653	-1,754	3,1307789***	3,1492571***	3,3091103***
23	-1,990	-1,687	-1,793	3,1292788***	3,193613***	3,3788462***
24	-2,025	-1,720	-1,830	3,1297697***	3,243575***	3,4427211***
25	-2,060	-1,753	-1,863	3,1333532***	3,2965391***	3,5012194***
26	-2,093	-1,784	-1,893	3,1406618***	3,3503598***	3,5548568***
27	-2,125	-1,814	-1,920	3,152001***	3,4033513***	3,6033862***
28	-2,156	-1,842	-1,946	3,1674462***	3,4542395***	3,6459513***
29	-2,186	-1,868	-1,971	3,1869102***	3,5020978***	3,6816358***
30	-2,216	-1,894	-1,995	3,2102117***	3,546293***	3,7099314***

Note: see note A at table A.1.1

Table A 6.1: Causality Test of Hong in mean for Canada, Kernel functions: Parzen, Tukey – Hanning (Tu – Ha) and Daniell.

Causality Test of Hong						
PANEL A mean						
Bandwidth	ParzenCNr_i	Tu-HaCNr_i	DaniellCNr_i	ParzenCNi_r	Tu-HaCNi_r	DaniellCNi_r
1	NaN	NaN	-0,675	NaN	NaN	0,923
2	2,6320573***	2,6320573***	2,7558013***	4,0070548***	4,0070548***	4,0007359***
3	2,7313314***	3,2355448***	3,8411156***	4,0150351***	4,0363465***	4,0002259***
4	3,2898626***	4,3552556***	4,9068038***	4,0369715***	3,9543493***	3,8057702***
5	4,065346***	5,0997788***	5,4273473***	3,9976497***	3,7782011***	3,6256424***
6	4,6963047***	5,4619604***	5,4945734***	3,8954113***	3,5905203***	3,3165973***
7	5,1226427***	5,5696325***	5,4363891***	3,7686004***	3,4022394***	3,0775169***
8	5,373325***	5,5268653***	5,271984***	3,6345173***	3,2242291***	2,917548***
9	5,4919469***	5,4002293***	5,0636342***	3,5014675***	3,0786923***	2,8213379***
10	5,5182012***	5,2300677***	4,7936323***	3,3753007***	2,9704746***	2,7364254***
11	5,4819101***	5,039546***	4,5108523***	3,2603809***	2,8886504***	2,6763084***
12	5,4042946***	4,8414885***	4,2712234***	3,1595652***	2,8215694***	2,6173111***
13	5,2998824***	4,6438063***	4,0550987***	3,0733448***	2,7612756***	2,5451658***
14	5,1789298***	4,452738***	3,8688814***	3,0003505***	2,703489***	2,4650315***
15	5,0485571***	4,2730869***	3,7062982***	2,9382495***	2,6461342***	2,3861839***
16	4,9138721***	4,1073341***	3,5729623***	2,8837637***	2,5880036***	2,3186139**
17	4,7784821***	3,9557739***	3,45767***	2,8340117***	2,5286491***	2,2548271**
18	4,644973***	3,817332***	3,3462582***	2,787011***	2,468166***	2,1911347**
19	4,5150807***	3,6902705***	3,2336363***	2,7414425***	2,4068484***	2,131063**
20	4,3899542***	3,5727321***	3,1199129***	2,6965334***	2,3449918***	2,0668117**
21	4,2702541***	3,4630097***	3,0126695***	2,6518286***	2,2827959**	1,9980889**
22	4,1563363***	3,359619***	2,9141422***	2,607072***	2,2204665**	1,9277534**
23	4,0482776***	3,2613257***	2,8186615***	2,5621334***	2,1582322**	1,8577193**
24	3,9459415***	3,1671378***	2,7213121***	2,5169957***	2,096274**	1,7872114**
25	3,8490326***	3,0762877***	2,6227366***	2,4716795***	2,0347145**	1,7149292**
26	3,7571132***	2,9882638***	2,5265658***	2,4262038***	1,9736238**	1,6418048**
27	3,6696925***	2,9028017***	2,435344***	2,380595***	1,9130319**	1,5702525*
28	3,58626***	2,8198004***	2,3491841***	2,3349111***	1,8529817**	1,5019766*
29	3,5063359***	2,7392396***	2,266825**	2,2892148**	1,7935479**	1,4372441*
30	3,4295083***	2,6611235***	2,1871065**	2,2435827**	1,734805**	1,375584*

Note: see note A at table A.1.1

Table A.6.2: Causality Test of Hong in volatility for Canada, Kernel functions: Parzen, Tukey – Hanning (Tu – Ha) and Daniell.

Causality Test of Hong						
PANEL B volatility						
Bandwidth	ParzenCNr_i	Tu-HaCNr_i	DaniellCNr_i	ParzenCNi_r	Tu-HaCNi_r	DaniellCNi_r
1	NaN	NaN	-3,588	NaN	NaN	7,023466***
2	-0,688	-0,688	-0,825	-0,709	-0,709	-0,558
3	-0,698	-0,745	-0,915	-0,711	-0,716	-0,727
4	-0,751	-0,851	-1,038	-0,713	-0,653	-0,411
5	-0,829	-0,956	-1,166	-0,667	-0,441	-0,324
6	-0,905	-1,055	-1,268	-0,554	-0,241	0,032
7	-0,980	-1,148	-1,375	-0,411	-0,117	0,217
8	-1,052	-1,237	-1,474	-0,282	-0,060	0,083
9	-1,122	-1,321	-1,571	-0,188	-0,048	-0,117
10	-1,188	-1,402	-1,666	-0,127	-0,068	-0,237
11	-1,252	-1,479	-1,744	-0,094	-0,105	-0,257
12	-1,314	-1,551	-1,829	-0,083	-0,135	-0,214
13	-1,374	-1,617	-1,907	-0,086	-0,135	-0,107
14	-1,431	-1,679	-1,968	-0,095	-0,099	0,032
15	-1,486	-1,737	-2,018	-0,103	-0,034	0,181
16	-1,538	-1,790	-2,065	-0,105	0,052	0,296
17	-1,587	-1,840	-2,113	-0,097	0,148	0,427
18	-1,634	-1,887	-2,161	-0,079	0,247	0,542
19	-1,679	-1,931	-2,207	-0,050	0,343	0,609
20	-1,721	-1,973	-2,250	-0,010	0,433	0,647
21	-1,762	-2,013	-2,291	0,039	0,514	0,709
22	-1,800	-2,052	-2,331	0,096	0,586	0,778
23	-1,837	-2,090	-2,369	0,156	0,647	0,815
24	-1,872	-2,127	-2,408	0,218	0,699	0,823
25	-1,906	-2,164	-2,448	0,280	0,740	0,824
26	-1,938	-2,201	-2,489	0,341	0,773	0,827
27	-1,970	-2,237	-2,532	0,398	0,798	0,826
28	-2,000	-2,273	-2,575	0,452	0,815	0,818
29	-2,030	-2,309	-2,617	0,502	0,826	0,807
30	-2,060	-2,344	-2,660	0,547	0,831	0,798

Note: see note A at table A.1.1

Table A 7.1: Causality Test of Hong in mean for Chile, Kernel functions: Parzen, Tukey – Hanning (Tu – Ha) and Daniell.

Causality Test of Hong						
PANEL A mean						
Bandwidth	ParzenCLr_i	Tu-HaCLr_i	DaniellCLr_i	ParzenCLi_r	Tu-HaCLi_r	DaniellCLi_r
1	NaN	NaN	0,993	NaN	NaN	-1,483
2	1,3393097*	1,3393097*	1,6001526*	-0,708	-0,708	-0,791
3	1,3333332*	1,2953623*	1,4345773*	-0,720	-0,781	-0,811
4	1,2953009*	1,229	1,2957753*	-0,788	-0,916	-1,042
5	1,265	1,3725536*	1,7868805**	-0,884	-1,020	-1,039
6	1,3201259*	1,6792805**	2,1138625**	-0,965	-1,045	-0,994
7	1,4726158*	1,9984921**	2,37166***	-1,015	-1,016	-0,935
8	1,6763645**	2,2529716**	2,5689116***	-1,032	-0,974	-0,935
9	1,8908919**	2,4443291***	2,7240542***	-1,023	-0,941	-0,961
10	2,0878554**	2,5943908***	2,7878817***	-1,003	-0,913	-0,844
11	2,2564955**	2,7167781***	2,858472***	-0,978	-0,887	-0,769
12	2,3977278***	2,8173966***	2,948217***	-0,955	-0,860	-0,751
13	2,5161729***	2,8990393***	3,0634365***	-0,933	-0,834	-0,757
14	2,6166787***	2,9648444***	3,1208093***	-0,913	-0,810	-0,741
15	2,703196***	3,0182263***	3,1399234***	-0,894	-0,790	-0,719
16	2,7782016***	3,0612451***	3,1434672***	-0,876	-0,774	-0,714
17	2,8434138***	3,094696***	3,1508428***	-0,859	-0,763	-0,702
18	2,8998943***	3,1187793***	3,1541442***	-0,842	-0,755	-0,698
19	2,9484429***	3,133711***	3,1526761***	-0,827	-0,750	-0,707
20	2,98978***	3,1399167***	3,1513554***	-0,813	-0,748	-0,722
21	3,0245309***	3,137999***	3,1347622***	-0,801	-0,746	-0,728
22	3,0532037***	3,1287218***	3,1001213***	-0,791	-0,743	-0,725
23	3,0762563***	3,1129477***	3,0550542***	-0,783	-0,739	-0,721
24	3,0941521***	3,0917763***	3,0094756***	-0,776	-0,732	-0,722
25	3,1073064***	3,0664678***	2,965027***	-0,770	-0,724	-0,723
26	3,116008***	3,0381671***	2,9195414***	-0,765	-0,714	-0,720
27	3,1205277***	3,0077891***	2,8738552***	-0,760	-0,704	-0,710
28	3,1211602***	2,9760001***	2,8273302***	-0,755	-0,692	-0,690
29	3,1182159***	2,9432876***	2,780385***	-0,751	-0,680	-0,660
30	3,1120316***	2,9100127***	2,7367799***	-0,747	-0,666	-0,623

Note: see note A at table A.1.1

Table A.7.2: Causality Test of Hong in volatility for Chile, Kernel functions: Parzen, Tukey – Hanning (Tu – Ha) and Daniell.

Causality Test of Hong						
PANEL B volatility						
Bandwidth	ParzenCLr_i	Tu-HaCLr_i	DaniellCLr_i	ParzenCLi_r	Tu-HaCLi_r	DaniellCLi_r
1	NaN	NaN	-2,418	NaN	NaN	-1,099
2	-0,698	-0,698	-0,822	-0,007	-0,007	-0,116
3	-0,709	-0,764	-0,903	-0,001	0,031	0,136
4	-0,770	-0,883	-1,056	0,034	0,091	0,130
5	-0,856	-0,991	-1,143	0,072	0,078	0,259
6	-0,938	-1,081	-1,216	0,081	0,033	0,144
7	-1,012	-1,158	-1,311	0,063	-0,029	0,208
8	-1,077	-1,228	-1,366	0,029	-0,103	-0,152
9	-1,136	-1,295	-1,483	-0,014	-0,178	-0,234
10	-1,190	-1,360	-1,509	-0,062	-0,234	0,085
11	-1,242	-1,422	-1,526	-0,111	-0,262	0,415
12	-1,291	-1,479	-1,601	-0,155	-0,265	0,523
13	-1,339	-1,531	-1,690	-0,191	-0,250	0,449
14	-1,385	-1,579	-1,742	-0,218	-0,224	0,262
15	-1,429	-1,623	-1,764	-0,233	-0,193	0,051
16	-1,470	-1,664	-1,770	-0,238	-0,163	-0,061
17	-1,509	-1,702	-1,768	-0,235	-0,136	-0,101
18	-1,546	-1,738	-1,768	-0,224	-0,107	-0,069
19	-1,581	-1,772	-1,784	-0,210	-0,070	0,061
20	-1,614	-1,804	-1,818	-0,192	-0,017	0,281
21	-1,645	-1,834	-1,862	-0,171	0,062	0,547
22	-1,674	-1,862	-1,905	-0,147	0,171	0,821
23	-1,702	-1,888	-1,944	-0,117	0,310	1,107
24	-1,729	-1,912	-1,981	-0,082	0,478	1,4065747*
25	-1,754	-1,935	-2,015	-0,039	0,668	1,7165765**
26	-1,779	-1,956	-2,048	0,013	0,877	2,0247924**
27	-1,802	-1,976	-2,080	0,074	1,099	2,3213677**
28	-1,824	-1,995	-2,111	0,145	1,328892*	2,6017704***
29	-1,845	-2,013	-2,137	0,227	1,5619413*	2,8613033***
30	-1,865	-2,030	-2,157	0,319	1,7946818**	3,0950514***

Note: see note A at table A.1.1

Table A 8.1: Causality Test of Hong in mean for China, Kernel functions: Parzen, Tukey – Hanning (Tu – Ha) and Daniell.

Causality Test of Hong						
PANEL A mean						
Bandwidth	ParzenCHr_i	Tu-HaCHr_i	DaniellCHr_i	ParzenCHi_r	Tu-HaCHi_r	DaniellCHi_r
1	NaN	NaN	-0,831	NaN	NaN	0,186
2	-0,364	-0,364	-0,471	-0,476	-0,476	-0,588
3	-0,373	-0,419	-0,492	-0,468	-0,421	-0,391
4	-0,425	-0,527	-0,671	-0,417	-0,316	-0,339
5	-0,501	-0,618	-0,729	-0,350	-0,290	-0,355
6	-0,569	-0,654	-0,717	-0,311	-0,306	-0,345
7	-0,618	-0,659	-0,716	-0,304	-0,342	-0,459
8	-0,645	-0,661	-0,703	-0,317	-0,393	-0,527
9	-0,657	-0,673	-0,738	-0,341	-0,455	-0,559
10	-0,663	-0,697	-0,791	-0,373	-0,521	-0,628
11	-0,671	-0,731	-0,841	-0,412	-0,585	-0,699
12	-0,683	-0,773	-0,862	-0,454	-0,642	-0,775
13	-0,700	-0,820	-0,868	-0,499	-0,692	-0,833
14	-0,722	-0,871	-0,924	-0,543	-0,736	-0,889
15	-0,749	-0,924	-1,006	-0,585	-0,775	-0,928
16	-0,779	-0,977	-1,096	-0,626	-0,810	-0,951
17	-0,812	-1,029	-1,175	-0,663	-0,839	-0,952
18	-0,846	-1,079	-1,225	-0,697	-0,861	-0,931
19	-0,882	-1,127	-1,257	-0,728	-0,878	-0,907
20	-0,919	-1,173	-1,294	-0,756	-0,888	-0,897
21	-0,956	-1,216	-1,332	-0,781	-0,894	-0,897
22	-0,992	-1,255	-1,359	-0,802	-0,897	-0,906
23	-1,028	-1,290	-1,380	-0,821	-0,898	-0,913
24	-1,064	-1,320	-1,401	-0,837	-0,897	-0,915
25	-1,098	-1,345	-1,419	-0,851	-0,895	-0,915
26	-1,130	-1,364	-1,428	-0,862	-0,893	-0,916
27	-1,161	-1,378	-1,428	-0,871	-0,892	-0,915
28	-1,190	-1,386	-1,417	-0,878	-0,891	-0,913
29	-1,217	-1,390	-1,396	-0,884	-0,891	-0,907
30	-1,241	-1,390	-1,368	-0,888	-0,892	-0,898

Note: see note A at table A.1.1

Table A.8.2: Causality Test of Hong in volatility for China, Kernel functions: Parzen, Tukey – Hanning (Tu – Ha) and Daniell.

Causality Test of Hong						
PANEL B volatility						
Bandwidth	ParzenCHr_i	Tu-HaCHr_i	DaniellCHr_i	ParzenCHi_r	Tu-HaCHi_r	DaniellCHi_r
1	NaN	NaN	-0,576	NaN	NaN	0,863
2	0,325	0,325	0,211	-0,016	-0,016	-0,054
3	0,324	0,315	0,221	-0,029	-0,092	-0,173
4	0,313	0,264	0,114	-0,100	-0,255	-0,247
5	0,277	0,156	-0,027	-0,212	-0,410	-0,385
6	0,213	0,023	-0,198	-0,326	-0,534	-0,576
7	0,127	-0,110	-0,324	-0,429	-0,628	-0,683
8	0,033	-0,235	-0,394	-0,516	-0,671	-0,634
9	-0,062	-0,353	-0,584	-0,580	-0,648	-0,544
10	-0,155	-0,462	-0,690	-0,619	-0,569	-0,355
11	-0,244	-0,563	-0,737	-0,629	-0,454	-0,181
12	-0,329	-0,655	-0,765	-0,610	-0,321	-0,011
13	-0,409	-0,741	-0,831	-0,565	-0,183	0,170
14	-0,485	-0,820	-0,915	-0,500	-0,051	0,285
15	-0,557	-0,893	-1,008	-0,422	0,070	0,368
16	-0,625	-0,959	-1,110	-0,335	0,178	0,431
17	-0,689	-1,018	-1,203	-0,245	0,272	0,498
18	-0,749	-1,071	-1,278	-0,156	0,351	0,549
19	-0,805	-1,119	-1,332	-0,069	0,416	0,588
20	-0,858	-1,161	-1,354	0,013	0,469	0,620
21	-0,907	-1,198	-1,354	0,089	0,512	0,645
22	-0,953	-1,229	-1,341	0,159	0,546	0,657
23	-0,995	-1,252	-1,321	0,222	0,572	0,662
24	-1,034	-1,266	-1,293	0,278	0,592	0,668
25	-1,070	-1,272	-1,262	0,329	0,607	0,672
26	-1,102	-1,271	-1,231	0,373	0,619	0,670
27	-1,130	-1,263	-1,200	0,412	0,627	0,663
28	-1,154	-1,250	-1,164	0,446	0,632	0,653
29	-1,175	-1,232	-1,124	0,475	0,634	0,641
30	-1,192	-1,210	-1,081	0,500	0,635	0,628

Note: see note A at table A.1.1

Table A 9.1: Causality Test of Hong in mean for Colombia, Kernel functions: Parzen, Tukey – Hanning (Tu – Ha) and Daniell.

Causality Test of Hong						
PANEL A mean						
Bandwidth	ParzenCBr_i	Tu-HaCBr_i	DaniellCBr_i	ParzenCBi_r	Tu-HaCBi_r	DaniellCBi_r
1	NaN	NaN	0,749	NaN	NaN	0,537
2	-0,546	-0,546	-0,305	1,056	1,056	1,175
3	-0,558	-0,620	-0,604	1,085	1,230	1,4187386*
4	-0,624	-0,709	-0,548	1,246	1,5491022*	1,7669361**
5	-0,682	-0,636	-0,350	1,4690142*	1,7682582**	1,8258308**
6	-0,671	-0,493	-0,051	1,651162**	1,8645666**	1,879336**
7	-0,601	-0,366	0,004	1,7737372**	1,8968635**	1,869086**
8	-0,510	-0,278	-0,050	1,8454707**	1,8988297**	1,8754871**
9	-0,423	-0,204	-0,042	1,8808557**	1,8790749**	1,8542954**
10	-0,346	-0,123	0,047	1,8933777**	1,8410975**	1,8035208**
11	-0,279	-0,024	0,219	1,8912618**	1,7876141**	1,716316**
12	-0,216	0,104	0,471	1,877485**	1,7229454**	1,5881153*
13	-0,150	0,263	0,815	1,8535835**	1,6519731**	1,5146374*
14	-0,075	0,445	1,063	1,8213444**	1,5782582*	1,4184907*
15	0,012	0,638	1,261	1,7825029**	1,5047063*	1,3178002*
16	0,111	0,830	1,4472912*	1,7386899**	1,4343143*	1,234
17	0,221	1,014	1,6206592*	1,6914215**	1,3700002*	1,166
18	0,339	1,184	1,7475743**	1,6422451**	1,3137771*	1,126
19	0,463	1,3370561*	1,8227404**	1,5925751*	1,266	1,114
20	0,591	1,4731075*	1,8806529**	1,5436971*	1,228	1,112
21	0,720	1,5919997*	1,9369437**	1,4966489*	1,198	1,111
22	0,847	1,6946153**	1,99232**	1,4521971*	1,176	1,109
23	0,969	1,7824594**	2,0490235**	1,410882*	1,160	1,112
24	1,085	1,8575089**	2,1060575**	1,3730704*	1,151	1,123
25	1,195	1,9219002**	2,1623915**	1,3389909*	1,146	1,142
26	1,2965348*	1,9776385**	2,2150337**	1,3087929*	1,146	1,165
27	1,3906177*	2,0264081**	2,2597415**	1,2825194*	1,149	1,191
28	1,4770248*	2,0695315**	2,2959994**	1,260	1,154	1,217
29	1,5560484*	2,1079933**	2,3266113**	1,241	1,161	1,239
30	1,6281225*	2,1425041**	2,3540157***	1,226	1,169	1,255

Note: see note A at table A.1.1

Table A.9.2: Causality Test of Hong in volatility for Colombia, Kernel functions: Parzen, Tukey – Hanning (Tu – Ha) and Daniell.

Causality Test of Hong						
PANEL B volatility						
Bandwidth	ParzenCBr_i	Tu-HaCBr_i	DaniellCBr_i	ParzenCBi_r	Tu-HaCBi_r	DaniellCBi_r
1	NaN	NaN	0,024	NaN	NaN	-1,189
2	1,8363222**	1,8363222**	1,7831371**	-0,195	-0,195	-0,229
3	1,8235346**	1,7475419**	1,5343195*	-0,127	0,228	0,733
4	1,7385376**	1,5066278*	1,2923308*	0,263	1,036	1,4477761*
5	1,5816869*	1,276	1,069	0,809	1,5027952*	1,7124467**
6	1,412264*	1,079	0,834	1,233	1,7090068**	1,8500071**
7	1,256	0,904	0,619	1,4971508*	1,7864308**	1,7970597**
8	1,115	0,758	0,531	1,6478026**	1,7957483**	1,7324724**
9	0,988	0,645	0,496	1,7274265**	1,7689594**	1,6523075**
10	0,875	0,561	0,406	1,7626416**	1,7247735**	1,5806983*
11	0,778	0,495	0,350	1,7698472**	1,6789181**	1,531345*
12	0,696	0,440	0,292	1,7597157**	1,6411505**	1,4932481*
13	0,627	0,388	0,290	1,7397867**	1,6128723*	1,4906285*
14	0,569	0,336	0,273	1,7156988**	1,5922828*	1,5150373*
15	0,518	0,284	0,203	1,6911196**	1,5769676*	1,5119234*
16	0,473	0,232	0,105	1,6680029**	1,5648115*	1,4996338*
17	0,430	0,179	0,013	1,6473186**	1,554191*	1,4798886*
18	0,389	0,127	-0,060	1,6295973*	1,5437302*	1,4624232*
19	0,349	0,076	-0,113	1,614866*	1,5322696*	1,4362168*
20	0,310	0,026	-0,155	1,6024317*	1,518904*	1,4063506*
21	0,271	-0,021	-0,197	1,5914753*	1,5029852*	1,3752532*
22	0,232	-0,066	-0,237	1,5813335*	1,4841718*	1,3355466*
23	0,194	-0,109	-0,272	1,5714654*	1,4625083*	1,2912291*
24	0,156	-0,150	-0,301	1,5614543*	1,438335*	1,251
25	0,119	-0,186	-0,320	1,5509821*	1,4120812*	1,216
26	0,083	-0,219	-0,329	1,5398003*	1,3841629*	1,182
27	0,048	-0,248	-0,330	1,5277362*	1,3549938*	1,150
28	0,014	-0,272	-0,326	1,5146974*	1,324978*	1,121
29	-0,018	-0,292	-0,316	1,5006423*	1,2944843*	1,094
30	-0,049	-0,309	-0,302	1,4855601*	1,264	1,068

Note: see note A at table A.1.1

Table A 10.1: Causality Test of Hong in mean for Cyprus, Kernel functions: Parzen, Tukey – Hanning (Tu – Ha) and Daniell.

