THE FORWARD PREMIUM PUZZLE REVISITED

by

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ABSTRACT

ANAN ZHUANG. The forward premium puzzle revisited. (Under the direction of DR. LLOYD BLENMAN)

The forward premium puzzle in currency markets is the standard empirical finding that the expected changes in currency exchange rates and interest rate differential are negatively correlated, implying a violation of uncovered interest rate parity in the data. This dissertation solves the forward premium puzzle by introducing a new generalized risk factor that consistently changes the negative slope to positive across 11 countries. In this dissertation, I conclude that, the forward premium puzzle is likely to be caused by large but infrequent shocks to the exchange spot rates. The shocks could be the market participants inability of forecasting the exchange rate movement given short-term information. Over the long run, the market participants are more likely to learn and make accurate forecasting which cause a less violation of the UIP at the long horizon. The second explanation is the carry trade holding risk. Over the long run, the carry trade unwinding happens which reduce the violation of the UIP. Finally, the empirical evidence shows that conventional theories of risk do not explain the forward premium puzzle.

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CHAPTER 1: INTRODUCTION

According to the hypothesis of uncovered interest rate parity (UIP), expected changes in the exchange rate between any currency pair should be positively related to the changes in the interest rates across the country currency pairs. In particular, the IRP hypothesis also implies that in the regression of exchange rate changes on the interest rate differentials, the slope coefficient should be one. [1]

The forward premium puzzle, which is first famously defined in Fama (1984), reveals an empirical negative relationship between exchange rate changes and interest rate differentials for each of nine major currencies. This seminal paper is the first to conclusively explain the meaning of the negative slope and decompose a time varying risk premium from the forward exchange rates. The negative slope is due to the fact that the risk premium has large variance and is negatively correlated to the future exchange rate.[2] However, the author fails to provide a solution to the puzzle.

Among the previous attempts to solve the puzzle, the explanations fall into two main categories: (a) the foreign exchange risk premium which is perhaps time-varying

[1]The forward premium puzzle is linked with IRP theory which suggests that, in any country's currency pair, the country with the higher interest rate should see its currency depreciate in the future spot market. If the forward rate equals the expected future spot rate, then ex-ante the two hypotheses are equivalent.

[2]Fama (1984) splits the forward rate, a purely deterministic rate in his setting, into an expected future spot rate and a risk premium. There are variations in both the risk premium and the expected depreciation of the spot rate components. However, this was a purely mechanical decomposition and there are multiple other potential ways of addressing the premiums in the forward market. Based on his conjecture of market efficiency and trader rationality, he attributes most of the variation in the forward currency rates to variation in the risk premium component without specifying what causes these risks. Most of the variations in forward currency rates are from the risk premium component.

and (b) investor's forecast error. The risk premium explanation assumes that investors in the foreign exchange market are rational and risk-averse. The risk premium is a compensation to investors for holding a volatile foreign asset. Thus, the interest rate differential across countries not only reflects the future exchange rate depreciation as shown in the UIP hypothesis, but also contains a risk premium as a hedge which causes a violation of the UIP hypothesis. As a result, the change of interest rate or the interest rate differential across country pairs is not an unbiased forecast of the expected exchange rate depreciation. However, a wide variety of economic models on risk premium fail to provide empirical evidence to correct the negative slope sign.[3]

An alternative class of explanation of the forward premium puzzle is the forecast error. Forecast error is defined as the difference between the exchange rate forecast and the exchange rate realization. Many papers in the literature argue that the foreign exchange market is a decentralized market in which market makers and traders play a central role.[4] Market traders are not always rational which in turn introduce forecast error in the forward premium. Therefore, the forward premium puzzle may possibly be, at times, a deviation from rational expectations in foreign exchange markets.[5]

These two explanations are not mutually exclusive.[6] Frankel and Chinn (1993) and Cavaglia et al. (1994) find evidence of both effects from survey data which helps to decompose the forward premium bias into a forecast error component and a risk premium component. But the use of survey data brings measurement and

[3] See Mark (1988), Backus et al. (1993), Hodrick (1989), Bansal et al.(1995), etc.

[4] See Lyons (2001), Sarno and Taylor (2001).

[5] Forecast errors can arise from both trader irrationality as well as from rational behavior on their part. So my approach subsumes that of Fama (1984).

[6] See Lewis (1995).

other errors, such as survey design bias, into play, which is criticized in many papers. Thus, the fact that the previous literature on one class of explanation fail to generate consistent empirical correction results is likely due to the existence of the other factor from time to time.

In this dissertation, I propose a new generalized solution that encompasses both factors, risk premium in the market and forecast errors caused by traders who may be irrational or rational. In my setting, the generalized risk premium factor enters the payoff function multiplicatively rather than through an additive scale factor[7]. The scale factor is decomposable and set in the dissertation to scale the payoffs across both currency pair. The scale factor varies over time and across countries. This permits the model to incorporate many different factors into the payoff function as long as the market participants well realize the uncertainty and ask for a premium in the spot exchange rates. For example, even though interest rates are deterministic, there are still risks embedded in the payment, such as implicit liquidity risk, default risk, delivery risk and expected errors on any contract. All the risks are assumed to be observed and are already estimated by the market participants to scale the payout.[8] After the arrangement, the generalized factor comprises the standard differential of log (interest rates), log exchange rate differentials over time, local volatilities of the exchange rate and a term for all other embedded risks, which may include default

[7]The expected payoff of investing one dollar is equal to the return on the contract multiplied by a scale factor.

[8]The recent literature shows an alternative way to define risk factors. Risk factors can be derived directly from historical currency returns. In stock returns literature, like Fama and French (1993), risk factors can be defined from particular investment strategies or from stock returns characteristics. Lustig et al. (2009) first construct risk factors using excess exchange rate return. Other factors include global currency volatility factor derived by Menkhoff et al. (2012) and skewness factor by Rafferty (2010). All the factors above are from historical exchange rate returns.

and delivery risks.

This dissertation contributes to the literature by providing empirical evidence that the generalized factor consistently corrects negative signs of the slopes to positive for both monthly and daily prices in the empirical regressions.[9] The generalized risk premium factor has considerable economic significance. It shows the possibility of using the historical factor model to solve the puzzle. The risk premium is now measurable and can be extracted from the model. However the coefficients are not significant for the long run. It is hard to find a risk premium or forecast error that can persistently cause the deviation from time to time. For example, transaction costs are expected to fall monotonically over time. Expectation errors are also corrected after a learning process. Other risk components may vary over time in different directions and the effects may be canceled out.

In the dissertation, I assume that the market participants make rational decisions on the risk premiums based on previous historical interest rates and spot rates. However, it is hard to believe that the market participants can make quick adjustment based on short term information. After comparing the short-term and long-term information model, I conclude that UIP is less violated in the long run and the investors make more accurately decisions with a long lag. In the short run, the models present evidence of incomplete and improper adjustment of exchange rate movements. Thus, my empirical finding supports the peso problem explanation which states that UIP is caused by market participant inability to forecast the spot rate movement.

[9]For the monthly regression, I use the interest rate and exchange rate of the last trading day of a month as proxies for the monthly exchange rate and interest rate. Then I can generate a time series of monthly returns. I regress monthly exchange rate changes on interest rate differentials.

Infrequent carry trade unwinding is another explanation for better long-run results. One type of risks that may not be fully captured by the generalized factor using historical returns is an unexpected change in the exchange market. However, it is reasonable to assume a change of currency policy does not count as an unexpected change under certain conditions.[10] In the dissertation, I extend my study to understand whether the generalized risk factor can explain some circumstances under which risks that are hard to be captured by historical returns, like risk from the unexpected carry trade reversal.[11] Carry trade pays off on average, but at times produces big losses.[12] Speculators may trade in random order and when liquidity is tight or a constraint is reached, a sudden unwinding of the carry trade might happen. Investors are well aware of the risk but the size and timing of a carry trade reversal are outside the realm of investors' expectation.

In the dissertation, I also investigate whether the model could capture or even predict the carry trade unwinding. Due to the liquidity constraints, carry trade reversal is more likely to present during the crisis. The model reveals correct signs that match the empirical facts. The coefficients turn back to negative and significant for funding currencies, like Japanese Yen and Swiss Franc, during the financial crisis, which indicates the significant change of carry trade holding. The two holding

[10]Mitchell et al. (2007) argues that exchange market has slow moving capital to currency policy. Any risk triggered from a sudden currency adjustment could be well captured by my generalized factor.

[11]Carry trade is a strategy in which investors borrows a certain currency with a relatively low interest rate and uses the funds to purchase another currency yielding a higher interest rate. Carry trader attempts to benefit from the appreciation of high interest rate currency, the forward rate puzzle. A reversal is the sudden selling pressure of high interest currency and the appreciation of low interest rate currency.

[12]Abreu and Brunnermeier (2003) find that there is always a crash after holding carry trade position. Plantin and Shin (2007) show carry trades are not always stable in a dynamic global environment.

currencies, Australia and Canadian dollar, all have positive coefficients, which show the depreciation of the currencies during the crisis. IMF documents Australian dollar is the biggest profit currency among overall 150 currencies and Australia economy and financial market are relatively healthy. The deprecation is largely due to the unwinding which is captured well by the model. Meanwhile, the short-term model shows evidence of the prediction ability. The coefficients of the funding currencies change signs right before the crisis starts.

Sudden order flow and unexpected unwinding may cause price fluctuation and over or under reaction to the uncertainty. In this article, I use high minus low spread as a proxy for disagreement between investors. The regression results show significance of high low spread coefficients during the financial crisis, indicating the out of control uncertainty which is not reflected in historical returns. However, the coefficient sign is mixed. Over and under reaction may cause different trading directions [13].

Bid and ask spread measures conventional risk, like liquidity risk and default risk. In Burnside et al. (2009), bid and ask spread has more meaning to account for forward premium puzzle. The spread is created by adverse selection problems between participants, not just a risk premium.[14] My results imply that the bid ask spread

[13] During the sudden unwind, different judgement may affect trading directions. For example, when the price hit a low level, some investors believe that it is the bottom and start to buy back the decreasing currency. However, this may be wrong and in this way investors under-react to the crisis. While for the pessimistic investors, they may sell the decreasing currency even the price hit the real bottom which causes over-reaction selling.

[14] Burnside et al. (2009) assume there are informed and uninformed risk neutral traders in the market with market maker. Informed traders have more information than market maker, and the presence of informed investors creates an adverse-selection problem for market maker. When a currency is about to depreciate based on the public information and if the market maker receives a large purchase order, he will quote a high forward ask price because the purchase order is highly likely from informed traders. Forward premiums in ask price and bid ask spread are high in this situation. Consequently, a negative relationship is built that defines the forward premium puzzle.

is not significant as an explanatory variable. First of all, it could be because the generalized factor already captures conventional risk in the historical prices. Second, it further proves that conventional risk premiums cannot explain the puzzle. [15] Third, according to Burnside et al. (2009), active trading size is not large in the foreign exchange market. So the adverse selection problem is not sufficient to generate a large and persistent effect and to create forward premium puzzle. [16]

One more contribution of the dissertation is that the generalized solution is measurable and simple enough to provide an efficient way to check and capture many stylized facts. For example, I find a significant difference between emerging and developed countries from sample statistics and slope sign, which matches Bansal (1997). There is no restrictive assumption for the generalized factor. Fama (1984), Bansal (1997, 2000), and Clarida et al. (2009) are now simply special cases of my model.

The solution is general enough to permit regime difference.[17]In this dissertation, I approach regime test on interest rate differential,[18], outlying observations on both interest rate differential and the generalized factor[19]. There is no obvious regime difference after adding the generalized factor to the regression model. Historical prices already show how the regime difference can arise and affect the behavior of trading. The presence of general solution will correct and leave the sign of slope

[15]Lustig et al. (2011), Menkhoff et al. (2011) and Burnside (2011) show that traditional risk premiums have difficulty in explaining the profitability of the carry trade and instead construct empirical risk factors from the historical returns.

[16]Bacchetta and Wincoop (2007, 2010) also confirm the infrequent trading in foreign exchange market. They posit that only some small hedge fund managers actively manage foreign currency holdings.

[17]Different conditions affect the behavior of states and affect the results. Regime test allows us to check whether the forward premium puzzle is attributed to the effect of some special conditions.

[18]This is a replication of Bansal (1997).

[19]This is an approach applied first by Bilson (1981) in forward premium puzzle.

unaffected by the regime difference.

The rest of the dissertation is organized as follows. Chapter two provides a brief literature review on forward premium puzzle. Chapter three sets up the model and provides an empirical application. Chapter four introduces data and descriptive statistics. Chapter 5 is the empirical analysis. Chapter six shows the regime test and the last Chapter seven is the conclusion.

CHAPTER 2: LITERATURE REVIEW

The uncovered interest rate parity (UIP) is one of the three financial relations [20] that are wildly used in the fields of international finance and macroeconomics in both theoretical framework and practical analysis. The UIP hypothesis implies that change in the exchange rate should be positively related to interest rate differential and the coefficient should be one. However, in the empirical tests, high interest rate currencies always appreciate rather than depreciate as UIP suggests or do not depreciate as much as is implied by the theoretical relation. This empirical puzzle, known in the other name as the forward premium puzzle, and the stylized facts related to the puzzle are well documented in the literature.

2.1 Some Empirical Anomalies and Explanations

2.1.1 The Fama Result

Fama (1984) splits the forward exchange rate (F_t) into two components, an expected future spot rate, $E(S_{t+1})$ and a risk premium. He uses a simple regression test:

$$S_{t+1} - St = \alpha + \beta(F_t - S_t) + \epsilon_{t+1} \tag{1}$$

The purpose of this regression is to show whether the current forward-spot differential, $F_t - S_t$, has a prediction power to explain the movement in the spot rate, $S_{t+1} - S_t$.

[20] The other two parity relationships in international finance literature are purchasing power parity (PPP) and real interest rate equality (RIE).

In other words, if the forward rate is a perfect estimation of the future spot rate, we should observe a positive relationship. However, the coefficient is not close to one and even negative for 122 observations covering the period from August 31, 1973 to December 10, 1982, which means the future spot rate moves oppositely as is stated in the theory. To explain significant negative coefficient, Fama (1984) tests sampling error and uses Zellner's (1962) SUR approach but fails to solve the negative coefficient puzzle. Fama (1984) also tests sub-periods difference because the exchange rate is not well understood by market participants until late 1970's. However none of these results provide reasonable explanations. The negative coefficients are significant and robust for all nine tested countries. Then Fama (1984) leaves a puzzle to international finance literature.

