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"Professional Exchange Rate Forecasts and Currency Investments"

with emphasis on the performance of real time currency investments

HEADS OR ….TAILS ???

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BRIEF CONTENTS

1. INTRODUCTION

The foreign exchange market establishes the price of each (domestic) currency in terms of other (foreign) currencies. The Exchange rate is the price of one unit of foreign currency in units of domestic currency, in other words how much one has to pay in domestic currency in order to buy one unit of foreign currency.

Markets for the exchange of national currencies have existed for centuries. For most of the 20th century, the list of the markets participants was static (commercial banks in the United States and other banks around the world), the product list also was static (spot- forward products with fixed short-term maturities) and competition from exchange- traded products was nonexistent.

Over the last 35 years however, financial innovation and competitive pressures have forced massive changes on the structure and institutions of the foreign exchange market. The list of foreign exchange market products has grown considerably while new competitors have entered the market. Investment banking firms and securities firms worldwide now support trading activities in foreign exchange and interest rate products. Many corporate customers now have well- developed financial subsidiaries that seek a more direct role in the market. Direct and transparent access could include access to the traditional (i.e. voice/telephone) brokerage network (comparable to bank dealers), access to automated brokerage networks (i.e. Reuters system) and access to Web-based auction systems (i.e. Currenex system). New ways of foreign exchange clearing and settlement (netting systems and continuous linked settlement systems like FXNET, Continuous Linked Settlement Bank) are being developed in order to lower delivery risks to individual banks, as well as the systemic risk in global exchange trading.

In addition, the United States and the U.S dollar (USD) were once undisputed as the dominant country and the dominant currency in the world financial markets, but now they play a much smaller role. London and Tokyo as well as Singapore and the so-called emerging markets, are now considered as important centers of primary securities issues and secondary market trading.

Moreover, in 1999, the European Economic and Monetary Union (EMU) introduced its new common currency, the euro, which poses a further threat to the dominant role of the USD in international markets.

Over the last 15 years, the nature of international financial markets has been transformed, as a result of the increase in size and mobility (across borders) on capital invested internationally, which is denominated in foreign currency.

In the latter half of the 1990s, even more abrupt changes occurred. The sudden collapse of pegged rates in many countries including Mexico (1994),

Thailand (1997), Korea (1997). Russia (1998) and Brazil (1999) with the ensuing currency, banking and financial crisis spreading across Latin America and other Asian countries, raised fundamental questions about the operation of international financial markets.

To sum up, over the past decades, not only financial markets have experienced unusually large price swings but also the speed and volatility of price movements accelerated. Exchange rate volatility, along with volatility in other financial prices, has fostered the development of new markets and instruments (such as forwards futures and options) that may either reduce or enhance one's exposure to these volatile conditions.

Since exchange rate changes are inevitable and create both risks and opportunities, volatility on this magnitude led to increased demands for financial forecasting on a professional basis -and as a result the development of professional forecasting services- and moreover underlined that exchange rate forecasts play a fundamental role in nearly all aspects of financial transactions and international financial management.

We have to point out that, while domestic currency is usually the medium of exchange for domestic transactions, domestic residents may desire foreign currency as an asset or store of value.

For example in countries that have experienced high and variable inflation (such as Argentina, Russia, Vietnam) domestic currency may be a poor store of value. As a result, residents of these countries often desire foreign currency denominated assets to protect their real wealth.

In addition foreign currency denominated assets may serve as a direct hedge for the exchange risk associated with anticipated foreign currency liabilities.

Finally, domestic residents may simply view foreign currency assets as undervalued, and they may demand foreign exchange for pure speculative purposes to earn higher returns.

2. THE FOREIGN EXCHANGE MARKET - I

MARKET STRUCTURE AND INSTITUTIONS

- Volume of Foreign Exchange Trading

The estimate of total daily worldwide foreign exchange trading volume (in 2004) is about $ 1.9 trillion per day or nearly $ 475 trillion per year. This estimate covers the traditional market segments of spot, forward and swap contracts. Trading in currency futures and options adds another $ 290 billion per day to the estimate of trading volume.

The annual volume of foreign exchange trading is about 30.5 times larger than annual world trade ($ 15,6 trillion counting both world imports and exports in 2004) and even 11 times larger than world GDP ($ 43,9 trillion in 2004).

Some of the forces that were important in understanding changes in turnover in the past continue to have an impact today, although new factors have emerged as more important in explaining the recent increase in turnover.

Between 1998 and 2001, foreign exchange market activity declined markedly, arguably because of the adaptation of the euro, the consolidation in the banking industry, the growth of electronic broking, mergers in the corporate sector, and other events like the collapse of Long Term Capital Management (LTCM) in September 1998, a well-regarded hedge fund with two Nobel laureates in economics among the company founders, and the withdrawal from the market of Tiger and Quantum, characterized by higher risk aversion and a global withdrawal of liquidity.

Trends that continue today include consolidation in the banking sector and the growth of electronic broking. Yet these factors are viewed as being relatively less important than they were before. For instance, the market share of electronic broking appears to have remained fairly stable since 2001.

The surge in market activity between 2001 and 2004 was probably due to several related factors. First, the presence of clear trends and higher volatility in foreign exchange markets led to investments in currencies that experienced a persistent trend of appreciation. These factors also induced an increase in hedging activity, which further supported currency trades. Second, interest differentials encouraged investments in high interest currencies financed by short positions in low interest rate currencies if the target currencies, tended to appreciate against the funding currencies. In addition, the broad search for yield that has characterized financial markets in recent years urged investors to become increasingly interested in foreign exchange as an asset class alternative to equity and fixed income.

Data are reported in the following tables:

Global Foreign Exchange Market Turnover[1] Daily averages in April 2004 (in billions of USD)						
	1989	1992	1995	1998	2001	2004
Spot transactions	317	394	494	568	387	621
Outright forwards	27	58	97	128	131	208
Foreign exchange swaps	190	324	546	734	656	944
Estimated gaps in reporting	56	44	53	60	26	107
Total traditional turnover	590	820	1,190	1,490	1,200	1,880
Turnover at April 2004 exchange rates[2]	650	840	1,120	1,590	1,380	1,880

Notes:

1. Adjusted for local and cross-border double-counting
2. Non- USD legs of foreign currency transactions were converted into original currency amounts at the average exchange rates for April of each survey year and then reconverted into USD amounts at average April 2004 exchange rates

- Source: Bank for International Settlements (BIS) Quarterly Review, December 2004

Reported Foreign Exchange Market Turnover by Counterparty[1] Daily averages in April 2004 (in billions of USD) and per cent								
	1995		1998		2001		2004	
	Amount	% share	Amount	% share	Amount	% share	Amount	% share
Total[2]	1,137	100	1,430	100	1,174	100	1,773	100
With reporting dealers	728	64	908	64	689	59	936	53
With other financial institutions	230	20	279	20	329	28	585	33
With non-financial customers	179	16	242	17	156	13	252	14
Local	526	46	657	46	499	43	674	38
Cross-Border	613	54	772	54	674	57	1,099	62

Notes:

1. Adjusted for local and cross-border double-counting
2. Excludes the estimated gaps in reporting included in the table above

- Source: Bank for International Settlements (BIS) Quarterly Review, December 2004

- Foreign Exchange Market Products and Activities

The most well known products of the foreign exchange market are the spot contract and the forward contract.

A spot contract represents a binding commitment for an exchange of funds with normal settlement and delivery of bank balances following in two days settlement or in one day in the case of North American currencies.

A forward contract is an agreement made today for an obligatory exchange of funds at some specified time in the future. The most common maturities for forward contracts are 1, 2, 3, 6 and 12 months. Nonstandard maturities are available but transaction costs make them more expensive. No cash changes hands when a forward contract is arranged or at any time until the settlement day. Forward contracts typically involve a bank and a corporate counterparty and are used to manage their exposures to foreign exchange risk.

The final category of contract called foreign exchange swaps is less well-known but nevertheless represents a vital element in the market.

A foreign exchange swap is the simultaneous sale of a currency for spot delivery and purchase of that currency for forward delivery.

- Types of Trading Activities

Trading activities link together the various segments of the foreign exchange market and in general, trading contributes to consistent pricing across market segments and the operational efficiency of the market.

Speculation. Implies financial transactions undertaken when an individual's expectations differ from the market's expectation. These transactions expose the individual, trader or corporation, to price risk from foreign exchange rate changes.

Arbitrage. It is the simultaneous or nearly simultaneous purchase of securities in one market for sale in another market with the expectation of a risk- free profit.

Spatial Arbitrage. Suggests arbitrage between segments of the foreign exchange market that are physically separated and is due to price dispersion across markets, reflecting the cost of searching for favorable prices and the uncertainty that expected arbitrage profits may disappear before all transactions can be completed.

Triangular Arbitrage. For any three currencies, there are only two independent exchange rates. The exchange rate of the third currency can be determined as the cross- rate. In practice, triangular arbitrage holds automatically because one currency is used as the vehicle currency

(traditionally the USD). Exchange rates of all currencies are quoted in USD. Any cross rate between currency X and currency Y can be calculated using the USD rates:

$$\frac{X/USD}{Y/USD} \Rightarrow \frac{X}{Y}$$

Covered Interest Arbitrage. Describes capital flows that seek risk-free profits based on differences between the forward exchange premium and the relative rate of interest in the domestic and foreign currency, while transactions are profitable when the interest rate parity relationship is violated.

We have to point out that the occurrence of a round-trip, covered interest arbitrage profit opportunity is exceedingly rare. According to a study based on intraday prices by S.G. Rhee and R. Chang in 1992, it was found that, most often, there were no sample points of round trip arbitrage profits and just occasionally 2-3 percent of a sample.

- The Relationship between Spot and Forward Contracts

A forward purchase of € can be replicated by borrowing USD, buying € in the spot market and lending the €. In absence of transaction costs, taxes or default the relationship is given from the following equation:

$$F_{t,n} = S_t \frac{(1+i_{\$,n}(n/360))}{(1+i_{\in,n}(n/360))}$$

We define the spot rate at time t, S_t (USD/€), as the cost of each € bought in USD terms and the forward rate at time t for delivery in n periods ($F_{t,n}$). The term $(1+i_{\$,n}(n/360))$ represents the cost of each borrowed USD, while the component $\frac{1}{(1+i_{e,n}(n/360))}$ represents the present value of one €.

A forward contract is equivalent to a spot contract combined with borrowing and lending in two currencies and is a type of derivative security because the forward price is derived from the spot price and the borrowing and lending rates.

It can be quoted for maturities longer than 12 months using bond market rates, so that by combining a spot contract with fixed-rate n-period borrowing and lending in two currencies, an n-period forward exchange contract can be constructed:

$$F_{t,nyears} = S_t \left[\frac{1 + i_{\$,nyears}}{1 + i_{e,nyears}} \right]^{nyears}$$

The above relationship suggests that synthetic securities can be designed by combining a foreign currency denominated security with a spot and a forward contract.

While the above equation suggests an exact pricing formula for long-term forwards, there seem to exist deviations between outright forward and synthetic forward prices.

Bid–ask spreads of actual (or outright) forward contracts exceed the bid-ask spreads of synthetic forwards constructed using spot rates and long-term borrowing and lending, revealing that other factors may influence actual long-term forward rates.

Several explanations could be offered. First, as long-term forward markets are thin and illiquid, traders face risks that they attempt to pass along to customers in the way of high spreads. Second, long-term contracts expose banks to considerably greater credit risk, increasing bank's capital requirements and hence costs.

BIS (Bank of International Settlements) capital adequacy guidelines require a capital commitment from the bank to support its exposure to counterparty risk, meaning the risk of default on the terms and conditions of a contract. Thus, the bank might set a higher price than implied by the equation above in order to cover these costs.

In general, BIS which is the principal organization of Central Banks in the major economies of the world, defines operational risk as "the risk of direct or indirect loss resulting from inadequate or failed internal processes, people and systems or from external events". (Basel Committee On Bank Supervision, "Overview of the New Capital Accord", Bank for International Settlements, January 2001, p.27)

- The Foreign Exchange Market Setting

The foreign exchange market is an excellent example of a dispersed, broker-dealer market where trading takes place 24 hours per day between banks located around the world. Bank traders act as market makers as they have financial capital committed to trading, they take positions and they are exposed to the risks of price changes.

There is an automated brokerage system (Reuters Dealing 2000-2), which permits dealers to enter their live prices into the system for broadcast. Prices appear on a screen as anonymous live quotations and once a price is hit, the

system checks for mutual credit availability between the two counterparties and completes the transaction with ticket writing and confirmations.

In addition, in April 2000 Currenex launched the first multibank Internet foreign exchange trading system working on an auction principle whereby corporate users request quotations from participating banks. The system is charging both banks and corporate customers a fee for using the service while it simplifies the back-office bookkeeping elements of currency trading.

There is also development of private systems for clearing and settlement. A multilateral netting system (the leading firm is FXNET) with banks clearing against a central clearinghouse reduces transaction costs and liquidity risks.

More than 85% of trading is between banks and financial institutions while almost 14% is between banks and non-financial customers according to earlier surveys. In addition almost 62% of all foreign exchange deals represent cross-border transactions

Finally, among the top 20 dealers there are prominent investment banks and securities houses (like Warburg Dillon Read, Goldman Sachs, Merrill Lynch, Morgan Stanley, and Lehman Brothers), confirming that noncommercial banks have gained leading positions in the market.

- Controls over Foreign Exchange Trading

Exchange rate risk associated with unexpected exchange rate changes can be contained by placing limits on the size of open currency positions (including limits on trader's position, overnight position limits and limits on the overall position of the trading room).

Interest rate risk associated with unexpected changes in forward exchange rates due to changes in term structure of interest rates between two currencies can be contained by placing limits on the absolute size of forward positions, by restricting the permissible maturities and by limiting the difference in maturities of assets and liabilities for a single currency.

Credit risk associated with default on a contract. One example called rate risk applies to the case of default on an outstanding contract and the magnitude of risk depends on whether the bank retains the right-of-set, the maturity of the contracts and the underlying variability of prices.

Rate risks can be controlled by limiting customer positions, placing maturity limits on each customer and having a diversified portfolio of customers. Another example of credit risk is delivery risk, which is associated with default on a contract in the process of settlement across time zones.

INTERNATIONAL PARITY CONDITIONS

Parity conditions play a key role in the understanding of international financial markets and in a decision maker's strategic posture towards the markets. The parity conditions can usefully be thought of as international financial benchmarks or break-even values and when they hold they imply points of indifference between two alternative financial choices.

When parity conditions do not hold, they indicate market forces favoring one financial alternative over another and a violation of parity often implies that a direct or indirect profit opportunity (or cost advantage) is available to the decision maker.

The analysis of international parity conditions begins by assuming a perfect capital market (PCM) setting, not because this is an accurate picture of the world but because it facilitates the analysis and provides a useful benchmark for comparison with other more realistic assumptions.

The standard PCM assumptions are:

- no transaction costs
- no taxes
- complete certainty

Compared to Purchasing Power Parity (PPP), which is built on the notion of arbitrage across goods markets and the Law of one Price -which is the principle that in a PCM setting, homogenous goods will sell for the same price in two markets taking into account the exchange rate, in symbols:

$$P_{us,product} = S_{US/FC} * P_{FC,product}$$

it should be clear that violations in the remaining parity conditions may present more immediate profit opportunities because the cost of entering into financial transactions is typically less than in goods market.

However, financial markets are often subject to controls or restrictions and taxes that limit the ability of market participants to complete an arbitrage transaction. When controls or taxes are present that create a deviation from parity condition, the magnitude of the deviation reveals how advantageous (real profitable) it would be for an agent to overcome the control or tax.

- Interest Rate Parity

Interest Rate Parity (IRP) establishes the linkages across spot and forward currency markets simultaneously with domestic and foreign security markets.

IRP draws on the principle that, in equilibrium, two investments exposed to the same risks must have the same returns and it is maintained by arbitrage. The interest rate parity line represents the break-even point or the dividing line between investments in the domestic security and investments in the foreign security that have been covered against exchange risk.

Interest rate parity condition is presented on the following equation:

$$\frac{F_{t,1} - S_t}{S_t} = \frac{i_{\$} - i_{\in}}{1 + i_{\in}} \Rightarrow$$

% forward premium = % interest differential

The $(1+i_{\in})$ term in the denominator of the interest differential is sometimes omitted on the grounds that the interest rate for one period such as 1/12 of the per annum (p.a) rate for monthly data is usually very small.

The term (F-S)/S is called the forward premium and the term forward discount is used when (F-S)/S < 0.

- Relaxing the Perfect Capital Market Assumptions

Transaction Costs. Interest rate parity is enforced by arbitrage transactions. It follows intuitively that arbitrage will not take place unless the absolute magnitude of the deviation from the parity exceeds the cost of undertaking the arbitrage transactions. This constraint has the effect of creating a neutral band within which covered interest arbitrage transactions will not occur. Deviations from IRP will persist because it is not profitable for arbitrageurs to exploit them. When transaction costs are present, all points within the neutral band are equilibrium points, not simply those points on the original parity line.

Taxes. Taxes on income and capital gains may have a different impact than tariffs on the goods or transfer taxes. Interest parity condition balanced pretax returns from two alternative investments. Clearly arbitrageurs are more interested in the balance between after-tax returns, where both ordinary income and capital gains are taxed at different rates- τ_y ant τ_κ respectively. On an after tax basis the equation should be modified as follows :

$$\frac{F_{t,1} - S_t}{S_t} \times (1 - \tau_\kappa) = \frac{i_\$ - i_\in}{1 + i_\in} \times (1 - \tau_y)$$

If the tax rates on capital gains and ordinary income are identical, then the IRP equation with taxes becomes identical to the IRP equation without taxes.

However, tax rates on capital gains frequently are lower than the taxes on ordinary income.

Uncertainty. All prices in covered interest arbitrage are observed before conducting the transaction, but still there are elements of risk. The foreign currency investment includes a forward contract issued by a bank, which is subject to default risk in addition with country risk and risk of exchange controls. All of these risks serve to inhibit the process of arbitrage and widen the neutral band around the traditional parity line.

Empirical evidence generally supports IRP, especially for short- term maturities and interest rates set in the Euro markets. However, other evidence suggests that deviations from parity may appear in the very short run or for long-term maturities. Bank traders are reluctant to carry the extra trading risks and capital costs associated with long-dated forward contracts while some customers may be attracted to long-dated forwards perhaps because they face still higher costs in creating their own synthetic long-term forward positions.

- The Fisher Parity

The parity describes how information regarding expected inflation and expected exchange rates are captured in the current interest rates. It relates the nominal interest rate to the expected rate of inflation in the single country and represents another example of arbitrage, this time between real assets and nominal (or financial assets) within a single economy.

In most developed countries where inflation and the real interest rate are low, the Fisher Effect is usually approximated as :

$$i = r + E(\tilde{p}) \Rightarrow$$

% nominal interest rate = % real interest rate + % expected inflation rate

To execute the arbitrage implied by the Fisher Effect, individuals would move out of financial assets into commodities when inflation is high but not fully reflected in nominal returns. Similarly, when inflation is receding, individuals would prefer financial assets to lock in higher returns that would no longer be available through storing commodities. The mechanism may be more

applicable to countries with poorly developed capital markets where commodities and real estate are preferred store of value against inflation.

- The International Fisher Effect (Uncovered Interest Parity)

Under the PCM assumptions, the derivation of the International Fisher Effect is another straightforward application of arbitrage. Two investments sharing the same maturity, risk and financial currency of denomination should produce identical ending wealth:

$$\frac{E(\tilde{S}_{t+1}) - S_t}{S_t} = \frac{i_{\$} - i_{€}}{1 + i_{€}} \Rightarrow$$

% expected exchange rate change = % interest differential.

Once again, it is common to see the right-hand side of the above equation simply approximated by $i_{\$} - i_{€}$ when $i_{€}$ is small.

Uncovered Interest Parity states that if domestic interest rate is higher than foreign interest rate, the domestic currency is expected to depreciate. The logic underpinning this result is that investors must be paid a higher interest rate to compensate them for a unit of account that is expected to depreciate in value.

The International Fisher Effect looks much like the Covered Interest Rate Parity shown before, but there is an important difference. Under the IRP, all four variables $(F_t, S_t, i_{\$}, i_{€})$ can be observed at the time of arbitrage even in the real world. In the case of IFE, only three variables $(F_t, i_{\$}, i_{€})$ can be observed at the time of investment. The forth variable $E(\tilde{S}_{t+1})$ is an expectation that is not realized until the conclusion of the investment.

So, in the real world the foreign investment proposed in the International Fisher Effect contains exchange risk.

However, given expectations of future exchange rates -meaning that the variable $E(\tilde{S}_{t+1})$ stays constant-, an increase in domestic interest rates (or a decrease in foreign rates) gives rise to an appreciation of the domestic currency. An increase in $i_{\$}$ that leaves $E(\tilde{S}_{t+1})$ unchanged more likely reflects a change in the real interest rate generating a capital inflow into USD and an appreciation of the USD.

It is important to stress why these two versions of uncovered interest parity lead to such radically different predictions. Both equations are meaningful, but they are based on different working assumptions.

Relaxing the Perfect Capital Market Assumptions

Transaction Costs and Taxes. Introducing transaction costs and taxes have similar effects like in CIP.

Uncertainty. If there is uncertainty about the expected spot rate and agents are risk averse, they would require a compensation for foreign exchange risk resulting in systematic deviations from the International Fisher Effect.

Empirical evidence suggests little relationship between the current interest rate differentials and the future exchange rate changes. Tests, in the simple linear regression:

$$\frac{S_{t+1} - S_t}{S_t} = a + b\,\frac{i_{\$} - i_e}{1 + i_e} + \varepsilon_{t+1}$$

where UIP is the null hypothesis (a=0, b=1) and under the assumption of rational expectations so that the actual future spot rate is equal to the expected future spot rate augmented by an error term:

$$S_{t+1} = E(\tilde{S}_{t+1}) + e_{t+1} \text{ where } e_{t+1} \sim \text{iid } (0,\sigma^2),$$

have reached the following conclusions:

- Exchange rates often go to the opposite direction than interest rate differentials (estimates of b coefficient in the regression test of the equation above are significantly less than unity and often negative) and the volatility of interest rate differentials cannot explain volatility of changes in spot exchange rates (expressed by very low prices of R^2 coefficient in the formal regression test of the equation above).

We have to point out that this may be due to either non-rational expectations or to the existence of a time-varying risk premium , in that case:

$$E(\tilde{S}_{t+1}) - S_{t+1} + RP_{t+1} = i_{\$} - i_e$$

Supposing instead that the UIP is being assessed by measuring the deviation between the exchange rate change and the interest differential:

$$d_{t+1} = \frac{(S_{t+1} - S_t)}{S_t} - \frac{(i_{\$} - i_e)}{(1 + i_e)}$$

tests made over a 27-year sample period (from Jan 73 to Jan 99) revealed both positive and negative deviations (periods when the interest differential overestimates and underestimates the future exchange rate) but the average deviation from the UIP was not significantly different from zero.

Therefore, it can be argued that even though the UIP performs poorly in any individual period, over extended periods of time it appears that the interest rate differential tends to provide an offset to the realized exchange rate change.

Currencies with high interest rates tend to depreciate and currencies with low interest rate tend to appreciate along the lines predicted by the International Fisher Effect.

- The Forward Rate Unbiased Condition

The Forward Rate Unbiased condition is a logical consequence of IRP and the International Fisher Effect suggesting, under the PCM assumptions, that the expected percentage change in the exchange rate will equal the forward exchange premium.

When the forward rate equals the expected future spot rate, those who hedge (and convert their foreign currency assets and liabilities to domestic currency at the forward rate), and those who do not hedge (and convert their foreign currency positions at the expected future spot rate) have the same expected domestic currency results.

$$\frac{E(\tilde{S}_{t+1}) - S_t}{S_t} = \frac{F_{t,1} - S_t}{S_t}$$

$\Rightarrow$ % expected exchange rate change = % forward premium.

If the average deviation between today's forward rate ($F_{t,1}$) and the actual future spot exchange rate (S_{t+1}) is small and near zero, then the forward rate is an unbiased predictor of the future spot rate.

Relaxing the PCM assumptions, it is clear that the forward rate unbiased condition depends on two further assumptions:

Market Efficiency: $E(\tilde{S}_{t+1}) = S_{t+1}$

meaning that speculators are able to form unbiased expectations of future spot rates.

Forward Rate Pricing: $F_{t,1} = E(\tilde{S}_{t+1})$

meaning that the forward rate must fully reflect expectations about the future spot exchange.