Causality Test of Hong						
PANEL A mean						
Bandwidth	ParzenCPr_i	Tu-HaCPr_i	DaniellCPr_i	ParzenCPi_r	Tu-HaCPi_r	DaniellCPi_r
1	NaN	NaN	0,688	NaN	NaN	-0,687
2	-0,256	-0,256	-0,277	2,894	2,894	2,809
3	-0,268	-0,327	-0,404	2,882	2,803	2,614
4	-0,335	-0,475	-0,551	2,792	2,503	2,201
5	-0,439	-0,624	-0,792	2,597	2,149	1,796
6	-0,546	-0,752	-0,883	2,355	1,831	1,474
7	-0,647	-0,823	-0,835	2,114	1,576	1,261
8	-0,727	-0,836	-0,788	1,895	1,381	1,113
9	-0,782	-0,815	-0,751	1,706	1,232	1,007
10	-0,810	-0,784	-0,718	1,547	1,116	0,905
11	-0,816	-0,754	-0,728	1,414	1,023	0,800
12	-0,809	-0,732	-0,727	1,303	0,943	0,713
13	-0,794	-0,717	-0,705	1,210	0,874	0,664
14	-0,778	-0,704	-0,674	1,130	0,813	0,625
15	-0,761	-0,692	-0,658	1,060	0,758	0,584
16	-0,747	-0,680	-0,655	0,999	0,710	0,542
17	-0,733	-0,668	-0,651	0,944	0,666	0,500
18	-0,722	-0,656	-0,643	0,894	0,627	0,460
19	-0,712	-0,644	-0,630	0,849	0,591	0,419
20	-0,703	-0,632	-0,610	0,807	0,557	0,379
21	-0,694	-0,620	-0,586	0,768	0,526	0,340
22	-0,685	-0,610	-0,564	0,733	0,496	0,304
23	-0,676	-0,600	-0,548	0,699	0,467	0,270
24	-0,668	-0,591	-0,538	0,669	0,439	0,241
25	-0,659	-0,583	-0,534	0,640	0,411	0,215
26	-0,650	-0,577	-0,533	0,612	0,384	0,191
27	-0,642	-0,571	-0,533	0,586	0,357	0,169
28	-0,635	-0,567	-0,533	0,561	0,332	0,147
29	-0,627	-0,563	-0,535	0,537	0,307	0,126
30	-0,620	-0,560	-0,537	0,514	0,283	0,104

Note: see note A at table A.1.1

Table A.10.2: Causality Test of Hong in volatility for Cyprus, Kernel functions: Parzen, Tukey – Hanning (Tu – Ha) and Daniell.

Causality Test Of Hong						
PANEL B volatility						
Bandwidth	ParzenCPr_i	Tu-HaCPr_i	DaniellCPr_i	ParzenCPi_r	Tu-HaCPi_r	DaniellCPi_r
1	NaN	NaN	-0,528	NaN	NaN	-2,959
2	5,722	5,722	6,226	-0,301	-0,301	-0,376
3	5,708	5,612	5,341	-0,313	-0,375	-0,560
4	5,607	5,322	5,231	-0,381	-0,509	-0,679
5	5,448	5,307	5,394	-0,474	-0,597	-0,763
6	5,364	5,360	5,407	-0,550	-0,660	-0,841
7	5,368	5,343	5,260	-0,608	-0,721	-0,915
8	5,385	5,251	4,963	-0,657	-0,781	-0,990
9	5,374	5,120	4,821	-0,703	-0,842	-1,064
10	5,329	4,981	4,754	-0,748	-0,903	-1,136
11	5,259	4,853	4,638	-0,793	-0,965	-1,209
12	5,174	4,745	4,489	-0,838	-1,028	-1,284
13	5,083	4,653	4,440	-0,884	-1,090	-1,359
14	4,994	4,573	4,424	-0,929	-1,153	-1,432
15	4,910	4,498	4,387	-0,975	-1,215	-1,502
16	4,832	4,426	4,341	-1,020	-1,277	-1,570
17	4,760	4,353	4,293	-1,066	-1,338	-1,637
18	4,693	4,279	4,228	-1,112	-1,399	-1,703
19	4,632	4,204	4,128	-1,158	-1,458	-1,767
20	4,573	4,126	3,994	-1,203	-1,516	-1,830
21	4,516	4,048	3,840	-1,249	-1,573	-1,890
22	4,460	3,969	3,687	-1,293	-1,629	-1,948
23	4,404	3,890	3,550	-1,338	-1,683	-2,004
24	4,348	3,813	3,438	-1,381	-1,736	-2,059
25	4,292	3,736	3,352	-1,425	-1,788	-2,111
26	4,236	3,660	3,291	-1,467	-1,839	-2,162
27	4,179	3,586	3,249	-1,509	-1,888	-2,211
28	4,122	3,516	3,223	-1,551	-1,937	-2,259
29	4,066	3,451	3,207	-1,592	-1,984	-2,306
30	4,009	3,392	3,200	-1,632	-2,031	-2,351

Note: see note A at table A.1.1

Table A 11.1: Causality Test of Hong in mean for Czech Republic, Kernel functions: Parzen, Tukey – Hanning (Tu – Ha) and Daniell.

Causality Test of Hong						
PANEL A mean						
Bandwidth	ParzenCZr_i	Tu-HaCZr_i	DaniellCZr_i	ParzenCZi_r	Tu-HaCZi_r	DaniellCZi_r
1	NaN	NaN	0,883	NaN	NaN	-1,952
2	0,221	0,221	0,143	-0,709	-0,709	-0,811
3	0,237	0,321	0,461	-0,707	-0,693	-0,754
4	0,329	0,494	0,564	-0,692	-0,648	-0,725
5	0,445	0,557	0,601	-0,666	-0,636	-0,732
6	0,520	0,578	0,613	-0,650	-0,659	-0,800
7	0,556	0,579	0,550	-0,653	-0,707	-0,890
8	0,571	0,570	0,575	-0,672	-0,768	-0,967
9	0,576	0,558	0,545	-0,703	-0,834	-1,041
10	0,575	0,548	0,516	-0,742	-0,899	-1,110
11	0,570	0,540	0,520	-0,786	-0,962	-1,171
12	0,563	0,537	0,529	-0,832	-1,022	-1,225
13	0,557	0,537	0,528	-0,878	-1,080	-1,291
14	0,552	0,539	0,524	-0,924	-1,138	-1,368
15	0,548	0,541	0,538	-0,970	-1,194	-1,440
16	0,546	0,545	0,575	-1,014	-1,250	-1,505
17	0,545	0,548	0,598	-1,057	-1,304	-1,554
18	0,545	0,552	0,606	-1,100	-1,358	-1,592
19	0,546	0,554	0,602	-1,141	-1,410	-1,632
20	0,547	0,555	0,590	-1,183	-1,461	-1,678
21	0,549	0,554	0,574	-1,224	-1,511	-1,726
22	0,551	0,551	0,562	-1,264	-1,559	-1,774
23	0,552	0,545	0,551	-1,303	-1,606	-1,823
24	0,553	0,537	0,539	-1,342	-1,651	-1,872
25	0,554	0,527	0,522	-1,381	-1,695	-1,921
26	0,554	0,516	0,502	-1,418	-1,737	-1,969
27	0,553	0,504	0,479	-1,455	-1,778	-2,016
28	0,551	0,490	0,455	-1,492	-1,818	-2,061
29	0,548	0,476	0,431	-1,527	-1,857	-2,104
30	0,545	0,461	0,409	-1,562	-1,895	-2,144

Note: see note A at table A.1.1

Table A.11.2: Causality Test of Hong in volatility for Czech Republic, Kernel functions: Parzen, Tukey – Hanning (Tu – Ha) and Daniell.

Causality Test of Hong						
PANEL B volatility						
Bandwidth	ParzenCZr_i	Tu-HaCZr_i	DaniellCZr_i	ParzenCZi_r	Tu-HaCZi_r	DaniellCZi_r
1	NaN	NaN	0,815	NaN	NaN	-0,605
2	5,5741287***	5,5741287***	5,4282955***	0,681	0,681	0,605
3	5,5719599***	5,5325713***	5,3083678***	0,679	0,665	0,535
4	5,5244015***	5,2324253***	4,8106078***	0,663	0,605	0,710
5	5,3395967***	4,7791213***	4,2558995***	0,624	0,524	0,467
6	5,0517065***	4,3206447***	3,7749886***	0,570	0,422	0,231
7	4,7288959***	3,9098798***	3,3165853***	0,505	0,315	0,162
8	4,4099887***	3,5555138***	3,0230372***	0,434	0,265	0,237
9	4,1114942***	3,2511407***	2,7289604***	0,372	0,287	0,325
10	3,8393356***	2,9871058***	2,459276***	0,329	0,352	0,442
11	3,5936212***	2,7562252***	2,2696642**	0,313	0,433	0,532
12	3,3721385***	2,5530999***	2,1002088**	0,323	0,512	0,586
13	3,1719773***	2,3723615***	1,9403254**	0,354	0,580	0,632
14	2,9904332***	2,2091479**	1,8075763**	0,398	0,635	0,670
15	2,8249428***	2,0595608**	1,6971213**	0,447	0,675	0,695
16	2,6732281***	1,9208111**	1,5934967*	0,496	0,702	0,705
17	2,5332826***	1,7909523**	1,4834936*	0,541	0,715	0,697
18	2,4035088***	1,6685321**	1,3620337*	0,581	0,717	0,672
19	2,282514**	1,5524584*	1,230	0,614	0,709	0,631
20	2,1690233**	1,4419086*	1,093	0,640	0,693	0,578
21	2,0619275**	1,3362912*	0,958	0,660	0,670	0,521
22	1,9603463**	1,235	0,828	0,674	0,640	0,462
23	1,8635573**	1,138	0,710	0,682	0,606	0,402
24	1,7710048**	1,046	0,606	0,684	0,568	0,340
25	1,6822535**	0,959	0,517	0,682	0,528	0,278
26	1,5970046*	0,877	0,443	0,675	0,485	0,219
27	1,515056*	0,802	0,385	0,664	0,442	0,165
28	1,436296*	0,734	0,339	0,649	0,398	0,115
29	1,3606603*	0,672	0,305	0,631	0,353	0,070
30	1,2881166*	0,616	0,281	0,611	0,310	0,030

Note: see note A at table A.1.1

Table A 12.1: Causality Test of Hong in mean for Denmark, Kernel functions: Parzen, Tukey – Hanning (Tu – Ha) and Daniell.

Causality Test of Hong						
PANEL A mean						
Bandwidth	ParzenDKr_i	Tu-HaDKr_i	DaniellDKr_i	ParzenDKi_r	Tu-HaDKi_r	DaniellDKi_r
1	NaN	NaN	-1,241	NaN	NaN	0,880
2	-0,533	-0,533	-0,360	1,3216904*	1,3216904*	1,249
3	-0,510	-0,389	0,093	1,320389*	1,3068646*	1,192
4	-0,376	-0,088	0,196	1,3042183*	1,222	1,074
5	-0,172	0,154	0,352	1,250	1,091	0,920
6	0,022	0,415	0,790	1,167	0,952	0,814
7	0,210	0,757	1,231	1,071	0,812	0,639
8	0,419	1,127	1,6317459*	0,971	0,677	0,433
9	0,653	1,4608341*	1,9134604**	0,871	0,548	0,286
10	0,902	1,7339588**	2,082812**	0,772	0,430	0,182
11	1,148	1,9457069**	2,22879**	0,675	0,328	0,083
12	1,3758204*	2,1029753**	2,2969327**	0,585	0,249	0,063
13	1,5768042*	2,2154107**	2,3450697***	0,501	0,192	0,086
14	1,747883**	2,2923418**	2,3615375***	0,426	0,151	0,078
15	1,8900509**	2,3419163***	2,3471542***	0,360	0,121	0,064
16	2,0061762**	2,3707363***	2,3253149**	0,304	0,098	0,043
17	2,099637**	2,3841125***	2,3118072**	0,256	0,079	0,005
18	2,1735744**	2,3861927***	2,2869612**	0,217	0,061	-0,031
19	2,2308838**	2,3798219***	2,2575037**	0,184	0,042	-0,058
20	2,2742715**	2,3668992***	2,2187365**	0,158	0,023	-0,088
21	2,3060963**	2,3487846***	2,1833067**	0,135	0,002	-0,122
22	2,3283564**	2,3266983**	2,1508851**	0,115	-0,020	-0,148
23	2,342713***	2,3018041**	2,1144795**	0,097	-0,043	-0,166
24	2,3505356***	2,2750378**	2,0733837**	0,080	-0,068	-0,190
25	2,352965***	2,2470634**	2,0348046**	0,064	-0,092	-0,217
26	2,3509762***	2,2183228**	2,002722**	0,047	-0,117	-0,241
27	2,3453766***	2,1890787**	1,9715491**	0,031	-0,141	-0,257
28	2,3368067***	2,159467**	1,9353692**	0,015	-0,164	-0,272
29	2,3257897**	2,1295858**	1,8951976**	-0,002	-0,185	-0,292
30	2,3127786**	2,0995266**	1,8556856**	-0,019	-0,206	-0,316

Note: see note A at table A.1.1

Table A.12.2: Causality Test of Hong in volatility for Denmark, Kernel functions: Parzen, Tukey – Hanning (Tu – Ha) and Daniell.

Causality Test of Hong						
PANEL B volatility						
Bandwidth	ParzenDKr_i	Tu-HaDKr_i	DaniellDKr_i	ParzenDKi_r	Tu-HaDKi_r	DaniellDKi_r
1	NaN	NaN	-4,524	NaN	NaN	1,3122495*
2	-0,399	-0,399	-0,451	19,403643***	19,403643***	19,159256***
3	-0,408	-0,452	-0,576	19,38911***	19,21441***	18,531613***
4	-0,456	-0,543	-0,687	19,185189***	18,123933***	16,820932***
5	-0,520	-0,599	-0,684	18,518018***	16,668896***	15,130419***
6	-0,571	-0,648	-0,759	17,563274***	15,292699***	13,725149***
7	-0,611	-0,703	-0,846	16,555721***	14,09123***	12,539531***
8	-0,649	-0,762	-0,953	15,595164***	13,062309***	11,588182***
9	-0,690	-0,823	-1,027	14,714329***	12,180982***	10,765032***
10	-0,732	-0,877	-1,074	13,919224***	11,420649***	10,059887***
11	-0,774	-0,918	-1,098	13,204849***	10,758426***	9,440408***
12	-0,814	-0,947	-1,108	12,562937***	10,176562***	8,9115497***
13	-0,851	-0,968	-1,120	11,984492***	9,6619794***	8,4449239***
14	-0,884	-0,982	-1,139	11,461407***	9,2042461***	8,0137223***
15	-0,912	-0,993	-1,157	10,9865***	8,7951118***	7,6491608***
16	-0,934	-1,001	-1,179	10,55374***	8,4279667***	7,3321112***
17	-0,952	-1,010	-1,199	10,157981***	8,0975454***	7,0387847***
18	-0,967	-1,019	-1,222	9,7949654***	7,7995571***	6,7683564***
19	-0,979	-1,030	-1,246	9,4610792***	7,5300472***	6,5300923***
20	-0,989	-1,043	-1,270	9,1533013***	7,2852984***	6,3131922***
21	-0,998	-1,057	-1,297	8,8689984***	7,0620365***	6,1106243***
22	-1,007	-1,073	-1,321	8,6058654***	6,8575446***	5,9580669***
23	-1,016	-1,090	-1,345	8,3618439***	6,6695593***	5,7917782***
24	-1,024	-1,108	-1,374	8,1350885***	6,4961164***	5,6643814***
25	-1,033	-1,127	-1,405	7,9239557***	6,3354776***	5,5063992***
26	-1,043	-1,147	-1,433	7,7270248***	6,1860976***	5,4011655***
27	-1,053	-1,168	-1,459	7,5430184***	6,0465845***	5,2993583***
28	-1,064	-1,189	-1,488	7,370748***	5,9157015***	5,1814827***
29	-1,075	-1,212	-1,520	7,2091344***	5,7923658***	5,0886182***
30	-1,087	-1,235	-1,555	7,0572282***	5,6756273***	4,9770883***

Note: see note A at table A.1.1

Table A 13.1: Causality Test of Hong in mean for Finland, Kernel functions: Parzen, Tukey – Hanning (Tu – Ha) and Daniell.

Causality Test of Hong						
PANEL A mean						
Bandwidth	ParzenFNr_i	Tu-HaFNr_i	DaniellFNr_i	ParzenFNi_r	Tu-HaFNi_r	DaniellFNi_r
1	NaN	NaN	-0,642	NaN	NaN	2,7842981***
2	0,946	0,946	0,903	-0,657	-0,657	-0,429
3	0,993	1,232	1,6108776*	-0,668	-0,718	-0,759
4	1,256	1,7430839**	1,959568**	-0,719	-0,750	-0,677
5	1,60477*	2,0037082**	2,0918079**	-0,734	-0,550	-0,280
6	1,8578286**	2,1105524**	2,1157312**	-0,649	-0,268	-0,009
7	2,0052428**	2,1491985**	2,1102737**	-0,486	-0,023	0,297
8	2,0850044**	2,146872**	2,0647182**	-0,301	0,150	0,426
9	2,1252345**	2,1228244**	1,9943109**	-0,130	0,256	0,417
10	2,140579**	2,0892057**	1,9315221**	0,010	0,308	0,359
11	2,1395099**	2,0494836**	1,8772259**	0,117	0,322	0,298
12	2,1271891**	2,0058365**	1,8298056**	0,192	0,310	0,231
13	2,1071326**	1,9610504**	1,7836704**	0,240	0,285	0,206
14	2,0823513**	1,9168596**	1,7361979**	0,268	0,258	0,231
15	2,0549618**	1,8735412**	1,6871036**	0,280	0,239	0,279
16	2,0259147**	1,8307177**	1,6368161*	0,281	0,229	0,322
17	1,9956843**	1,7878529**	1,5857956*	0,276	0,228	0,350
18	1,9646804**	1,74446**	1,5342412*	0,268	0,234	0,367
19	1,9331979**	1,7002014**	1,4821065*	0,259	0,245	0,380
20	1,9014798**	1,6549126**	1,4292773*	0,251	0,258	0,392
21	1,8696643**	1,6086476*	1,3757261*	0,245	0,272	0,406
22	1,8377649**	1,5616142*	1,3215675*	0,242	0,285	0,420
23	1,8057342**	1,5140471*	1,267	0,242	0,298	0,433
24	1,7734778**	1,4661597*	1,212	0,244	0,310	0,443
25	1,7409083**	1,4181309*	1,158	0,249	0,319	0,451
26	1,7079918**	1,3701132*	1,104	0,255	0,327	0,455
27	1,6747203**	1,3222402*	1,051	0,262	0,333	0,456
28	1,6411151**	1,275	0,999	0,270	0,338	0,455
29	1,6072091*	1,227	0,948	0,278	0,343	0,452
30	1,5730475*	1,181	0,898	0,286	0,347	0,449

Note: see note A at table A.1.1

Table A.13.2: Causality Test of Hong in volatility for Finland, Kernel functions: Parzen, Tukey – Hanning (Tu – Ha) and Daniell.

Causality Test of Hong						
PANEL B volatility						
Bandwidth	ParzenFNr_i	Tu-HaFNr_i	DaniellFNr_i	ParzenFNi_r	Tu-HaFNi_r	DaniellFNi_r
1	NaN	NaN	-1,356	NaN	NaN	-0,076
2	-0,002	-0,002	-0,116	0,294	0,294	1,4001573*
3	-0,014	-0,077	-0,185	0,282	0,223	0,136
4	-0,085	-0,241	-0,298	0,234	0,333	1,027
5	-0,198	-0,397	-0,516	0,341	1,158	2,0652334**
6	-0,311	-0,492	-0,625	0,748	2,0698814**	2,9832645***
7	-0,404	-0,536	-0,598	1,3498573*	2,8077514***	3,5903016***
8	-0,468	-0,524	-0,505	1,9652754**	3,3709542***	3,9713187***
9	-0,501	-0,469	-0,396	2,5072212***	3,7884172***	4,2251868***
10	-0,508	-0,397	-0,308	2,9599634***	4,0858474***	4,4006431***
11	-0,492	-0,327	-0,247	3,3311389***	4,2949084***	4,5288572***
12	-0,462	-0,268	-0,214	3,6317544***	4,4434764***	4,6155663***
13	-0,421	-0,224	-0,201	3,873357***	4,5488637***	4,6634624***
14	-0,377	-0,196	-0,204	4,0660045***	4,6212783***	4,6795335***
15	-0,335	-0,181	-0,218	4,2184066***	4,6672534***	4,6716429***
16	-0,298	-0,179	-0,241	4,3381917***	4,6916131***	4,6462493***
17	-0,268	-0,187	-0,272	4,4316862***	4,6982159***	4,6081535***
18	-0,244	-0,203	-0,308	4,5041158***	4,6902478***	4,5608737***
19	-0,227	-0,224	-0,348	4,559507***	4,6704104***	4,5070183***
20	-0,217	-0,250	-0,388	4,6005272***	4,6410535***	4,448551***
21	-0,212	-0,279	-0,429	4,6291724***	4,6042199***	4,386971***
22	-0,212	-0,310	-0,469	4,6471422***	4,5616353***	4,3234373***
23	-0,217	-0,342	-0,508	4,6558868***	4,5147434***	4,2588569***
24	-0,226	-0,376	-0,546	4,6566796***	4,4647477***	4,1939466***
25	-0,238	-0,409	-0,582	4,6506345***	4,4126298***	4,1292766***
26	-0,252	-0,443	-0,617	4,6387529***	4,3591743***	4,0653005***
27	-0,269	-0,476	-0,650	4,6219144***	4,3049984***	4,0023778***
28	-0,287	-0,508	-0,683	4,6008981***	4,2505824***	3,9407892***
29	-0,307	-0,540	-0,713	4,5763816***	4,1962957***	3,8807501***
30	-0,327	-0,571	-0,743	4,5489569***	4,1424209***	3,8224211***

Note: see note A at table A.1.1

Table A 14.1: Causality Test of Hong in mean for France, Kernel functions: Parzen, Tukey – Hanning (Tu – Ha) and Daniell.