2.1.2 Other Empirical Evidence

Before Fama (1984), Bilson (1981) first introduces a regime test on developed economies to check whether the puzzle is attributed to extreme observations . He tests the model by dividing exchange rate changes into two groups, one group with observations less than ten per cent in absolute value and another group greater than ten per cent in absolute value. He finds that the forward premium puzzle does not exist for small exchange rate changes. However, large exchange rate changes are negatively related to the interest rate differential and the coefficients are greater than unity. Later empirical works, like Froot (1990) and McCallum (1994), confirm that the negative slope is robust and slope parameter in the model has large magnitude which is significantly different from one. Froot (1990) documents the average value of the coefficient over 75 published estimates as -0.88. McCallum (1994) shows an average value for the coefficient of -4. Besides those mentioned above, other well-known literature that document the forward premium puzzle include Hodrick (1987), Bekaert and Hodrick (1993), Bekaert (1996), Dumas and Solnik (1995), Engel (1996), Flood and Rose (1996), Bansal (1997), Bakshi and Naka (1997), Backus, Foresi, and Telmer (2001), Chinn and Meredith (2005), Brennan and Xia (2005) and etc.

2.1.3 Potential Explanations

The explanations fall into two categories, time-varying risk premium and forecast errors. Each track contains quite different assumptions and explanations. Deviations from UIP can arise from two sources: differences between actual and expected exchange rates and differences in the riskiness of the two assets.

$$E_t(S_{ij,t+T}) - S_{ij,t} = R_{j,t+T} - R_{i,t+T} \tag{2}$$

$$E_t(S_{ij,t+T}) - f_{ij,t} + f_{ij,t} - S_{ij,t} = R_{j,t+T} - R_{i,t+T} \tag{3}$$

Risk premium is defined as $E_t(S_{ij,t+T}) - f_{ij,t}$ and forecast error is expressed as $S_{ij,t+T} - E_t(S_{ij,t+T})$. If we combine the risk premium and forecast error terms, we have the excess return:

$$E_t(S_{ij,t+T}) - f_{ij,t} + S_{ij,t+T} - E_t(S_{ij,t+T}) = S_{ij,t+T} - f_{ij,t} \tag{4}$$

In Fama (1984), the expectations of future exchange rate are rational and the excess return above is entirely due to the risk premium. Thus, the variance of the risk premium should exceed the variance of the markets expectations of exchange rate changes. In the other situation, if the risk premium is constant, then excess return is caused only by the forecast error. Then the variation of the excess return arises from the forecast error that is correlated with lagged information.

First of all, the predicted movement in the spot exchange rate could come from an equilibrium process. One possible reason that causes the puzzle is an omitted time-varying risk factor which is negatively correlated with the expected change in the exchange rate. The risk premium could be positive or negative. It is the compensation for domestic investors holding foreign risky assets and converting the return back into local currency in the future. Second, forecast errors may cause the excess returns from time to time. Under the assumption of rational investors, the exchange rate forecast error should be random. However, there are conditions that the exchange rate forecast error will be systematic over time. For example, in the sudden shift of monetary policy, when we have many irrational investors in the market, they may continually anticipate the wrong direction or the wrong return distribution. Systematic forecast error may also be caused from the difficulties in measuring expectations of the excess return. Meanwhile, the two explanations are not mutually exclusive and both of them can explain some aspects of the puzzle.

In the next part, I will briefly explain two risk premium models, static (partial) CAPM and general CAPM. I will introduce the basic idea of partial and general CAPM models and include major papers.

2.2 The Foreign Exchange Risk Premium

2.2.1 The Risk Premium in the Partial Equilibrium CAPM

In the partial equilibrium CAPM model, we always assume two representative agents in two countries, local and foreign countries. The representative agents can hold one home asset and one foreign asset in their portfolios. The investor is assumed to maximize the wealth utility function by choosing the optimal weight on home asset. The first order condition is the basic CAPM relationship. This type of model involves exchange rates, interest rates, and inflation rates as exogenous. The first order condition depends on the variability of the exchange rates and the covariance between exchange rate changes and inflation. Due to the Jensen's inequality term, even there is no risk premium and forecast error, the excess return is not zero and it is equal to the covariance between the exchange rate and inflation. However, in the empirical tests, the covariance between the exchange rate and inflation is near zero. So the Jensen's inequality term is not attributed a lot to the excess return. Engel (1984) and Cumby (1988) have shown that the nominal term and real term of the excess returns do not explain the puzzle.

There is a lot of literature on the static CAPM model. For example, Hansen and Hodrick (1983) develop three linear econometric models of the risk premiums. In economic models, the risk premium is time varying and is determined by aggregate consumption and inflation risk across countries. In their paper, the static CAPM model states that there are representative agents in two countries holding a variety of domestic and foreign assets with a utility function to maximize their returns under exchange rate risk. Static CAPM literature include Frankel (1982, 1983), Frankel and Engel (1984), Engel and Rodrigues (1989), Branson et al. (1977, 1979), Dooley and Isard (1979, 1983) and Lewis (1988*a*).

However, the partial equilibrium models fail to explain the forward premium puzzle. Empirically, asset positions, the conditional variance and covariance terms from the model cannot generate a high degree of variability that is shown in the risk premium. For example, Lewis (1988) shows that the standard deviation of wealth changes measured by the historical data of outside bonds is about 1% to 3%. Basically, the excess returns change sign more frequently, and the risk premiums should also exhibit sufficient variation to explain the variability in the excess return.

2.2.2 The Risk Premium in the General Equilibrium CAPM

In a more general setting, the investors in the market can maximize their utility functions by choosing consumption of any asset. According to the law of one price, the relative price of any asset can be expressed by the nominal exchange rate, which is the marginal rate of substitution in utility between holdings of domestic and foreign money positions. With the above definition and the covered interest parity, the general CAPM model can be solved for the risk premium.

Backus et al. (1993), and Hodrick (1989) propose a general CAPM model in which the forward risk premium is time varying and is determined by aggregate consumption and inflation risks across countries. Yaron (1996) incorporates participation constraints and nominal price rigidities to the general equilibrium model and suggests these improvements may potentially solve the puzzle. Bekaert (1996) builds a complex general CAPM model by introducing a more realistic decision interval for agents. Simulations in the paper show the time aggregation effect can generate more volatile risk premium than traditional general CAPM model.

Empirically, Mark (1985) first tests the general CAPM model using a constant relative risk aversion utility and finds the relative risk aversion parameter cannot be estimated precisely due to the over-identifying restrictions of the model. More general tests for the general CAPM model are done by relaxing the assumption of particular utility functions, like the latent variable models and Hansen-Jaganathan bounds.

For the latent variable model, Hansen and Hodrick (1983) construct constant ratios of covariance by assuming that the conditional covariance between the excess return on asset over the risk free rate and the marginal rate of substitution in consumption move in proportion to each other according to the ratios of the conditional covariance. Their empirical test works only for low frequency data, which is also shown in Lewis (1991). Other empirical tests on the latent variable model include Cumby (1988, 1990), Bekaert and Hodrick (1992). However, as argued in Lewis (1995), although this type of model shows some factors are helpful to explain the excess returns, it is too general to draw any implication since any factor works as long as there is a proportional relationship between returns over time. The Hansen-Jaganathan bounds model provide a lower bound on the volatility of the marginal rate of substitution in consumption but this type of model also fails in the empirical tests, as shown in Bekaert (1994).

Overall, empirical evidence suggests that both static and general CAPM models fail to explain the forward premium puzzle. The main problem is that the risk premium suggested in static and general CAPM model does not match the high variability of exchange rates. As shown in Fama (1984), a negative coefficient indicates the variance of the risk premium must be greater than the variance of expected depreciation. In the static CAPM, bond position changes and conditional variances fail to exhibit large variance. In the general CAPM model, the consumption also fails to provide higher variability that matches the excess returns.

Later work by Engle (1996) concludes that the models of risk premium do not explain the negative relation between the future exchange rate differentials and forward premium even when nonstandard utility functions are applied. Verdelhan (2010) designs a two-country model in which agents are fully rational and characterized by slow-moving external habit preferences, a nonstandard utility function. He uses simulations to show a time-varying exchange risk caused by slow-moving preferences can solve the puzzle.

The implication problem of the risk premium promotes the argument that the risk premium alone cannot fully explain the puzzle. The puzzle may be caused by the systematic forecast errors. The systematic forecast errors may come from two resources: irrational traders in the market and statistical problem with measuring expectations. In the next section, I discuss each of the two explanations.

2.3 The Forecast Error

2.3.1 Inefficient Market and Irrational investors

In Fama (1984), under the rational expectations, the markets forecast error is constant and is not correlated with the forward premium. Then the variation of excess return is completely caused by the time-varying risk premium. If the risk premium is constant, then Fama (1984) model can derive a negative correlation between the forecast error and the forward premium. Froot and Frankel (1989) decompose the risk premium and the forecast error components using survey data, and document a negative relationship between the forecast error and the forward premium, which shows that the forecast error exists and is an important component in explaining the excess return.

Theoretically, the literature argues that foreign exchange market is not an idealized and efficient market and investors in the market are not rational, which may explain why forecast errors are correlated with the lagged forward premium. Frankel and Froot (1987) find the expected exchange rate is significantly different from the realized exchange rate and is dependent on the lagged past exchange rate.

Lyons (2001) and Sarno and Taylor (2001) find that the exchange market is a decentralized, over-the-counter market. There are some irrational investors in the market, and these investors can even get higher returns than rational counterparts. Frankel and Froot (1988) show that irrational investors behavior can explain expectation errors in the survey data. Gourinchas and Tornell (2004) assume there is a distortion in investors' beliefs and this mistake will cause an under-reaction of nominal exchange rate to news. Burnside et al. (2011) explain the forward premium puzzle based upon investor overconfidence. Overconfident investors think their information signal is more precise and overreact to the signal. When the overreaction in the spot rate is reversed, forward premium rise will cause a negative relationship.

2.3.2 Rational Systematic Forecast Errors

The forecast errors in the international market can be systematic and caused by learning behavior, learning past information and learning to expect future distribution. The methodology assumes that the old information about the market is updated based on a rational learning process. When the investor is not sure about the future exchange rate distribution or any other shifts, he will use historical information and give it a probability weight. The model can show a negative correlation between the forecast error and the forward premium if the investors give a large probability on the historical information. For example, if the investors expected a weaker domestic currency from the historical regime, the expectation that is dependent on the past regime will reflect the expected change in the exchange rate, which is that the exchange rate should depreciate. Thus, if the new regime is not the case, the investors will be surprised at the appreciation of the domestic currency. This generates a negative covariance between the forecast error and the forward premium. Learning past information cannot explain the forward premium puzzle completely. Lewis (1989b) concludes that learning explains half of the variations in the excess return.

Learning process should also incorporate the information in the future. The anticipation about future shift in the economy is defined as a peso problem in the literature. Rogoff (1980) believes that the forward premium puzzle is caused by the anticipation of a devaluation in the peso. However, peso problem alone cannot explain the forward premium puzzle.

Other recent literature that is related to investors behavior: Bacchetta and Wincoop (2007, 2010) explain the puzzle by infrequent portfolio trading. Their idea is motivated by the fact that only some small hedge fund managers actively manage foreign currency holdings. Burnside et al. (2009) argues that informed traders have more information than market maker, and the presence of informed investors creates an adverse-selection problem for market maker. They treat bid ask spread as the level of the asymmetric information between market maker and informed currency traders. When a foreign currency is about to decline based on public information but market maker receives a large purchase order instead of sell order, market maker may define these purchase volumes come from informed trader and charge a high forward ask price. Forward premium is high in this situation and a negative relationship will be observed which will theoretically solve the puzzle.

The major problem of the forecast error explanation is that it is difficult to get the forecast error from real data. Although behavioral approach can capture the negative relationship theoretically, it is hard to explain that how irrational investors can generate such significant profits on the exchange market since market maker and sophisticated investors are the main participants in the market. The challenge is how irrational behavior can persist for a long period and is not corrected by participants. These models cannot explain some other stylized facts. For example, forward premium puzzle is less severe for emerging currencies. It seems that investors are more rational on trading emerging currencies.

2.4 Discussion on the Two Components

In the literature, the risk premium model and the forecast error alone cannot explain the entire excess return. Under the assumption that the forecast error is uncorrelated with the lagged information, the risk premium dominates. However, risk premium model fails to generate a high degree of variation in the excess returns that is observed in the data. Meanwhile, literature shows evidence that actions by the investors are correlated with the historical information. We cannot exclude either one of them.

There are papers that try to decompose and test the effectiveness of both categories. Mark and Wu (1998) use both international asset pricing model and noise-trader model to explain the forward premium puzzle. They find that the noise trader model works much better while asset pricing model is unable to generate a correct sign.

Lewis (1995) points out that these potential explanations are not mutually exclusive. Frankel and Froot (1989) try to discompose the bias using survey data and conclude in the paper that there is no risk premium effect. Frankel and Chinn (1993) use survey data of 17 currencies and take care of in-sample bias in the test. However, they fail to prove the risk premium is a powerful explanation. Different from Frankel and Froot (1989), they find some evidence of both effects. The magnitude of the coefficient of risk premium effect is significantly smaller than 1, indicating the evidence of risk premium but the entire bias is also attributable to forecast errors. Frankel and Chinn (2002) use 24 currencies and find risk premium is a significant factor at the 12-month horizon but not at longer horizon. The coefficient is positive but the magnitude of the coefficient is not close to one which indicates risk premium is not enough to explain the puzzle. Cavaglia et al. (1994) also find both time-varying risk premium and forecast error components can explain the bias. Landon et al. (2002) use quarterly data for the yen-dollar exchange rate and support the existence of a time-varying risk premium.

2.5 Carry Trade

Motivated by the failure of uncovered interest parity, there is an old and popular trading strategy in the exchange market, the carry trade. Recent empirical studies show that currency carry trade significantly affects the exchange rate movement (Fan and Lyons (2003); Gagnon and Chaboud (2007); Galati et al. (2007)).

Carry trade is a popular trading strategy in exchange rate markets which consists of buying high interest rate currencies and selling low interest rate currencies. A carry trade will generate profit if high interest rate currencies appreciate and low interest rate currencies depreciate or if the interest rate differential is not offset because of the small level appreciation of the low interest rate currency. Carry trade is risky.