If the first assumption is violated, a forward rate bias signifies market inefficiency. However, a forward bias could result from a failure of the second assumption, the pricing rule used by the market for setting forward prices which could reflect the existence of a time-varying risk premium positively correlated with the forward premium:

$$F_{t,1} = E(\tilde{S}_{t+1}) + RP_{t+1}$$

Thus, a forward rate bias does not necessarily imply foreign exchange market inefficiency or nonrational expectations.

If forward rate in not an unbiased predictor of future spot rate, then the cost of hedging FX risk has a systematic component equal to the forward bias:

$$F_{t,1} - S_{t+1} = RP_{t+1} + \varepsilon_{t+1}$$

Taking into consideration a view about risk premium, it may be chosen deliberately not to hedge foreign currency risk and take instead an open position. If there is a belief that the $RP_{t+1} > 0$, it is preferred not to buy FX forward since the currency is expected to depreciate($S_{t+1} \uparrow$) and in this case an open liability position in foreign currency is preferable.

Empirical evidence suggests that over long periods, the forward rate appears to be unbiased in the sense that periods of positive and negative bias offset each other. During shorter time intervals, on the other hand, it appears that the forward premium is a poor predictor of the future exchange rate change. Test results suggest that forward rate miss predicts even the direction of spot rate changes, while volatility of forward premia cannot explain volatility of changes in spot exchange rates.

3. THE FOREIGN EXCHANGE MARKET - II

SPOT EXCHANGE RATE DETERMINATION

Economists have studied exchange rates intensely for the last 125 years. Yet, to many economists, exchange rate models built around a set of structural macroeconomic variables seem to have little power to explain the patterns of short- term exchange rate behavior.

The principal result from models of exchange rate determination is that the exchange rate is a forward-looking variable that should be priced in the same way as other financial assets. Just as the price of an equity share reflects in theory the net present value of all cash flows that accrue to its owner, the current price of foreign exchange should reflect in theory the net present value of all the fundamental variables that affect the exchange rate. This immediately suggests why the exchange rate would be difficult to model and even more difficult to forecast, since the current exchange rate already reflects (in the sense of net present value) the expected values of future macroeconomic variables.

We developed this idea previously as the Uncovered Interest Parity (UIP) previously and repeat the equation below:

$$\frac{E(S_{t+1})}{S_t} = \frac{1+i_{DOM}}{i_{FOR}} \Rightarrow S_t = \frac{1+i_{FOR}}{1+i_{DOM}} \times E(S_{t+1})$$

The equation tells us that once $E(S_{t+1})$, $(1+i_{dom})$, $(1+i_{for})$ are known, the current spot rate must take on a unique value in order to equalize expected returns on domestic and foreign investments. Re- arranging the above equation we have:

$$S_t = \frac{E(S_{t+1})}{1+(i_{DOM} - i_{FOR})}$$

The current spot rate can be thought of as the discounted present value of the expected future spot rate, where the interest differential (i_{dom}- i_{for}) is the discount factor. It is worthwhile repeating that the discount factor in the above formula ignores any premium for foreign exchange risk, country risk or loss of liquidity that could be associated with a foreign currency investment.

As we point out in the end of this section, although the link between exchange rates and macroeconomic variables may be difficult to uncover, there is evidence that such a link exists in the short run and to a greater extent in the long run.

- News and Foreign Exchange Rates

Financial markets are preoccupied with news. Examining the response of exchange rates one can observe that news items which appear to be the same may differ in some critical respect, and that this causes the exchange rate to respond differently following what might seem to be similar economic events.

Two reasons explain why we do not find a simple, unambiguous link between a news announcement and an exchange reaction. First, the foreign exchange market, like other financial markets, is a forward-looking market. Once a news item has occurred, traders are concerned whether the news represents a permanent change or only a transitory phenomenon (sustainability is a key issue here). Second, while two news announcements may seem similar, on closer examination we may conclude that they are not.

To sum up, a number of key principles affect the foreign exchange behavior. Exchange rates deviate from their expected path only in response to unanticipated relationship to expected values. It is also clear that a single variable explanation of the exchange rate cannot be supported.

A variety of monetary and real variables (national income, real interest rates, inflation rate, changes in national wealth through the current account, financial and political risk factors) affect the demand for a currency or for financial assets denominated in that currency. And because the exchange rate is a relative price, changes in these variables can affect the exchange rate.

The character of the economic news (meaning whether the news item represent an anticipated/unanticipated, permanent/transitory disturbance, real/nominal disturbance, shock affecting a single industry/whole economy, shock weakly/strongly held) and the context in which it occurs (meaning a variety of factors including whether monetary authorities are perceived to have discipline relative to their targets, foreign demand for home country currency is satiated/growing, prices in the economy are free/sticky to adjust quickly, shock due to change in imports/exports, public/private savings and so forth) help formulate the scenario that traders extrapolate from a particular news story. It is this scenario for the future that determines how the exchange rate reacts to news.

- Asset Models of the Spot Exchange Rate

The stock approach –also referred to as the asset approach- focuses on the total quantity of the currency outstanding at the moment in time. Currency is treated as an asset one that is infinitely durable, which can be transferred but not destroyed.

The asset market approach considers the exchange rate as the relative price of domestic and foreign assets. This term evokes another aspect of the stock

approach, namely that the current exchange rate is set to equilibrate the risk-adjusted expected rate of return on assets denominated in different currencies. It also predicts that the current spot rate should reflect in the sense of net present value everything that is known or expected to happen in the macroeconomic environment.

This notion of market efficiency predicts quick movements in the exchange rate to reflect new information. Thus, the main determinants of the exchange rate according to the asset market approach are relative prices and expectations.

All asset models of exchange rate determination assume a high degree of capital mobility between assets denominated in different currencies. In these models perfect capital mobility is implied by the interest rate parity condition for which there is strong empirical support. The interrelationships between the demand and the supply of those assets determines the price of foreign exchange.

- The Monetary Approach

In the monetary approach, the only assets are domestic and foreign money. It can be characterized by the assumption that domestic and foreign currency denominated bonds display perfect substitutability. Investors are indifferent between holding foreign and domestic bonds when they receive an interest differential on the bonds equal to the expected exchange rate change.

The main hypothesis of the monetary approach is that the exchange rate is determined by relative price levels (PPP). The price level in each country is determined by money supply and money demand. Thus, relative money supplies and relative money demands determine the exchange rate.

There are two basic monetary models:

The Flexible-Price Model. The model assumes that domestic good prices are fully flexible. It implies that purchasing power parity holds continuously and that the real exchange rate never changes. It predicts that the rate of change in the spot rate depends on the rate of change in the foreign and domestic money supplies, on the rate of change in the foreign and domestic real incomes and on the level of change in the foreign and domestic interest rates.

The Sticky-Price (Overshooting) Model. The model was introduced by R. Dornbusch to highlight the impact of assuming that the speed of adjustment of goods prices is slow relative to the speed of adjustment of asset prices.

The model is built on the three following assumptions perfect capital mobility, slow price adjustment and perfect certainty. According to the

model, it is necessary for asset prices to move by more than in the flexible price case in order for markets to reach a temporary equilibrium. In the long run, the sticky price monetary model reaches the same conclusions like the flexible monetary model –an expansionary monetary policy leads to proportionate depreciation. The relationship, where the immediate short-run change in the nominal exchange rate exceeds the long-run change in the nominal exchange rate, is defined as overshooting. Because goods prices are sticky in the short run, the real exchange rate also follows an overshooting path.

Thus, a monetary disturbance which in the long run has only nominal effects (changing the price level and the nominal exchange rate) has real effects in the short run by changing the real exchange rate and the competitiveness of firms in international trade.

- The Portfolio- Balance Approach

In the portfolio- balance approach the menu of assets is expanded to include domestic and foreign bonds (B and F) as well as domestic and foreign monies. It can also be characterized by the assumption that domestic and foreign currency denominated bonds do not display perfect substitutability.

Investors require a risk premium (due to reasons such as liquidity, tax treatment, default/political/exchange risk) in addition to the expected percentage exchange rate change to establish indifference between holding foreign and domestic bonds.

The balance between domestic bonds and foreign bonds in a portfolio should be positively related to:

$$RP = i - i^* - E(s).$$

The quantity RP defines the exchange-risk premium and is the expected excess return on domestic currency bonds over foreign currency bonds. A rise in the domestic interest rate, a fall in the foreign interest rate or a decrease in the expected rate of domestic currency depreciation will lead investors to reallocate their portfolios out of foreign bonds into domestic bonds.

The simplest assumption about investors' asset preferences is that they are similar across countries known as uniform preference model. Under this model, if wealth grows faster in local or foreign country, there is no exchange rate impact because investors from both countries bid for assets in the same proportions.

An alternative assumption is that residents of both countries prefer to hold a larger fraction of their wealth in local bonds known as preferred local habitat model.

To be more precise the preferred local habitat model assumes that $B_H/W_H > F_H/W_H$ and $F_F/W_F > B_F/W_F$ where the subscripts $_H$ and $_F$ indicate home and foreign residents and B (domestic bonds), F (foreign bonds) and W (wealth).

International trade provides an important chance for the transfer of financial wealth. A country's current account (CA_t) a flow item in the balance of payments measures a country's change in its international investment position

$$NAP_{t+1} = NAP_t + CA_t.$$

For example, a home country with a current account deficit (where imports of goods and services exceeds exports) pays for its excess current consumption or investments by lowering its stock of foreign assets ($F_H\downarrow$) or issuing new bonds that are held by the foreign country ($B_F\uparrow$).

The portfolio-balance model with demand given by preferred local habitat, predicts a correlation between current account surpluses (deficits) and strong (weak) currencies. It is based on the below equation:

$$S = (Ø/(1+Ø)) \times [i^{*}+E(S_{t+1})-i] - (1/(1-Ø)) \times f \text{ , where:}$$

Ø: degree of risk aversion. In case of risk neutral $Ø=\infty$ the condition reduces to the standard Uncovered Interest Parity (UIP).
f: NAP_t= FA-FL (FA: foreign assets, FL: foreign liabilities)

In most structural models of exchange determination, the exchange rate is thought of as a variable which depends on a set of economic fundamentals and the expected future exchange rate. To model an explanation based on speculative bubbles we assume that the exchange rate can be decomposed into a fundamental term and a bubble term:

$$S_t = \bar{S} + B_t .$$

The observed exchange rate can deviate from its fundamentals value by the amount of the bubble and the spot exchange rate becomes more overvalued relative to fundamentals until the bubble bursts.

To sum up, we have to point out that empirical evidence suggests that during some periods –the 1920s hyperinflation, the early 1970s and over the longer run- exchange rate behavior is significantly related to fundamentals (actually Money Supply). Also, in the very short run exchange rate changes often closely follow news about fundamental economic events. Thus, while exchange rate movements may approximate a random walk the evidence show a significant link between exchange rates and many of the macroeconomic variables used to model exchange rates.

EXCHANGE RATE FORECASTING

Exchange rate forecasts play a fundamental role in nearly all aspects of international financial management since forecasts of future spot exchange rates are necessary to convert expected foreign currency cash flows into their expected domestic currency value.

While numerous business and financial decisions depend on exchange rate forecasts, there is considerable skepticism about the possibility of accurate forecasts. Sometimes this pessimistic view has been fostered by the alleged poor performance of popular models of exchange rate determination as previously mentioned.

Another argument against successful forecasting in based on foreign exchange market efficiency. The acceptance of market efficiency notion predicts quick movements in the exchange rate to reflect any new information. If markets are efficient, and prices fully reflect all available information, including structural economic information, then unanticipated exchange movements are only the results of unanticipated events- and by definition these cannot be forecasted.

- The Forecasting Approach and the Market Setting

Economic modeling can make a contribution to currency forecasting once we clearly define the market setting, meaning the exchange rate system, the forecasting horizon and the units of forecast.

Exchange rate system. The exchange rate system has an important effect on how we approach the exchange rate question. Under a pegged exchange rate regime, an exchange rate between two countries is allowed to vary within narrow bands and is maintained ultimately by central bank intervention (supported by international reserves) at the upper and lower intervention points.

Under pegged-rate system, once an exchange rate becomes misaligned, the likely direction of change in the exchange rate is fairly easy to predict: depreciation in countries that have experienced losses in international reserves, excess inflation and current account deficits, and appreciation where there has been relatively low inflation and current account surpluses.

It may also be possible to infer the likely magnitude of change in the exchange rate needed to restore equilibrium. The deviation from purchasing power parity offers one natural estimate of the likely exchange rate change.

Under a floating exchange rate system, the exchange rate is free to adjust quickly in response to changing relative macroeconomic conditions. A floating exchange rate reflects the speculative dynamics of the market- with prices moving by large amounts in response to unanticipated changes in economic

fundamentals, and short-run price movements overshooting their required long-term adjustment. Forecasting in the floating exchange rate environment is easier when the market is efficient in processing available information, but forecasting for profit can be more difficult for the same reason.

Forecast Horizon. Another important element in selecting a forecasting approach is the forecast horizon. It seems reasonable to assume that some techniques would be more suitable for very short-run forecasts while others are more effective at the longer-run horizons.

Adopting technical models and indicators –for example filter rules and moving average crossover rules- have shown greater success in forecasting short-term horizons (intraday to one week) since almost 90 percent of market participants place greater reliance for their forecasts. The first empirical studies to report on the profitability of using filter rules in the foreign exchange market were prepared by M. Dooley and J. Shaffer (1976, 1983). A sample of their results is presented on Levich M.R, "International Financial Markets Prices and Policies", 2nd edition McGraw Hill International Edition, pp. 244

As the forecast horizon lengthens, market participants turn to fundamentals to guide their exchange rate expectations. At the one-year or longer horizon, roughly 85 percent of responders rely primarily on economic fundamentals.

The argument that short-run exchange rate movements are nearly random -so that a random-walk forecast is the best short-term forecast that one can formulate- stem from the failure of traditional econometric models to find a connection between past trends and future trends.

Using a linear regression model similar to:

$$\text{Future trend} = \beta_0 + \beta_1 (\text{Past Trend}) + e$$

results have shown that β_1 coefficient is not significant and the R^2 of these kind of regressions are generally less than 1%. A random-walk view is supported meaning that future trend appears unrelated to the past trend. Results are presented on a study by Levich M.R, "International Financial Markets – Prices and Policies", 2nd edition McGraw Hill International Edition, pp. 279 and also R. Meese – K. Rogoff / 1990, p. 132)

The above assumption, could be a result of flawed methodology being used (reliance on linear regression testing) since the underlying relationships may be nonlinear.

Papers by J. Bilson (1990,1993) have shown that even if the data clearly reject a linear relationship between past and future trends, the current upward (downward) trends seem to be followed by further upward (downward) movements

As a result, data seem more consistent with a technical explanation that markets may become “overbought” or “oversold” and that a trend reversal is more likely than a continuation.

When trend is defined in a nonlinear fashion -introducing a dummy variable regression that takes the value +1 if the past price trend falls within a specified interval and 0 (zero) otherwise- J. Bilson proved that future trend is significantly related to the past trend.

On the other hand, at the long-run horizon, there is considerable reason to be optimistic that one can construct a forecast of the real exchange rate (nominal exchange rate between two currencies adjusted for relative prices between the two countries: $Q= S (P^*/P)$, where P and P^* denote the domestic and the foreign price level respectively) that is superior to random walk. This optimism relies on an assumption of stationary real rates, which implies a reversion to the mean real rate or a reversion to the equilibrium exchange rate implied by macroeconomic fundamentals.

Tests for mean reversion have being conducted by multiple authors such as N. Abuaf – P. Jorion (1990, p.173). Using monthly data they concluded that a 50 percent overappreciation of a currency with respect to PPP would take three to five years to be cut in half.

Further tests for mean reversion were conducted by P. Jorion – R. Sweeney (1996) in a 10 years out-of-sample forecasts between1983 to1993 and by J. Lothian – M. Taylor (1996) who examined nearly 200 years of data on dollar/sterling and French franc/sterling real exchange rates. Once again, the above authors concluded that taking mean reversion into account had significant beneficial effect on forecasting accuracy, especially at horizons of three to five years.

Finally N. Mark (1995) provided in his study strong evidence that the long-run path of the exchange rate can be accurately gauged from knowledge of the current level of the rate relative to its equilibrium value in a monetary model. He found that on an in-sample basis, his model explains between 50 and 75 percent of the variation in the DM, CHF and JPY rates at the three and four years horizons.

Foreign Exchange Units. It is necessary for forecasters to clarify the units of the exchange rate they wish to forecast, thus making a distinction between real and nominal exchange rates.

In the short run with price levels relatively constant, changes in the nominal exchange rate and the real exchange rate are virtually the same. But in the longer run, the nominal and real exchange rates may take substantially different courses.

- Forecasting Performance Evaluation: Accurate versus Useful Forecasts

Another source of controversy surrounding the value of exchange rate forecasts is the method of measuring performance. While economists typically judge a model on the basis of accuracy, professional economists may take more pragmatic stance and judge a forecast by its ability to achieve correct hedging decisions or speculative profits.

The traditional econometric approach begins with the forecast error made at time t, defined as:

$$e_t = \frac{(\hat{S}_{t,j} - S_{t+j})}{S_{t+j}}$$

where $\hat{S}_{t,j}$ is the j-period ahead forecast made at time t and $S_{t,j}$ is the actual spot rate at time t+j. Intuitively, it seems natural to prefer forecasts that produce smaller errors. Thus, criteria such as the following are often adopted as measures of performance:

Mean Error: $ME = (\Sigma_i e_i)/n$

Mean Absolute Error: $MAE = (\Sigma_i |e_i|/n$

Mean Squared Error: $MSE = (\Sigma_i e_i^2)/n$

Root Mean Squared Error: $RMSE = \sqrt{MSE}$

It is possible to produce a small mean error as a result of large negative and positive individual errors. Therefore, in practice, the MAE and RMSE are more commonly used to estimate the average error size.

All of these traditional measures could be seriously misleading when the forecast is used for financial hedging or speculative purposes. It is of vital importance to distinguish between accurate forecasts and useful forecasts.

Accurate forecasts have small forecasting errors gauged by traditional statistical measures such as the MAE and RMSE. Useful forecasts are those “on the right side of the market” and lead to profitable speculative positions and correct hedging decisions.

In the absence of a currency risk premium, “the right side of the market” implies “right side of the forward rate”. Thus, useful forecasts are those that lead to correct hedging or profitable decisions.

By this measure, forecasts are either “correct” or “incorrect” leading to a simple binomial test for the presence of forecasting expertise or market timing ability.

According to the 2 X 2 matrix below:

		Actual Exchange Rate Change	
		$S_{t+j} > F_{t,j}$	$S_{t+j} < F_{t,j}$
Predicted Exchange Rate Change	$\hat{S}_{t,j} > F_{t,j}$	Correct	Incorrect
	$\hat{S}_{t,j} < F_{t,j}$	Incorrect	Correct

A forecaster’s performance in terms of usefulness can be summarized by the percentage of correct forecasts. We define the percentage of correct forecasts as:

$$p = \frac{r}{n}$$

where: r = number of correct forecasts
n= total number of forecasts

A test for forecasting expertise, or market timing, is simply:

H_0: $p \leq 0.5$ (no timing or expertise)

H_1: $p > 0.5$ (positive timing or expertise)

A directional test is based on a simple binomial model. If p follows the binomial distribution:

mean of p is:

$$E(p) = 0.5$$

and the standard deviation of p is:

$$\sigma(p) = \sqrt{(E(p)(1-E(p))/n} = (E(p)(1\text{-}E(p)/n)^{1/2}$$

In order to test whether a model has directional forecast power (i.e. generates useful forecasts), we generate n out of sample forecasts of the model and measure the percentage of correct directional forecasts

$$p = \frac{r}{n}$$

Then, we use the standard normal distribution to test whether the z-statistic

$$z = \frac{p - E(p)}{\sigma(p)}$$

is significant. As a rule, if z > 1.645, we reject the null hypothesis (H_0) meaning that our model produces useful forecasts.

To sum up, a related source of confusion surrounding forecast performance evaluation is the connection between statistical significance and economic significance.The link between accurate forecasts and economic value is ambiguous. An accurate forecast on the wrong side of the forward rate has no economic value.

On the other hand, an inaccurate forecast could be extremely valuable and may result in highly profitable currency trading strategies if it frequently puts the investor on the right side of the market. A possible explanation for this is that a marginal change in a forecasting equation may substantially alter the direction of the forecast and thus have a significant effect on profitability even though it stems from a negligible change in forecasting accuracy (measured by R^2).

But even the link between useful forecasts and economic value is ambiguous. A statistically significant track record of 55-60 percent correct forecasts (with directional forecasting power) may be insufficient to produce profitable results. This would occur if the profits on the correct forecasts did not exceed the losses on the incorrect forecasts.

On the other hand, a small excess of correct predictions (or even no excess of correct predictions) can lead to considerable profit. One explanation for this outcome is that the forecaster may be better at forecasting large changes.

A similar illustration can be found in the context of a technical trading model, reversing one incorrect decision quickly (resulting in a small loss) while allowing one correct decision to run on into a lengthy profitable string.

- Special Problems in Exchange Rate Forecasting

Both consumers and producers of exchange rate forecasts face special problems because of the competitive and dynamic nature of currency markets.

In the international financial environment, the biggest risks arise when structural breaks interrupt the stability and stationarity of an exchange rate series. The classic examples are the structural breaks associated with changes in the central rate of a pegged-rate system or changes in government intervention policy within a target zone system. Structural changes of this sort pose the greatest risk, both because exchange rate changes are likely to be more extreme and because the historical database may no longer be appropriate as the basis for future forecasts.

Structural changes in the international economy represent one of the biggest challenges to forecasters. For producers of forecasts, operating in a competitive industry, it is necessary to forecast better than the market as a whole. As the market learns more, the ability of the model to produce valuable forecasts decline (known as the speculative efficiency problem). Market prices incorporate successful forecasts rending them without any further value.

In addition, success depends in part on whether past economic relationships will persist in the future since an econometric model may actually decline as the sample period expands. This would be expected if the new sample observations are drawn from a different period that reflects a different economic policy regime.

Knowing how the forecast will be used and knowing whether the forecast should be evaluated on the basis of accuracy, usefulness or both are key elements for consumers to understand.

4. DERIVATIVE SECURITY MARKETS: FUTURES AND OPTIONS

CURRENCY FUTURES (FX) CONTRACTS

- Introduction

A futures contract is an agreement between two counterparties that fixes terms of an exchange that will take place between them at some future date. Futures contracts are standardized agreements to exchange specific types of good, in specific amounts and at a specific future delivery or maturity dates and they are arranged through an organized exchange.

One of the important features (to some economists the defining feature) of a futures contract, and a characteristic that distinguishes a futures contract from a forward contract, is the process by which the prices on outstanding futures contracts are adjusted on a daily basis to reflect the market value of the underlying position, known as marking to market.

It is common to associate futures contracts with physical commodities such as agricultural commodities (like corn and wheat), primary commodities (like lumber and copper), or precious metals (like silver and gold). Indeed, prior to 1972, futures contracts were associated exclusively with these physical commodities.

With the rise of exchange rate volatility, the demand for financial hedging instruments multiplied. As a result, in May 1972, the International Money Market (IMM) of the Chicago Mercantile Exchange (CME) introduced trading in foreign currency futures. With currency futures “up and running”, futures exchange officials realized that futures contracts could be structured around prices of other financial instruments and intangibles (such as price indexes) and not only physical or tangible commodities as in the past.

Since their introduction, the markets have expanded dramatically in terms of numbers of different contracts and trading volume (as we have pointed out in previous section the estimate of total daily trading volume in currency futures and options is about $ 290 billion).

- Market Outline and Contract Specifications

Currency futures are traded on centralized financial derivatives exchanges, some of the most active ones including the EUREX (which was created in 1998), the Chicago Mercantile Exchange (CME), the Chicago Board of Trade (CBOT), the Singapore International Monetary Exchange (SIMEX), the Brazilian Mercantile & Futures Exchange (BM&F) and finally the Euronext which was created in 2001 through a merger of the Amsterdam, Brussels, and Paris exchanges. In fall 2001, Euronext acquired the London International

Financial Futures Exchange (LIFFE) and subsequently signed deals with exchanges in Helsinki (Finland), Lisbon (Portugal), Warsaw (Poland) and Luxembourg.

Increasing competition between exchanges has forced the use of electronic trading systems, for which trading costs are lower than for open outcry system (which is still used in SIMEX and CME).

In 1992, the Chicago Mercantile Exchange (CME) launched GLOBEX, a computer-based system to allow after-hours trading of its listed futures contracts. Today the system has evolved into the "GLOBEX Alliance" linking together six exchanges (CME, SGX-DT, Brazil's BM&F, Euronext, MEFF Renta Variable in Spain and the Montreal Exchange).