Causality Test of Hong						
PANEL A mean						
Bandwidth	ParzenFRr_i	Tu-HaFRr_i	DaniellFRr_i	ParzenFRi_r	Tu-HaFRi_r	DaniellFRi_r
1	NaN	NaN	-0,147	NaN	NaN	-0,609
2	0,507	0,507	1,101	-0,477	-0,477	-0,462
3	0,529	0,640	0,792	-0,438	-0,232	0,387
4	0,662	1,032	1,5936084*	-0,211	0,256	0,600
5	0,948	1,7079098**	2,2588057**	0,120	0,616	0,912
6	1,3597886*	2,3152833**	2,9417917***	0,421	1,011	1,4790917*
7	1,8167963**	2,7340414***	3,2423669***	0,702	1,4431262*	1,9690878**
8	2,2236815**	2,9862844***	3,216071***	0,990	1,8460626**	2,3313842***
9	2,5419329***	3,1143095***	3,1069644***	1,2911291*	2,1790143**	2,5929341***
10	2,7729832***	3,1572437***	3,0257746***	1,5827612*	2,4298302***	2,7498551***
11	2,9307982***	3,1512996***	3,0012337***	1,8478081**	2,6041239***	2,8046276***
12	3,031331***	3,1320186***	3,0160669***	2,0766419**	2,7165399***	2,7930428***
13	3,0901175***	3,1221624***	3,0628895***	2,266496**	2,7830653***	2,7561948***
14	3,1212023***	3,1277815***	3,1124033***	2,4187108***	2,8162201***	2,7435397***
15	3,1357961***	3,1461643***	3,1451878***	2,5368744***	2,8249677***	2,7242868***
16	3,1422576***	3,1719086***	3,1710863***	2,6256837***	2,816285***	2,6893325***
17	3,1462173***	3,1997684***	3,2017584***	2,6899014***	2,795948***	2,6492614***
18	3,1511722***	3,2256728***	3,2163654***	2,7340463***	2,7685046***	2,6061226***
19	3,1589547***	3,2468154***	3,2127576***	2,7621088***	2,7370959***	2,5709488***
20	3,1700478***	3,261481***	3,2056484***	2,7775508***	2,7035798***	2,5357265***
21	3,1840634***	3,2689453***	3,1872298***	2,783207***	2,6689064***	2,4867445***
22	3,199642***	3,2692129***	3,152092***	2,7812631***	2,6334754***	2,42489***
23	3,2153325***	3,2626592***	3,1194007***	2,7734157***	2,5973961***	2,3565874***
24	3,2299691***	3,2498161***	3,08601***	2,7609927***	2,5606455***	2,2945551**
25	3,2426632***	3,2312886***	3,042409***	2,7450299***	2,5231775***	2,2485217**
26	3,2528067***	3,2077052***	2,989014***	2,7263663***	2,4849981***	2,2111481**
27	3,2600041***	3,1796962***	2,9308704***	2,705659***	2,4462583***	2,1734418**
28	3,264033***	3,1478786***	2,874133***	2,683425***	2,4072314***	2,1337033**
29	3,2648021***	3,1128195***	2,8213586***	2,6600597***	2,3681969***	2,0949515**
30	3,2623327***	3,0750392***	2,7706258***	2,6358444***	2,3294108**	2,0601049**

Note: see note A at table A.1.1

Table A.14.2: Causality Test of Hong in volatility for France, Kernel functions: Parzen, Tukey – Hanning (Tu – Ha) and Daniell.

Causality Test of Hong						
PANEL B volatility						
Bandwidth	ParzenFRr_i	Tu-HaFRr_i	DaniellFRr_i	ParzenFRi_r	Tu-HaFRi_r	DaniellFRi_r
1	NaN	NaN	-1,810	NaN	NaN	-1,157
2	0,122	0,122	0,388	-0,289	-0,289	-0,250
3	0,113	0,066	-0,089	-0,294	-0,319	-0,239
4	0,066	0,031	0,063	-0,323	-0,386	-0,402
5	0,053	0,240	0,405	-0,371	-0,471	-0,546
6	0,139	0,484	0,600	-0,427	-0,521	-0,543
7	0,293	0,653	0,676	-0,474	-0,477	-0,336
8	0,448	0,737	0,701	-0,490	-0,366	-0,115
9	0,571	0,758	0,642	-0,469	-0,237	-0,035
10	0,654	0,738	0,556	-0,415	-0,116	0,043
11	0,701	0,692	0,465	-0,340	-0,016	0,106
12	0,720	0,629	0,374	-0,257	0,060	0,133
13	0,716	0,556	0,296	-0,176	0,115	0,176
14	0,695	0,477	0,196	-0,103	0,154	0,230
15	0,663	0,397	0,103	-0,040	0,184	0,250
16	0,622	0,317	0,020	0,014	0,208	0,244
17	0,575	0,239	-0,072	0,060	0,228	0,238
18	0,524	0,164	-0,137	0,097	0,243	0,245
19	0,471	0,091	-0,202	0,128	0,255	0,250
20	0,416	0,021	-0,283	0,153	0,262	0,252
21	0,361	-0,047	-0,361	0,173	0,265	0,253
22	0,306	-0,112	-0,430	0,191	0,266	0,250
23	0,251	-0,174	-0,494	0,205	0,264	0,244
24	0,198	-0,234	-0,554	0,216	0,260	0,235
25	0,145	-0,290	-0,607	0,226	0,255	0,217
26	0,094	-0,343	-0,653	0,234	0,249	0,195
27	0,044	-0,394	-0,697	0,240	0,242	0,177
28	-0,004	-0,442	-0,742	0,244	0,234	0,158
29	-0,051	-0,487	-0,784	0,247	0,226	0,140
30	-0,097	-0,530	-0,818	0,249	0,217	0,123

Note: see note A at table A.1.1

Table A 15.1: Causality Test of Hong in mean for Germany, Kernel functions: Parzen, Tukey – Hanning (Tu – Ha) and Daniell.

Causality Test of Hong						
PANEL A mean						
Bandwidth	ParzenBDr_i	Tu-HaBDr_i	DaniellBDr_i	ParzenBDi_r	Tu-HaBDi_r	DaniellBDi_r
1	NaN	NaN	-2,324	NaN	NaN	1,4493992*
2	0,375	0,375	0,888	-0,256	-0,256	-0,207
3	0,404	0,556	0,828	-0,245	-0,186	-0,062
4	0,580	1,029	1,8819435**	-0,180	-0,048	0,085
5	0,920	1,7234328**	2,5287096***	-0,089	0,015	0,123
6	1,3620789*	2,3334516***	3,0029884***	-0,026	0,007	0,022
7	1,8297791**	2,7645964***	3,3901066***	-0,001	-0,032	-0,040
8	2,2446528**	3,0995387***	3,6598212***	-0,005	-0,078	-0,084
9	2,5873107***	3,3918601***	3,8504012***	-0,026	-0,099	-0,123
10	2,8707659***	3,6545937***	4,0327621***	-0,050	-0,085	-0,060
11	3,1132446***	3,8916249***	4,2702141***	-0,067	-0,043	0,112
12	3,3298649***	4,1100513***	4,4809765***	-0,073	0,018	0,257
13	3,5304905***	4,316585***	4,7011006***	-0,067	0,092	0,350
14	3,7179426***	4,5130342***	4,8899767***	-0,047	0,170	0,428
15	3,8935247***	4,6983957***	5,0717321***	-0,015	0,248	0,477
16	4,0589203***	4,8702759***	5,2277588***	0,026	0,319	0,531
17	4,2155716***	5,0261228***	5,3669044***	0,073	0,381	0,560
18	4,3639545***	5,1638807***	5,4903836***	0,122	0,432	0,588
19	4,5042628***	5,2823143***	5,5827108***	0,172	0,473	0,598
20	4,6366627***	5,3810371***	5,634279***	0,221	0,503	0,609
21	4,7611317***	5,4603979***	5,6528808***	0,268	0,525	0,619
22	4,8770312***	5,5213465***	5,6405901***	0,312	0,541	0,640
23	4,9837479***	5,5652298***	5,5979079***	0,351	0,551	0,666
24	5,080927***	5,5935717***	5,5418508***	0,386	0,559	0,684
25	5,16841***	5,6079398***	5,4864641***	0,417	0,564	0,694
26	5,2461282***	5,6098639***	5,4274191***	0,444	0,567	0,697
27	5,3141556***	5,6007884***	5,3638823***	0,466	0,569	0,691
28	5,3727122***	5,5821126***	5,2976275***	0,486	0,570	0,680
29	5,4221237***	5,5552028***	5,229025***	0,501	0,569	0,672
30	5,4627975***	5,5213523***	5,1552824***	0,514	0,567	0,655

Note: see note A at table A.1.1

Table A.15.2: Causality Test of Hong in volatility for Germany, Kernel functions: Parzen, Tukey – Hanning (Tu – Ha) and Daniell.

Causality Test of Hong						
PANEL B volatility						
Bandwidth	ParzenBDr_i	Tu-HaBDr_i	DaniellBDr_i	ParzenBDi_r	Tu-HaBDi_r	DaniellBDi_r
1	NaN	NaN	-4,570	NaN	NaN	25,916815***
2	-0,636	-0,636	-0,748	-0,497	-0,497	-0,496
3	-0,644	-0,684	-0,845	-0,509	-0,568	-0,609
4	-0,689	-0,766	-0,904	-0,576	-0,708	-0,773
5	-0,748	-0,836	-0,989	-0,675	-0,843	-0,891
6	-0,803	-0,909	-1,091	-0,775	-0,967	-1,058
7	-0,857	-0,987	-1,170	-0,870	-1,079	-1,196
8	-0,911	-1,067	-1,282	-0,960	-1,178	-1,290
9	-0,968	-1,145	-1,378	-1,042	-1,250	-0,996
10	-1,025	-1,220	-1,458	-1,115	-1,289	-1,387
11	-1,083	-1,293	-1,482	-1,175	-1,303	-1,068
12	-1,140	-1,362	-1,610	-1,223	-1,298	-0,727
13	-1,195	-1,427	-1,693	-1,256	-1,279	-1,135
14	-1,249	-1,490	-1,705	-1,276	-1,251	-1,216
15	-1,301	-1,551	-1,717	-1,285	-1,220	-0,727
16	-1,351	-1,609	-1,790	-1,284	-1,189	-0,263
17	-1,400	-1,664	-1,910	-1,276	-1,161	-0,221
18	-1,448	-1,718	-2,023	-1,263	-1,136	-0,531
19	-1,493	-1,769	-2,100	-1,248	-1,117	-0,945
20	-1,538	-1,819	-2,137	-1,231	-1,103	-1,209
21	-1,581	-1,866	-2,145	-1,213	-1,094	-1,218
22	-1,623	-1,911	-2,130	-1,196	-1,090	-0,987
23	-1,663	-1,954	-2,110	-1,180	-1,089	-0,590
24	-1,702	-1,994	-2,092	-1,165	-1,091	-0,135
25	-1,741	-2,032	-2,096	-1,152	-1,095	0,292
26	-1,777	-2,068	-2,120	-1,141	-1,100	0,625
27	-1,813	-2,102	-2,163	-1,133	-1,107	0,837
28	-1,847	-2,134	-2,219	-1,126	-1,115	0,919
29	-1,880	-2,165	-2,276	-1,121	-1,124	0,869
30	-1,913	-2,194	-2,336	-1,118	-1,135	0,729

Note: see note A at table A.1.1

Table A 16.1: Causality Test of Hong in mean for Greece, Kernel functions: Parzen, Tukey – Hanning (Tu – Ha) and Daniell.

Causality Test of Hong						
PANEL A mean						
Bandwidth	ParzenGRr_i	Tu-HaGRr_i	DaniellGRr_i	ParzenGRi_r	Tu-HaGRi_r	DaniellGRi_r
1	NaN	NaN	2,649	NaN	NaN	0,663
2	-0,693	-0,693	-0,611	1,976	1,976	1,966
3	-0,706	-0,765	-0,727	1,966	1,902	1,755
4	-0,772	-0,897	-0,875	1,894	1,687	1,463
5	-0,866	-1,011	-1,111	1,756	1,472	1,298
6	-0,953	-1,086	-1,044	1,600	1,282	1,124
7	-1,022	-1,072	-0,809	1,453	1,110	0,902
8	-1,058	-0,988	-0,697	1,317	0,950	0,726
9	-1,057	-0,882	-0,604	1,189	0,807	0,599
10	-1,023	-0,782	-0,534	1,069	0,688	0,551
11	-0,967	-0,700	-0,502	0,959	0,597	0,483
12	-0,902	-0,635	-0,437	0,860	0,530	0,428
13	-0,836	-0,577	-0,334	0,773	0,480	0,405
14	-0,774	-0,518	-0,245	0,699	0,445	0,392
15	-0,717	-0,455	-0,175	0,636	0,420	0,377
16	-0,665	-0,390	-0,110	0,585	0,401	0,371
17	-0,617	-0,323	-0,039	0,543	0,387	0,376
18	-0,570	-0,256	0,036	0,509	0,377	0,390
19	-0,524	-0,189	0,111	0,482	0,370	0,405
20	-0,478	-0,122	0,183	0,460	0,366	0,411
21	-0,432	-0,056	0,253	0,442	0,363	0,410
22	-0,384	0,009	0,320	0,427	0,362	0,407
23	-0,336	0,072	0,384	0,415	0,361	0,401
24	-0,287	0,134	0,445	0,406	0,361	0,393
25	-0,238	0,194	0,504	0,398	0,360	0,382
26	-0,190	0,252	0,560	0,392	0,360	0,372
27	-0,142	0,308	0,615	0,387	0,359	0,363
28	-0,094	0,364	0,669	0,383	0,358	0,358
29	-0,047	0,418	0,722	0,379	0,357	0,355
30	-0,001	0,471	0,773	0,376	0,356	0,353

Note: see note A at table A.1.1

Table A.16.2: Causality Test of Hong in volatility for Greece, Kernel functions: Parzen, Tukey – Hanning (Tu – Ha) and Daniell.

Causality Test of Hong						
PANEL B volatility						
Bandwidth	ParzenGRr_i	Tu-HaGRr_i	DaniellGRr_i	ParzenGRi_r	Tu-HaGRi_r	DaniellGRi_r
1	NaN	NaN	1,846	NaN	NaN	-2,413
2	0,105	0,105	0,055	-0,711	-0,711	-0,779
3	0,124	0,221	0,308	-0,712	-0,715	-0,802
4	0,230	0,427	0,613	-0,715	-0,705	-0,785
5	0,368	0,507	0,588	-0,712	-0,700	-0,804
6	0,457	0,489	0,380	-0,709	-0,720	-0,865
7	0,486	0,423	0,378	-0,714	-0,756	-0,903
8	0,475	0,371	0,368	-0,730	-0,799	-0,947
9	0,445	0,362	0,475	-0,753	-0,847	-1,013
10	0,414	0,389	0,568	-0,783	-0,899	-1,090
11	0,395	0,434	0,610	-0,815	-0,954	-1,178
12	0,390	0,482	0,669	-0,850	-1,011	-1,254
13	0,400	0,524	0,749	-0,888	-1,070	-1,313
14	0,421	0,557	0,807	-0,927	-1,127	-1,369
15	0,447	0,579	0,818	-0,967	-1,182	-1,421
16	0,475	0,591	0,803	-1,008	-1,234	-1,476
17	0,502	0,597	0,765	-1,049	-1,282	-1,528
18	0,525	0,597	0,721	-1,089	-1,326	-1,570
19	0,544	0,592	0,684	-1,129	-1,368	-1,607
20	0,560	0,585	0,656	-1,168	-1,408	-1,643
21	0,571	0,577	0,636	-1,206	-1,446	-1,681
22	0,578	0,569	0,625	-1,242	-1,483	-1,716
23	0,583	0,564	0,626	-1,276	-1,518	-1,749
24	0,585	0,561	0,637	-1,310	-1,553	-1,780
25	0,585	0,563	0,656	-1,341	-1,588	-1,812
26	0,584	0,568	0,681	-1,372	-1,621	-1,846
27	0,583	0,579	0,713	-1,402	-1,655	-1,882
28	0,581	0,595	0,752	-1,430	-1,688	-1,921
29	0,580	0,616	0,799	-1,458	-1,720	-1,961
30	0,580	0,644	0,853	-1,486	-1,753	-2,001

Note: see note A at table A.1.1

Table A 17.1: Causality Test of Hong in mean for Hungary, Kernel functions: Parzen, Tukey – Hanning (Tu – Ha) and Daniell.

Causality Test of Hong						
PANEL A mean						
Bandwidth	ParzenHNr_i	Tu-HaHNr_i	DaniellHNr_i	ParzenHNi_r	Tu-HaHNi_r	DaniellHNi_r
1	NaN	NaN	-0,168	NaN	NaN	0,204
2	-0,078	-0,078	0,033	-0,598	-0,598	-0,664
3	-0,025	0,255	0,750	-0,602	-0,621	-0,697
4	0,285	0,916	1,4397787*	-0,623	-0,657	-0,717
5	0,735	1,3900943*	1,7845467**	-0,652	-0,705	-0,768
6	1,127	1,7108414**	2,1199007**	-0,685	-0,767	-0,838
7	1,4276344*	1,9494369**	2,2706303**	-0,725	-0,831	-0,906
8	1,6607765**	2,1482051**	2,3429063***	-0,769	-0,896	-0,956
9	1,8511155**	2,3161821**	2,4761892***	-0,816	-0,961	-1,008
10	2,0123416**	2,4572044***	2,6251496***	-0,863	-1,023	-1,055
11	2,1526401**	2,585978***	2,7884868***	-0,910	-1,080	-1,127
12	2,2776141**	2,7117995***	2,9360144***	-0,956	-1,129	-1,175
13	2,3916915***	2,8331552***	3,0531405***	-1,001	-1,170	-1,191
14	2,4970481***	2,9448049***	3,1510122***	-1,042	-1,203	-1,219
15	2,5949807***	3,0422211***	3,2080172***	-1,080	-1,229	-1,242
16	2,6866379***	3,1227587***	3,2512603***	-1,115	-1,247	-1,236
17	2,772683***	3,185473***	3,2798094***	-1,145	-1,256	-1,222
18	2,8530445***	3,2307381***	3,2874922***	-1,172	-1,257	-1,206
19	2,9272773***	3,2600326***	3,2643949***	-1,193	-1,249	-1,190
20	2,9943394***	3,2754024***	3,2186383***	-1,210	-1,235	-1,172
21	3,0533681***	3,2788838***	3,1700939***	-1,223	-1,214	-1,147
22	3,1039702***	3,2723243***	3,1246542***	-1,232	-1,188	-1,110
23	3,1461038***	3,2573477***	3,0794752***	-1,236	-1,158	-1,061
24	3,1800256***	3,2354529***	3,033194***	-1,237	-1,124	-1,007
25	3,2061672***	3,2080352***	2,9819***	-1,233	-1,088	-0,949
26	3,2250818***	3,1763382***	2,923205***	-1,227	-1,049	-0,888
27	3,2373785***	3,1414596***	2,8613602***	-1,216	-1,008	-0,822
28	3,2437018***	3,1043205***	2,8040706***	-1,203	-0,966	-0,755
29	3,2446914***	3,0656598***	2,7560562***	-1,187	-0,922	-0,692
30	3,2409755***	3,0260622***	2,7165604***	-1,168	-0,879	-0,636

Note: see note A at table A.1.1

Table A.17.2: Causality Test of Hong in volatility for Hungary, Kernel functions: Parzen, Tukey – Hanning (Tu – Ha) and Daniell.

Causality Test of Hong						
PANEL B volatility						
Bandwidth	ParzenHNr_i	Tu-HaHNr_i	DaniellHNr_i	ParzenHNi_r	Tu-HaHNi_r	DaniellHNi_r
1	NaN	NaN	1,8582267**	NaN	NaN	-3,572
2	0,244	0,244	0,145	-0,673	-0,673	-0,816
3	0,612	2,5292042***	5,1790199***	-0,685	-0,746	-0,932
4	2,7282842***	6,9370506***	9,3874807***	-0,754	-0,884	-1,075
5	5,7194374***	9,6831841***	11,029687***	-0,852	-1,011	-1,198
6	8,1219724***	10,999545***	11,526288***	-0,947	-1,118	-1,344
7	9,6950404***	11,507224***	11,516097***	-1,034	-1,212	-1,395
8	10,634303***	11,604238***	11,317179***	-1,113	-1,297	-1,509
9	11,150771***	11,500319***	11,06674***	-1,184	-1,377	-1,629
10	11,396733***	11,294399***	10,739469***	-1,249	-1,451	-1,683
11	11,471673***	11,034883***	10,395128***	-1,311	-1,521	-1,690
12	11,43945***	10,747878***	9,9880945***	-1,369	-1,587	-1,724
13	11,339979***	10,448988***	9,5949959***	-1,425	-1,651	-1,802
14	11,197423***	10,147912***	9,2335695***	-1,478	-1,713	-1,890
15	11,026972***	9,8508839***	8,9102611***	-1,530	-1,772	-1,985
16	10,838836***	9,5621699***	8,6233988***	-1,579	-1,830	-2,089
17	10,640019***	9,2856427***	8,3680293***	-1,627	-1,887	-2,186
18	10,435649***	9,0244839***	8,1279947***	-1,673	-1,942	-2,263
19	10,229511***	8,7801673***	7,9602119***	-1,718	-1,996	-2,315
20	10,024507***	8,5526825***	7,7554778***	-1,762	-2,047	-2,350
21	9,8227746***	8,3410635***	7,6044833***	-1,806	-2,094	-2,371
22	9,6258938***	8,1438302***	7,4447445***	-1,848	-2,135	-2,386
23	9,4349407***	7,959312***	7,2873825***	-1,888	-2,169	-2,393
24	9,2506104***	7,7858476***	7,1118097***	-1,927	-2,197	-2,395
25	9,0732838***	7,6219045***	6,9245743***	-1,965	-2,218	-2,391
26	8,9031372***	7,4661506***	6,7764517***	-2,000	-2,233	-2,384
27	8,740161***	7,3175208***	6,6447248***	-2,033	-2,244	-2,375
28	8,5842086***	7,1751968***	6,479643***	-2,064	-2,250	-2,364
29	8,435037***	7,0385243***	6,2912757***	-2,092	-2,254	-2,352
30	8,2923519***	6,9069633***	6,1240738***	-2,118	-2,255	-2,339

Note: see note A at table A.1.1

Table A 18.1: Causality Test of Hong in mean for India, Kernel functions: Parzen, Tukey – Hanning (Tu – Ha) and Daniell.

Causality Test of Hong						
PANEL A mean						
Bandwidth	ParzenINr_i	Tu-HaINr_i	DaniellINr_i	ParzenINi_r	Tu-HaINi_r	DaniellINi_r
1	NaN	NaN	-2,539	NaN	NaN	0,019
2	-0,379	-0,379	-0,487	0,488	0,488	0,396
3	-0,391	-0,451	-0,586	0,508	0,611	0,682
4	-0,459	-0,596	-0,759	0,620	0,817	0,841
5	-0,561	-0,737	-0,932	0,760	0,880	0,797
6	-0,664	-0,854	-1,007	0,841	0,836	0,733
7	-0,759	-0,942	-1,079	0,856	0,740	0,537
8	-0,840	-1,009	-1,154	0,824	0,623	0,391
9	-0,908	-1,063	-1,219	0,765	0,501	0,331
10	-0,964	-1,111	-1,265	0,690	0,381	0,237
11	-1,012	-1,153	-1,310	0,608	0,274	0,100
12	-1,054	-1,190	-1,350	0,524	0,180	-0,041
13	-1,091	-1,220	-1,372	0,441	0,099	-0,131
14	-1,124	-1,245	-1,376	0,363	0,027	-0,165
15	-1,153	-1,266	-1,390	0,289	-0,037	-0,189
16	-1,180	-1,284	-1,411	0,222	-0,095	-0,208
17	-1,203	-1,300	-1,429	0,160	-0,144	-0,223
18	-1,224	-1,314	-1,441	0,103	-0,184	-0,246
19	-1,243	-1,329	-1,452	0,052	-0,215	-0,266
20	-1,260	-1,343	-1,470	0,006	-0,239	-0,284
21	-1,275	-1,358	-1,495	-0,036	-0,256	-0,303
22	-1,289	-1,373	-1,523	-0,073	-0,269	-0,326
23	-1,302	-1,389	-1,547	-0,106	-0,279	-0,343
24	-1,314	-1,406	-1,568	-0,136	-0,287	-0,350
25	-1,326	-1,424	-1,590	-0,161	-0,294	-0,351
26	-1,338	-1,442	-1,611	-0,184	-0,299	-0,350
27	-1,350	-1,461	-1,635	-0,203	-0,305	-0,344
28	-1,362	-1,481	-1,659	-0,220	-0,309	-0,333
29	-1,374	-1,501	-1,686	-0,234	-0,312	-0,318
30	-1,386	-1,521	-1,712	-0,245	-0,315	-0,304

Note: see note A at table A.1.1

Table A.18.2: Causality Test of Hong in volatility for India, Kernel functions: Parzen, Tukey – Hanning (Tu – Ha) and Daniell.

