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In

MODERN METHODS IN ASSET ALLOCATION AND PORTFOLIO MANAGEMENT

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Abstact

Various researchers proposed different approaches for asset allocation. Optimal investment portfolios were first developed by Markowitz in his Modern Portfolio Theory (MPT). Markowitz relied in some unrealistic assumptions to build his theory. We located problems using this theory in practice sush as the fact that the market efficiency does not exist, the returns are not following the normal distributed function and it is one period problem. We tried to propose a model to forecast the returns in order to overtake the problems above and use the theory in practice.

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I. Introduction

A. Scope and Purpose

For an investor, asset allocation is the most crusial decision required to achieve its investment goals. The basic allocation problem is to decide which asset classes to include in the investment portfolio and in what proportions. The structure of a portfolio is determined by investor's risk tolerance, time frame and desirable return. How an investor can decide the best proportion of each asset class to achive its goals? Which is the optimal investment portfolio for an investor?

Various researchers proposed different approaches for asset allocation. Optimal investment portfolios first developed by Markowitz in his Modern Portfolio Theory (MPT). Markowitz relied in some unrealistic assumptions to build his theory. We tried to note some of these assumptions, prove that the theory cannot be used in practice and propose a solution in order to overtake the problems and use the improved theory in practice.

In this section, we continue with the definition and strategies of asset allocation. In section II, we present the existing literature in asset allocation and we quote in detail MPT. In section III, we locate the problems of MPT in practice and we propose an econometric model which can forecast the returns of S&P500 so we can use them to structure optimal portfolios. In section IV, we present the conclusion of our analysis and in section V is the appendix with all the tables and calculations from our analysis from Matlab and E-views.

B. Definition of Asset allocation

Asset allocation is an investment strategy that attempts to balance risk versus return by adjusting the percentage of each asset in an investment portfolio according to the investor's risk tolerance, goals and investment time frame.

Asset allocation is based on the principle that different assets perform differently in different market and economic conditions. Different asset classes offer returns that are not perfectly correlated; hence diversification reduces the overall risk in terms of the variability of returns for a given level of expected return. It is typically forecast based on statistical relationships that existed over some past period.

Here are the basic steps to asset allocation:

- Choosing which asset classes to include (stocks, bonds, money market, real estate, precious metals, etc.).
- Selecting the ideal percentage (the target) to allocate to each asset class.
- Identifying an acceptable range within that target.
- Diversification within each asset class.

C. Allocation Strategies

There are different strategies in asset allocation as we see below:

- *Strategic Asset Allocation:* The primary goal of a strategic asset allocation is to create an asset mix that will provide the optimal balance between expected risk and return for a long-term investment horizon. Strategic asset allocation is a traditional approach to determining which proportion of investor's money should be allocated in each asset class in order to achieve investor's long term investing goals. It starts with assessing investor's tolerance for risk and investing time frame. Once investor's risk tolerance and time frame are understood, a recommended allocation is devised by creating an allocation of investments that, when combined, should match the long term returns and risk tolerance that you desire. Strategic asset allocation approaches determine how much of investor's money should be in each asset class by looking at the long term expected returns and risk levels of each asset class. Then a recommendation is made as to how much of your money should be in cash, bonds and stocks, for example. Each asset class is also broken down into additional categories; stocks for example would be broken down into large cap, small cap, U.S., international or emerging markets, just to name a few sub-categories.

- *Tactical Asset Allocation:* Is a method in which an investor takes a more active approach that tries to position a portfolio into those assets, sectors, or individual stocks that show the most potential for gains. Tactical asset allocation is a more active approach than strategic asset allocation. With tactical asset allocation, rather than following a static allocation and rebalancing on a periodic basis, you choose to overweight or underweight asset classes based on an analytical assessment of the value of the asset. With tactical asset allocation you start with a base allocation, such as 60% stocks/30% bonds/10% cash, but with a range of plus or minus ten or twenty percent. If calculations show that stock valuations are high, you would choose to underweight stocks and your allocation may be at 40% stocks/30% bonds/30% cash. Or, if stocks seem undervalued you may be up to 80% stocks with only 20% in bonds and cash. Opponents of tactical asset allocation consider it a form of market timing. Market timing, however, is more akin to trying to guess, use technical analysis, or use your "gut feeling" to determine when to get in or out of investments. Most market timing techniques have poor results. Tactical allocation follows a defined process of “appraising” an asset class based on numerous factors such as price to earnings ratios, price to book ratios, the macro economic outlook, consumer spending, interest rates, and much more. Tactical asset allocation is difficult to do without having a great deal of investment expertise. A tactical asset allocation fund, or combination of funds, may be a better choice.

- *Core-Satellite Asset Allocation:* is more or less a hybrid of both the strategic and tactical allocation.

- *Systematic Asset Allocation:* is another approach which depends on three assumptions.

  a) The markets provide explicit information about the available returns.

  b) The relative expected returns reflect consensus.

  c) Expected returns provide clues to actual returns.

II. Literature Presentation

Previous Researches for Asset Allocation

Many researchers have proposed various methods in asset allocation. The most famous method is this of Harry Markowitz who proposed the Modern Portfolio Theory (MPT) in a 1952 article and a 1959 book. Markowitz classifies it simply as "Portfolio Theory," because "There's nothing modern about it.”

In the following section we are going to see in detail the MPT and then we are going make a short presentation of existing literature in asset allocation.

A. Modern portfolio theory – Markowitz (1959)

Modern portfolio theory (MPT) attempts to maximize portfolio expected return for a given amount of portfolio risk, or equivalently minimize risk for a given level of expected return, by carefully choosing the proportions of various assets.

MPT is a mathematical formulation of the concept of diversification in investing, with the aim of selecting a collection of investment assets that has collectively lower risk than any individual asset. This is possible, intuitively speaking, because different types of assets often change in value in opposite ways. But diversification lowers risk even if assets' returns are not negatively correlated—indeed, even if they are positively correlated.

More technically, MPT models an asset's return as a normally distributed function, defines risk as the standard deviation of return, and models a portfolio as a weighted combination of assets, so that the return of a portfolio is the weighted combination of the assets' returns. By combining different assets whose returns are not perfectly positively correlated, MPT seeks to reduce the total variance of the portfolio return.

One very important assumption of MPT is that markets ase efficient. In addition, MPT assumes that investors are rational and have a single investment orizon in which they expect to maximize their utility. MPT also assumes that investors are risk averse, meaning that given two portfolios that offer the same expected return, investors will prefer the less risky one. Thus, an investor will take on increased risk only if compensated by higher expected returns. Conversely, an investor who wants higher expected returns must accept more risk. The exact trade-off will be the same for all investors, but different investors will evaluate the trade-off differently based on individual risk aversion characteristics. The implication is that a rational investor will not invest in a portfolio if a second portfolio exists with a more favorable risk-expected return profile.

There are three phases involved in formulating the model of Markowitz:

1. *Security Analysis:* This focuses on the estimation of the risk/return characteristics of individual securities as well as on the estimation of the covariability of all the securities under consideration.
2. *Portfolio Analysis:* This uses the estimated data from the previous phase and identifies the best combinations of individuals securities that can be achieved through diversification. In this fase the portfolio rate of retuerns is estimated, the risk/return characteristics of portfolios are calculated and efficient frontier is designed.
3. *Portfolio Selection:* This considers the best portfolio possibilities traced out by means of the portfolio analysis phase and selects the portfolio that maximizes the investor's expected utility.

❖ ***In general under the model:***

- Expected return: $E(R_p) = \sum_i w_i E(R_i)$

where R_p is the return on the portfolio, R_i is the return on asset *i* and w_i is the weighting of component asset

- Portfolio return variance: $\sigma_p^2 = \sum_i w_i^2 \sigma_i^2 + \sum_{i \neq j} \sum_i w_i w_j \sigma_i \sigma_j \rho_{ij}$

where ρ_{ij} is the correlation coefficient between the returns on assets *i* and *j*.

- Portfolio return volatility (standard deviation): $\sigma_p = \sigma_p^2$

➢ Portfolio return is the proportion-weighted combination of the constituent assets' returns.

➢ Portfolio volatility is a function of the correlations ρ_{ij} of the component assets, for all asset pairs (*i*, *j*).

Diversification:

An investor can reduce portfolio risk simply by holding combinations of instruments that are not perfectly positively correlated (correlation coefficient $-1 \leq \rho_{ij}$

≤1). In other words, investors can reduce their exposure to individual asset risk by holding a diversified portfolio of assets.

If all the asset pairs have correlations of 0—they are perfectly uncorrelated—the portfolio's return variance is the sum over all assets of the square of the fraction held in the asset times the asset's return variance (and the portfolio standard deviation is the square root of this sum).

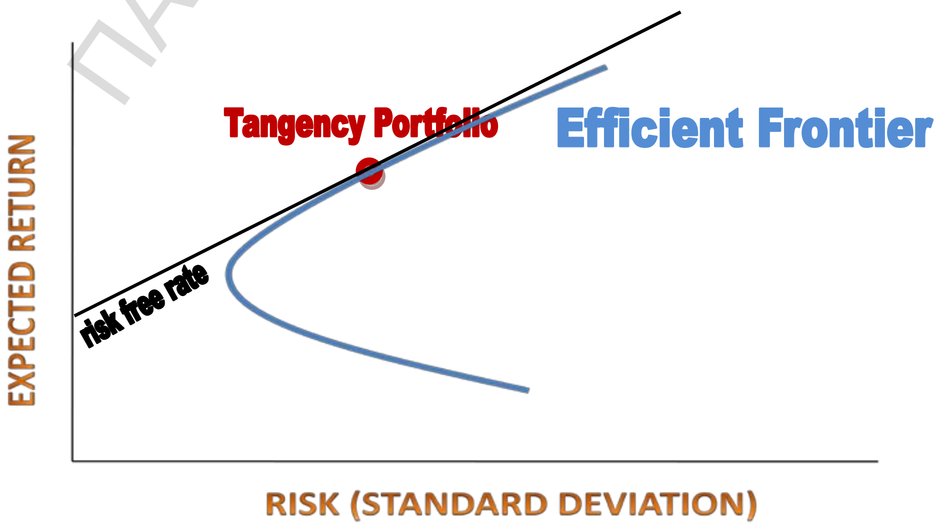
- *Systematic and unsystematic risk:*

The total risk of a portfolio is composed of two parts. The first part is calles unsystematic risk or diversifiable risk, while the second part is called systematic risk or undiversifiable risk. The unsystematic risk is the variability of a security's rate of return caused by factors unique to the firm. The unsystematic risk can be reduced or eliminated by diversification, since bad returns caused by factors unique to some securities in the portfolio are offset by good returns related to other securities in the portfolio. The systematic risk is the variability of a security's rate of return resulting from factors that affect all shares in the market to a greater or less extent. The systematic risk cannot be eliminated through diversification because it is common to all securities.

- *The efficient frontier with no risk-free asset:*

As shown in the following figure, every possible combination of the risky assets, without including any holdings of the risk-free asset, can be plotted in risk-expected return space, and the collection of all such possible portfolios defines a region in this space.

Figure 1 – Efficient Frontier



The left boundary of this region is a hyperbola, and the upper edge of this region is the *efficient frontier* in the absence of a risk-free asset (sometimes called "the Markowitz bullet"). Combinations along this upper edge represent portfolios (including no holdings of the risk-free asset) for which there is lowest risk for a given level of expected return. Equivalently, a portfolio lying on the efficient frontier represents the combination offering the best possible expected return for given risk level.

Matrices are preferred for calculations of the efficient frontier. In matrix form, for a given "risk tolerance" $q\ \varepsilon[0,\infty)$, the efficient frontier is found by minimizing the following expression: $w^T \Sigma w - q^* R^T w$

Where:

- w is a vector of portfolio weights and $\sum_i w_i = 1$
- Σ is the covariance matrix for the returns on the assets in the portfolio
- $q \geq 0$ is a "risk tolerance" factor, where 0 results in the portfolio with minimal risk and ∞ results in the portfolio infinitely far out on the frontier with both expected return and risk unbounded
- R is a vector of expected returns.
- $w^T \Sigma w$ is the variance of portfolio return.
- $R^T w$ is the expected return on the portfolio.

The above optimization finds the point on the frontier at which the inverse of the slope of the frontier would be q if portfolio return variance instead of standard deviation were plotted horizontally. The frontier in its entirety is parametric on q.

Assumptions

In this section we present the assumptions of MPT in detail in show that some of them are unrealistic and they cannot be used in practice.

- ✓ ***Investors are interested in the optimization problem described above (maximizing the mean for a given variance)***. In reality, investors have utility functions that may be sensitive to higher moments of the distribution of the returns. For the investors to use the mean-variance optimization, one must suppose that the combination of utility and returns make the optimization of utility problem similar to the mean-variance optimization problem. A quadratic utility without any assumption about returns is sufficient.

- ***Asset returns are normally distributed random variables.*** In fact, it is frequently observed that returns in equity and other markets are not normally distributed. Large swings (3 to 6 standard deviations from the mean) occur in the market far more frequently than the normal distribution assumption would predict. While the model can also be justified by assuming any return distribution that is jointly elliptical, all the joint elliptical distributions are symmetrical whereas asset returns empirically are not.
- ***All investors aim to maximize economic utility.*** This is a key assumption of the efficient market hypothesis, upon which MPT relies.
- ***Correlations between assets are fixed and constant forever.*** Correlations depend on systemic relationships between the underlying assets, and change when these relationships change. During times of financial crisis all assets tend to become positively correlated, because they all move (down) together. In other words, MPT breaks down precisely when investors are most in need of protection from risk.
- ***All investors are rational and risk-averse.*** This is another assumption of the efficient market hypothesis. In reality, as proven by behavioral economics, market participants are not always rational or consistently rational.
- ***All investors have access to the same information at the same time.*** In fact, real markets contain information asymmetry, insider trading, and those who are simply better informed than others. Moreover, estimating the mean and the covariance matrix of the returns are difficult statistical tasks.
- ***Any investor can lend and borrow an unlimited amount at the risk free rate of interest.*** In reality, every investor has a credit limit.
- ***All securities can be divided into parcels of any size.*** In reality, fractional shares usually cannot be bought or sold, and some assets have minimum orders sizes.
- ***Investors have an accurate conception of possible returns, i.e., the probability beliefs of investors match the true distribution of returns.*** A different possibility is that investors' expectations are biased, causing market

prices to be informationally inefficient. This possibility is studied in the field of behavioral finance.

- ✓ ***There are no taxes or transaction costs.*** Real financial products are subject both to taxes and transaction costs (such as broker fees), and taking these into account will alter the composition of the optimum portfolio. These assumptions can be relaxed with more complicated versions of the model.
- ✓ ***All investors are price takers, i.e., their actions do not influence prices.*** In reality, sufficiently large sales or purchases of individual assets can shift market prices for that asset and others (via cross elasticity of demand.) An investor may not even be able to assemble the theoretically optimal portfolio if the market moves too much while they are buying the required securities.
- ✓ ***Risk/Volatility of an asset is known in advance/is constant***. In fact, markets often misprice risk (e.g. the US mortgage bubble or the European debt crisis) and volatility changes rapidly.

Criticisms about mpt

MPT was developed in the 1950s through the early 1970s and was considered an important advance in the mathematical modeling of finance. Since then, some theoretical and practical criticisms have been leveled against it. As we see in the assumptions above there problems with the practical approach of MPT.

More complex versions of MPT can take into account a more sophisticated model of the world (such as one with non-normal distributions and taxes) but all mathematical models of finance still rely on many unrealistic premises.

B. Determinants of portfolio performance - Brinson, Hood & Beebower (1986)

They tried to investigate how the portfolio return is affected by investment policy, market timing and security selection. In order to examine this they collected historical data of 91 US corporate pension plans which invested in various asset classes.

The goal of their analysis was to rank in order of importance the investment decisions and how these decisions affected actual returns.

They made four quadrants to examine what affects more the return. At 1^{st}, 2^{nd} and 3^{rd} quadrant they only used cash, stocks and bonds to calculate the return because they had, ,only for these, complete data. As passive benchmark returns they used S&P 500 for stocks, SLGC for bonds and 30-day Treasury bill for cash.

In the following scheme we can see the process they followed and their results.

Figure 2

4 Quadrants

		Selection	
		Actual	Passive
Timing	Actual	4^{th} : Actual return Average Return **9,01%**	2^{nd} : Examine investment policy and market timing Explains 95,3% of variation of actual return. Average Return **9,44%**
	Passive	3^{rd} : Examine investment policy and the selection of specific assets of each class Explains 97,8% of variation of actual return. Average Return **9,75%**	1^{st} : Examine investment policy a) choice of asset classes and their weights b) the passive return assigned to each asset class Explains 93,6% of variation of actual return. Average Return **10,11%**

They concluded that investment policy affects the most a portfolio's return.

C. *Does asset allocation policy explain 40, 90, or 100% of performance? - Ibbotson & Kaplan (2000)*

They tried to extend the analysis of the previous paper, which answers only if the variability of returns across time is explained by policy, and to answer in two more questions.

1) How much of the variation in returns among funds is explained by differences in policy?

2) What portion of the return level is explained by policy return?

They used data of 94 US mutual funds and 58 pension funds and as benchmarks CRSP for US stocks, MSCI Europe/Australia/Far East Index for non-US stocks, Lehman Brothers Aggregate Bond Index and 30-days T-bills for cash.

They considered a model in which total return has two components: policy return (comes from asset allocation) and active return (comes from managers’ ability to actively over)

Concerning if the variability of returns across time is explained by policy they ended to same conclusions with the first paper and it explains 90%.

About question 1 they compared each fund return, which has different allocation policy, with each other and they found R^2 40% for mutual funds and 35% for pension funds. The rest percent of return is explained by other factors such as asset class timing, style within asset classes, security selection and fees. Also R^2 depends on active management, so they run a regression in which included the level of active management and they found that higher active management less explains the variation of returns.

About question 2, they calculated the percentage of fund return explained by policy return for each fund as the ratio of policy return to total return. A fund that stayed at its policy mix and invested passively had a ratio 1 but a fund that outperformed its policy had ratio less than 1.

D. *Macroeconomic influences on optimal asset allocation - Flavin & Wickens (2001*)

In a previous research in 1998 they found that investors in UK assets could succeed a reduction in portfolio risk by using a time-varying conditional covariance matrix to form the portfolio frontier instead of a constant unconditional covariance matrix. As the frontier is also time varying, the portfolio needs to be continuously rebalanced. They also found that inflation exerts a strong influence on the volatility of equity, long government bond and short-term bond returns, and on the shape and location of the portfolio mean variance frontier.

Based on these results they tried to develop a tactical asset allocation strategy in which included the effects of the inflation. They examined three UK risky assets equity, long government bond and short-term bond which were continuously updated in the portfolio in order to response to their risk changes because of the inflation.

They included in their model only the variable of inflation because if investors seek real returns then they will want to be fully compensated for inflation. Empirical evidence has shown a strong relation between inflation and stock and bond returns which is also negative. Furthermore the relation between inflation and stock returns has produced a puzzle that has attracted much attention.

They used data from Datastream of this three risky UK assets. Equity was represented by the Financial Times All Share Index, long government bonds are represented by the FT British government stock and short government bonds are represented by the FT British government stock. They also used a risk free rate of the 30-day Treasury bill. The inflation rate is calculated from the UK Retail Price Index. The data were from January 1976 to September 1996.

They built a multivariate GARCH (1, 1)—M-GARCH (1, 1) model which explains the volatility contagion of past realised values. They used three types of portfolio a)minimum variance portfolio (MVP), the optimal unconstrained portfolio (OUP) and the optimal constrained portfolio (OCP). OUP and OCP portfolios represent the optimal portfolio of risky assets. The OUP allowed weights to be negative, and permitted short sales. The OCP was restricted to have nonnegative weights.

They concluded, taking account of inflation effects, that there are important changes to portfolios. The OUP portfolio has highly volatile shares, but the OCP portfolio is stable and the optimal share of equities increases from 70% to 74%, the share of the long bond's share falls from 20% to 14%, and the share of the short bond increases from 10% to 12%. Inflation has long-run impact on equity and short run impact on bonds. The negative covariance between inflation and the excess returns generates a significant reduction in portfolio risk over and above what can be achieved by using a time varying covariance matrix of excess returns alone. The risk of the time-varying portfolio is at least 20% lower than that of the constant proportions portfolio.

E. A multivariate model of strategic asset allocation - Campbella, Chanb & Viceirac (2002)

They developed an approximate solution method for the optimal consumption and portfolio choice problem of an infinitely long-lived investor with Epstein–Zin utility who faces a set of asset returns described by a vector autoregression in returns and state variables. Empirical estimates in long-run annual and post-war quarterly U.S. data suggest that the predictability of stock returns greatly increases the optimal demand for stocks. The role of nominal bonds in long-term portfolios depends on the importance of real interest rate risk relative to other sources of risk. Long-term inflation-indexed bonds greatly increase the utility of conservative investors.

The mean–variance analysis of Markowitz provides a basic paradigm and usefully emphasizes the effect of diversification on risk, but this model ignores several critically important factors. Most important, the analysis is static; it assumes that investors care only about risks to wealth one period ahead. In reality, however, many investors—individuals as well as institutions such as charitable foundations or universities—seek to finance a stream of consumption over a long lifetime.

Financial economists have understood that the solution to a multiperiod portfolio choice problem can be very different from the solution to a static portfolio choice problem. In particular, if investment opportunities vary over time, then long-term investors care about shocks to investment opportunities—the productivity of wealth— as well as shocks to wealth itself. They may wish to hedge their exposures to wealth productivity shocks, giving rise to intertemporal hedging demands for financial assets. Unfortunately, Merton's intertemporal model is hard to solve in closed form. For many years solutions to the model were generally unavailable unless the investor had log utility of consumption withconstant relative risk aversion equal to one, but this case is relatively uninteresting because it implies that Merton's model reduces to the static model. But these preferences are not standard and most economists have continued to assume constant relative risk aversion. The lack of closed-form solutions for optimal portfolios with constant relative risk aversion has limited the applicability of the Merton model; it has not become a usable empirical paradigm, has not displaced the Markowitz model, and has had little influence on financial planners and their clients. Recently, this situation has begun to change as a result of several related developments. Despite this encouraging progress, it remains extremely hard to solve realistically complex cases of the Merton model. Discrete-state numerical algorithms become slow and unreliable in the presence of many assets and state variables, and approximate analytical methods seem to require a daunting quantity of algebra. Neither approach has been developed to the point at which one can specify a general vector autoregression (VAR) for asset returns and hope to solve the associated portfolio choice problem.

The purpose of their paper was to remedy this situation by extending the approximate analytical approachof Campbell and Viceira (1999, 2001, 2002). Specifically, they showed that if asset returns are described by a VAR, if the investor is infinitely longlived with Epstein–Zin utility, and if there are no borrowing or short sales constraints on asset allocations, then the Campbell-Viceira approach implies a system of linear–quadratic equations for portfolio weights and consumption as functions of state variables. These equations are generally too cumbersome to solve analytically, but can be solved very rapidly by simple numerical methods. As the time interval of the model shrinks, the solutions become exact if the elasticity of intertemporal substitution equals one. They are accurate approximations for short time intervals and elasticities close to one.

Their method was applied to a VAR for short-term real interest rates, excess stock returns, and excess bond returns. They also included variables that have been identified as return predictors by past empirical research: the short-term interest rate, the dividend–price ratio and the yield spread between long-term and short-term bonds In a variant of the basic approach they constructed data on hypothetical inflation-indexed bond returns, following the approach of Campbell and Shiller (1996), and study the allocation to stocks, inflation-indexed bonds, nominal bonds, and bills. In their paper assumed recursive Epstein–Zin utility defined over an infinite stream of consumption and does not impose any portfolio constraints. The simplicity of this solution method allowed them to consider an unrestricted VAR in which lagged returns are state variables along with the short-term nominal interest rate, dividend–price ratio, and yield spread. Their method also allowed them to break intertemporal hedging demands into components associated with individual state variables.

Their model was set in discrete time. They assumed an infinitely long-lived investor with Epstein–Zin recursive preferences defined over a stream of consumption. Furthermore, they allowed an arbitrary set of traded assets and state variables. they did not make the assumption that markets are complete, and they extended the work of Campbell and Viceira (1999) in which there is a single risky asset with a single state variable. There are n assets available for investment. The investor allocates after consumption wealth among these assets. In most of their empirical analysis they considered two other assets: stocks and long-term nominal bonds. They postulated that the dynamics of the relevant state variables are well captured by a first-order vector autoregressive process or VAR(1). They avoided additional lags that would require an expanded state vector withad ditional parameters to estimate.