During regimes of low volatility, carry trade holding of high interest rate currencies is popular, and the built-up of carry-trade position exaggerate the demand of high interest rate currencies, as shown in Brunnermeir et al. (2008) and Clarida et al. (2009). While in the crisis, we always observe carry trade positions unwind (Kohler (2010) and Coudert et al. (2011)). During the crisis, high interest rate currencies are abandoned and those low yield currencies, defined as safe-haven currencies, appreciate (Ranaldo and Soderlind (2007) and McCauley and McGuire (2009)).

Burnside et al. (2006) and Lustig et al. (2011) all show that traditional risk factors in the exchange market cannot explain the return. These risks are either not correlated with carry trade returns or too small to explain the carry trade profit. Burnside (2011) also confirms that traditional factor models, like CAPM and Fama and French 3-factor model, are not helpful to capture the risk factors in carry trade.

2.6 Recent Trend in the Literature

Lustig and Verdelhan (2007) discuss an alternative way to define risk factors. They are motivated by stock returns literature, like Fama and French (1993), in which risk factors are derived from particular investment strategies or stock returns. In Fama and French (1993), size and book-to-market ratio are two proxies of the risk factors. Such risk proxies will help to capture the estimates of risk-return trade-off in equity market, which can also be applied in the exchange rate excess return literature. They shift their focus on explaining the excess return of individual currency to explaining the excess return on portfolios of currencies. Lustig and Verdelhan (2007) sort currencies into portfolios according to their forward discount and define risk factors to price the portfolios. The first factor is called the dollar risk factor and is simply equal to the average excess return of the portfolios. The second factor is the return differentials between the portfolios. They show in the paper that the excess return is used to compensate the US investors consumption growth risk. When US consumption growth is low, high interest rate currencies depreciate, which shows no forward risk premium puzzle.

Other proxy factor papers emerge and grow to be the new trend to explain the forward premium puzzle. Hollifield and Yaron (2001) first propose factors that can explain the forward premium in empirical work. In Lustig et al. (2011) paper, the authors propose a single global risk factor that explains most of variation in the excess return between high and low interest rate currencies. Menkhoff et. al (2012) use global currency volatility which is the average sample standard deviation of the daily log changes. Brunnermeier et al. (2009) argues that unwinding happens when liquidity dries up and high interest rate currencies are exposed to these crashes. Rafferty (2010) applies their work and propose another pricing factor, a global currency skewness. He separates currencies into two groups based on their interest differentials and calculates the average skewness difference between the two groups. These factors work well in explaining the return of carry trade.

2.7 Stylized Empirical Facts

The well-known stylized empirical facts in the forward premium puzzle literature indicate that the puzzle is not consistent over time or over countries and it is regime dependent. Chinn and Meredith (2005) find that the forward premium regression coefficients switch from negative to positive at very long horizon. Boudoukh et al. (2005) confirm this stylized fact and attribute the forward premium anomaly to anomalous behavior of short-term interest rates.

Bansal (1997) deepens the puzzle and provides new empirical evidence. He introduces regime dependent variables and finds that in some regimes the puzzle disappeared. The violation of UIP depends on the sign of the interest rate differential. When the foreign interest rate minus U.S. interest rate factor is positive, the slope coefficient is negative and UIP is rejected. However, when the differential factor is negative, the slope is positive and the uncovered interest rate parity holds. The paper posits that risk premium has explanatory power and discusses the possibility that term structure models may explain the puzzle.

Bansal and Dahlquist (2000) document a country difference of the puzzle. The puzzle is not a pervasive phenomenon as conventional belief. After testing 28 developed and emerging economies, they find the puzzle does not present in emerging economies. There might be local risk factors, such as GNP per capita, average inflation, and inflation volatility, that can explain the puzzle for high income and relatively low inflation economies.

CHAPTER 3: MODEL

3.1 Theoretical Model

Let country i be the home country, USA and country j be the foreign country. The interest rates at time t in country i and j are $R_{i,t+T}$ and $R_{j,t+T}$ respectively (non-stochastic), for a contract of length T. If the term structure is flat then I expect $R_{i,t+1} = R_{i,t+1+T}$ and $R_{j,t+1} = R_{j,t+1+T}$, however this is not necessary for my results to hold. All the model needs is that the interest rate that is promised at time t, will apply to time $t+T$. At time t, spot exchange rate is $S_{ij,t}$. The actual future spot exchange rate, at time t+T, is $S_{ij,t+T}$. I can in full generality let T be 1 year but of course T can be any arbitrary length of time. The expectation at time t of the future spot exchange rate at time t+T, is $E_t(\tilde{S}_{ij,t+T} \mid I_t)$, where I_t is the information set. $\tilde{S}_{ij,t+T}$ denotes that the future spot rate is a random variable with respect to time t information.

Now let us consider a dollar (home) investment in country i(USA), in a non-stochastic interest rate environment, for a period of time T. The expected payoff to this strategy (apparently riskless) of an investment of $1 is, in dollars,

$$E_t\left[(1 + R_{i,t+T})\exp(\tilde{w}_{i,t+T})\right] \tag{5}$$

$\tilde{w}_{i,t+T}$ is a scale factor. The need to be able to scale the payoffs determines the choice of how risks are incorporated into the payoff function. This setting allows the risk factor to enter the payoff function multiplicatively rather than additively. The additive specification while possible/feasible will be more arbitrary in general.

The scale factor is preference free. Even though interest rates are deterministic, there are still risks associated with the payment on the contract. There are implicit liquidity risks, default risks and delivery risks on any contract. I need to allow for the fact that if things go horribly wrong, even a domestic contract can lead to realized payments that are less than $(1+R_{i,t+T})$. A Poisson distribution allows for this possibility as well as the lognormal and some other distributions. The lognormal specification permits that the payoff (realized) lie in the range of $0 \leq (1 + R_{i,t+T}) \leq \infty$.

It is of course not the only other specification that can lead to a scaling payoff. More complicated models that permit this sort of scaling are to be found in Duffie and Singleton (2003). $E_t(\exp(\tilde{w}_{i,t+T}))$ is essentially a loss/recovery function and I can figure out the probabilities of a recovery/loss of any percentage of the payoff by looking at tables for the lognormal. It can also proxy for value at risk. Hence, if $E_t(\exp(\tilde{w}_{i,t+T})) < 1$, there is only partial recovery. If $E_t(\exp(\tilde{w}_{i,t+T})) = 1$, there is full recovery. If $E_t(\exp(\tilde{w}_{i,t+T})) > 1$, there is greater than required recovery.

A stochastic discount factor is a random variable $\tilde{M}_{i,t+T}$ such that for any payoff $\tilde{R}_{i,t+T}$ at time t+T,

$$E_t(\tilde{M}_{i,t+T}\tilde{R}_{i,t+T}) = p_{i,t} \tag{6}$$

That is if I take the payoff of the asset and discount it, the present value should be equal to the price of the asset, $p_{i,t}$ in the market place. Then it follows that

$$E_t(\tilde{M}_{i,t+1}\tilde{R}_{i,t+T})(p_{i,t})^{-1} = 1, \forall i, t \tag{7}$$

I will now apply this technology to the trade specified in (1). The payoff to this strategy of an investment of \$1 is, in dollars,

$$(1 + R_{i,t+T}) \exp(\tilde{w}_{i,t+T}) = \text{random payoff} \tag{8}$$

Using stochastic discount factor methodology, this implies that the expected present value of the payoff is

$$E_t \left[\tilde{M}_{i,t+T}(1 + R_{i,t+T})(\exp(\tilde{w}_{i,t+T}) \right] = 1 \tag{9}$$

For uncovered interest rate parity to hold in an ex-ante sense, present values of expected payoffs from both hedged and unhedged strategies (in investments that are not interest rate sensitive) must be the same in country i's currency at time t (or their expected payoffs at all points in time must be the same).

The unhedged payoff from investing assets of 1 dollar (1 unit of currency i in country j) overseas in riskless assets, is

$$S_{ij,t} E_t \left[(1 + R_{j,t+T}) \frac{1}{\tilde{S}_{ij,t+T}} \exp(\tilde{w}_{j,t+T}) \right] \tag{10}$$

Hence the present value of the expected payoff is

$$E_t \left[\tilde{M}_{i,t+T} \frac{(1 + R_{j,t+T})(S_{ij,t}) \exp(\tilde{w}_{j,t+T})}{\tilde{S}_{ij,t+T}} \right] = 1 \tag{11}$$

Generally if there is no arbitrage opportunity and if the existence of a stochastic discount factor assumes an absence of such opportunities, then

$$E_t \left[\tilde{M}_{i,t+T} \frac{(1 + R_{j,t+T})(S_{ij,t}) \exp(\tilde{w}_{j,t+T})}{\tilde{S}_{ij,t+T}} \right] = E_t \left[\tilde{M}_{i,t+T}(1 + R_{i,t+T}) \exp(\tilde{w}_{i,t+T}) \right], \forall t \tag{12}$$

Where I have now applied the fundamental property that assets valued at the same price initially must generate the same risk adjusted payoff at all times.

$$E_t\left[\tilde{M}_{i,t+T}(1+R_{i,t+T})\exp(\tilde{w}_{i,t+T})\right] = E_t(\tilde{M}_{i,t+T})E_t\left[(1+R_{i,t+T})\exp(\tilde{w}_{i,t+T})\right] + Cov\left[\tilde{M}_{i,t+T},(1+R_{i,t+T})\exp(\tilde{w}_{i,t+T})\right] \tag{13}$$

$$\begin{aligned} E_t\left[\tilde{M}_{i,t+T}\frac{(1+R_{j,t+T})(S_{ij,t})\exp(\tilde{w}_{j,t+T})}{\tilde{S}_{ij,t+T}}\right] &= \\ E_t(\tilde{M}_{i,t+T})E_t\left[\frac{(1+R_{j,t+T})(S_{ij,t})\exp(\tilde{w}_{j,t+T})}{\tilde{S}_{ij,t+T}}\right] &+ \\ Cov\left[\tilde{M}_{i,t+T},(\frac{(1+R_{j,t+T})(S_{ij,t})\exp(\tilde{w}_{j,t+T})}{\tilde{S}_{ij,t+T}})\right] \end{aligned} \tag{14}$$

In the model, the scale factor is defined to be a general premium that captures all time-varying risk components. Let us assume that the covariance term in (14) is zero and that the stochastic discount factor is independent of the other risk factors, then there will be a condition like (equation 15). It then follows that regardless of what the stochastic discount factor is, there must be a condition such that

$$E_t(\tilde{M}_{i,t+T})E_t\left[\frac{(1+R_{j,t+T})(S_{ij,t})\exp(\tilde{w}_{j,t+T})}{\tilde{S}_{ij,t+T}}\right] = E_t(\tilde{M}_{i,t+T})E_t\left[(1+R_{i,t+T})\exp(\tilde{w}_{i,t+T})\right] \tag{15}$$

Now you can move on to equation (16) without any difficulties.

$$E_t\left[\frac{(1+R_{j,t+T})(S_{ij,t})\exp(\tilde{w}_{j,t+T})}{\tilde{S}_{ij,t+T}}\right] = E_t\left[(1+R_{i,t+T})\exp(\tilde{w}_{i,t+T})\right] \tag{16}$$

Now decompose both the left and right hand sides of equation (16) to get equation

(17).

$$E_t\left[\frac{(1+R_{j,t+T})(S_{ij,t})}{\tilde{S}_{ij,t+T}}\right]E_t\left[\exp(\tilde{w}_{j,t+T})\right]+Cov\left[\frac{(1+R_{j,t+T})(S_{ij,t})}{\tilde{S}_{ij,t+T}},\exp(\tilde{w}_{j,t+T})\right]=$$
$$E_t(1+R_{i,t+T})E_t(\exp(\tilde{w}_{i,t+T}))+Cov\left[(1+R_{i,t+T}),\exp(\tilde{w}_{i,t+T})\right] \quad (17)$$

If we further assume that the covariance terms are zero then we must have equation (18).

$$E_t\left[\frac{(1+R_{j,t+T})(S_{ij,t})}{\tilde{S}_{ij,t+T}}\right]E_t(\exp(\tilde{w}_{j,t+T}))=E_t(1+R_{i,t+T})E_t(\exp(\tilde{w}_{i,t+T})) \quad (18)$$

must hold at all times. Let $\tilde{w}_{j,t+T}$ be a normal random variable. If $\tilde{w}_{j,t+T}$ is identically equal to one $\forall t$ or if $E_t(\tilde{w}_{j,t+T})=1$, then I have the standard UIP relation. If the mean of $\tilde{w}_{j,t+T}$ is not equal to one in any time period it implies the violation of uncovered arbitrage opportunities, in that particular time period. It also implies the existence of one-way and other types of trades that are profitable. This is shown in Blenman(1997), Blenman et al. (2001 and 2005), Callier (1988) and others.

Let $\tilde{w}_{j,t+T}$ be infinitely divisible. This allows for the non-occurrence of UIP to be attributable to a variety of factors and is also model independent. These factors are essentially latent variables and can be the state of the economy, the state of the stock market, the state of the business cycle, or the risk of sovereign default etc. Some of these risks are of course picked up by increases in the spreads of the country's sovereign default risk bonds and or by the size and level of the VIX in the case of the USA.

However for low maturities, and in some developing countries there are no viable measures of default risks. Country risk measures are too blunt and take too long to adjust. Hence the currency markets may be the best source of measuring those risks. My specification is general enough to permit regime dependency of interest rates, exchange rates and their volatilities.[21] It nests the stochastic discount factor approach.

Let $\tilde{w}_{j,t+T}$ be normally distributed. Then $\exp(\tilde{w}_{j,t+T})$ is log-normally distributed and I can draw on the well known properties of the log-normal distribution.

Let $\log(E_t(1 + R_{i,t+T})) = r_{i,t+T}$ and $\log(E_t(1 + R_{j,t+T})) = r_{j,t+T}$. Assuming that UIP holds, then $\exp(\tilde{w}_{i,t+T})$ and $\exp(\tilde{w}_{j,t+T})$ are both equal to one. So that equation (18) will be $\log(S_{ij,t+T}) - \log(S_{ij,t}) = \log(1+R_{j,t+T}) - \log(1+R_{i,t+T}) = r_{j,t+T} - r_{i,t+T}$.