In 1998, LIFFE introduced an electronic trading platform called "LIFFE Connect" (futures trading introduced in 1999). In addition, the Deutsche Terminbörse (DTB) and the Swiss Options and Financial Futures Exchange (SOFFEX) have merged and created EUREX which is a single electronic trading platform covering all German and Swiss derivatives. Eurex has subsequently formed alliances with financial derivative exchanges in Vienna (Austria) and Dublin (Ireland). The Chicago Board of Trade (CBOT) has also linked up with Eurex and there are plans for further link with Tokyo Futures Exchange (TFE) and the Singapore International Monetary Exchange (SIMEX), in order to permit global trading in derivatives using a single trading platform.

The specifications of five currency futures contracts traded on the Chicago Mercantile Exchange (CME) are shown in the table below.

The settlement price is the basis on which mark-to-market margin requirements are computed and usually represents the closing price for the day. Currency futures have maturity months of March, June, September and December.

The expiration date for U.S.-traded futures is the second business date day preceding the third Wednesday of the contract month (except for Canadian dollars, which expire on the business day immediately preceding the third Wednesday of the contract month).

The settlement date for U.S.-traded futures is the third Wednesday of the contract month.

The number of contracts outstanding at any time for which delivery is obliged, is known as the open interest. When a contract begins initial trading, there are zero contracts outstanding and no open interest. The first transaction obligates a seller to deliver to a buyer and creates one unit of open interest.

Before expiration, a seller who closes his or her position by buying a contract from someone who previously owned the contract acts to reduce open interest by one unit. At maturity, open interest is once again zero.

CME currency futures contracts

Currency	Quotation	Contract Size	Minimum Price Change	Value of One Tick
Euro	USD per €	€ 125,000	$ 0.0001	$ 12.50
Japanese yen	USD per 100 ¥	¥ 12, 500, 000	$ 0.000001	$ 12.50
Canadian dollar	USD per C$	C$ 100,000	$ 0.0001	$ 10.50
Swiss Franc	USD per SFr	SFr 125,000	$ 0.0001	$ 12.50
Sterling	USD per £	£ 62,500	$ 0.0002	$ 12.50

Exchange Delivery Settlement Price (EDSP): the CME official closing price on the last trading day

- Distinctions between Futures and Forwards

While both forward and futures contracts entail a binding contract executed today for settlement at a future specified date, there are important differences between the two transactions.

Dispersed versus Centralized Trading

Forward contracts are usually traded by commercial banks, investment banks, or securities firms through the foreign exchange market which is geographically dispersed and open on a 24 hour basis (see The Foreign Exchange Market Setting page 8)

In contrast, currency futures contracts are traded on centralized exchanges as we pointed out above. A centralized exchange has advantages with respect to price discovery, which refers to the ability of market participants to observe or "discover" the current market price. In the interbank forward foreign exchange market there is no centralized record of prices while some price quotations represent true transactions and others are for "indications only". The futures market exhibits transparency while anonymous orders enjoy the democracy of the marketplace.

Customized versus Standardized Transactions

Transactions in the interbank forward market are customized and flexible to meet customer preferences. While certain maturities (such as 1,2,3,6 and 12 months) are popular for currency forwards, a counterparty can request a quotation for any forward maturity and for any contract.

By comparison, transactions in the futures market are highly standardized. The exchange designs the contracts and sets their specifications in order to obtain regulatory permission to begin trading. Each futures contract specifies

a contract size or quantity of the underlying asset. Contract expiration dates are also standardized (often maturing in March, June, September and December) and in addition the exchange will standardize delivery terms for futures contracts, daily price-limit movements, minimum price fluctuations and the trading days and hours.
Standardization in the futures market is an effective means to promote trading and liquidity since all futures contracts for a given asset and maturity are identical and it is possible to close a position in a futures contract at any time by performing a reversing trade (at least for the near maturing contracts).

The standardization of futures contracts creates limitations in some ways. For example, if a corporate wants to hedge a € amount which is not a multiple of € 125,000 (unit of trading) then there may be an amount that remains unhedged and may create a loss in the end.

Counterparty Risk(s) versus the Clearinghouse

Forward market transactions link banks with other banks (the interbank market) or banks with customers (the retail market). Each counterparty to a transaction assumes the credit risk and the risk of default of the other counterparty and that is why bank credit officers make a detailed appraisal of the credit and risk quality of any potential counterparty before trading particulars are discussed. Banks may often lower the credit limits or the maturity limits of more risky counterparties.

Every futures contract traded on an organized exchange, by comparison, has the clearinghouse as one of the two counterparties. The clearinghouse standardizes the counterparty risk of all futures contracts, and facilitates trade between buyers and sellers who remain anonymous to one another. At the end of every day's trading, the profits or losses accruing to the counterparties as a result of that day's change in futures price have to be received or paid (mark to market process). Failure to pay the daily loss results in default and the closure of the contract against the defaulting counterparty.

The credit risk to the clearinghouse has now disappeared because accumulated losses are not allowed to built up. Even a single day's loss is covered by a deposit that each counterparty must make when the contract is first taken out.

Cash Settlement and Delivery versus the Marking-to-Market Convention

Another distinction between forwards and futures concerns the obligation of a buyer or seller between the point of entering into the contract and the point of closing out and settling or selling the contract.

The essential feature of a forward contract is that no cash flows take place or capital commitment is required until the final maturity of the contract. Only at

maturity is there an exchange of funds for either delivery or cash settlement of the gains (or losses) on the contract.

On the contrary, a participant in the futures market needs to post a mandatory initial margin in advance of any trades either in form of cash a bank letter of credit or collateral (for example short-term Treasury securities). As the price of the contract goes against one of the counterparties, the resulting loss is met from that counterparty's initial margin and is paid over to the other counterparty as profit. As the margin account falls below a particular threshold (the maintenance margin level), it has to be topped up with additional payments know as variation margin in order to restore the margin account to the level of the initial margin. Such payments have to be made immediately before the end of the day or in some cases within 24 hours in response to a margin call from the clearinghouse.

Small initial margins in the futures market are possible since it is required to replenish the margin account on a daily basis following adverse price movements. The appeal of a currency futures contract lies in the fact that it can produce large leverage effect since the initial margin (meaning the capital to be used) is very low relative to the contract size or unit of trade. However, in case of negative rate developments, the variation margin that needs to be paid creates negative leverage effects.

- Futures Pricing and the Empirical Evidence

Taking into consideration all the above arguments and since it is not known a priori whether the futures contract will create loss or value, we can conclude that the marking-to-market feature of futures contracts imposes a cash-flow risk that is not present with forward contracts.

If speculators expected the futures contract to accumulate cash over its life, then futures prices would exceed forward prices. Speculators would rather get their winnings sooner than later. But if speculators expected the futures contract to require margin calls over its life, then futures prices would be lower then forward prices. As a theoretical matter, since both possibilities are allowed, this risk should decrease the attractiveness of futures relative to forwards.

On the other hand, futures contracts are traded on exchanges and enhance their liquidity relative to forward contracts. Since investors and speculators place a positive value on liquidity, this factor may increase the attractiveness of futures relative to forwards.

The empirical results from studies by B. Cornell, M. Reinganum (1981) and also by C. Chang, J. Chang (1990) have shown that the average difference between futures and forward prices for foreign exchange is not significantly different from zero and that futures and forward prices for foreign exchange are not statistically different from each other.

- Deciding on Futures versus Forwards

As a matter of fact both futures and forward contracts lead to the same value at maturity. As we have pointed out, what distinguishes futures and forwards are the intermediate cash flows associated with marking-to-market the various aspects of futures that are standardized and the trading mechanism.
The decision to use futures or forwards depends on the purpose and scale of the transaction. Hedgers who buy or sell a contract to offset an underlying business transaction have little need for liquidity. Since they match the maturity of their hedge contract to their underlying exposure they do not intend to trade or liquidate their contract prior to maturity and to marking-to-market feature could create undesired cash flows. In addition since the futures contracts have standard delivery dates and contract sizes, hedgers may be unable to create a perfect hedge, which they could in the interbank market.

Therefore, when prices are similar, hedgers will prefer interbank forward contracts, as long as they have the scale of activity and credit rating to gain access to the market.

In contrast to a hedger, a speculator relies heavily on market liquidity meaning the ability to buy and sell quickly with transactions having little impact on market prices. Since interbank forward contracts are relative illiquid, a short-term speculator may prefer to trade in exchange-traded futures contracts as long as he is able to meet the explicit margin requirements of the market.

CURRENCY OPTIONS (FX) CONTRACTS

- Introduction

Option contracts on foreign exchange are among the most recent financial innovations. Options on currencies and debt instruments were traded over the counter (OTC) among banks in the late 1970s.Exchange traded options on currencies began trading on the Philadelphia Stock Exchange (PHLX) in 1982.

Options on foreign currencies bear many similarities to options on equities, which began trading on the Chicago Board Options Exchange in 1972 and had been traded on a customized, over-the-counter basis since the 1920s.Much of the terminology is the same, as are the basic pictures of an option's value at and prior to maturity.

Since their introduction, the markets for exchange – traded currency options have expanded in many directions- more option exchange markets around the world, more currencies on which options are traded, option contracts with longer maturities, more styles of option contracts and greater volume of trading activity.

The essential characteristic of an option contract is its asymmetric payoff profile. If the price of an underlying asset moves in one direction ("up" for a call option and "down" for a put option) the price of an option on that asset will generally rise. However, if the price of the underlying asset moves in the opposite direction, option prices will generally fall, but the option price cannot fall below zero. Thus, the owner of an option can participate in upside gains, but losses are limited to the amount of the initial option purchase price.

By comparison, a futures contract displays a symmetric payoff profile so that both upside gains and downside losses are virtually unlimited. While a corresponding forward or futures contract would have committed the holder to take delivery, an option serves simply as a kind if insurance. This is a fundamental difference between option and futures/forward contracts.

Financial options are derivative securities meaning that the value of an option is "derived from" the value and the anticipated behavior of an underlying asset. As in any derivative market, contracts have zero-net supply for every buyer of a contract there must be a seller. Like the futures market, the options market as a whole is a sum-zero game before we take transaction costs into account. The profit (or loss) that the buyer of a call earns is exactly equal to the loss (or profit) that the seller of the call earns.

- Types of Currency Options

The standard definition of a conventional option is:

- The right, but not the obligation, to buy (or sell) a fixed quantity of an underlying financial asset or commodity at a given price on (or before) a specified date.

From this general definition we can provide a few more details:

- A currency call option provides the right, but not the obligation, to buy a given amount of foreign exchange at a specified rate (price) on or before a specified future date.

- A currency put option provides the right, but not the obligation, to sell a given amount of foreign exchange at a specified rate (price) on or before a specified future date.

We have to point out that, by writing a call option the seller obligates himself to deliver a defined amount of a certain currency at a specified rate (price) on or before a stipulated future date

By writing a put option the buyer obligates himself to buy a defined amount of a certain currency at a specified rate (price), on or before a stipulated future date

The given price specified in the contract is called the strike price or the exercise price.

The maturity date specified in the option contract is called the expiration date.

The price paid for the option is usually called the option premium.

The option definition also specifies when the option can be exercised. There are two generic types:

- A European Option can be exercised once only at the maturity date.

- An American Option can be exercised at any time on or before the maturity date of the option.

- Market Outline and Contract Specifications

Today, standardized currency options on major currencies trade at a large number of exchanges around the world, including (some of the most active ones) the Chicago Mercantile Exchange (CME), the Chicago Board of Trade (CBOT), the Korea Stock Exchange (KSE) and the Euronext and EUREX exchanges in Europe.

The organized exchanges have standard contract specifications and market conventions, while contract attributes are often customized in the over-the-counter (OTC) market.
Some essential characteristics of currency option contracts on the Chicago Mercantile Exchange (CME) and the Philadelphia Stock Exchange (PHLX) are summarized on the following table:

Contract Specifications for Selected Currency Option Contracts

Market	Currency	Underlying Asset	Contract Size	Strike Price Interval	Minimum Price Change	Value of One Tick
CME	Euro	€ futures	€ 125,000	$ 0.01	$ 0.01	$ 12.50
	Japanese yen	¥ futures	¥ 12,500,000	$ 0.0001	$ 0.0001	$ 12.50
	Canadian dollar	C$ futures	C$ 100,000	$ 0.005	$ 0.01	$ 10.00
	Sterling	GBP futures	£ 62,500	$ 0.01	$ 0.01	$ 6.25

Market	Currency	Underlying Asset	Contract Size	Strike Price Interval	Minimum Price Change	Value of One Tick
PHLX	Euro	€ spot	€ 62,500	$ 0.02	$ 0.01	$ 6.25
	Japanese yen	¥ spot	¥ 6,500,000	$ 0.05	$ 0.0001	$ 6.25
	Canadian dollar	C$ spot	C$ 50,000	$ 0.005	$ 0.01	$ 5.00
	Sterling	GBP spot	£ 31,250	$ 0.01	$ 0.01	$ 6.25

Notes:

1. All CME options are American options. PHLX trades both American and European options.
2. All CME options have maturity dates of March, June, September and December plus the two additional near-term months. The expiration date of these options is the Saturday before the third Wednesday of the month, so the preceding Friday is the last trading date. Settlement day is the third Wednesday of the month.
3. Conventional PHLX options have the same maturity dates and expiration dates as the CME options. In addition, PHLX trades “end of month” currency options that expire on the last Friday of the three nearest months, and “long-term” currency options that expire in June and December with maturities up to 24 months from the date of issue..
4. Currency options are not subject to daily price limit movements.
5. The permitted strike price interval may vary depending on option maturity.

- Source: Chicago Mercantile Exchange (CME) and Philadelphia Stock Exchange (PHLX) and updates from these exchanges’ websites at www.cme.com and www.phlx.com

The strike price interval is set so that as the currency price changes over time, new option contracts are opened up to begin trading. When a new contract month is listed initially, the rules of the CME require that nine strike prices be

established for both calls and puts. The central strike price is the one nearest to the underlying futures price, with four strike prices higher and four lower.

The value associated with the minimum price movement is determined by multiplying the contract size by the minimum price movement.
All option contracts traded on the CME or the PHLX are in fact issued by the Option Clearing Corporation (OCC), and bear their guarantee of performance.

The owner of the option does not need to perform an individualized credit analysis of each counterparty in an option transaction that takes place on these organized exchanges. The counterparty in every case is the OCC. If owners of a call option choose to exercise their option, the exchange-clearing house will randomly select option sellers (writers) who will provide a position in the underlying asset. The OCC is obligated to meet this contractual commitment to option holders if any private counterparties default.

- Over–the–Counter (OTC) Currency Options

A large amount of currency options exists outside the organized exchanges where commercial and investment banks conduct an active over-the-counter (OTC) market in currency options. Whereas exchange-traded options are standardized contracts, OTC products customized to fit specific requirements and needs of the banks' wholesale or retail customers. Expiration dates and contract amounts are specified by the customer in the OTC market while prices and fees are then quoted by the bank.

Retail clients include corporations and financial institutions exposed to currency risk. International commercial and investment banks are the principal writers (sellers) of currency options. International banks also maintain an active wholesale market in which they hedge the net currency exposures in their asset/liability portfolios.

Contract terms are now internationally accepted, first set out by the London Interbank Currency Options Market (LICOM) in 1985. These standard terms and conditions have now been revised and being referred to as the International Interbank Currency Options Market terms and conditions (ICOM).

Over-the-counter (OTC) products are generally European options, but most banks nowadays guarantee the client the facility to sell back the option and promise to pay "fair value" fir it in order to cover any intrinsic or time value left. Premiums are normally quoted as a percentage of the underlying currency amount and paid two days after the option contract is agreed.

- THE DETERMINATS OF CURRENCY OPTION VALUES

In general, the option price is composed of two pieces its intrinsic value and its time value.

- The intrinsic value of an option is the value of the option if it is exercised today. If we designate C and P as the values of the call and put prices, then at maturity:
  - $C = \text{Max } [(S^{d/f} - K^{d/f}),0]$
  - $P = \text{Max } [(K^{d/f} - S^{d/f}),0]$

where $S^{d/f}$ is the spot exchange rate at the maturity of the option and $K^{d/f}$ the exercise price.

It is also clear that the value of an option at maturity can never be negative. If the call or put option is out-of-the-money its intrinsic value is zero. If the option is in-the-money, its intrinsic value is equal to the difference between the exercise price and the value of the underlying asset.

In addition, the buyer of either a call or put option faces limited liability in that the loss is capped at the initial option premium paid. The seller of a call option faces unlimited liability as the underlying asset could appreciate without limit. On the other hand, the seller of a put option faces a large liability, which is limited by the fact that the price of the underlying asset cannot fall below zero.

- The time value of an option is the difference between the option's market value and its intrinsic value. We could point out that represents the present value of the expected payouts from the option, given the option is exercised.

Currency option values are a function of the six variables. The marginal effect on both call and put option prices of a change (increase) in each parameter conditional on the other variables remaining constant, is shown in the following table:

Marginal Effect of a Variable Change on Option Prices

Variable	Price Effect on Call Option	Price Effect on Put Option
Spot Price ($S^{d/f}$ or $Fut^{d/f}$)	Call price ↑	Put price ↓
Exercise Price ($K^{d/f}$)	Call price ↓	Put price ↑
Domestic interest rate (r_d)	Call price ↑	Put price ↓
Foreign interest rate (r_f)	Call price ↓	Put price ↑
Spot rate volatility (σ)	Call price ↑	Put price ↑
Time to maturity (T)	Ambiguous effect, depends on r_d, r_f and σ	Ambiguous effect, depends on r_d, r_f and σ

With the exception of volatility, each of the above variables is observable for currency options quoted on major exchanges. The exercise price and expiration date are stated in the option contract. The underlying exchange rate and the foreign and domestic interest rates are quoted in the financial press. The volatility of the underlying exchange rate is not directly observable, which makes it an extremely important ingredient in option valuation.

We have to point out that volatility is measured by the standard deviation of continuously compounded returns to the underlying asset.

- OTHER SENSITIVITY FACTOR – THE GREEKS

An option's price is sensitive, having a tendency to change in response to certain key variables. These variables called "the sensitivities" or "the Greeks", measure a change in the premium of an option in response to a change in each of these five parameters

The Greeks (delta, gamma, theta , vega and rho) enable, among other things:

- Prediction of a movement in an option's premium, given a change in a variable.
- Calculation of the number of options required to hedge a change in a variable.

❖ DELTA: The delta, Δ, of an option is defined as the rate of change of its value in response to a given change of the underlying asset. In calculus terminology, delta is the first derivative and is defined as:

$$\partial C / \partial S$$

- GAMMA: The gamma, Γ, of an option is the rate of change of its value in response to a given change of the underlying asset. In calculus terminology, gamma is the second derivative and is defined as:

$$\partial^2 C / \partial^2 S$$

- VEGA: The vega, Λ, of an option is the rate of change of its value in response to a given change in the volatility (i.e. the standard deviation) of the underlying asset. In calculus terminology, vega is the first derivative and is defined as:

$$\partial C / \partial \sigma$$

- THETA: The theta, Θ, of an option is the rate of change of its value in response to a one-day decrease in the time to expiration. In calculus terminology, vega is the first derivative and is defined as:

$$\partial C / \partial t$$

- RHO:. The rho, ρ, of an option is the rate of change of its value in response to a change by one unit of the riskless domestic and foreign interest rates. In calculus terminology, rho is the first derivative and is defined as:

$$\partial C / \partial r_d$$

$$\partial C / \partial r_f$$

- PUT-CALL-FORWARD PARITY

An important relationship between prices of calls and puts, relating the value of a long call (C), a short put (P), the exercise price (K) and the forward price (F) at expiration is the following equation referred to as put-call-forward parity:

$$C_T^{d/f} - P_T^{d/f} + K^{d/f} = F_T^{d/f}$$

The above relationship which applies to European options only (since they cannot be exercised prior to expiration date) shows that the value of a European call with a certain exercise price and exercise date can be deducted from the value of a European put with the same exercise price and date and vice versa assuming that there are no transaction costs or taxes. It can be viewed as a pricing rule, a formula for creating synthetic securities or the basis for an arbitrage trading strategies.

Put-call-forward parity implies that buying a European call is equivalent to buying a put and buying a forward contract. If the price of buying this

synthetic call (C_{syn}) were not identical to the price of the true call (C), then arbitrage profit opportunities would be available.

Similarly, parity implies that buying a put is equivalent to buying a call and selling a forward contract. Once again, if price of the synthetic put (P_{syn}) were not identical to the price of the true put (P), arbitrage opportunities would be possible.

There is also another interesting implication. For puts and calls written at a strike price equal to the currency forward rate, put-call-forward parity implies that the put price and call price should be identical (C = P).

- BENEFITS AND RISKS OF CURRENCY OPTIONS

Just like other derivative products, currency options are mainly aimed at hedging and decreasing risks. In this sense, they provide portfolio insurance against unfavorable changes in exchange rates.

Credit risk aside, currency options are characterized by market risk only meaning the prevailing risk that exchange rates will not move in direction originally forecasted by the option buyer, thereby rendering the option useless.

The most significant development in the currency option market has probably been the increased willingness of both financial institutions and investors to use the product. A greater variety of option products have been made available nowadays, meaning that end-users at the corporate level have been able to take more advantage of tailor-made over-the-counter (OTC) products.

One of the major advantages of currency option products is related with the increasing size of foreign exchange transactions in our days. Options provide the purchaser a guaranteed exchange rate on the contract amount, regardless of market conditions.

For many participants in the market, a currency option represents the most efficient and least costly method in order to manage an exposure, especially in periods of sharp movements in the exchange rates. Their risk gets transferred to financial institutions that specialize in risk management or are able to pass on that risk to counterparties with opposite risks or needs.

On the other hand, transaction costs have come down drastically in the decade since currency options were first introduced in exchanges. Bid-offer spreads are now almost in the same range as the spot market, which are usually adequately liquid. Consequently, there are more investors nowadays willing to look at options as a mean of assuming a position (supported by the view of the future market trend) or protecting an existing position against

currency risk. Several years ago, the costs involved in adopting the above strategies would have been prohibitive.

Compared to futures, currency options are advantageous because they do not involve any margin requirements and in addition give the right but not the obligation to transact. Compared to currency forward contracts, options are costly since an initial premium has to be paid in advance, in contrast to forwards which are virtually costless to enter into. Once again they involve no obligation to fulfill the contract

5. THE ECONOMIST (FX) FORECASTS

DESCRIPTION

We pointed out previously that exchange rate forecasts play a fundamental role for financial transactions and international financial management, since they are necessary in order to evaluate foreign borrowing or investment opportunities.

For data, we use exchange rate forecasts from a professional forecasting service J.P Morgan Chase (www.jpmorganchase.com) as presented on the Economist print edition (www.economist.com), for several currencies and several forecasting periods (specifically in a 3 month/12 month period ahead) for a period between February 2002 to March 2005.

We also use DataStream in order to gather data on spot and forward prices on exchange rates for each set of currencies.

We use professional (FX) forecasts on the following currencies and exchange rates:

- Euro (USD per EUR)
- Japanese Yen (JPY per USD)
- Australian Dollar (AUD per USD)
- British Pound (USD per GBP)
- Canadian Dollar (CAD per USD)
- Danish Krone (DKK per USD)
- Swedish Krone (SEK per USD)
- Swiss Franc (CHF per USD)
- Chinese Yuan (CNY per USD)
- Singapore Dollar (SGD per USD)
- South Korean Won (KRW per USD)
- Brazilian Real (BRL per USD)
- Mexican Peso (MXN per USD)

- Polish Zloty (PLN per USD)
- Russian Rouble (RUB per USD)
- South Africa Rand (ZAR per USD)

Our purpose is to evaluate the above professional (FX) forecasts in terms of accuracy (small forecasting errors) and usefulness ("right" side of the market) and to adopt them in speculative strategies (using financial instruments such as Forwards) in order to produce profitable results.

A set of raw data on each exchange rate of our sample and each forecasting period ahead, between February 2002 to March 2005, is presented in Appendix A at the end of this dissertation.

The first five (5) columns after each date, report the prices on spot exchange rates as well as the professional (FX) forecasts in a 3 month/12 month period ahead, for each set of currencies respectively.

In columns six (6) and seven (7) we test whether the professional (FX) forecasts are on the "right" side of the market (according to a test based on a 2X2 matrix, which is presented below)

Finally, in columns eight (8) and nine (9) we measure the forecast errors defined as:

$$e_t = \frac{(\hat{S}_{t,j} - S_{t+j})}{S_{t+j}}$$

and then we calculate the Mean Absolute Error (MAE = $(\Sigma_i |e_i| / n)$) and Root Mean Squared Error (RMSE = $\sqrt{MSE}$) in order to estimate the average error size.