Causality Test of Hong						
PANEL B volatility						
Bandwidth	ParzenlNr_i	Tu-HalNr_i	DaniellINr_i	ParzenlNi_r	Tu-HalNi_r	DaniellINi_r
1	NaN	NaN	0,327	NaN	NaN	5,2747653***
2	-0,708	-0,708	-0,629	-0,250	-0,250	-0,272
3	-0,715	-0,750	-0,835	-0,255	-0,280	-0,288
4	-0,752	-0,786	-0,646	-0,284	-0,349	-0,262
5	-0,777	-0,728	-0,602	-0,334	-0,443	-0,405
6	-0,760	-0,663	-0,633	-0,396	-0,543	-0,563
7	-0,720	-0,625	-0,579	-0,466	-0,634	-0,436
8	-0,680	-0,584	-0,478	-0,535	-0,683	-0,377
9	-0,644	-0,519	-0,404	-0,594	-0,685	-0,496
10	-0,609	-0,435	-0,308	-0,636	-0,652	-0,494
11	-0,569	-0,345	-0,216	-0,658	-0,598	-0,365
12	-0,522	-0,258	-0,144	-0,660	-0,531	-0,175
13	-0,467	-0,177	-0,051	-0,645	-0,449	-0,023
14	-0,408	-0,101	0,032	-0,614	-0,346	0,118
15	-0,347	-0,033	0,082	-0,573	-0,223	0,279
16	-0,286	0,029	0,119	-0,520	-0,083	0,430
17	-0,227	0,083	0,173	-0,458	0,065	0,574
18	-0,172	0,130	0,211	-0,387	0,217	0,712
19	-0,120	0,169	0,221	-0,308	0,367	0,850
20	-0,071	0,202	0,224	-0,222	0,513	0,999
21	-0,027	0,227	0,235	-0,130	0,654	1,156
22	0,014	0,246	0,244	-0,034	0,789	1,3129688*
23	0,051	0,259	0,242	0,067	0,920	1,4535289*
24	0,084	0,267	0,226	0,169	1,048	1,5770561*
25	0,114	0,271	0,203	0,273	1,173	1,6936941**
26	0,140	0,270	0,180	0,377	1,2932603*	1,8083994**
27	0,162	0,267	0,161	0,480	1,4096118*	1,919068**
28	0,182	0,260	0,145	0,581	1,5211616*	2,0238426**
29	0,197	0,251	0,132	0,681	1,627488*	2,1236907**
30	0,210	0,240	0,117	0,778	1,728322**	2,2196056**

Note: see note A at table A.1.1

Table A 19.1: Causality Test of Hong in mean for Indonesia, Kernel functions: Parzen, Tukey – Hanning (Tu – Ha) and Daniell.

Causality Test of Hong						
PANEL A mean						
Bandwidth	ParzenIDr_i	Tiu-HaIDr_i	DaniellIDr_i	ParzenIDi_r	Tu-HaIDi_r	DaniellIDi_r
1	NaN	NaN	-1,186	NaN	NaN	-1,308
2	-0,304	-0,304	-0,187	-0,708	-0,708	-0,699
3	-0,257	-0,011	0,432	-0,705	-0,687	-0,631
4	0,017	0,593	0,982	-0,686	-0,640	-0,607
5	0,429	1,073	1,3541053*	-0,659	-0,642	-0,612
6	0,808	1,4254083*	1,6760226**	-0,649	-0,682	-0,741
7	1,120	1,6996378**	1,9031408**	-0,661	-0,710	-0,754
8	1,3731124*	1,9123846**	2,0428108**	-0,682	-0,714	-0,666
9	1,5823325*	2,0642713**	2,1537692**	-0,700	-0,692	-0,587
10	1,7544014**	2,1604595**	2,1890222**	-0,707	-0,647	-0,557
11	1,893472**	2,2101404**	2,1792999**	-0,701	-0,592	-0,490
12	2,0016112**	2,2225257**	2,1276522**	-0,684	-0,538	-0,409
13	2,0811778**	2,2057786**	2,0512794**	-0,658	-0,492	-0,344
14	2,1352044**	2,1667907**	1,9518864**	-0,627	-0,455	-0,334
15	2,1669803**	2,1111722**	1,8477302**	-0,594	-0,425	-0,353
16	2,1799513**	2,0435193**	1,7455449**	-0,560	-0,400	-0,368
17	2,1772494**	1,9676543**	1,6474419**	-0,528	-0,380	-0,357
18	2,1616153**	1,8870186**	1,5520123*	-0,499	-0,363	-0,332
19	2,1354114**	1,8046575**	1,4565962*	-0,473	-0,350	-0,306
20	2,1007653**	1,7228287**	1,3689168*	-0,451	-0,339	-0,287
21	2,0595155**	1,6429309**	1,2917586*	-0,431	-0,330	-0,275
22	2,0132734**	1,5657589*	1,220	-0,414	-0,323	-0,267
23	1,963389**	1,4917106*	1,150	-0,400	-0,317	-0,264
24	1,9110076**	1,4209455*	1,082	-0,387	-0,311	-0,263
25	1,8570621**	1,3535598*	1,017	-0,376	-0,304	-0,261
26	1,8023264**	1,289602*	0,955	-0,366	-0,296	-0,257
27	1,747421**	1,229	0,898	-0,357	-0,288	-0,254
28	1,6928577**	1,172	0,845	-0,349	-0,279	-0,255
29	1,6390355*	1,117	0,797	-0,341	-0,270	-0,258
30	1,5862613*	1,066	0,754	-0,334	-0,261	-0,259

Note: see note A at table A.1.1

Table A.19.2: Causality Test of Hong in volatility for Indonesia, Kernel functions: Parzen, Tukey – Hanning (Tu – Ha) and Daniell.

Causality Test of Hong						
PANEL B volatility						
Bandwidth	ParzenIDr_i	Tiu-HaIDr_i	DanielIDr_i	ParzenIDi_r	Tu-HaIDi_r	DanielIDi_r
1	NaN	NaN	-1,312	NaN	NaN	-0,399
2	-0,652	-0,652	-0,679	5,4613094***	5,4613094***	5,4142136***
3	-0,663	-0,719	-0,768	5,4556746***	5,3986741***	5,1901856***
4	-0,725	-0,841	-0,884	5,3895582***	5,0735664***	4,7149735***
5	-0,813	-0,950	-1,074	5,1889574***	4,6446762***	4,2333481***
6	-0,896	-1,041	-1,062	4,905756***	4,225475***	3,7012994***
7	-0,969	-1,086	-1,102	4,604033***	3,8558825***	3,3549349***
8	-1,025	-1,093	-1,029	4,3128428***	3,5450139***	3,0784098***
9	-1,063	-1,086	-0,977	4,0443877***	3,2965813***	2,902816***
10	-1,083	-1,076	-0,965	3,8053527***	3,103909***	2,7783306***
11	-1,089	-1,065	-1,014	3,5976211***	2,9508297***	2,6509053***
12	-1,088	-1,053	-1,047	3,4191968***	2,8220591***	2,516252***
13	-1,083	-1,038	-1,043	3,26623***	2,707389***	2,409363***
14	-1,076	-1,021	-1,022	3,134568***	2,6011026***	2,3219179**
15	-1,068	-1,002	-0,976	3,0200536***	2,500046***	2,2273565**
16	-1,059	-0,977	-0,927	2,918321***	2,4027796***	2,112396**
17	-1,048	-0,946	-0,874	2,8257387***	2,308811**	1,9946413**
18	-1,036	-0,906	-0,801	2,7397268***	2,217902**	1,8917297**
19	-1,022	-0,859	-0,714	2,6584858***	2,1299471**	1,792229**
20	-1,004	-0,807	-0,633	2,5808737***	2,0451924**	1,7041022**
21	-0,984	-0,752	-0,564	2,5061627***	1,9641017**	1,6353498*
22	-0,961	-0,696	-0,504	2,4339617***	1,8870167**	1,5734142*
23	-0,935	-0,641	-0,450	2,3640548***	1,8140388**	1,5073707*
24	-0,907	-0,587	-0,397	2,2963289**	1,7450497**	1,4409861*
25	-0,876	-0,536	-0,349	2,23072**	1,6798046**	1,3823993*
26	-0,844	-0,488	-0,307	2,1672032**	1,6181548*	1,3333492*
27	-0,810	-0,444	-0,274	2,1057667**	1,5600896*	1,2895153*
28	-0,774	-0,404	-0,250	2,046427**	1,5055974*	1,246
29	-0,738	-0,368	-0,236	1,9891956**	1,4546113*	1,202
30	-0,701	-0,335	-0,230	1,9340625**	1,4069919*	1,160

Note: see note A at table A.1.1

Table A 20.1: Causality Test of Hong in mean for Ireland, Kernel functions: Parzen, Tukey – Hanning (Tu – Ha) and Daniell.

Causality Test of Hong						
PANEL A mean						
Bandwidth	ParzenIRr_i	Tiu-HaIRr_i	DaniellIRr_i	ParzenIRi_r	Tu-HaIRi_r	DaniellIRi_r
1	NaN	NaN	3,171	NaN	NaN	-2,751
2	-0,419	-0,419	-0,439	0,356	0,356	0,362
3	-0,427	-0,469	-0,586	0,358	0,369	0,337
4	-0,473	-0,550	-0,577	0,370	0,386	0,364
5	-0,530	-0,594	-0,614	0,383	0,389	0,337
6	-0,572	-0,634	-0,720	0,388	0,357	0,238
7	-0,605	-0,682	-0,716	0,379	0,304	0,132
8	-0,636	-0,720	-0,733	0,355	0,243	0,088
9	-0,667	-0,743	-0,759	0,321	0,190	0,054
10	-0,696	-0,754	-0,735	0,282	0,148	0,026
11	-0,719	-0,759	-0,726	0,243	0,116	-0,021
12	-0,736	-0,763	-0,761	0,207	0,087	-0,072
13	-0,748	-0,766	-0,791	0,175	0,061	-0,117
14	-0,755	-0,768	-0,779	0,147	0,034	-0,143
15	-0,761	-0,766	-0,763	0,122	0,007	-0,185
16	-0,764	-0,761	-0,748	0,100	-0,021	-0,223
17	-0,766	-0,753	-0,721	0,079	-0,048	-0,251
18	-0,767	-0,743	-0,697	0,058	-0,075	-0,275
19	-0,766	-0,731	-0,671	0,038	-0,101	-0,300
20	-0,765	-0,718	-0,665	0,018	-0,126	-0,321
21	-0,762	-0,703	-0,643	-0,002	-0,150	-0,339
22	-0,758	-0,686	-0,615	-0,022	-0,175	-0,360
23	-0,752	-0,669	-0,576	-0,042	-0,200	-0,390
24	-0,746	-0,653	-0,528	-0,061	-0,225	-0,428
25	-0,738	-0,636	-0,487	-0,081	-0,250	-0,468
26	-0,729	-0,621	-0,464	-0,100	-0,277	-0,509
27	-0,719	-0,608	-0,450	-0,119	-0,304	-0,553
28	-0,709	-0,596	-0,438	-0,138	-0,332	-0,598
29	-0,699	-0,586	-0,439	-0,157	-0,360	-0,640
30	-0,688	-0,578	-0,460	-0,176	-0,390	-0,680

Note: see note A at table A.1.1

Table A.20.2: Causality Test of Hong in volatility for Ireland, Kernel functions: Parzen, Tukey – Hanning (Tu – Ha) and Daniell.

Causality Test of Hong						
PANEL B volatility						
Bandwidth	ParzenIRr_i	Tiu-HaIRr_i	DaniellIRr_i	ParzenIRi_r	Tu-HaIRi_r	DaniellIRi_r
1	NaN	NaN	1,015	NaN	NaN	-4,621
2	-0,708	-0,708	-0,590	-0,307	-0,307	-0,299
3	-0,703	-0,678	-0,671	-0,294	-0,225	-0,182
4	-0,673	-0,572	-0,477	-0,217	-0,039	0,078
5	-0,602	-0,417	-0,325	-0,090	0,136	0,181
6	-0,504	-0,294	-0,163	0,038	0,249	0,273
7	-0,404	-0,212	-0,201	0,144	0,294	0,292
8	-0,320	-0,162	-0,113	0,217	0,294	0,219
9	-0,257	-0,137	-0,117	0,259	0,267	0,122
10	-0,212	-0,128	-0,221	0,274	0,226	0,021
11	-0,180	-0,128	-0,198	0,271	0,177	-0,018
12	-0,160	-0,134	-0,133	0,255	0,126	-0,075
13	-0,148	-0,144	-0,034	0,231	0,082	-0,114
14	-0,143	-0,158	-0,006	0,202	0,045	-0,112
15	-0,143	-0,176	-0,087	0,171	0,016	-0,101
16	-0,146	-0,198	-0,142	0,140	-0,007	-0,124
17	-0,152	-0,225	-0,223	0,111	-0,026	-0,175
18	-0,161	-0,256	-0,332	0,083	-0,044	-0,221
19	-0,172	-0,290	-0,431	0,059	-0,061	-0,252
20	-0,186	-0,327	-0,536	0,037	-0,078	-0,276
21	-0,201	-0,366	-0,564	0,017	-0,097	-0,296
22	-0,219	-0,406	-0,575	-0,001	-0,117	-0,313
23	-0,239	-0,446	-0,559	-0,017	-0,138	-0,329
24	-0,260	-0,483	-0,542	-0,032	-0,161	-0,345
25	-0,284	-0,515	-0,541	-0,046	-0,184	-0,365
26	-0,308	-0,541	-0,538	-0,061	-0,208	-0,390
27	-0,333	-0,559	-0,538	-0,075	-0,233	-0,420
28	-0,357	-0,570	-0,530	-0,090	-0,258	-0,455
29	-0,381	-0,574	-0,506	-0,105	-0,283	-0,493
30	-0,405	-0,572	-0,479	-0,121	-0,309	-0,536

Note: see note A at table A.1.1

Table A 21.1: Causality Test of Hong in mean for Italy, Kernel functions: Parzen, Tukey – Hanning (Tu – Ha) and Daniell.

Causality Test of Hong						
PANEL A mean						
Bandwidth	ParzenITr_i	Tu-HaITr_i	DaniellITr_i	ParzenITi_r	Tu-HaITi_r	DaniellITi_r
1	NaN	NaN	-0,520	NaN	NaN	-0,577
2	2,0542609**	2,0542609**	2,4500537***	-0,635	-0,635	-0,666
3	2,0810382**	2,2101262**	2,3515276***	-0,626	-0,572	-0,503
4	2,2292417**	2,5363812***	2,8282042***	-0,567	-0,441	-0,373
5	2,470838***	2,9616025***	3,368241***	-0,482	-0,385	-0,442
6	2,7503517***	3,3013078***	3,4956311***	-0,424	-0,396	-0,392
7	3,026866***	3,4894282***	3,4934912***	-0,403	-0,418	-0,402
8	3,2493611***	3,5560311***	3,5068533***	-0,405	-0,434	-0,474
9	3,4013794***	3,5629881***	3,4438982***	-0,417	-0,446	-0,535
10	3,4924823***	3,5493662***	3,3793282***	-0,429	-0,458	-0,525
11	3,5393148***	3,5267713***	3,3793958***	-0,440	-0,467	-0,497
12	3,5573691***	3,4966505***	3,3727256***	-0,448	-0,466	-0,446
13	3,5578461***	3,4580588***	3,3364089***	-0,454	-0,456	-0,408
14	3,548124***	3,410896***	3,254182***	-0,459	-0,438	-0,354
15	3,5323098***	3,3561159***	3,1390298***	-0,460	-0,418	-0,341
16	3,5114737***	3,2948633***	3,015346***	-0,458	-0,397	-0,360
17	3,4857756***	3,2282053***	2,9136487***	-0,453	-0,380	-0,386
18	3,455451***	3,1570872***	2,8026604***	-0,445	-0,366	-0,398
19	3,4207815***	3,0823054***	2,6919453***	-0,436	-0,357	-0,402
20	3,3821***	3,0046006***	2,5986821***	-0,425	-0,351	-0,416
21	3,3397694***	2,9252357***	2,5157601***	-0,414	-0,348	-0,415
22	3,294237***	2,8460081***	2,4482946***	-0,403	-0,348	-0,406
23	3,2459975***	2,7686476***	2,3828525***	-0,392	-0,349	-0,395
24	3,1956177***	2,6944705***	2,3144037**	-0,384	-0,350	-0,377
25	3,1436625***	2,6242722***	2,2407548**	-0,376	-0,351	-0,356
26	3,0906575***	2,5583666***	2,1730616**	-0,370	-0,353	-0,342
27	3,0370802***	2,496718***	2,1122569**	-0,366	-0,354	-0,340
28	2,9833701***	2,4390675***	2,0604583**	-0,362	-0,354	-0,346
29	2,9299086***	2,3850272***	2,0208239**	-0,360	-0,354	-0,362
30	2,8770326***	2,3341662***	1,9845497**	-0,359	-0,354	-0,379

Note: see note A at table A.1.1

Table A.21.2: Causality Test of Hong in volatility for Italy, Kernel functions: Parzen, Tukey – Hanning (Tu – Ha) and Daniell.

Causality Test of Hong						
PANEL B volatility						
Bandwidth	ParzenITr_i	Tu-HaITr_i	DaniellITr_i	ParzenITi_r	Tu-HaITi_r	DaniellITi_r
1	NaN	NaN	-1,747	NaN	NaN	0,758
2	1,9588539**	1,9588539**	1,8903069**	-0,397	-0,397	1,3960383*
3	2,0521848**	2,5287008***	3,112297***	-0,397	-0,395	-0,191
4	2,5767262***	3,5509209***	3,9759447***	-0,368	0,024	1,250
5	3,2768116***	4,0909941***	4,1768454***	-0,036	1,489336*	2,9833407***
6	3,7885523***	4,2582595***	4,1539585***	0,747	3,0463328***	4,5609762***
7	4,0739772***	4,2423255***	3,9941196***	1,8071867**	4,3482285***	5,7290094***
8	4,1986785***	4,1413663***	3,8006165***	2,8761683***	5,3656863***	6,4697455***
9	4,2227132***	3,9978091***	3,5822738***	3,8258449***	6,1130861***	6,987718***
10	4,1863974***	3,8332618***	3,3779414***	4,6292078***	6,6303246***	7,1717839***
11	4,1140684***	3,6620728***	3,1888178***	5,2932941***	6,9654084***	7,2766785***
12	4,019869***	3,4929062***	2,9901625***	5,827675***	7,1650077***	7,3253901***
13	3,9125143***	3,3292394***	2,8250894***	6,2459228***	7,2676787***	7,3236318***
14	3,798006***	3,1719044***	2,6781398***	6,564752***	7,3013484***	7,2697058***
15	3,6802794***	3,0210325***	2,5088767***	6,8008133***	7,2855326***	7,1460557***
16	3,5619988***	2,8766193***	2,3754287***	6,9693671***	7,2341831***	7,0050149***
17	3,444856***	2,7384593***	2,2371675**	7,0834814***	7,1576632***	6,8775676***
18	3,3299788***	2,6061741***	2,103501**	7,1541307***	7,063695***	6,7404419***
19	3,2179852***	2,479276***	1,9634562**	7,1902687***	6,9580044***	6,5566577***
20	3,1090746***	2,3572556***	1,8466523**	7,1991985***	6,8449117***	6,370503***
21	3,00323***	2,2396763**	1,7318683**	7,1867322***	6,7276134***	6,2200202***
22	2,900396***	2,1262124**	1,6171162*	7,1573803***	6,6083781***	6,0903799***
23	2,8004691***	2,0166811**	1,5015669*	7,1147002***	6,4888376***	5,9610303***
24	2,7033595***	1,9109938**	1,4007986*	7,0615785***	6,370542***	5,8430289***
25	2,6089673***	1,8090728**	1,2958677*	7,0003556***	6,2552239***	5,7294018***
26	2,5172143***	1,7108182**	1,194	6,9329887***	6,1444858***	5,6181921***
27	2,428013***	1,6161043*	1,110	6,8611151***	6,0395009***	5,5113581***
28	2,3412668***	1,524831*	1,031	6,7861344***	5,9409373***	5,4095366***
29	2,2568746**	1,4369345*	0,946	6,7092239***	5,8490173***	5,3266569***
30	2,1747513**	1,3523596*	0,861	6,6313703***	5,7636404***	5,2560217***

Note: see note A at table A.1.1

Table A 22.1: Causality Test of Hong in mean for Japan, Kernel functions: Parzen, Tukey – Hanning (Tu – Ha) and Daniell.

Causality Test of Hong						
PANEL A mean						
Bandwidth	ParzenJPr_i	Tu-HaJPr_i	DaniellJPr_i	ParzenJPi_r	Tu-HaJPi_r	DaniellJPi_r
1	NaN	NaN	-0,393	NaN	NaN	-1,469
2	2,3568074***	2,3568074***	2,3073582**	-0,703	-0,703	-0,682
3	2,3876591***	2,5364705***	2,8431719***	-0,623	-0,202	0,306
4	2,5507115***	2,7974278***	2,8651837***	-0,157	0,811	1,3906504*
5	2,737678***	2,8944777***	2,9928638***	0,530	1,5207987*	1,8562334**
6	2,8537674***	2,962822***	3,0457617***	1,117	1,8923755**	1,9814874**
7	2,9220439***	3,014168***	3,0933952***	1,5287015*	2,0422878**	1,9774543**
8	2,9696947***	3,0339385***	3,0477583***	1,7875465**	2,0739114**	1,9267418**
9	3,0070432***	3,0274681***	2,9744497***	1,9341059**	2,0483842**	1,8683373**
10	3,031416***	3,0086214***	2,8807251***	2,0055701**	1,9936947**	1,7875435**
11	3,0418521***	2,9871633***	2,8417078***	2,0286333**	1,9222608**	1,6489586**
12	3,0414658***	2,9676267***	2,8346672***	2,0211772**	1,8404343**	1,5371743*
13	3,034205***	2,9535683***	2,8298446***	1,9943535**	1,7518655**	1,4004785*
14	3,0234907***	2,9474994***	2,8505331***	1,9547211**	1,6590899**	1,3009462*
15	3,0120723***	2,9493543***	2,8773018***	1,9062178**	1,5640604*	1,239
16	3,0019459***	2,95689***	2,8977051***	1,8513769**	1,4688459*	1,140
17	2,9942957***	2,9671635***	2,9036131***	1,7919485**	1,3753673*	1,021
18	2,9893602***	2,9774527***	2,9007054***	1,7293789**	1,2847797*	0,912
19	2,9869565***	2,9855774***	2,8896117***	1,6648041**	1,198	0,825
20	2,986759***	2,9900029***	2,8650451***	1,5991399*	1,114	0,756
21	2,9883273***	2,9898352***	2,8362823***	1,5330813*	1,033	0,682
22	2,9910862***	2,9846524***	2,8069726***	1,4671906*	0,955	0,605
23	2,99443***	2,9743277***	2,7891367***	1,4018812*	0,879	0,523
24	2,9976844***	2,9589595***	2,7732695***	1,3374761*	0,806	0,435
25	3,0002296***	2,9388564***	2,7474812***	1,274	0,735	0,345
26	3,0015027***	2,9144574***	2,7049611***	1,212	0,667	0,263
27	3,00106***	2,8862309***	2,6472158***	1,152	0,600	0,197
28	2,998608***	2,8546288***	2,5817425***	1,092	0,536	0,143
29	2,9939627***	2,8200656***	2,5135386***	1,035	0,475	0,096
30	2,9870352***	2,7829111***	2,4456658***	0,978	0,416	0,054

Note: see note A at table A.1.1

Table A.22.2: Causality Test of Hong in volatility for Japan, Kernel functions: Parzen, Tukey – Hanning (Tu – Ha) and Daniell.