Also note that if one takes the logarithm of equation (18), assuming that currency risks and contract risks exist and are approximately separable, we will get

$$r_{j,t+T} - r_{i,t+T} = \log(E_t(\tilde{S}_{ij,t+T})) + \log\{\frac{E_t(\tilde{y}_{i,t+T})}{E_t(\tilde{y}_{j,t+T})}\} - \log(S_{ij,t}) \qquad (19)$$

If $\tilde{w}_{j,t+T}$ is normally distributed $(\mu_{j,t+T}, \sigma^2_{j,t+T,})$,then $\tilde{y}_{j,t+T} = \exp(\tilde{w}_{j,t+T})$ has distribution with mean=$\exp(\mu_{j,t+T}+.5\sigma^2_{j,t+T})$ and variance= $\exp(2\mu_{j,t+T}+\sigma^2_{j,t+T})(\exp(\sigma^2_{j,t+T})-1)$. However, it is highly likely that both the mean and variance of $\tilde{w}_{j,t+T}$ are time varying. That is in general I could expect that $\mu_{j,t+T} \neq \mu_{j,t+T+1}$ and $\sigma^2_{j,t+T} \neq \sigma^2_{j,t+T+1}$.

[21] $E_t(\exp(\tilde{w}_{i,t+T}))$ and $E_t(\exp(\tilde{w}_{j,t+T}))$ capture the excess returns to the UIP strategy and I measure these excess returns empirically by looking at past returns. So I am using ex-post measures to predict ex-ante what will occur.Hence the specifications tested by Fama (1984), Bansal (1997 and 2000) are now simply special cases of this model. It therefore is also a generalization of the approach of Clarida et al. (2009). It is also general enough to accomodate the affine currency models of Backus and Telmer (1993 and 2001) and even the newer model of Sarno et al. (2011).

Hence I can write as follows

$$\log(E_t(\tilde{S}_{ij,t+T})) - \log(S_{ij,t}) = (r_{j,t+T} - r_{i,t+T}) + (\mu_{j,t+T} + .5\sigma^2_{j,t+T}) - (\mu_{i,t+T} + .5\sigma^2_{i,t+T}) \tag{20}$$

I am now able to generate a form of Clarida (1999), Bilson (1981) and Bansal (1997) type regression specifications, without making any ad hoc assumptions. Expected excess rate of returns are driven by implicit risks $\log(E_t(\tilde{S}_{ij,t+T})) - \log(S_{ij,t}) - (r_{j,t+T} - r_{i,t+T}) = (\mu_{j,t+T} + .5\sigma^2_{j,t+T}) - (\mu_{i,t+T} + .5\sigma^2_{i,t+T})$ and these can be either negative or positive.

I can use proxies for some of the variables. For instance if volatility of the spot rate is zero, then maybe $\mu_{i,t+T} = 0$ and $\sigma^2_{i,t+T} = 0$. Rate of growth of the exchange rate over any short time period is also close to zero. My guess is that $\mu_{i,t+T} \approx 0$ almost always. The assumption is that USA is basically a no riskiness environment but there are periods when that assumption is not true.

A more general form of the specification that can be tested is of course,

$$\begin{aligned}\log(E_t(\tilde{S}_{ij,t+T})) - \log(S_{ij,t}) = \alpha_0 + \alpha_1(r_{j,t+T} - r_{i,t+T}) - \alpha_2(\log(\frac{E_t(y_{i,t+T})}{E_t(y_{j,t+T})})) \\ +\alpha_3(cov_t(S_{ij,t+T}, y_{j,t+T}))\end{aligned} \tag{21}$$

3.2 Empirical Test Model

Based on equation (11), a generalized solution $\tilde{x}_{j,t+T}$ can be simply expressed as

$$\tilde{x}_{j,t+30} = \log(\frac{1 + R_{i,t+30}/12}{1 + R_{j,t+30}/12}) + \log(\frac{S_{ij,t+30}}{S_{ij,t}}) \tag{22}$$

for monthly data and

$$\tilde{x}_{j,t+1} = \log(\frac{1 + R_{i,t+1}/365}{1 + R_{j,t+1}/365}) + \log(\frac{S_{ij,t+1}}{S_{ij,t}}) \quad (23)$$

for daily data.

After I get a series of $\tilde{x}_{j,t+30}$ and $\tilde{x}_{j,t+1}$, I need to calculate mean and variance of the generalized solution. I use the moving average method and here I show the mean and the standard deviation for daily data as follows

$$\mu_{\tilde{x}_{j,n,t+1}} = \frac{\tilde{x}_{j,1,t+1} + \tilde{x}_{j,2,t+1} + ... + \tilde{x}_{j,n,t+1}}{n} \quad (24)$$

$$\sigma_{\tilde{x}_{j,n,t+1}} = std(\tilde{x}_{j,1,t+1} + \tilde{x}_{j,2,t+1} + ... + \tilde{x}_{j,n,t+1}) \quad (25)$$

This method assumes that investors will observe risks and errors in the market prices, like interest rate and exchange rate, and will use the historical information to estimate risk premiums for holding the foreign assets. The generalized factor will capture the historical information and provide appropriate estimation for risk premiums. In this dissertation, I make the assumptions that investors use 3 month, 6 month and aggregate information. For example, 3 month moving average means that investors who trade today estimated the risk premiums and anticipate exchange rate movement according to previous historical 90 days information.

$$\mu_{\tilde{x}_{j,90,t+1}} = \frac{\tilde{x}_{j,1,t+1} + \tilde{x}_{j,2,t+1} + ... + \tilde{x}_{j,90,t+1}}{90} \quad (26)$$

$$\sigma_{\tilde{x}_{j,90,t+1}} = std(\tilde{x}_{j,1,t+1} + \tilde{x}_{j,2,t+1} + ... + \tilde{x}_{j,90,t+1}) \quad (27)$$

The 6 month moving average is similar to the 3 month method, except the anticipation horizon is 180 days. The aggregate moving average includes all the historical information. Thus n is equal to the total number of the given currency observations.[22]

The regression model is

$$\log(E_t(S_{ij,t+1})) - \log(S_{ij,t}) = \beta_1(r_{j,t+1} - r_{i,t+1}) + \beta_2(\mu_{\tilde{x}_{j,t+1}}) + \beta_3(\sigma^2_{\tilde{x}_{j,t+T}}) \tag{28}$$

The monthly regression has similar equation. If the generalized solution catches the historical risks and errors, I expect β_1 should be positive. The high interest rate currency appreciation is due to the general risk premiums captured by the generalized solution. The regression model with constant term is

$$\log(E_t(S_{ij,t+1})) - \log(S_{ij,t}) = c + \beta_1(r_{j,t+1} - r_{i,t+1}) + \beta_2(\mu_{\tilde{x}_{j,t+1}}) + \beta_3(\sigma^2_{\tilde{x}_{j,t+T}}) \tag{29}$$

I also involve bid ask spread and high minus low spread of exchange rate into the robust test model

$$\begin{aligned} \log(E_t(S_{ij,t+1})) - \log(S_{ij,t}) = \beta_1(r_{j,t+1} - r_{i,t+1}) + \beta_2(\mu_{\tilde{x}_{j,t+1}}) + \beta_3(\sigma^2_{\tilde{x}_{j,t+T}}) + \\ \beta_4(bid - ask)_t + \beta_5(high - low)_t \end{aligned} \tag{30}$$

Now define $y = \log(E_t(S_{ij,t+1})) - \log(S_{ij,t})$, $x = r_{j,t+1} - r_{i,t+1}$, $meanrf = \mu_{\tilde{x}_{j,t+1}}$ and $devrf = \sigma^2_{\tilde{x}_{j,t+T}}$ for later results.

[22]For aggregate information, I eliminate the first 30 observations in the regression, because for the first 30 observations, standard deviation varies a lot due to the moving average calculation. After 30 observations, the standard deviation seems stable and this will make less error.

CHAPTER 4: DATA

4.1 Data Description

Daily data for spot exchange rate, forward rate and interest rate are all taken from Bloomberg. There are eleven independent floating countries in the sample. They are Australia, Canada, Japan, New Zealand, Norway, Poland, South Africa, Sweden, Switzerland, Turkey and United Kingdom. Other independent floating countries available in Bloomberg, such as Armenia, Brazil, Colombia, Iceland, Mexico, Philippine, South Korea, Sri Lanka, Tanzania, the State of Israel, Uganda and Uruguay, are not tested.

I do not include Armenia, Iceland, Mexico, Sri Lanka, Tanzania, the State of Israel, Uganda and Uruguay because Bloomberg does not have enough data for monthly regression.[23] In the empirical test, I provide regression fitting using both monthly and daily data. These countries only have short period daily exchange rate and interest rate, which doesn't cover enough months to regress. I will extend daily test in the future for these countries. For Brazil, Colombia, Philippine and South Korea, they are not involved in the sample because their forward rates are not available in Bloomberg. [24] Both forward rates and interest rates are available for one month,

[23]For instance, Mexico has interest rate data starting from 7/2010 which is 28 monthly observations by the end of 10/2012, the last month of test period. The test result is not reliable based on such small number of observations.

[24]Datastream has the forward rate but it does not separate prices: All tested countries in the paper have spot exchange rate, forward rate and interest rate of high, low, bid, ask, middle, open and last prices, which are unique and are only provided by Bloomberg.

Table 1: Daily data sample statistics

Panel A: Daily Exchange Rate mid price

Country	Mean	Std	Max	Min	Skew	Kurt	Obs
Australia	0.75	0.16	1.10	0.48	0.33	2.05	3785
Canada	1.28	0.18	1.61	0.92	−0.10	1.83	5606
Japan	112.37	17.48	159.90	75.82	−0.06	2.73	6229
New Zealand	0.63	0.12	0.88	0.39	−0.21	1.94	4128
Norway	6.88	1.09	9.58	4.96	0.59	2.55	4294
Poland	3.43	0.58	4.71	2.03	−0.08	2.16	3736
South Africa	7.37	1.38	12.45	4.67	0.98	4.19	3937
Sweden	7.64	1.12	11.03	5.09	0.85	3.72	5403
Switzerland	1.31	0.22	1.82	0.72	−0.04	2.40	5607
Turkey	1.30	0.42	1.92	0.27	−1.17	3.31	3737
United Kingdom	1.67	0.17	2.11	1.37	0.61	2.53	4166

Panel B: Daily Deposit Rate mid price

Country	Mean	Std	Max	Min	Skew	Kurt	Obs
Australia	5.12	0.97	8.45	2.83	0.27	3.25	3785
Canada	3.02	1.61	6.13	0.16	−0.11	1.85	3975
Japan	0.24	0.28	1.50	−0.18	1.23	3.98	4167
New Zealand	5.61	1.92	10.25	2.35	−0.12	1.92	4128
Norway	4.17	2.09	8.93	1.27	0.41	1.81	4294
Poland	7.85	5.26	22.50	2.39	1.14	2.77	3736
South Africa	10.28	4.49	26.75	4.88	1.58	5.21	3937
Sweden	3.08	1.46	6.68	0.23	0.02	2.60	4312
Switzerland	1.20	1.00	3.51	−0.57	0.63	2.28	4166
Turkey	30.60	24.94	97.00	0.00	1.06	2.85	3737
United Kingdom	4.11	2.20	7.66	0.00	−0.55	2.09	4166
United States	3.07	2.23	6.73	0.00	0.02	1.39	4210

Panel C: Daily Future mid price

Country	Mean	Std	Max	Min	Skew	Kurt	Obs
Australia	0.75	0.16	1.10	0.48	0.32	2.05	3785
Canada	1.28	0.18	1.61	0.92	−0.11	1.83	5606
Japan	112.12	17.44	159.74	75.80	−0.04	2.73	6229
New Zealand	0.63	0.12	0.88	0.39	−0.21	1.94	4128
Norway	6.88	1.09	9.59	4.98	0.60	2.55	4294
Poland	3.44	0.60	4.76	2.03	−0.05	2.14	3736
South Africa	7.42	1.39	12.54	4.71	1.00	4.20	3937
Sweden	7.74	1.11	11.03	5.15	0.88	3.73	5403
Switzerland	1.31	0.22	1.82	0.72	−0.04	2.38	5607
Turkey	1.32	0.42	1.93	0.14	−1.16	3.25	3737
United Kingdom	1.67	0.17	2.11	1.37	0.61	2.53	4166

three month, six month and twelve month periods. Brazil, Colombia, Philippine and South Korea are not included in the sample test because they lack of bid, ask, high or low prices.

For a specific country, different type of observations may vary at time horizon. For example, Switzerland has forward rate and spot rate available from 5/20/1991 while its its monthly interest rate starts from 11/26/1996. I regress the data from 11/26/1996 and omit previous un-matching data. I pick the last day of each month and form a series of monthly data. I also pick middle day and first day of each month but do not find significant difference. Table 1 is the daily data description. For monthly data, the sample statistics is similar, and it is reported in Table 10 in the appendix.

Table 1 shows daily data description for mid prices of eleven countries. The descriptive statistics are also available for last, bid, ask, high, and low prices, which provide similar results. I attach monthly description of mid price after the paper. There is a clear difference between the standard deviation of daily exchange rate and daily interest rate. United Kingdom has daily interest rate 10 times volatile of its exchange rate. The only exception is the Japanese yen, with relative constant interest rate. 6 out of 11 currencies have negative skewness of daily exchange rate while only 3 currencies have negative skewness of daily interest rate. Canada and New Zealand have negative skewness on both exchange rate and interest rate. South Africa has the largest exchange rate kurtosis of 4.19 and interest rate kurtosis of 5.21 among all the countries.