FORECASTING PERFORMANCE EVALUATION

I). Sign Tests

As mentioned before, useful forecasts are those on the "right side of the market" and lead to profitable speculative positions and correct hedging decisions.

In order to test whether the professional estimates have directional forecast power (generate useful forecasts), we measure the percentage of correct directional forecasts:

$$p = r/n.$$

where: r = number of correct forecasts
n= total number of forecasts

according to the following rationale based on the 2X2 matrix:

		Actual Exchange Rate Change	
		$S_{t+j} > S_t$	$S_{t+j} < S_t$
Predicted Exchange Rate Change	$\hat{S}_{t+j} > S_t$	Correct	Incorrect
	$\hat{S}_{t+j} < S_t$	Incorrect	Correct

Results for each exchange rate of our sample in a 3 month/ 12 month forecasting period ahead are summarized on the following tables. A more detailed analysis is presented on tables in Appendix A, page 68.

T0TAL RESULTS

Direction of Exchange Rate Change (0,1)*
Estimate of p**

Exchange Rates	3 month	12 month
USD/EUR	6/12	7/9
JPY/USD	6/12	7/9
AUD/USD	8/12	7/9
USD/GBP	10/12	6/9
CAD/USD	6/12	8/9
DKK/USD	6/12	9/9
SEK/USD	9/12	9/9
CHF/USD	8/12	6/9
CNY/USD	2/12	0/9
SGD/USD	9/12	8/9
KRW/USD	6/12	8/9
BRL/USD	4/12	4/9
MXN/USD	6/12	7/9
PLN/USD	8/12	7/9
RUB/USD	7/12	3/9
ZAR/USD	5/12	0/9
6 major currencies***	44/72	41/54
All currencies	106/192	96/144

Notes:

*Exchange Rate Change (1=Correct, 0=Incorrect)

**p=r/n where: r=number of correct forecasts, n=total number of forecasts

***USD/EUR, JPY/USD, AUD/USD,USD/GBP,CAD/USD, CHF/USD

(p) Estimates
(as percentage of correct directional forecasts)

Exchange Rates	3 month	12 month
USD/EUR	0,50	0,78
JPY/USD	0,50	0,78
AUD/USD	0,67	0,78
USD/GBP	0,83	0,67
CAD/USD	0,50	0,89
DKK/USD	0,50	1,00
SEK/USD	0,75	1,00
CHF/USD	0,67	0,67
CNY/USD	0,17	0,00
SGD/USD	0,75	0,89
KRW/USD	0,50	0,89
BRL/USD	0,33	0,44
MXN/USD	0,50	0,78
PLN/USD	0,67	0,78
RUB/USD	0,58	0,33
ZAR/USD	0,42	0,00
6 major currencies*	0,61	0,76
All currencies	0,55	0,67

Notes:

*USD/EUR, JPY/USD, AUD/USD,USD/GBP,CAD/USD, CHF/USD

A test for forecasting expertise, or market timing, is simply:

H_0: p ≤ 0.5 (no timing or expertise)

H_1: p > 0.5 (positive timing or expertise)

A directional test is based on a simple binomial model. When p follows the binomial distribution, the expected value (mean) of p is:

$$E(p) = 0.5$$

and the standard deviation of p is:

$$\sigma(p) = \sqrt{(E(p)(1 - E(p))/n} = (E(p)(1\text{-}E(p)/n)^{1/2}$$

Then, we use the standard normal distribution to test whether the z-statistic:

$$z = p\text{-}E(p)/\sigma(p)$$

is significant.

As a rule, if z ≥1.645, we reject the null hypothesis (H_0) and we can argue that professional estimates generate useful forecasts.

The above methodology (the z-statistic test) can be used only for the sum of total observations on the 6 major currencies and of the total number of currencies, in order to have a large and adequate number of samples and be able to use the normal distribution as a close approximation

Results of the z-statistic test are shown on the following table:

Z-STATISTIC ESTIMATES

6 major currencies*	1,89	3,81
All currencies	1,42	4,00

Notes:

*USD/EUR, JPY/USD, AUD/USD,USD/GBP,CAD/USD, CHF/USD

- In order to evaluate professional (FX) forecasts in terms of usefulness separately on each exchange rate of our sample, we have to use a non-parametric test since we have a small number of observations – 12 observations in a 3month and 9 observations in a 12 month forecasting period ahead. Nonparametric methods do not assume that the data follow any particular distributional form.

We use the Signed Rank Test (also called the Wilcoxon signed rank test) based on ranks for paired samples ($\hat{S}_{t,n}$ and S_{t+n}). We compute the absolute values of the differences $|D_i|$, rank these observations and then restore the signs of the D_i to the ranks, obtaining signed ranks.

The idea behind the Wilcoxon test is intuitively simple and based on the fact that the sum of the ranks for the samples above and below the median should be equal.

Using Eviews econometric program, we get p-values estimates on each exchange rate of our sample in a 3 month as well as in a 12 month forecasting period ahead.

Whenever p-value ≥ 0.05 we accept the null hypothesis H_0 which states that the distribution of the D_i is symmetric about zero.

In economic terms it means that professional (FX) estimates are lacking in usefulness.

Results of the Wilcoxon test are shown on the following table:

Wilcoxon signed rank test

Estimate of p-values

Exchange Rates	3 month	12 month
USD/EUR	0.2832	0.0801
JPY/USD	0.8445	0.4069
AUD/USD	0.1547	0.0435
USD/GBP	0.0966	0.0176
CAD/USD	0.6460	0.1544
DKK/USD	0.2240	0.0972
SEK/USD	0.9687	0.1925
CHF/USD	0.3061	0.0750
CNY/USD	0.0055	0.0088
SGD/USD	0.8579	0.3963
KRW/USD	0.9687	0.6356
BRL/USD	0.4101	0.5936
MXN/USD	0.2894	0.0244
PLN/USD	0.8445	0.4772
RUB/USD	0.0653	0.0330
ZAR/USD	0.0068	0.0092

CONCLUSIONS

According to the z-statistic estimates table we conclude that, for the sum of total observations on the 6 major currencies, professional (FX) estimates appear to have directional forecasting power in a 3 month forecasting period and as a result they are able to generate useful forecasts.

On the contrary, our results are lacking in directional forecasting power for the total number of currencies in a 3 month forecasting period ahead.

On the other hand, in a 12 month period ahead, the Economist's FX estimates generate useful forecasts for the total number of currencies as well as for the sum of the 6 major currencies of our sample.

II). Traditional Statistical Measures (MAE / RMSE)

As pointed out previously, the traditional econometric approach begin with the forecast error defined as:

$$e_t = \frac{(\hat{S}_{t,j} - S_{t+j})}{S_{t+j}}$$

made at time t.

Intuitively, it seems natural to prefer forecasts that produce smaller errors, while in practice the Mean Absolute Error (MAE) and Root Mean Squared Error are more commonly used to estimate the average error size.

As a rule of thumb, accurate forecasts regarded as those having small forecasting errors gauged by statistical measures as the MAE and RMSE.

Results, with respect to our sample of exchange rates, are summarized on the following table:

T0TAL RESULTS

Mean Absolut Error (MAE) - Root Mean Squared Error (RMSE) Estimates

Exchange Rates	3- month MAE %	12 month MAE %	3 month RMSE %	12 month RMSE %
USD/EUR	0,046	0,099	0,059	0,116
JPY/USD	0,048	0,072	0,059	0,087
AUD/USD	0,048	0,092	0,063	0,012
USD/GBP	0,026	0,069	0,036	0,078
CAD/USD	0,036	0,053	0,049	0,063
DKK/USD	0,050	0,115	0,064	0,138
SEK/USD	0,044	0,092	0,058	0,103
CHF/USD	0,051	0,111	0,061	0,134
CNY/USD	0,008	0,015	0,014	0,022
SGD/USD	0,017	0,014	0,019	0,018
KRW/USD	0,044	0,036	0,047	0,045
BRL/USD	0,126	0,192	0,150	0,216
MXN/USD	0,039	0,062	0,047	0,069
PLN/USD	0,059	0,066	0,068	0,080
RUB/USD	0,033	0,104	0,038	0,118
ZAR/USD	0,118	0,446	1,147	0,481
6 major currencies*	0,043	0,083	0,056	0,103
All currencies	0,051	0,102	0,071	0,158

Notes:

*USD/EUR, JPY/USD, AUD/USD,USD/GBP,CAD/USD, CHF/USD

CONCLUSIONS

According to our results, we conclude that the Economist's FX estimates produce more accurate forecasts (with smaller forecast errors) in a 3 month than in a 12 month period ahead.

In addition, forecast errors turn up to be smaller for the sum of total observations on the 6 major currencies than for the whole sample of currencies.

Finally, the Economist's FX forecasts appear to be more accurate when gauged by the Mean Absolute Error (MAE) than by the Root Mean Squared Error (RMSE) statistical measure

Taking into consideration the summarized results of the above tables (on pages 46, 48) on tests undertaken in both terms of usefulness and accuracy, we can sum up that the Economist (FX) professional forecasts, not only appear to be more accurate -on both statistical measures used- for the sum of the 6 major currencies than for the total number of exchange rates, in a 3 month as well as in a 12 month period ahead, but also they have directional forecasting power which means the existence of economic value.

On the other hand, for the total number of currencies, even if professional forecasts appear to be more accurate (smaller forecast errors) in a 3 month than in a 12 month period ahead, they are lacking in directional forecasting power (usefulness) and as a result have no economic value.

6. SPECULATIVE STRATEGIES WITH THE ECONOMIST (FX) FORECASTS

SPECULATIVE STRATEGIES WITH FORWARDS

We have pointed out previously that speculation implies financial transactions undertaken when an individual's expectations differ from the market's expectation, exposing the individual to price risk from foreign exchange rate changes.

Forward speculation strategy is based on the following rationale (using as an example the USD/euro exchange rate):

- If E_tS_{t+n} (USD/euro) > $F_{t,n}$ (USD/euro) then :

at time t we purchase euros at the forward rate for delivery in n periods ahead ($F_{t,n}$).Then, At time t+n we pay $F_{t,n}$ (USD/euro) and sell each euro at the spot rate (S_{t+n}).

$$\text{Rate of return (\%)} = (S_{t+n} - F_{t,n}) / F_{t,n}$$

- If E_tS_{t+n} (USD/euro) < $F_{t,n}$ (USD/euro) then :

at time t we sell euros (or buy USD) at the forward rate for delivery in n periods ahead ($F_{t,n}$).Then, at time t+n we get $F_{t,n}$ (USD/euro) and purchase back each euro at the the spot rate (S_{t+n}).

$$\text{Rate of return (\%)} = (F_{t,n} - S_{t+n}) / F_{t,n}$$

- Finally, in case where E_tS_{t+n} (USD/euro) = $F_{t,n}$ (USD/euro) we do not undertake any transaction.

In order to have a more meaningful basis for comparison on forward speculation at each exchange rate, since the average rate of return on each alternative may not be the same, we have to estimate the Reward to Variability Ratio (R/V) which shows the return per unit of risk, using the standard deviation (σ) as a measure of risk.

In order to ave a benchmark for comparison, we are going to estimate the average libor interest rate returns for each of our 6 major currencies (Euro, USD, Japanese Yen, Canadian Dollar, British Pound, Swiss Franc) in a 3 month / 12 month basis.

Then we will use the standard deviation (σ) as a measure of risk in order to estimate the Reward to Variability Ratios (R/V Ratios).

The currency providing the higher R/V Ratio (in the 3 month and the 12 month period respectively) will be used as a benchmark for comparison.

We do not take into consideration the average libor returns of Japanese Yen, even if it provides the higher R/V Ratio in the 12 month period ahead, because during the whole sample period, interest rates on Japanese Yen were extremely low (close to zero) and steady (as a result variability was almost zero)

Results are shown on the following table:

Calendar Date	3 month libor rate i_{CHF}	12 month libor rate i_{CHF}	3 month libor rate i_{CAD}	12 month libor rate i_{CAD}	3 month libor rate i_{JPY}	12 month libor rate i_{JPY}	3 month libor rate i_{USD}	12 month libor rate i_{USD}	3 month libor rate i_{EUR}	12 month libor rate i_{EUR}	3 month libor rate i_{GBP}	12 month libor rate i_{GBP}
Feb 13th 2002	0,416	2,053	0,532	2,585	0,024	0,103	0,475	2,450	0,840	3,630	1,014	4,665
May 15th 2002	0,320	1,825	0,665	3,545	0,020	0,104	0,480	2,733	0,875	4,042	1,039	4,865
Aug 7th 2002	0,197	1,000	0,705	2,962	0,017	0,096	0,440	1,833	0,835	3,412	0,989	4,113
Nov 6th 2002	0,185	0,843	0,718	2,990	0,019	0,096	0,403	1,633	0,803	3,105	0,979	3,998
Feb 12th 2003	0,149	0,630	0,724	3,285	0,015	0,092	0,335	1,400	0,681	2,518	0,932	3,609
May14th 2003	0,074	0,443	0,842	3,570	0,014	0,092	0,323	1,281	0,608	2,273	0,917	3,690
Aug 13th 2003	0,063	0,518	0,733	2,905	0,014	0,089	0,283	1,360	0,533	2,250	0,874	3,813
Nov 12th 2003	0,066	0,658	0,715	3,113	0,014	0,094	0,295	1,580	0,542	2,476	0,994	4,513
Feb 11th 2004	0,061	0,480	0,601	2,350	0,013	0,089	0,283	1,453	0,518	2,187	1,040	4,525
May 12th 2004	0,068	0,797	0,532	2,463	0,012	0,089	0,310	2,040	0,521	2,310	1,118	4,965
Aug 18th 2004	0,130	0,850	0,545	2,645	0,013	0,089	0,433	2,230	0,528	2,270	1,240	5,226
Nov 16th 2004	0,185	1,028	0,690	3,133	0,013	0,094	0,578	2,840	0,543	2,325	1,222	4,970
Mar 1th 2005	0,190	1,013	0,656	2,903	0,013	0,093	0,733	3,570	0,534	2,342	1,245	5,215
Average Rate of Return (%)	0,162	0,934	0,666	2,958	0,015	0,094	0,413	2,031	0,643	2,703	1,046	4,474
Std. Deviat. (σ)	0,104	0,471	0,088	0,366	0,003	0,005	0,128	0,672	0,138	0,600	0,119	0,551
R/V Ratio*	1,560	1,981	7,547	8,086	4,573	19,861	3,237	3,021	4,676	4,509	8,800	8,114

Notes:

since 3 month libor rates are annualized we have divided them with 4 (periods per year) in order to estimate the average 3 month rate of return.

* Reward / Variability Ratio

A set of raw data on each exchange rate of our sample and each forecasting period ahead, between February 2002 to March 2005, is presented in Appendix B at the end of this dissertation.

The first seven (7) columns after each date, report the prices on spot and forward exchange rates, in a 3 month/12 month period ahead, for each set of currencies respectively.

Finally, in columns eight (8) and nine (9) we measure the 3 month and 12 month rate of return according to the forward speculation strategy, which is presented above. Then, we calculate the average rate of return and the standard deviation (σ) in order to estimate the Reward to Variability (R/V) Ratios, and use them as a measure of evaluation.

The following table summarizes total results on Forward Speculation for each exchange rate of our sample, in a 3 month /12 month period, and also uses the libor rates of i_{GBP} (with the higher R/V Ratios) as a benchmark for comparison on each period:

TOTAL RESULTS ON FORWARD SPECULATION VS i_{GBP} LIBOR RATES

Exchange Rates	3 month average i_{GBP} libor rate of return (%)	3 month Standard Deviation (σ) on i_{GBP}	3 month R/V Ratio on i_{GBP}	3 month Average Rate of Return (%) on F.S	3 month Standard Deviation (σ) on F.S	3 month R/V Ratio on F.S	12 month average i_{GBP} libor rate of return (%)	12 month Standard Deviation (σ) on i_{GBP}	12 month R/V Ratio on i_{GBP}	12 month Average Rate of Return (%) on F.S	12 month Standard Deviation (σ) on F.S	12 month R/V Ratio on F.S
USD/EUR	1,046	0,119	8,800	2,754	6,087	0,452	4,474	0,551	8,114	15,400	8,094	1,903
JPY/USD	1,046	0,119	8,800	0,784	4,713	0,166	4,474	0,551	8,114	-1,419	6,124	-0,232
AUD/USD	1,046	0,119	8,800	3,968	6,340	0,626	4,474	0,551	8,114	13,239	10,630	1,245
USD/GBP	1,046	0,119	8,800	4,405	3,723	1,183	4,474	0,551	8,114	12,375	4,955	2,498
CAD/USD	1,046	0,119	8,800	1,488	3,196	0,293	4,474	0,551	8,114	9,412	4,563	2,063
DKK/USD	1,046	0,119	8,800	1,878	6,930	0,271	4,474	0,551	8,114	12,831	6,673	1,923
SEK/USD	1,046	0,119	8,800	2,803	5,577	0,503	4,474	0,551	8,114	13,883	6,823	2,035
CHF/USD	1,046	0,119	8,800	1,055	5,313	0,199	4,474	0,551	8,114	0,177	10,931	0,016
CNY/USD	1,046	0,119	8,800	0,009	0,621	0,114	4,474	0,551	8,114	0,219	2,358	0,093
SGD/USD	1,046	0,119	8,800	1,198	1,624	0,738	4,474	0,551	8,114	2,217	1,639	1,353
KRW/USD	1,046	0,119	8,800	1,367	4,157	0,329	4,474	0,551	8,114	6,205	4,339	1,430
BRL/USD	1,046	0,119	8,800	n.a	n.a	n.a	4,474	0,551	8,114	n.a	n.a	n.a
MXN/USD	1,046	0,119	8,800	1,038	4,090	0,254	4,474	0,551	8,114	1,255	6,005	0,209
PLN/USD	1,046	0,119	8,800	3,328	5,076	0,656	4,474	0,551	8,114	11,040	7,453	1,481
RUB/USD	1,046	0,119	8,800	n.a	n.a	n.a	4,474	0,551	8,114	n.a	n.a	n.a
ZAR/USD	1,046	0,119	8,800	12,798	16,235	0,788	4,474	0,551	8,114	15,913	40,991	0,388

Notes:

* Reward / Variability Ratio

** F.S : Forward Speculation

FORWARD SPECULATION VS i_{GBP} LIBOR RATES
(Total Results for the Sum of 6 Major Currencies)

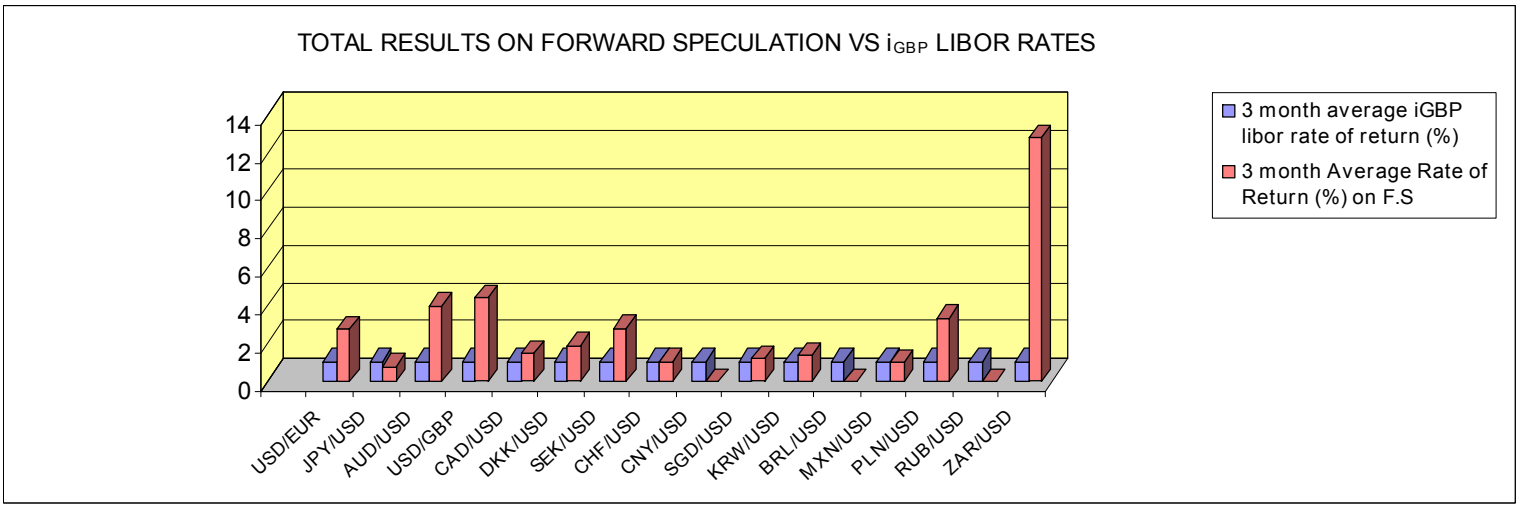
	3 month Forward Speculation	3 month i_{GBP} libor rates	12 month Forward Speculation	12 month i_{GBP} libor rates
Average Rate of Return (%)	2,355	1,046	8,197	4,474
Std. Deviat. (σ)	5,383	0,119	10,279	0,551
R/V Ratio*	0,437	8,800	0,797	8,114

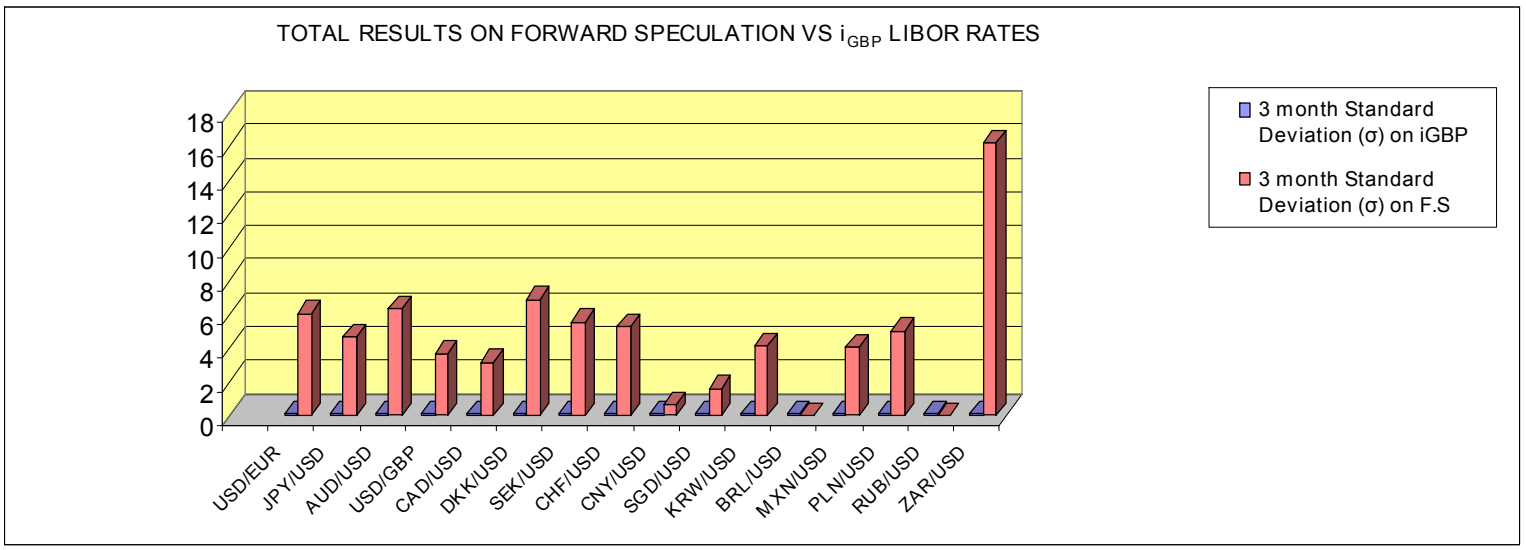
Notes:

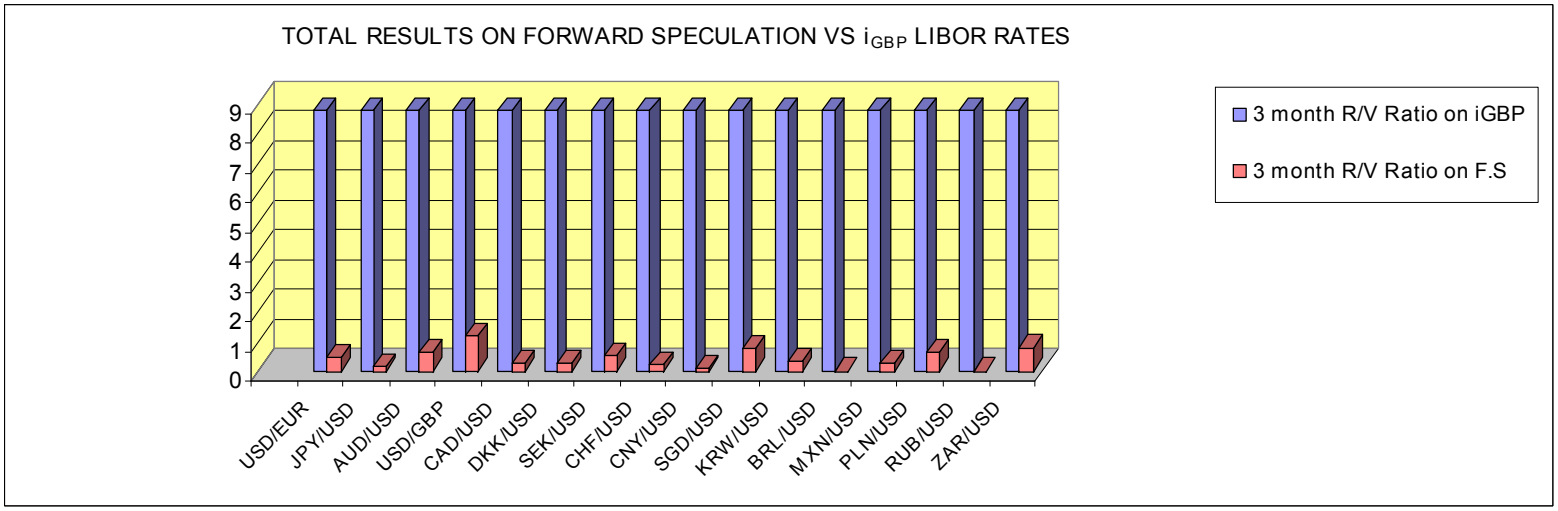
*USD/EUR, JPY/USD, AUD/USD,USD/GBP,CAD/USD, CHF/USD

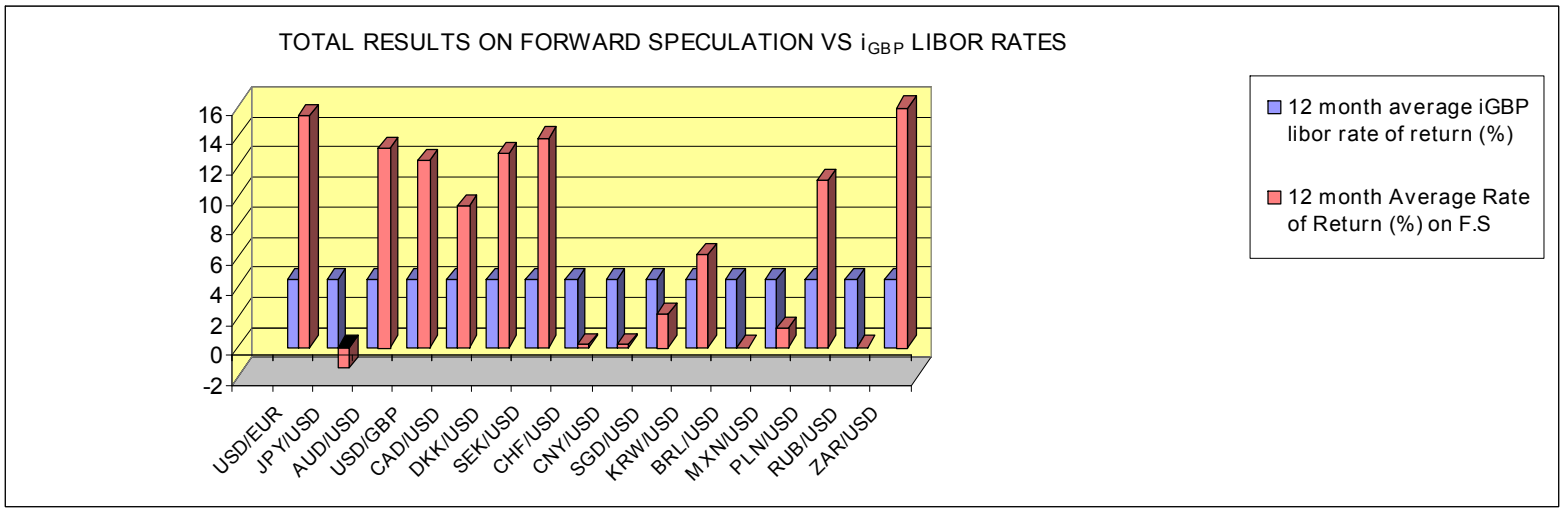
** Reward / Variability Ratio

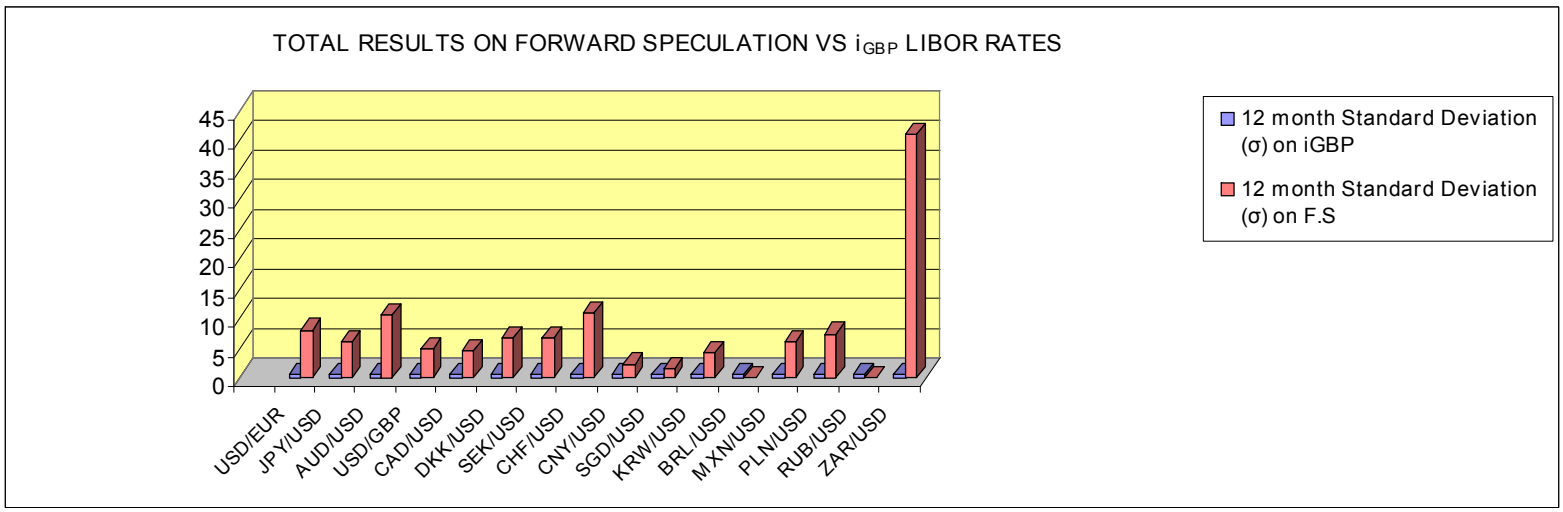
Total results on Forward Speculation, for each exchange rate of our sample using the libor rates of i_{GBP} as a benchmark for comparison (since it provides the higher R/V Ratio), and then for the sum of the 6 major currencies (Euro, Japanese Yen, Canadian Dollar, Australian Dollar, British Pound, Swiss Franc) compared to the libor rates of i_{GBP} in a 3 month / 12 month forecasting period ahead, are also summarized on the following charts:

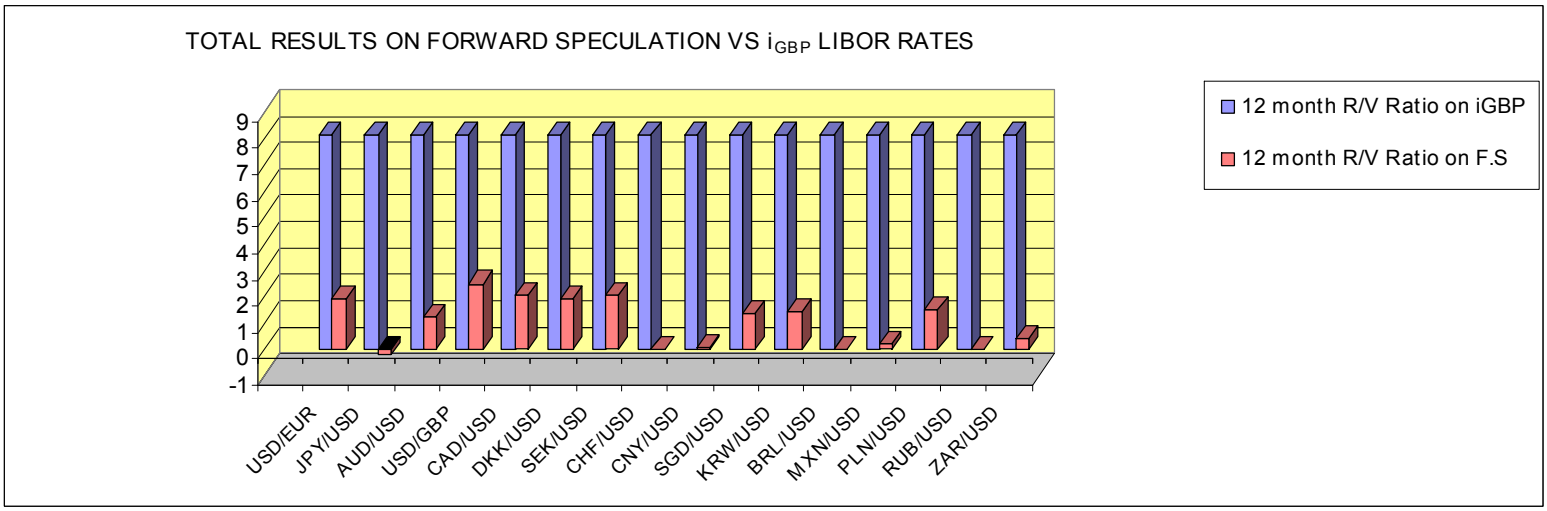


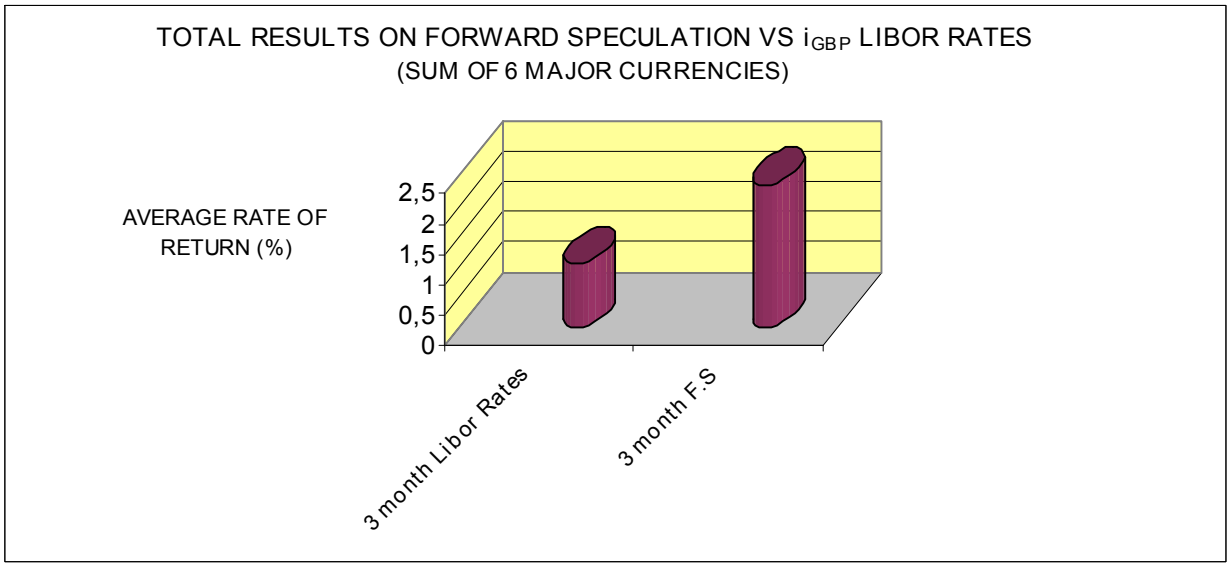


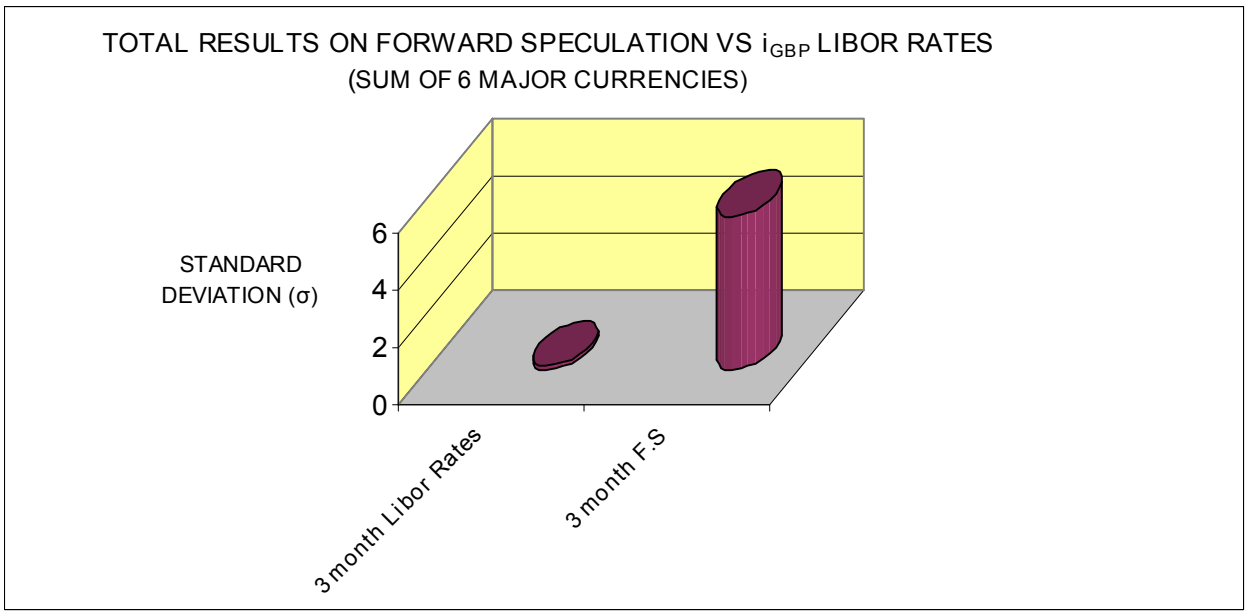

TOTAL RESULTS ON FORWARD SPECULATION VS i_{GBP} LIBOR RATES
9
8
7
6
5
4
3
2
1
0
USD/EUR
JPY/USD
AUD/USD
USD/GBP
CAD/USD
DKK/USD
SEK/USD
CHF/USD
CNY/USD
SGD/USD
KRW/USD
BRL/USD
MXN/USD
PLN/USD
RUB/USD
ZAR/USD
3 month R/V Ratio on iGBP
3 month R/V Ratio on F.S

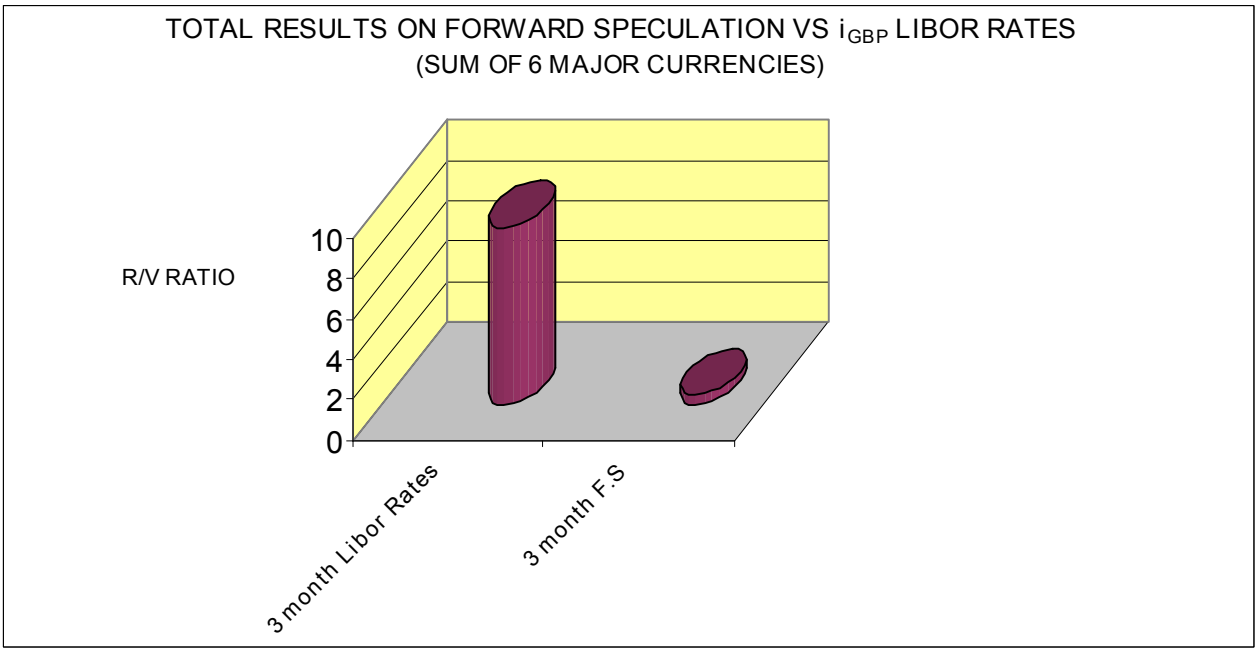

TOTAL RESULTS ON FORWARD SPECULATION VS i_{GBP} LIBOR RATES
16
14
12
10
8
6
4
2
0
-2
USD/EUR
JPY/USD
AUD/USD
USD/GBP
CAD/USD
DKK/USD
SEK/USD
CHF/USD
CNY/USD
SGD/USD
KRW/USD
BRL/USD
MXN/USD
PLN/USD
RUB/USD
ZAR/USD
12 month average iGBP libor rate of return (%)
12 month Average Rate of Return (%) on F.S

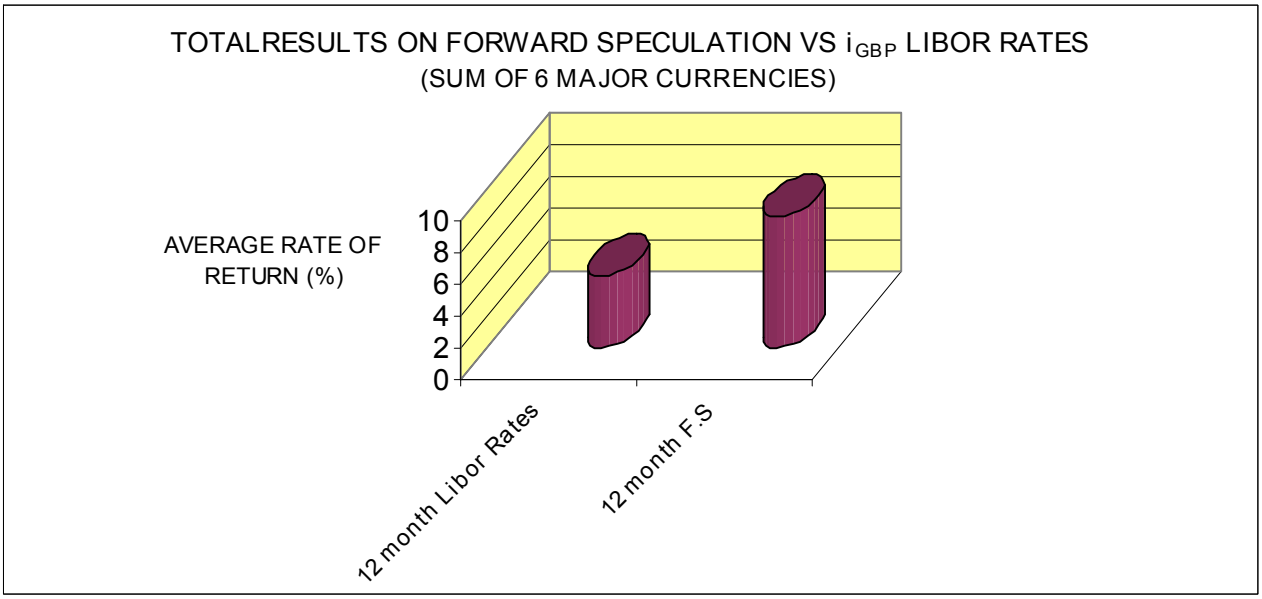

TOTAL RESULTS ON FORWARD SPECULATION VS i_{GBP} LIBOR RATES
45
40
35
30
25
20
15
10
5
0
USD/EUR
JPY/USD
AUD/USD
USD/GBP
CAD/USD
DKK/USD
SEK/USD
CHF/USD
CNY/USD
SGD/USD
KRW/USD
BRL/USD
MXN/USD
PLN/USD
RUB/USD
ZAR/USD
12 month Standard Deviation (σ) on iGBP
12 month Standard Deviation (σ) on F.S

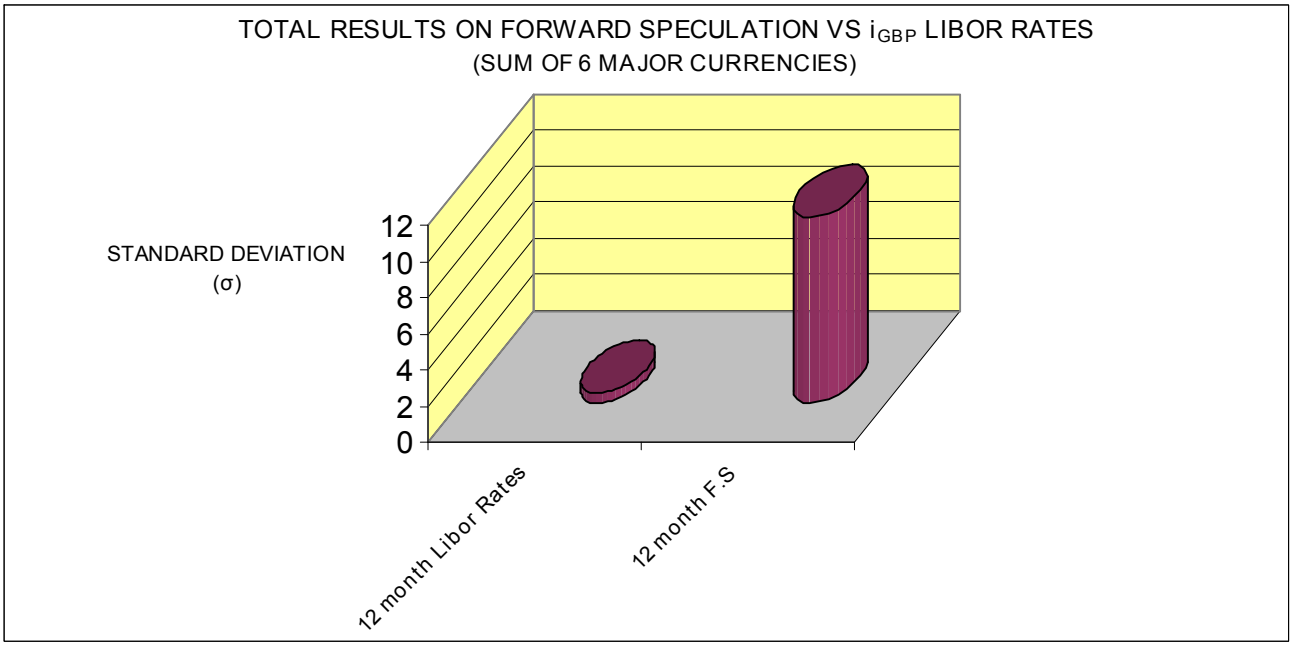

TOTAL RESULTS ON FORWARD SPECULATION VS i_{GBP} LIBOR RATES
12 month R/V Ratio on iGBP
12 month R/V Ratio on F.S
9
8
7
6
5
4
3
2
1
0
-1
USD/EUR
JPY/USD
AUD/USD
USD/GBP
CAD/USD
DKK/USD
SEK/USD
CHF/USD
CNY/USD
SGD/USD
KRW/USD
BRL/USD
MXN/USD
PLN/USD
RUB/USD
ZAR/USD