Causality Test of Hong						
PANEL B volatility						
Bandwidth	ParzenJPr_i	Tu-HaJPr_i	DaniellJPr_i	ParzenJPi_r	Tu-HaJPi_r	DaniellJPi_r
1	NaN	NaN	-2,189	NaN	NaN	1,8069977**
2	5,8843272***	5,8843272***	5,8308379***	0,026	0,026	-0,046
3	5,8931776***	5,9093103***	5,7819422***	0,081	0,369	0,809
4	5,908151***	5,745513***	5,4360392***	0,398	1,014	1,314982*
5	5,8198775***	5,4281563***	4,9358994***	0,833	1,3691641*	1,4524774*
6	5,6298987***	5,0743004***	4,5850753***	1,165	1,5301639*	1,6172027*
7	5,3959741***	4,7443631***	4,2478848***	1,3685129*	1,6087451*	1,5719367*
8	5,1520787***	4,4505903***	3,9416896***	1,4893264*	1,6411094**	1,5949656*
9	4,9146573***	4,1843282***	3,6422937***	1,5614224*	1,6367235*	1,6371307*
10	4,6910968***	3,9378547***	3,3847345***	1,601925*	1,6024496*	1,5964988*
11	4,4828081***	3,7074125***	3,1483099***	1,6192526*	1,5454836*	1,4774732*
12	4,2878469***	3,4936026***	2,9371986***	1,6175643*	1,4725982*	1,3158665*
13	4,1040576***	3,2975112***	2,7278001***	1,5997892*	1,3893715*	1,132
14	3,9303696***	3,1181502***	2,5575302***	1,5689093*	1,2999103*	0,991
15	3,7661256***	2,9534416***	2,404025***	1,5275942*	1,208	0,871
16	3,6109647***	2,8015779***	2,2549807**	1,4783055*	1,117	0,783
17	3,4645125***	2,66118***	2,143365**	1,4232343*	1,032	0,762
18	3,3264553***	2,53094***	2,0384403**	1,3645273*	0,960	0,750
19	3,196411***	2,4095433***	1,9288741**	1,3041884*	0,901	0,738
20	3,0739882***	2,2957221**	1,8100219**	1,244	0,856	0,754
21	2,9586903***	2,1883779**	1,6974156**	1,186	0,823	0,750
22	2,8498597***	2,0866297**	1,5951444*	1,130	0,801	0,740
23	2,7468232***	1,9897572**	1,4972759*	1,079	0,788	0,731
24	2,6489992***	1,897147**	1,4040385*	1,032	0,782	0,724
25	2,5558668***	1,8082744**	1,3058726*	0,990	0,780	0,726
26	2,4669896***	1,7226913**	1,217	0,954	0,781	0,729
27	2,3819788***	1,6400264**	1,135	0,922	0,785	0,747
28	2,3004992**	1,5600051*	1,057	0,896	0,789	0,781
29	2,2222403**	1,4824387*	0,987	0,874	0,793	0,806
30	2,1469009**	1,407203*	0,918	0,857	0,797	0,822

Note: see note A at table A.1.1

Table A 23.1: Causality Test of Hong in mean for Luxembourg, Kernel functions: Parzen, Tukey – Hanning (Tu – Ha) and Daniell.

Causality Test of Hong						
PANEL A mean						
Bandwidth	ParzenLXr_i	Tu-HaLXr_i	DaniellLXr_i	ParzenLXi_r	Tu-HaLXi_r	DaniellLXi_r
1	NaN	NaN	-1,905	NaN	NaN	3,0692313***
2	-0,665	-0,665	-0,717	-0,708	-0,708	-0,685
3	-0,675	-0,724	-0,709	-0,703	-0,677	-0,590
4	-0,730	-0,829	-0,848	-0,675	-0,610	-0,390
5	-0,805	-0,905	-0,983	-0,635	-0,603	-0,516
6	-0,865	-0,911	-0,754	-0,615	-0,629	-0,506
7	-0,898	-0,864	-0,642	-0,618	-0,632	-0,539
8	-0,899	-0,802	-0,661	-0,626	-0,576	-0,347
9	-0,877	-0,747	-0,704	-0,620	-0,465	-0,041
10	-0,842	-0,708	-0,734	-0,591	-0,321	0,212
11	-0,804	-0,677	-0,679	-0,536	-0,168	0,390
12	-0,769	-0,640	-0,573	-0,459	-0,022	0,459
13	-0,736	-0,586	-0,462	-0,367	0,108	0,498
14	-0,705	-0,516	-0,350	-0,268	0,220	0,544
15	-0,673	-0,433	-0,235	-0,167	0,315	0,633
16	-0,638	-0,345	-0,141	-0,070	0,393	0,715
17	-0,598	-0,256	-0,058	0,022	0,461	0,818
18	-0,553	-0,169	0,021	0,107	0,525	0,889
19	-0,503	-0,088	0,089	0,184	0,590	0,955
20	-0,448	-0,015	0,138	0,254	0,657	1,031
21	-0,391	0,051	0,175	0,319	0,729	1,096
22	-0,332	0,108	0,203	0,379	0,803	1,167
23	-0,273	0,157	0,225	0,436	0,880	1,260
24	-0,215	0,198	0,243	0,491	0,958	1,3641112*
25	-0,160	0,232	0,259	0,544	1,038	1,457724*
26	-0,108	0,261	0,271	0,597	1,117	1,5386551*
27	-0,058	0,283	0,275	0,650	1,197	1,6183224*
28	-0,013	0,301	0,270	0,703	1,275	1,706932**
29	0,029	0,314	0,256	0,756	1,3529447*	1,8048883**
30	0,067	0,323	0,237	0,811	1,4295*	1,9045729**

Note: see note A at table A.1.1

Table A.23.2: Causality Test of Hong in volatility for Luxembourg, Kernel functions: Parzen, Tukey – Hanning (Tu – Ha) and Daniell.

Causality Test of Hong						
PANEL B volatility						
Bandwidth	ParzenLXr_i	Tu-HaLXr_i	DaniellLXr_i	ParzenLXi_r	Tu-HaLXi_r	DaniellLXi_r
1	NaN	NaN	-4,222	NaN	NaN	0,323
2	-0,566	-0,566	-0,693	-0,586	-0,586	-0,657
3	-0,578	-0,639	-0,809	-0,592	-0,619	-0,759
4	-0,646	-0,777	-0,989	-0,623	-0,680	-0,791
5	-0,744	-0,896	-1,059	-0,668	-0,756	-0,938
6	-0,836	-0,999	-1,166	-0,720	-0,841	-0,884
7	-0,919	-1,092	-1,317	-0,779	-0,926	-1,112
8	-0,994	-1,180	-1,438	-0,840	-1,008	-1,204
9	-1,064	-1,262	-1,516	-0,902	-1,086	-1,128
10	-1,130	-1,331	-1,568	-0,963	-1,162	-1,122
11	-1,192	-1,383	-1,594	-1,022	-1,234	-1,210
12	-1,248	-1,421	-1,613	-1,080	-1,304	-1,362
13	-1,297	-1,449	-1,638	-1,135	-1,370	-1,510
14	-1,340	-1,472	-1,667	-1,189	-1,434	-1,684
15	-1,377	-1,493	-1,698	-1,242	-1,495	-1,699
16	-1,407	-1,514	-1,729	-1,292	-1,554	-1,780
17	-1,432	-1,537	-1,763	-1,342	-1,607	-1,701
18	-1,454	-1,562	-1,799	-1,389	-1,646	-1,730
19	-1,474	-1,590	-1,839	-1,434	-1,669	-1,690
20	-1,493	-1,619	-1,882	-1,476	-1,675	-1,566
21	-1,511	-1,650	-1,928	-1,514	-1,664	-1,540
22	-1,530	-1,684	-1,976	-1,547	-1,641	-1,540
23	-1,548	-1,718	-2,025	-1,574	-1,607	-1,444
24	-1,568	-1,754	-2,074	-1,595	-1,566	-1,304
25	-1,589	-1,791	-2,123	-1,610	-1,520	-1,222
26	-1,610	-1,828	-2,171	-1,619	-1,471	-1,218
27	-1,632	-1,865	-2,218	-1,622	-1,421	-1,232
28	-1,656	-1,903	-2,265	-1,618	-1,372	-1,202
29	-1,679	-1,941	-2,309	-1,610	-1,324	-1,117
30	-1,704	-1,979	-2,353	-1,596	-1,278	-1,007

Note: see note A at table A.1.1

Table A 24.1: Causality Test of Hong in mean for Malaysia, Kernel functions: Parzen, Tukey – Hanning (Tu – Ha) and Daniell.

Causality Test of Hong						
PANEL A mean						
Bandwidth	ParzenMYr_i	Tu-HaMYr_i	DaniellMYr_i	ParzenMYi_r	Tu-HaMYi_r	DaniellMYi_r
1	NaN	NaN	2,0278685**	NaN	NaN	0,892
2	0,680	0,680	0,657	-0,666	-0,666	-0,360
3	0,694	0,769	1,041	-0,678	-0,736	-0,879
4	0,776	0,916	1,032	-0,736	-0,770	-0,648
5	0,880	1,012	1,184	-0,753	-0,544	-0,337
6	0,968	1,169	1,3969791*	-0,659	-0,280	-0,060
7	1,061	1,3608738*	1,5854352*	-0,492	-0,072	0,084
8	1,174	1,5493056*	1,7547873**	-0,317	0,075	0,197
9	1,3054356*	1,717898**	1,953205**	-0,165	0,170	0,289
10	1,4403841*	1,861638**	2,0634251**	-0,044	0,221	0,332
11	1,5687462*	1,9792885**	2,1347131**	0,048	0,239	0,274
12	1,6862029**	2,0712609**	2,1487983**	0,115	0,230	0,169
13	1,7913281**	2,1393741**	2,2213909**	0,160	0,202	0,092
14	1,883177**	2,1858971**	2,2418296**	0,186	0,161	0,007
15	1,9615866**	2,2136061**	2,2520154**	0,196	0,112	-0,042
16	2,0270716**	2,2253546**	2,2384939**	0,194	0,061	-0,068
17	2,0804562**	2,2241432**	2,1973485**	0,181	0,011	-0,103
18	2,1225443**	2,2128626**	2,1413774**	0,162	-0,034	-0,146
19	2,1542631**	2,1938172**	2,0840032**	0,137	-0,073	-0,161
20	2,1767402**	2,1687108**	2,0343642**	0,109	-0,104	-0,157
21	2,1910941**	2,1387561**	1,9888923**	0,079	-0,128	-0,159
22	2,1983262**	2,1048341**	1,9429265**	0,049	-0,146	-0,162
23	2,1993393**	2,0677398**	1,8954545**	0,019	-0,158	-0,163
24	2,1949906**	2,0282926**	1,8451037**	-0,008	-0,167	-0,164
25	2,1860509**	1,9873152**	1,7919199**	-0,034	-0,172	-0,160
26	2,1732185**	1,9456474**	1,7407205**	-0,056	-0,176	-0,154
27	2,1571126**	1,9040888**	1,6985148**	-0,077	-0,177	-0,148
28	2,1382851**	1,863306**	1,6681252**	-0,095	-0,178	-0,140
29	2,1172309**	1,8237829**	1,6468595**	-0,110	-0,177	-0,130
30	2,0944125**	1,7858166**	1,629552*	-0,123	-0,176	-0,118

Note: see note A at table A.1.1

Table A.24.2: Causality Test of Hong in volatility for Malaysia, Kernel functions: Parzen, Tukey – Hanning (Tu – Ha) and Daniell.

Causality Test of Hong						
PANEL B volatility						
Bandwidth	ParzenMYr_i	Tu-HaMYr_i	DaniellMYr_i	ParzenMYi_r	Tu-HaMYi_r	DaniellMYi_r
1	NaN	NaN	-1,575	NaN	NaN	5,1981318***
2	-0,415	-0,415	-0,531	-0,479	-0,479	-0,553
3	-0,424	-0,472	-0,610	-0,477	-0,465	-0,480
4	-0,478	-0,587	-0,707	-0,464	-0,433	-0,476
5	-0,560	-0,707	-0,889	-0,446	-0,441	-0,511
6	-0,646	-0,821	-0,953	-0,442	-0,475	-0,577
7	-0,732	-0,927	-1,022	-0,456	-0,513	-0,581
8	-0,815	-1,022	-1,171	-0,479	-0,550	-0,588
9	-0,892	-1,104	-1,292	-0,505	-0,585	-0,679
10	-0,964	-1,178	-1,365	-0,532	-0,621	-0,695
11	-1,030	-1,243	-1,379	-0,559	-0,660	-0,727
12	-1,091	-1,294	-1,407	-0,585	-0,701	-0,777
13	-1,145	-1,327	-1,423	-0,613	-0,744	-0,818
14	-1,193	-1,345	-1,420	-0,641	-0,786	-0,880
15	-1,234	-1,350	-1,417	-0,669	-0,826	-0,927
16	-1,267	-1,346	-1,414	-0,699	-0,863	-0,951
17	-1,293	-1,338	-1,387	-0,729	-0,896	-0,955
18	-1,313	-1,327	-1,352	-0,758	-0,926	-0,960
19	-1,326	-1,314	-1,318	-0,787	-0,953	-0,996
20	-1,334	-1,301	-1,297	-0,815	-0,978	-1,024
21	-1,337	-1,288	-1,298	-0,841	-0,999	-1,029
22	-1,336	-1,275	-1,298	-0,866	-1,017	-1,021
23	-1,333	-1,263	-1,287	-0,890	-1,032	-1,016
24	-1,328	-1,252	-1,274	-0,911	-1,045	-1,013
25	-1,321	-1,243	-1,269	-0,931	-1,055	-1,005
26	-1,314	-1,236	-1,271	-0,950	-1,064	-0,993
27	-1,307	-1,230	-1,276	-0,967	-1,071	-0,979
28	-1,299	-1,227	-1,283	-0,982	-1,077	-0,968
29	-1,292	-1,225	-1,291	-0,996	-1,083	-0,965
30	-1,285	-1,226	-1,301	-1,008	-1,088	-0,971

Note: see note A at table A.1.1

Table A 25.1: Causality Test of Hong in mean for Mexico, Kernel functions: Parzen, Tukey – Hanning (Tu – Ha) and Daniell.

Causality Test of Hong						
PANEL A mean						
Bandwidth	ParzenMXr_i	Tu-HaMXr_i	DaniellMXr_i	ParzenMXi_r	Tu-HaMXi_r	DaniellMXi_r
1	NaN	NaN	-0,745	NaN	NaN	6,0470141***
2	-0,335	-0,335	-0,092	2,8281875***	2,8281875***	3,0411807***
3	-0,288	-0,042	0,314	2,8168794***	2,7437993***	2,6115671***
4	-0,011	0,611	1,247	2,7385534***	2,5352291***	2,4500589***
5	0,439	1,253	1,721895**	2,6146937***	2,468371***	2,4524027***
6	0,904	1,7307259**	2,1138179**	2,5295362***	2,4593135***	2,4647365***
7	1,3143701*	2,0356355**	2,3635379***	2,4958341***	2,4282075***	2,5482224***
8	1,6413389**	2,2314727**	2,4477513***	2,4777234***	2,3584236***	2,4252573***
9	1,8875956**	2,3618573***	2,4863494***	2,4514692***	2,2586416**	2,1579311**
10	2,069447**	2,4437621***	2,4783927***	2,4092328***	2,1427997**	1,9005779**
11	2,2029472**	2,4872791***	2,467163***	2,3510574***	2,0218117**	1,7358869**
12	2,300942**	2,5076716***	2,4793215***	2,2807167**	1,9069407**	1,6672234**
13	2,3729827***	2,5188574***	2,4869527***	2,2029291**	1,8142694**	1,6584518**
14	2,4252382***	2,5273691***	2,4824646***	2,1231513**	1,755763**	1,7072439**
15	2,4623897***	2,5348354***	2,481521***	2,0466622**	1,733287**	1,8031111**
16	2,4884475***	2,5413569***	2,4881357***	1,9779598**	1,7416894**	1,9062191**
17	2,5066159***	2,5467636***	2,4970423***	1,9202106**	1,7731713**	1,9897342**
18	2,5194484***	2,5506067***	2,5037223***	1,8752329**	1,8199443**	2,0533714**
19	2,5288671***	2,5523621***	2,5056482***	1,8437305**	1,875266**	2,1071203**
20	2,5363313***	2,551633***	2,5010679***	1,8256516**	1,9338265**	2,1579264**
21	2,5427335***	2,5481769***	2,4888798***	1,820288**	1,991875**	2,2073119**
22	2,5481585***	2,5418227***	2,4689614***	1,8263024**	2,0469876**	2,253887**
23	2,5524449***	2,5324599***	2,4421661***	1,8420026**	2,0976868**	2,2957946**
24	2,5554527***	2,5200646***	2,4099729***	1,8651561**	2,143191**	2,3318014***
25	2,5570606***	2,5047486***	2,374054***	1,8936037**	2,1832671**	2,3614393***
26	2,5571817***	2,4867329***	2,3359468***	1,9254661**	2,2180406**	2,3847871***
27	2,5557681***	2,4662765***	2,2968817**	1,9591886**	2,2477986**	2,402226***
28	2,55283***	2,4436428***	2,2577367**	1,9935385**	2,2728951**	2,4142738***
29	2,548393***	2,4190812***	2,2190703**	2,0275684**	2,2937604**	2,4214984***
30	2,5424529***	2,3928177***	2,1811878**	2,0605899**	2,3108841**	2,42448***

Note: see note A at table A.1.1

Table A.25.2: Causality Test of Hong in volatility for Mexico, Kernel functions: Parzen, Tukey – Hanning (Tu – Ha) and Daniell.

Causality Test of Hong						
PANEL B volatility						
Bandwidth	ParzenMXr_i	Tu-HaMXr_i	DaniellMXr_i	ParzenMXi_r	Tu-HaMXi_r	DaniellMXi_r
1	NaN	NaN	-2,583	NaN	NaN	4,3004811***
2	-0,115	-0,115	-0,216	-0,581	-0,581	-0,656
3	-0,121	-0,149	-0,274	-0,590	-0,635	-0,627
4	-0,153	-0,227	-0,380	-0,640	-0,727	-0,724
5	-0,209	-0,327	-0,499	-0,706	-0,787	-0,838
6	-0,276	-0,438	-0,657	-0,756	-0,798	-0,656
7	-0,352	-0,545	-0,764	-0,785	-0,788	-0,548
8	-0,431	-0,642	-0,859	-0,795	-0,786	-0,658
9	-0,508	-0,728	-0,943	-0,796	-0,797	-0,810
10	-0,580	-0,802	-1,012	-0,796	-0,821	-0,864
11	-0,648	-0,868	-1,076	-0,800	-0,852	-0,831
12	-0,709	-0,928	-1,133	-0,810	-0,872	-0,833
13	-0,766	-0,985	-1,190	-0,823	-0,867	-0,768
14	-0,818	-1,040	-1,247	-0,836	-0,834	-0,611
15	-0,867	-1,093	-1,304	-0,845	-0,779	-0,439
16	-0,912	-1,144	-1,363	-0,847	-0,707	-0,315
17	-0,956	-1,194	-1,422	-0,840	-0,628	-0,239
18	-0,997	-1,242	-1,480	-0,824	-0,545	-0,183
19	-1,038	-1,290	-1,535	-0,799	-0,463	-0,120
20	-1,077	-1,336	-1,587	-0,765	-0,385	-0,040
21	-1,115	-1,381	-1,635	-0,723	-0,311	0,051
22	-1,153	-1,424	-1,678	-0,675	-0,244	0,146
23	-1,189	-1,466	-1,718	-0,624	-0,182	0,232
24	-1,225	-1,506	-1,753	-0,571	-0,126	0,302
25	-1,260	-1,544	-1,786	-0,517	-0,077	0,355
26	-1,294	-1,580	-1,817	-0,464	-0,033	0,388
27	-1,328	-1,615	-1,846	-0,413	0,005	0,406
28	-1,360	-1,648	-1,874	-0,363	0,039	0,410
29	-1,392	-1,680	-1,901	-0,316	0,069	0,405
30	-1,422	-1,710	-1,927	-0,271	0,096	0,394

Note: see note A at table A.1.1

Table A 26.1: Causality Test of Hong in mean for Netherlands, Kernel functions: Parzen, Tukey – Hanning (Tu – Ha) and Daniell.

Causality Test of Hong						
PANEL A mean						
Bandwidth	ParzenNLr_i	Tu-HaNLr_i	DaniellNLr_i	ParzenNLi_r	Tu-HaNLi_r	DaniellNLi_r
1	NaN	NaN	-1,2862927	NaN	NaN	1,2568035
2	-0,3102129	-0,3102129	-0,18259922	-0,70892404	-0,70892404	-0,73558781
3	-0,32099179	-0,37561245	-0,37510362	-0,71622311	-0,75068059	-0,68200866
4	-0,38128539	-0,49308849	-0,45697784	-0,7547907	-0,81888701	-0,8684521
5	-0,46269871	-0,56841952	-0,69603163	-0,8049479	-0,86288342	-0,79101583
6	-0,52853798	-0,61262356	-0,63497812	-0,84043071	-0,83715297	-0,72488373
7	-0,57139717	-0,56440686	-0,41539813	-0,85002002	-0,77419107	-0,57611091
8	-0,58137933	-0,43629821	-0,24425562	-0,83309884	-0,71406557	-0,4615194
9	-0,55407992	-0,28367553	-0,075858215	-0,79847139	-0,67224712	-0,4211062
10	-0,49238387	-0,14384993	0,011174444	-0,75927137	-0,64714203	-0,46861696
11	-0,4058309	-0,030588277	0,084168983	-0,72396661	-0,63291996	-0,56990049
12	-0,30977665	0,055261697	0,14846466	-0,6955886	-0,62473603	-0,63299718
13	-0,21606752	0,11718662	0,17837209	-0,67430844	-0,61542293	-0,58295416
14	-0,1312818	0,15973426	0,17812587	-0,65852224	-0,59793917	-0,48761548
15	-0,058310131	0,18717156	0,15607837	-0,64590458	-0,56685215	-0,38659451
16	0,002396733	0,20275473	0,13209197	-0,63381638	-0,51881409	-0,26670902
17	0,051556964	0,20883176	0,13430108	-0,61982523	-0,45396532	-0,12868764
18	0,090467247	0,20716509	0,137068	-0,60205675	-0,37511329	0,00255143
19	0,12050216	0,19930696	0,12957567	-0,57918211	-0,28617198	0,11791102
20	0,14291047	0,18664897	0,11805643	-0,55035205	-0,19120482	0,226958
21	0,15879124	0,1702938	0,10072291	-0,51517727	-0,093899369	0,32714097
22	0,16911581	0,15106223	0,073307475	-0,47364975	0,00269196	0,41615105
23	0,17471668	0,12955569	0,03625005	-0,42612809	0,096245168	0,49448321
24	0,17631585	0,106266	-0,007214952	-0,37345196	0,18515427	0,56165385
25	0,1745178	0,081609222	-0,053643095	-0,31659501	0,2684384	0,62053049
26	0,169821	0,055906089	-0,1003032	-0,25652937	0,34565229	0,67680183
27	0,16263926	0,029407986	-0,14549129	-0,19420424	0,41683116	0,73404747
28	0,15332738	0,002338059	-0,18843447	-0,13064994	0,482321	0,79188643
29	0,1421893	-0,02511099	-0,22886295	-0,066800408	0,54258583	0,84781315
30	0,1295041	-0,052795479	-0,26660094	-0,003464609	0,59810064	0,89953644

Note: see note A at table A.1.1

Table A.26.2: Causality Test of Hong in volatility for Netherlands, Kernel functions: Parzen, Tukey – Hanning (Tu – Ha) and Daniell.