Thus, they allowed the shocks to be cross-sectionally correlated, but assume that they are homoskedastic and independently distributed over time. The VAR framework conveniently captures the dependence of expected returns of various assets on their past histories as well as on other predictive variables. The assumption of Epstein–Zin recursive preferences has the desirable property that the notion of risk aversion is separated from that of the elasticity of intertemporal substitution.

They used their method to an empirical application with stocks, bonds and bills to investigate how investors who differ in their consumption preferences and risk aversion allocate their portfolios among these three assets. Investment opportunities are described by a VAR system that includes short-term ex post real interest rates, excess stock returns, excess bond returns, and variables that have been identified as return predictors by empirical research. In addition, they used their method to an empirical application to strategic asset allocation with inflation-indexed bonds.

They concluded that strategic effects on asset demands arise because shocks to the forecasting variables are correlated with the unexpected returns on stocks and bonds. The correlation is strongest for the dividend–price ratio, and thus we find that this variable is the most important determinant of both the level and the variability of optimal portfolio demands. Predictability of stock returns from the dividend–price ratio tilts the optimal portfolio holdings of moderately conservative investors towards stocks and away from bonds and cash. They found that the intertemporal hedging demand for long-term nominal bonds is negative for intermediate levels of risk aversion in post-war quarterly data, and positive in long-term annual data covering the whole twentieth century. These contrasting results reflect the importance of real interest rate risk in each period. In the annual dataset, real interest rates are much more variable than in the quarterly postwar dataset, thus increasing the desire of conservative investors to use bonds to hedge real interest rate risk. Also, nominal bonds have been positively correlated with stocks in the post-war period, encouraging investors to use short bond positions to hedge long stock positions; this correlation is much weaker in the long-term annual dataset. When they added inflation-indexed bonds to the asset menu, they found that conservative investors use these assets to hedge real interest rate risk; extremely conservative investors should hold most of their wealth in inflation-indexed bonds when these assets are available.

Their research had several limitations that should be kept in mind when interpreting the results.

1. They considered a long-term investor who has financial wealth but no labor income.
2. They do not impose borrowing or short-sales constraints; to do so would take us outside the tractable linear–quadratic approximate framework and would require a fully numerical solution method of the sort used by Brennan et al. (1997, 1999) and Lynch (2001).
3. Their solutions are approximate for investors withelasticity of intertemporal substitution not equal to one. Campbell et al. (2001) have checked the accuracy of the approximation in the simpler model of Campbell and Viceira (1999) withonly one risky asset and one state variable, and have explored the effects of portfolio constraints in that context, but further work is needed within the richer dynamic framework used here.
4. They ignored the differential tax treatment of interest or dividend income and capital gains. Dammon et al. (2001) have recently argued that tax effects can be particularly important for long-term investors.

5. They assumed that a VAR system, estimated without corrections for small-sample biases and without the use of Bayesian priors, is a reasonable description of the dynamic behavior of stock and bond returns. They assumed that investors know all the parameters of the model. They had found that these parameters, including not only the means and covariances of asset returns but also the parameters governing the dynamics of asset returns and state variables, can have enormous effects on optimal portfolio demands. Given this, it is not surprising that parameter uncertainty and learning can have a large effect on optimal long-term investment strategies as shown by Barberis (2000), Brennan (1998), Xia (2001), and others. A challenging task for future research will be to integrate all these effects into a single empirically implementable framework.

F. Optimal deviations from an asset allocation - Gratcheva & Falk (2002)

Institutional investors have long recognized that asset allocation is the most crucial decision required to achieve their investment goals. After having determining a ‘strategic benchmark portfolio’, a portfolio manager may wish to set tolerable limits within which individual asset class managers can vary. They modeled this problem mathematically as a convex optimization problem, and proposed an algorithm to solve it.

They considered a portfolio management problem of asset classes, each of which is managed by an independent ‘submanager’. Given a ‘benchmark’ portfolio, the general manager often wished to allow the submanagers some :exibility in risk, but wishes to limit the overall risk of the portfolio. Thus, the general manager wishes to set optimal limits for the submanagers o; of the benchmark in such a way that the overall risk is limited. The mathematical model that reflects this situation is a convex optimization problem with a (potentially) huge number of constraints. They proposed a ‘cutting plane’ method to solve it. In addition, they proposed a heuristic scheme to start the algorithm which, in practice, predicts the crucial constraints in one or two steps.

Global asset allocation, or allocation to various international asset classes, is the largest source of differences in performance among portfolios. Global asset markets offer significant opportunities to improve investment returns. However, to take advantage of investment opportunities in the global market, the investor (institutional or individual) has to develop a consistent and rigorous approach to asset allocation. One of the challenges of the asset allocation problem is that the asset allocation decision is not a single decision. A rigorous approach should include the following main steps:

1. Selection and justification of what asset classes should be considered for the asset allocation problem. Currency composition of the asset mix should be addressed either through currency hedging or considering the currency component as a separate asset class in the asset allocation.
2. Estimation/forecasting of the risk and return parameters of the selected asset classes to be used in an optimization model using quantitative or qualitative models or a combination of the two.
3. Building optimal portfolios with the above parameters using some type of optimization model.
4. Validating the candidate optimal portfolios via testing their out-of-sample performance or historical simulation.
5. Estimating the explicit limits of allowed deviations from the established asset allocation mix.

The first four steps are related to strategic asset allocation and the fifth with tactical asset allocation which is the main focus of their paper.

There are a number of risks to an institutional portfolio. The nature of their paper was to address strategic risk. When the stop loss is determined, it is an explicit risk allocation of the overall portfolio, which should be used for active management of the assets. The next step of the portfolio manager is to distribute this risk among all or some asset classes in a way that is most beneficial to the total portfolio return. This is not an easy problem to solve, and even more difficult to implement in practice. Since the portfolio is invested in a number of asset classes, which require very distinct sets of expertise and experience, respective subportfolios (portions of the portfolio invested in a particular asset class) should be managed by di;erent portfolio managers. To address this issue, many institutions hire various external managers specializing in a particular asset class.

It is impossible to generate return without taking risk. It implies, however, that the risk as well as its allocation among the subportfolios must be managed. It is possible to diversify the total risk to different asset classes. They proposed the following process for active risk allocation. The total risk for active management gets distributed among all asset classes to optimize overall risk and is based on historical or projected risk/return characteristics of all asset classes.

They assumed that the four steps of strategic asset alloction, which is the fraction of the portfolio invested in different asset classes, as a benchmark for an institution and that a portfolio manager is allowed to deviate from the strategic mix within certain constraints. Therefore, an active allocation (fifth step for tactical allocation) over all asset classes is within the active bounds at any given time. They tried to build a model with th above assumptions to see if a portfolio is under-invested with respect to its benchmark and if a portfolio is over-invested so a manager can be aware within which individual asset class can vary.

Under-investment of the portfolio results in the remainder of the funds being kept in cash instruments. Over-investment can be financed through borrowing cash from the market or other types of fnancing. Note that once the benchmark is established for a portfolio, it becomes the risk reference point. Since performance of the portfolio is reported as the difference between the actual portfolio returns and its benchmark return (i.e. excess return), any deviation from the benchmark produces volatility of excess returns and therefore, creates risk.

They applied their optimization model to several examples to see if it can work. The algorithm converged to the optimal solution on average between 2 and 3 iterations, with 95% of the problems all included constraints being banding. They concluded that the algorithm found the optimal solution in one iteration in 44%, 36% and 24% of the problems for 32, 1024 and 32768 constraints respectively.

G. *Strategic asset allocation with liabilities: beyond stocks and bonds - Hoevenaars, Molenaar, Schotman & Steencamp (2005)*

They studied the strategic asset allocation for an investor’s portfolio not only with assets but also with risky liabilities which are subject to inflation and real interest rate risk. Assets included in this portfolio were stocks, government bonds, corporate bonds, T-bills, listed real estate, commodities and hedge funds. They extended the traditional mix of asset and showed how investors with liabilities can hedge against inflation and real estate interest with different assets. They examined time and risk diversification properties, how the investment horizon influences the importance of the liabilities, and if the benefits from long-term investing are larger when there are liabilities.

They used a vector autoregression for returns and macro-economic state variables which had two forms one for only asset investor and one for asset-liability investor. They used US quarterly data for all the assets from Datastream.

They concluded which alternative asset classes add value for long-term investors because their structure of risk is different from that of stocks and bonds. Commodities help in hedging inflation risk and hedge funds have good inflation hedging qualities in the long run, but a high exposure to stocks and bonds. Traditional asset classes include structure properties of listed real estate and credits.

Asset-only investors have a large demand for short-term instruments due to their strong positive correlation with inflation at longer horizons. Although T-bills are a bad liability hedge, they remain attractive for their low risks at short horizons and good diversification properties with stocks and bonds at longer horizons. Bonds and credits are the best real rate hedge.

Furthermore they showed that the benefits of long-term investing are larger when there are liabilities. The asset–liability investor focus more on interest rate risk and fixed-income products than asset-only investors. Investors sometimes do not invest in alternatives because of liquidity reasons, reputation risk or legal constraints. Liquidity forms a restriction whenever the desired allocation to an asset class is not available in the market at realistic transaction costs. Reputation risk comes in as most institutional investors are evaluated and compared to their peers and competitors Legal constraints could follow from rules which restrict investments to specific classes (e.g. no hedge funds allowed).

H. Active fund management: global asset allocation funds - Larrymore & Rodriguez (2006)

They used a modified Sharpe's Return-Based Style analysis method to create a three-index model of returns in order to examine the value of active fund management of global asset allocation funds.

They used data of 17 mutual funds which are classified as global asset allocation funds. Investors find it advantageous to invest abroad when the global asset allocation fund is referenced in U.S. dollars, the non-U.S. investment is denominated in a foreign currency, and that foreign currency advances against the dollar. Active asset allocation managers can also benefit from favorable fundamentals in foreign stock and bond markets, such as low inflation, falling interest rates, and economic growth. Additionally, these funds invest in both stocks and bonds worldwide, including U.S. securities. When short-term interest rates creep upward, when stock prices are relatively high, or when dividend yields are low compared to bond yields, fund managers can reposition toward bonds, which can include both corporate and sovereign debt in U.S. and non-U.S. markets. Money that the fund does not deploy in stocks and bonds remains in the form of cash or cash equivalents. They are the first to use daily data and to recognize the impact of fixed-income exposure.

They calculated the alpha measure of Jensen and the root mean square errors (RMSE) with which compared their results of the three-index model.

They found that their sample of global asset allocation funds adds value to their investor portfolios. They found a positive and statistically significant average attribution return and further evidence that funds outperform when we use the more traditional performance measure alpha as evidenced by a positive, statistically significant mean alpha during the study sample period. Also, the two performance measures they used here, attribution returns and alpha, are positively correlated; this correlation is statistically significant.

I. *Strategic asset allocation: determining the optimal portfolio with ten asset classes - Bekkers, Doeswijk & Lam (2009)*

They tried to explore which asset classes add value to the traditional asset mix of stocks, bonds and cash and which are the optimal weights of all asset classes in the optimal portfolio. They also made simultaneously a mean-variance analysis as well as a market portfolio approach and the combination these two methods.

They concluded that real estate, commodities and high yield add most value for the investors although these asset classes are a small proportion of the market portfolio.

J. *How should individual investors diversify? An empirical evaluation of alternative asset allocation policies - Jacobs, Muller & Weber (2012)*

They tried to evaluate various diversification strategies to help individual investors to avoid investment mistakes.

Individual investors prefer domestic investments and they lose the benefits of international diversification. They own few individual stocks and exposure to idiosyncratic risk. Tend to be overconfident and trade too much. Most asset allocations are extreme and investors make inefficient portfolios. Usually investors don’t have the knowledge to use optimization models.

So, they compared 11 optimization models and 3 heuristic models of returns to examine which offers better diversification for both international diversification and diversification over asset classes.

For their analysis they used 3 asset classes stocks (represented by 4 regional indices MSCI Europe/North America/Pacific/Emerging markets), bonds (because of their low correlation with stocks) and commodities (diversification benefits)

They concluded that optimization models and heuristic models offer the same diversification for both international diversification and diversification over asset classes. Optimization models do not outperform heuristic stock weighting schemes and do not add substantial value. The inclusion of additional asset classes is highly beneficial. Diversification gains are driven by a well-balanced allocation over different asset classes. As long as the portfolio is not heavily titles towards one asset class almost any form of naïve-weight allocation strategy realizes diversification potential.

Individual investors relying on simple rules of thumb in asset allocation significantly improves the performance of any single asset class portfolio.

K. Strategic asset allocation: the global multi-asset market portfolio 1959-2011 - Doeswijk, Lam & Swinkels(2012)

They estimated the invested global market portfolio for the period 1990-2011 by taking the portfolio of the average investor which contains important information for strategic asset allocation purposes and shows the relative value of all assets according to the market crowd, which one could interpret as a benchmark or the optimal portfolio for the average investor. They determined the market values of equities, private equity, real estate, high yield bonds, emerging debt, non-government bonds, government bonds, inflation linked bonds, commodities, and hedge funds.

They found that equities are 34.7% of global market portfolio, government bonds 30%, non-government bonds 18,4% and real estate 4,4% in 2011. Across time investments in equities have reduced but investments in bonds and real estate have risen. Investments in other assets like commodities and hedge funds are small however in latest years more investors choose these assets.

III. An Other Proposal For Asset Allocation

In the followings section we are trying to locate the problems in the MPT in practice and propose a solution.

A. Definition of the Problem

As we mentioned above MPT needs inputs of expected returns, variances and covariances taken by historical data in order to make estimations.

When the sample moments can be used as estimators?

- ✓ ***When the process of returns is IID***

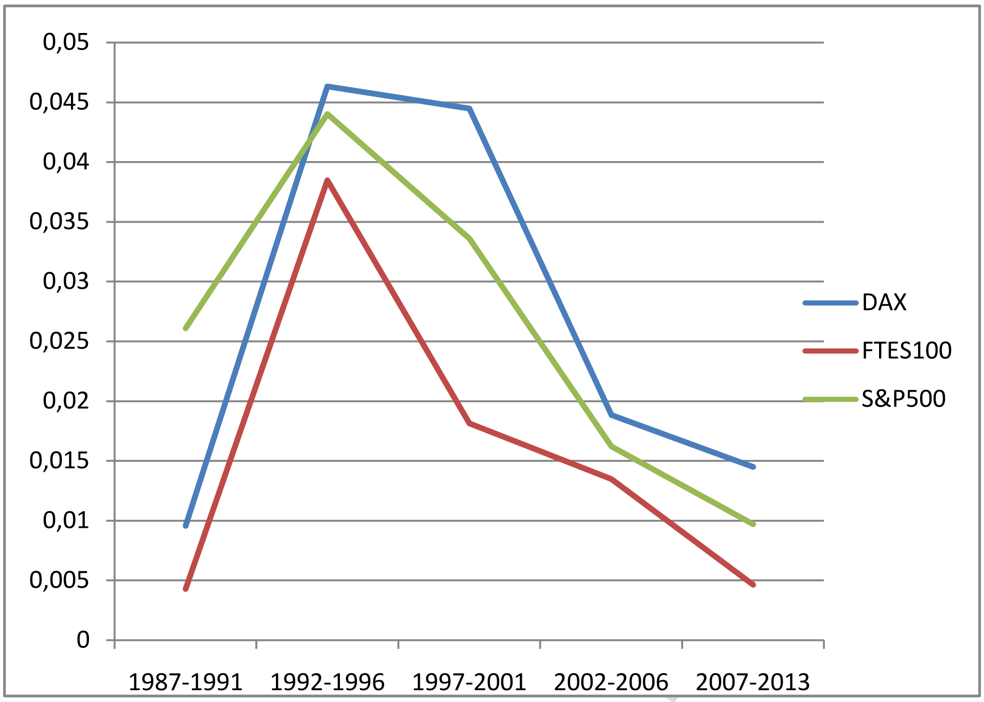
For example if we use a sample of three price indices DAX, S&P500 and FTSE-100 and their daily returns R_1, R_2, R_3 for a period 1987-2013 the process of returns according to Markowitz model should be IID which means that returns and covariance matrix is stable through time.

In order to examine if a process of returns is IID we used the above sample of three price indices DAX, S&P500 and FTSE-100.

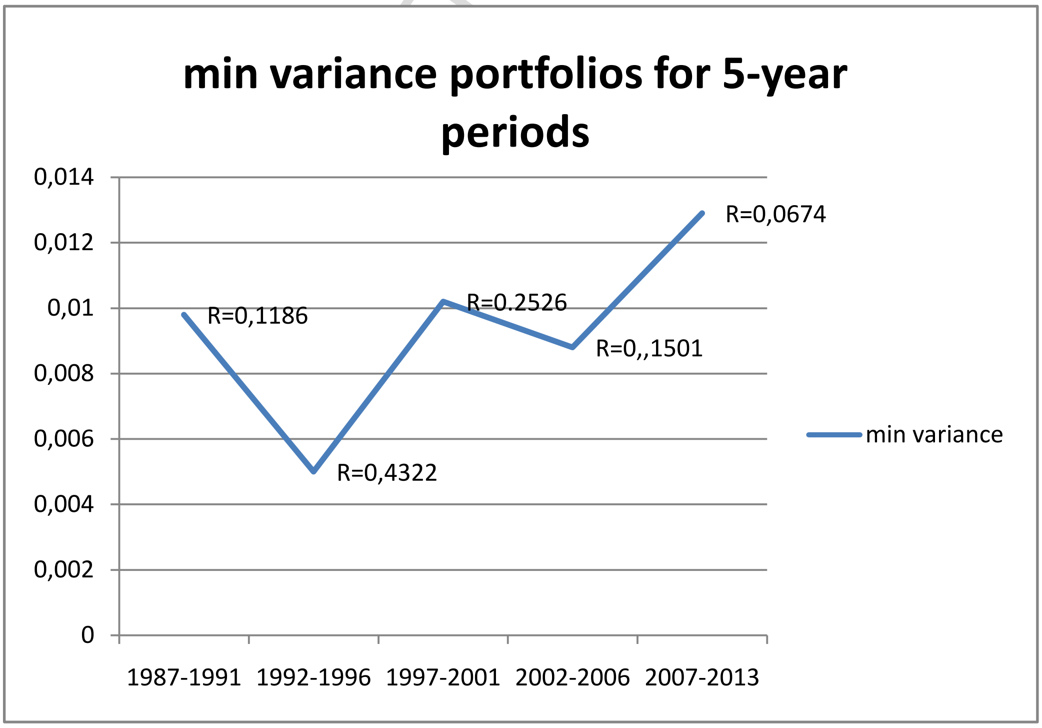
First, we divided our sample in five-year samples. We calculated the returns, the covariance, the weights of a portfolio with these three assets and the efficient frontiers with Matlab.

We found that for each five-year period the returns, the covariance matrix and the weights are different which means that this model is unstable. The efficient frontier is also different for each period of five years. In the following graphs we show the mean returns and the efficient frontiers for each period of five years. Additionally, in the following graphs we show the minimum variance portfolios for each period of five years with their returns and weights.(tables 2-7, see appendix)

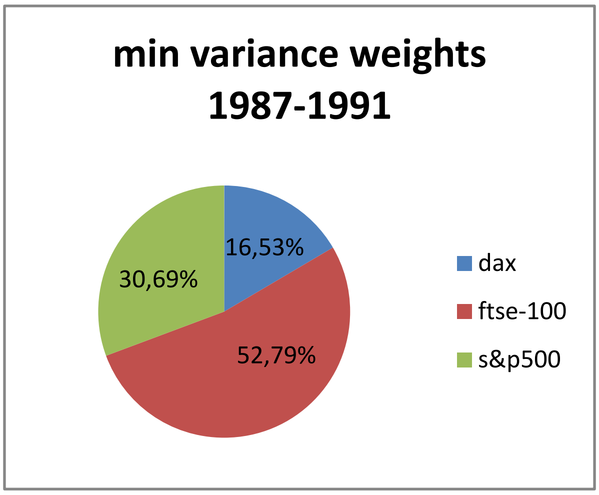
Graph 1 – Mean Returns for 5-Year Periods

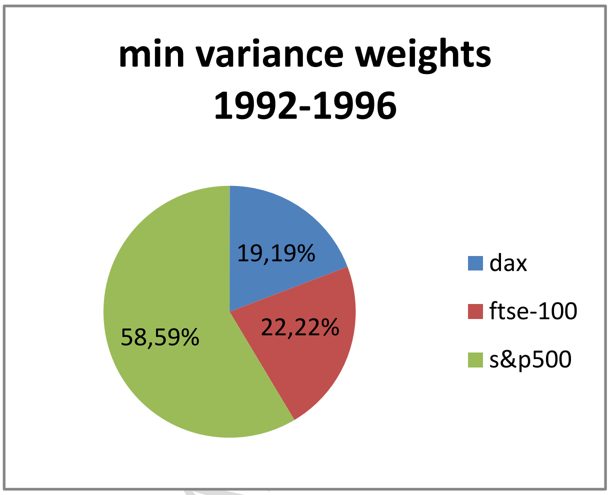


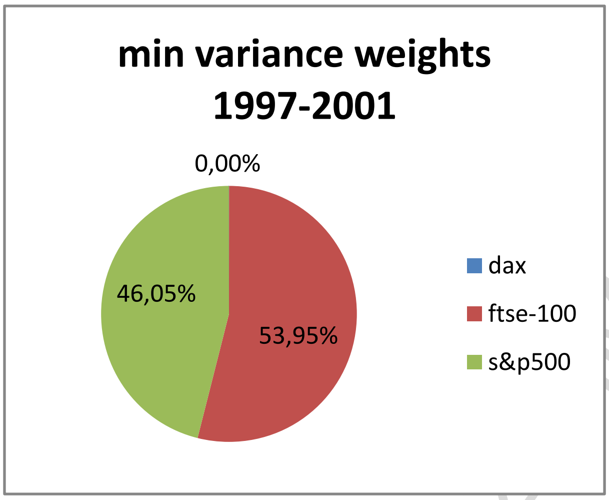
Graph 2 – Minimum Variance Portfolios with their Returns for 5-Year Periods

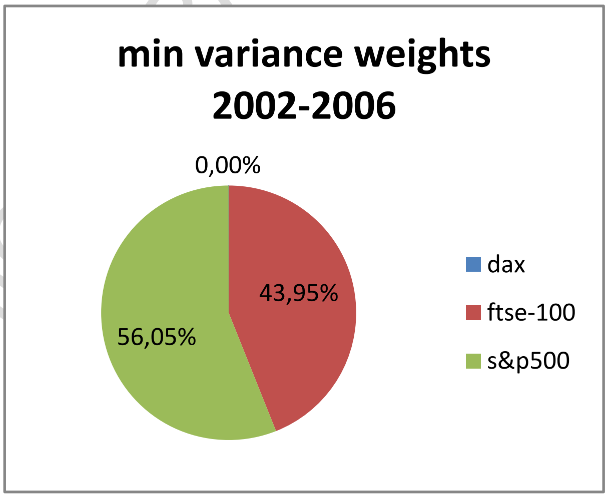


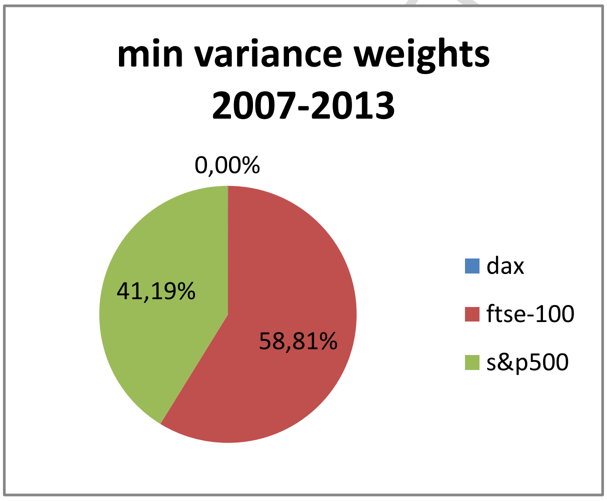
Graph 3 – Weights for Minimum Variance Portfolios