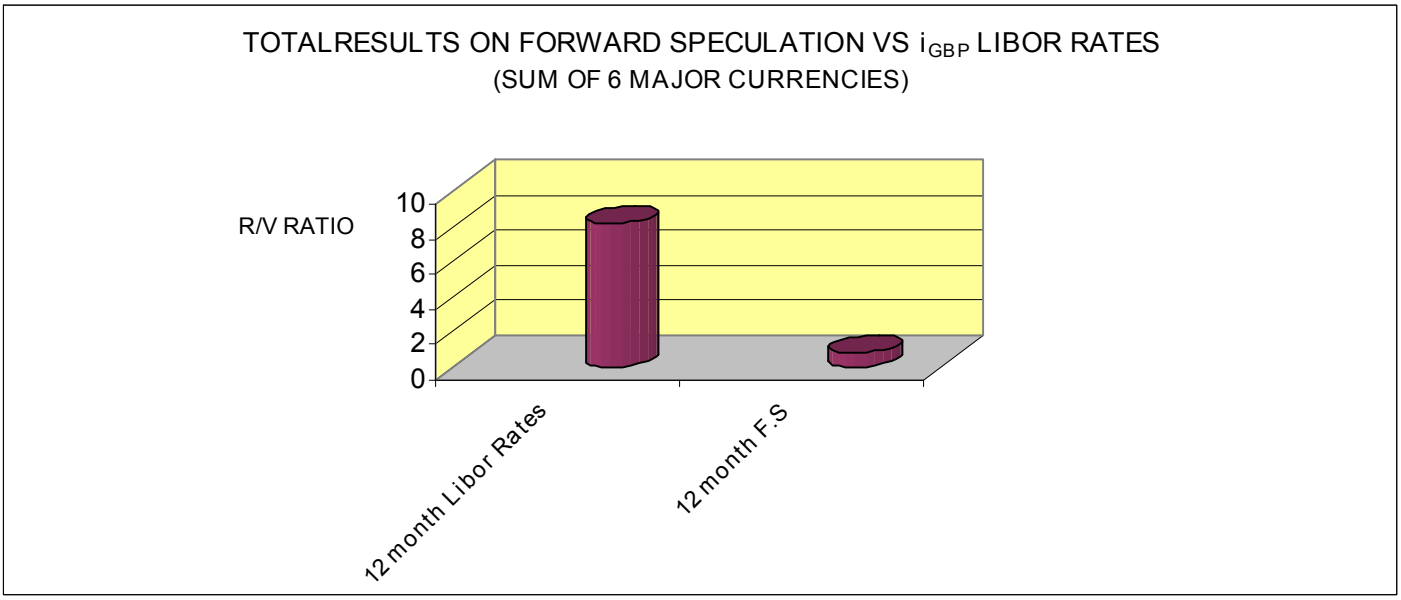

TOTAL RESULTS ON FORWARD SPECULATION VS i_{GBP} LIBOR RATES
(SUM OF 6 MAJOR CURRENCIES)
AVERAGE RATE OF RETURN (%)
2,5
2
1,5
1
0,5
0
3 month Libor Rates
3 month F.S


TOTAL RESULTS ON FORWARD SPECULATION VS i_{GBP} LIBOR RATES
(SUM OF 6 MAJOR CURRENCIES)
STANDARD DEVIATION (σ)
6
4
2
0
3 month Libor Rates
3 month F.S


TOTAL RESULTS ON FORWARD SPECULATION VS i_{GBP} LIBOR RATES
(SUM OF 6 MAJOR CURRENCIES)
R/V RATIO
10
8
6
4
2
0
3 month Libor Rates
3 month F.S


TOTALRESULTS ON FORWARD SPECULATION VS i_{GBP} LIBOR RATES
(SUM OF 6 MAJOR CURRENCIES)
AVERAGE RATE OF RETURN (%)
10
8
6
4
2
0
12 month Libor Rates
12 month F.S


TOTAL RESULTS ON FORWARD SPECULATION VS i_{GBP} LIBOR RATES
(SUM OF 6 MAJOR CURRENCIES)
STANDARD DEVIATION
(σ)
12
10
8
6
4
2
0
12 month Libor Rates
12 month F.S


TOTALRESULTS ON FORWARD SPECULATION VS i_{GBP} LIBOR RATES
(SUM OF 6 MAJOR CURRENCIES)
R/V RATIO
10
8
6
4
2
0
12 month Libor Rates
12 month F.S

CONCLUSIONS

According to summarized results of the above tables (on pages 54, 55) we conclude that Forward Speculation strategy produces -in most cases of our sample of exchange rates- more profitable results (higher average rates of return) than the average return of i_{GBP} libor rates in the 3 month as well as the 12 month period ahead.

For the sum of the 6 major currencies, Forward Speculation strategy also produces more profitable results (higher average rate of return) than the average return of i_{GBP} libor rates in the 3 month as well as the 12 month period ahead.

On the other hand, Reward to Variability Ratios (R/V) appear to be lower on Forward Speculation strategy as a result of the higher risk incurred and adopted as measured by Standard Deviation (σ) estimates.

It is also worth mentioning that even the link between useful forecasts and economic value is ambiguous.

When we examine the professional estimates there are cases, almost exclusively in the 3 month forecast period (the exchange rates of USD/euro, JPY/USD, CAD/USD, DKK/USD, KRW/USD, CNY/USD, MXN/USD, ZAR/USD and in the 12 month period the exchange rates of CNY/USD, ZAR/USD) where even if there is no excess of correct predictions we observe the existence of considerable profits while undertaking forward speculation.

One explanation of this outcome is that the professional forecaster may be better at forecasting large changes.

Another explanation is that since the speculator chooses to trade forward contracts at prices equal to his expectations of future spot exchange rates (the adopted professional forecasts) he might possibly have exploited the pattern of a forward rate bias (meaning that $F_{t,n}$ differs from S_{t+n}) by identifying the direction of bias in advance, when risk ($RP_{t,n}$) is present and being reflected to forward prices, so that :

$$F_{t,n} = E(S_{t+n})+RP_{t,n}>E(S_{t+n}),$$

known as the general efficiency hypothesis. Once again, forward exchange market efficiency requires that market participants are able to form rational, forward-looking expectations, meaning that $E(S_{t+n}) = S_{t+n}$.

However, when a currency risk premium is present, the profits earned through forward speculation may only reflect a fair premium for the additional risk incurred (meaning that higher interest rates imply greater risk of a future depreciation when investing in a higher yield currency).

On the other hand, a significant track record of correct forecasts (78 percent in the case of JPY/USD in the 12 month period) proved insufficient to produce profitable results. This could have occurred since profits on the correct forecasts did not exceed the losses on the incorrect forecasts

Like before, the explanation might also be associated with a forward rate bias pattern ($F_{t,n} \neq S_{t+n}$) as a result of the failure on the "pricing rule" used by the market -meaning that $F_{t,n}$ differs from $E(S_{t+n})$- and the speculator's weakness to identify the direction of bias.

Expectational errors, meaning that $E(S_{t+n})$ differs from S_{t+n}, is the other major explanation of the losses occurred, arising naturally in a world of uncertainty.

As a rule of thumb, in both cases mentioned above, the inequality between today's forward rate ($F_{t,n}$) and the forecaster's expectations ($E(S_{t+n})$), alters the financial transactions undertaken each time affecting the final outcome (profits/ losses) when a forward speculation strategy is adopted.

7. CONCLUDING REMARKS

As pointed out previously, the nature of international financial markets has been transformed over the last 15 years, as a result of the increase in size and mobility (across borders) on capital invested internationally, which is denominated in foreign currency. Not only financial markets have experienced unusually large price swings but also the speed and volatility of price movements has accelerated.

Exchange rate volatility underlined the fundamental role of exchange rate forecasts in nearly all aspects of financial transactions and international financial management. Moreover, the existence of higher risk incurred, led to increased demands for financial forecasting on a professional basis and the development of multiple professional forecasting services.

On the other hand, although numerous business and financial decisions depend on exchange rate forecasts, considerable skepticism exists about the possibility of accurate forecasts, fostered by the alleged poor performance of popular models of exchange rate determination and econometric techniques proposed, as summarized on studies undertaken by several well-known economists as previously mentioned.

Taking into consideration our sample of exchange rate forecasts gathered from a professional forecasting service J.P Morgan Chase as presented on the Economist print edition, it appears to be a more optimistic view towards exchange rate forecasting than that suggested by the above comments.

Using an alternative measure of forecasting performance -usefulness rather than accuracy- since it is more meaningful for a broad class of financial decisions, we concluded that our professional (FX) forecasts generally had directional forecasting power and as a result they were economically valuable.

Finally, when a Forward Speculation strategy was adopted, professional (FX) forecasts led to substantial profits compared to the average return of i_{GBP} libor rates.

It is of vital importance to point out that Reward to Variability Ratios (R/V) appeared to be lower on Forward Speculation strategy as a result of the additional risk adopted, arising from a world of uncertainty and increased volatility in exchange rates.

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❖ Pertinent Websites

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○ Chicago Mercantile Exchange	www.cme.com
○ Commodity Future Trading Commission	www.cftc.gov
○ J.P Morgan Chase	www.jpmorganchase.com
○ Options Clearing Corporation	www.optionsclearing.com
○ The Economist	www.economist.com
○ Philadelphia Options Exchange	www.phlx.com

APPENDIX A

- Sign Tests
- Traditional Statistical Measures (MAE / RMSE)

Calendar Date/Forecast Period	USD per Euro								
	S_t	E_tS_{t+3}	E_tS_{t+12}	S_{t+3}	S_{t+12}	A	B	C	D
Feb 13th 2002	0,87	0,90	0,92	0,91	1,08	1	1	-0,011	-0,148
May 15th 2002	0,91	0,91	0,92	0,98	1,14	0	1	-0,071	-0,193
Aug 7th 2002	0,97	1,00	1,01	1,00	1,14	1	1	0,000	-0,114
Nov 6th 2002	1,00	1,01	1,00	1,08	1,14	1	0	-0,065	-0,123
Feb 12th 2003	1,07	1,02	1,07	1,15	1,28	0	0	-0,113	-0,164
May14th 2003	1,15	1,17	1,25	1,13	1,19	0	1	0,035	0,050
Aug 13th 2003	1,13	1,21	1,24	1,17	1,24	1	1	0,034	0,000
Nov 12th 2003	1,16	1,22	1,25	1,28	1,30	1	1	-0,047	-0,038
Feb 11th 2004	1,28	1,32	1,37	1,19	1,29	0	1	0,109	0,062
May 12th 2004	1,19	1,19	1,22	1,22	n.a	0	n.a	-0,025	n.a
Aug 18th 2004	1,23	1,23	1,22	1,29	n.a	0	n.a	-0,047	n.a
Nov 16th 2004	1,30	1,30	1,25	1,30	n.a	1	n.a	0,000	n.a
Mar 1th 2005	1,32	1,38	1,34	n.a	n.a	n.a	n.a	n.a	n.a
Mean Absolute Error (MAE) %								0,046	0,099
Root Mean Squared Error (RMSE) %								0,059	0,116

Notes:

A : 3month Exchange Rate Change (1=Correct, 0=Incorrect)

B : 12month Exchange Rate Change (1=Correct, 0=Incorrect)

C : 3month forecast error defined as: $e_t = (E_t(S_{t+3}) - S_{t+e}) / S_{t+3}$)

D : 12month forecast error defined as: $e_t = (E_t(S_{t+12}) - S_{t+12}) / S_{t+12}$)

Calendar Date/Forecast Period	Japanese Yen (JPY per USD)								
	S_t	E_tS_{t+3}	E_tS_{t+12}	S_{t+3}	S_{t+12}	A	B	C	D
Feb 13th 2002	133,24	138,00	136,00	127,53	120,38	0	0	0,082	0,130
May 15th 2002	127,85	126,00	126,00	117,26	116,03	1	1	0,075	0,086
Aug 7th 2002	120,33	118,00	117,00	121,35	118,86	0	1	-0,028	-0,016
Nov 6th 2002	122,22	122,30	120,00	119,74	110,16	0	1	0,021	0,089
Feb 12th 2003	121,31	126,40	120,60	116,88	105,38	0	1	0,081	0,144
May14th 2003	116,16	117,00	115,00	119,17	114,29	1	1	-0,018	0,006
Aug 13th 2003	119,20	116,00	110,00	108,31	110,57	1	1	0,071	-0,005
Nov 12th 2003	108,66	105,00	98,00	105,38	105,42	1	1	-0,004	-0,070
Feb 11th 2004	105,34	101,00	95,00	113,49	105,61	0	0	-0,110	-0,100
May 12th 2004	113,17	106,00	98,00	111,03	n.a	1	n.a	-0,045	n.a
Aug 18th 2004	109,65	104,00	102,00	104,33	n.a	1	n.a	-0,003	n.a
Nov 16th 2004	105,38	101,00	105,00	105,60	n.a	0	n.a	-0,044	n.a
Mar 1th 2005	104,37	96,00	100,00	n.a	n.a	n.a	n.a	n.a	n.a
Mean Absolute Error (MAE) %								0,048	0,072
Root Mean Squared Error (RMSE) %								0,059	0,087

Notes:

A : 3month Exchange Rate Change (1=Correct, 0=Incorrect)

B : 12month Exchange Rate Change (1=Correct, 0=Incorrect)

C : 3month forecast error defined as: $e_t = (E_t(S_{t+3}) - S_{t+e}) / S_{t+3}$)

D : 12month forecast error defined as: $e_t = (E_t(S_{t+12}) - S_{t+12}) / S_{t+12}$)

Calendar Date/Forecast Period	Australian Dollar (AUD per USD)								
	S_t	E_tS_{t+3}	E_tS_{t+12}	S_{t+3}	S_{t+12}	A	B	C	D
Feb 13th 2002	1,96	1,83	1,70	1,83	1,68	1	1	0,000	0,012
May 15th 2002	1,82	1,80	1,74	1,84	1,56	0	1	-0,022	0,115
Aug 7th 2002	1,86	1,80	1,61	1,77	1,54	1	1	0,017	0,045
Nov 6th 2002	1,77	1,79	1,59	1,69	1,41	0	1	0,059	0,128
Feb 12th 2003	1,70	1,69	1,59	1,54	1,27	1	1	0,097	0,252
May14th 2003	1,55	1,54	1,43	1,52	1,45	1	1	0,013	-0,014
Aug 13th 2003	1,52	1,45	1,49	1,39	1,39	1	1	0,043	0,072
Nov 12th 2003	1,40	1,39	1,47	1,27	1,30	1	0	0,094	0,131
Feb 11th 2004	1,27	1,25	1,20	1,44	1,27	0	0	-0,132	-0,055
May 12th 2004	1,43	1,39	1,35	1,40	n.a	1	n.a	-0,007	n.a
Aug 18th 2004	1,40	1,37	1,35	1,29	n.a	1	n.a	0,062	n.a
Nov 16th 2004	1,29	1,32	1,37	1,28	n.a	0	n.a	0,031	n.a
Mar 1th 2005	1,27	1,22	1,23	n.a	n.a	n.a	n.a	n.a	n.a
Mean Absolute Error (MAE) %								0,048	0,092
Root Mean Squared Error (RMSE) %								0,063	0,116

Notes:

A : 3month Exchange Rate Change (1=Correct, 0=Incorrect)

B : 12month Exchange Rate Change (1=Correct, 0=Incorrect)

C : 3month forecast error defined as: $e_t = (E_t(S_{t+3}) - S_{t+e}) / S_{t+3})$

D : 12month forecast error defined as: $e_t = (E_t(S_{t+12)} - S_{t+12}) / S_{t+12})$

Calendar Date/Forecast Period	USD per GBP								
	S_t	E_tS_{t+3}	E_tS_{t+12}	S_{t+3}	S_{t+12}	A	B	C	D
Feb 13th 2002	1,43	1,45	1,47	1,46	1,62	1	1	-0,007	-0,093
May 15th 2002	1,46	1,47	1,46	1,54	1,62	1	0	-0,045	-0,099
Aug 7th 2002	1,54	1,57	1,59	1,58	1,62	1	1	-0,006	-0,019
Nov 6th 2002	1,56	1,57	1,58	1,64	1,67	1	1	-0,043	-0,054
Feb 12th 2003	1,62	1,60	1,62	1,61	1,89	1	0	-0,006	-0,143
May14th 2003	1,62	1,63	1,67	1,60	1,76	0	1	0,019	-0,051
Aug 13th 2003	1,61	1,68	1,69	1,69	1,84	1	1	-0,006	-0,082
Nov 12th 2003	1,67	1,72	1,76	1,89	1,86	1	1	-0,090	-0,054
Feb 11th 2004	1,89	1,85	1,93	1,76	1,87	1	0	0,051	0,032
May 12th 2004	1,77	1,79	1,82	1,82	n.a	1	n.a	-0,016	n.a
Aug 18th 2004	1,82	1,84	1,79	1,85	n.a	1	n.a	-0,005	n.a
Nov 16th 2004	1,85	1,84	1,74	1,88	n.a	0	n.a	-0,021	n.a
Mar 1th 2005	1,92	1,99	1,91	n.a	n.a	n.a	n.a	n.a	n.a
Mean Absolute Error (MAE) %								0,026	0,069
Root Mean Squared Error (RMSE) %								0,036	0,078

Notes:

A : 3month Exchange Rate Change (1=Correct, 0=Incorrect)

B : 12month Exchange Rate Change (1=Correct, 0=Incorrect)

C : 3month forecast error defined as: $e_t = (E_t(S_{t+3}) - S_{t+e}) / S_{t+3})$

D : 12month forecast error defined as: $e_t = (E_t(S_{t+12)} - S_{t+12}) / S_{t+12})$

Calendar Date/Forecast Period	Canadian Dollar (CAD per USD)								
	S_t	E_tS_{t+3}	E_tS_{t+12}	S_{t+3}	S_{t+12}	A	B	C	D
Feb 13th 2002	1,59	1,56	1,49	1,56	1,52	1	1	0,000	-0,020
May 15th 2002	1,56	1,53	1,47	1,56	1,38	0	1	-0,019	0,065
Aug 7th 2002	1,58	1,55	1,45	1,55	1,40	1	1	0,000	0,036
Nov 6th 2002	1,56	1,56	1,45	1,52	1,34	0	1	0,026	0,082
Feb 12th 2003	1,53	1,54	1,46	1,39	1,32	0	1	0,108	0,106
May14th 2003	1,38	1,38	1,30	1,39	1,39	0	0	-0,007	-0,065
Aug 13th 2003	1,38	1,36	1,30	1,30	1,31	1	1	0,046	-0,008
Nov 12th 2003	1,30	1,29	1,29	1,32	1,19	0	1	-0,023	0,084
Feb 11th 2004	1,32	1,28	1,25	1,39	1,24	0	1	-0,079	0,008
May 12th 2004	1,39	1,35	1,32	1,33	n.a	1	n.a	0,015	n.a
Aug 18th 2004	1,31	1,30	1,32	1,21	n.a	1	n.a	0,074	n.a
Nov 16th 2004	1,19	1,20	1,25	1,24	n.a	1	n.a	-0,032	n.a
Mar 1th 2005	1,24	1,22	1,26	n.a	n.a	n.a	n.a	n.a	n.a
Mean Absolute Error (MAE) %								0,036	0,053
Root Mean Squared Error (RMSE) %								0,049	0,063

Notes:

A : 3month Exchange Rate Change (1=Correct, 0=Incorrect)

B : 12month Exchange Rate Change (1=Correct, 0=Incorrect)

C : 3month forecast error defined as: $e_t = (E_t(S_{t+3}) - S_{t+e}) / S_{t+3})$

D : 12month forecast error defined as: $e_t = (E_t(S_{t+12}) - S_{t+12}) / S_{t+12})$

Calendar Date/Forecast Period	Danish Krone (DKK per USD)								
	S_t	E_tS_{t+3}	E_tS_{t+12}	S_{t+3}	S_{t+12}	A	B	C	D
Feb 13th 2002	8,52	8,28	8,10	8,16	6,85	1	1	0,015	0,182
May 15th 2002	8,19	8,22	8,06	7,56	6,49	0	1	0,087	0,242
Aug 7th 2002	7,63	7,45	7,35	7,36	6,53	1	1	0,012	0,126
Nov 6th 2002	7,45	7,33	7,43	6,86	6,51	1	1	0,069	0,141
Feb 12th 2003	6,94	7,26	6,92	6,43	5,82	0	1	0,129	0,189
May14th 2003	6,45	6,40	5,95	6,61	6,27	0	1	-0,032	-0,051
Aug 13th 2003	6,57	6,20	6,00	6,35	6,02	1	1	-0,024	-0,003
Nov 12th 2003	6,38	6,10	5,95	5,82	5,73	1	1	0,048	0,038
Feb 11th 2004	5,82	5,60	5,40	6,29	5,78	0	1	-0,110	-0,066
May 12th 2004	6,24	6,22	6,10	6,08	n.a	1	n.a	0,023	n.a
Aug 18th 2004	6,03	6,05	6,09	5,74	n.a	0	n.a	0,054	n.a
Nov 16th 2004	5,73	5,72	5,92	5,73	n.a	0	n.a	-0,002	n.a
Mar 1th 2005	5,64	5,40	5,54	n.a	n.a	n.a	n.a	n.a	n.a
Mean Absolute Error (MAE) %								0,050	0,115
Root Mean Squared Error (RMSE) %								0,064	0,138

Notes:

A : 3month Exchange Rate Change (1=Correct, 0=Incorrect)

B : 12month Exchange Rate Change (1=Correct, 0=Incorrect)

C : 3month forecast error defined as: $e_t = (E_t(S_{t+3}) - S_{t+e}) / S_{t+3})$

D : 12month forecast error defined as: $e_t = (E_t(S_{t+12}) - S_{t+12}) / S_{t+12})$

Calendar Date/Forecast Period	Swedish Krone (SEK per USD)								
	S_t	E_tS_{t+3}	E_tS_{t+12}	S_{t+3}	S_{t+12}	A	B	C	D
Feb 13th 2002	10,59	9,86	9,48	10,24	8,40	1	1	-0,037	0,129
May 15th 2002	10,12	9,74	9,44	9,42	8,05	1	1	0,034	0,173
Aug 7th 2002	9,56	9,04	8,53	9,05	8,10	1	1	-0,001	0,053
Nov 6th 2002	9,09	8,79	8,62	8,48	7,88	1	1	0,037	0,094
Feb 12th 2003	8,53	8,88	8,08	7,93	7,13	0	1	0,120	0,133
May14th 2003	8,00	7,65	7,00	8,17	7,72	0	1	-0,064	-0,093
Aug 13th 2003	8,15	7,35	7,10	7,63	7,46	1	1	-0,037	-0,048
Nov 12th 2003	7,72	7,10	6,96	7,13	6,92	1	1	-0,004	0,006
Feb 11th 2004	7,11	6,85	6,40	7,74	7,08	0	1	-0,115	-0,096
May 12th 2004	7,69	7,66	7,20	7,52	n.a	1	n.a	0,019	n.a
Aug 18th 2004	7,48	7,34	7,46	6,93	n.a	1	n.a	0,059	n.a
Nov 16th 2004	6,91	6,94	7,20	6,97	n.a	1	n.a	-0,004	n.a
Mar 1th 2005	6,87	6,66	6,72	n.a	n.a	n.a	n.a	n.a	n.a
Mean Absolute Error (MAE) %								0,044	0,092
Root Mean Squared Error (RMSE) %								0,058	0,103

Notes:

A : 3month Exchange Rate Change (1=Correct, 0=Incorrect)

B : 12month Exchange Rate Change (1=Correct, 0=Incorrect)

C : 3month forecast error defined as: $e_t = (E_t(S_{t+3}) - S_{t+e}) / S_{t+3}$)

D : 12month forecast error defined as: $e_t = (E_t(S_{t+12)} - S_{t+12}) / S_{t+12}$)