Table 2: Other variables description-daily data

Panel A: y

Country	Mean	Std	Max	Min	Skew	Kurt	Obs
Australia	−0.000063	0.0037	0.0317	−0.0359	0.3201	12.2316	3754
Canada	0.000035	0.0025	0.0173	−0.0141	−0.1488	6.2803	3944
Japan	0.000040	0.0030	0.0302	−0.0239	0.4083	8.7151	4136
New Zealand	−0.000018	0.0037	0.0293	−0.0196	0.2281	5.9139	4097
Norway	0.000011	0.0033	0.0216	−0.0211	−0.0740	5.6686	4179
Poland	0.000013	0.0040	0.0284	−0.0224	−0.2362	7.2397	3705
South Africa	−0.000066	0.0048	0.0288	−0.0673	−1.0316	15.8162	3906
Sweden	−0.000003	0.0034	0.0216	−0.0183	0.0180	5.3633	4179
Switzerland	0.000038	0.0031	0.0204	−0.0395	−0.3317	11.4830	4135
Turkey	−0.000220	0.0051	0.0343	−0.1550	−8.3744	244.9313	3706
United Kingdom	0.000007	0.0025	0.0151	−0.0127	0.2435	5.2212	4135

Panel B: x

Country	Mean	Std	Max	Min	Skew	Kurt	Obs
Australia	0.000028	0.000021	0.000064	−0.000015	−0.2989	1.7578	3754
Canada	0.000001	0.000011	0.000028	−0.000028	0.0155	2.3057	3944
Japan	−0.000033	0.000025	0.000006	−0.000079	−0.0395	1.4642	4136
New Zealand	0.000031	0.000020	0.000075	−0.000024	−0.5069	2.9380	4097
Norway	0.000013	0.000026	0.000069	−0.000031	0.0547	2.1062	4179
Poland	0.000060	0.000050	0.000191	−0.000016	0.5655	2.4740	3705
South Africa	0.000087	0.000046	0.000252	0.000025	1.3692	4.5322	3906
Sweden	−0.000001	0.000021	0.000074	−0.000037	−0.0040	1.8841	4179
Switzerland	−0.000022	0.000019	0.000007	−0.000056	−0.2534	1.3937	4135
Turkey	0.000327	0.000283	0.001093	−0.000003	1.1132	2.9000	3706
United Kingdom	0.000013	0.000013	0.000040	−0.000016	−0.3316	1.9018	4135

Panel C: bid-ask spread for exchange rate

Country	Mean	Std	Max	Min	Skew	Kurt	Obs
Australia	0.000424	0.000304	0.0073	−0.0036	7.9601	162.7278	3754
Canada	0.000560	0.000422	0.0105	−0.0088	0.4612	163.0498	3944
Japan	0.042292	0.050393	1.1000	−1.6500	−4.6389	379.0365	4136
New Zealand	0.000601	0.000379	0.0063	−0.0023	4.8446	54.1327	3785
Norway	0.007035	0.009120	0.1610	−0.0193	6.9505	76.4089	4179
Poland	0.007801	0.027026	0.7919	−1.0540	−9.8431	873.9819	3705
South Africa	0.020363	0.026478	0.3891	−0.9950	−12.0176	574.4119	3906
Sweden	0.006827	0.005446	0.1075	−0.0235	6.0459	79.2316	4179
Switzerland	0.000574	0.000524	0.0150	−0.0062	7.6518	174.3914	4135
Turkey	0.005083	0.011854	0.4350	−0.0037	17.5234	530.2082	3644
United Kingdom	0.000602	0.002899	0.1840	−0.0056	61.3057	3878.0030	4135

Panel D: high-low spread for exchange rate

Country	Mean	Std	Max	Min	Skew	Kurt	Obs
Australia	0.0090	0.0058	0.0735	0.0005	2.9352	20.3305	3754
Canada	0.0102	0.0056	0.0744	0.0000	2.5571	16.7048	3944
Japan	1.1200	0.6924	11.5500	0.0000	3.4432	30.8228	4136
New Zealand	0.0082	0.0046	0.0511	0.0005	2.2260	12.6022	3785
Norway	0.0813	0.0411	0.4592	0.0000	2.2022	12.4871	4179
Poland	0.0440	0.0290	0.2435	0.0000	2.2022	9.3633	3705
South Africa	0.1272	0.0991	1.7651	0.0000	4.7139	52.2640	3906
Sweden	0.0934	0.0489	0.4923	0.0000	1.9745	9.4176	4179
Switzerland	0.0136	0.0066	0.0786	0.0000	1.7100	9.0981	4135
Turkey	0.0177	0.0187	0.3865	0.0000	5.0185	61.2015	3706
United Kingdom	0.0142	0.0073	0.1058	0.0000	2.3360	15.1971	4135

4.2 Variables Description

In Table 2, the sample statistics of the variables also indicate a difference between emerging countries and developed countries. The exchange rate differential (the dependent variable, y) has largest negative skewness for Turkey and second largest for South Africa. Turkey and South Africa, the only two developing countries in the sample, also have large kurtosis which is significantly different from others. However, unlike the results for the dependent variable, the interest rate differentials (independent variable, x) for Turkey and South Africa are positive. The magnitude of the interest rate differential is slightly larger than others. For example, Turkey's interest rate differential skewness is 2 times higher than the one of Poland while Turkey's exchange rate differential skewness is about 40 times higher than Poland's skewness. Kurtosis of exchange rate and interest rate differential has similar conclusion.

For the bid-ask spread, kurtosis is higher for United Kingdom and Poland and there is no emerging and developed country difference of the skewness. Emerging countries and developed countries have mixed signs of skewness. Compared with bid-ask spread, high-low spread all have positive skewness and emerging countries have significantly higher skewness and kurtosis in magnitude.

My generalized solution is $\tilde{x}_{j,t+1} = \log(\frac{1+R_{i,t+1}/365}{1+R_{j,t+1}/365}) + \log(\frac{S_{ij,t+1}}{S_{ij,t}})$. For each eleven countries, I calculate historical generalized solution skewness from daily data. From the description, I find a difference on skewness between emerging and developed countries. Australia, Japan, New Zealand, Sweden and United Kingdom have negative skewness, indicating carry trade returns have crash risk. For the two emerging countries, Turkey has a high positive 8.33 skewness and South Africa has 1.03 implying little crash risks. These numbers are much higher than other countries that also have positive skewness of the generalized solution. All these results are available to check in Table 3.

The volatility of generalized solution is in the same magnitude for all the tested currencies. However, the kurtosis values vary among different countries. Turkey's generalized solution has the largest kurtosis, indicating a sharper peak and longer fatter tails. South Africa is the second largest. These two emerging countries show a great difference from other developed countries on both skewness and kurtosis of the generalized solution. Empirical evidence in Bansal (2000) indicates the forward premium puzzle is only significant in developed countries and does not exist in emerging countries. The generalized solution does show a country difference on its sample statistics. I also have other variables description shown in Table 3. All these results are from middle price. [25]

Table 3: Generalized solution description-daily data

General Solution Country	Mean	Std	Max	Min	Skew	Kurt	Obs
Australia	0.000030	0.0037	0.0359	−0.0317	−0.3050	12.1538	3784
Canada	−0.000037	0.0025	0.0141	−0.0173	0.1476	6.3165	3974
Japan	−0.000003	0.0030	0.0239	−0.0301	−0.4073	8.7022	4166
New Zealand	−0.000015	0.0037	0.0196	−0.0293	−0.2293	5.9419	4127
Norway	−0.000025	0.0033	0.0211	−0.0216	0.0710	5.6976	4209
Poland	−0.000065	0.0040	0.0224	−0.0285	0.2328	7.2014	3735
South Africa	−0.000018	0.0048	0.0672	−0.0289	1.0274	15.9080	3936
Sweden	0.000004	0.0034	0.0183	−0.0217	−0.0213	5.3840	4209
Switzerland	−0.000010	0.0031	0.0395	−0.0204	0.3238	11.4464	4165
Turkey	−0.000109	0.0051	0.1544	−0.0350	8.3294	245.4812	3736
United Kingdom	−0.000018	0.0025	0.0127	−0.0151	−0.2541	5.2406	4165

[25] Other prices, last price, open price, ask price, bid price, high price and low prices are also tested. For example, I use last price of interest rate and exchange rate to get the generalized solution and replicate the regressions. The results are very similar, here I only report middle price in the paper.

4.3 Stationary Test

In this section, I investigate the stationary null hypothesis using Bloomberg data for all the tested countries. The stationary tests include test on the raw data, which includes both interest rates with different maturities and spot exchange rates with different maturities. I also test the stationarity of the variables in the regression, which include dependent variable (log exchange spot rate difference), independent variable (log interest rate difference), the generalized risk factor, the mean and the deviation of the generalized risk factor. All the stationary tests are repeated for the overall data and every five year data, from year 1998 to 2002, from 2003 to 2007, and from 2008 to 2012. The purpose of 5-year test is to check whether there is sub-period difference in the regression.

All the detailed stationary test results are reported in the Appendix. I separate the tests for all 11 countries. For example, in Appendix B, I report the stationary tests for Australia. For each country, I have stationary tests on 3 parts: The first two figures are about the raw interest rate and exchange rate data; the second two figures are the stationary tests on the dependent and independent variables; the last three figures are about generalized risk factor, the mean of the generalized risk factor and the variance of the generalized risk factor. In each figure, there are three sub-figures: The first sub-figure is the autocorrelation and partial correlation graph; the second sub-figure is the Augmented Dickey-Fuller test (ADF test) on the data to check the unit root; if the ADF test cannot reject the hypothesis that there is a unit root at some level of confidence, I continue to test whether the first difference is stationary and report the ADF test on the first difference in the third sub-figure.

Nominal interest rates are often found to be non-stationary. In my test, I find the same conclusion. Most countries have non-stationary nominal interest, except Japan and Poland which are stationary under 1% statistical significant level of ADF test. Sweden and United Kingdom are stationary under 10% statistical significant level. However, the non-stationarity of the data is largely due to the early sub-period, 1998 to 2002. For example, the nominal interest rate Australia is overall non-stationary but the interest rate is stationary under 5% level during the sub-period 2003 to 2007 and stationary under 10% level during the sub-period 2008 to 2012. Canada, New Zealand, Switzerland and Turkey have the same pattern as Australia. Norway, South Africa, and Sweden are only stationary during 2008 to 2012. Japan and United Kingdom are different from others, with stationarity during the early period 1998 to 2002 and the late sub-period, 2008 to 2012. The spot exchange rates of all the 11 tested countries are all non-stationary. There is no obvious pattern for the sub-periods as what is shown in the nominal interest rate. Canada and Poland show stationarity during the sub-period 2003 and 2007, while Japan is stationary during 2008 and 2012. Only Turkey is stationary during the early period 1998 and 2002.

The independent variable in the dissertation is defined as the log interest rate difference, which is to the log difference between the foreign country's interest rate and local (U.S.) interest rate. For the independent variable, most countries are non-stationary, except Canada, Poland, Sweden and United Kingdom. Canada and United Kingdom are stationary under 1% significant level. Poland and Sweden are stationary under 5% significant level. For the sub-periods, the conclusion is similar, most countries showing non-stationarity during the sub-periods. Canada and Switzerland are stationary during two sub-periods, 1998 to 2002 and 2008 to 2012. Japan is stationary during 2008 and 2012. Norway, Poland, South Africa and Turkey are stationary during 2003 to 2007. Sweden is only stationary during 2008 to 2012. The dependent variable is the log difference between exchange spot rate one period in the future and current exchange spot rate. All the countries show strong stationary evidence for the dependent variable for the overall data and sub-periods data.

The generalized risk factors for all the countries are stationary, but the mean and the deviation of the generalized risk factors are not. The mean and the deviation of the generalized risk factor are calculated based on 1-month (20 trading days), 3-month (60 trading days), 12-month (240 trading days), 2-year (480 trading days) and overall data moving average. In the Appendix, I only include the overall data graphs.

For the mean of the generalized risk factor, most countries are stationary for the overall data, except Sweden. Canada and Turkey are stationary under 5% level, but not under 1% level. For the 1-month, 3-month and 12-month moving average mean, all the countries are stationary. But for long run, the 2-year moving average, Australia, Canada, New Zealand, Norway, Poland, Sweden, Switzerland and United Kingdom are stationary under 5% confidence interval, not 1% level. South Africa and Turkey are stationary only under 10% level. It seems for the long run, the mean variables of the generalized factor are more and more non-stationary.

For the variance of the generalized risk factor, the conclusion is the opposite. Most countries are not stationary for the overall data, except Canada and Sweden. Canada is stationary even under 1% confidence interval while Sweden is stationary under 5%

level. For the short-run moving average, like the 1-month moving average deviation of the generalized risk factor, all the countries show stationary time series. But the moving average variance becomes more and more non-stationary when it is assumed to be calculated by 3-month, 6-month, 12-month and 2-year data. For the 3-month moving average, most countries are still stationary under 5% level, except Norway which is stationary under 10% level. For the 12-month, Australia is stationary under 5% level, Canada is stationary under 10% level but the other countries are not stationary. For the 2-year, no country is stationary.

CHAPTER 5: EMPIRICAL RESULTS ANALYSIS

5.1 A Replication of the Original Model

The first test is a replication of the original model without adding the impact of the generalized factor. The result is presented in Table 4 panel A. The test results match the previous literature by showing that the coefficients are negative for high interest rate countries. A negative coefficient sign indicates that when the foreign asset provides a higher interest return, the foreign currency will appreciate, a violation of UIP. Also note that the explanatory power of the original model is quite low. Low R^2 phenomenon is also documented in Fama (1984), which shows that the variation of the exchange rate movements can not be explained by interest rate changes.

The original model also shows inconsistency on the coefficient signs. Five out of eleven tested countries have positive coefficient signs. The test results are not consistent with Bansal and Dahlquist (2000)'s seminal empirical finding that developing countries have no forward premium puzzle. Using time-series information from 28 emerging and developed countries, Bansal and Dahlquist (2000) conclude that the forward premium puzzle is not a pervasive phenomenon and it is only confined to developed countries. Turkey and South Africa are the only two developing countries tested in the first round but their coefficients are both negative, South Africa -0.4327 and Turkey -0.7810. The five countries that present positive coefficients in the results are Norway, Canada, Sweden, United Kingdom and Switzerland. Switzerland has a lower-income on the asset and Swiss Franc is always used as the funding currency. The positive interest rate differential predicts a depreciation of the exchange rate, which shows no forward premium puzzle. This fact matches Bansal (1997), in which the forward premium puzzle is confined to the high interest rate currencies, not funding currencies. Whereas Japanese Yen is classified as one of the popular funding currency, the interest rate differential coefficient is negative, which is not consistent with Swiss Franc.

The original model test confirms the previous literature that the forward premium puzzle is state dependent. The forward premium puzzle is present at high income developed countries. It means that the puzzle is confined to the developed countries when foreign interest rates of the country exceed U.S. interest rates. The expected exchange rate changes and interest rate differentials are negatively related, indicating an appreciation of the foreign currency.