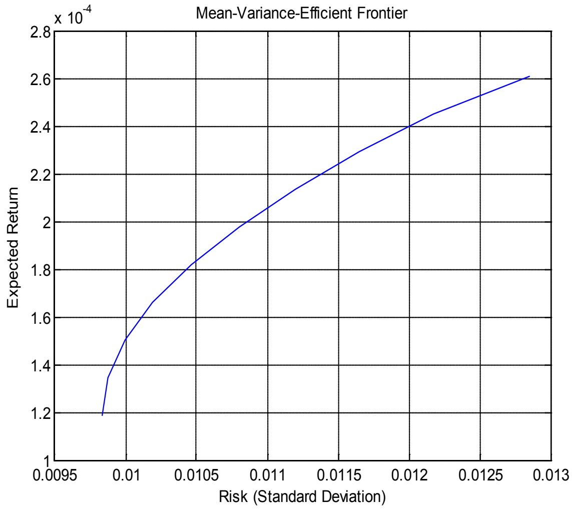




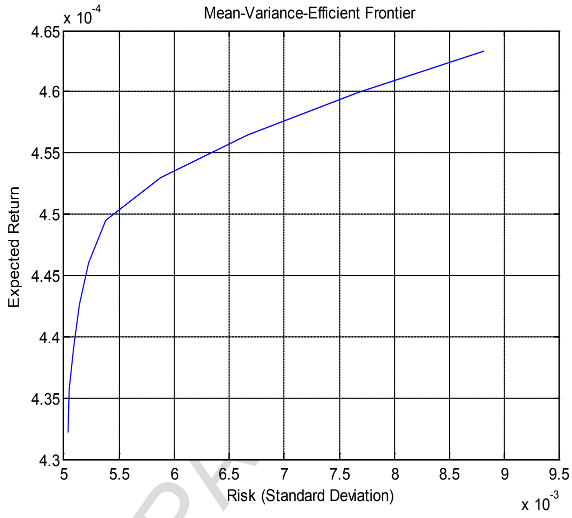


Graph 4 - Efficient Frontiers For 5-Year Periods

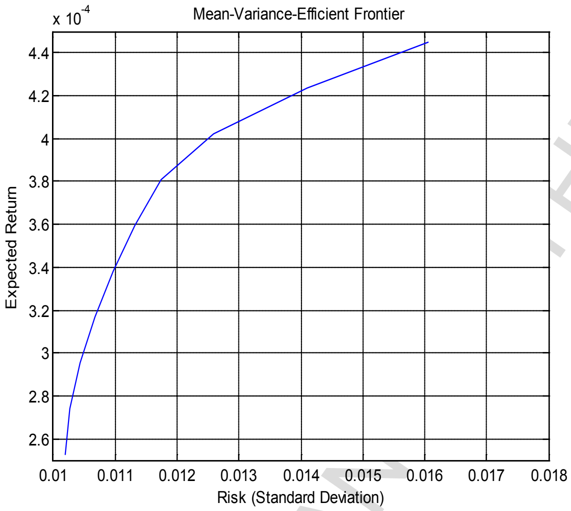
1987-1991



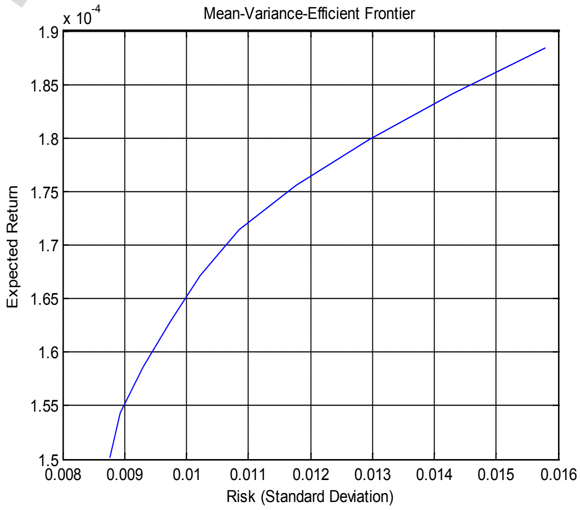
1992-1996



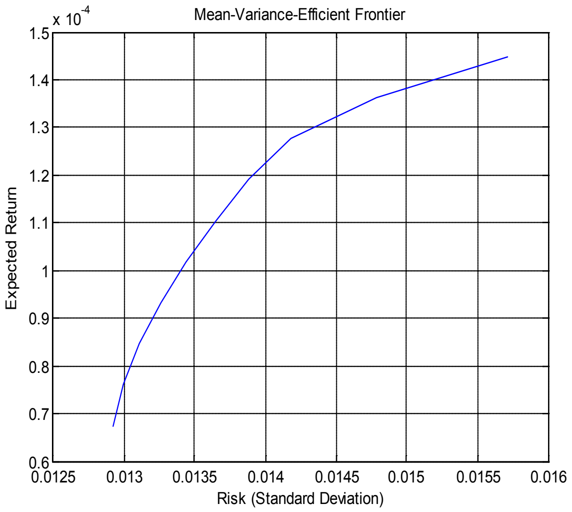
1997-2001



2002-2006

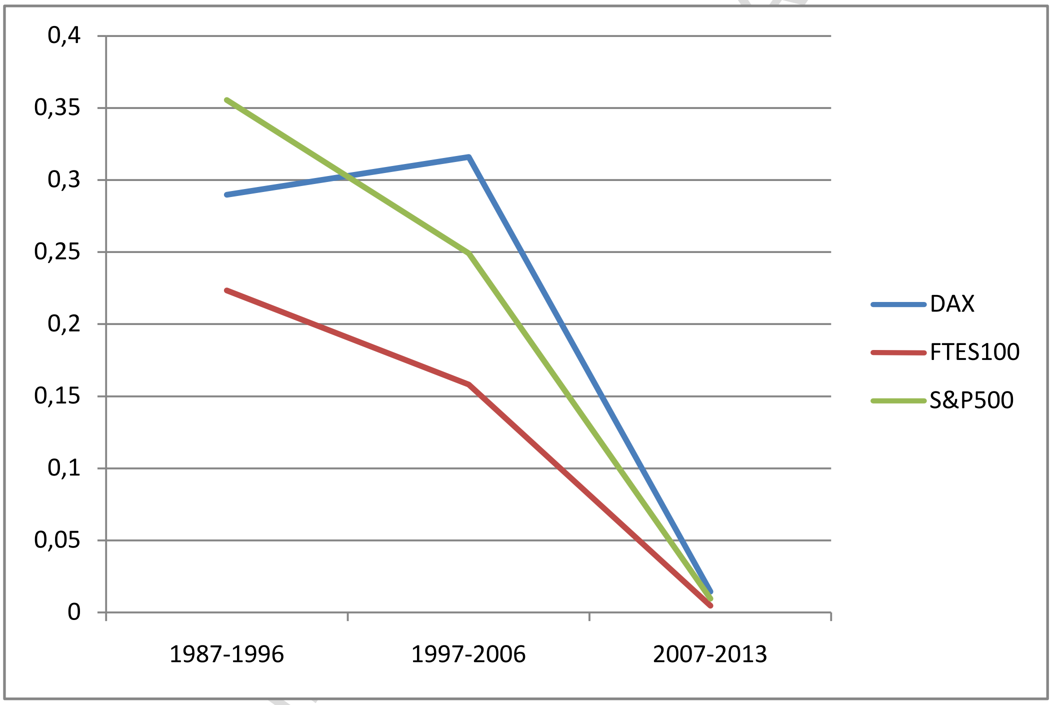


2007-2013

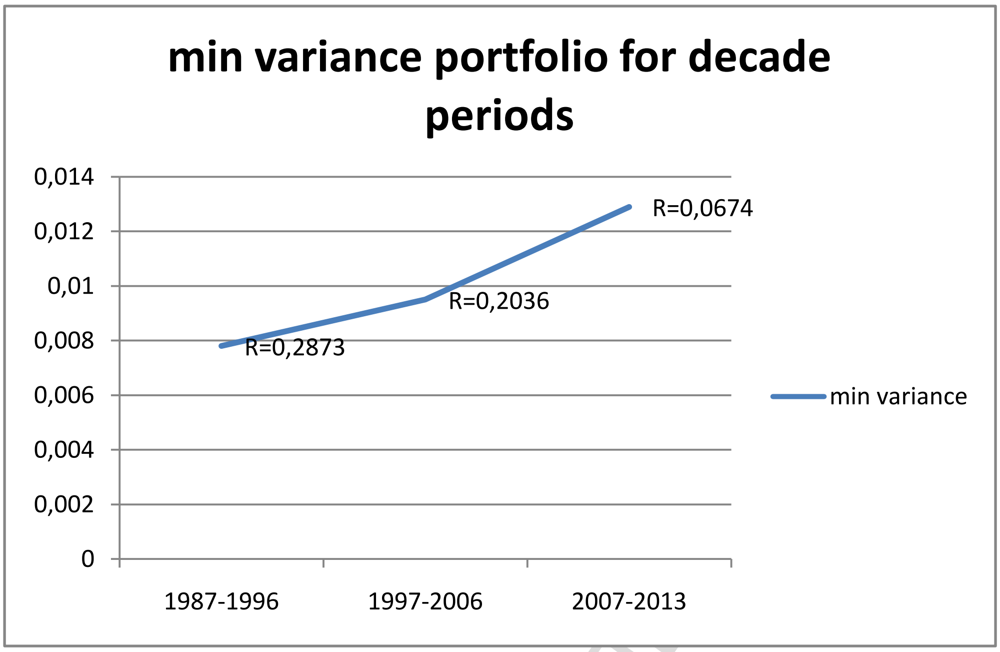


Second, we divided our sample in decades and we repeated the same process. This time also, we found that for each decade the returns, the covariance matrix and the weights are different which means that this model is unstable. The efficient frontier continues to be different for each decade. In the following graphs we show the mean returns and the efficient frontiers for each period of five years. Additionally, in the following graphs we show the minimum variance portfolios for each period of five years with their returns and weights. .(tables 8-10, see appendix)

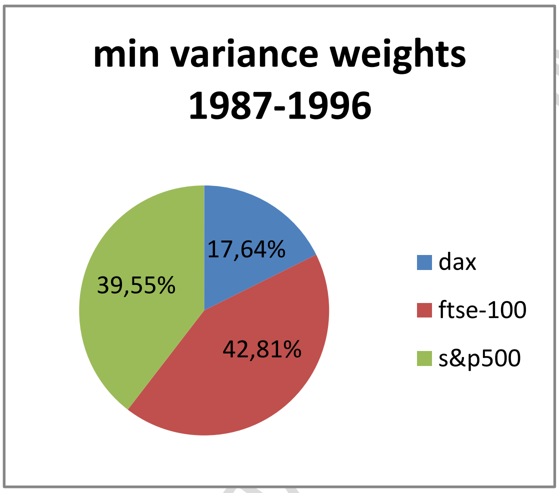
Graph 5 – Mean Returns for Decade Periods

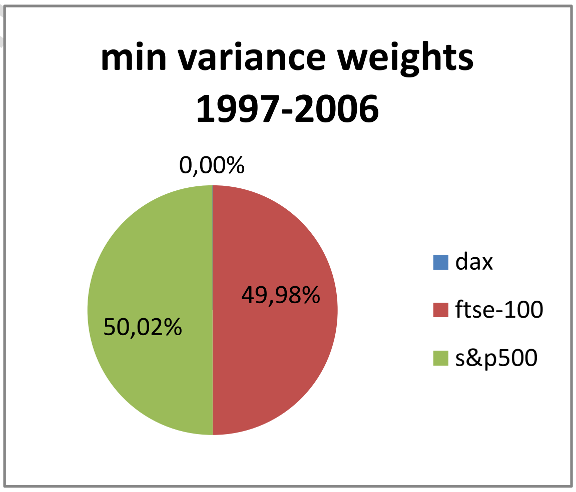


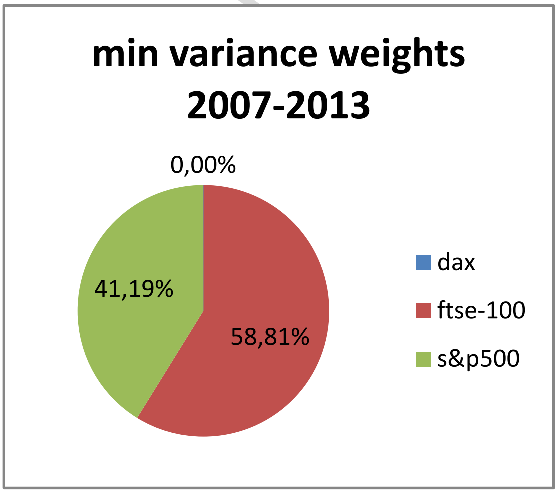
Graph 6 – Minimum Variance Portfolios with their Returns for Decade Periods



Graph 7 – Weights for Minimum Variance Portfolios

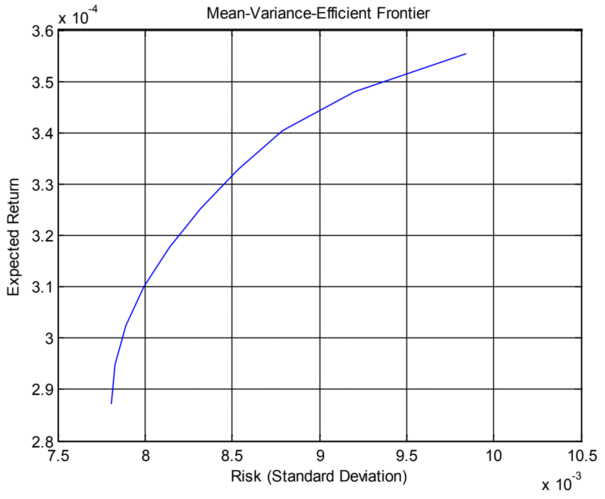




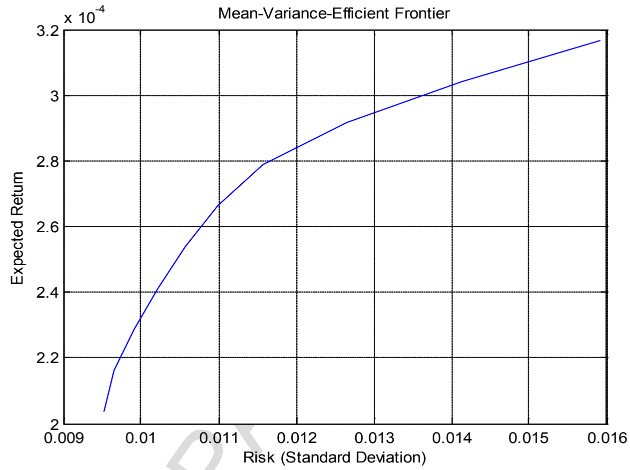


Graph 8 - Efficient Frontiers For Decade Periods

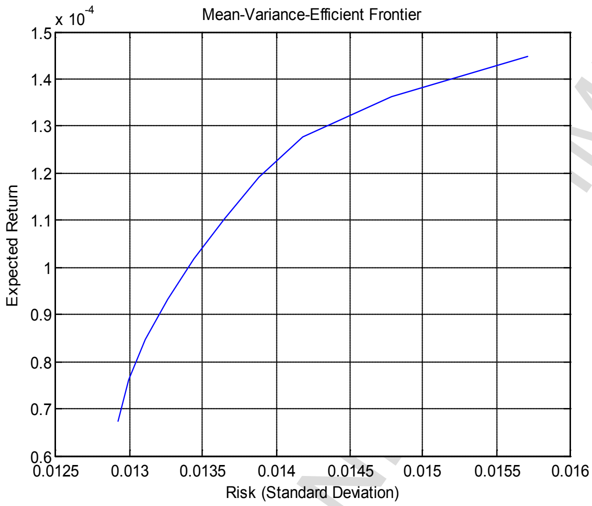
1987-1996



1997-2006



2007-2013



B. Findings

After our examination it is obvious that the expected returns, the covariance matrix, the portfolio weights and the efficient frontier are not stable through time.

We understand that IID does not seem to hold and because of that the sample moments cannot be used as estimators. Furthermore, the assumption of market efficiency does not seem to hold either.

In this section we prove that market efficiency does not exist. We use the One Factor Model for stock return for our portfolio:

$$\mathbf{R_{it} = c_i + b_i \{ X_t - \mathcal{E}(X_t/I_{t-1})\} + u_{it} \,,\ i=1,2,3 \quad (1)}$$

Where:

R_{it} = return of asset I in time t

X_t = risk factor

$\mathcal{E}(X_t/I_{t-1})$ = subjective expectation of agents for return depended from an information set in time t-1

u_{it} = residuals

If the market efficiency exists the subjective expectation of agents should be equal the objective expectation of the agents. Thus, in equation (1) if we replace:

$$\mathbf{\mathcal{E}(X_t/I_{t-1}) = E(X_t/I_{t-1})}$$

where $E(X_t/I_{t-1})$ is the objective expectation of agents for return we have:

$$\mathbf{R_{it} = c_i + b_i \{ X_t - E(X_t/I_{t-1})\} + u_{it}}$$

And the mean return is:

$$\mathbf{E(R_{it}/I_{t-1}) = c_i + b_i \{ E(X_t/I_{t-1}) - E(X_t/I_{t-1})\} + E(u_{it}/I_{t-1})}$$

$$\mathbf{E(R_{it}/I_{t-1}) = c_i}$$

We showed that the mean return is constant through time and that denotes mean conditional independence. In our research when we divided our data in smaller periods we found that the mean returns for each period were different. This outcome opposes to the theory of market efficiency. We concluded that market efficiency does not exist.

However, it can be argued that c_i could change through time because of the risk premium's changes. In reality it is difficult to have such large volatility in risk premium's prices which could justify the large volatily in the returns.

In addition, it can be argued that the three indices that we used in our example are from developed countries with strong economies and their markets cannot be inefficient like some less developed or emerging markets. Nevertheless, after our analysis it's obvious that market efficiency cannot hold and an investor in order to make effective investment choices must take into account this parameter.

C. Proposing a solution

As we mentioned above the historical mean returns, the covariance matrix, the weights of the portfolios and the efficient frontiers are not stable through time. That means that the process of returns is not IID and the sample moments cannot be used as estimators. Furthermore, because of the market inefficiency we need another way to calculate the returns.

In the next sections we used the returns of S&P500 and we tried to examine which economic variables from the US economy can help us to forecast the returns through an econometric model. If our model can forecast in a reliable way the returns, we will be able overtake the unrealistic assumptions of MPT, which are the stable returns through time and market efficiency. That way we can use the forecasting returns to structure a portfolio in practice.

D. Data

We used quarterly data of US economic variables in levels from 1947 Q1 to 2013 Q3 and the prices of S&P500 from Bloomberg. We decided to examine the US economy because is one of the most developed economies globaly and attract investors from all over the world. We did not have all the series of our data for the entire period from 1947 Q1 to 2013 Q3 and we present the variables with their symbol in the following table.

Table 1 – Economic Variables of US Economy

P1	US Employees on Nonfarm Payrolls Total SA
P2	US Initial Jobless Claims SA
P3	Federal Funds Target Rate US
P4	GDP US Nominal Dollars SAAR
P5	Conference Board Consumer Confidence SA 1985=100
P6	ISM Manufacturing PMI SA
P7	US CPI Urban Consumers SA
P8	University of Michigan Survey of Consumer Confidence Sentiment
P9	Mortgage Bankers Association Purchase Index SA
P10	US Durable Goods New Orders Industries SA
P11	US New One Family Houses Sold Annual Total SAAR
P12	Adjusted Retail & Food Services Sales Total SA
P13	U-3 US Unemployment Rate Total in Labor Force Seasonally Adjusted
P14	US New Privately Owned Housing Units Started by Structure Total SAAR
P15	US Industrial Production 2007=100 SA
P16	US Existing Homes Sales SAAR
P17	US PPI By Processing Stage Finished Goods Total SA
P18	US Manufacturers New Orders Total SA
P19	US Personal Income SAAR
P20	US Personal Consumption Expenditures Nominal Dollars SAAR
P21	Conference Board US Leading Index Ten Economic Indicators
P22	US Trade Balance Balance Of Payments SA
P23	US Empire State Manufacturing Survey General Business Conditions SA
P24	ADP National Employment Report SA Private Nonfarm Payrolls
P25	Chicago Business Barometer
P26	Merchant Wholesalers Inventories Total SA
P27	Census Bureau US Construction Spending Total SA
P28	US Import Price Index by End Use All MoM NSA

P29	Philadelphia Fed Business Outlook Survey Diffusion Index General Conditions
P30	US Pending Home Sales Index SA
P31	US CPI Urban Consumers Less Food & Energy SA
P32	US Treasury Federal Budget Debt Summary Deficit Or Surplus NSA
P33	ISM Non-Manufacturing NMI NSA
P34	US Durable Goods New Orders Total ex Transportation SA
P35	US Foreign Net Transactions
P36	Bureau of Labor Statistics Employment Cost Civilian Workers QoQ SA
P37	ISM Manufacturing Report on Business Prices Index NSA
P38	US Employees on Nonfarm Payrolls Manufacturing Industry SA
P39	Richmond Federal Reserve Manufacturing Survey Monthly % Change Overall Index
P40	US Continuing Jobless Claims SA
P41	US PPI By Processing Stage Finished Goods ex Foods & Energy SA
P42	GDP US Personal Consumption Chained 2009 Dlrs % Change from Previous Period SAAR
P43	US GDP Personal Consumption Core Price Index QoQ % SAAR
P44	FHFA US House Price Index Purchase Only SA
P45	Bloomberg US Weekly Consumer Comfort Index
P46	Dallas Fed Manufacturing Outlook Level Of General Business Activity
P47	Private Housing Authorized by Bldg Permits by Type Total SAAR
P48	US Capacity Utilization % of Total Capacity SA
P49	Chicago Fed National Activity Index
P50	NFIB Small Business Optimism Index
P51	Capital Goods New Orders Nondefense Ex Aircraft & Parts SA
P52	Nondefense Capital Goods Shipments Ex Aircraft and Parts SA
P53	S&P/Case-Shiller Composite-20 Home Price Index Not Seasonally Adjusted
P54	National Association of Home Builders Market Index SA
P55	US Auto Sales Total Annualized SA
P56	Federal Reserve Consumer Credit Total Net Change SA
P57	US Nonfarm Business Sector Output Per Hour Of All Persons SA 2005=100
P58	US Manufacturing & Trade Inventories Total SA
P59	US Auto Sales Domestic Vehicles Annualized SA
P60	US Unit Labor Costs Nonfarm Business Sector SA
P61	Bloomberg United States Financial Conditions Index
P62	Federal Reserve Bank of St Louis Business Loans SA
P63	Fed Resrv Bank of St Louis Loans & Leases in Bank Credit All Commercial Banks
P64	FOF Federal Reserve US Households & NPO Net Worth Nominal $ Value

P65	FOF Federal Reserve US Households & Nonprofit Organizations Gross Assets
P66	FOF Federal Reserve US Households & Nonprofit Organizations Liabilities
P67	FOF Balance Sheet of Nonfinancial Corp Net Worth Market Value
P68	FOF Balance Sheet of Nonfinancial Corp Total Assets at Market Value
P69	FOF Balance Sheet of Nonfinancial Corp Total Financial Liabilities
P70	FOF Balance Sheet of Noncorporate Proprietors Equity in Noncorp Liability Net
P71	FOF Balance Sheet of Noncorporate Total Assets
P72	FOF Balance Sheet of Noncorporate Total Financial Liabilities
P73	United States Nominal Effective Exchange Rate Broad
P74	Federal Reserve Money Supply USD SA
P75	Federal Reserve Money Supply M2 SA
P76	Monetary Base Total NSA
P77	US Total Public Debt Outstanding
P78	US Treasury Federal Budget Debt Summary Net Outlays NSA
P79	US Treasury Federal Budget Debt Summary Net Receipts NSA
P80	Foreign Purchases of US Securities Total
P81	Foreign Sales of US Securities Total
P82	US Export Price By End Use All Commodities MoM NSA
P83	US Nominal Account Balance In Billions of USD
P84	US Trade Balance BOP Exports SA
P85	US Trade Balance BOP Import SA
P86	Federal Reserve Percent of Consumers with New Bankruptcies National Average
P87	US Personal Savings SA
P88	Fed Rsv Total Debt Balance Composition Total
P89	Housing Completions Total
P90	Housing affordability for first Time homebuyers
P91	Delinquencies As % Of Total Loans SA
P92	Mortgage Debt Outstanding
P93	Homeownership Quarterly Rate
P94	Federal Reserve Percent of Consumers with New Foreclosures National Average
P95	Median Asking Rent In The United States
P96	US Existing Home Sales Months Supply SAAR
P97	Conference Board US Lagging Leading Economic Indicators Composite 2004=100
P98	Conference Board Coincident Composite of 4 Coincident Indicators 2004=100
P99	ICSC US Retail Chain Store Sales Index SA
P100	Auto Unit Inventory level SA
P101	US Manufacturing & Trade Sales in Nominal Dollars SA
P102	US Manufacturers New Orders Total SA

P103	US Durable Goods Unfilled Orders Total SA
P104	US Manufacturers Shipments Total SA
P105	US Manufacturers Inventories to Shipment Ratio All Industries SA
P106	Auto Unit Unit Auto Inventory Production SA BEA Table 7.2.5S
P107	E-COMMERCE SALES QUARTERLY
P108	Seasonally Adjusted Retail Inventories Total
P109	Merchant Wholesalers Sales Total SA
P110	Merchant Wholesalers Inventories Total SA
P111	U.S. Commerce Department Total Vehicle Sales NSA
P112	US Unemployment Unemployed Workers Total in Labor Force SA
P113	US Employment Total in Labor Force SA
P114	US Employment Civilian Labor Force Total in Labor Force SA Household Survey
P115	US Employment Civilian Nonlabor Force Total in Nonlabor Force SA
P116	US Continuing Jobless Claims Unemployment Rate SA
P117	US Job Openings By Industry Total SA
P118	U.S. Job Openings and Labor Turnovers Hires Level SA
P119	U.S. Job Openings and Labor Turnovers Separations Level SA
P120	US Compensation Per Hour Nonfarm Business Sector SA
P121	US Personal Consumption Expenditures Chain Type Price Index SA
P122	US Corp Profits With IVA and CCA Domestic Industries After Tax SA
P123	US Goods Spending as a % PCE Current Dollars SAAR
P124	US Service Spending as a % PCE Current Dollars SAAR
P125	US Gross Private Domestic Investment Total Nominal SAAR
P126	GDP US Imports and Exports Total Exports Chained 2009 Dollars
P127	GDP US Imports and Exports Total Imports Chained 2009 Dollars
P128	US GDP Govt Purchases & Investment Total Chained 2009 SAAR

Because our data were not stationary and in order to examine them we took the first logarithmic differences of non-negative series. The negative series were not considered in our analysis.