Causality Test of Hong						
PANEL B volatility						
Bandwidth	ParzenNLr_i	Tu-HaNLr_i	DaniellNLr_i	ParzenNLi_r	Tu-HaNLi_r	DaniellNLi_r
1	-0,34547996	NaN	-0,3102129	NaN	NaN	-0,45647569
2	-0,40652668	-0,3102129	-0,65220721	1,8150149	1,8150149	1,8230533
3	-0,53190924	-0,44885861	-0,57211028	1,8037092	1,7355714	1,557864
4	-0,62024126	-0,53536995	-0,82800785	1,7278544	1,5203974	1,4420107
5	-0,44514985	-0,60514173	1,0068959	1,5891538	1,3257568	1,238246
6	-0,20600985	-0,54011913	0,82049939	1,4425517	1,1544956	0,93662607
7	-0,024046896	-0,38176325	0,49975522	1,3086799	0,99912056	0,8078895
8	0,09462181	-0,23735599	0,24868549	1,186805	0,88342732	0,74063829
9	0,16170683	-0,13081868	0,25853059	1,0785828	0,82255909	0,75847567
10	0,19514233	-0,055014937	0,16760611	0,98949037	0,80573846	0,80437287
11	0,20292915	-0,000503451	0,062910494	0,92266498	0,81402576	0,89647427
12	0,19120843	0,036960228	0,061827478	0,8782852	0,83224309	0,96417587
13	0,16837982	0,062047853	-0,015376024	0,85374757	0,85015598	0,95120532
14	0,14051787	0,078180281	-0,19519643	0,8439905	0,86187823	0,89969978
15	0,10968533	0,085871329	-0,26732003	0,84382782	0,86517494	0,83855441
16	0,075016528	0,085999863	-0,40374412	0,84848112	0,85998175	0,7789091
17	0,034892231	0,079778657	-0,2623791	0,85436354	0,84717728	0,7437057
18	-0,009696012	0,069699267	-0,40653002	0,85924864	0,82817397	0,73251346
19	-0,056786254	0,057279641	-0,47150624	0,86181901	0,80454969	0,73530366
20	-0,10472263	0,042409311	-0,59425217	0,8613604	0,77832007	0,73821993
21	-0,15186846	0,025211311	-0,65317637	0,85761902	0,75166988	0,729716
22	-0,19669811	0,005876264	-0,61336188	0,85073404	0,72631458	0,71241134
23	-0,23813801	-0,014734966	-0,70588126	0,84107039	0,70333356	0,6915558
24	-0,27564636	-0,036156248	-0,81919688	0,8291485	0,68324178	0,66815889
25	-0,30909758	-0,058580984	-0,81459021	0,81552958	0,66612946	0,64261161
26	-0,33863192	-0,081801139	-0,79070394	0,80078369	0,65177062	0,61703258
27	-0,36453325	-0,10525179	-0,89405487	0,78541817	0,6397441	0,59405989
28	-0,38715206	-0,12883043	-1,0008521	0,76984444	0,6295366	0,57545284
29	-0,40686881	-0,15279108	-1,1015251	0,75439152	0,62064723	0,56193866
30	-0,42407917	-0,17730199	-0,68672158	0,73933406	0,61268961	0,55365672

Note: see note A at table A.1.1

Table A 27.1: Causality Test of Hong in mean for Norway, Kernel functions: Parzen, Tukey – Hanning (Tu – Ha) and Daniell.

Causality Test of Hong						
PANEL A mean						
Bandwidth	ParzenNWr_i	Tu-HaNWr_i	DaniellNWr_i	ParzenNWi_r	Tu-HaNWi_r	DaniellNWi_r
1	NaN	NaN	-2,097	NaN	NaN	-0,375
2	-0,688	-0,688	-0,648	-0,681	-0,681	-0,648
3	-0,679	-0,628	-0,564	-0,673	-0,630	-0,576
4	-0,623	-0,487	-0,390	-0,624	-0,493	-0,410
5	-0,530	-0,380	-0,302	-0,532	-0,333	-0,232
6	-0,445	-0,334	-0,374	-0,422	-0,180	0,000
7	-0,387	-0,317	-0,401	-0,309	-0,065	0,051
8	-0,352	-0,308	-0,375	-0,208	0,002	0,004
9	-0,333	-0,287	-0,304	-0,125	0,028	-0,049
10	-0,319	-0,249	-0,232	-0,064	0,025	-0,083
11	-0,304	-0,205	-0,161	-0,025	0,008	-0,082
12	-0,285	-0,163	-0,145	-0,004	-0,007	-0,075
13	-0,262	-0,129	-0,154	0,004	-0,016	-0,055
14	-0,236	-0,107	-0,168	0,004	-0,020	-0,053
15	-0,209	-0,097	-0,191	0,000	-0,020	-0,041
16	-0,184	-0,098	-0,211	-0,006	-0,019	-0,034
17	-0,162	-0,108	-0,226	-0,011	-0,020	-0,049
18	-0,144	-0,126	-0,256	-0,016	-0,024	-0,056
19	-0,133	-0,149	-0,292	-0,019	-0,031	-0,076
20	-0,126	-0,176	-0,332	-0,021	-0,042	-0,104
21	-0,124	-0,206	-0,382	-0,023	-0,057	-0,126
22	-0,127	-0,238	-0,425	-0,025	-0,074	-0,156
23	-0,134	-0,271	-0,460	-0,028	-0,094	-0,191
24	-0,145	-0,304	-0,499	-0,033	-0,115	-0,230
25	-0,158	-0,339	-0,546	-0,038	-0,138	-0,273
26	-0,174	-0,373	-0,593	-0,045	-0,162	-0,316
27	-0,192	-0,408	-0,638	-0,054	-0,186	-0,359
28	-0,212	-0,443	-0,681	-0,064	-0,211	-0,400
29	-0,233	-0,477	-0,722	-0,075	-0,235	-0,433
30	-0,254	-0,511	-0,760	-0,088	-0,259	-0,452

Note: see note A at table A.1.1

Table A.27.2: Causality Test of Hong in volatility for Norway, Kernel functions: Parzen, Tukey – Hanning (Tu – Ha) and Daniell.

Causality Test of Hong						
PANEL B volatility						
Bandwidth	ParzenNWr_i	Tu-HaNWr_i	DaniellNWr_i	ParzenNWi_r	Tu-HaNWi_r	DaniellNWi_r
1	NaN	NaN	-2,637	NaN	NaN	-1,022
2	-0,696	-0,696	-0,734	-0,617	-0,617	-0,578
3	-0,708	-0,767	-0,778	-0,593	-0,466	-0,340
4	-0,774	-0,899	-0,998	-0,450	-0,126	0,068
5	-0,869	-1,011	-1,170	-0,219	0,177	0,317
6	-0,953	-1,053	-1,073	0,007	0,380	0,457
7	-1,010	-1,012	-0,933	0,194	0,487	0,468
8	-1,029	-0,927	-0,846	0,331	0,528	0,455
9	-1,013	-0,838	-0,796	0,420	0,527	0,418
10	-0,972	-0,767	-0,772	0,473	0,501	0,312
11	-0,919	-0,716	-0,758	0,496	0,459	0,297
12	-0,865	-0,683	-0,738	0,500	0,407	0,226
13	-0,815	-0,661	-0,728	0,489	0,349	0,140
14	-0,774	-0,647	-0,735	0,468	0,288	0,151
15	-0,741	-0,639	-0,727	0,439	0,225	0,062
16	-0,715	-0,635	-0,719	0,404	0,160	-0,091
17	-0,696	-0,636	-0,728	0,366	0,094	-0,172
18	-0,682	-0,641	-0,750	0,325	0,028	-0,209
19	-0,671	-0,650	-0,786	0,282	-0,039	-0,253
20	-0,665	-0,663	-0,830	0,237	-0,105	-0,307
21	-0,661	-0,679	-0,867	0,191	-0,170	-0,366
22	-0,659	-0,699	-0,903	0,145	-0,234	-0,439
23	-0,660	-0,721	-0,937	0,097	-0,296	-0,545
24	-0,664	-0,746	-0,963	0,050	-0,356	-0,655
25	-0,669	-0,773	-0,983	0,003	-0,413	-0,740
26	-0,677	-0,802	-1,008	-0,044	-0,467	-0,783
27	-0,686	-0,832	-1,039	-0,091	-0,519	-0,785
28	-0,697	-0,862	-1,072	-0,137	-0,567	-0,764
29	-0,710	-0,894	-1,104	-0,182	-0,613	-0,730
30	-0,725	-0,925	-1,140	-0,226	-0,657	-0,692

Note: see note A at table A.1.1

Table A 28.1: Causality Test of Hong in mean for Peru, Kernel functions: Parzen, Tukey – Hanning (Tu – Ha) and Daniell.

Causality Test of Hong						
PANEL A mean						
Bandwidth	ParzenPEr_i	Tiu-HaPEr_i	DaniellPEr_i	ParzenPEi_r	Tu-HaPEi_r	DaniellPEi_r
1	NaN	NaN	0,398	NaN	NaN	-1,106
2	3,1292204***	3,1292204***	4,2507882***	-0,259	-0,259	-0,375
3	3,1169809***	3,0372837***	2,8501329***	-0,271	-0,332	-0,498
4	3,0464245***	3,0280288***	3,5504652***	-0,339	-0,483	-0,648
5	3,0868212***	3,7461875***	4,5718217***	-0,445	-0,631	-0,823
6	3,4141335***	4,5698554***	5,2613209***	-0,553	-0,762	-0,931
7	3,9456484***	5,1940217***	5,6989717***	-0,656	-0,878	-1,043
8	4,4890152***	5,6116279***	6,0073293***	-0,751	-0,981	-1,147
9	4,9487407***	5,871292***	6,0894419***	-0,837	-1,073	-1,230
10	5,3068992***	6,0142657***	6,0580457***	-0,917	-1,155	-1,313
11	5,5733524***	6,0714218***	5,9900682***	-0,990	-1,229	-1,394
12	5,763579***	6,0662494***	5,92811***	-1,057	-1,292	-1,443
13	5,8923273***	6,0168029***	5,8231533***	-1,118	-1,345	-1,477
14	5,9716701***	5,9367708***	5,6887219***	-1,174	-1,389	-1,495
15	6,0114447***	5,837452***	5,5307151***	-1,225	-1,423	-1,525
16	6,0198449***	5,7277791***	5,3656082***	-1,270	-1,451	-1,571
17	6,0036681***	5,6136291***	5,1973483***	-1,310	-1,471	-1,598
18	5,9686563***	5,4984164***	5,0450722***	-1,345	-1,486	-1,585
19	5,9194668***	5,383955***	4,9047189***	-1,376	-1,497	-1,561
20	5,8598504***	5,2717037***	4,7808439***	-1,402	-1,503	-1,536
21	5,7927719***	5,1630333***	4,6702427***	-1,424	-1,506	-1,516
22	5,7206262***	5,0588775***	4,567474***	-1,443	-1,507	-1,506
23	5,6453028***	4,9601475***	4,4783363***	-1,458	-1,506	-1,505
24	5,5683009***	4,8677927***	4,4101971***	-1,471	-1,504	-1,509
25	5,4908176***	4,7824111***	4,3601989***	-1,481	-1,501	-1,513
26	5,4138493***	4,7041363***	4,3183843***	-1,488	-1,497	-1,515
27	5,3381683***	4,6327155***	4,2768869***	-1,494	-1,494	-1,517
28	5,264283***	4,5676608***	4,2337081***	-1,499	-1,490	-1,520
29	5,1925473***	4,5083545***	4,1904168***	-1,502	-1,486	-1,523
30	5,1232312***	4,4541163***	4,1487342***	-1,504	-1,483	-1,525

Note: see note A at table A.1.1

Table A.28.2: Causality Test of Hong in volatility for Peru, Kernel functions: Parzen, Tukey – Hanning (Tu – Ha) and Daniell.

Causality Test of Hong						
PANEL B volatility						
Bandwidth	ParzenPEr_i	Tiu-HaPEr_i	DaniellPEr_i	ParzenPEi_r	Tu-HaPEi_r	DaniellPEi_r
1	NaN	NaN	-0,728	NaN	NaN	0,337
2	-0,706	-0,706	-0,778	-0,709	-0,709	-0,752
3	-0,706	-0,703	-0,765	-0,721	-0,782	-0,897
4	-0,704	-0,688	-0,731	-0,789	-0,910	-1,012
5	-0,698	-0,702	-0,783	-0,880	-1,004	-1,052
6	-0,701	-0,743	-0,791	-0,958	-1,077	-1,163
7	-0,721	-0,799	-0,905	-1,021	-1,143	-1,223
8	-0,751	-0,858	-0,980	-1,076	-1,206	-1,296
9	-0,789	-0,915	-0,980	-1,126	-1,262	-1,310
10	-0,830	-0,969	-0,980	-1,173	-1,308	-1,286
11	-0,871	-1,016	-1,031	-1,216	-1,344	-1,267
12	-0,912	-1,055	-1,084	-1,255	-1,376	-1,274
13	-0,949	-1,087	-1,150	-1,290	-1,406	-1,332
14	-0,984	-1,117	-1,219	-1,321	-1,434	-1,399
15	-1,016	-1,143	-1,265	-1,349	-1,462	-1,464
16	-1,045	-1,167	-1,269	-1,374	-1,488	-1,516
17	-1,071	-1,186	-1,248	-1,397	-1,512	-1,559
18	-1,095	-1,198	-1,226	-1,419	-1,532	-1,577
19	-1,115	-1,202	-1,209	-1,440	-1,546	-1,571
20	-1,133	-1,199	-1,194	-1,459	-1,552	-1,541
21	-1,149	-1,188	-1,176	-1,477	-1,550	-1,484
22	-1,161	-1,171	-1,148	-1,492	-1,537	-1,421
23	-1,171	-1,149	-1,105	-1,506	-1,516	-1,357
24	-1,177	-1,122	-1,051	-1,516	-1,485	-1,287
25	-1,180	-1,094	-0,992	-1,523	-1,447	-1,213
26	-1,180	-1,063	-0,935	-1,527	-1,403	-1,137
27	-1,177	-1,033	-0,882	-1,526	-1,354	-1,057
28	-1,171	-1,002	-0,837	-1,522	-1,300	-0,973
29	-1,162	-0,972	-0,799	-1,513	-1,244	-0,889
30	-1,151	-0,943	-0,769	-1,500	-1,186	-0,810

Note: see note A at table A.1.1

Table A 29.1: Causality Test of Hong in mean for Portugal, Kernel functions: Parzen, Tukey – Hanning (Tu – Ha) and Daniell.

Causality Test of Hong						
PANEL A mean						
Bandwidth	ParzenPTr_i	Tu-HaPTr_i	DaniellPTr_i	ParzenPTi_r	Tu-HaPTi_r	DaniellPTi_r
1	NaN	NaN	1,092	NaN	NaN	-2,180
2	-0,670	-0,670	-0,635	-0,473	-0,473	-0,531
3	-0,667	-0,646	-0,531	-0,485	-0,548	-0,588
4	-0,644	-0,578	-0,520	-0,555	-0,695	-0,842
5	-0,600	-0,505	-0,497	-0,659	-0,831	-0,803
6	-0,547	-0,411	-0,336	-0,761	-0,937	-0,923
7	-0,486	-0,282	-0,143	-0,850	-1,010	-1,106
8	-0,412	-0,145	0,020	-0,923	-1,062	-1,152
9	-0,325	-0,027	0,089	-0,981	-1,089	-1,130
10	-0,235	0,061	0,102	-1,024	-1,075	-1,013
11	-0,147	0,116	0,107	-1,051	-1,017	-0,876
12	-0,069	0,144	0,113	-1,059	-0,928	-0,725
13	-0,005	0,151	0,135	-1,050	-0,824	-0,575
14	0,045	0,144	0,110	-1,023	-0,717	-0,460
15	0,079	0,126	0,057	-0,981	-0,615	-0,387
16	0,102	0,102	0,011	-0,926	-0,522	-0,343
17	0,114	0,073	-0,049	-0,863	-0,441	-0,306
18	0,117	0,040	-0,115	-0,795	-0,371	-0,268
19	0,113	0,006	-0,169	-0,727	-0,314	-0,230
20	0,104	-0,031	-0,206	-0,660	-0,267	-0,197
21	0,091	-0,069	-0,232	-0,597	-0,230	-0,173
22	0,075	-0,107	-0,256	-0,538	-0,202	-0,158
23	0,055	-0,145	-0,283	-0,484	-0,181	-0,151
24	0,034	-0,182	-0,313	-0,436	-0,165	-0,152
25	0,012	-0,217	-0,347	-0,393	-0,155	-0,158
26	-0,012	-0,250	-0,381	-0,355	-0,148	-0,170
27	-0,037	-0,280	-0,413	-0,322	-0,144	-0,187
28	-0,061	-0,309	-0,441	-0,293	-0,144	-0,207
29	-0,086	-0,334	-0,465	-0,269	-0,145	-0,230
30	-0,111	-0,358	-0,484	-0,248	-0,149	-0,255

Note: see note A at table A.1.1

Table A.29.2: Causality Test of Hong in volatility for Portugal, Kernel functions: Parzen, Tukey – Hanning (Tu – Ha) and Daniell.

Causality Test of Hong						
PANEL B volatility						
Bandwidth	ParzenPTr_i	Tu-HaPTr_i	DaniellPTr_i	ParzenPTi_r	Tu-HaPTi_r	DaniellPTi_r
1	NaN	NaN	-1,462	NaN	NaN	4,2404689***
2	-0,665	-0,665	-0,766	-0,654	-0,654	-0,724
3	-0,674	-0,717	-0,846	-0,663	-0,704	-0,605
4	-0,723	-0,810	-0,875	-0,709	-0,795	-0,888
5	-0,790	-0,891	-1,006	-0,775	-0,866	-0,782
6	-0,852	-0,958	-1,109	-0,827	-0,822	-0,715
7	-0,907	-1,016	-1,103	-0,840	-0,716	-0,619
8	-0,956	-1,052	-1,107	-0,811	-0,611	-0,490
9	-0,996	-1,067	-1,123	-0,751	-0,513	-0,391
10	-1,027	-1,070	-1,146	-0,678	-0,418	-0,260
11	-1,048	-1,071	-1,161	-0,604	-0,331	-0,159
12	-1,062	-1,074	-1,180	-0,534	-0,258	-0,184
13	-1,070	-1,079	-1,176	-0,468	-0,200	-0,140
14	-1,075	-1,084	-1,169	-0,407	-0,158	-0,030
15	-1,078	-1,089	-1,178	-0,351	-0,132	0,020
16	-1,081	-1,092	-1,185	-0,301	-0,118	-0,032
17	-1,084	-1,095	-1,178	-0,258	-0,114	-0,138
18	-1,087	-1,099	-1,167	-0,224	-0,119	-0,228
19	-1,091	-1,105	-1,170	-0,196	-0,131	-0,264
20	-1,094	-1,112	-1,193	-0,176	-0,149	-0,249
21	-1,098	-1,121	-1,230	-0,162	-0,171	-0,201
22	-1,102	-1,132	-1,271	-0,154	-0,196	-0,140
23	-1,106	-1,145	-1,308	-0,150	-0,224	-0,088
24	-1,110	-1,160	-1,336	-0,152	-0,254	-0,059
25	-1,115	-1,177	-1,355	-0,157	-0,286	-0,061
26	-1,121	-1,196	-1,367	-0,165	-0,319	-0,096
27	-1,127	-1,216	-1,373	-0,176	-0,352	-0,158
28	-1,134	-1,238	-1,379	-0,190	-0,385	-0,239
29	-1,142	-1,260	-1,386	-0,205	-0,418	-0,332
30	-1,151	-1,284	-1,396	-0,222	-0,452	-0,428

Note: see note A at table A.1.1

Table A 30.1: Causality Test of Hong in mean for Russia, Kernel functions: Parzen, Tukey – Hanning (Tu – Ha) and Daniell.

Causality Test of Hong						
PANEL A mean						
Bandwidth	ParzenRSr_i	Tu-HaRSr_i	DanielIRSr_i	ParzenRSi_r	Tu-HaRSi_r	DanielIRSi_r
1	NaN	NaN	2,4874225***	NaN	NaN	-2,607
2	-0,333	-0,333	-0,334	5,9438368***	5,9438368***	5,7897402***
3	-0,341	-0,383	-0,512	5,9306753***	5,8318871***	5,5531069***
4	-0,387	-0,463	-0,550	5,8173115***	5,3804993***	4,8825417***
5	-0,442	-0,492	-0,462	5,5316827***	4,824047***	4,2513785***
6	-0,477	-0,519	-0,577	5,1585394***	4,3333462***	3,7853777***
7	-0,501	-0,562	-0,556	4,7830617***	3,9250868***	3,4148869***
8	-0,525	-0,619	-0,541	4,4396193***	3,5855901***	3,0819768***
9	-0,555	-0,680	-0,618	4,135975***	3,3015914***	2,8009441***
10	-0,592	-0,739	-0,764	3,8691235***	3,0596788***	2,5818397***
11	-0,633	-0,791	-0,850	3,633562***	2,8503752***	2,3854562***
12	-0,675	-0,835	-0,892	3,4247463***	2,6695325***	2,2320467**
13	-0,716	-0,872	-0,875	3,2389151***	2,5138958***	2,09101**
14	-0,754	-0,897	-0,874	3,0728985***	2,3789969***	1,9665877**
15	-0,789	-0,903	-0,816	2,9239745***	2,2609367**	1,8631513**
16	-0,818	-0,890	-0,729	2,7898849***	2,1567006**	1,7812268**
17	-0,841	-0,860	-0,637	2,6687314***	2,0635247**	1,7112461**
18	-0,857	-0,817	-0,540	2,5590203***	1,9790474**	1,6405218**
19	-0,866	-0,764	-0,445	2,4594301***	1,901458**	1,5664012*
20	-0,866	-0,705	-0,371	2,3687322***	1,8294256**	1,4928235*
21	-0,860	-0,644	-0,312	2,2857742**	1,7619327**	1,4212828*
22	-0,846	-0,583	-0,255	2,209413**	1,6981481**	1,3508452*
23	-0,827	-0,522	-0,199	2,1386316**	1,6373944*	1,2827084*
24	-0,801	-0,463	-0,149	2,0726084**	1,5791123*	1,217
25	-0,770	-0,407	-0,102	2,0106643**	1,5228427*	1,154
26	-0,736	-0,353	-0,057	1,9522627**	1,4682269*	1,094
27	-0,699	-0,303	-0,012	1,8969429**	1,4150221*	1,036
28	-0,660	-0,256	0,030	1,8442665**	1,363089*	0,981
29	-0,620	-0,211	0,068	1,7938499**	1,3123521*	0,930
30	-0,580	-0,169	0,103	1,7453872**	1,263	0,883

Note: see note A at table A.1.1

Table A.30.2: Causality Test of Hong in volatility for Russia, Kernel functions: Parzen, Tukey – Hanning (Tu – Ha) and Daniell.

Causality Test of Hong						
PANEL B volatility						
Bandwidth	ParzenRSr_i	Tu-HaRSr_i	DaniellRSr_i	ParzenRSi_r	Tu-HaRSi_r	DaniellRSi_r
1	NaN	NaN	1,3395174*	NaN	NaN	-3,722
2	0,916	0,916	0,936	-0,504	-0,504	-0,600
3	0,905	0,847	0,710	-0,470	-0,293	-0,114
4	0,841	0,692	0,546	-0,275	0,122	0,246
5	0,741	0,596	0,460	0,003	0,364	0,385
6	0,656	0,533	0,481	0,221	0,460	0,407
7	0,596	0,477	0,350	0,353	0,470	0,327
8	0,548	0,418	0,361	0,420	0,429	0,210
9	0,504	0,356	0,221	0,440	0,360	0,093
10	0,460	0,291	0,097	0,430	0,279	-0,014
11	0,415	0,227	0,085	0,399	0,197	-0,096
12	0,370	0,166	0,124	0,355	0,118	-0,170
13	0,323	0,108	0,146	0,304	0,045	-0,231
14	0,277	0,053	0,099	0,249	-0,022	-0,299
15	0,232	-0,001	0,005	0,194	-0,085	-0,378
16	0,187	-0,054	-0,101	0,140	-0,146	-0,456
17	0,144	-0,107	-0,231	0,087	-0,204	-0,527
18	0,102	-0,158	-0,332	0,036	-0,262	-0,591
19	0,060	-0,209	-0,391	-0,012	-0,318	-0,653
20	0,020	-0,259	-0,467	-0,059	-0,374	-0,715
21	-0,019	-0,307	-0,506	-0,105	-0,429	-0,775
22	-0,058	-0,353	-0,509	-0,149	-0,484	-0,835
23	-0,096	-0,394	-0,522	-0,193	-0,538	-0,894
24	-0,133	-0,428	-0,536	-0,235	-0,590	-0,953
25	-0,170	-0,453	-0,520	-0,277	-0,642	-1,008
26	-0,205	-0,468	-0,473	-0,319	-0,692	-1,060
27	-0,238	-0,475	-0,421	-0,360	-0,741	-1,110
28	-0,269	-0,474	-0,384	-0,400	-0,789	-1,159
29	-0,298	-0,466	-0,361	-0,440	-0,836	-1,208
30	-0,324	-0,451	-0,333	-0,480	-0,882	-1,257

Note: see note A at table A.1.1

Table A 31.1: Causality Test of Hong in mean for Slovenja, Kernel functions: Parzen, Tukey – Hanning (Tu – Ha) and Daniell.