Calendar Date/Forecast Period	Swiss Franc (CHF per USD)								
	S_t	E_tS_{t+3}	E_tS_{t+12}	S_{t+3}	S_{t+12}	A	B	C	D
Feb 13th 2002	1,70	1,68	1,67	1,60	1,35	1	1	0,050	0,237
May 15th 2002	1,60	1,64	1,65	1,49	1,33	0	0	0,101	0,241
Aug 7th 2002	1,50	1,47	1,49	1,45	1,35	1	1	0,014	0,104
Nov 6th 2002	1,46	1,45	1,52	1,35	1,38	1	0	0,074	0,101
Feb 12th 2003	1,37	1,43	1,38	1,31	1,23	0	0	0,092	0,122
May14th 2003	1,32	1,30	1,23	1,37	1,30	0	1	-0,051	-0,054
Aug 13th 2003	1,37	1,27	1,25	1,34	1,24	1	1	-0,052	0,008
Nov 12th 2003	1,35	1,26	1,23	1,23	1,17	1	1	0,024	0,051
Feb 11th 2004	1,23	1,17	1,11	1,30	1,21	0	1	-0,100	-0,083
May 12th 2004	1,29	1,28	1,23	1,26	n.a	1	n.a	0,016	n.a
Aug 18th 2004	1,24	1,22	1,20	1,17	n.a	1	n.a	0,043	n.a
Nov 16th 2004	1,18	1,19	1,18	1,19	n.a	1	n.a	0,000	n.a
Mar 1th 2005	1,17	1,07	1,12	n.a	n.a	n.a	n.a	n.a	n.a
Mean Absolute Error (MAE)								0,051	0,111
Root Mean Squared Error (RMSE) %								0,061	0,134

Notes:

A : 3month Exchange Rate Change (1=Correct, 0=Incorrect)

B : 12month Exchange Rate Change (1=Correct, 0=Incorrect)

C : 3month forecast error defined as: $e_t = (E_t(S_{t+3}) - S_{t+e}) / S_{t+3}$)

D : 12month forecast error defined as: $e_t = (E_t(S_{t+12)} - S_{t+12}) / S_{t+12}$)

Calendar Date/Forecast Period	Chinese Yuan (CNY per USD)								
	S_t	E_tS_{t+3}	E_tS_{t+12}	S_{t+3}	S_{t+12}	A	B	C	D
Feb 13th 2002	8,28	8,27	8,23	8,28	8,28	0	0	-0,001	-0,006
May 15th 2002	8,28	8,26	8,20	8,28	8,28	0	0	-0,002	-0,010
Aug 7th 2002	8,28	8,26	8,20	8,28	8,28	0	0	-0,002	-0,010
Nov 6th 2002	8,28	8,26	8,18	8,28	8,28	0	0	-0,002	-0,012
Feb 12th 2003	8,28	8,26	8,20	8,28	8,28	0	0	-0,002	-0,010
May14th 2003	8,28	8,27	8,23	8,28	8,28	0	0	-0,001	-0,006
Aug 13th 2003	8,28	8,28	8,18	8,28	8,28	1	0	0,000	-0,012
Nov 12th 2003	8,28	8,28	8,17	8,28	8,28	1	0	0,000	-0,013
Feb 11th 2004	8,28	8,20	7,80	8,28	8,28	0	0	-0,010	-0,058
May 12th 2004	8,28	7,95	7,60	8,28	n.a	0	n.a	-0,040	n.a
Aug 18th 2004	8,28	8,20	7,80	8,28	n.a	0	n.a	-0,010	n.a
Nov 16th 2004	8,28	8,06	7,60	8,28	n.a	0	n.a	-0,027	n.a
Mar 1th 2005	8,28	7,95	7,70	n.a	n.a	n.a	n.a	n.a	n.a
Mean Absolute Error (MAE)								0,008	0,015
Root Mean Squared Error (RMSE) %								0,014	0,022

Notes:

A : 3month Exchange Rate Change (1=Correct, 0=Incorrect)

B : 12month Exchange Rate Change (1=Correct, 0=Incorrect)

C : 3month forecast error defined as: $e_t = (E_t(S_{t+3}) - S_{t+e}) / S_{t+3})$

D : 12month forecast error defined as: $e_t = (E_t(S_{t+12)} - S_{t+12}) / S_{t+12})$

Calendar Date/Forecast Period	Singapore Dollar (SGD per USD)								
	S_t	E_tS_{t+3}	E_tS_{t+12}	S_{t+3}	S_{t+12}	A	B	C	D
Feb 13th 2002	1,83	1,82	1,78	1,80	1,75	1	1	0,011	0,017
May 15th 2002	1,80	1,79	1,74	1,75	1,72	1	1	0,023	0,012
Aug 7th 2002	1,77	1,74	1,70	1,76	1,76	1	1	-0,011	-0,034
Nov 6th 2002	1,77	1,79	1,74	1,74	1,74	0	1	0,029	0,000
Feb 12th 2003	1,76	1,75	1,72	1,73	1,67	1	1	0,012	0,030
May14th 2003	1,73	1,71	1,72	1,75	1,73	0	0	-0,023	-0,006
Aug 13th 2003	1,75	1,74	1,72	1,73	1,71	1	1	0,006	0,006
Nov 12th 2003	1,73	1,70	1,68	1,67	1,65	1	1	0,018	0,018
Feb 11th 2004	1,67	1,68	1,65	1,72	1,65	1	1	-0,023	0,000
May 12th 2004	1,72	1,66	1,60	1,72	n.a	0	n.a	-0,035	n.a
Aug 18th 2004	1,71	1,68	1.65	1,66	n.a	1	n.a	0,012	n.a
Nov 16th 2004	1,65	1,64	1,64	1,64	n.a	1	n.a	0,000	n.a
Mar 1th 2005	1,62	1,59	1,58	n.a	n.a	n.a	n.a	n.a	n.a
Mean Absolute Error (MAE)								0,017	0,014
Root Mean Squared Error (RMSE) %								0,019	0,018

Notes:

A : 3month Exchange Rate Change (1=Correct, 0=Incorrect)

B : 12month Exchange Rate Change (1=Correct, 0=Incorrect)

C : 3month forecast error defined as: $e_t = (E_t(S_{t+3}) - S_{t+e}) / S_{t+3})$

D : 12month forecast error defined as: $e_t = (E_t(S_{t+12)} - S_{t+12}) / S_{t+12})$

Calendar Date/Forecast Period	South Korean Won (KRW per USD)								
	S_t	E_tS_{t+3}	E_tS_{t+12}	S_{t+3}	S_{t+12}	A	B	C	D
Feb 13th 2002	1.315,00	1.317,00	1.281,00	1.281,50	1.202,90	0	1	0,028	0,065
May 15th 2002	1.272,00	1.270,00	1.232,00	1.183,50	1.197,75	1	1	0,073	0,029
Aug 7th 2002	1.203,45	1.170,00	1.116,00	1.217,40	1.188,45	0	1	-0,039	-0,061
Nov 6th 2002	1.223,00	1.254,00	1.185,00	1.176,65	1.184,45	0	1	0,066	0,000
Feb 12th 2003	1.193,50	1.185,00	1.181,00	1.197,50	1.160,25	0	1	-0,010	0,018
May14th 2003	1.197,50	1.150,00	1.250,00	1.180,05	1.186,88	1	0	-0,025	0,053
Aug 13th 2003	1.179,50	1.130,00	1.150,00	1.168,65	1.162,05	1	1	-0,033	-0,010
Nov 12th 2003	1.174,40	1.100,00	1.020,00	1.160,25	1.103,72	1	1	-0,052	-0,076
Feb 11th 2004	1.160,12	1.130,00	1.050,00	1.187,83	1.036,69	0	1	-0,049	0,013
May 12th 2004	1.183,50	1.105,00	1.100,00	1.159,50	n.a	1	n.a	-0,047	n.a
Aug 18th 2004	1.158,47	1.100,00	1.120,00	1.066,90	n.a	1	n.a	0,031	n.a
Nov 16th 2004	1.092,50	1.100,00	1.150,00	1.027,19	n.a	0	n.a	0,071	n.a
Mar 1th 2005	1.006,50	985,00	1.000,00	n.a	n.a	n.a	n.a	n.a	n.a
Mean Absolute Error (MAE)								0,044	0,036
Root Mean Squared Error (RMSE) %								0,047	0,045

Notes:

A : 3month Exchange Rate Change (1=Correct, 0=Incorrect)

B : 12month Exchange Rate Change (1=Correct, 0=Incorrect)

C : 3month forecast error defined as: $e_t = (E_t(S_{t+3}) - S_{t+e}) / S_{t+3})$

D : 12month forecast error defined as: $e_t = (E_t(S_{t+12)} - S_{t+12}) / S_{t+12})$

Calendar Date/Forecast Period	Brazilian Real (BRL per USD)								
	S_t	E_tS_{t+3}	E_tS_{t+12}	S_{t+3}	S_{t+12}	A	B	C	D
Feb 13th 2002	2,42	2,53	2,51	2,49	3,64	1	1	0,016	-0,310
May 15th 2002	2,51	2,55	2,53	3,19	2,93	1	1	-0,201	-0,137
Aug 7th 2002	3,06	2,77	2,62	3,62	3,01	0	1	-0,235	-0,130
Nov 6th 2002	3,60	4,13	4,00	3,60	2,87	0	0	0,147	0,394
Feb 12th 2003	3,60	3,76	3,65	2,88	2,90	0	0	0,306	0,259
May14th 2003	2,89	3,20	3,40	3,01	3,10	1	1	0,063	0,097
Aug 13th 2003	3,03	3,20	3,30	2,92	3,02	0	0	0,096	0,093
Nov 12th 2003	2,91	3,10	3,25	2,90	2,80	0	0	0,069	0,161
Feb 11th 2004	2,92	2,85	3,00	3,10	2,62	0	0	-0,081	0,145
May 12th 2004	3,12	2,92	3,10	3,03	n.a	1	n.a	-0,036	n.a
Aug 18th 2004	2,99	3,08	3,15	2,76	n.a	0	n.a	0,116	n.a
Nov 16th 2004	2,79	2,97	3,11	2,59	n.a	0	n.a	0,147	n.a
Mar 1th 2005	2,60	2,65	2,80	n.a	n.a	n.a	n.a	n.a	n.a
Mean Absolute Error (MAE)								0,126	0,192
Root Mean Squared Error (RMSE) %								0,150	0,216

Notes:

A : 3month Exchange Rate Change (1=Correct, 0=Incorrect)

B : 12month Exchange Rate Change (1=Correct, 0=Incorrect)

C : 3month forecast error defined as: $e_t = (E_t(S_{t+3}) - S_{t+e}) / S_{t+3})$

D : 12month forecast error defined as: $e_t = (E_t(S_{t+12)} - S_{t+12}) / S_{t+12})$

Calendar Date/Forecast Period	Mexican Peso (MXN per USD)								
	S_t	E_tS_{t+3}	E_tS_{t+12}	S_{t+3}	S_{t+12}	A	B	C	D
Feb 13th 2002	9,06	9,33	9,79	9,53	10,95	1	1	-0,021	-0,106
May 15th 2002	9,44	9,27	9,69	9,94	10,43	0	1	-0,067	-0,071
Aug 7th 2002	9,76	9,64	9,60	10,25	10,68	0	0	-0,060	-0,101
Nov 6th 2002	11,17	9,83	10,20	10,90	10,97	1	1	-0,098	-0,070
Feb 12th 2003	10,96	10,70	10,60	10,19	10,97	1	0	0,050	-0,034
May14th 2003	10,23	10,50	10,70	10,70	11,64	1	1	-0,019	-0,081
Aug 13th 2003	10,72	10,60	10,80	11,15	11,38	0	1	-0,049	-0,051
Nov 12th 2003	11,12	11,00	11,30	10,97	11,36	1	1	0,003	-0,005
Feb 11th 2004	11,01	11,30	11,60	11,61	11,15	1	1	-0,027	0,040
May 12th 2004	11,63	11,70	11,60	11,43	n.a	0	n.a	0,024	n.a
Aug 18th 2004	11,36	11,60	11,60	11,34	n.a	0	n.a	0,023	n.a
Nov 16th 2004	11,36	11,50	11,90	11,15	n.a	0	n.a	0,031	n.a
Mar 1th 2005	11,11	11,40	11,90	n.a	n.a	n.a	n.a	n.a	n.a
Mean Absolute Error (MAE)								0,039	0,062
Root Mean Squared Error (RMSE) %								0,047	0,069

Notes:

A : 3month Exchange Rate Change (1=Correct, 0=Incorrect)

B : 12month Exchange Rate Change (1=Correct, 0=Incorrect)

C : 3month forecast error defined as: $e_t = (E_t(S_{t+3}) - S_{t+e}) / S_{t+3}$)

D : 12month forecast error defined as: $e_t = (E_t(S_{t+12}) - S_{t+12}) / S_{t+12}$)

Calendar Date/Forecast Period	Polish Zloty (PLN per USD)								
	S_t	E_tS_{t+3}	E_tS_{t+12}	S_{t+3}	S_{t+12}	A	B	C	D
Feb 13th 2002	4,18	3,78	3,77	4,06	3,84	1	1	-0,069	-0,018
May 15th 2002	4,08	4,10	3,66	4,17	3,79	1	1	-0,017	-0,034
Aug 7th 2002	4,20	4,05	4,07	3,97	3,83	1	1	0,020	0,063
Nov 6th 2002	3,98	3,87	3,84	3,85	4,01	1	0	0,005	-0,042
Feb 12th 2003	3,86	4,06	3,65	3,76	3,81	0	1	0,080	-0,042
May14th 2003	3,77	3,70	3,30	3,87	4,02	0	0	-0,044	-0,179
Aug 13th 2003	3,86	3,50	3,30	3,91	3,59	0	1	-0,105	-0,081
Nov 12th 2003	3,92	3,69	3,44	3,81	3,29	1	1	-0,031	0,046
Feb 11th 2004	3,79	3,60	3,40	4,03	3,12	0	1	-0,107	0,090
May 12th 2004	4,02	3,90	3,70	3,61	n.a	1	n.a	0,080	n.a
Aug 18th 2004	3,61	3,60	3,50	3,28	n.a	1	n.a	0,098	n.a
Nov 16th 2004	3,29	3,21	3,20	3,06	n.a	1	n.a	0,049	n.a
Mar 1th 2005	2,97	2,86	2,84	n.a	n.a	n.a	n.a	n.a	n.a
Mean Absolute Error (MAE)								0,059	0,066
Root Mean Squared Error (RMSE) %								0,068	0,080

Notes:

A : 3month Exchange Rate Change (1=Correct, 0=Incorrect)

B : 12month Exchange Rate Change (1=Correct, 0=Incorrect)

C : 3month forecast error defined as: $e_t = (E_t(S_{t+3}) - S_{t+e}) / S_{t+3}$)

D : 12month forecast error defined as: $e_t = (E_t(S_{t+12}) - S_{t+12}) / S_{t+12}$)

Calendar Date/Forecast Period	Russian Rouble (RUB per USD)								
	S_t	E_tS_{t+3}	E_tS_{t+12}	S_{t+3}	S_{t+12}	A	B	C	D
Feb 13th 2002	30,84	32,10	33,70	31,21	31,71	1	1	0,029	0,063
May 15th 2002	31,25	33,00	35,80	31,54	30,98	1	0	0,046	0,156
Aug 7th 2002	31,53	32,30	33,40	31,78	30,30	1	0	0,016	0,102
Nov 6th 2002	31,79	32,40	33,90	31,84	29,81	1	0	0,018	0,137
Feb 12th 2003	31,78	32,70	34,70	31,10	28,53	0	0	0,051	0,216
May14th 2003	30,98	31,50	31,70	30,38	29,08	0	0	0,037	0,090
Aug 13th 2003	30,35	30,00	29,00	29,81	29,28	1	1	0,006	-0,010
Nov 12th 2003	29,80	30,30	31,10	28,53	28,69	0	0	0,062	0,084
Feb 11th 2004	28,50	27,00	26,00	28,95	28,09	0	1	-0,067	-0,074
May 12th 2004	28,99	28,70	28,00	29,25	n.a	0	n.a	-0,019	n.a
Aug 18th 2004	29,22	29,00	29,00	28,27	n.a	1	n.a	0,026	n.a
Nov 16th 2004	28,67	28,60	28,20	28,02	n.a	1	n.a	0,021	n.a
Mar 1th 2005	27,70	27,30	27,70	n.a	n.a	n.a	n.a	n.a	n.a
Mean Absolute Error (MAE)								0,033	0,104
Root Mean Squared Error (RMSE) %								0,038	0,118

Notes:

A : 3month Exchange Rate Change (1=Correct, 0=Incorrect)

B : 12month Exchange Rate Change (1=Correct, 0=Incorrect)

C : 3month forecast error defined as: $e_t = (E_t(S_{t+3}) - S_{t+e}) / S_{t+3}$)

D : 12month forecast error defined as: $e_t = (E_t(S_{t+12)} - S_{t+12}) / S_{t+12}$)

Calendar Date/Forecast Period	South Africa Rand (ZAR per USD)								
	S_t	E_tS_{t+3}	E_tS_{t+12}	S_{t+3}	S_{t+12}	A	B	C	D
Feb 13th 2002	11,47	12,64	13,98	10,10	8,29	0	0	0,251	0,686
May 15th 2002	10,21	10,80	12,90	10,63	8,03	1	0	0,016	0,606
Aug 7th 2002	10,43	10,90	11,40	9,77	7,27	0	0	0,116	0,568
Nov 6th 2002	9,87	11,10	11,60	8,38	7,01	0	0	0,325	0,655
Feb 12th 2003	8,41	8,29	9,45	7,29	6,64	1	0	0,137	0,423
May14th 2003	7,64	7,00	9,00	7,34	6,75	1	0	-0,046	0,333
Aug 13th 2003	7,42	7,90	8,50	6,75	6,46	0	0	0,170	0,316
Nov 12th 2003	6,87	7,20	7,80	6,64	6,11	0	0	0,084	0,277
Feb 11th 2004	6,74	7,25	7,00	6,84	6,09	1	0	0,060	0,149
May 12th 2004	6,87	7,15	7,20	6,44	n.a	0	n.a	0,110	n.a
Aug 18th 2004	6,51	6,30	6,75	6,04	n.a	1	n.a	0,043	n.a
Nov 16th 2004	6,05	6,30	6,85	5,97	n.a	0	n.a	0,055	n.a
Mar 1th 2005	5,84	5,60	5,85	n.a	n.a	n.a	n.a	n.a	n.a
Mean Absolute Error (MAE)								0,118	0,446
Root Mean Squared Error (RMSE) %								0,147	0,481

Notes:

A : 3month Exchange Rate Change (1=Correct, 0=Incorrect)

B : 12month Exchange Rate Change (1=Correct, 0=Incorrect)

C : 3month forecast error defined as: $e_t = (E_t(S_{t+3}) - S_{t+e}) / S_{t+3}$)

D : 12month forecast error defined as: $e_t = (E_t(S_{t+12)} - S_{t+12}) / S_{t+12}$)

APPENDIX B

- Forward Speculation Strategy

Calendar Date/Forecast Period	USD per Euro								
	S_t	E_tS_{t+3}	E_tS_{t+12}	S_{t+3}	S_{t+12}	$F_{t,3}$	$F_{t,12}$	A	B
Feb 13th 2002	0,87	0,90	0,92	0,91	1,08	0,87	0,86	4,598	25,581
May 15th 2002	0,91	0,91	0,92	0,98	1,14	0,90	0,90	8,889	26,667
Aug 7th 2002	0,97	1,00	1,01	1,00	1,14	0,97	0,96	3,093	18,750
Nov 6th 2002	1,00	1,01	1,00	1,08	1,14	0,99	0,98	9,091	16,327
Feb 12th 2003	1,07	1,02	1,07	1,15	1,28	1,07	1,06	-7,477	20,755
May14th 2003	1,15	1,17	1,25	1,13	1,19	1,15	1,14	-1,739	4,386
Aug 13th 2003	1,13	1,21	1,24	1,17	1,24	1,13	1,12	3,540	10,714
Nov 12th 2003	1,16	1,22	1,25	1,28	1,30	1,16	1,15	10,345	13,043
Feb 11th 2004	1,28	1,32	1,37	1,19	1,29	1,26	1,26	-5,556	2,381
May 12th 2004	1,19	1,19	1,22	1,22	n.a	1,19	1,17	no action	n.a
Aug 18th 2004	1,23	1,23	1,22	1,29	n.a	1,23	1,23	no action	n.a
Nov 16th 2004	1,30	1,30	1,25	1,30	n.a	1,30	1,30	no action	n.a
Mar 1th 2005	1,32	1,38	1,34	n.a	n.a	1,32	1,33	n.a	n.a
Average Rate of Return (%)								2,754	15,400
Std. Deviat. (σ)								6,087	8,094
R/V Ratio*								0,452	1,903

Notes:

A: 3 month rate of return (%)

B: 12 month rate of return (%)

* Reward / Variability Ratio

Calendar Date/Forecast Period	Japanese Yen (JPY per USD)								
	S_t	E_tS_{t+3}	E_tS_{t+12}	S_{t+3}	S_{t+12}	$F_{t,3}$	$F_{t,12}$	A	B
Feb 13th 2002	133,24	138,00	136,00	127,53	120,38	132,66	130,10	-3,867	-7,471
May 15th 2002	127,85	126,00	126,00	117,26	116,03	127,24	124,45	7,843	-6,766
Aug 7th 2002	120,33	118,00	117,00	121,35	118,86	119,79	118,21	-1,302	-0,550
Nov 6th 2002	122,22	122,30	120,00	119,74	110,16	121,74	120,30	-1,643	8,429
Feb 12th 2003	121,31	126,40	120,60	116,88	105,38	120,93	119,66	-3,349	-11,934
May14th 2003	116,16	117,00	115,00	119,17	114,29	115,77	114,70	2,937	-0,357
Aug 13th 2003	119,20	116,00	110,00	108,31	110,57	118,85	117,61	8,868	5,986
Nov 12th 2003	108,66	105,00	98,00	105,38	105,42	108,33	107,03	2,723	1,504
Feb 11th 2004	105,34	101,00	95,00	113,49	105,61	105,06	103,93	-8,024	-1,616
May 12th 2004	113,17	106,00	98,00	111,03	n.a	112,81	110,90	1,578	n.a
Aug 18th 2004	109,65	104,00	102,00	104,33	n.a	109,17	107,26	4,433	n.a
Nov 16th 2004	105,38	101,00	105,00	105,60	n.a	104,77	102,46	-0,792	n.a
Mar 1th 2005	104,37	96,00	100,00	n.a	n.a	103,61	100,80	n.a	n.a
Average Rate of Return (%)								0,784	-1,419
Std. Deviat. (σ)								4,713	6,129
R/V Ratio*								0,166	-0,232

Notes:

A: 3 month rate of return (%)

B: 12 month rate of return (%)

* Reward / Variability Ratio

Calendar Date/Forecast Period	Australian Dollar (AUD per USD)								
	S_t	E_tS_{t+3}	E_tS_{t+12}	S_{t+3}	S_{t+12}	$F_{t,3}$	$F_{t,12}$	A	B
Feb 13th 2002	1,96	1,83	1,70	1,83	1,68	1,98	2,01	7,576	16,418
May 15th 2002	1,82	1,80	1,74	1,84	1,56	1,84	1,87	0,000	16,578
Aug 7th 2002	1,86	1,80	1,61	1,77	1,54	1,88	1,92	5,851	19,792
Nov 6th 2002	1,77	1,79	1,59	1,69	1,41	1,79	1,84	no action	23,370
Feb 12th 2003	1,70	1,69	1,59	1,54	1,27	1,71	1,75	9,942	27,429
May14th 2003	1,55	1,54	1,43	1,52	1,45	1,56	1,60	2,564	9,375
Aug 13th 2003	1,52	1,45	1,49	1,39	1,39	1,54	1,58	9,740	12,025
Nov 12th 2003	1,40	1,39	1,47	1,27	1,30	1,41	1,45	9,929	-10,345
Feb 11th 2004	1,27	1,25	1,20	1,44	1,27	1,29	1,33	-11,628	4,511
May 12th 2004	1,43	1,39	1,35	1,40	n.a	1,45	1,49	3,448	n.a
Aug 18th 2004	1,40	1,37	1,35	1,29	n.a	1,41	1,44	8,511	n.a
Nov 16th 2004	1,29	1,32	1,37	1,28	n.a	1,31	1,33	-2,290	n.a
Mar 1th 2005	1,27	1,22	1,23	n.a	n.a	1,28	1,30	n.a	n.a
Average Rate of Return (%)								3,968	13,239
Std. Deviat. (σ)								6,340	10,630
R/V Ratio*								0,626	1,245

Notes:

A: 3 month rate of return (%)

B: 12 month rate of return (%)