E. *Econometric Model*

1. *Methodology*

We examined the relation between the returns of S&P500 and all the non-negative series of the above economic variables. In order to do that, we divided our variables in three samples. First we examined the sample 1 from P1 to P30 to show which variable separately is statistically important to forecast the returns of S&P500. Second we repeated the same process for sample 2 from P31 to P60 and finally for sample 3 from P60 to P128. The samples were divided by the importance of the economic variables. In sample 1 and 2 the variables are less important for our purpose,whereas the variables in sample 3 are more. The first 60 variables are divided in two samples to make our analysis easier. As we mentioned above we did not take into account the negative series.

For every sample we examined the relation of S&P500 and the economic variables with a single factor model.

$$\mathbf{DLSPX_t = b_1 + b_2\, DLPi_{t-1} + u_t \quad (2)}$$

where

$DLSPX_t$: the returns of S&P500 in time t

$DLPi_{t-1}$: the economic variable i in time t-1

u_t : the residuals of the regression

The economic variables which were statistically important in level of significance 15% and the observations were before 1995, in order to have reliable results, are taken into account for every sample to examine if all variables together could forecast the returns of S&P500.

$$\mathbf{DLSPX_t = b_1 + \sum_i b_i DLPi_{t-1} + e_t \quad (3)}$$

$DLSPX_t$: the returns of S&P500 in time t

$DLPi_{t-1}$: the economic variable i in time t-1

e_t : the residuals of the regression

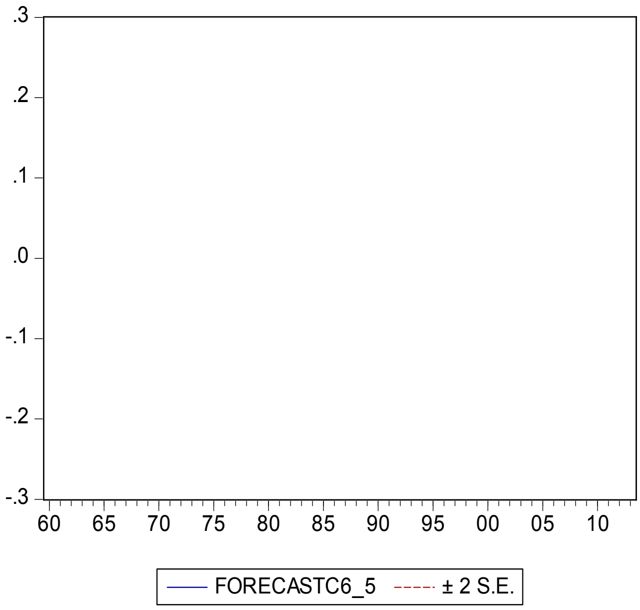
2. Results

After our analysis with E-views, we found that in <u>*sample 1*</u>, from the regression (2) the variables which were statistically important in level of significance 15% and their observations were before 1995, were P1, P10, P11, P12, P14 and P21 (tables 10-34,see appendix). Then we used all of the six variables to run regression (3) by removing each time the less statistically important variable. We concluded only in variable P21 (tables 121-126, see appendix). As we can see in the above table is *Conference Board US Leading Index Ten Economic Indicators.* Our model for sample 1 from table 126 (see appendix) is:

$$\mathbf{DLSPX_t = 0{,}01 + 0{,}46DLP21_{t-1} \quad (4)}$$

If we use only P21 to forecast the returns of S&P500 with the model from this sample we can see in the following graph that although the root mean squared error is low, the theil inequality coefficient is 0,806, which is close to 1. According to the latter , the model is not very reliable in order to forecast the returns of S&P500.

Graph 9 – Forecast Sample 1



Forecast: FORECASTC6_5
Actual: DLSPX
Forecast sample: 1947Q1 2013Q3
Adjusted sample: 1959Q3 2013Q3
Included observations: 217

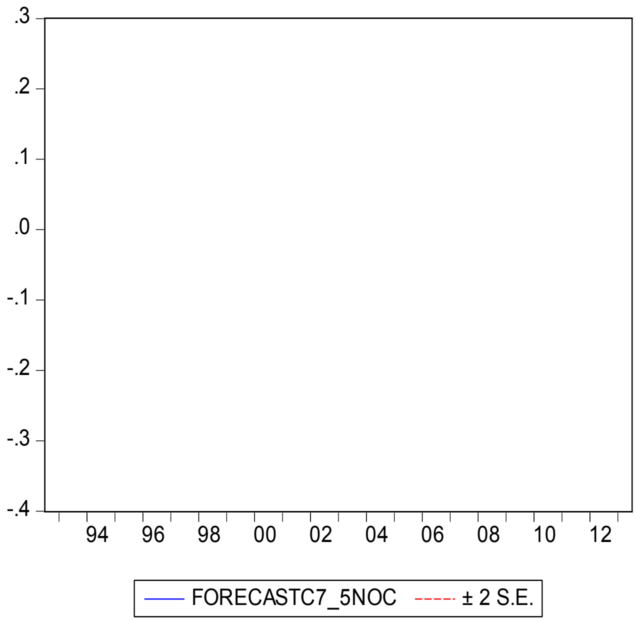
Root Mean Squared Error	0.081242
Mean Absolute Error	0.060919
Mean Abs. Percent Error	153.1084
Theil Inequality Coefficient	0.806083
Bias Proportion	0.000000
Variance Proportion	0.811920
Covariance Proportion	0.188080

In <u>*sample 2*</u> we repeated the same process and the variables which were statistically important in level of significance 15% and their observations were before 1995, were P38, P44, P47, P51, P54, P5 and P60. (tables 35-56, see appendix). Then we used all of the seven variables to run regression (3) by removing each time the less statistically important variable. We concluded only in variables P51 and P54 (tables 127-133, see appendix). These variables as we see in the table above are *Capital Goods New Orders Nondefense Ex Aircraft & Parts SA* and *National Association of Home Builders Market Index SA*. Furthermore the estimator b_1 is not statistically important so we did not take it into account. Our model for sample 2 from table 133(see appendix) is:

DLSPX = 0,49DLP51+ 0,1DLP54 (5)

If we use only P51 and P54 to forecast the returns of S&P500 with the model from this sample we can see in the following graph that the root mean squared error is low and the theil inequality coefficient is 0,703 which is close to 0,6 - 0,7. That shows us that the model is quite reliable in order to forecast the returns of S&P500. However, the bias proportion is not 0 and that means that there are systematic errors.

Graph 10 – Forecast Sample 2



Forecast: FORECASTC7_5NOC
Actual: DLSPX
Forecast sample: 1947Q1 2013Q3
Adjusted sample: 1992Q3 2013Q3
Included observations: 85

Root Mean Squared Error	0.078934
Mean Absolute Error	0.059285
Mean Abs. Percent Error	122.0301
Theil Inequality Coefficient	0.703134
Bias Proportion	0.025595
Variance Proportion	0.470064
Covariance Proportion	0.504341

In <u>*sample 3*</u> the variables which were statistically important in level of significance 15% were P63, P64, P76, P79, P81, P84, P91, P95, P97, P103, P105, P109 and P117 (tables 57-120, see appendix). For variable P117 although it is statistically important, the observations begins in 2001 and the sample is very small to have reliable results so we did not take it into account when we used the other twelve variables to run regression (3).

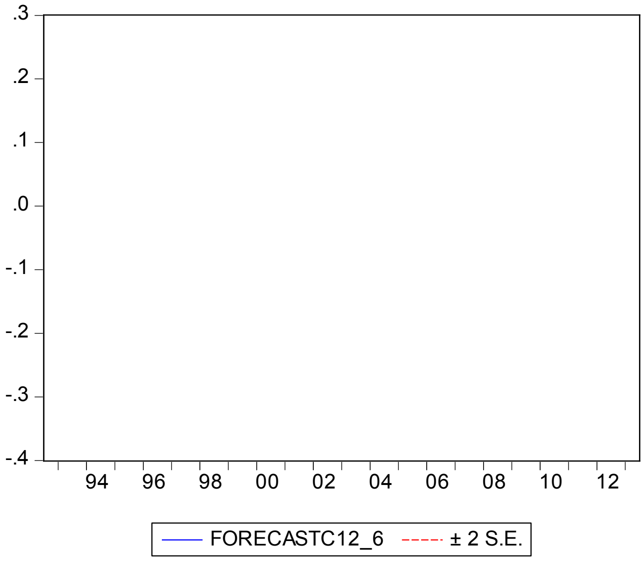
As we did before, we removed each time the less statistically important variable. We concluded in variables P76, P79, P81, P91, P95 and P105(tables 134-140, see appendix). These variables as we see in the table above are *Monetary Base Total NSA, US Treasury Federal Budget Debt Summary Net Receipts NSA, Foreign Sales of US Securities Total, Delinquencies As % Of Total Loans SA, Median Asking Rent In The United States, US Manufacturers Inventories to Shipment Ratio All Industries SA.*

Moreover, all the variables in the model were statistically important in level of significance 10%. Our model for sample 3 from table 140(see appendix) is:

$$\mathbf{DLSPX_t = 0{,}03 - 0{,}26DLP76_{t-1} - 0{,}06DLP79_{t-1} - 0{,}1DLP81_{t-1} - 0{,}33DLP91_{t-1} - 0{,}54DLP95_{t-1} - 0{,}74DLP105_{t-1} \quad (6)}$$

If we use P76, P79, P81, P91, P95 and P105 to forecast the returns of S&P500 with the model from this sample we can see in the following graph that the root mean squared error is low and the theil inequality coefficient is 0,56 which is close to 0,5 and that shows us that the model is very good to forecast the returns of S&P500. Additionally, the bias proportion is 0 and that means that there are no systematic errors.

Graph 11 – Forecast Sample 3



Forecast: FORECASTC12_6
Actual: DLSPX
Forecast sample: 1947Q1 2013Q3
Adjusted sample: 1992Q3 2013Q3
Included observations: 85

Root Mean Squared Error	0.071976
Mean Absolute Error	0.056545
Mean Abs. Percent Error	252.9601
Theil Inequality Coefficient	0.566931
Bias Proportion	0.000000
Variance Proportion	0.348428
Covariance Proportion	0.651572

From our analysis it's obvious that the variables in sample 3 are those which can better forecast the returns of S&P500. However, because the variables in the first two samples continue to be statistically important, we run regression (3) with all nine variables from the three samples and we remove every time the less statistically important variable. We remove first the variables from sample 1and 2 because among all variables there are no longer statistically important(tables 141-144, see appendix). Thus, we concluded that the six variables of sample 3 continue to explain the returns of S&P500.

The final model that can forecast the returns of S&P500 is model (6).

$$\mathbf{DLSPX_t = 0,03 - 0,26DLP76_{t-1} - 0,06DLP79_{t-1} - 0,1DLP81_{t-1} - 0,33DLP91_{t-1} - 0,54DLP95_{t-1} - 0,74DLP105_{t-1} \quad (7)}$$

IV. CONCLUSIONS

In the previous section, we managed to create a model that forecasts the returns of S&P500. This can be done for various assets in different asset classes. If we can forecast the returns of different assets, we can overtake the assumption of MPT that the process of returns should be IID and we can use MPT in practice with better results.

If we repeated a similar process for the returns of DAX and FTSE-100 and tried to determine which economic variables can also forecast them, we could create the portfolio of section III A without the assumption that the process of returns should be IID. In such a similar process we should calculate the covariance matrix again in order to find the new weights and the efficient frontiers. However, the calculation of the covariance matrix is beyond the purpose of this paper.

Our goal was to show another approach about the process of returns and use it in markets that are not efficient, as we proved. In practice, it is unlikely for returns to be IID and the use of MPT to create optimal portfolios would not give reliable results. If we use the forecasting models, we can make MPT to work more credible in practice.

V. APPENDIX

PART 1
MATLAB TABLES

5-YEAR PERIODS

TABLE 2: 1987-1991

mean=mean(a)	**PortReturn =**	**PortRisk =**	**PortWts =**
DAX / FTSE-100 / S&P500			
0.0956 0.0430 0.2609	1.0e-03 *		
1.0e-03 *			*DAX / FTSE-100 / S&P500*
cov=cov(a)	0.1186	0.0098	0.1653 0.5279 0.3069
1.0e-03 *	0.1344	0.0099	0.1636 0.4565 0.3798
	0.1502	0.0100	0.1620 0.3852 0.4528
0.2149 0.0780 0.0652	0.1660	0.0102	0.1603 0.3139 0.5258
0.0780 0.1199 0.0668	0.1818	0.0105	0.1587 0.2425 0.5988
0.0652 0.0668 0.1651	0.1977	0.0108	0.1570 0.1712 0.6718
	0.2135	0.0112	0.1554 0.0999 0.7448
>> portopt(mean, cov, 10)	0.2293	0.0117	0.1537 0.0285 0.8177
>> [PortRisk, PortReturn, PortWts] =	0.2451	0.0122	0.0957 0 0.9043
portopt(mean, cov, 10)	0.2609	0.0128	0 0 1.0000

TABLE 3: 1992-1996

mean=mean(b)	**PortReturn =**	**PortRisk =**	**PortWts =**
DAX / FTSE-100 / S&P500			
0.4633 0.3846 0.4401	1.0e-03 *		
1.0e-03 *			*DAX / FTSE-100 / S&P500*
cov=cov(b)	0.4322	0.0050	0.1919 0.2222 0.5859
1.0e-04 *	0.4357	0.0050	0.2217 0.1724 0.6060
	0.4392	0.0051	0.2514 0.1225 0.6260
0.7755 0.2820 0.0722	0.4426	0.0051	0.2812 0.0727 0.6461
0.2820 0.5443 0.1344	0.4461	0.0052	0.3109 0.0229 0.6662
0.0722 0.1344 0.3586	0.4495	0.0054	0.4050 0 0.5950
	0.4530	0.0059	0.5538 0 0.4462
portopt(mean, cov, 10)	0.4564	0.0067	0.7025 0 0.2975
[PortRisk, PortReturn, PortWts] =	0.4599	0.0077	0.8513 0 0.1487
portopt(mean, cov, 10)	0.4633	0.0088	1.0000 0 0

TABLE 4: 1997-2001

mean=mean(c)	**PortReturn =**	**PortRisk =**	**PortWts =**
DAX / FTSE-100 / S&P500			
0.4449 0.1814 0.3360	1.0e-03 *		
1.0e-03 *			*DAX / FTSE-100 / S&P500*
cov=cov(c)	0.2526	0.0102	0 0.5395 0.4605
1.0e-03 *	0.2740	0.0103	0.0556 0.4405 0.5039
	0.2953	0.0104	0.1249 0.3511 0.5240
0.2576 0.1350 0.0833	0.3167	0.0107	0.1942 0.2618 0.5441
0.1350 0.1412 0.0600	0.3381	0.0110	0.2635 0.1724 0.5642
0.0833 0.0600 0.1551	0.3594	0.0113	0.3328 0.0830 0.5843
	0.3808	0.0117	0.4111 0 0.5889
portopt(mean, cov, 10)	0.4022	0.0126	0.6074 0 0.3926
[PortRisk, PortReturn, PortWts]	0.4235	0.0141	0.8037 0 0.1963
= portopt(mean, cov, 10)	0.4449	0.0160	1.0000 0 0

TABLE 5: 2002-2006

mean=mean(d)	**PortReturn =**	**PortRisk =**	**PortWts =**
DAX / FTSE-100 / S&P500	1.0e-03 *		*DAX / FTSE-100 / S&P500*
0.1884 0.1349 0.1621			0 0.4395 0.5605
1.0e-03 *			0 0.2833 0.7167
cov=cov(d)	0.1501	0.0088	0.0615 0.1865 0.7520
1.0e-03 *	0.1544	0.0089	0.1341 0.1004 0.7655
	0.1586	0.0093	0.2067 0.0143 0.7791
0.2490 0.1280 0.0987	0.1629	0.0097	0.3535 0 0.6465
0.1280 0.1134 0.0482	0.1671	0.0102	0.5151 0 0.4849
0.0987 0.0482 0.0993	0.1714	0.0108	0.6767 0 0.3233
	0.1756	0.0118	0.8384 0 0.1616
portopt(mean, cov, 10)	0.1799	0.0129	1.0000 0 0
[PortRisk, PortReturn, PortWts] =	0.1841	0.0143	
portopt(mean, cov, 10)	0.1884	0.0158	

TABLE 6: 2007-2013

mean=mean(e)	**PortReturn** =	**PortRisk** =	**PortWts** =
DAX / FTSE-100 / S&P500	1.0e-03 *		
0.1449 0.0466 0.0971			*DAX / FTSE-100 / S&P500*
1.0e-03 *	0.0674	0.0129	0 0.5881 0.4119
cov=cov(e)	0.0760	0.0130	0.0722 0.4860 0.4417
1.0e-03 *	0.0846	0.0131	0.1604 0.3990 0.4407
	0.0932	0.0133	0.2485 0.3119 0.4396
0.2469 0.1921 0.1536	0.1019	0.0134	0.3366 0.2249 0.4385
0.1921 0.1961 0.1254	0.1105	0.0136	0.4248 0.1378 0.4374
0.1536 0.1254 0.2263	0.1191	0.0139	0.5129 0.0507 0.4364
	0.1277	0.0142	0.6394 0 0.3606
portopt(mean, cov, 10)	0.1363	0.0148	0.8197 0 0.1803
[PortRisk, PortReturn, PortWts] = portopt(mean, cov, 10)	0.1449	0.0157	1.0000 0 0

DECADE PERIODS

TABLE 7: 1987-1996

mean=mean(e)	**PortReturn** =	**PortRisk** =	**PortWts** =
DAX / FTSE-100 / S&P500	1.0e-03 *		*DAX / FTSE-100 / S&P500*
0.2897 0.2233 0.3555			
1.0e-03 *	0.2873	0.0078	0.1764 0.4281 0.3955
cov=cov(e)	0.2949	0.0078	0.1873 0.3653 0.4473
1.0e-03 *	0.3024	0.0079	0.1982 0.3026 0.4992
	0.3100	0.0080	0.2092 0.2398 0.5510
0.1424 0.0517 0.0346	0.3176	0.0081	0.2201 0.1770 0.6029
0.0517 0.0854 0.0387	0.3252	0.0083	0.2310 0.1143 0.6547
0.0346 0.0387 0.0968	0.3327	0.0085	0.2419 0.0515 0.7066
	0.3403	0.0088	0.2302 0 0.7698
portopt(mean, cov, 10)	0.3479	0.0092	0.1151 0 0.8849
[PortRisk, PortReturn, PortWts] = portopt(mean, cov, 10)	0.3555	0.0098	0 0 1.0000

TABLE 8: 1997-2006

mean=mean(e)	**PortReturn =**	**PortRisk =**	**PortWts =**
DAX / FTSE-100 / S&P500	1.0e-03 *		*DAX / FTSE-100 / S&P500*
0.3166 0.1581 0.2491	0.2036	0.0095	0 0.4998 0.5002
1.0e-03 *	0.2162	0.0097	0.0226 0.3785 0.5989
cov=cov(e)	0.2287	0.0099	0.0911 0.2913 0.6176
1.0e-03 *	0.2413	0.0102	0.1596 0.2041 0.6363
0.2532 0.1314 0.0910	0.2538	0.0106	0.2281 0.1169 0.6550
0.1314 0.1272 0.0541	0.2664	0.0110	0.2966 0.0297 0.6737
0.0910 0.0541 0.1272	0.2790	0.0116	0.4425 0 0.5575
	0.2915	0.0127	0.6283 0 0.3717
	0.3041	0.0141	0.8142 0 0.1858
portopt(mean, cov, 10)	0.3166	0.0159	1.0000 0 0
[PortRisk, PortReturn, PortWts] = portopt(mean, cov, 10)			

TABLE 9: 2007-2013

mean=mean(e)	**PortReturn =**	**PortRisk =**	**PortWts =**
DAX / FTSE-100 / S&P500	1.0e-03 *		*DAX / FTSE-100 / S&P500*
0.1449 0.0466 0.0971	0.0674	0.0129	0 0.5881 0.4119
1.0e-03 *	0.0760	0.0130	0.0722 0.4860 0.4417
cov=cov(e)	0.0846	0.0131	0.1604 0.3990 0.4407
1.0e-03 *	0.0932	0.0133	0.2485 0.3119 0.4396
0.2469 0.1921 0.1536	0.1019	0.0134	0.3366 0.2249 0.4385
0.1921 0.1961 0.1254	0.1105	0.0136	0.4248 0.1378 0.4374
0.1536 0.1254 0.2263	0.1191	0.0139	0.5129 0.0507 0.4364
	0.1277	0.0142	0.6394 0 0.3606
portopt(mean, cov, 10)	0.1363	0.0148	0.8197 0 0.1803
[PortRisk, PortReturn, PortWts] = portopt(mean, cov, 10)	0.1449	0.0157	1.0000 0 0

PART 2
E-VIEWS TABLES

In the following section we quoted the E-view tables from our analysis.

a. $DLSPX_t = b_1 + b_2\ DLPi_{t-1} + u_t$ (2)

TABLE 10

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 18:34
Sample (adjusted): 1947Q4 2013Q3
Included observations: 264 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP1(-1)	-1.027598	0.699132	-1.469820	0.1428
C	0.022254	0.005666	3.927959	0.0001

R-squared	0.008178	Mean dependent var	0.017849
Adjusted R-squared	0.004393	S.D. dependent var	0.078291
S.E. of regression	0.078119	Akaike info criterion	-2.253624
Sum squared resid	1.598868	Schwarz criterion	-2.226534
Log likelihood	299.4784	Hannan-Quinn criter.	-2.242739
F-statistic	2.160371	Durbin-Watson stat	1.822107
Prob(F-statistic)	0.142810		

TABLE 11

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 18:38
Sample (adjusted): 1967Q3 2013Q3
Included observations: 185 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP2(-1)	-0.066360	0.056321	-1.178253	0.2402
C	0.015889	0.006159	2.579852	0.0107

R-squared	0.007529	Mean dependent var	0.015787
Adjusted R-squared	0.002106	S.D. dependent var	0.083848
S.E. of regression	0.083760	Akaike info criterion	-2.110970
Sum squared resid	1.283880	Schwarz criterion	-2.076155
Log likelihood	197.2647	Hannan-Quinn criter.	-2.096861
F-statistic	1.388280	Durbin-Watson stat	1.860945
Prob(F-statistic)	0.240226		

TABLE 12

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 18:39

Sample (adjusted): 1971Q3 2013Q3
Included observations: 169 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP3(-1)	0.001084	0.028837	0.037604	0.9700
C	0.016738	0.006507	2.572207	0.0110

R-squared	0.000008	Mean dependent var	0.016718
Adjusted R-squared	-0.005980	S.D. dependent var	0.084063
S.E. of regression	0.084314	Akaike info criterion	-2.096774
Sum squared resid	1.187178	Schwarz criterion	-2.059734
Log likelihood	179.1774	Hannan-Quinn criter.	-2.081743
F-statistic	0.001414	Durbin-Watson stat	1.822889
Prob(F-statistic)	0.970049		

TABLE 13

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 18:40
Sample (adjusted): 1947Q4 2013Q3
Included observations: 264 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP4(-1)	-0.259066	0.432552	-0.598924	0.5497
C	0.021984	0.008423	2.609951	0.0096

R-squared	0.001367	Mean dependent var	0.017849
Adjusted R-squared	-0.002444	S.D. dependent var	0.078291
S.E. of regression	0.078387	Akaike info criterion	-2.246781
Sum squared resid	1.609848	Schwarz criterion	-2.219690
Log likelihood	298.5751	Hannan-Quinn criter.	-2.235895
F-statistic	0.358710	Durbin-Watson stat	1.826150
Prob(F-statistic)	0.549741		

TABLE 14

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 18:41
Sample (adjusted): 1967Q3 2013Q3
Included observations: 185 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP5(-1)	-0.048754	0.041839	-1.165268	0.2454
C	0.015657	0.006160	2.541889	0.0119

R-squared	0.007365	Mean dependent var	0.015787
Adjusted R-squared	0.001941	S.D. dependent var	0.083848
S.E. of regression	0.083767	Akaike info criterion	-2.110805
Sum squared resid	1.284092	Schwarz criterion	-2.075990
Log likelihood	197.2495	Hannan-Quinn criter.	-2.096696

F-statistic	1.357851	Durbin-Watson stat	1.786211
Prob(F-statistic)	0.245427		

TABLE 15

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 18:41
Sample (adjusted): 1948Q3 2013Q3
Included observations: 261 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP6(-1)	0.035984	0.043686	0.823690	0.4109
C	0.017639	0.004864	3.626449	0.0003

R-squared	0.002613	Mean dependent var	0.017662
Adjusted R-squared	-0.001238	S.D. dependent var	0.078532
S.E. of regression	0.078580	Akaike info criterion	-2.241762
Sum squared resid	1.599283	Schwarz criterion	-2.214448
Log likelihood	294.5500	Hannan-Quinn criter.	-2.230783
F-statistic	0.678466	Durbin-Watson stat	1.826702
Prob(F-statistic)	0.410873		

TABLE 16

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 18:42
Sample (adjusted): 1947Q4 2013Q3
Included observations: 264 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP7(-1)	-0.650644	0.553894	-1.174673	0.2412
C	0.023656	0.006901	3.427975	0.0007

R-squared	0.005239	Mean dependent var	0.017849
Adjusted R-squared	0.001442	S.D. dependent var	0.078291
S.E. of regression	0.078234	Akaike info criterion	-2.250665
Sum squared resid	1.603606	Schwarz criterion	-2.223575
Log likelihood	299.0878	Hannan-Quinn criter.	-2.239780
F-statistic	1.379856	Durbin-Watson stat	1.840845
Prob(F-statistic)	0.241192		

TABLE 17

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 18:43
Sample (adjusted): 1978Q3 2013Q3
Included observations: 141 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.