Causality Test of Hong						
PANEL A mean						
Bandwidth	ParzenSJr_i	Tu-HaSJr_i	DaniellSJr_i	ParzenSJi_r	Tu-HaSJi_r	DaniellSJi_r
1	NaN	NaN	-1,103	NaN	NaN	0,926
2	1,7761539**	1,7761539**	1,6575549**	-0,474	-0,474	-0,543
3	1,8117932**	1,9886244**	2,1876531**	-0,383	0,090	0,717
4	2,0051219**	2,3207396**	2,4729984***	0,138	1,186	1,7670171**
5	2,2351818**	2,4140833***	2,280528**	0,879	1,8552646**	2,1541457**
6	2,3625463***	2,3457581***	2,2787858**	1,4692969*	2,151553**	2,2972926**
7	2,3850869***	2,2082014**	2,1520657**	1,8445906**	2,2412459**	2,2312755**
8	2,3395262***	2,0518353**	1,8758209**	2,0560131**	2,2246489**	2,1363216**
9	2,2560213**	1,8953412**	1,6139446*	2,1580051**	2,1550924**	2,030514**
10	2,1543875**	1,7435619**	1,4659564*	2,1903897**	2,0608241**	1,8970734**
11	2,0456279**	1,6007461*	1,361597*	2,1791727**	1,9585671**	1,7658099**
12	1,9360066**	1,4805529*	1,2954088*	2,1412352**	1,8591953**	1,6471595**
13	1,829984**	1,3939775*	1,273	2,0876352**	1,7678319**	1,5643441*
14	1,7313123**	1,3408996*	1,2805374*	2,0259396**	1,6869028**	1,5020431*
15	1,6428173**	1,314874*	1,294929*	1,9611825**	1,6173301*	1,45431*
16	1,5664291*	1,3079433*	1,3190189*	1,8967075**	1,558544*	1,4211901*
17	1,503013*	1,313151*	1,3583836*	1,8346649**	1,5097635*	1,3960484*
18	1,4526718*	1,3258398*	1,3973071*	1,776489**	1,47048*	1,379063*
19	1,4148959*	1,3432222*	1,426871*	1,7230383**	1,4399721*	1,3664057*
20	1,3887891*	1,3633195*	1,4482952*	1,6746902**	1,4170036*	1,3524532*
21	1,3730635*	1,384601*	1,4658642*	1,6315135*	1,3999959*	1,3397503*
22	1,3656524*	1,4059302*	1,4801863*	1,5933237*	1,3873521*	1,3336887*
23	1,3645235*	1,4264955*	1,4895176*	1,5598208*	1,3778396*	1,3339488*
24	1,3680037*	1,4456983*	1,4939529*	1,5307044*	1,3706814*	1,3359263*
25	1,3747414*	1,4630931*	1,4961126*	1,5056301*	1,3653515*	1,3363236*
26	1,3836833*	1,4784403*	1,498914*	1,4841422*	1,3614226*	1,335143*
27	1,3940182*	1,4916838*	1,5036323*	1,4657916*	1,3585136*	1,3339929*
28	1,4051482*	1,5028439*	1,5096634*	1,4501969*	1,3563386*	1,3339685*
29	1,4166315*	1,5120006*	1,5154488*	1,4370214*	1,3547143*	1,3349157*
30	1,4281483*	1,5193326*	1,5195327*	1,425961*	1,3534925*	1,335883*

Note: see note A at table A.1.1

Table A.31.2: Causality Test of Hong in volatility for Slovenja, Kernel functions: Parzen, Tukey – Hanning (Tu – Ha) and Daniell.

Causality Test of Hong						
PANEL B volatility						
Bandwidth	ParzenSJr_i	Tu-HaSJr_i	DaniellSJr_i	ParzenSJi_r	Tu-HaSJi_r	DaniellSJi_r
1	NaN	NaN	-0,565	NaN	NaN	1,6343555*
2	-0,512	-0,512	-0,547	-0,604	-0,604	-0,721
3	-0,486	-0,348	-0,137	-0,617	-0,678	-0,797
4	-0,335	-0,030	0,151	-0,686	-0,819	-1,004
5	-0,123	0,132	0,153	-0,786	-0,946	-1,082
6	0,033	0,179	0,119	-0,881	-1,041	-1,113
7	0,118	0,200	0,146	-0,964	-1,115	-1,242
8	0,162	0,228	0,212	-1,033	-1,181	-1,313
9	0,187	0,263	0,280	-1,092	-1,242	-1,319
10	0,209	0,299	0,302	-1,144	-1,295	-1,371
11	0,232	0,327	0,298	-1,191	-1,337	-1,379
12	0,256	0,344	0,272	-1,234	-1,371	-1,371
13	0,279	0,348	0,236	-1,272	-1,399	-1,393
14	0,299	0,340	0,207	-1,307	-1,424	-1,429
15	0,315	0,321	0,177	-1,337	-1,447	-1,484
16	0,325	0,295	0,142	-1,364	-1,470	-1,527
17	0,329	0,265	0,099	-1,387	-1,493	-1,551
18	0,327	0,232	0,053	-1,408	-1,513	-1,568
19	0,320	0,198	0,005	-1,427	-1,530	-1,568
20	0,309	0,162	-0,039	-1,445	-1,544	-1,554
21	0,294	0,125	-0,079	-1,462	-1,554	-1,537
22	0,276	0,089	-0,117	-1,478	-1,561	-1,522
23	0,256	0,051	-0,153	-1,493	-1,565	-1,505
24	0,234	0,014	-0,189	-1,506	-1,565	-1,485
25	0,211	-0,023	-0,227	-1,518	-1,561	-1,466
26	0,186	-0,061	-0,267	-1,528	-1,554	-1,449
27	0,161	-0,099	-0,307	-1,537	-1,545	-1,436
28	0,135	-0,136	-0,348	-1,544	-1,533	-1,425
29	0,109	-0,173	-0,388	-1,550	-1,519	-1,412
30	0,083	-0,210	-0,429	-1,553	-1,503	-1,397

Note: see note A at table A.1.1

Table A 32.1: Causality Test of Hong in mean for South Korea, Kernel functions: Parzen, Tukey – Hanning (Tu – Ha) and Daniell.

Causality Test of Hong						
PANEL A mean						
Bandwidth	ParzenKOr_i	Tu-HaKOr_i	DaniellKOr_i	ParzenKOi_r	Tu-HaKOi_r	DaniellKOi_r
1	NaN	NaN	0,581	NaN	NaN	-1,841
2	3,106844***	3,106844***	3,0142938***	-0,658	-0,658	-0,760
3	3,1138153***	3,134327***	3,0559552***	-0,647	-0,586	-0,496
4	3,1343619***	3,0666354***	3,0065686***	-0,580	-0,440	-0,454
5	3,0994573***	2,8858232***	2,6828341***	-0,486	-0,371	-0,341
6	2,9981421***	2,6785132***	2,3650451***	-0,415	-0,327	-0,336
7	2,8634405***	2,4839114***	2,2049387**	-0,371	-0,299	-0,274
8	2,7212957***	2,3427453***	2,143864**	-0,342	-0,294	-0,298
9	2,5898199***	2,2589901**	2,1123356**	-0,322	-0,311	-0,365
10	2,4789337***	2,2106554**	2,0676133**	-0,313	-0,344	-0,396
11	2,391301***	2,1775824**	2,0412012**	-0,315	-0,385	-0,443
12	2,3255665**	2,1472696**	2,0248783**	-0,326	-0,431	-0,520
13	2,2777315**	2,113355**	1,9826378**	-0,346	-0,478	-0,605
14	2,2412672**	2,0733716**	1,8815266**	-0,371	-0,521	-0,667
15	2,2105093**	2,0272323**	1,812313**	-0,399	-0,558	-0,701
16	2,1817486**	1,9757884**	1,7396609**	-0,429	-0,585	-0,720
17	2,1526995**	1,9199343**	1,6810551**	-0,459	-0,604	-0,698
18	2,1220871**	1,8604258**	1,6249273*	-0,487	-0,617	-0,669
19	2,0892669**	1,798029**	1,5682531*	-0,513	-0,622	-0,625
20	2,0540463**	1,733578**	1,5175986*	-0,536	-0,621	-0,585
21	2,0164662**	1,667859**	1,4436331*	-0,556	-0,615	-0,557
22	1,9767235**	1,6015362*	1,3544551*	-0,572	-0,603	-0,546
23	1,935078**	1,5351906*	1,266	-0,585	-0,588	-0,542
24	1,891844**	1,4693203*	1,187	-0,593	-0,569	-0,539
25	1,8473301**	1,4043001*	1,122	-0,599	-0,550	-0,532
26	1,8018345**	1,3403729*	1,062	-0,601	-0,530	-0,519
27	1,7556182**	1,278	0,998	-0,600	-0,511	-0,501
28	1,7089029**	1,216	0,934	-0,596	-0,493	-0,479
29	1,6618755**	1,156	0,868	-0,591	-0,476	-0,456
30	1,6147118*	1,097	0,798	-0,584	-0,462	-0,437

Note: see note A at table A.1.1

Table A.32.2: Causality Test of Hong in volatility for South Korea, Kernel functions: Parzen, Tukey – Hanning (Tu – Ha) and Daniell.

Causality Test of Hong						
PANEL B volatility						
Bandwidth	ParzenKOr_i	Tu-HaKOr_i	DaniellKOr_i	ParzenKOi_r	Tu-HaKOi_r	DaniellKOi_r
1	NaN	NaN	2,6077221***	NaN	NaN	-2,227
2	5,8956018***	5,8956018***	5,774421***	-0,236	-0,236	-0,328
3	5,8822667***	5,7827127***	5,4900151***	-0,246	-0,296	-0,382
4	5,7680788***	5,330707***	4,807612***	-0,302	-0,421	-0,561
5	5,4819254***	4,7758067***	4,2225418***	-0,390	-0,552	-0,669
6	5,1093967***	4,2890992***	3,8528171***	-0,483	-0,659	-0,688
7	4,7357906***	3,8855196***	3,425272***	-0,571	-0,748	-0,783
8	4,3947976***	3,5423792***	2,9964188***	-0,649	-0,826	-0,921
9	4,0922216***	3,2419945***	2,7022097***	-0,716	-0,896	-1,023
10	3,8230106***	2,9770008***	2,5004424***	-0,777	-0,952	-1,047
11	3,5810797***	2,7525686***	2,3263755**	-0,831	-0,990	-1,037
12	3,3631665***	2,5718445***	2,1932642**	-0,879	-1,005	-0,988
13	3,1677463***	2,4290671***	2,1376251**	-0,918	-0,998	-0,956
14	2,9940469***	2,3148572**	2,0745049**	-0,948	-0,972	-0,906
15	2,8409598***	2,2201879**	2,0016514**	-0,967	-0,934	-0,827
16	2,7070427***	2,1379729**	1,9110857**	-0,976	-0,888	-0,778
17	2,5904439***	2,0633334**	1,8301345**	-0,976	-0,840	-0,747
18	2,4891201***	1,9931883**	1,7871707**	-0,966	-0,792	-0,702
19	2,4008277***	1,92589**	1,7183826**	-0,950	-0,745	-0,645
20	2,3228611**	1,8606994**	1,6205213*	-0,928	-0,701	-0,579
21	2,2527603**	1,7972339**	1,5423487*	-0,902	-0,659	-0,516
22	2,1885985**	1,735256**	1,4915915*	-0,873	-0,621	-0,473
23	2,1288845**	1,6745931**	1,4453164*	-0,842	-0,586	-0,451
24	2,0725223**	1,6151785*	1,3897445*	-0,811	-0,554	-0,442
25	2,0187033**	1,557147*	1,3398251*	-0,780	-0,527	-0,439
26	1,9668668**	1,5007679*	1,2807127*	-0,749	-0,502	-0,439
27	1,9166258**	1,446338*	1,209	-0,720	-0,482	-0,439
28	1,8677442**	1,3941083*	1,144	-0,692	-0,464	-0,440
29	1,8200802**	1,3442551*	1,093	-0,665	-0,450	-0,440
30	1,7735664**	1,2968746*	1,052	-0,640	-0,439	-0,438

Note: see note A at table A.1.1

Table A 33.1: Causality Test of Hong in mean for Spain, Kernel functions: Parzen, Tukey – Hanning (Tu – Ha) and Daniell.

Causality Test of Hong						
PANEL A mean						
Bandwidth	ParzenESr_i	Tu-HaESr_i	DaniellESr_i	ParzenESi_r	Tu-HaESi_r	DaniellESi_r
1	NaN	NaN	-1,247	NaN	NaN	0,585
2	2,2148834**	2,2148834**	2,1381756**	1,065	1,065	1,2856869*
3	2,2462681**	2,3985902***	2,5260945***	1,084	1,176	1,250
4	2,4120824***	2,6549971***	2,6532454***	1,188	1,3988672*	1,5826367*
5	2,5921299***	2,6732603***	2,4912144***	1,3492359*	1,636052*	1,7306583**
6	2,6652659***	2,5470734***	2,2952624**	1,514792*	1,7928436**	1,9107754**
7	2,6398956***	2,3814239***	2,0899737**	1,6601547**	1,8741871**	1,9637308**
8	2,5580042***	2,2180113**	1,8919918**	1,7677585**	1,902502**	1,880911**
9	2,4506038***	2,067153**	1,7226171**	1,8359651**	1,8895671**	1,7482312**
10	2,3364783***	1,9303425**	1,594375*	1,8722204**	1,8460101**	1,6554035**
11	2,2248189**	1,8079827**	1,490102*	1,8840506**	1,7877896**	1,5696732*
12	2,1188167**	1,6995714**	1,39392*	1,8770503**	1,7293142**	1,5250468*
13	2,0193624**	1,6028872*	1,3084839*	1,8563471**	1,6795545**	1,5137172*
14	1,9268263**	1,5150538*	1,233	1,8271264**	1,6420902**	1,5123358*
15	1,8410319**	1,4332594*	1,158	1,7938143**	1,6157859*	1,4880768*
16	1,7613646**	1,3552342*	1,064	1,7599107**	1,5975065*	1,4574755*
17	1,6870297**	1,279	0,974	1,7278193**	1,5841973*	1,4343504*
18	1,6173114*	1,205	0,880	1,6991276**	1,5734147*	1,4301661*
19	1,5514913*	1,132	0,781	1,6745743**	1,563217*	1,4201457*
20	1,4887889*	1,061	0,700	1,653975**	1,5522239*	1,4165373*
21	1,4285115*	0,990	0,636	1,6367824*	1,5396201*	1,4063912*
22	1,3701488*	0,921	0,574	1,6223544*	1,5249764*	1,3906545*
23	1,3133126*	0,854	0,506	1,6100123*	1,5080797*	1,3703867*
24	1,258	0,788	0,446	1,598983*	1,4888596*	1,3375199*
25	1,203	0,725	0,393	1,5885733*	1,4673472*	1,2981031*
26	1,150	0,663	0,342	1,5782477*	1,4436272*	1,257
27	1,097	0,604	0,292	1,5676003*	1,4178059*	1,211
28	1,045	0,547	0,243	1,5563562*	1,3900027*	1,165
29	0,994	0,492	0,192	1,5443259*	1,3603485*	1,122
30	0,945	0,439	0,139	1,5313883*	1,3289806*	1,080

Note: see note A at table A.1.1

Table A.33.2: Causality Test of Hong in volatility for Spain, Kernel functions: Parzen, Tukey – Hanning (Tu – Ha) and Daniell.

Causality Test of Hong						
PANEL B volatility						
Bandwidth	ParzenESr_i	Tu-HaESr_i	DaniellESr_i	ParzenESi_r	Tu-HaESi_r	DaniellESi_r
1	NaN	NaN	-3,902	NaN	NaN	0,675
2	-0,082	-0,082	-0,224	0,680	0,680	0,594
3	-0,045	0,150	0,323	0,673	0,633	0,486
4	0,169	0,583	0,686	0,627	0,502	0,336
5	0,460	0,797	0,745	0,539	0,343	0,125
6	0,669	0,835	0,670	0,431	0,185	-0,016
7	0,773	0,782	0,560	0,317	0,045	-0,139
8	0,800	0,684	0,425	0,206	-0,077	-0,245
9	0,777	0,567	0,251	0,103	-0,184	-0,413
10	0,725	0,444	0,099	0,009	-0,281	-0,507
11	0,656	0,321	-0,059	-0,077	-0,367	-0,522
12	0,576	0,203	-0,188	-0,156	-0,441	-0,516
13	0,492	0,092	-0,287	-0,227	-0,505	-0,548
14	0,407	-0,010	-0,373	-0,293	-0,560	-0,621
15	0,322	-0,103	-0,449	-0,353	-0,609	-0,705
16	0,239	-0,186	-0,525	-0,408	-0,653	-0,768
17	0,160	-0,261	-0,601	-0,457	-0,694	-0,818
18	0,085	-0,330	-0,663	-0,503	-0,733	-0,878
19	0,014	-0,393	-0,722	-0,544	-0,770	-0,913
20	-0,053	-0,453	-0,779	-0,582	-0,806	-0,939
21	-0,116	-0,509	-0,833	-0,617	-0,840	-0,951
22	-0,175	-0,563	-0,890	-0,650	-0,870	-0,946
23	-0,230	-0,616	-0,951	-0,681	-0,897	-0,938
24	-0,282	-0,667	-1,009	-0,711	-0,918	-0,944
25	-0,332	-0,716	-1,061	-0,738	-0,934	-0,952
26	-0,379	-0,765	-1,112	-0,764	-0,945	-0,948
27	-0,424	-0,812	-1,164	-0,789	-0,951	-0,934
28	-0,467	-0,859	-1,217	-0,811	-0,954	-0,917
29	-0,509	-0,905	-1,269	-0,832	-0,954	-0,907
30	-0,550	-0,950	-1,317	-0,850	-0,952	-0,899

Note: see note A at table A.1.1

Table A 34.1: Causality Test of Hong in mean for Sweden, Kernel functions: Parzen, Tukey – Hanning (Tu – Ha) and Daniell.

Causality Test of Hong						
PANEL A mean						
Bandwidth	ParzenSWr_i	Tu-HaSWr_i	DaniellSWr_i	ParzenSWi_r	Tu-HaSWi_r	DaniellSWi_r
1	NaN	NaN	-0,269	NaN	NaN	1,8425939**
2	-0,468	-0,468	-0,560	-0,665	-0,665	-0,573
3	-0,444	-0,316	0,005	-0,674	-0,718	-0,509
4	-0,304	-0,019	0,055	-0,723	-0,812	-0,768
5	-0,104	0,177	0,310	-0,791	-0,881	-0,667
6	0,068	0,393	0,587	-0,843	-0,838	-0,594
7	0,222	0,612	0,767	-0,855	-0,697	-0,347
8	0,373	0,785	0,893	-0,815	-0,519	-0,150
9	0,523	0,900	0,952	-0,731	-0,326	0,048
10	0,657	0,967	0,964	-0,617	-0,120	0,283
11	0,765	0,994	0,916	-0,486	0,089	0,541
12	0,846	0,992	0,862	-0,345	0,292	0,795
13	0,902	0,969	0,799	-0,201	0,482	1,020
14	0,937	0,930	0,735	-0,056	0,659	1,192
15	0,954	0,881	0,664	0,089	0,820	1,3045992*
16	0,956	0,825	0,592	0,231	0,965	1,3828323*
17	0,947	0,766	0,521	0,368	1,092	1,452337*
18	0,929	0,705	0,453	0,498	1,202	1,5163749*
19	0,904	0,644	0,392	0,621	1,2946951*	1,5699387*
20	0,874	0,584	0,338	0,735	1,3727465*	1,6142599*
21	0,839	0,525	0,285	0,840	1,4385096*	1,6545025**
22	0,802	0,467	0,231	0,936	1,4947501*	1,6936594**
23	0,762	0,410	0,177	1,025	1,5437376*	1,7319696**
24	0,722	0,355	0,126	1,105	1,5871448*	1,7688561**
25	0,680	0,301	0,074	1,178	1,6263221*	1,8039609**
26	0,638	0,249	0,023	1,244	1,6624196**	1,8371492**
27	0,596	0,197	-0,030	1,303329*	1,6962843**	1,8683278**
28	0,555	0,148	-0,085	1,3570697*	1,7284658**	1,8974179**
29	0,514	0,099	-0,140	1,4057217*	1,759277**	1,9244151**
30	0,473	0,052	-0,193	1,4499054*	1,7888488**	1,9494169**

Note: see note A at table A.1.1

Table A.34.2: Causality Test of Hong in volatility for Sweden, Kernel functions: Parzen, Tukey – Hanning (Tu – Ha) and Daniell.

Causality Test of Hong						
PANEL B volatility						
Bandwidth	ParzenSWr_i	Tu-HaSWr_i	DaniellSWr_i	ParzenSWi_r	Tu-HaSWi_r	DaniellSWi_r
1	NaN	NaN	-0,113	NaN	NaN	-0,475
2	-0,323	-0,323	-0,418	0,495	0,495	0,473
3	-0,322	-0,311	-0,294	0,490	0,460	0,343
4	-0,311	-0,294	-0,351	0,456	0,372	0,281
5	-0,303	-0,328	-0,359	0,398	0,286	0,209
6	-0,314	-0,370	-0,432	0,334	0,194	0,113
7	-0,340	-0,405	-0,442	0,270	0,100	0,080
8	-0,368	-0,433	-0,528	0,203	0,006	-0,017
9	-0,394	-0,454	-0,448	0,135	-0,086	-0,190
10	-0,416	-0,464	-0,393	0,066	-0,174	-0,322
11	-0,433	-0,465	-0,478	-0,001	-0,251	-0,413
12	-0,446	-0,462	-0,524	-0,066	-0,310	-0,436
13	-0,455	-0,458	-0,473	-0,127	-0,346	-0,417
14	-0,460	-0,456	-0,391	-0,182	-0,360	-0,369
15	-0,463	-0,458	-0,322	-0,228	-0,352	-0,301
16	-0,463	-0,464	-0,292	-0,265	-0,324	-0,221
17	-0,463	-0,474	-0,310	-0,292	-0,281	-0,137
18	-0,464	-0,486	-0,362	-0,308	-0,228	-0,056
19	-0,465	-0,501	-0,428	-0,313	-0,169	0,015
20	-0,467	-0,518	-0,497	-0,308	-0,109	0,077
21	-0,472	-0,537	-0,561	-0,295	-0,050	0,129
22	-0,478	-0,558	-0,618	-0,274	0,006	0,175
23	-0,485	-0,581	-0,669	-0,248	0,059	0,214
24	-0,494	-0,605	-0,710	-0,218	0,107	0,249
25	-0,504	-0,631	-0,742	-0,184	0,150	0,279
26	-0,516	-0,657	-0,763	-0,148	0,189	0,305
27	-0,529	-0,682	-0,772	-0,110	0,223	0,326
28	-0,543	-0,703	-0,769	-0,073	0,252	0,342
29	-0,557	-0,720	-0,757	-0,036	0,276	0,353
30	-0,572	-0,732	-0,734	-0,001	0,296	0,359

Note: see note A at table A.1.1

Table A 35.1: Causality Test of Hong in mean for Taiwan, Kernel functions: Parzen, Tukey – Hanning (Tu – Ha) and Daniell.