* Reward / Variability Ratio

Calendar Date/Forecast Period	USD per GBP								
	S_t	E_tS_{t+3}	E_tS_{t+12}	S_{t+3}	S_{t+12}	$F_{t,3}$	$F_{t,12}$	A	B
Feb 13th 2002	1,43	1,45	1,47	1,46	1,62	1,42	1,40	2,817	15,714
May 15th 2002	1,46	1,47	1,46	1,54	1,62	1,45	1,43	6,207	13,287
Aug 7th 2002	1,54	1,57	1,59	1,58	1,62	1,53	1,50	3,268	8,000
Nov 6th 2002	1,56	1,57	1,58	1,64	1,67	1,55	1,52	5,806	9,868
Feb 12th 2003	1,62	1,60	1,62	1,61	1,89	1,61	1,58	0,000	19,620
May14th 2003	1,62	1,63	1,67	1,60	1,76	1,61	1,58	-0,621	11,392
Aug 13th 2003	1,61	1,68	1,69	1,69	1,84	1,60	1,57	5,625	17,197
Nov 12th 2003	1,67	1,72	1,76	1,89	1,86	1,66	1,63	13,855	14,110
Feb 11th 2004	1,89	1,85	1,93	1,76	1,87	1,87	1,83	5,882	2,186
May 12th 2004	1,77	1,79	1,82	1,82	n.a	1,76	1,73	3,409	n.a
Aug 18th 2004	1,82	1,84	1,79	1,85	n.a	1,81	1,77	2,210	n.a
Nov 16th 2004	1,85	1,84	1,74	1,88	n.a	1,84	1,82	no action	n.a
Mar 1th 2005	1,92	1,99	1,91	n.a	n.a	1,91	1,98	n.a	n.a
Average Rate of Return (%)								4,405	12,375
Std. Deviat. (σ)								3,723	4,955
R/V Ratio*								1,183	2,498

Notes:

A: 3 month rate of return (%)

B: 12 month rate of return (%)

* Reward / Variability Ratio

Calendar Date/Forecast Period	Canadian Dollar (CAD per USD)								
	S_t	E_tS_{t+3}	E_tS_{t+12}	S_{t+3}	S_{t+12}	$F_{t,3}$	$F_{t,12}$	A	B
Feb 13th 2002	1,59	1,56	1,49	1,56	1,52	1,59	1,59	1,887	4,403
May 15th 2002	1,56	1,53	1,47	1,56	1,38	1,59	1,57	1,887	12,102
Aug 7th 2002	1,58	1,55	1,45	1,55	1,40	1,59	1,60	2,516	12,500
Nov 6th 2002	1,56	1,56	1,45	1,52	1,34	1,56	1,58	no action	15,190
Feb 12th 2003	1,53	1,54	1,46	1,39	1,32	1,53	1,56	-0,092	15,385
May14th 2003	1,38	1,38	1,30	1,39	1,39	1,37	1,41	0,015	1,418
Aug 13th 2003	1,38	1,36	1,30	1,30	1,31	1,39	1,41	0,065	7,092
Nov 12th 2003	1,30	1,29	1,29	1,32	1,19	1,31	1,32	-0,763	9,848
Feb 11th 2004	1,32	1,28	1,25	1,39	1,24	1,32	1,33	-5,303	6,767
May 12th 2004	1,39	1,35	1,32	1,33	n.a	1,39	1,39	4,317	n.a
Aug 18th 2004	1,31	1,30	1,32	1,21	n.a	1,31	1,31	7,634	n.a
Nov 16th 2004	1,19	1,20	1,25	1,24	n.a	1,19	1,20	4,202	n.a
Mar 1th 2005	1,24	1,22	1,26	n.a	n.a	1,24	1,23	n.a	n.a
Average Rate of Return (%)								1,488	9,412
Std. Deviat. (σ)								3,196	4,563
R/V Ratio*								0,465	2,063

Notes:

A: 3 month rate of return (%)

B: 12 month rate of return (%)

* Reward / Variability Ratio

Calendar Date/Forecast Period	Danish Krone (DKK per USD)								
	S_t	E_tS_{t+3}	E_tS_{t+12}	S_{t+3}	S_{t+12}	$F_{t,3}$	$F_{t,12}$	A	B
Feb 13th 2002	8,52	8,28	8,10	8,16	6,85	8,55	8,64	4,561	20,718
May 15th 2002	8,19	8,22	8,06	7,56	6,49	8,22	8,32	no action	21,995
Aug 7th 2002	7,63	7,45	7,35	7,36	6,53	8,66	7,77	15,012	15,959
Nov 6th 2002	7,45	7,33	7,43	6,86	6,51	7,48	7,58	8,289	14,116
Feb 12th 2003	6,94	7,26	6,92	6,43	5,82	6,96	7,02	-7,615	17,094
May14th 2003	6,45	6,40	5,95	6,61	6,27	6,47	6,52	-2,164	3,834
Aug 13th 2003	6,57	6,20	6,00	6,35	6,02	6,58	6,63	3,495	9,201
Nov 12th 2003	6,38	6,10	5,95	5,82	5,73	6,40	6,44	9,063	11,025
Feb 11th 2004	5,82	5,60	5,40	6,29	5,78	5,83	5,87	-7,890	1,533
May 12th 2004	6,24	6,22	6,10	6,08	n.a	6,26	6,27	2,875	n.a
Aug 18th 2004	6,03	6,05	6,09	5,74	n.a	6,04	6,04	-4,967	n.a
Nov 16th 2004	5,73	5,72	5,92	5,73	n.a	5,73	5,70	0,000	n.a
Mar 1th 2005	5,64	5,40	5,54	n.a	n.a	5,63	5,58	n.a	n.a
Average Rate of Return (%)								1,878	12,831
Std. Deviat. (σ)								6,930	6,673
R/V Ratio*								0,271	1,923

Notes:

A: 3 month rate of return (%)

B: 12 month rate of return (%)

* Reward / Variability Ratio

Calendar Date/Forecast Period	Swedish Krone (SEK per USD)								
	S_t	E_tS_{t+3}	E_tS_{t+12}	S_{t+3}	S_{t+12}	$F_{t,3}$	$F_{t,12}$	A	B
Feb 13th 2002	10,59	9,86	9,48	10,24	8,40	10,64	10,79	3,759	22,150
May 15th 2002	10,12	9,74	9,44	9,42	8,05	10,22	10,38	7,828	22,447
Aug 7th 2002	9,56	9,04	8,53	9,05	8,10	9,65	9,84	6,218	17,683
Nov 6th 2002	9,09	8,79	8,62	8,48	7,88	9,18	9,37	7,625	15,902
Feb 12th 2003	8,53	8,88	8,08	7,93	7,13	8,56	8,71	-7,360	18,140
May14th 2003	8,00	7,65	7,00	8,17	7,72	8,01	8,13	-1,998	5,043
Aug 13th 2003	8,15	7,35	7,10	7,63	7,46	8,20	8,30	6,951	10,120
Nov 12th 2003	7,72	7,10	6,96	7,13	6,92	7,73	7,82	7,762	11,509
Feb 11th 2004	7,11	6,85	6,40	7,74	7,08	7,16	7,22	-8,101	1,939
May 12th 2004	7,69	7,66	7,20	7,52	n.a	7,71	7,72	2,464	n.a
Aug 18th 2004	7,48	7,34	7,46	6,93	n.a	7,49	7,50	7,477	n.a
Nov 16th 2004	6,91	6,94	7,20	6,97	n.a	6,90	6,88	1,014	n.a
Mar 1th 2005	6,87	6,66	6,72	n.a	n.a	6,85	6,78	n.a	n.a
Average Rate of Return (%)								2,803	13,882
Std. Deviat. (σ)								5,577	6,823
R/V Ratio*								0,503	2,035

Notes:

A: 3 month rate of return (%)

B: 12 month rate of return (%)

* Reward / Variability Ratio

Calendar Date/Forecast Period	Swiss Franc (CHF per USD)								
	S_t	E_tS_{t+3}	E_tS_{t+12}	S_{t+3}	S_{t+12}	$F_{t,3}$	$F_{t,12}$	A	B
Feb 13th 2002	1,70	1,68	1,67	1,60	1,35	1,70	1,69	5,882	20,118
May 15th 2002	1,60	1,64	1,65	1,49	1,33	1,60	1,59	-6,875	-16,352
Aug 7th 2002	1,50	1,47	1,49	1,45	1,35	1,49	1,48	2,685	-8,784
Nov 6th 2002	1,46	1,45	1,52	1,35	1,38	1,46	1,45	7,534	-4,828
Feb 12th 2003	1,37	1,43	1,38	1,31	1,23	1,37	1,36	-4,380	-9,559
May14th 2003	1,32	1,30	1,23	1,37	1,30	1,31	1,30	-4,580	0,000
Aug 13th 2003	1,37	1,27	1,25	1,34	1,24	1,36	1,35	1,471	8,148
Nov 12th 2003	1,35	1,26	1,23	1,23	1,17	1,34	1,33	8,209	12,030
Feb 11th 2004	1,23	1,17	1,11	1,30	1,21	1,23	1,22	-5,691	0,820
May 12th 2004	1,29	1,28	1,23	1,26	n.a	1,28	1,27	no action	n.a
Aug 18th 2004	1,24	1,22	1,20	1,17	n.a	1,24	1,23	5,645	n.a
Nov 16th 2004	1,18	1,19	1,18	1,19	n.a	1,17	1,15	1,709	n.a
Mar 1th 2005	1,17	1,07	1,12	n.a	n.a	1,16	1,14	n.a	n.a
Average Rate of Return (%)								1,055	0,177
Std. Deviat. (σ)								5,313	10,931
R/V Ratio*								0,199	0,016

Notes:

A: 3 month rate of return (%)

B: 12 month rate of return (%)

* Reward / Variability Ratio

Calendar Date/Forecast Period	Chinese Yuan (CNY per USD)								
	S_t	E_tS_{t+3}	E_tS_{t+12}	S_{t+3}	S_{t+12}	$F_{t,3}$	$F_{t,12}$	A	B
Feb 13th 2002	8,28	8,27	8,23	8,28	8,28	8,29	8,34	0,121	0,719
May 15th 2002	8,28	8,26	8,20	8,28	8,28	8,29	8,31	0,121	0,361
Aug 7th 2002	8,28	8,26	8,20	8,28	8,28	8,28	8,29	0,000	0,121
Nov 6th 2002	8,28	8,26	8,18	8,28	8,28	8,28	8,29	0,000	0,121
Feb 12th 2003	8,28	8,26	8,20	8,28	8,28	8,27	8,22	-0,121	-0,730
May14th 2003	8,28	8,27	8,23	8,28	8,28	8,26	8,20	0,242	0,976
Aug 13th 2003	8,28	8,28	8,18	8,28	8,28	8,26	8,15	0,242	1,595
Nov 12th 2003	8,28	8,28	8,17	8,28	8,28	8,24	7,95	0,485	4,151
Feb 11th 2004	8,28	8,20	7,80	8,28	8,28	8,18	7,86	1,222	-5,344
May 12th 2004	8,28	7,95	7,60	8,28	n.a	8,26	8,11	-0,242	n.a
Aug 18th 2004	8,28	8,20	7,80	8,28	n.a	8,25	8,11	-0,364	n.a
Nov 16th 2004	8,28	8,06	7,60	8,28	n.a	8,15	7,89	-1,595	n.a
Mar 1th 2005	8,28	7,95	7,70	n.a	n.a	8,20	7,94	n.a	n.a
Average Rate of Return (%)								0,009	0,219
Std. Deviat. (σ)								0,621	2,358
R/V Ratio*								0,015	0,093

Notes:

A: 3 month rate of return (%)

B: 12 month rate of return (%)

* Reward / Variability Ratio

Calendar Date/Forecast Period	Singapore Dollar (SGD per USD)								
	S_t	E_tS_{t+3}	E_tS_{t+12}	S_{t+3}	S_{t+12}	$F_{t,3}$	$F_{t,12}$	A	B
Feb 13th 2002	1,83	1,82	1,78	1,80	1,75	1,83	1,81	1,639	3,315
May 15th 2002	1,80	1,79	1,74	1,75	1,72	1,80	1,78	2,778	3,371
Aug 7th 2002	1,77	1,74	1,70	1,76	1,76	1,76	1,75	0,000	-0,571
Nov 6th 2002	1,77	1,79	1,74	1,74	1,74	1,76	1,76	-1,136	1,136
Feb 12th 2003	1,76	1,75	1,72	1,73	1,67	1,76	1,75	1,705	4,571
May14th 2003	1,73	1,71	1,72	1,75	1,73	1,72	1,71	-1,744	1,170
Aug 13th 2003	1,75	1,74	1,72	1,73	1,71	1,75	1,75	1,143	2,286
Nov 12th 2003	1,73	1,70	1,68	1,67	1,65	1,73	1,72	3,468	4,070
Feb 11th 2004	1,67	1,68	1,65	1,72	1,65	1,67	1,66	2,994	0,602
May 12th 2004	1,72	1,66	1,60	1,72	n.a	1,72	1,72	0,000	n.a
Aug 18th 2004	1,71	1,68	1.65	1,66	n.a	1,71	1,70	2,924	n.a
Nov 16th 2004	1,65	1,64	1,64	1,64	n.a	1,65	1,63	0,606	n.a
Mar 1th 2005	1,62	1,59	1,58	n.a	n.a	1,62	1,60	n.a	n.a
Average Rate of Return (%)								1,198	2,217
Std. Deviat. (σ)								1,624	1,639
R/V Ratio*								0,738	1,353

Notes:

A: 3 month rate of return (%)

B: 12 month rate of return (%)

* Reward / Variability Ratio

Calendar Date/Forecast Period	South Korean Won (KRW per USD)								
	S_t	E_tS_{t+3}	E_tS_{t+12}	S_{t+3}	S_{t+12}	$F_{t,3}$	$F_{t,12}$	A	B
Feb 13th 2002	1.315,00	1.317,00	1.281,00	1.281,50	1.202,90	1334,35	1357,50	3,961	11,389
May 15th 2002	1.272,00	1.270,00	1.232,00	1.183,50	1.197,75	1286,65	1309,10	8,017	8,506
Aug 7th 2002	1.203,45	1.170,00	1.116,00	1.217,40	1.188,45	1212,35	1236,70	-0,417	3,902
Nov 6th 2002	1.223,00	1.254,00	1.185,00	1.176,65	1.184,45	1231,35	1258,35	-4,442	5,873
Feb 12th 2003	1.193,50	1.185,00	1.181,00	1.197,50	1.160,25	1208,40	1232,75	0,902	5,881
May14th 2003	1.197,50	1.150,00	1.250,00	1.180,05	1.186,88	1208,70	1227,80	2,370	-3,333
Aug 13th 2003	1.179,50	1.130,00	1.150,00	1.168,65	1.162,05	1188,30	1208,40	1,654	3,836
Nov 12th 2003	1.174,40	1.100,00	1.020,00	1.160,25	1.103,72	1182,20	1198,55	1,857	7,912
Feb 11th 2004	1.160,12	1.130,00	1.050,00	1.187,83	1.036,69	1162,25	1176,50	-2,201	11,884
May 12th 2004	1.183,50	1.105,00	1.100,00	1.159,50	n.a	1189,75	1200,10	2,543	n.a
Aug 18th 2004	1.158,47	1.100,00	1.120,00	1.066,90	n.a	1163,25	1170,35	8,283	n.a
Nov 16th 2004	1.092,50	1.100,00	1.150,00	1.027,19	n.a	1094,15	1093,50	-6,120	n.a
Mar 1th 2005	1.006,50	985,00	1.000,00	n.a	n.a	1004,05	1003,25	n.a	n.a
AverageRate of Return (%)								1,367	6,205
Std. Deviat. (σ)								4,157	4,339
R/V Ratio*								0,329	1,430

Notes:

A: 3 month rate of return (%)

B: 12 month rate of return (%)

* Reward / Variability Ratio

Calendar Date/Forecast Period	Brazilian Real (BRL per USD)								
	S_t	E_tS_{t+3}	E_tS_{t+12}	S_{t+3}	S_{t+12}	$F_{t,3}$	$F_{t,12}$	A	B
Feb 13th 2002	2,42	2,53	2,51	2,49	3,64	n.a	n.a	n.a	n.a
May 15th 2002	2,51	2,55	2,53	3,19	2,93	n.a	n.a	n.a	n.a
Aug 7th 2002	3,06	2,77	2,62	3,62	3,01	n.a	n.a	n.a	n.a
Nov 6th 2002	3,60	4,13	4,00	3,60	2,87	n.a	n.a	n.a	n.a
Feb 12th 2003	3,60	3,76	3,65	2,88	2,90	n.a	n.a	n.a	n.a
May14th 2003	2,89	3,20	3,40	3,01	3,10	n.a	n.a	n.a	n.a
Aug 13th 2003	3,03	3,20	3,30	2,92	3,02	n.a	n.a	n.a	n.a
Nov 12th 2003	2,91	3,10	3,25	2,90	2,80	n.a	n.a	n.a	n.a
Feb 11th 2004	2,92	2,85	3,00	3,10	2,62	n.a	n.a	n.a	n.a
May 12th 2004	3,12	2,92	3,10	3,03	n.a	n.a	n.a	n.a	n.a
Aug 18th 2004	2,99	3,08	3,15	2,76	n.a	n.a	n.a	n.a	n.a
Nov 16th 2004	2,79	2,97	3,11	2,59	n.a	n.a	n.a	n.a	n.a
Mar 1th 2005	2,60	2,65	2,80	n.a	n.a	n.a	n.a	n.a	n.a

Notes:

A: 3 month rate of return (%)

B: 12 month rate of return (%)

Calendar Date/Forecast Period	Mexican Peso (MXN per USD)								
	S_t	E_tS_{t+3}	E_tS_{t+12}	S_{t+3}	S_{t+12}	$F_{t,3}$	$F_{t,12}$	A	B
Feb 13th 2002	9,06	9,33	9,79	9,53	10,95	9,22	9,71	3,362	12,770
May 15th 2002	9,44	9,27	9,69	9,94	10,43	9,62	10,00	-3,326	-4,300
Aug 7th 2002	9,76	9,64	9,60	10,25	10,68	9,89	10,43	-3,640	-2,397
Nov 6th 2002	11,17	9,83	10,20	10,90	10,97	10,35	11,02	-5,314	0,454
Feb 12th 2003	10,96	10,70	10,60	10,19	10,97	11,21	11,92	9,099	7,970
May14th 2003	10,23	10,50	10,70	10,70	11,64	10,27	10,75	4,187	-8,279
Aug 13th 2003	10,72	10,60	10,80	11,15	11,38	10,86	11,31	-2,670	-0,619
Nov 12th 2003	11,12	11,00	11,30	10,97	11,36	11,16	11,56	1,703	1,730
Feb 11th 2004	11,01	11,30	11,60	11,61	11,15	11,17	11,61	3,939	3,962
May 12th 2004	11,63	11,70	11,60	11,43	n.a	11,81	12,31	3,218	n.a
Aug 18th 2004	11,36	11,60	11,60	11,34	n.a	11,51	12,04	-1,477	n.a
Nov 16th 2004	11,36	11,50	11,90	11,15	n.a	11,54	12,09	3,380	n.a
Mar 1th 2005	11,11	11,40	11,90	n.a	n.a	11,29	11,81	n.a	n.a
Average Rate of Return (%)								1,038	1,255
Std. Deviat. (σ)								4,090	6,005
R/V Ratio*								0,254	0,209

Notes:

A: 3 month rate of return (%)

B: 12 month rate of return (%)

* Reward / Variability Ratio

Calendar Date/Forecast Period	Polish Zloty (PLN per USD)								
	S_t	E_tS_{t+3}	E_tS_{t+12}	S_{t+3}	S_{t+12}	$F_{t,3}$	$F_{t,12}$	A	B
Feb 13th 2002	4,18	3,78	3,77	4,06	3,84	4,27	4,49	4,918	14,477
May 15th 2002	4,08	4,10	3,66	4,17	3,79	4,16	4,35	-0,240	12,874
Aug 7th 2002	4,20	4,05	4,07	3,97	3,83	4,27	4,45	7,026	13,933
Nov 6th 2002	3,98	3,87	3,84	3,85	4,01	4,02	4,16	4,229	3,606
Feb 12th 2003	3,86	4,06	3,65	3,76	3,81	3,91	4,03	-3,836	5,459
May14th 2003	3,77	3,70	3,30	3,87	4,02	3,80	3,90	-1,842	-3,024
Aug 13th 2003	3,86	3,50	3,30	3,91	3,59	3,91	4,01	0,000	10,474
Nov 12th 2003	3,92	3,69	3,44	3,81	3,29	3,98	4,10	4,271	19,756
Feb 11th 2004	3,79	3,60	3,40	4,03	3,12	3,87	3,99	-4,134	21,805
May 12th 2004	4,02	3,90	3,70	3,61	n.a	4,06	4,20	11,084	n.a
Aug 18th 2004	3,61	3,60	3,50	3,28	n.a	3,67	3,80	10,627	n.a
Nov 16th 2004	3,29	3,21	3,20	3,06	n.a	3,32	3,41	7,831	n.a
Mar 1th 2005	2,97	2,86	2,84	n.a	n.a	2,99	3,02	n.a	n.a
Average Rate of Return (%)								3,328	11,040
Std. Deviat. (σ)								5,076	7,453
R/V Ratio*								0,656	1,481

Notes:

A: 3 month rate of return (%)

B: 12 month rate of return (%)

* Reward / Variability Ratio

Calendar Date/Forecast Period	Russian Rouble (RUB per USD)								
	S_t	E_tS_{t+3}	E_tS_{t+12}	S_{t+3}	S_{t+12}	$F_{t,3}$	$F_{t,12}$	A	B
Feb 13th 2002	30,84	32,10	33,70	31,21	31,71	n.a	n.a	n.a	n.a
May 15th 2002	31,25	33,00	35,80	31,54	30,98	n.a	n.a	n.a	n.a
Aug 7th 2002	31,53	32,30	33,40	31,78	30,30	n.a	n.a	n.a	n.a
Nov 6th 2002	31,79	32,40	33,90	31,84	29,81	n.a	n.a	n.a	n.a
Feb 12th 2003	31,78	32,70	34,70	31,10	28,53	n.a	n.a	n.a	n.a
May14th 2003	30,98	31,50	31,70	30,38	29,08	n.a	n.a	n.a	n.a
Aug 13th 2003	30,35	30,00	29,00	29,81	29,28	n.a	n.a	n.a	n.a
Nov 12th 2003	29,80	30,30	31,10	28,53	28,69	n.a	n.a	n.a	n.a
Feb 11th 2004	28,50	27,00	26,00	28,95	28,09	n.a	n.a	n.a	n.a
May 12th 2004	28,99	28,70	28,00	29,25	n.a	n.a	n.a	n.a	n.a
Aug 18th 2004	29,22	29,00	29,00	28,27	n.a	n.a	n.a	n.a	n.a
Nov 16th 2004	28,67	28,60	28,20	28,02	n.a	n.a	n.a	n.a	n.a
Mar 1th 2005	27,70	27,30	27,70	n.a	n.a	n.a	n.a	n.a	n.a

Notes:

A: 3 month rate of return (%)

B: 12 month rate of return (%)

Calendar Date/Forecast Period	South Africa Rand (ZAR per USD)								
	S_t	E_tS_{t+3}	E_tS_{t+12}	S_{t+3}	S_{t+12}	$F_{t,3}$	$F_{t,12}$	A	B
Feb 13th 2002	11,47	12,64	13,98	10,10	8,29	11,76	12,56	-14,116	-33,997
May 15th 2002	10,21	10,80	12,90	10,63	8,03	12,98	11,25	18,105	-28,622
Aug 7th 2002	10,43	10,90	11,40	9,77	7,27	10,73	11,59	-8,947	37,274
Nov 6th 2002	9,87	11,10	11,60	8,38	7,01	12,90	11,09	35,039	-36,790
Feb 12th 2003	8,41	8,29	9,45	7,29	6,64	10,88	17,92	32,996	62,946
May14th 2003	7,64	7,00	9,00	7,34	6,75	9,94	15,75	26,157	57,143
Aug 13th 2003	7,42	7,90	8,50	6,75	6,46	9,25	13,39	27,027	51,755
Nov 12th 2003	6,87	7,20	7,80	6,64	6,11	7,00	7,32	-5,143	-16,530
Feb 11th 2004	6,74	7,25	7,00	6,84	6,09	8,16	12,19	16,176	50,041
May 12th 2004	6,87	7,15	7,20	6,44	n.a	8,12	11,68	20,690	n.a
Aug 18th 2004	6,51	6,30	6,75	6,04	n.a	6,58	6,86	8,207	n.a
Nov 16th 2004	6,05	6,30	6,85	5,97	n.a	6,13	6,32	-2,610	n.a
Mar 1th 2005	5,84	5,60	5,85	n.a	n.a	5,92	6,07	n.a	n.a
Average Rate of Return (%)								12,798	15,913
Std. Deviat. (σ)								16,235	40,991
R/V Ratio*								0,788	0,388

Notes:

A: 3 month rate of return (%)

B: 12 month rate of return (%)

* Reward / Variability Ratio