DLP8(-1)	-0.062821	0.080861	-0.776900	0.4385
C	0.020370	0.006859	2.969800	0.0035

R-squared	0.004323	Mean dependent var	0.020341
Adjusted R-squared	-0.002840	S.D. dependent var	0.081329
S.E. of regression	0.081444	Akaike info criterion	-2.163718
Sum squared resid	0.922006	Schwarz criterion	-2.121891
Log likelihood	154.5421	Hannan-Quinn criter.	-2.146721
F-statistic	0.603573	Durbin-Watson stat	1.808457
Prob(F-statistic)	0.438538		

TABLE 18

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 18:43
Sample (adjusted): 1990Q3 2013Q3
Included observations: 93 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP9(-1)	-0.011612	0.044471	-0.261123	0.7946
C	0.016730	0.008616	1.941711	0.0553

R-squared	0.000749	Mean dependent var	0.016633
Adjusted R-squared	-0.010232	S.D. dependent var	0.082591
S.E. of regression	0.083012	Akaike info criterion	-2.118387
Sum squared resid	0.627083	Schwarz criterion	-2.063923
Log likelihood	100.5050	Hannan-Quinn criter.	-2.096396
F-statistic	0.068185	Durbin-Watson stat	1.772717
Prob(F-statistic)	0.794588		

TABLE 19

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 18:45
Sample (adjusted): 1992Q3 2013Q3
Included observations: 85 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP10(-1)	0.386164	0.157378	2.453744	0.0162
C	0.013424	0.008812	1.523346	0.1315

R-squared	0.067634	Mean dependent var	0.016657
Adjusted R-squared	0.056401	S.D. dependent var	0.082699
S.E. of regression	0.080333	Akaike info criterion	-2.182035
Sum squared resid	0.535626	Schwarz criterion	-2.124561
Log likelihood	94.73650	Hannan-Quinn criter.	-2.158918
F-statistic	6.020858	Durbin-Watson stat	1.854396
Prob(F-statistic)	0.016230		

TABLE 20

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 18:45
Sample (adjusted): 1963Q3 2013Q3
Included observations: 201 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP11(-1)	0.083203	0.054683	1.521561	0.1297
C	0.015867	0.005740	2.764416	0.0062

R-squared	0.011500	Mean dependent var	0.015861
Adjusted R-squared	0.006533	S.D. dependent var	0.081642
S.E. of regression	0.081375	Akaike info criterion	-2.169591
Sum squared resid	1.317765	Schwarz criterion	-2.136722
Log likelihood	220.0439	Hannan-Quinn criter.	-2.156290
F-statistic	2.315147	Durbin-Watson stat	1.900266
Prob(F-statistic)	0.129707		

TABLE 21

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 18:46
Sample (adjusted): 1992Q3 2013Q3
Included observations: 85 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP12(-1)	0.817256	0.520792	1.569255	0.1204
C	0.007513	0.010632	0.706667	0.4818

R-squared	0.028815	Mean dependent var	0.016657
Adjusted R-squared	0.017113	S.D. dependent var	0.082699
S.E. of regression	0.081988	Akaike info criterion	-2.141243
Sum squared resid	0.557927	Schwarz criterion	-2.083769
Log likelihood	93.00283	Hannan-Quinn criter.	-2.118125
F-statistic	2.462561	Durbin-Watson stat	1.950170
Prob(F-statistic)	0.120393		

TABLE 22

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 18:47
Sample (adjusted): 1948Q3 2013Q3
Included observations: 261 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP13(-1)	0.097182	0.069114	1.406107	0.1609
C	0.017398	0.004855	3.583270	0.0004

R-squared	0.007576	Mean dependent var	0.017662

Adjusted R-squared	0.003744	S.D. dependent var	0.078532
S.E. of regression	0.078384	Akaike info criterion	-2.246751
Sum squared resid	1.591325	Schwarz criterion	-2.219437
Log likelihood	295.2010	Hannan-Quinn criter.	-2.235771
F-statistic	1.977136	Durbin-Watson stat	1.804684
Prob(F-statistic)	0.160891		

TABLE 23

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 18:47
Sample (adjusted): 1959Q3 2013Q3
Included observations: 217 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP14(-1)	0.108668	0.054026	2.011410	0.0455
C	0.015811	0.005522	2.863510	0.0046

R-squared	0.018470	Mean dependent var	0.015479
Adjusted R-squared	0.013905	S.D. dependent var	0.081872
S.E. of regression	0.081301	Akaike info criterion	-2.172146
Sum squared resid	1.421114	Schwarz criterion	-2.140995
Log likelihood	237.6778	Hannan-Quinn criter.	-2.159562
F-statistic	4.045769	Durbin-Watson stat	1.920988
Prob(F-statistic)	0.045531		

TABLE 24

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 18:48
Sample (adjusted): 1947Q4 2013Q3
Included observations: 264 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP15(-1)	-0.128978	0.241380	-0.534336	0.5936
C	0.018813	0.005152	3.651961	0.0003

R-squared	0.001089	Mean dependent var	0.017849
Adjusted R-squared	-0.002724	S.D. dependent var	0.078291
S.E. of regression	0.078398	Akaike info criterion	-2.246502
Sum squared resid	1.610297	Schwarz criterion	-2.219411
Log likelihood	298.5382	Hannan-Quinn criter.	-2.235616
F-statistic	0.285515	Durbin-Watson stat	1.825515
Prob(F-statistic)	0.593562		

TABLE 25

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 18:49
Sample (adjusted): 1999Q3 2013Q3
Included observations: 57 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP16(-1)	-0.068120	0.222998	-0.305473	0.7612
C	0.003539	0.012053	0.293629	0.7701

R-squared	0.001694	Mean dependent var	0.003560
Adjusted R-squared	-0.016457	S.D. dependent var	0.090257
S.E. of regression	0.090996	Akaike info criterion	-1.921541
Sum squared resid	0.455417	Schwarz criterion	-1.849854
Log likelihood	56.76390	Hannan-Quinn criter.	-1.893681
F-statistic	0.093314	Durbin-Watson stat	1.736777
Prob(F-statistic)	0.761159		

TABLE 26
Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 18:49
Sample (adjusted): 1947Q4 2013Q3
Included observations: 264 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP17(-1)	-0.222544	0.373184	-0.596338	0.5515
C	0.019549	0.005604	3.488500	0.0006

R-squared	0.001355	Mean dependent var	0.017849
Adjusted R-squared	-0.002456	S.D. dependent var	0.078291
S.E. of regression	0.078387	Akaike info criterion	-2.246769
Sum squared resid	1.609867	Schwarz criterion	-2.219678
Log likelihood	298.5735	Hannan-Quinn criter.	-2.235883
F-statistic	0.355619	Durbin-Watson stat	1.833909
Prob(F-statistic)	0.551465		

TABLE 27
Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 18:50
Sample (adjusted): 1958Q3 2013Q3
Included observations: 221 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP18(-1)	0.061831	0.154711	0.399657	0.6898
C	0.015534	0.005872	2.645154	0.0088

R-squared	0.000729	Mean dependent var	0.016360
Adjusted R-squared	-0.003834	S.D. dependent var	0.081558
S.E. of regression	0.081715	Akaike info criterion	-2.162160
Sum squared resid	1.462322	Schwarz criterion	-2.131408
Log likelihood	240.9187	Hannan-Quinn criter.	-2.149743
F-statistic	0.159726	Durbin-Watson stat	1.829215
Prob(F-statistic)	0.689798		

TABLE 28

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 18:51
Sample (adjusted): 1947Q4 2013Q3
Included observations: 264 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP19(-1)	-0.340326	0.469337	-0.725121	0.4690
C	0.023398	0.009046	2.586571	0.0102

R-squared	0.002003	Mean dependent var	0.017849
Adjusted R-squared	-0.001806	S.D. dependent var	0.078291
S.E. of regression	0.078362	Akaike info criterion	-2.247417
Sum squared resid	1.608823	Schwarz criterion	-2.220327
Log likelihood	298.6591	Hannan-Quinn criter.	-2.236532
F-statistic	0.525800	Durbin-Watson stat	1.832351
Prob(F-statistic)	0.469025		

TABLE 29

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 18:52
Sample (adjusted): 1959Q3 2013Q3
Included observations: 217 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP20(-1)	0.074465	0.587173	0.126819	0.8992
C	0.014243	0.011223	1.269080	0.2058

R-squared	0.000075	Mean dependent var	0.015479
Adjusted R-squared	-0.004576	S.D. dependent var	0.081872
S.E. of regression	0.082059	Akaike info criterion	-2.153578
Sum squared resid	1.447748	Schwarz criterion	-2.122427
Log likelihood	235.6632	Hannan-Quinn criter.	-2.140994
F-statistic	0.016083	Durbin-Watson stat	1.837312
Prob(F-statistic)	0.899202		

TABLE 30

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 18:52
Sample (adjusted): 1959Q3 2013Q3
Included observations: 217 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP21(-1)	0.456418	0.298255	1.530294	0.1274
C	0.012888	0.005794	2.224477	0.0272

R-squared	0.010775	Mean dependent var	0.015479

Adjusted R-squared	0.006174	S.D. dependent var	0.081872
S.E. of regression	0.081619	Akaike info criterion	-2.164336
Sum squared resid	1.432256	Schwarz criterion	-2.133185
Log likelihood	236.8305	Hannan-Quinn criter.	-2.151753
F-statistic	2.341801	Durbin-Watson stat	1.899401
Prob(F-statistic)	0.127414		

TABLE 31

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 18:53
Sample (adjusted): 2001Q2 2013Q3
Included observations: 50 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP24(-1)	1.600817	2.101826	0.761631	0.4500
C	0.006841	0.012949	0.528322	0.5997

R-squared	0.011941	Mean dependent var	0.007420
Adjusted R-squared	-0.008644	S.D. dependent var	0.091014
S.E. of regression	0.091407	Akaike info criterion	-1.907819
Sum squared resid	0.401048	Schwarz criterion	-1.831338
Log likelihood	49.69548	Hannan-Quinn criter.	-1.878695
F-statistic	0.580082	Durbin-Watson stat	1.783823
Prob(F-statistic)	0.450006		

TABLE 32

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 18:54
Sample (adjusted): 1992Q3 2013Q3
Included observations: 85 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP25(-1)	-0.207730	0.529795	-0.392095	0.6960
C	0.019012	0.010833	1.755042	0.0829

R-squared	0.001849	Mean dependent var	0.016657
Adjusted R-squared	-0.010177	S.D. dependent var	0.082699
S.E. of regression	0.083118	Akaike info criterion	-2.113856
Sum squared resid	0.573418	Schwarz criterion	-2.056382
Log likelihood	91.83887	Hannan-Quinn criter.	-2.090738
F-statistic	0.153739	Durbin-Watson stat	1.783644
Prob(F-statistic)	0.695993		

TABLE 33

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 18:55
Sample (adjusted): 1964Q3 2013Q3
Included observations: 197 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP27(-1)	-0.215275	0.192466	-1.118506	0.2647
C	0.018062	0.006346	2.846088	0.0049

R-squared	0.006375	Mean dependent var	0.015353
Adjusted R-squared	0.001279	S.D. dependent var	0.082385
S.E. of regression	0.082332	Akaike info criterion	-2.146013
Sum squared resid	1.321819	Schwarz criterion	-2.112681
Log likelihood	213.3823	Hannan-Quinn criter.	-2.132520
F-statistic	1.251056	Durbin-Watson stat	1.815357
Prob(F-statistic)	0.264727		

TABLE 34
Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 18:55
Sample (adjusted): 2001Q3 2013Q3
Included observations: 49 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP30(-1)	-0.066148	0.177440	-0.372789	0.7110
C	0.006590	0.013224	0.498340	0.6206

R-squared	0.002948	Mean dependent var	0.006474
Adjusted R-squared	-0.018266	S.D. dependent var	0.091709
S.E. of regression	0.092542	Akaike info criterion	-1.882338
Sum squared resid	0.402513	Schwarz criterion	-1.805120
Log likelihood	48.11727	Hannan-Quinn criter.	-1.853041
F-statistic	0.138972	Durbin-Watson stat	1.586848
Prob(F-statistic)	0.710981		

TABLE 35
Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 18:58
Sample (adjusted): 1957Q3 2013Q3
Included observations: 225 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP31(-1)	-0.481008	0.805418	-0.597215	0.5510
C	0.020347	0.009272	2.194363	0.0292

R-squared	0.001597	Mean dependent var	0.015864
Adjusted R-squared	-0.002880	S.D. dependent var	0.081542
S.E. of regression	0.081659	Akaike info criterion	-2.163678
Sum squared resid	1.487011	Schwarz criterion	-2.133312
Log likelihood	245.4137	Hannan-Quinn criter.	-2.151422
F-statistic	0.356665	Durbin-Watson stat	1.814988
Prob(F-statistic)	0.550970		

TABLE 36

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 18:58
Sample (adjusted): 1998Q1 2013Q3
Included observations: 63 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP33(-1)	0.235602	0.242350	0.972156	0.3348
C	0.008959	0.011580	0.773698	0.4421

R-squared	0.015257	Mean dependent var	0.008726
Adjusted R-squared	-0.000886	S.D. dependent var	0.091851
S.E. of regression	0.091892	Akaike info criterion	-1.905170
Sum squared resid	0.515095	Schwarz criterion	-1.837134
Log likelihood	62.01287	Hannan-Quinn criter.	-1.878411
F-statistic	0.945086	Durbin-Watson stat	1.960083
Prob(F-statistic)	0.334812		

TABLE 37

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 18:59
Sample (adjusted): 1958Q3 2013Q3
Included observations: 221 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP34(-1)	-0.063441	0.124964	-0.507675	0.6122
C	0.017175	0.005726	2.999772	0.0030

R-squared	0.001175	Mean dependent var	0.016360
Adjusted R-squared	-0.003385	S.D. dependent var	0.081558
S.E. of regression	0.081696	Akaike info criterion	-2.162608
Sum squared resid	1.461668	Schwarz criterion	-2.131855
Log likelihood	240.9681	Hannan-Quinn criter.	-2.150190
F-statistic	0.257734	Durbin-Watson stat	1.825149
Prob(F-statistic)	0.612192		

TABLE 38

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 18:59
Sample (adjusted): 1997Q2 2013Q3
Included observations: 56 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP36(-1)	-0.014565	0.049566	-0.293849	0.7700
C	0.011773	0.012318	0.955700	0.3435

R-squared	0.001596	Mean dependent var	0.011895
Adjusted R-squared	-0.016892	S.D. dependent var	0.091361
S.E. of regression	0.092129	Akaike info criterion	-1.896188
Sum squared resid	0.458341	Schwarz criterion	-1.823854
Log likelihood	55.09325	Hannan-Quinn criter.	-1.868144
F-statistic	0.086348	Durbin-Watson stat	1.665048
Prob(F-statistic)	0.769999		

TABLE 39

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 19:00
Sample (adjusted): 1948Q3 2013Q3
Included observations: 261 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP37(-1)	0.014294	0.022260	0.642132	0.5214
C	0.017677	0.004867	3.632309	0.0003

R-squared	0.001589	Mean dependent var	0.017662
Adjusted R-squared	-0.002265	S.D. dependent var	0.078532
S.E. of regression	0.078620	Akaike info criterion	-2.240737
Sum squared resid	1.600924	Schwarz criterion	-2.213423
Log likelihood	294.4162	Hannan-Quinn criter.	-2.229758
F-statistic	0.412333	Durbin-Watson stat	1.809626
Prob(F-statistic)	0.521356		

TABLE 40

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 19:00
Sample (adjusted): 1947Q4 2013Q3
Included observations: 264 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP38(-1)	-0.643693	0.343980	-1.871310	0.0624
C	0.017431	0.004801	3.630845	0.0003

R-squared	0.013189	Mean dependent var	0.017849
Adjusted R-squared	0.009423	S.D. dependent var	0.078291
S.E. of regression	0.077921	Akaike info criterion	-2.258690
Sum squared resid	1.590790	Schwarz criterion	-2.231599
Log likelihood	300.1470	Hannan-Quinn criter.	-2.247804
F-statistic	3.501801	Durbin-Watson stat	1.830443
Prob(F-statistic)	0.062417		

TABLE 41

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 19:01
Sample (adjusted): 1967Q3 2013Q3

Included observations: 185 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP40(-1)	-0.021102	0.073464	-0.287240	0.7743
C	0.015884	0.006189	2.566364	0.0111

R-squared	0.000451	Mean dependent var	0.015787
Adjusted R-squared	-0.005011	S.D. dependent var	0.083848
S.E. of regression	0.084058	Akaike info criterion	-2.103863
Sum squared resid	1.293037	Schwarz criterion	-2.069049
Log likelihood	196.6073	Hannan-Quinn criter.	-2.089754
F-statistic	0.082507	Durbin-Watson stat	1.843876
Prob(F-statistic)	0.774254		

TABLE 42

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 19:01
Sample (adjusted): 1974Q3 2013Q3
Included observations: 157 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP41(-1)	-0.880573	0.786764	-1.119234	0.2648
C	0.026232	0.009429	2.781951	0.0061

R-squared	0.008017	Mean dependent var	0.018937
Adjusted R-squared	0.001617	S.D. dependent var	0.085451
S.E. of regression	0.085382	Akaike info criterion	-2.070701
Sum squared resid	1.129968	Schwarz criterion	-2.031768
Log likelihood	164.5501	Hannan-Quinn criter.	-2.054889
F-statistic	1.252686	Durbin-Watson stat	1.814679
Prob(F-statistic)	0.264772		

TABLE 43

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 19:02
Sample (adjusted): 1959Q4 2013Q3
Included observations: 216 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP43(-1)	0.012757	0.017035	0.748851	0.4548
C	0.015749	0.005587	2.819175	0.0053

R-squared	0.002614	Mean dependent var	0.015678
Adjusted R-squared	-0.002047	S.D. dependent var	0.082009
S.E. of regression	0.082093	Akaike info criterion	-2.152703
Sum squared resid	1.442215	Schwarz criterion	-2.121450
Log likelihood	234.4919	Hannan-Quinn criter.	-2.140076
F-statistic	0.560778	Durbin-Watson stat	1.818766
Prob(F-statistic)	0.454769		

TABLE 44

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 19:02
Sample (adjusted): 1991Q3 2013Q3
Included observations: 89 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP44(-1)	0.993208	0.666941	1.489200	0.1401
C	0.009108	0.010053	0.906027	0.3674

R-squared	0.024857	Mean dependent var	0.016976
Adjusted R-squared	0.013649	S.D. dependent var	0.081242
S.E. of regression	0.080685	Akaike info criterion	-2.174302
Sum squared resid	0.566382	Schwarz criterion	-2.118378
Log likelihood	98.75646	Hannan-Quinn criter.	-2.151761
F-statistic	2.217718	Durbin-Watson stat	1.837389
Prob(F-statistic)	0.140051		

TABLE 45

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 19:03
Sample (adjusted): 1960Q3 2013Q3
Included observations: 213 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP47(-1)	0.158667	0.051477	3.082313	0.0023
C	0.015925	0.005529	2.880511	0.0044

R-squared	0.043087	Mean dependent var	0.015896
Adjusted R-squared	0.038552	S.D. dependent var	0.082290
S.E. of regression	0.080688	Akaike info criterion	-2.187113
Sum squared resid	1.373720	Schwarz criterion	-2.155552
Log likelihood	234.9276	Hannan-Quinn criter.	-2.174358
F-statistic	9.500655	Durbin-Watson stat	1.944425
Prob(F-statistic)	0.002328		

TABLE 46

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 19:03
Sample (adjusted): 1967Q3 2013Q3
Included observations: 185 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP48(-1)	-0.226553	0.398019	-0.569202	0.5699
C	0.015636	0.006182	2.529444	0.0123

R-squared	0.001767	Mean dependent var	0.015787
Adjusted R-squared	-0.003688	S.D. dependent var	0.083848
S.E. of regression	0.084003	Akaike info criterion	-2.105181
Sum squared resid	1.291334	Schwarz criterion	-2.070367
Log likelihood	196.7293	Hannan-Quinn criter.	-2.091072
F-statistic	0.323991	Durbin-Watson stat	1.841388
Prob(F-statistic)	0.569917		

TABLE 47

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 19:05
Sample (adjusted): 1975Q2 2013Q3
Included observations: 154 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP50(-1)	0.084293	0.199608	0.422293	0.6734
C	0.019484	0.006536	2.980827	0.0033

R-squared	0.001172	Mean dependent var	0.019508
Adjusted R-squared	-0.005399	S.D. dependent var	0.080893
S.E. of regression	0.081112	Akaike info criterion	-2.173081
Sum squared resid	1.000020	Schwarz criterion	-2.133640
Log likelihood	169.3273	Hannan-Quinn criter.	-2.157060
F-statistic	0.178331	Durbin-Watson stat	1.903515
Prob(F-statistic)	0.673408		

TABLE 48

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 19:06
Sample (adjusted): 1992Q3 2013Q3
Included observations: 85 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP51(-1)	0.488033	0.197996	2.464863	0.0158
C	0.012741	0.008854	1.438909	0.1539

R-squared	0.068207	Mean dependent var	0.016657
Adjusted R-squared	0.056980	S.D. dependent var	0.082699
S.E. of regression	0.080308	Akaike info criterion	-2.182650
Sum squared resid	0.535297	Schwarz criterion	-2.125175
Log likelihood	94.76260	Hannan-Quinn criter.	-2.159532
F-statistic	6.075548	Durbin-Watson stat	1.927276
Prob(F-statistic)	0.015769		

TABLE 49

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 19:07
Sample (adjusted): 1992Q3 2013Q3

Included observations: 85 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP52(-1)	0.139911	0.315361	0.443654	0.6584
C	0.015646	0.009297	1.682839	0.0962