Table 4: A replication regression

Original model											
Variables	Australia	Canada	Japan	New Zealand	Norway	Poland	South Africa	Sweden	Switzerland	Turkey	UK
x	−2.1717	4.3973	−0.0782	−0.6918	1.3888	−0.2930	−0.4327	1.9982	0.6840	−0.7810	0.0049
	−1.2531	1.2309	−0.0700	−0.4397	0.7813	−0.3526	−0.5556	0.8035	0.4210	−4.1169	0.0024
R-squared	0.0002	0.0002	0.0001	0.0000	0.0001	0.0000	0.0001	0.0002	0.0001	0.0026	0.0000
DW	2.0792	2.0955	2.0258	2.0162	2.0529	1.9304	2.0428	2.0582	2.0737	1.9204	1.9355

5.2 Short-term Rolling Regression Models

Fama (1984) points out that the negative relationship between the exchange rate changes and interest rate differentials implies that the risk premium should be negatively related to the exchange rate changes. Now suppose the exchange rate change can be separated into two parts, the interest rate differential and the risk premium (P) which is omitted in the model.

$$\log(E_t(S_{ij,t+1})) - \log(S_{ij,t}) = P + (r_{j,t+1} - r_{i,t+1}) \tag{31}$$

$$\begin{aligned} \beta &= \frac{cov(\log(E_t(S_{ij,t+1})) - \log(S_{ij,t}), r_{j,t+1} - r_{i,t+1})}{var(r_{j,t+1} - r_{i,t+1})} \\ &= \frac{cov(P + (r_{j,t+1} - r_{i,t+1}), r_{j,t+1} - r_{i,t+1})}{var(r_{j,t+1} - r_{i,t+1})} \\ &= \frac{var(r_{j,t+1} - r_{i,t+1}) + cov(P, (r_{j,t+1} - r_{i,t+1}))}{var(r_{j,t+1} - r_{i,t+1})} \end{aligned} \tag{32}$$

Thus, the risk premium should be negatively correlated to the interest rate differentials. Intuitively, since the interest change differentials and exchange rate changes are expected to present a positive relationship, the missing risk premium should relate to the exchange rate changes negatively to change the coefficient signs.

For the short run test, I assume investors observe risks from 2-weeks (10 days), 1-month (20 days) and 3-month (60 days) historical prices and ask for risk premiums, which are documented in the generalized risk factor. The mean and variance of the generalized risk factor come from the moving average of 10, 20 and 60 days prices, as introduced in Chapter 4. Table 5 reports the short-term rolling regression results. Investors are assumed to use 2-weeks (Panel A), 1-month (Panel B), and 3-month (Panel C) information to make adjustment on the exchange spot rate movement. The variable x is the log term of the foreign interest rate minus the log term of the US interest rate, which is the term in the first parentheses of equation (28). The variable meanrf is the mean of the generalized risk factor and the variable devrf represents the variance of the generalized risk factor, which are the second and third independent variables in equation (28). The corresponding coefficient for each country is reported after each variable and the number under the coefficient is the t-statistics. R^2 and Durbin-Watson (DW) statistic are also reported in each panel.

For the short run regression model, the variance and the mean of the generalized risk factor (devrf and meanrf) do not present a significant negative relationship with the exchange rate changes. For the 2-weeks regression model, only Switzerland has -0.0022 coefficient of the mean of the risk factor and Sweden has -0.2165 of the deviation of the risk factor. For other short-term periods, there are more negative coefficients, but the results are not persistent. For example, the coefficient of the mean variable of Turkey is negative for 1-month rolling regression but it becomes positive for 3-month rolling model. It is not likely that the mean and deviation of the generalized risk factors in the short run to be the omitted risk premium that is missed in the original model.

Another empirical irregularity of the uncovered interest rate parity is that the coefficients are not close to one. From equation (32), the risk premiums should be more volatile than the interest rate differentials to get the negative signs. In the rolling regression model, the magnitudes of the coefficients on variance factor are consistently larger than the ones of the interest rate differentials. However, the signs of the coefficients change across countries.

For the short-run rolling model, adding the mean and variance of the historical generalized factor does not correct the negative coefficients of interest rate differentials to positive. However, the magnitudes of the negative coefficients are gradually decreased. For example, the coefficients of Australia decrease from -3.5340 of the 2-weeks rolling model, -2.8504 of the 1-month rolling model, to -1.8810 of the 3-month rolling model. Switzerland, New Zealand and United Kingdom reveal the same pattern. However, for the two developing countries, the magnitude maintains on the same level no matter what maturity the rolling model uses. Turkey has -0.8884, -0.8518 and -0.8157. South Africa even has larger negative coefficient for the 3-month rolling model.

For lower income economies, the new added factors will increase the magnitude of the coefficients, making the coefficients even more deviated from one. The coefficient of Japan is 1.3519 for the 2-weeks rolling model and it increases to 2.1086 and 2.2601 for the 1-month and 3-month rolling models. Sweden show similar evidence, with the magnitude of the coefficients increasing for longer maturity rolling models. Moreover, R^2 is increased but the explanation power of the new model is still small.

The above implications promote another assumption that investors are not traded based on short term historical information. It could also be the case that the short run information is too noisy for the market participants to observe and require proper compensation. The results also suggest that, on average, there is no major difference between 2-weeks, 1-month and 3-month rolling models.

For the relative long-term rolling regression, the mean and variance are now calculated based on 240 and 480 days moving average. The final step is the overall regression, where all the historical information is put in and the mean and variance are achieved through the same moving average methodology as the short-term rolling models, and the results are reported in the next subsections.

Table 5: Short-term rolling regressions

Panel A: 2-weeks Rolling Regression

Variables	Australia	Canada	Japan	New Zealand	Norway	Poland	South Africa	Sweden	Switzerland	Turkey	UK
x	−3.5340	5.6704	1.3519	−1.3734	2.4324	0.5836	−0.6703	2.2087	−0.4683	−0.8884	−2.8022
	−1.8754	1.5395	0.9811	−0.7072	1.2414	0.6388	−0.7403	0.8808	−0.2631	−4.5039	−1.1622
meanrf	0.1047	0.1214	0.0299	0.0459	0.1506	0.0969	0.0804	0.0687	−0.0022	0.0751	0.0427
	1.8955	2.3031	0.5615	0.8988	2.8279	1.7791	1.4144	1.3194	−0.0437	1.1638	0.8672
devrf	3.4544	−2.0767	7.3988	1.9292	2.8740	5.8148	1.3776	−0.2165	5.3373	1.7938	13.8357
	1.7143	−0.5486	1.7880	0.5741	0.8673	2.2525	0.7269	−0.0699	1.5452	2.7392	2.7259
R-squared	0.0016	0.0016	0.0006	0.0003	0.0021	0.0019	0.0008	0.0006	0.0005	0.0071	0.0018
DW	2.0593	2.0733	2.0223	2.0076	2.0256	1.9123	2.0257	2.0449	2.0771	1.8990	1.9305

Panel B: 1-month Rolling Regression

Variables	Australia	Canada	Japan	New Zealand	Norway	Poland	South Africa	Sweden	Switzerland	Turkey	UK
x	−2.8504	5.9918	2.1086	−1.6788	2.9393	0.1693	−0.6122	2.4001	−1.4398	−0.8518	−1.6979
	−1.4645	1.6005	1.4326	−0.8221	1.4589	0.1802	−0.6371	0.9535	−0.7812	−4.1537	−0.6921
meanrf	0.0701	0.1595	0.1077	0.0420	0.1256	−0.0760	0.0062	0.0749	−0.0364	−0.0896	−0.0282
	0.8708	2.0402	1.4046	0.5759	1.6423	−0.9988	0.0768	1.0151	−0.5171	−0.9860	−0.3979
devrf	1.7362	−3.0682	11.1450	2.8560	−5.2035	−3.1577	1.0126	−2.4729	−9.4616	0.7462	8.9293
	0.7447	−0.7654	2.2851	0.7422	−1.3900	−1.0985	0.4450	−0.7507	−2.2936	0.8299	1.6265
R-squared	0.0004	0.0013	0.0012	0.0002	0.0011	0.0008	0.0001	0.0005	0.0012	0.0029	0.0008
DW	2.0734	2.0812	2.0182	2.0125	2.0416	1.9332	2.0421	2.0507	2.0816	1.9271	1.9388

Panel C: 3-month Rolling Regression

Variables	Australia	Canada	Japan	New Zealand	Norway	Poland	South Africa	Sweden	Switzerland	Turkey	UK
x	−1.8810	4.7185	2.2601	−0.3874	2.0013	0.2910	−1.5411	2.6259	−0.5652	−0.8157	−1.1567
	−0.8718	1.2028	1.3625	−0.1756	0.9529	0.2908	−1.3810	1.0130	−0.2949	−3.4230	−0.4657
meanrf	0.0715	0.1163	0.1711	−0.0101	0.0578	0.0466	−0.0076	0.1012	0.0944	0.0492	0.0505
	0.4891	0.8453	1.2116	−0.0787	0.4419	0.3555	−0.0558	0.7883	0.7382	0.3137	0.3978
devrf	−0.9819	1.2298	13.4286	−0.9943	−1.6205	−3.2525	4.9368	−0.3490	−3.9998	0.0086	6.5813
	−0.3099	0.2743	2.2128	−0.2172	−0.3889	−0.9631	1.5602	−0.0997	−0.8560	0.0058	1.0993
R-squared	0.0003	0.0004	0.0010	0.0000	0.0002	0.0003	0.0006	0.0003	0.0001	0.0028	0.0003
DW	2.0776	2.0922	2.0253	2.0163	2.0509	1.9223	2.0441	2.0517	2.0732	1.9191	1.9302

5.3 Relative Long-term Rolling Regression Models

Adding the mean and variance of the historical generalized factor correct the negative coefficients of interest rate differentials to positive for 12-month rolling and 2-year rolling models, especially, higher income economies. However, the coefficients are significantly different from one.

These relative long term rolling models work much better than the short run models, especially for the higher interest rate countries, like Australia, New Zealand and United Kingdom. The coefficients of Australia and United Kingdom become positive for the 12-month and 2-year rolling regression. New Zealand has a coefficient of 2.006 for the 12-month rolling model. For lower income economies, the new added factors will not change the positive coefficients in the short-run model. It still just increase the magnitude of the coefficients, making the coefficients even more deviated from one. Moreover, R^2 is increased but the explanation power of the new model is still small.

This empirical fact indicates the possibility that the risks captured by the generalized fact are due to the carry trade holding. Carry-trade is an old and popular strategy in international market. It consists of borrowing low interest rate currencies such as the Japanese yen, and simultaneously longing finance high interest rate currencies such as the New Zealand dollar. The violation of UIP theory shows that high interest rate currency will appreciate which means holding such currencies will generate profits for investors. Carry trade holdings, in turn, exaggerate the forward premium puzzle.

Since the model works better for popular high interest carry trade currencies, the risks captured in the model may reflect the danger of carry trade holding. Given the short time frame, carry trade may dominate the exchange rate movement which causes a violation from UIP hypothesis until carry trade unwinds. Carry trade pays off on average but the volatility is high. At times the strategy produces big losses and this is often called carry trade unwinding. Carry trade unwinding happens from time to time, but the timing and the magnitude is not certain in the short run. Assume there is a small probability that a substantial appreciation of foreign currency will occur. During the long run, carry trade unwinding will happen for sure and the benefits of carry trade are eliminated. Thus, market participant may observe risks and ask for proper compensation in the long run. I will do more analysis on this part when I compare different rolling models.

Table 6: Long-term rolling regressions

PanelA: 12-month Rolling Regression

Variables	Australia	Canada	Japan	New Zealand	Norway	Poland	South Africa	Sweden	Switzerland	Turkey	UK
x	0.4033	3.4083	2.4987	2.0060	1.3312	0.3883	−2.2012	3.2513	0.8224	−1.2908	1.0170
	0.1374	0.8111	1.2279	0.7798	0.5732	0.3438	−1.5219	1.1478	0.3690	−3.3648	0.3786
meanrf	0.0252	0.1899	0.3324	−0.1147	0.2818	0.4382	−0.0804	0.2449	0.0759	−0.3198	−0.0172
	0.0749	0.6982	0.9370	−0.4594	0.9866	1.5502	−0.3251	0.8960	0.2576	−1.0705	−0.0620
devrf	−6.9925	6.8939	13.6127	−8.9776	1.8899	−0.4334	9.4463	2.0453	2.1401	5.2206	−2.6247
	−1.3433	1.3303	1.7740	−1.5322	0.4015	−0.1099	2.0184	0.5262	0.3703	1.7633	−0.3647
R-squared	0.0009	0.0005	0.0006	0.0006	0.0004	0.0007	0.0011	0.0005	0.0002	0.0026	0.0000
DW	2.0925	2.0955	2.0182	2.0118	2.0456	1.9230	2.0480	2.0501	2.0632	1.9212	1.9291

PanelB: 2-year Rolling Regression

Variables	Australia	Canada	Japan	New Zealand	Norway	Poland	South Africa	Sweden	Switzerland	Turkey	UK
x	0.0609	3.1630	3.7164	−0.1652	0.8824	0.7271	−2.5755	2.7082	2.2373	−1.5796	1.5826
	0.0144	0.7418	1.6734	−0.0480	0.3798	0.5495	−1.1680	0.9221	0.8104	−2.6785	0.5003
meanrf	0.0774	0.4077	1.0978	0.0610	0.3033	0.2790	0.1305	0.1591	0.1790	−0.3422	−0.1435
	0.1178	0.8764	2.1808	0.1240	0.7118	0.6013	0.3470	0.3981	0.3746	−0.9154	−0.3030
devrf	−6.1109	7.6392	21.2593	−4.1944	2.4383	−0.3429	9.7289	2.5146	6.9546	8.3916	−3.1937
	−0.7906	1.3062	2.4545	−0.5420	0.4704	−0.0793	1.4209	0.5903	0.9323	1.7280	−0.3649
R-squared	0.0005	0.0004	0.0015	0.0002	0.0002	0.0001	0.0005	0.0003	0.0000	0.0021	0.0001
DW	2.0895	2.0986	2.0275	2.0099	2.0442	1.9221	2.0499	2.0525	2.0711	1.9206	1.9370

5.4 Overall Rolling Regression

In the overall rolling regression, I assume that the market participants will use all the historical prices to observe the risks and errors. I first test my model on total monthly data and the results are reported in Table 7. The purpose of this overall regression which covers more than 10 years time period for all currencies is to check whether the risks that investors might ask for a premium over time to compensate for holding foreign assets are due to long-term risks and whether the risk premiums that have been asked for are more appropriate in the long run. If the long-term risks and errors are well understood by investors in the market and are captured by the historical exchange rate and interest rate prices, then the generalized solution should solve the forward premium puzzle by changing the negative coefficients to positive and the results should be better than the short-term model.