Causality Test of Hong						
PANEL A mean						
Bandwidth	ParzenTWr_i	Tu-HaTWr_i	DaniellTWr_i	ParzenTWi_r	Tu-HaTWi_r	DaniellTWi_r
1	NaN	NaN	1,3831111*	NaN	NaN	-0,955
2	2,2487579**	2,2487579**	2,1280584**	-0,707	-0,707	-0,593
3	2,3052574**	2,5884005***	2,9837467***	-0,716	-0,758	-0,841
4	2,6157795***	3,1500382***	3,3291356***	-0,760	-0,794	-0,739
5	3,0040823***	3,3866632***	3,3781811***	-0,782	-0,674	-0,561
6	3,259361***	3,436671***	3,3917535***	-0,735	-0,500	-0,407
7	3,3811018***	3,3942399***	3,3165379***	-0,636	-0,344	-0,263
8	3,4174166***	3,2942903***	3,1413792***	-0,520	-0,217	-0,130
9	3,4019689***	3,1586312***	2,8937127***	-0,409	-0,116	-0,074
10	3,3514171***	3,0041119***	2,6716953***	-0,311	-0,042	-0,039
11	3,275736***	2,8427515***	2,5323884***	-0,227	0,006	-0,021
12	3,1830464***	2,6860073***	2,4180977***	-0,158	0,030	-0,054
13	3,0799384***	2,5435424***	2,3145497**	-0,102	0,033	-0,098
14	2,9721379***	2,4199939***	2,1799588**	-0,060	0,022	-0,132
15	2,8641632***	2,3154271**	2,0770528**	-0,030	0,000	-0,168
16	2,7594896***	2,2276253**	2,0054681**	-0,012	-0,030	-0,212
17	2,6604398***	2,1538946**	1,9477248**	-0,003	-0,066	-0,265
18	2,5684317***	2,0917072**	1,9074936**	-0,003	-0,106	-0,321
19	2,4841886***	2,0390563**	1,8738728**	-0,010	-0,148	-0,375
20	2,4080424***	1,9943987**	1,8560772**	-0,023	-0,192	-0,422
21	2,3399221***	1,956641**	1,8493325**	-0,040	-0,237	-0,464
22	2,2792892**	1,9252057**	1,8440868**	-0,061	-0,283	-0,506
23	2,2254611**	1,8997506**	1,838491**	-0,085	-0,329	-0,553
24	2,1777244**	1,8798476**	1,8310738**	-0,111	-0,375	-0,605
25	2,1354169**	1,8648833**	1,821454**	-0,139	-0,421	-0,664
26	2,0979453**	1,8541146**	1,8110669**	-0,168	-0,466	-0,725
27	2,0647963**	1,8467436**	1,800799**	-0,199	-0,512	-0,784
28	2,0355517**	1,8419771**	1,7907728**	-0,230	-0,556	-0,837
29	2,009845**	1,8390739**	1,7818367**	-0,261	-0,600	-0,884
30	1,9873323**	1,8373967**	1,7759432**	-0,294	-0,644	-0,925

Note: see note A at table A.1.1

Table A.35.2: Causality Test of Hong in volatility for Taiwan, Kernel functions: Parzen, Tukey – Hanning (Tu – Ha) and Daniell.

Causality Test of Hong						
PANEL B volatility						
Bandwidth	ParzenTWr_i	Tu-HaTWr_i	DaniellTWr_i	ParzenTWi_r	Tu-HaTWi_r	DaniellTWi_r
1	NaN	NaN	1,4551974*	NaN	NaN	-1,640
2	-0,548	-0,548	-0,446	-0,560	-0,560	-0,540
3	-0,559	-0,617	-0,737	-0,546	-0,470	-0,299
4	-0,620	-0,697	-0,726	-0,461	-0,267	-0,133
5	-0,673	-0,626	-0,580	-0,324	-0,094	0,182
6	-0,661	-0,502	-0,371	-0,193	0,021	0,262
7	-0,598	-0,401	-0,356	-0,086	0,093	0,206
8	-0,520	-0,344	-0,339	-0,005	0,133	0,118
9	-0,452	-0,328	-0,347	0,052	0,151	0,109
10	-0,402	-0,343	-0,337	0,092	0,176	0,263
11	-0,372	-0,376	-0,399	0,121	0,230	0,444
12	-0,361	-0,421	-0,491	0,148	0,311	0,594
13	-0,364	-0,472	-0,560	0,179	0,409	0,698
14	-0,379	-0,525	-0,631	0,216	0,511	0,776
15	-0,402	-0,580	-0,685	0,261	0,609	0,843
16	-0,431	-0,635	-0,732	0,315	0,697	0,896
17	-0,464	-0,687	-0,777	0,376	0,774	0,926
18	-0,500	-0,734	-0,814	0,441	0,839	0,943
19	-0,536	-0,775	-0,843	0,507	0,892	0,966
20	-0,573	-0,807	-0,861	0,571	0,935	0,996
21	-0,609	-0,833	-0,873	0,632	0,970	1,026
22	-0,643	-0,852	-0,881	0,689	1,001	1,047
23	-0,675	-0,864	-0,880	0,740	1,028	1,062
24	-0,706	-0,871	-0,868	0,787	1,052	1,073
25	-0,733	-0,873	-0,845	0,829	1,075	1,082
26	-0,757	-0,871	-0,811	0,866	1,096	1,091
27	-0,779	-0,865	-0,769	0,899	1,116	1,100
28	-0,797	-0,855	-0,723	0,929	1,134	1,111
29	-0,812	-0,843	-0,678	0,956	1,151	1,123
30	-0,825	-0,829	-0,640	0,981	1,166	1,137

Note: see note A at table A.1.1

Table A 36.1: Causality Test of Hong in mean for Turkey, Kernel functions: Parzen, Tukey – Hanning (Tu – Ha) and Daniell.

Causality Test of Hong						
PANEL A mean						
Bandwidth	ParzenTKr_i	Tu-HaTKr_i	DaniellTKr_i	ParzenTKi_r	Tu-HaTKi_r	DaniellTKi_r
1	NaN	NaN	3,6945662***	NaN	NaN	0,893
2	-0,622	-0,622	-0,446	-0,599	-0,599	-0,615
3	-0,586	-0,396	-0,042	-0,609	-0,660	-0,559
4	-0,374	0,092	0,485	-0,666	-0,765	-0,851
5	-0,043	0,493	0,916	-0,739	-0,806	-0,667
6	0,267	0,736	1,054	-0,780	-0,709	-0,545
7	0,509	0,880	1,065	-0,765	-0,543	-0,294
8	0,683	0,973	1,083	-0,699	-0,387	-0,117
9	0,804	1,043	1,188	-0,599	-0,257	-0,010
10	0,893	1,114	1,3165895*	-0,490	-0,151	0,056
11	0,965	1,200	1,4774392*	-0,387	-0,068	0,083
12	1,029	1,2980711*	1,5644074*	-0,296	-0,008	0,099
13	1,090	1,3990527*	1,6712677**	-0,219	0,035	0,139
14	1,153	1,4960853*	1,777624**	-0,153	0,066	0,148
15	1,218	1,5847252*	1,8811825**	-0,098	0,092	0,153
16	1,2855498*	1,6627833**	1,9634483**	-0,053	0,117	0,176
17	1,354035*	1,7295839**	2,007951**	-0,014	0,143	0,208
18	1,4218131*	1,785406**	2,0187584**	0,018	0,169	0,244
19	1,4870379*	1,8312784**	2,0191603**	0,046	0,196	0,293
20	1,5483288*	1,8686512**	2,0116643**	0,070	0,224	0,349
21	1,6048305*	1,8988649**	2,0119356**	0,092	0,252	0,402
22	1,6561995**	1,9230307**	2,0286439**	0,113	0,280	0,447
23	1,7024019**	1,942024**	2,0433238**	0,133	0,308	0,479
24	1,743572**	1,9566713**	2,0527154**	0,154	0,336	0,498
25	1,7799668**	1,9678302**	2,0587338**	0,174	0,363	0,512
26	1,8119446**	1,9762731**	2,0631705**	0,195	0,388	0,521
27	1,8398987**	1,9827172**	2,0630396**	0,216	0,412	0,529
28	1,8642098**	1,9878489**	2,0579384**	0,236	0,433	0,536
29	1,8852599**	1,9922497**	2,0546819**	0,257	0,453	0,543
30	1,903451**	1,9964103**	2,0591388**	0,277	0,471	0,551

Note: see note A at table A.1.1

Table A.36.2: Causality Test of Hong in volatility for Turkey, Kernel functions: Parzen, Tukey – Hanning (Tu – Ha) and Daniell.

Causality Test of Hong						
PANEL B volatility						
Bandwidth	ParzenTKr_i	Tu-HaTKr_i	DaniellTKr_i	ParzenTKi_r	Tu-HaTKi_r	DaniellTKi_r
1	NaN	NaN	1,6898879**	NaN	NaN	-2,564
2	0,216	0,216	0,120	-0,664	-0,664	-0,677
3	0,223	0,261	0,231	-0,668	-0,685	-0,747
4	0,264	0,322	0,266	-0,687	-0,700	-0,729
5	0,304	0,289	0,188	-0,699	-0,682	-0,721
6	0,303	0,196	0,025	-0,695	-0,666	-0,723
7	0,261	0,077	-0,129	-0,685	-0,660	-0,684
8	0,194	-0,045	-0,223	-0,675	-0,658	-0,736
9	0,114	-0,156	-0,315	-0,670	-0,663	-0,743
10	0,030	-0,253	-0,396	-0,668	-0,672	-0,777
11	-0,052	-0,334	-0,481	-0,669	-0,685	-0,797
12	-0,129	-0,403	-0,549	-0,672	-0,699	-0,800
13	-0,200	-0,462	-0,603	-0,678	-0,715	-0,821
14	-0,264	-0,514	-0,629	-0,686	-0,730	-0,843
15	-0,321	-0,559	-0,644	-0,695	-0,746	-0,858
16	-0,372	-0,597	-0,680	-0,705	-0,763	-0,874
17	-0,418	-0,629	-0,699	-0,716	-0,780	-0,879
18	-0,459	-0,655	-0,724	-0,727	-0,799	-0,892
19	-0,496	-0,675	-0,741	-0,738	-0,819	-0,921
20	-0,528	-0,690	-0,755	-0,750	-0,842	-0,950
21	-0,558	-0,702	-0,759	-0,763	-0,866	-0,981
22	-0,583	-0,711	-0,757	-0,776	-0,892	-1,017
23	-0,606	-0,717	-0,765	-0,790	-0,918	-1,061
24	-0,626	-0,721	-0,772	-0,804	-0,946	-1,112
25	-0,643	-0,724	-0,751	-0,819	-0,974	-1,163
26	-0,658	-0,724	-0,715	-0,835	-1,003	-1,211
27	-0,670	-0,723	-0,694	-0,852	-1,032	-1,253
28	-0,681	-0,721	-0,689	-0,869	-1,062	-1,289
29	-0,689	-0,718	-0,687	-0,887	-1,090	-1,316
30	-0,696	-0,713	-0,680	-0,906	-1,119	-1,338

Note: see note A at table A.1.1

Table A 37.1: Causality Test of Hong in mean for United Kingdom, Kernel functions: Parzen, Tukey – Hanning (Tu – Ha) and Daniell.

Causality Test of Hong						
PANEL A mean						
Bandwidth	ParzenUKr_i	Tu-HaUKr_i	DaniellUKr_i	ParzenUKi_r	Tu-HaUKi_r	DaniellUKi_r
1	NaN	NaN	-1,758	NaN	NaN	1,6277452*
2	-0,597	-0,597	-0,294	5,7043433***	5,7043433***	5,5844578***
3	-0,548	-0,294	0,106	5,7002694***	5,6499721***	5,5137657***
4	-0,262	0,389	0,920	5,640922***	5,3234993***	4,880118***
5	0,209	1,071	1,5911827*	5,4403402***	4,8827074***	4,4367728***
6	0,700	1,6092313*	2,0442449**	5,1552279***	4,5245154***	4,1632697***
7	1,147	1,9845129**	2,2748967**	4,870216***	4,2510906***	3,906343***
8	1,5168622*	2,2272668**	2,3914913***	4,6203215***	4,0214562***	3,6857702***
9	1,8064961**	2,3748606***	2,4735949***	4,408952***	3,8113132***	3,4461244***
10	2,0247532**	2,4552796***	2,4867196***	4,2247031***	3,6111995***	3,2384305***
11	2,1841024**	2,4904379***	2,4519528***	4,0570236***	3,4225391***	3,0412404***
12	2,2968987**	2,4960504***	2,3873064***	3,900197***	3,2485544***	2,8584008***
13	2,3737289***	2,4818618***	2,3115206**	3,7515927***	3,0893745***	2,6908334***
14	2,4230391***	2,4542166***	2,2415082**	3,6103774***	2,9448105***	2,5439003***
15	2,4513399***	2,4178475***	2,1840736**	3,4763897***	2,8149824***	2,425951***
16	2,4636214***	2,3763492***	2,1277274**	3,3499193***	2,6994247***	2,3259492**
17	2,4637535***	2,3323489***	2,0745998**	3,2312608***	2,5973263***	2,2625843**
18	2,4549024***	2,2880563**	2,0333994**	3,120702***	2,5076887***	2,2076633**
19	2,4395289***	2,2450937**	2,0012839**	3,0182978***	2,4291391***	2,1501527**
20	2,4193999***	2,204207**	1,967393**	2,9237284***	2,359989***	2,1034347**
21	2,3958615***	2,1654251**	1,9331266**	2,8365282***	2,2987463**	2,071674**
22	2,3700314***	2,1283605**	1,89937**	2,7562448***	2,2442415**	2,0385504**
23	2,3427726***	2,092477**	1,8636894**	2,6824297***	2,1954035**	1,987938**
24	2,3147232**	2,0572695**	1,8237956**	2,6146856***	2,1511875**	1,9360248**
25	2,2863399**	2,0223163**	1,7764628**	2,5525923***	2,1105907**	1,8903442**
26	2,2579549**	1,987271**	1,7217608**	2,4956317***	2,072699**	1,8504053**
27	2,2297802**	1,9518796**	1,667614**	2,4432741***	2,0367852**	1,8133285**
28	2,2019099**	1,9159907**	1,6200251*	2,3950181***	2,0023212**	1,7754739**
29	2,1743731**	1,8795389**	1,5767214*	2,350394***	1,9689087**	1,7367251**
30	2,1471724**	1,8425109**	1,5332438*	2,3089665**	1,9362875**	1,6968669**

Note: see note A at table A.1.1

Table A.37.2: Causality Test of Hong in volatility for United Kingdom, Kernel functions: Parzen, Tukey – Hanning (Tu – Ha) and Daniell.

Causality Test of Hong						
PANEL B volatility						
Bandwidth	ParzenUKr_i	Tu-HaUKr_i	DaniellUKr_i	ParzenUKi_r	Tu-HaUKi_r	DaniellUKi_r
1	NaN	NaN	-4,768	NaN	NaN	5,093853***
2	0,023	0,023	0,040	-0,505	-0,505	-0,618
3	0,014	-0,031	-0,176	-0,516	-0,574	-0,731
4	-0,034	-0,116	-0,237	-0,581	-0,705	-0,890
5	-0,090	-0,119	-0,143	-0,674	-0,819	-1,001
6	-0,114	-0,110	-0,150	-0,761	-0,906	-1,071
7	-0,116	-0,127	-0,259	-0,836	-0,978	-1,143
8	-0,118	-0,170	-0,398	-0,900	-1,046	-1,226
9	-0,130	-0,231	-0,475	-0,956	-1,111	-1,295
10	-0,154	-0,292	-0,497	-1,008	-1,176	-1,360
11	-0,188	-0,341	-0,517	-1,058	-1,240	-1,420
12	-0,226	-0,377	-0,546	-1,107	-1,303	-1,486
13	-0,264	-0,404	-0,575	-1,156	-1,362	-1,566
14	-0,300	-0,424	-0,604	-1,203	-1,419	-1,632
15	-0,332	-0,444	-0,642	-1,249	-1,474	-1,696
16	-0,360	-0,464	-0,685	-1,294	-1,525	-1,740
17	-0,383	-0,486	-0,728	-1,338	-1,573	-1,784
18	-0,403	-0,510	-0,767	-1,381	-1,619	-1,833
19	-0,421	-0,538	-0,803	-1,422	-1,661	-1,863
20	-0,438	-0,566	-0,841	-1,461	-1,699	-1,888
21	-0,455	-0,596	-0,881	-1,499	-1,735	-1,926
22	-0,472	-0,626	-0,919	-1,535	-1,767	-1,931
23	-0,490	-0,656	-0,957	-1,569	-1,797	-1,934
24	-0,508	-0,687	-0,994	-1,602	-1,825	-1,961
25	-0,528	-0,718	-1,033	-1,633	-1,850	-1,987
26	-0,548	-0,749	-1,073	-1,663	-1,875	-1,992
27	-0,568	-0,781	-1,114	-1,690	-1,898	-1,988
28	-0,589	-0,812	-1,154	-1,717	-1,920	-2,011
29	-0,611	-0,844	-1,195	-1,742	-1,942	-2,049
30	-0,633	-0,876	-1,235	-1,766	-1,964	-2,076

Note: see note A at table A.1.1

Table A 38.1: Causality Test of Hong in mean for United States of America, Kernel functions: Parzen, Tukey – Hanning (Tu – Ha) and Daniell.

Causality Test of Hong						
PANEL A mean						
Bandwidth	ParzenUSr_i	Tu-HaUSr_i	DaniellUSr_i	ParzenUSi_r	Tu-HaUSi_r	DaniellUSi_r
1	NaN	NaN	0,186	NaN	NaN	-0,138
2	1,001	1,001	1,5509638*	-0,327	-0,327	-0,461
3	1,3650328*	3,2566496***	6,020072***	-0,337	-0,389	-0,498
4	3,4632008***	7,7337821***	10,783872***	-0,396	-0,518	-0,643
5	6,524318***	10,968506***	13,037585***	-0,487	-0,648	-0,766
6	9,1722882***	12,874035***	14,113317***	-0,581	-0,754	-0,859
7	11,119869***	13,887164***	14,597707***	-0,668	-0,840	-0,948
8	12,458096***	14,406979***	14,762143***	-0,743	-0,905	-1,015
9	13,346762***	14,668834***	14,736686***	-0,807	-0,951	-1,062
10	13,925116***	14,776106***	14,655643***	-0,860	-0,981	-1,038
11	14,294453***	14,779108***	14,531196***	-0,902	-0,995	-1,010
12	14,524101***	14,714554***	14,374986***	-0,935	-0,999	-1,007
13	14,659483***	14,608927***	14,192025***	-0,960	-0,996	-0,993
14	14,727441***	14,477617***	13,99959***	-0,976	-0,988	-0,974
15	14,745449***	14,329054***	13,783679***	-0,986	-0,980	-0,980
16	14,725872***	14,167943***	13,528531***	-0,992	-0,973	-0,984
17	14,677832***	13,997514***	13,27837***	-0,993	-0,968	-0,994
18	14,60844***	13,820585***	13,064144***	-0,993	-0,966	-1,002
19	14,523148***	13,639705***	12,859504***	-0,990	-0,966	-1,006
20	14,426135***	13,456927***	12,670174***	-0,988	-0,968	-1,009
21	14,320495***	13,273878***	12,480734***	-0,985	-0,972	-1,008
22	14,208222***	13,09202***	12,289293***	-0,982	-0,975	-1,006
23	14,090776***	12,912588***	12,096166***	-0,980	-0,980	-1,008
24	13,969401***	12,736468***	11,903151***	-0,979	-0,984	-1,004
25	13,845145***	12,564208***	11,715963***	-0,979	-0,988	-1,001
26	13,7189***	12,396091***	11,536963***	-0,979	-0,992	-1,004
27	13,59142***	12,23221***	11,360629***	-0,980	-0,997	-1,009
28	13,463376***	12,072531***	11,192777***	-0,982	-1,001	-1,018
29	13,335331***	11,916945***	11,028223***	-0,984	-1,006	-1,030
30	13,207775***	11,765324***	10,865318***	-0,987	-1,011	-1,038

Note: see note A at table A.1.1

Table A.38.2: Causality Test of Hong in volatility for United States of America, Kernel functions: Parzen, Tukey – Hanning (Tu – Ha) and Daniell.

Causality Test of Hong						
PANEL B volatility						
Bandwidth	ParzenUSr_i	Tu-HaUSr_i	DaniellUSr_i	ParzenUSi_r	Tu-HaUSi_r	DaniellUSi_r
1	NaN	NaN	-3,258	NaN	NaN	-0,572
2	-0,660	-0,660	-0,682	45,36102***	45,36102***	44,917555***
3	-0,614	-0,368	-0,062	45,35208***	45,073633***	43,756642***
4	-0,342	0,233	0,491	45,020553***	42,846749***	40,094021***
5	0,065	0,674	0,833	43,683493***	39,731244***	36,453492***
6	0,424	0,949	1,009	41,668224***	36,747432***	33,33323***
7	0,694	1,101	1,056	39,504938***	34,127735***	30,756184***
8	0,884	1,163	1,027	37,425149***	31,873639***	28,634093***
9	1,010	1,163	0,944	35,508548***	29,932742***	26,756687***
10	1,085	1,122	0,833	33,771489***	28,249392***	25,233179***
11	1,120	1,054	0,714	32,205007***	26,776431***	23,9034***
12	1,125	0,969	0,607	30,7922***	25,476118***	22,633671***
13	1,107	0,876	0,492	29,514373***	24,318641***	21,60074***
14	1,072	0,778	0,366	28,354399***	23,280451***	20,743572***
15	1,025	0,679	0,245	27,296954***	22,342952***	19,9176***
16	0,970	0,581	0,128	26,329027***	21,49134***	19,093005***
17	0,908	0,484	0,016	25,439414***	20,713799***	18,297594***
18	0,843	0,389	-0,095	24,618707***	20,000834***	17,600286***
19	0,776	0,297	-0,199	23,858854***	19,344595***	17,00341***
20	0,707	0,207	-0,296	23,153074***	18,738506***	16,499298***
21	0,638	0,121	-0,395	22,49553***	18,176997***	16,071483***
22	0,569	0,037	-0,477	21,881266***	17,655234***	15,6766***
23	0,500	-0,043	-0,554	21,305976***	17,169179***	15,311179***
24	0,433	-0,121	-0,623	20,765962***	16,715495***	14,972042***
25	0,366	-0,195	-0,690	20,25799***	16,291248***	14,628672***
26	0,301	-0,266	-0,753	19,779258***	15,893757***	14,290231***
27	0,237	-0,334	-0,820	19,32729***	15,520539***	13,954285***
28	0,175	-0,399	-0,884	18,899901***	15,169303***	13,624105***
29	0,114	-0,462	-0,946	18,495137***	14,837966***	13,274503***
30	0,055	-0,523	-1,014	18,111259***	14,524652***	12,939308***

Note: see note A at table A.1.1

Appendix B - Matlab Code

In this section we present the matlab code which helped us in retrieving the results of our empirical research. In this section we will refer to:

- The Cheung & Ng Test
- The Hong Test
- The Kernel Functions and
- The main programme for causality in mean and variance among real stock returns and industrial production growth rate, using GARCH model specification.

The matlab code is available from the author upon request