R-squared	0.002366	Mean dependent var	0.016657
Adjusted R-squared	-0.009654	S.D. dependent var	0.082699
S.E. of regression	0.083097	Akaike info criterion	-2.114374
Sum squared resid	0.573121	Schwarz criterion	-2.056900
Log likelihood	91.86089	Hannan-Quinn criter.	-2.091256
F-statistic	0.196829	Durbin-Watson stat	1.807798
Prob(F-statistic)	0.658447		

TABLE 50

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 19:08
Sample (adjusted): 2000Q3 2013Q3
Included observations: 53 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP53(-1)	0.341175	0.377249	0.904374	0.3700
C	-0.000143	0.012943	-0.011086	0.9912

R-squared	0.015784	Mean dependent var	0.002736
Adjusted R-squared	-0.003514	S.D. dependent var	0.091168
S.E. of regression	0.091328	Akaike info criterion	-1.911711
Sum squared resid	0.425382	Schwarz criterion	-1.837361
Log likelihood	52.66035	Hannan-Quinn criter.	-1.883120
F-statistic	0.817892	Durbin-Watson stat	1.775664
Prob(F-statistic)	0.370050		

TABLE 51

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 19:08
Sample (adjusted): 1985Q3 2013Q3
Included observations: 113 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP54(-1)	0.079162	0.050212	1.576541	0.1177
C	0.019250	0.007899	2.437154	0.0164

R-squared	0.021901	Mean dependent var	0.019210
Adjusted R-squared	0.013090	S.D. dependent var	0.084519
S.E. of regression	0.083964	Akaike info criterion	-2.099325
Sum squared resid	0.782538	Schwarz criterion	-2.051053
Log likelihood	120.6119	Hannan-Quinn criter.	-2.079737
F-statistic	2.485481	Durbin-Watson stat	1.968422
Prob(F-statistic)	0.117747		

TABLE 52

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 19:09
Sample (adjusted): 1976Q3 2013Q3
Included observations: 149 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP55(-1)	0.078189	0.078337	0.998107	0.3199
C	0.018561	0.006570	2.825007	0.0054

R-squared	0.006731	Mean dependent var	0.018660
Adjusted R-squared	-0.000026	S.D. dependent var	0.080191
S.E. of regression	0.080192	Akaike info criterion	-2.195442
Sum squared resid	0.945332	Schwarz criterion	-2.155121
Log likelihood	165.5605	Hannan-Quinn criter.	-2.179060
F-statistic	0.996218	Durbin-Watson stat	1.853897
Prob(F-statistic)	0.319868		

TABLE 53

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 19:10
Sample (adjusted): 1947Q4 2013Q3
Included observations: 264 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP57(-1)	0.701755	0.538181	1.303938	0.1934
C	0.014037	0.005630	2.493196	0.0133

R-squared	0.006448	Mean dependent var	0.017849
Adjusted R-squared	0.002655	S.D. dependent var	0.078291
S.E. of regression	0.078187	Akaike info criterion	-2.251881
Sum squared resid	1.601658	Schwarz criterion	-2.224791
Log likelihood	299.2483	Hannan-Quinn criter.	-2.240995
F-statistic	1.700255	Durbin-Watson stat	1.843036
Prob(F-statistic)	0.193399		

TABLE 54

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 19:10
Sample (adjusted): 1948Q3 2013Q3
Included observations: 261 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP58(-1)	-0.462206	0.279089	-1.656125	0.0989
C	0.023895	0.006135	3.894822	0.0001

R-squared	0.010479	Mean dependent var	0.017662
Adjusted R-squared	0.006658	S.D. dependent var	0.078532
S.E. of regression	0.078270	Akaike info criterion	-2.249680
Sum squared resid	1.586670	Schwarz criterion	-2.222366
Log likelihood	295.5833	Hannan-Quinn criter.	-2.238701
F-statistic	2.742751	Durbin-Watson stat	1.838651
Prob(F-statistic)	0.098907		

TABLE 55
Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 19:11
Sample (adjusted): 1967Q3 2013Q3
Included observations: 185 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP59(-1)	0.015205	0.057881	0.262697	0.7931
C	0.015756	0.006181	2.548975	0.0116

R-squared	0.000377	Mean dependent var	0.015787
Adjusted R-squared	-0.005085	S.D. dependent var	0.083848
S.E. of regression	0.084061	Akaike info criterion	-2.103790
Sum squared resid	1.293133	Schwarz criterion	-2.068975
Log likelihood	196.6005	Hannan-Quinn criter.	-2.089680
F-statistic	0.069010	Durbin-Watson stat	1.838678
Prob(F-statistic)	0.793079		

TABLE 56
Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 19:11
Sample (adjusted): 1947Q4 2013Q3
Included observations: 264 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP60(-1)	-0.615849	0.404801	-1.521362	0.1294
C	0.022179	0.005586	3.970485	0.0001

R-squared	0.008757	Mean dependent var	0.017849
Adjusted R-squared	0.004973	S.D. dependent var	0.078291
S.E. of regression	0.078096	Akaike info criterion	-2.254208
Sum squared resid	1.597936	Schwarz criterion	-2.227117
Log likelihood	299.5554	Hannan-Quinn criter.	-2.243322
F-statistic	2.314543	Durbin-Watson stat	1.859742
Prob(F-statistic)	0.129375		

TABLE 57
Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 19:59
Sample (adjusted): 1973Q3 2013Q3

Included observations: 161 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP62(-1)	-0.263836	0.219333	-1.202899	0.2308
C	0.020869	0.007363	2.834240	0.0052

R-squared	0.009018	Mean dependent var	0.017271
Adjusted R-squared	0.002786	S.D. dependent var	0.085490
S.E. of regression	0.085371	Akaike info criterion	-2.071283
Sum squared resid	1.158817	Schwarz criterion	-2.033004
Log likelihood	168.7382	Hannan-Quinn criter.	-2.055740
F-statistic	1.446967	Durbin-Watson stat	1.830684
Prob(F-statistic)	0.230803		

TABLE 58

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 20:00
Sample (adjusted): 1973Q3 2013Q3
Included observations: 161 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP63(-1)	-0.813864	0.443463	-1.835248	0.0683
C	0.031607	0.010284	3.073505	0.0025

R-squared	0.020744	Mean dependent var	0.017271
Adjusted R-squared	0.014585	S.D. dependent var	0.085490
S.E. of regression	0.084864	Akaike info criterion	-2.083185
Sum squared resid	1.145106	Schwarz criterion	-2.044907
Log likelihood	169.6964	Hannan-Quinn criter.	-2.067643
F-statistic	3.368136	Durbin-Watson stat	1.834205
Prob(F-statistic)	0.068337		

TABLE 59

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 20:00
Sample (adjusted): 1952Q2 2013Q3
Included observations: 246 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP64(-1)	0.406620	0.275979	1.473373	0.1419
C	0.010427	0.006852	1.521634	0.1294

R-squared	0.008818	Mean dependent var	0.017212
Adjusted R-squared	0.004756	S.D. dependent var	0.079775
S.E. of regression	0.079585	Akaike info criterion	-2.215893
Sum squared resid	1.545428	Schwarz criterion	-2.187395
Log likelihood	274.5549	Hannan-Quinn criter.	-2.204418
F-statistic	2.170827	Durbin-Watson stat	1.948578
Prob(F-statistic)	0.141939		

TABLE 60
Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 20:01
Sample (adjusted): 1952Q2 2013Q3
Included observations: 246 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP65(-1)	0.433759	0.313003	1.385799	0.1671
C	0.009799	0.007375	1.328617	0.1852

R-squared	0.007809	Mean dependent var	0.017212
Adjusted R-squared	0.003743	S.D. dependent var	0.079775
S.E. of regression	0.079625	Akaike info criterion	-2.214876
Sum squared resid	1.547001	Schwarz criterion	-2.186377
Log likelihood	274.4297	Hannan-Quinn criter.	-2.203401
F-statistic	1.920438	Durbin-Watson stat	1.938089
Prob(F-statistic)	0.167074		

TABLE 61
Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 20:02
Sample (adjusted): 1952Q2 2013Q3
Included observations: 246 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP66(-1)	-0.074300	0.383509	-0.193737	0.8465
C	0.018742	0.009399	1.994034	0.0473

R-squared	0.000154	Mean dependent var	0.017212
Adjusted R-squared	-0.003944	S.D. dependent var	0.079775
S.E. of regression	0.079932	Akaike info criterion	-2.207190
Sum squared resid	1.558938	Schwarz criterion	-2.178691
Log likelihood	273.4843	Hannan-Quinn criter.	-2.195715
F-statistic	0.037534	Durbin-Watson stat	1.807871
Prob(F-statistic)	0.846543		

TABLE 62
Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 20:02
Sample (adjusted): 1952Q2 2013Q3
Included observations: 246 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP67(-1)	-0.018672	0.259827	-0.071862	0.9428
C	0.017517	0.006629	2.642236	0.0088

R-squared	0.000021	Mean dependent var	0.017212
Adjusted R-squared	-0.004077	S.D. dependent var	0.079775
S.E. of regression	0.079937	Akaike info criterion	-2.207057
Sum squared resid	1.559144	Schwarz criterion	-2.178559
Log likelihood	273.4680	Hannan-Quinn criter.	-2.195582
F-statistic	0.005164	Durbin-Watson stat	1.810274
Prob(F-statistic)	0.942771		

TABLE 63

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 20:03
Sample (adjusted): 1952Q2 2013Q3
Included observations: 246 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP68(-1)	-0.031822	0.365426	-0.087082	0.9307
C	0.017760	0.008095	2.193951	0.0292

R-squared	0.000031	Mean dependent var	0.017212
Adjusted R-squared	-0.004067	S.D. dependent var	0.079775
S.E. of regression	0.079937	Akaike info criterion	-2.207067
Sum squared resid	1.559129	Schwarz criterion	-2.178568
Log likelihood	273.4692	Hannan-Quinn criter.	-2.195592
F-statistic	0.007583	Durbin-Watson stat	1.811116
Prob(F-statistic)	0.930678		

TABLE 64

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 20:03
Sample (adjusted): 1952Q2 2013Q3
Included observations: 246 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP69(-1)	0.011388	0.203066	0.056078	0.9553
C	0.016997	0.006378	2.665063	0.0082

R-squared	0.000013	Mean dependent var	0.017212
Adjusted R-squared	-0.004085	S.D. dependent var	0.079775
S.E. of regression	0.079937	Akaike info criterion	-2.207049
Sum squared resid	1.559157	Schwarz criterion	-2.178550
Log likelihood	273.4670	Hannan-Quinn criter.	-2.195574
F-statistic	0.003145	Durbin-Watson stat	1.809705
Prob(F-statistic)	0.955325		

TABLE 65

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 20:04
Sample (adjusted): 1952Q2 2013Q3

Included observations: 246 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP70(-1)	0.199587	0.217801	0.916372	0.3604
C	0.014147	0.006089	2.323628	0.0210

R-squared	0.003430	Mean dependent var	0.017212
Adjusted R-squared	-0.000655	S.D. dependent var	0.079775
S.E. of regression	0.079801	Akaike info criterion	-2.210472
Sum squared resid	1.553830	Schwarz criterion	-2.181973
Log likelihood	273.8880	Hannan-Quinn criter.	-2.198997
F-statistic	0.839737	Durbin-Watson stat	1.814288
Prob(F-statistic)	0.360377		

TABLE 66
Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 20:04
Sample (adjusted): 1952Q2 2013Q3
Included observations: 246 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP71(-1)	0.137037	0.276070	0.496384	0.6201
C	0.014868	0.006946	2.140615	0.0333

R-squared	0.001009	Mean dependent var	0.017212
Adjusted R-squared	-0.003085	S.D. dependent var	0.079775
S.E. of regression	0.079898	Akaike info criterion	-2.208045
Sum squared resid	1.557604	Schwarz criterion	-2.179547
Log likelihood	273.5896	Hannan-Quinn criter.	-2.196570
F-statistic	0.246397	Durbin-Watson stat	1.811306
Prob(F-statistic)	0.620070		

TABLE 67
Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 20:05
Sample (adjusted): 1952Q2 2013Q3
Included observations: 246 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP72(-1)	-0.028352	0.295652	-0.095897	0.9237
C	0.017864	0.008497	2.102306	0.0366

R-squared	0.000038	Mean dependent var	0.017212
Adjusted R-squared	-0.004061	S.D. dependent var	0.079775
S.E. of regression	0.079936	Akaike info criterion	-2.207074
Sum squared resid	1.559119	Schwarz criterion	-2.178575
Log likelihood	273.4701	Hannan-Quinn criter.	-2.195599
F-statistic	0.009196	Durbin-Watson stat	1.810895
Prob(F-statistic)	0.923681		

TABLE 68

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 20:05
Sample (adjusted): 1994Q3 2013Q3
Included observations: 77 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP73(-1)	-0.031979	0.386474	-0.082746	0.9343
C	0.017340	0.009945	1.743612	0.0853

R-squared	0.000091	Mean dependent var	0.017286
Adjusted R-squared	-0.013241	S.D. dependent var	0.086509
S.E. of regression	0.087080	Akaike info criterion	-2.018346
Sum squared resid	0.568721	Schwarz criterion	-1.957468
Log likelihood	79.70631	Hannan-Quinn criter.	-1.993995
F-statistic	0.006847	Durbin-Watson stat	1.791349
Prob(F-statistic)	0.934274		

TABLE 69

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 20:06
Sample (adjusted): 1959Q3 2013Q3
Included observations: 217 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP74(-1)	-0.066373	0.369888	-0.179440	0.8578
C	0.016364	0.007441	2.199292	0.0289

R-squared	0.000150	Mean dependent var	0.015479
Adjusted R-squared	-0.004501	S.D. dependent var	0.081872
S.E. of regression	0.082056	Akaike info criterion	-2.153653
Sum squared resid	1.447639	Schwarz criterion	-2.122502
Log likelihood	235.6713	Hannan-Quinn criter.	-2.141069
F-statistic	0.032199	Durbin-Watson stat	1.837892
Prob(F-statistic)	0.857762		

TABLE 70

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 20:06
Sample (adjusted): 1959Q3 2013Q3
Included observations: 217 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP75(-1)	0.345744	0.623102	0.554875	0.5796
C	0.009741	0.011745	0.829348	0.4078

R-squared	0.001430	Mean dependent var	0.015479
Adjusted R-squared	-0.003215	S.D. dependent var	0.081872
S.E. of regression	0.082004	Akaike info criterion	-2.154934
Sum squared resid	1.445786	Schwarz criterion	-2.123783
Log likelihood	235.8104	Hannan-Quinn criter.	-2.142350
F-statistic	0.307886	Durbin-Watson stat	1.832907
Prob(F-statistic)	0.579557		

TABLE 71

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 20:07
Sample (adjusted): 1959Q3 2013Q3
Included observations: 217 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP76(-1)	-0.239699	0.115650	-2.072622	0.0394
C	0.020079	0.005946	3.377107	0.0009

R-squared	0.019589	Mean dependent var	0.015479
Adjusted R-squared	0.015029	S.D. dependent var	0.081872
S.E. of regression	0.081255	Akaike info criterion	-2.173286
Sum squared resid	1.419494	Schwarz criterion	-2.142135
Log likelihood	237.8016	Hannan-Quinn criter.	-2.160703
F-statistic	4.295761	Durbin-Watson stat	1.859127
Prob(F-statistic)	0.039400		

TABLE 72

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 20:07
Sample (adjusted): 1974Q1 2013Q3
Included observations: 159 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP77(-1)	0.660190	0.484579	1.362398	0.1750
C	0.002988	0.012868	0.232220	0.8167

R-squared	0.011684	Mean dependent var	0.017906
Adjusted R-squared	0.005389	S.D. dependent var	0.085451
S.E. of regression	0.085220	Akaike info criterion	-2.074661
Sum squared resid	1.140206	Schwarz criterion	-2.036059
Log likelihood	166.9356	Hannan-Quinn criter.	-2.058985
F-statistic	1.856128	Durbin-Watson stat	1.835113
Prob(F-statistic)	0.175024		

TABLE 73

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 20:08
Sample (adjusted): 1968Q3 2013Q3

Included observations: 181 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP78(-1)	0.020861	0.042127	0.495190	0.6211
C	0.015335	0.006300	2.434293	0.0159

R-squared	0.001368	Mean dependent var	0.015616
Adjusted R-squared	-0.004211	S.D. dependent var	0.084231
S.E. of regression	0.084408	Akaike info criterion	-2.095316
Sum squared resid	1.275329	Schwarz criterion	-2.059974
Log likelihood	191.6261	Hannan-Quinn criter.	-2.080988
F-statistic	0.245213	Durbin-Watson stat	1.827642
Prob(F-statistic)	0.621073		

TABLE 74

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 20:08
Sample (adjusted): 1968Q3 2013Q3
Included observations: 181 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP79(-1)	-0.034533	0.020571	-1.678742	0.0949
C	0.016224	0.006240	2.599960	0.0101

R-squared	0.015500	Mean dependent var	0.015616
Adjusted R-squared	0.010000	S.D. dependent var	0.084231
S.E. of regression	0.083809	Akaike info criterion	-2.109568
Sum squared resid	1.257282	Schwarz criterion	-2.074226
Log likelihood	192.9159	Hannan-Quinn criter.	-2.095240
F-statistic	2.818174	Durbin-Watson stat	1.801747
Prob(F-statistic)	0.094947		

TABLE 75

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 20:09
Sample (adjusted): 1977Q3 2013Q3
Included observations: 145 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP80(-1)	0.043538	0.030587	1.423447	0.1568
C	0.017497	0.006823	2.564325	0.0114

R-squared	0.013971	Mean dependent var	0.019431
Adjusted R-squared	0.007076	S.D. dependent var	0.080803
S.E. of regression	0.080517	Akaike info criterion	-2.186999
Sum squared resid	0.927068	Schwarz criterion	-2.145941
Log likelihood	160.5574	Hannan-Quinn criter.	-2.170316
F-statistic	2.026201	Durbin-Watson stat	1.898775
Prob(F-statistic)	0.156785		

TABLE 76

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 20:10
Sample (adjusted): 1977Q3 2013Q3
Included observations: 145 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP81(-1)	0.049256	0.032507	1.515232	0.1319
C	0.017113	0.006853	2.497055	0.0137

R-squared	0.015802	Mean dependent var	0.019431
Adjusted R-squared	0.008919	S.D. dependent var	0.080803
S.E. of regression	0.080442	Akaike info criterion	-2.188857
Sum squared resid	0.925347	Schwarz criterion	-2.147799
Log likelihood	160.6921	Hannan-Quinn criter.	-2.172174
F-statistic	2.295929	Durbin-Watson stat	1.894808
Prob(F-statistic)	0.131921		

TABLE 77

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 20:11
Sample (adjusted): 1992Q3 2013Q3
Included observations: 85 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP84(-1)	0.403650	0.263500	1.531880	0.1294
C	0.010332	0.009810	1.053219	0.2953

R-squared	0.027496	Mean dependent var	0.016657
Adjusted R-squared	0.015779	S.D. dependent var	0.082699
S.E. of regression	0.082044	Akaike info criterion	-2.139886
Sum squared resid	0.558684	Schwarz criterion	-2.082412
Log likelihood	92.94515	Hannan-Quinn criter.	-2.116768
F-statistic	2.346655	Durbin-Watson stat	1.818508
Prob(F-statistic)	0.129355		

TABLE 78

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 20:11
Sample (adjusted): 1992Q3 2013Q3
Included observations: 85 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP85(-1)	0.116131	0.229468	0.506087	0.6141
C	0.014680	0.009821	1.494783	0.1388

R-squared	0.003076	Mean dependent var	0.016657
Adjusted R-squared	-0.008935	S.D. dependent var	0.082699
S.E. of regression	0.083067	Akaike info criterion	-2.115086
Sum squared resid	0.572713	Schwarz criterion	-2.057612
Log likelihood	91.89117	Hannan-Quinn criter.	-2.091969
F-statistic	0.256124	Durbin-Watson stat	1.801039
Prob(F-statistic)	0.614137		

TABLE 79

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 20:12
Sample (adjusted): 1947Q4 2013Q3
Included observations: 264 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP86(-1)	-0.021370	0.035112	-0.608622	0.5433
C	0.018188	0.004856	3.745248	0.0002

R-squared	0.001412	Mean dependent var	0.017849
Adjusted R-squared	-0.002400	S.D. dependent var	0.078291
S.E. of regression	0.078385	Akaike info criterion	-2.246825
Sum squared resid	1.609776	Schwarz criterion	-2.219735
Log likelihood	298.5810	Hannan-Quinn criter.	-2.235940
F-statistic	0.370420	Durbin-Watson stat	1.836680
Prob(F-statistic)	0.543303		

TABLE 80

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 20:13
Sample (adjusted): 2003Q3 2013Q3
Included observations: 41 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP88(-1)	-0.386896	0.694991	-0.556692	0.5809
C	0.017395	0.015021	1.158084	0.2539

R-squared	0.007884	Mean dependent var	0.013306
Adjusted R-squared	-0.017555	S.D. dependent var	0.083167
S.E. of regression	0.083894	Akaike info criterion	-2.070972
Sum squared resid	0.274491	Schwarz criterion	-1.987383
Log likelihood	44.45492	Hannan-Quinn criter.	-2.040533
F-statistic	0.309906	Durbin-Watson stat	1.544967
Prob(F-statistic)	0.580919		

TABLE 81

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 20:13
Sample (adjusted): 1968Q3 2013Q3

Included observations: 181 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP89(-1)	-0.000471	0.075492	-0.006238	0.9950
C	0.015615	0.006283	2.485384	0.0139

R-squared	0.000000	Mean dependent var	0.015616
Adjusted R-squared	-0.005586	S.D. dependent var	0.084231
S.E. of regression	0.084466	Akaike info criterion	-2.093947
Sum squared resid	1.277076	Schwarz criterion	-2.058605
Log likelihood	191.5022	Hannan-Quinn criter.	-2.079619
F-statistic	3.89E-05	Durbin-Watson stat	1.831135
Prob(F-statistic)	0.995030		

TABLE 82
Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 20:14
Sample (adjusted): 1986Q3 2013Q3
Included observations: 109 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP90(-1)	0.034470	0.159526	0.216077	0.8293
C	0.017302	0.008135	2.126962	0.0357

R-squared	0.000436	Mean dependent var	0.017456
Adjusted R-squared	-0.008906	S.D. dependent var	0.084230
S.E. of regression	0.084604	Akaike info criterion	-2.083495
Sum squared resid	0.765887	Schwarz criterion	-2.034112
Log likelihood	115.5505	Hannan-Quinn criter.	-2.063468
F-statistic	0.046689	Durbin-Watson stat	1.878055
Prob(F-statistic)	0.829339		

TABLE 83
Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 20:15
Sample (adjusted): 1979Q3 2013Q3
Included observations: 137 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP91(-1)	-0.307998	0.152335	-2.021849	0.0452
C	0.021407	0.006947	3.081263	0.0025

R-squared	0.029391	Mean dependent var	0.020391
Adjusted R-squared	0.022201	S.D. dependent var	0.082021
S.E. of regression	0.081105	Akaike info criterion	-2.171644
Sum squared resid	0.888041	Schwarz criterion	-2.129016
Log likelihood	150.7576	Hannan-Quinn criter.	-2.154321
F-statistic	4.087875	Durbin-Watson stat	1.885024
Prob(F-statistic)	0.045168		

TABLE 84

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 20:18
Sample (adjusted): 2003Q3 2013Q3
Included observations: 41 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP92(-1)	0.475996	0.743820	0.639934	0.5260
C	0.008479	0.015104	0.561406	0.5777

R-squared	0.010391	Mean dependent var	0.013306
Adjusted R-squared	-0.014983	S.D. dependent var	0.083167
S.E. of regression	0.083788	Akaike info criterion	-2.073502
Sum squared resid	0.273797	Schwarz criterion	-1.989914
Log likelihood	44.50680	Hannan-Quinn criter.	-2.043064
F-statistic	0.409516	Durbin-Watson stat	1.524975
Prob(F-statistic)	0.525957		

TABLE 85

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 20:19
Sample (adjusted): 1965Q3 2013Q3
Included observations: 193 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP93(-1)	1.179296	1.318802	0.894217	0.3723
C	0.015319	0.005995	2.555314	0.0114

R-squared	0.004169	Mean dependent var	0.015519
Adjusted R-squared	-0.001045	S.D. dependent var	0.083181
S.E. of regression	0.083224	Akaike info criterion	-2.124247
Sum squared resid	1.322919	Schwarz criterion	-2.090436
Log likelihood	206.9898	Hannan-Quinn criter.	-2.110555
F-statistic	0.799624	Durbin-Watson stat	1.815045
Prob(F-statistic)	0.372331		