My finding is consistent with what I expect. It is shown that for each of the eleven countries, all of the interest rate differential coefficients are positive after adding mean and variance of the generalized solution. For the daily regression shown in the appendix, the coefficients sign are mixed. For example, Japan and Turkey have negative coefficients in the model without constant term. This is consistent with the stylized fact in the literature that UIP holds better in monthly data.[26]

Compared with the short-term rolling and the relative long-term rolling models, overall rolling model work even better. The major improvement is that all the co-

[26] This stylized fact is well documented by Chinn and Meredith (2005), Boudoukh et al. (2005) and Chinn (2006). In the latest Chinn and Quayyum (2012), they extend their previous work to the period up to 2011 and show this stylized fact is still hold. Monthly data disclose less forward premium puzzle than short daily data.

efficients are positive. The coefficients of the two developing countries, Turkey and South Africa are not just positive but also significant, which is not shown in the other models. The mean of the generalized factor is not significant for many countries but the coefficients are all negative and have large magnitude. The deviation of the generalized factor are negative for the high interest rate countries with large magnitude but positive for the low interest rate countries, like Japan, Norway, Sweden and Switzerland. As shown in the previous sections, this indicates over the long run the mean of the generalized factor might capture the omitted risk premiums and the deviation of the generalized factor might capture the risk premiums for the high interest rate currencies, the carry trade risks. It seems that the information captured by the long run prices is more accurate to correct the puzzle than the short run. Forward premium puzzle indicates higher interest rates are associated with future appreciation of exchange rate at short horizon. Over the long run,like 10 years, the temporary effects fade. Exchange rate will drop to reflect more fundamental dynamics as shown in UIP hypothesis.

In short run test, I state that carry trade holding will cause the deviation from UIP hypothesis. But in the long run, unwinding will happen to carry trade currencies when investors reach the liquidity limit. Carry trade reversal will cut the profitability of carry trade, making the total returns not far away from UIP's prediction. The insignificant long run test continuously confirms the argument on carry trading holding risks.

The results are robust on regressions with constant and regressions with high-low spread and bid-ask spread. However most of the interest rate coefficients are not significant, except South Africa and Turkey. This indicates conventional risks are not dominant reasons to drive exchange rate movement. Transaction costs are expected to fall monotonically over time and these conventional risks are fade over time. Risk premiums vary in the long run. For example, country risk and political risk change from time to time. The recession of early 90's US economy brings lower US interest rates. Investors trade in high yield emerging markets. Later US interest rates increase while Japanese interest rates fall to almost zero. Contagious crises associated with Russia and LTCM of 1998 change the currency trade again the market. Forecast errors are also corrected after a learning process. Thus long horizon movement reflects more fundamental dynamics and the returns are moderate.

R^2 results further provide evidence for this stylized fact. Most countries have less than 3% R^2, except South Africa (6%) and Turkey (17%). The coefficients of generalized factor's mean are negative for all countries, which is consistent with the 3-month information regression. Thus, the foreign currencies tend to appreciate when the expected risk captured by the generalized solution increase. The coefficients of the volatility provide meaningful results. Most high interest rate currencies have negative coefficients on the volatility term. This shows that when the currency is more volatile from the historical trading pattern exchange rate is more likely to appreciate to compensate investors. There are four countries that have negative coefficients and three of them are low interest rate currencies. Interestingly, bid-ask spread coefficients are not significant which hints that the movement of exchange rate is not derived by conventional transaction costs.

The low R^2 in the regression motivates me to test for a special time period, the financial crisis. During the crisis, investors are more likely to reach the liquidity constraint and have to give up the holdings on risky currencies. Expected carry trade holding risk premium disappears because of the capital liquidity constraint and carry trade reversal. The generalized solution from historical returns has no predictability on the timing of carry trade reversal. The unexpected change in exchange market will make the generalized factor useless since now there is no forward premium anomaly and the risk premiums from carry trade holding should not correct the coefficient sign. Hence, I continue to provide short run tests focusing on this special time period, financial crisis.

Table 7: Overall monthly regression result

PanelA: without constant coefficient

Variables	Australia	Canada	Japan	New Zealand	Norway	Poland	South Africa	Sweden	Switzerland	Turkey	UK
x	4.6453	1.8824	0.8283	2.5015	0.7764	0.3003	6.1264	1.1968	1.1346	1.9360	0.9164
	1.2064	0.5840	0.5460	0.9176	0.4906	0.2186	2.6621	0.6370	0.4788	2.8061	0.4604
meanrf	−3.4092	−1.8408	−3.4307	−1.5716	−1.1319	−3.9504	−5.0431	−0.8221	−0.7309	−9.9011	−2.7189
	−1.8249	−1.3721	−1.9979	−1.8053	−1.2739	−2.2557	−3.0520	−1.0501	−0.7931	−4.5481	−1.6553
devrf	−30.8224	−0.4013	23.6977	−30.6843	3.2765	−37.7288	−43.8143	9.0113	16.7763	−140.1248	−19.0335
	−1.6161	−0.0296	2.5071	−1.7593	0.3927	−1.8487	−2.8657	1.0355	1.7744	−4.2989	−1.2325
R-squared	0.0251	0.0121	0.0307	0.0254	0.0103	0.0349	0.0632	0.0130	0.0117	0.1702	0.0176

PanelB: with constant coefficient

Variables	Australia	Canada	Japan	New Zealand	Norway	Poland	South Africa	Sweden	Switzerland	Turkey	UK
c	0.0056	0.0057	0.0004	−0.0003	0.0162	−0.0515	0.0074	0.0081	0.0149	0.0169	−0.0066
	0.6465	1.6105	0.0906	−0.0295	1.4347	−2.2450	0.4503	0.7543	0.8230	0.7873	−1.0146
x	5.2853	2.9664	0.7882	2.5524	0.7914	2.5558	6.1786	1.6964	2.6193	2.4205	2.0991
	1.3268	0.9055	0.4973	0.7893	0.5017	1.5157	2.6741	0.8505	0.8789	2.6161	0.9101
meanrf	−3.6589	−3.5235	−3.4182	−1.6037	−2.4881	−13.8514	−5.8777	−1.6612	−1.1327	−10.5152	−3.5076
	−1.9142	−2.0790	−1.9779	−1.1494	−1.9208	−2.9247	−2.3641	−1.2207	−1.0852	−4.5416	−1.9303
devrf	−57.7385	−69.1516	22.0132	−29.6842	−93.6916	50.2242	−63.0254	−34.1297	−66.2478	−182.0055	40.3177
	−1.2604	−1.5445	1.0548	−0.7778	−1.3758	1.1404	−1.3901	−0.5899	−0.6538	−2.9162	0.6664
R-squared	0.0280	0.0291	0.0308	0.0254	0.0229	0.0691	0.0645	0.0165	0.0159	0.1739	0.0240

PanelC: with other variables

Variables	Australia	Canada	Japan	New Zealand	Norway	Poland	South Africa	Sweden	Switzerland	Turkey	UK
x	4.7837	1.9305	0.8153	2.4410	1.2534	0.3897	8.5538	1.5682	2.0774	1.6433	0.6092
	1.2354	0.5968	0.5281	0.8890	0.7722	0.2848	3.6425	0.8449	0.8996	2.5422	0.3037
meanrf	−3.9178	−1.3939	−3.2480	−1.6268	−0.7698	−3.2128	−4.3791	−0.4493	−1.2867	−6.2031	−2.7412
	−2.0324	−0.9142	−1.8859	−1.8308	−0.7681	−1.8159	−2.7114	−0.4914	−1.3092	−2.8760	−1.4007
devrf	−50.9241	29.3461	12.1862	−36.9934	25.2384	−4.8880	−27.6629	36.8630	3.1072	−74.7805	−48.9742
	−2.1304	1.0280	0.9727	−1.5738	1.2866	−0.1996	−1.7756	2.1999	0.1875	−2.2763	−1.7488
bid-ask	2.5341	0.9643	−0.0200	−0.3658	−0.1948	−0.1857	−0.0270	−0.5646	−4.0787	−0.1900	0.7477
	0.5937	0.4288	−0.6951	−0.1630	−0.8960	−1.0088	−0.4598	−2.4759	−3.1517	−0.8014	0.3017
high-low	0.3407	−0.2652	0.0031	0.1856	−0.0326	−0.1189	−0.0789	−0.0131	0.4376	−0.5071	0.1633
	1.1332	−1.4802	2.0067	0.4687	−0.8869	−1.7892	−3.0969	−0.4219	2.1992	−4.7338	1.1076
R-squared	0.0390	0.0267	0.0569	0.0268	0.0214	0.0730	0.1313	0.0583	0.0863	0.3032	0.0285

5.5 Comparison of Different Rolling Period Models

The model in the dissertation assumes that market participants anticipate risks or forecast errors and asks for appropriate risk premiums. It is not clear and materialized in the literature how market participants anticipate the risks and the movement of the exchange rate. In this section, I will make an empirical investigation on the forecast behavior of market participants.

I assume that investors anticipate risks or forecast errors using 2-weeks, 1-month, 3-month, 12-month, 2-year, and overall data rolling regressions for all the countries. For example, for 2-weeks information model, investors anticipate risks or errors from 10 trading days. The generalized risk factor is calculated using 10 days exchange spot rate and interest rate. The mean and deviation are derived from the 10 days generalized factors moving average. 2-weeks, 1-month, 3-month information are categorized as short-term information model. 12-month, 2-year model and overall data are long-term model.

Fisher (1930) discusses the Fish Equation that market participants generally did not adjust at all accurately and promptly to changes in the behavior of prices but did so only with a long lag. Friedman and Schwartz (1991) also state the problems of stochastic disturbances in the short run and importance of long-run relations. From the comparison, I reach the similar conclusion: For UIP, market participants have inaccurate and delayed adjustment of the nominal interest rate differentials and exchange rate differences in the short run. However, in the long run, the failures of UIP are not persistent.

In the 2-weeks rolling regression model, Australia has a significant negative coefficient of -3.5340, which indicates the model doesnt work. Market participants are not likely to get an accurate risk premium from 2-weeks nominal interest rate and exchange rate information. For other short-run model, the coefficients are still negative, -2.8504 for the 1-month rolling regression and -1.8810 for the 3-month rolling regression, with decreased magnitude of the coefficients. The coefficient becomes positive first in the 12-month rolling regression, which indicates the improvement in the performance of the model. In other words, market participants could anticipate risk premiums more properly when they average the data over longer time periods. The coefficient maintain positive in the 2-year and overall rolling regressions. Other countries show similar pattern. United Kingdom and Switzerland also provide evidence of stable longer horizon analysis, with positive coefficients in the 12-month and 2-year rolling regressions.

New Zealand, South Africa, Turkey have negative coefficients in the short-term rolling regression and relative long-term rolling regression model, but become positive in the overall data rolling regression. For example, Turkey has coefficients -0.8884 in the 2-weeks rolling regression, -0.8518 in the 1-month rolling regression, -0.8157 in the 3-month rolling regression, -1.2908 in the 12-month rolling regression, and -1.5796 in the 2-year rolling regression. But from the overall rolling regression, the coefficient becomes positive eventually. New Zealand and South Africa reveals similar pattern. New Zealand has the coefficient of 2.5015, South Africa has a significant positive coefficient of 6.1264 and the coefficient of Turkey is also significant and positive 1.9360. It seems for the two developing countries, Turkey and South Africa, it takes a longer horizon to anticipate the risk premiums. All these evidence indicate that there is an improvement in the performance of UIP in the long term.

The evidence shown in the empirical rolling regressions can be related to the peso problem, which refers to the effects of low-probability events. The peso-problem type explanation is first discussed by Irving Fisher. He argued that UIP is caused by the market participants inability to forecast the movement of the exchange rates. Agents may overestimate or underestimate occasionally but in the long run the agents are able to forecast the interest rates more certainly so the UIP is less violated in the long horizon.

My results support peso problem explanation. Traditional risk factors are not proper explanation for the puzzle, which is wildly argued in the literature. In my model, agents observe the historical trading pattern and ask for the appropriate risk premiums. If the compensation for the agents comes from the traditional risk factors, which is high frequent and easily to be observed, then there should not be any difference between the short run rolling regression and long run rolling regression results. However, that is not the case in my empirical test. It seems that the market participants are not able to make appropriate adjustment from the nominal interest rate differential to estimate the movement of the exchange rate changes. Then it has to be low-probability events that do not occur often in sample that cause this difference. In the long run, peso problem is not that important and UIP is less violated.

5.6 Rolling Model Regression During the Financial Crisis

I set 8/01/2007 to 8/01/2008 as my regression test period for the financial crisis.[27] Table 8 shows my regression results using daily data. [28] More models are tried in this part. Panel A is the result without the constant term while Panel B adds the bid-ask variable which is the bid and ask spread of the spot rate and high-low variable which is the highest price on a trading day minus the lowest price. The corresponding coefficient for each country is reported after each variable and the number under the coefficient is the t-statistics. Figure 1 shows the spot rate movement during the financial crisis for each country.

The coefficients turn back to negative for Canada, Japan, Norway, Poland, Sweden, Switzerland and UK. Among them, Japan, Norway, Sweden, Switzerland and UK are significant negative during the financial crisis which shows the likelihood of disappearance of carry trade and relevant risk components.

The recent financial crisis means high uncertainty and risk aversion itself. The "safe haven currencies", Japanese yen and Swiss Franc, appear more attractive than others, since such currencies represent hedge assets with low risk or high liquidity. Thus, previous literature also documents the fact that for periods of high risk aversion, we always observe appreciation of the yen and the Swiss franc against the dollar. The negative coefficients on interest rate differential seem to capture this effect and the appreciation of the two safe haven currencies is related to the volatility of the

[27] Financial crisis starts early in equity market and moves to exchange market in August 2007.