TABLE 86

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 20:20
Sample (adjusted): 2003Q3 2013Q3
Included observations: 41 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP94(-1)	0.055139	0.106894	0.515829	0.6089
C	0.013273	0.013110	1.012455	0.3176

R-squared	0.006776	Mean dependent var	0.013306
Adjusted R-squared	-0.018691	S.D. dependent var	0.083167
S.E. of regression	0.083941	Akaike info criterion	-2.069856
Sum squared resid	0.274797	Schwarz criterion	-1.986267
Log likelihood	44.43205	Hannan-Quinn criter.	-2.039418
F-statistic	0.266080	Durbin-Watson stat	1.510340
Prob(F-statistic)	0.608886		

TABLE 87

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 20:20
Sample (adjusted): 1988Q3 2013Q3
Included observations: 101 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP95(-1)	-0.429540	0.277617	-1.547242	0.1250
C	0.021387	0.008227	2.599754	0.0108

R-squared	0.023610	Mean dependent var	0.017982
Adjusted R-squared	0.013748	S.D. dependent var	0.080217
S.E. of regression	0.079663	Akaike info criterion	-2.202407
Sum squared resid	0.628281	Schwarz criterion	-2.150623
Log likelihood	113.2216	Hannan-Quinn criter.	-2.181443
F-statistic	2.393958	Durbin-Watson stat	1.844809
Prob(F-statistic)	0.124996		

TABLE 88

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 20:21
Sample (adjusted): 1999Q3 2013Q3
Included observations: 57 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP96(-1)	-0.062250	0.112704	-0.552336	0.5830
C	0.003582	0.012030	0.297745	0.7670

R-squared	0.005516	Mean dependent var	0.003560
Adjusted R-squared	-0.012565	S.D. dependent var	0.090257
S.E. of regression	0.090822	Akaike info criterion	-1.925377
Sum squared resid	0.453673	Schwarz criterion	-1.853691
Log likelihood	56.87324	Hannan-Quinn criter.	-1.897517
F-statistic	0.305075	Durbin-Watson stat	1.788853
Prob(F-statistic)	0.582956		

TABLE 89

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 20:21
Sample (adjusted): 1959Q3 2013Q3

Included observations: 217 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP97(-1)	-1.042116	0.578922	-1.800098	0.0732
C	0.021600	0.006491	3.327618	0.0010

R-squared	0.014848	Mean dependent var	0.015479
Adjusted R-squared	0.010266	S.D. dependent var	0.081872
S.E. of regression	0.081451	Akaike info criterion	-2.168462
Sum squared resid	1.426359	Schwarz criterion	-2.137311
Log likelihood	237.2781	Hannan-Quinn criter.	-2.155878
F-statistic	3.240354	Durbin-Watson stat	1.879142
Prob(F-statistic)	0.073247		

TABLE 90

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 20:21
Sample (adjusted): 1959Q3 2013Q3
Included observations: 217 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP98(-1)	-0.700985	0.655448	-1.069474	0.2861
C	0.019485	0.006701	2.907901	0.0040

R-squared	0.005292	Mean dependent var	0.015479
Adjusted R-squared	0.000665	S.D. dependent var	0.081872
S.E. of regression	0.081845	Akaike info criterion	-2.158809
Sum squared resid	1.440195	Schwarz criterion	-2.127658
Log likelihood	236.2308	Hannan-Quinn criter.	-2.146225
F-statistic	1.143775	Durbin-Watson stat	1.829840
Prob(F-statistic)	0.286055		

TABLE 91

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 20:22
Sample (adjusted): 1990Q2 2013Q3
Included observations: 94 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP99(-1)	-0.338394	0.421672	-0.802504	0.4243
C	0.019882	0.009221	2.156088	0.0337

R-squared	0.006951	Mean dependent var	0.017007
Adjusted R-squared	-0.003843	S.D. dependent var	0.082226
S.E. of regression	0.082383	Akaike info criterion	-2.133817
Sum squared resid	0.624407	Schwarz criterion	-2.079704
Log likelihood	102.2894	Hannan-Quinn criter.	-2.111959
F-statistic	0.644013	Durbin-Watson stat	1.806621
Prob(F-statistic)	0.424330		

TABLE 92

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 20:23
Sample (adjusted): 1967Q3 2013Q3
Included observations: 185 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP100(-1)	-0.041558	0.072999	-0.569291	0.5699
C	0.015754	0.006176	2.550645	0.0116

R-squared	0.001768	Mean dependent var	0.015787
Adjusted R-squared	-0.003687	S.D. dependent var	0.083848
S.E. of regression	0.084003	Akaike info criterion	-2.105182
Sum squared resid	1.291333	Schwarz criterion	-2.070367
Log likelihood	196.7293	Hannan-Quinn criter.	-2.091072
F-statistic	0.324093	Durbin-Watson stat	1.839125
Prob(F-statistic)	0.569857		

TABLE 93

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 20:23
Sample (adjusted): 1948Q3 2013Q3
Included observations: 261 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP101(-1)	-0.056689	0.209628	-0.270429	0.7870
C	0.018448	0.005672	3.252242	0.0013

R-squared	0.000282	Mean dependent var	0.017662
Adjusted R-squared	-0.003578	S.D. dependent var	0.078532
S.E. of regression	0.078672	Akaike info criterion	-2.239429
Sum squared resid	1.603020	Schwarz criterion	-2.212114
Log likelihood	294.2454	Hannan-Quinn criter.	-2.228449
F-statistic	0.073132	Durbin-Watson stat	1.804314
Prob(F-statistic)	0.787046		

TABLE 94

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 20:24
Sample (adjusted): 1958Q3 2013Q3
Included observations: 221 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP102(-1)	0.061831	0.154711	0.399657	0.6898
C	0.015534	0.005872	2.645154	0.0088

R-squared	0.000729	Mean dependent var	0.016360
Adjusted R-squared	-0.003834	S.D. dependent var	0.081558
S.E. of regression	0.081715	Akaike info criterion	-2.162160
Sum squared resid	1.462322	Schwarz criterion	-2.131408
Log likelihood	240.9187	Hannan-Quinn criter.	-2.149743
F-statistic	0.159726	Durbin-Watson stat	1.829215
Prob(F-statistic)	0.689798		

TABLE 95

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 20:24
Sample (adjusted): 1958Q3 2013Q3
Included observations: 221 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP103(-1)	-0.435708	0.189680	-2.297072	0.0226
C	0.022562	0.006067	3.718461	0.0003

R-squared	0.023527	Mean dependent var	0.016360
Adjusted R-squared	0.019068	S.D. dependent var	0.081558
S.E. of regression	0.080777	Akaike info criterion	-2.185239
Sum squared resid	1.428960	Schwarz criterion	-2.154487
Log likelihood	243.4690	Hannan-Quinn criter.	-2.172822
F-statistic	5.276542	Durbin-Watson stat	1.875526
Prob(F-statistic)	0.022559		

TABLE 96

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 20:25
Sample (adjusted): 1947Q4 2013Q3
Included observations: 264 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP104(-1)	-0.054235	0.160470	-0.337978	0.7357
C	0.018559	0.005264	3.525709	0.0005

R-squared	0.000436	Mean dependent var	0.017849
Adjusted R-squared	-0.003379	S.D. dependent var	0.078291
S.E. of regression	0.078423	Akaike info criterion	-2.245848
Sum squared resid	1.611350	Schwarz criterion	-2.218758
Log likelihood	298.4520	Hannan-Quinn criter.	-2.234963
F-statistic	0.114229	Durbin-Watson stat	1.824286
Prob(F-statistic)	0.735651		

TABLE 97

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 20:25

Sample (adjusted): 1992Q3 2013Q3
Included observations: 85 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP105(-1)	-0.994493	0.364359	-2.729432	0.0077
C	0.014375	0.008685	1.655241	0.1017

R-squared	0.082364	Mean dependent var	0.016657
Adjusted R-squared	0.071308	S.D. dependent var	0.082699
S.E. of regression	0.079695	Akaike info criterion	-2.197960
Sum squared resid	0.527164	Schwarz criterion	-2.140485
Log likelihood	95.41328	Hannan-Quinn criter.	-2.174842
F-statistic	7.449798	Durbin-Watson stat	1.820271
Prob(F-statistic)	0.007744		

TABLE 98
Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 20:26
Sample (adjusted): 1967Q3 2013Q3
Included observations: 185 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP106(-1)	-0.001734	0.050218	-0.034533	0.9725
C	0.015782	0.006183	2.552564	0.0115

R-squared	0.000007	Mean dependent var	0.015787
Adjusted R-squared	-0.005458	S.D. dependent var	0.083848
S.E. of regression	0.084077	Akaike info criterion	-2.103419
Sum squared resid	1.293612	Schwarz criterion	-2.068604
Log likelihood	196.5663	Hannan-Quinn criter.	-2.089309
F-statistic	0.001193	Durbin-Watson stat	1.839167
Prob(F-statistic)	0.972490		

TABLE 99
Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 20:26
Sample (adjusted): 2000Q2 2013Q3
Included observations: 54 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP107(-1)	0.133425	0.289724	0.460522	0.6471
C	-0.004477	0.018966	-0.236068	0.8143

R-squared	0.004062	Mean dependent var	0.002133
Adjusted R-squared	-0.015091	S.D. dependent var	0.090412
S.E. of regression	0.091092	Akaike info criterion	-1.917562
Sum squared resid	0.431482	Schwarz criterion	-1.843896
Log likelihood	53.77418	Hannan-Quinn criter.	-1.889152
F-statistic	0.212081	Durbin-Watson stat	1.727082

Prob(F-statistic)	0.647061

TABLE 100

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 20:27
Sample (adjusted): 1992Q3 2013Q3
Included observations: 85 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP108(-1)	0.259906	0.609232	0.426613	0.6708
C	0.014302	0.010570	1.353142	0.1797

R-squared	0.002188	Mean dependent var	0.016657
Adjusted R-squared	-0.009834	S.D. dependent var	0.082699
S.E. of regression	0.083104	Akaike info criterion	-2.114196
Sum squared resid	0.573223	Schwarz criterion	-2.056721
Log likelihood	91.85331	Hannan-Quinn criter.	-2.091078
F-statistic	0.181999	Durbin-Watson stat	1.791377
Prob(F-statistic)	0.670766		

TABLE 101

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 20:28
Sample (adjusted): 1992Q3 2013Q3
Included observations: 85 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP109(-1)	0.489919	0.310386	1.578416	0.1183
C	0.010461	0.009719	1.076325	0.2849

R-squared	0.029142	Mean dependent var	0.016657
Adjusted R-squared	0.017445	S.D. dependent var	0.082699
S.E. of regression	0.081974	Akaike info criterion	-2.141580
Sum squared resid	0.557739	Schwarz criterion	-2.084106
Log likelihood	93.01717	Hannan-Quinn criter.	-2.118463
F-statistic	2.491397	Durbin-Watson stat	1.818529
Prob(F-statistic)	0.118274		

TABLE 102

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 20:29
Sample (adjusted): 1992Q3 2013Q3
Included observations: 85 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP110(-1)	-0.207730	0.529795	-0.392095	0.6960
C	0.019012	0.010833	1.755042	0.0829

R-squared	0.001849	Mean dependent var	0.016657
Adjusted R-squared	-0.010177	S.D. dependent var	0.082699
S.E. of regression	0.083118	Akaike info criterion	-2.113856
Sum squared resid	0.573418	Schwarz criterion	-2.056382
Log likelihood	91.83887	Hannan-Quinn criter.	-2.090738
F-statistic	0.153739	Durbin-Watson stat	1.783644
Prob(F-statistic)	0.695993		

TABLE 103
Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 20:29
Sample (adjusted): 1976Q3 2013Q3
Included observations: 149 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP111(-1)	0.027587	0.045159	0.610884	0.5422
C	0.018635	0.006584	2.830435	0.0053

R-squared	0.002532	Mean dependent var	0.018660
Adjusted R-squared	-0.004253	S.D. dependent var	0.080191
S.E. of regression	0.080362	Akaike info criterion	-2.191224
Sum squared resid	0.949329	Schwarz criterion	-2.150902
Log likelihood	165.2462	Hannan-Quinn criter.	-2.174842
F-statistic	0.373180	Durbin-Watson stat	1.858806
Prob(F-statistic)	0.542219		

TABLE 104
Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 20:30
Sample (adjusted): 1948Q3 2013Q3
Included observations: 261 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP112(-1)	0.040096	0.065402	0.613073	0.5404
C	0.017417	0.004883	3.566799	0.0004

R-squared	0.001449	Mean dependent var	0.017662
Adjusted R-squared	-0.002406	S.D. dependent var	0.078532
S.E. of regression	0.078626	Akaike info criterion	-2.240596
Sum squared resid	1.601149	Schwarz criterion	-2.213282
Log likelihood	294.3978	Hannan-Quinn criter.	-2.229617
F-statistic	0.375859	Durbin-Watson stat	1.807162
Prob(F-statistic)	0.540366		

TABLE 105
Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 20:30

Sample (adjusted): 1948Q3 2013Q3
Included observations: 261 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP113(-1)	-0.840483	0.735662	-1.142485	0.2543
C	0.020610	0.005501	3.746602	0.0002

R-squared	0.005014	Mean dependent var	0.017662
Adjusted R-squared	0.001173	S.D. dependent var	0.078532
S.E. of regression	0.078485	Akaike info criterion	-2.244173
Sum squared resid	1.595432	Schwarz criterion	-2.216859
Log likelihood	294.8646	Hannan-Quinn criter.	-2.233194
F-statistic	1.305271	Durbin-Watson stat	1.815517
Prob(F-statistic)	0.254308		

TABLE 106
Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 20:31
Sample (adjusted): 1948Q3 2013Q3
Included observations: 261 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP114(-1)	-0.591888	0.964117	-0.613917	0.5398
C	0.019823	0.006007	3.299961	0.0011

R-squared	0.001453	Mean dependent var	0.017662
Adjusted R-squared	-0.002402	S.D. dependent var	0.078532
S.E. of regression	0.078626	Akaike info criterion	-2.240600
Sum squared resid	1.601142	Schwarz criterion	-2.213286
Log likelihood	294.3983	Hannan-Quinn criter.	-2.229621
F-statistic	0.376894	Durbin-Watson stat	1.807854
Prob(F-statistic)	0.539809		

TABLE 107
Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 20:31
Sample (adjusted): 1950Q3 2013Q3
Included observations: 253 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP115(-1)	0.086246	0.676435	0.127501	0.8986
C	0.017753	0.005351	3.317738	0.0010

R-squared	0.000065	Mean dependent var	0.018002
Adjusted R-squared	-0.003919	S.D. dependent var	0.079095
S.E. of regression	0.079250	Akaike info criterion	-2.224545
Sum squared resid	1.576421	Schwarz criterion	-2.196613
Log likelihood	283.4050	Hannan-Quinn criter.	-2.213307
F-statistic	0.016256	Durbin-Watson stat	1.809878

Prob(F-statistic)	0.898646

TABLE 108

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 20:32
Sample (adjusted): 1971Q3 2013Q3
Included observations: 169 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP116(-1)	0.011100	0.077975	0.142351	0.8870
C	0.016756	0.006491	2.581459	0.0107

R-squared	0.000121	Mean dependent var	0.016718
Adjusted R-squared	-0.005866	S.D. dependent var	0.084063
S.E. of regression	0.084309	Akaike info criterion	-2.096887
Sum squared resid	1.187044	Schwarz criterion	-2.059847
Log likelihood	179.1870	Hannan-Quinn criter.	-2.081855
F-statistic	0.020264	Durbin-Watson stat	1.819474
Prob(F-statistic)	0.886975		

TABLE 109

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 20:32
Sample (adjusted): 2001Q2 2013Q3
Included observations: 50 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP117(-1)	0.340388	0.199563	1.705670	0.0945
C	0.009421	0.012682	0.742880	0.4612

R-squared	0.057147	Mean dependent var	0.007420
Adjusted R-squared	0.037504	S.D. dependent var	0.091014
S.E. of regression	0.089291	Akaike info criterion	-1.954652
Sum squared resid	0.382699	Schwarz criterion	-1.878171
Log likelihood	50.86629	Hannan-Quinn criter.	-1.925527
F-statistic	2.909309	Durbin-Watson stat	1.921781
Prob(F-statistic)	0.094534		

TABLE 110

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 20:32
Sample (adjusted): 2001Q2 2013Q3
Included observations: 50 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP118(-1)	-0.032170	0.298351	-0.107824	0.9146
C	0.007272	0.013076	0.556132	0.5807

R-squared	0.000242	Mean dependent var	0.007420
Adjusted R-squared	-0.020586	S.D. dependent var	0.091014
S.E. of regression	0.091946	Akaike info criterion	-1.896049
Sum squared resid	0.405797	Schwarz criterion	-1.819568
Log likelihood	49.40122	Hannan-Quinn criter.	-1.866925
F-statistic	0.011626	Durbin-Watson stat	1.724325
Prob(F-statistic)	0.914584		

TABLE 111

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 20:33
Sample (adjusted): 2001Q2 2013Q3
Included observations: 50 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP119(-1)	-0.160541	0.339170	-0.473336	0.6381
C	0.006674	0.013070	0.510597	0.6120

R-squared	0.004646	Mean dependent var	0.007420
Adjusted R-squared	-0.016091	S.D. dependent var	0.091014
S.E. of regression	0.091743	Akaike info criterion	-1.900464
Sum squared resid	0.404009	Schwarz criterion	-1.823983
Log likelihood	49.51159	Hannan-Quinn criter.	-1.871339
F-statistic	0.224047	Durbin-Watson stat	1.747902
Prob(F-statistic)	0.638119		

TABLE 112

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 20:33
Sample (adjusted): 1947Q4 2013Q3
Included observations: 264 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP120(-1)	-0.447065	0.581441	-0.768891	0.4427
C	0.023420	0.008704	2.690738	0.0076

R-squared	0.002251	Mean dependent var	0.017849
Adjusted R-squared	-0.001557	S.D. dependent var	0.078291
S.E. of regression	0.078352	Akaike info criterion	-2.247667
Sum squared resid	1.608423	Schwarz criterion	-2.220576
Log likelihood	298.6920	Hannan-Quinn criter.	-2.236781
F-statistic	0.591193	Durbin-Watson stat	1.838928
Prob(F-statistic)	0.442651		

TABLE 113

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 20:34

Sample (adjusted): 1959Q3 2013Q3
Included observations: 217 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP121(-1)	-0.418885	0.832348	-0.503257	0.6153
C	0.019017	0.008967	2.120750	0.0351

R-squared	0.001177	Mean dependent var	0.015479
Adjusted R-squared	-0.003469	S.D. dependent var	0.081872
S.E. of regression	0.082014	Akaike info criterion	-2.154680
Sum squared resid	1.446153	Schwarz criterion	-2.123529
Log likelihood	235.7828	Hannan-Quinn criter.	-2.142097
F-statistic	0.253267	Durbin-Watson stat	1.849550
Prob(F-statistic)	0.615299		

TABLE 114
Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 20:34
Sample (adjusted): 1947Q4 2013Q3
Included observations: 264 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP122(-1)	0.077437	0.072780	1.063986	0.2883
C	0.016436	0.004997	3.289158	0.0011

R-squared	0.004302	Mean dependent var	0.017849
Adjusted R-squared	0.000502	S.D. dependent var	0.078291
S.E. of regression	0.078271	Akaike info criterion	-2.249724
Sum squared resid	1.605117	Schwarz criterion	-2.222634
Log likelihood	298.9636	Hannan-Quinn criter.	-2.238838
F-statistic	1.132065	Durbin-Watson stat	1.826792
Prob(F-statistic)	0.288315		

TABLE 115
Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 20:35
Sample (adjusted): 1959Q3 2013Q3
Included observations: 217 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP123(-1)	0.501175	0.581037	0.862552	0.3893
C	0.016602	0.005711	2.906773	0.0040

R-squared	0.003449	Mean dependent var	0.015479
Adjusted R-squared	-0.001187	S.D. dependent var	0.081872
S.E. of regression	0.081921	Akaike info criterion	-2.156958
Sum squared resid	1.442863	Schwarz criterion	-2.125806
Log likelihood	236.0299	Hannan-Quinn criter.	-2.144374

F-statistic	0.743996	Durbin-Watson stat	1.839821
Prob(F-statistic)	0.389345		

TABLE 116

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 20:35
Sample (adjusted): 1959Q3 2013Q3
Included observations: 217 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP124(-1)	-0.348464	0.771268	-0.451806	0.6519
C	0.016098	0.005734	2.807393	0.0055

R-squared	0.000949	Mean dependent var	0.015479
Adjusted R-squared	-0.003698	S.D. dependent var	0.081872
S.E. of regression	0.082023	Akaike info criterion	-2.154452
Sum squared resid	1.446483	Schwarz criterion	-2.123301
Log likelihood	235.7581	Hannan-Quinn criter.	-2.141868
F-statistic	0.204129	Durbin-Watson stat	1.834232
Prob(F-statistic)	0.651864		

TABLE 117

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 20:35
Sample (adjusted): 1947Q4 2013Q3
Included observations: 264 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP125(-1)	-0.025260	0.094074	-0.268513	0.7885
C	0.018263	0.005068	3.603895	0.0004

R-squared	0.000275	Mean dependent var	0.017849
Adjusted R-squared	-0.003541	S.D. dependent var	0.078291
S.E. of regression	0.078429	Akaike info criterion	-2.245688
Sum squared resid	1.611609	Schwarz criterion	-2.218597
Log likelihood	298.4308	Hannan-Quinn criter.	-2.234802
F-statistic	0.072099	Durbin-Watson stat	1.825113
Prob(F-statistic)	0.788516		

TABLE 118

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 20:36
Sample (adjusted): 1947Q4 2013Q3
Included observations: 264 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP126(-1)	0.011659	0.112596	0.103543	0.9176

C	0.017705	0.005023	3.525146	0.0005

R-squared	0.000041	Mean dependent var	0.017849
Adjusted R-squared	-0.003776	S.D. dependent var	0.078291
S.E. of regression	0.078439	Akaike info criterion	-2.245454
Sum squared resid	1.611986	Schwarz criterion	-2.218363
Log likelihood	298.3999	Hannan-Quinn criter.	-2.234568
F-statistic	0.010721	Durbin-Watson stat	1.823010
Prob(F-statistic)	0.917611		

TABLE 119

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 20:36
Sample (adjusted): 1947Q4 2013Q3
Included observations: 264 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP127(-1)	-0.040225	0.120510	-0.333789	0.7388
C	0.018450	0.005152	3.581415	0.0004

R-squared	0.000425	Mean dependent var	0.017849
Adjusted R-squared	-0.003390	S.D. dependent var	0.078291
S.E. of regression	0.078424	Akaike info criterion	-2.245838
Sum squared resid	1.611367	Schwarz criterion	-2.218747
Log likelihood	298.4506	Hannan-Quinn criter.	-2.234952
F-statistic	0.111415	Durbin-Watson stat	1.824692
Prob(F-statistic)	0.738806		

TABLE 120

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/09/14 Time: 20:37
Sample (adjusted): 1947Q4 2013Q3
Included observations: 264 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP128(-1)	-0.141570	0.283546	-0.499285	0.6180
C	0.018811	0.005196	3.620311	0.0004

R-squared	0.000951	Mean dependent var	0.017849
Adjusted R-squared	-0.002863	S.D. dependent var	0.078291
S.E. of regression	0.078403	Akaike info criterion	-2.246364
Sum squared resid	1.610520	Schwarz criterion	-2.219273
Log likelihood	298.5200	Hannan-Quinn criter.	-2.235478
F-statistic	0.249285	Durbin-Watson stat	1.823329
Prob(F-statistic)	0.617998		

b. $\mathbf{DLSPX_t = b_1 + \sum_i b_i DLPi_{t-1} + e_t}$ **(3)**

TABLE 121

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/10/14 Time: 13:50
Sample (adjusted): 1992Q3 2013Q3
Included observations: 85 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP1(-1)	-0.637846	2.255110	-0.282845	0.7780
DLP10(-1)	0.175457	0.215416	0.814501	0.4178
DLP11(-1)	-0.094155	0.126071	-0.746842	0.4574
DLP12(-1)	-0.316930	0.827351	-0.383066	0.7027
DLP14(-1)	0.108926	0.132380	0.822831	0.4131
DLP21(-1)	0.971800	0.753273	1.290103	0.2008
C	0.016561	0.012535	1.321153	0.1903

R-squared	0.099703	Mean dependent var	0.016657
Adjusted R-squared	0.030450	S.D. dependent var	0.082699
S.E. of regression	0.081430	Akaike info criterion	-2.099389
Sum squared resid	0.517203	Schwarz criterion	-1.898229
Log likelihood	96.22403	Hannan-Quinn criter.	-2.018477
F-statistic	1.439682	Durbin-Watson stat	1.920529
Prob(F-statistic)	0.210312		

TABLE 122

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/10/14 Time: 13:51
Sample (adjusted): 1992Q3 2013Q3
Included observations: 85 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP10(-1)	0.167204	0.212185	0.788012	0.4330
DLP11(-1)	-0.092986	0.125267	-0.742299	0.4601
DLP12(-1)	-0.352828	0.812784	-0.434098	0.6654
DLP14(-1)	0.112481	0.131012	0.858549	0.3932
DLP21(-1)	0.912779	0.719567	1.268511	0.2083
C	0.015609	0.012004	1.300279	0.1973

R-squared	0.098780	Mean dependent var	0.016657
Adjusted R-squared	0.041741	S.D. dependent var	0.082699
S.E. of regression	0.080954	Akaike info criterion	-2.121893
Sum squared resid	0.517733	Schwarz criterion	-1.949471
Log likelihood	96.18046	Hannan-Quinn criter.	-2.052540
F-statistic	1.731786	Durbin-Watson stat	1.925288
Prob(F-statistic)	0.136990		

TABLE 123

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/10/14 Time: 13:52
Sample (adjusted): 1992Q3 2013Q3
Included observations: 85 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP10(-1)	0.165607	0.211074	0.784590	0.4350
DLP11(-1)	-0.099531	0.123724	-0.804459	0.4235
DLP14(-1)	0.092715	0.122221	0.758586	0.4503
DLP21(-1)	0.756680	0.620103	1.220248	0.2260
C	0.012234	0.009100	1.344341	0.1826

R-squared	0.096630	Mean dependent var	0.016657
Adjusted R-squared	0.051462	S.D. dependent var	0.082699
S.E. of regression	0.080543	Akaike info criterion	-2.143040
Sum squared resid	0.518968	Schwarz criterion	-1.999355
Log likelihood	96.07921	Hannan-Quinn criter.	-2.085246
F-statistic	2.139325	Durbin-Watson stat	1.925395
Prob(F-statistic)	0.083508		

TABLE 124

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/10/14 Time: 13:53
Sample (adjusted): 1992Q3 2013Q3
Included observations: 85 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP10(-1)	0.198380	0.206063	0.962715	0.3386
DLP11(-1)	-0.059429	0.111568	-0.532672	0.5957
DLP21(-1)	0.854432	0.604975	1.412342	0.1617
C	0.011149	0.008964	1.243794	0.2172

R-squared	0.090132	Mean dependent var	0.016657
Adjusted R-squared	0.056433	S.D. dependent var	0.082699
S.E. of regression	0.080331	Akaike info criterion	-2.159402
Sum squared resid	0.522701	Schwarz criterion	-2.044454
Log likelihood	95.77459	Hannan-Quinn criter.	-2.113167
F-statistic	2.674634	Durbin-Watson stat	1.939761
Prob(F-statistic)	0.052694		

TABLE 125

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/10/14 Time: 13:54
Sample (adjusted): 1992Q3 2013Q3
Included observations: 85 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.

DLP10(-1)	0.229629	0.196671	1.167580	0.2464
DLP21(-1)	0.714366	0.542457	1.316908	0.1915
C	0.011634	0.008878	1.310445	0.1937

R-squared	0.086945	Mean dependent var	0.016657
Adjusted R-squared	0.064675	S.D. dependent var	0.082699
S.E. of regression	0.079980	Akaike info criterion	-2.179435
Sum squared resid	0.524532	Schwarz criterion	-2.093224
Log likelihood	95.62598	Hannan-Quinn criter.	-2.144758
F-statistic	3.904184	Durbin-Watson stat	1.979613
Prob(F-statistic)	0.024009		

TABLE 126

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/10/14 Time: 13:55
Sample (adjusted): 1959Q3 2013Q3
Included observations: 217 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP21(-1)	0.456418	0.298255	1.530294	0.1274
C	0.012888	0.005794	2.224477	0.0272

R-squared	0.010775	Mean dependent var	0.015479
Adjusted R-squared	0.006174	S.D. dependent var	0.081872
S.E. of regression	0.081619	Akaike info criterion	-2.164336
Sum squared resid	1.432256	Schwarz criterion	-2.133185
Log likelihood	236.8305	Hannan-Quinn criter.	-2.151753
F-statistic	2.341801	Durbin-Watson stat	1.899401
Prob(F-statistic)	0.127414		

TABLE 127

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/10/14 Time: 13:58
Sample (adjusted): 1992Q3 2013Q3
Included observations: 85 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP38(-1)	0.218467	1.645684	0.132751	0.8947
DLP44(-1)	0.839269	0.729155	1.151015	0.2533
DLP47(-1)	-0.069700	0.129223	-0.539375	0.5912
DLP51(-1)	0.515725	0.243483	2.118114	0.0374
DLP54(-1)	0.100455	0.071313	1.408650	0.1630
DLP58(-1)	-0.597385	1.075218	-0.555594	0.5801
DLP60(-1)	-0.154400	0.866652	-0.178157	0.8591
C	0.011841	0.019601	0.604095	0.5476

R-squared	0.124711	Mean dependent var	0.016657
Adjusted R-squared	0.045139	S.D. dependent var	0.082699

S.E. of regression	0.080811	Akaike info criterion	-2.104030
Sum squared resid	0.502836	Schwarz criterion	-1.874133
Log likelihood	97.42126	Hannan-Quinn criter.	-2.011559
F-statistic	1.567274	Durbin-Watson stat	2.062975
Prob(F-statistic)	0.157889		

TABLE 128

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/10/14 Time: 13:59
Sample (adjusted): 1992Q3 2013Q3
Included observations: 85 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP44(-1)	0.852948	0.717277	1.189148	0.2380
DLP47(-1)	-0.071140	0.127954	-0.555983	0.5798
DLP51(-1)	0.525273	0.231148	2.272447	0.0258
DLP54(-1)	0.101688	0.070259	1.447328	0.1518
DLP58(-1)	-0.486563	0.673352	-0.722598	0.4721
DLP60(-1)	-0.121609	0.825456	-0.147323	0.8833
C	0.009755	0.011646	0.837614	0.4048

R-squared	0.124510	Mean dependent var	0.016657
Adjusted R-squared	0.057165	S.D. dependent var	0.082699
S.E. of regression	0.080300	Akaike info criterion	-2.127330
Sum squared resid	0.502951	Schwarz criterion	-1.926171
Log likelihood	97.41153	Hannan-Quinn criter.	-2.046418
F-statistic	1.848835	Durbin-Watson stat	2.057911
Prob(F-statistic)	0.100417		

TABLE 129

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/10/14 Time: 14:00
Sample (adjusted): 1992Q3 2013Q3
Included observations: 85 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP44(-1)	0.848617	0.712223	1.191504	0.2370
DLP47(-1)	-0.067427	0.124668	-0.540854	0.5901
DLP51(-1)	0.523920	0.229532	2.282563	0.0251
DLP54(-1)	0.100065	0.068959	1.451079	0.1507
DLP58(-1)	-0.501617	0.661419	-0.758395	0.4505
C	0.009587	0.011518	0.832331	0.4077

R-squared	0.124267	Mean dependent var	0.016657
Adjusted R-squared	0.068841	S.D. dependent var	0.082699
S.E. of regression	0.079801	Akaike info criterion	-2.150581
Sum squared resid	0.503091	Schwarz criterion	-1.978159
Log likelihood	97.39971	Hannan-Quinn criter.	-2.081228
F-statistic	2.242025	Durbin-Watson stat	2.053936

Prob(F-statistic)	0.058147

TABLE 130

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/10/14 Time: 14:02
Sample (adjusted): 1992Q3 2013Q3
Included observations: 85 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP44(-1)	0.733052	0.676405	1.083747	0.2817
DLP51(-1)	0.489603	0.219610	2.229421	0.0286
DLP54(-1)	0.079618	0.057417	1.386665	0.1694
DLP58(-1)	-0.513757	0.658109	-0.780656	0.4373
C	0.011047	0.011148	0.990953	0.3247

R-squared	0.121024	Mean dependent var	0.016657
Adjusted R-squared	0.077075	S.D. dependent var	0.082699
S.E. of regression	0.079448	Akaike info criterion	-2.170415
Sum squared resid	0.504954	Schwarz criterion	-2.026729
Log likelihood	97.24263	Hannan-Quinn criter.	-2.112621
F-statistic	2.753753	Durbin-Watson stat	2.061474
Prob(F-statistic)	0.033540		

TABLE 131

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/10/14 Time: 14:02
Sample (adjusted): 1992Q3 2013Q3
Included observations: 85 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP44(-1)	0.700292	0.673472	1.039822	0.3015
DLP51(-1)	0.416968	0.198445	2.101171	0.0387
DLP54(-1)	0.087541	0.056376	1.552797	0.1244
C	0.007583	0.010202	0.743253	0.4595

R-squared	0.114328	Mean dependent var	0.016657
Adjusted R-squared	0.081526	S.D. dependent var	0.082699
S.E. of regression	0.079256	Akaike info criterion	-2.186355
Sum squared resid	0.508801	Schwarz criterion	-2.071407
Log likelihood	96.92010	Hannan-Quinn criter.	-2.140120
F-statistic	3.485335	Durbin-Watson stat	2.043042
Prob(F-statistic)	0.019490		

TABLE 132

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/10/14 Time: 14:03
Sample (adjusted): 1992Q3 2013Q3

Included observations: 85 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP51(-1)	0.434135	0.197856	2.194200	0.0311
DLP54(-1)	0.098188	0.055466	1.770243	0.0804
C	0.013054	0.008744	1.492823	0.1393

R-squared	0.102506	Mean dependent var	0.016657
Adjusted R-squared	0.080616	S.D. dependent var	0.082699
S.E. of regression	0.079295	Akaike info criterion	-2.196625
Sum squared resid	0.515593	Schwarz criterion	-2.110413
Log likelihood	96.35654	Hannan-Quinn criter.	-2.161948
F-statistic	4.682749	Durbin-Watson stat	2.033907
Prob(F-statistic)	0.011866		

TABLE 133

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/10/14 Time: 14:04
Sample (adjusted): 1992Q3 2013Q3
Included observations: 85 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP51(-1)	0.487417	0.196044	2.486259	0.0149
DLP54(-1)	0.096512	0.055863	1.727642	0.0878

R-squared	0.078115	Mean dependent var	0.016657
Adjusted R-squared	0.067008	S.D. dependent var	0.082699
S.E. of regression	0.079880	Akaike info criterion	-2.193340
Sum squared resid	0.529605	Schwarz criterion	-2.135865
Log likelihood	95.21693	Hannan-Quinn criter.	-2.170222
Durbin-Watson stat	1.994113		

TABLE 134

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/10/14 Time: 14:20
Sample (adjusted): 1992Q3 2013Q3
Included observations: 85 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP63(-1)	-0.415305	0.739187	-0.561841	0.5760
DLP64(-1)	-0.062944	0.397356	-0.158406	0.8746
DLP76(-1)	-0.341565	0.160485	-2.128326	0.0367
DLP79(-1)	-0.061217	0.031923	-1.917633	0.0591
DLP81(-1)	-0.082581	0.054315	-1.520420	0.1328
DLP84(-1)	-0.299917	0.436785	-0.686647	0.4945
DLP91(-1)	-0.366128	0.188789	-1.939349	0.0564
DLP95(-1)	-0.621907	0.301999	-2.059304	0.0431
DLP97(-1)	0.724756	1.414581	0.512347	0.6100

DLP103(-1)	0.161983	0.466023	0.347585	0.7292
DLP105(-1)	-1.186250	0.572892	-2.070634	0.0420
DLP109(-1)	-0.373799	0.554016	-0.674709	0.5020
C	0.043577	0.015882	2.743734	0.0077

R-squared	0.259208	Mean dependent var	0.016657
Adjusted R-squared	0.135743	S.D. dependent var	0.082699
S.E. of regression	0.076881	Akaike info criterion	-2.153217
Sum squared resid	0.425570	Schwarz criterion	-1.779636
Log likelihood	104.5117	Hannan-Quinn criter.	-2.002952
F-statistic	2.099443	Durbin-Watson stat	1.698884
Prob(F-statistic)	0.027367		

TABLE 135

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/10/14 Time: 14:21
Sample (adjusted): 1992Q3 2013Q3
Included observations: 85 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP63(-1)	-0.433897	0.724920	-0.598544	0.5513
DLP76(-1)	-0.341026	0.159374	-2.139780	0.0357
DLP79(-1)	-0.060964	0.031670	-1.925005	0.0581
DLP81(-1)	-0.082641	0.053950	-1.531823	0.1299
DLP84(-1)	-0.305569	0.432409	-0.706667	0.4820
DLP91(-1)	-0.358932	0.182015	-1.971998	0.0524
DLP95(-1)	-0.623016	0.299895	-2.077447	0.0413
DLP97(-1)	0.722168	1.405010	0.513995	0.6088
DLP103(-1)	0.166736	0.461940	0.360947	0.7192
DLP105(-1)	-1.177644	0.566489	-2.078846	0.0411
DLP109(-1)	-0.383970	0.546596	-0.702474	0.4846
C	0.043157	0.015555	2.774533	0.0070

R-squared	0.258950	Mean dependent var	0.016657
Adjusted R-squared	0.147285	S.D. dependent var	0.082699
S.E. of regression	0.076366	Akaike info criterion	-2.176398
Sum squared resid	0.425718	Schwarz criterion	-1.831554
Log likelihood	104.4969	Hannan-Quinn criter.	-2.037692
F-statistic	2.318990	Durbin-Watson stat	1.728211
Prob(F-statistic)	0.016707		

TABLE 136

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/10/14 Time: 14:22
Sample (adjusted): 1992Q3 2013Q3
Included observations: 85 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP63(-1)	-0.361819	0.692767	-0.522281	0.6030

DLP76(-1)	-0.341885	0.158417	-2.158130	0.0342
DLP79(-1)	-0.059858	0.031335	-1.910247	0.0600
DLP81(-1)	-0.083802	0.053536	-1.565322	0.1218
DLP84(-1)	-0.246491	0.397876	-0.619518	0.5375
DLP91(-1)	-0.358759	0.180941	-1.982739	0.0511
DLP95(-1)	-0.616077	0.297514	-2.070747	0.0419
DLP97(-1)	0.849998	1.351629	0.628869	0.5314
DLP105(-1)	-1.123848	0.543311	-2.068519	0.0421
DLP109(-1)	-0.361711	0.539906	-0.669953	0.5050
C	0.041875	0.015054	2.781589	0.0069

R-squared	0.257628	Mean dependent var	0.016657
Adjusted R-squared	0.157307	S.D. dependent var	0.082699
S.E. of regression	0.075916	Akaike info criterion	-2.198145
Sum squared resid	0.426478	Schwarz criterion	-1.882037
Log likelihood	104.4212	Hannan-Quinn criter.	-2.070997
F-statistic	2.568042	Durbin-Watson stat	1.736983
Prob(F-statistic)	0.010061		

TABLE 137

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/10/14 Time: 14:24
Sample (adjusted): 1992Q3 2013Q3
Included observations: 85 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP63(-1)	-0.445864	0.676557	-0.659018	0.5119
DLP76(-1)	-0.332776	0.157084	-2.118457	0.0374
DLP79(-1)	-0.058140	0.031084	-1.870421	0.0653
DLP81(-1)	-0.082315	0.053262	-1.545463	0.1264
DLP91(-1)	-0.346174	0.179057	-1.933318	0.0570
DLP95(-1)	-0.584491	0.291907	-2.002322	0.0489
DLP97(-1)	0.973575	1.331326	0.731282	0.4669
DLP105(-1)	-1.062688	0.532067	-1.997283	0.0494
DLP109(-1)	-0.530554	0.464151	-1.143064	0.2566
C	0.040280	0.014771	2.726879	0.0080

R-squared	0.253777	Mean dependent var	0.016657
Adjusted R-squared	0.164230	S.D. dependent var	0.082699
S.E. of regression	0.075603	Akaike info criterion	-2.216501
Sum squared resid	0.428690	Schwarz criterion	-1.929130
Log likelihood	104.2013	Hannan-Quinn criter.	-2.100913
F-statistic	2.834020	Durbin-Watson stat	1.764556
Prob(F-statistic)	0.006327		

TABLE 138

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/10/14 Time: 14:25
Sample (adjusted): 1992Q3 2013Q3
Included observations: 85 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP76(-1)	-0.320465	0.155388	-2.062358	0.0426
DLP79(-1)	-0.057778	0.030963	-1.866044	0.0659
DLP81(-1)	-0.080095	0.052958	-1.512431	0.1346
DLP91(-1)	-0.362832	0.176603	-2.054506	0.0434
DLP95(-1)	-0.595354	0.290354	-2.050441	0.0438
DLP97(-1)	0.588745	1.191966	0.493928	0.6228
DLP105(-1)	-1.139736	0.517127	-2.203974	0.0306
DLP109(-1)	-0.574995	0.457514	-1.256784	0.2127
C	0.035871	0.013121	2.733971	0.0078

R-squared	0.249456	Mean dependent var	0.016657
Adjusted R-squared	0.170451	S.D. dependent var	0.082699
S.E. of regression	0.075321	Akaike info criterion	-2.234256
Sum squared resid	0.431173	Schwarz criterion	-1.975623
Log likelihood	103.9559	Hannan-Quinn criter.	-2.130227
F-statistic	3.157487	Durbin-Watson stat	1.766220
Prob(F-statistic)	0.003859		

TABLE 139

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/10/14 Time: 14:27
Sample (adjusted): 1992Q3 2013Q3
Included observations: 85 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP76(-1)	-0.323819	0.154475	-2.096253	0.0393
DLP79(-1)	-0.057675	0.030810	-1.871956	0.0650
DLP81(-1)	-0.081930	0.052567	-1.558582	0.1232
DLP91(-1)	-0.360190	0.175653	-2.050575	0.0437
DLP95(-1)	-0.585472	0.288238	-2.031207	0.0457
DLP105(-1)	-1.031343	0.465950	-2.213419	0.0298
DLP109(-1)	-0.519776	0.441461	-1.177401	0.2427
C	0.038596	0.011846	3.258175	0.0017

R-squared	0.247047	Mean dependent var	0.016657
Adjusted R-squared	0.178596	S.D. dependent var	0.082699
S.E. of regression	0.074951	Akaike info criterion	-2.254581
Sum squared resid	0.432557	Schwarz criterion	-2.024684
Log likelihood	103.8197	Hannan-Quinn criter.	-2.162110
F-statistic	3.609141	Durbin-Watson stat	1.767932
Prob(F-statistic)	0.002053		

TABLE 140

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/10/14 Time: 14:28
Sample (adjusted): 1992Q3 2013Q3
Included observations: 85 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP76(-1)	-0.259736	0.144927	-1.792190	0.0770
DLP79(-1)	-0.061847	0.030681	-2.015798	0.0473
DLP81(-1)	-0.095189	0.051474	-1.849268	0.0682
DLP91(-1)	-0.334839	0.174760	-1.915996	0.0590
DLP95(-1)	-0.542040	0.286575	-1.891440	0.0623
DLP105(-1)	-0.735341	0.393279	-1.869769	0.0653
C	0.031027	0.009974	3.110645	0.0026

R-squared	0.233491	Mean dependent var	0.016657
Adjusted R-squared	0.174529	S.D. dependent var	0.082699
S.E. of regression	0.075136	Akaike info criterion	-2.260267
Sum squared resid	0.440344	Schwarz criterion	-2.059107
Log likelihood	103.0613	Hannan-Quinn criter.	-2.179355
F-statistic	3.960008	Durbin-Watson stat	1.749020
Prob(F-statistic)	0.001650		

TABLE 141

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/10/14 Time: 14:30
Sample (adjusted): 1992Q3 2013Q3
Included observations: 85 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP76(-1)	-0.231068	0.151508	-1.525120	0.1314
DLP79(-1)	-0.063510	0.031592	-2.010327	0.0480
DLP81(-1)	-0.086313	0.053008	-1.628307	0.1077
DLP91(-1)	-0.307067	0.201884	-1.521004	0.1325
DLP95(-1)	-0.535413	0.291915	-1.834141	0.0706
DLP105(-1)	-0.698076	0.493016	-1.415930	0.1609
DLP21(-1)	-0.381757	0.705961	-0.540761	0.5903
DLP51(-1)	0.250763	0.251975	0.995189	0.3228
DLP54(-1)	0.035738	0.061611	0.580067	0.5636
C	0.029548	0.010608	2.785466	0.0068

R-squared	0.245453	Mean dependent var	0.016657
Adjusted R-squared	0.154907	S.D. dependent var	0.082699
S.E. of regression	0.076024	Akaike info criterion	-2.205408
Sum squared resid	0.433472	Schwarz criterion	-1.918037
Log likelihood	103.7298	Hannan-Quinn criter.	-2.089819
F-statistic	2.710822	Durbin-Watson stat	1.763244
Prob(F-statistic)	0.008648		

TABLE 142

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/10/14 Time: 14:32
Sample (adjusted): 1992Q3 2013Q3
Included observations: 85 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP76(-1)	-0.229689	0.150780	-1.523340	0.1318
DLP79(-1)	-0.065246	0.031282	-2.085750	0.0404
DLP81(-1)	-0.090978	0.052057	-1.747661	0.0846
DLP91(-1)	-0.269743	0.188834	-1.428466	0.1573
DLP95(-1)	-0.523925	0.289782	-1.807994	0.0746
DLP105(-1)	-0.572334	0.432708	-1.322680	0.1899
DLP51(-1)	0.192066	0.226336	0.848588	0.3988
DLP54(-1)	0.031499	0.060825	0.517858	0.6061
C	0.028529	0.010391	2.745685	0.0075

R-squared	0.242511	Mean dependent var	0.016657
Adjusted R-squared	0.162775	S.D. dependent var	0.082699
S.E. of regression	0.075669	Akaike info criterion	-2.225046
Sum squared resid	0.435162	Schwarz criterion	-1.966412
Log likelihood	103.5644	Hannan-Quinn criter.	-2.121016
F-statistic	3.041438	Durbin-Watson stat	1.815081
Prob(F-statistic)	0.005078		

TABLE 143

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/10/14 Time: 14:32
Sample (adjusted): 1992Q3 2013Q3
Included observations: 85 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP76(-1)	-0.247645	0.146040	-1.695731	0.0940
DLP79(-1)	-0.065683	0.031122	-2.110536	0.0381
DLP81(-1)	-0.091464	0.051801	-1.765692	0.0814
DLP91(-1)	-0.289008	0.184251	-1.568557	0.1209
DLP95(-1)	-0.521563	0.288366	-1.808683	0.0744
DLP105(-1)	-0.634409	0.413793	-1.533156	0.1293
DLP51(-1)	0.179594	0.223979	0.801835	0.4251
C	0.029094	0.010284	2.829129	0.0059

R-squared	0.239838	Mean dependent var	0.016657
Adjusted R-squared	0.170733	S.D. dependent var	0.082699
S.E. of regression	0.075309	Akaike info criterion	-2.245053
Sum squared resid	0.436698	Schwarz criterion	-2.015156
Log likelihood	103.4147	Hannan-Quinn criter.	-2.152582
F-statistic	3.470603	Durbin-Watson stat	1.777199
Prob(F-statistic)	0.002773		

TABLE 144

Dependent Variable: DLSPX
Method: Least Squares
Date: 01/10/14 Time: 14:34
Sample (adjusted): 1992Q3 2013Q3
Included observations: 85 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLP76(-1)	-0.259736	0.144927	-1.792190	0.0770
DLP79(-1)	-0.061847	0.030681	-2.015798	0.0473
DLP81(-1)	-0.095189	0.051474	-1.849268	0.0682
DLP91(-1)	-0.334839	0.174760	-1.915996	0.0590
DLP95(-1)	-0.542040	0.286575	-1.891440	0.0623
DLP105(-1)	-0.735341	0.393279	-1.869769	0.0653
C	0.031027	0.009974	3.110645	0.0026

R-squared	0.233491	Mean dependent var	0.016657
Adjusted R-squared	0.174529	S.D. dependent var	0.082699
S.E. of regression	0.075136	Akaike info criterion	-2.260267
Sum squared resid	0.440344	Schwarz criterion	-2.059107
Log likelihood	103.0613	Hannan-Quinn criter.	-2.179355
F-statistic	3.960008	Durbin-Watson stat	1.749020
Prob(F-statistic)	0.001650		

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