[28] For Monthly data, I used a two year rolling model. Monthly data show even more significant results for two year period with 24 observations. Since the observations are too small to indicate the results are convincing, I do not report the monthly result here.

generalized factor. Meanwhile, in 2006, the Bank of England cut interest rates due to inflationary concerns. The pound appreciated against the dollar and it continued to appreciate in the following year, while the US dollar declined. However, the UK currency started to lose its value until December 2008 at a rapid rate and it is not a holding currency during financial crisis. Canada and Norway are also used as safe-haven currencies from time to time by investors. Canada and Norway are always treated as commodity safe-haven currencies. These facts are consistent with the negative coefficients during the time period as what I observe in the regression results. There is no clear reason showing why Sweden also experience currency appreciation during the crisis, since there is a long-term debate on whether the Swedish Krona is a safe-haven currency. [29]

For the 9 tested developed countries, the Australian and New Zealand dollars are two strong carry trade holding (target) currencies. IMF documents that Australian dollar is the biggest profitable currency among overall 150 currencies in the financial crisis. The effect of the financial crisis on Australia is less than most of the other countries, given the fact that the Australia economy does not experience severe recessions or rises in unemployment as the other developed economies. The local economy and the financial market are relatively healthy. Thus, unwinding of the carry trade positions for the Australian may largely explain the depreciation of the currency during the financial crisis. The impact of the financial crisis on Australia started later in 2008. New Zealand has unwinding impact during financial crisis which also happens

[29] Arguments in favor of the Swedish Krona as a safe-haven currency include: Free floating currency inside Europe, budget balance, taxes, small and open economy, and C/A surplus; Arguments against the Swedish Krona as a safe-haven currency include: a negative net international investment position, no safe-haven banking sector, no commodity safe-haven sector and etc.

later than other currencies. The slow unwinding starts from March 2008. However, the coefficients are all positive as what is expected, indicating the depreciation of the two currencies. Two emerging countries, South Africa and Turkey, provide no evidence on carry trade unwinding but they both show impact from the financial crisis. The magnitude of the coefficients is large for both countries, 31.54 for South Africa and 28.58 for Turkey, but they are not significant.

Compared with original model, the generalized factor model are more consistent with the empirical facts. For example, both Australia and New Zealand have positive coefficients which show the depreciation of the currencies, while in the original model Australia has the negative coefficient but New Zealand has the positive sign. South Africa and United Kingdom also have coefficient signs that do not match the empirical facts. From figure 1, South African rand declined during the crisis, while in the original model the coefficient is negative not positive as it should be.

Adding high-low spread and bid-ask spread does not change the sign of interest rate differential. In my regression, for all tested countries, bid-ask spread coefficients are not significant. This could because my solution is general enough to capture these conventional risks required by market participants. The generalized solution comes from historical exchange rate and interest rate, which already involves historical risk factors and errors. Another possible reason is that during the financial crisis, there is less insider information.[30]

High-low spread measures the market participants' preference. 7 out of 11 high-low

[30] See Burnside et al. (2009)'s explanation of bid ask spread which is also discussed in the literature review.

spread coefficients are significant and help to increase R^2. But the signs are mixed, indicating less consistent preference and judgement on future price movement. Emerging countries, South Africa and Turkey, all have significant negative coefficients while developed countries show both positive slope, such as Australia and New Zealand, and negative sign, such as Norway and Canada. One noticeable thing is that the magnitude of the coefficients is relatively small compared with interest rate differential coefficients. This is because for interest rate differential I am using the log price. The largest two happen to be Australia and New Zealand, which also have the significant positive interest rate differential coefficients. For comparison, the magnitude of Australia's high-low spread coefficient is 20 times the one of Canada and 60 times the one of Japan. It seems market participants have stronger disagreement on holding Australian dollar and New Zealand dollar during financial crisis.

The mean of the generalized solution has negative relationship with the exchange rate differential under all two tested cases. Most negative coefficients are significant and have very large magnitude. From Panel A, the coefficients of mean are all significant, except Australia and Poland. The historical risk components do accelerate the downturn momentum of currencies during financial crisis. The volatility of the risk factor captured by generalized solution does not fully help to understand the movement of exchange rate changes. The coefficients of the volatility factor are not consistent. Japan, Sweden and United Kingdom have positive coefficients. It seems the historical volatilities of these three currencies will smooth the decrease of exchange rate. While for most other countries, historical volatility is an accelerating factor.

The greater R^2 after adding high-low spread implies that there are some risks or errors that may be not fully captured by the generalized factor. These types of risk are out of expectation and are not captured by the historical interest rate and exchange rate differentials. One possible explanation is expectation errors caused by over or under reaction to the financial crisis. This might explain the mixed signs. Since this is not a sudden unwinding, these negative coefficients are not as large as the later sudden unwinding coefficients in next section. Mitchell et al. (2007) shows that exchange market has slow movement to currency policy and the comparison between the sudden unwinding and my result of financial crisis unwinding well captures this fact.

To sum up, carry trade unwind caused crisis-related movements reversed strongly for Australia and New Zealand. During the financial crisis, safe haven effects dominate carry trade effects. UIP is less violated and interest rate differentials explain more of the crisis-related exchange rate movements in 2008-2009 than in the past. The generalized factor model works well since the information captured from the historical pattern reveal the risks of the crisis.

Now, I am turning to run short term rolling model. I use 1-month rolling model which assumes the market participants ask for risk premiums from the previous 20 trading-day information, interest rate and exchange spot rate. Then I do the regressions for a 3-month rolling period in Table 9. Panel A means the regression is from 5/01/2007 to 7/01/2008, Panel B is from 6/01/2007 to 8/01/2008, Panel C is from 7/01/2007 to 9/01/2008 and Panel D is from 8/01/2007 to 10/01/2008. In this way, I could check whether the generalized factor model has the prediction ability for the financial crisis.

The short term rolling model reveals some evidence on the forecasting ability. Both Japanese Yen and Swiss Franc switch coefficient signs right before the financial crisis. Japanese Yen changes to negative coefficient since June, 2007, which is due to the demand of the safe haven currency. Swiss Franc also switches from positive coefficient to negative in July, 2007. All these facts reveal a gradually changed demand from target currency to safe haven currency. For the carry trade holding currencies, Australian and New Zealand dollars, it seems that the market participants start to sell Australian dollars earlier than New Zealand dollars. But the evidence is not clear here, since the coefficients are not significant. It seems that the generalized model do provide us some evidence on the forecasting.

Table 8: The financial crisis-from 8/1/2007 to 8/1/2008

Panel A: without constant coefficient

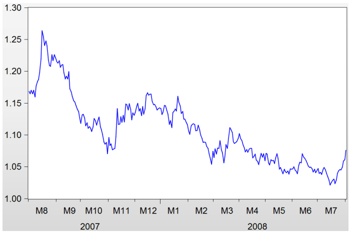
Variables	Australia	Canada	Japan	New Zealand	Norway	Poland	South Africa	Sweden	Switzerland	Turkey	UK
x	41.6489	−2.2488	−102.5313	36.7979	−63.9076	−24.6048	31.5453	−45.9625	−83.8285	28.5794	−51.4919
	2.2619	−0.0707	−3.1988	1.7733	−2.7326	−1.0364	1.5080	−1.7814	−2.2754	1.2819	−2.5167
meanrf	−171.2618	−77.6347	−184.1121	−163.4579	−195.2106	−43.8536	−102.6581	−117.9931	−125.6428	−66.7374	−190.2604
	0.0022	−2.1008	−3.0885	−3.1510	−2.8584	−1.2438	−2.3079	−1.9144	−2.2602	−1.9994	−3.1080
devrf	617.99	−1018.36	426.20	−441.57	−678.38	−556.88	−236.06	41.21	−49.16	−532.95	752.16
	0.0049	−2.0218	2.6020	−2.6572	−2.6714	−1.1398	−1.8910	1.6946	−1.0912	−2.3597	3.0857
R-squared	0.0355	0.0194	0.0386	0.0372	0.0313	0.0063	0.0201	0.0139	0.0199	0.0215	0.0361

Panel B: with other variables

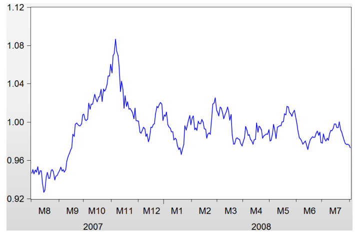
Variables	Australia	Canada	Japan	New Zealand	Norway	Poland	South Africa	Sweden	Switzerland	Turkey	UK
x	46.7642	−3.1266	−90.7308	52.7136	−60.5550	−23.1177	25.2725	−43.7818	−84.7540	29.1941	−58.8080
	2.6427	−0.0990	−2.6161	2.4519	−2.5796	−0.9672	1.2258	−1.6819	−2.2944	1.3139	−2.8863
meanrf	−131.3924	−98.2172	−158.6228	−153.3080	−181.1628	−38.7031	−65.7193	−110.9488	−133.3297	−46.2561	−210.9935
	−2.4391	−2.5977	−2.4098	−2.9717	−2.6337	−1.0893	−1.4597	−1.7739	−2.3551	−1.0758	−3.4638
devrf	146.41	−966.87	299.68	−651.64	−481.54	−415.69	−27.65	85.99	−16.99	−395.06	584.02
	0.6107	−1.9051	1.4186	−3.4178	−1.7464	−0.8246	−0.2019	1.1648	−0.1908	−1.3337	2.3526
bid-ask	−0.2569	−0.4816	0.0062	0.0849	−0.0465	−0.0157	−0.0134	−0.0032	0.2587	0.1890	0.3993
	−0.1861	−0.6289	0.7219	0.0998	−0.7988	−0.1205	−0.6116	−0.0530	0.6410	0.3585	0.9083
high-low	0.2169	−0.0914	0.0003	0.1311	−0.0143	−0.0254	−0.0195	−0.0055	−0.0321	−0.0648	0.0626
	4.9461	−2.1924	0.6784	2.5689	−1.7245	−1.2705	−3.4960	−0.7563	−0.7228	−2.0139	2.7185
R-squared	0.1191	0.0401	0.0424	0.0612	0.0449	0.0125	0.0661	0.0161	0.0236	0.0366	0.0663

Panel C: Original Model

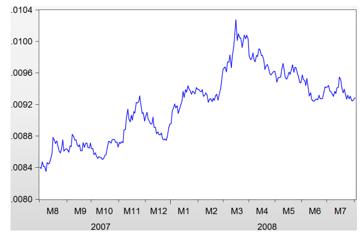
Variables	Australia	Canada	Japan	New Zealand	Norway	Poland	South Africa	Sweden	Switzerland	Turkey	UK
x	−2.6485	−17.6421	−5.3228	1.6044	3.3942	13.8476	−0.2542	2.4947	−10.4572	1.2343	1.0940
	−0.4871	−0.6586	−1.0742	0.3755	0.4547	2.1745	−0.0744	0.2548	−1.2239	0.7524	0.2015
R-squared	0.0006	0.0012	0.0019	0.0002	0.0031	0.0115	0.0000	0.0034	0.0000	0.0005	0.0003



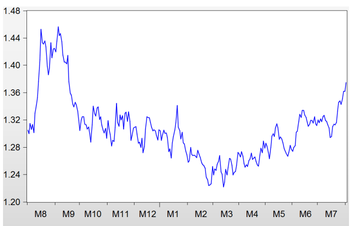
(a) Australia exchange spot rate during the financial crisis



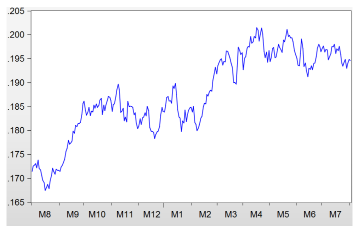
(b) Canada exchange spot rate during the financial crisis



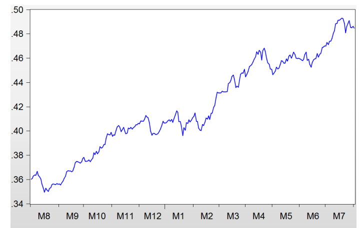
(c) Japan exchange spot rate during the financial crisis



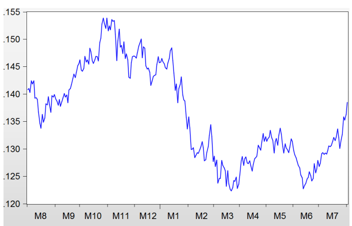
(d) New Zealand exchange spot rate during the financial crisis



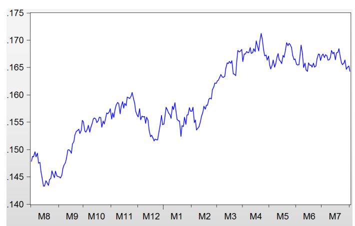
(e) Norway exchange spot rate during the financial crisis



(f) Poland exchange spot rate during the financial crisis

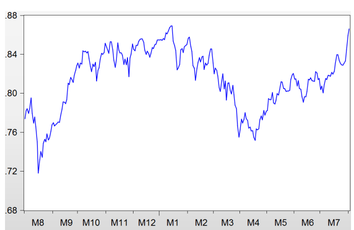


(g) South Africa exchange spot rate during the financial crisis

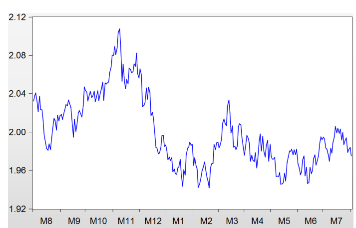


(h) Sweden exchange spot rate during the financial crisis

(i) Switzerland exchange spot rate during the financial crisis



(j) Turkey exchange spot rate during the financial crisis



(k) United Kingdom exchange spot rate during the financial crisis

Figure 1: Exchange spot rate during the financial crisis

Table 9: The financial crisis-every 3 months

Panel A: May

Variables	Australia	Canada	Japan	New Zealand	Norway	Poland	South Africa	Sweden	Switzerland	Turkey	UK
x	45.3581	−337.9024	0.5992	−14.5763	126.5384	76.2663	35.7694	91.3867	32.2115	23.4374	−167.6388
	0.4356	−3.1118	0.0303	−0.4677	2.0085	0.7058	1.2275	3.2105	1.3113	2.4986	−1.3149
meanrf	0.3401	3.1111	−0.5192	0.1133	1.0133	−0.0001	0.6676	0.1914	1.0948	3.9626	0.8422
	0.4174	2.7938	−0.3363	0.1593	1.6732	−0.0003	0.9090	0.5179	1.1929	3.1998	0.9078
devrf	−187.1563	−500.6608	77.1025	35.8880	458.6146	204.4765	−190.9356	560.3495	401.1314	−123.8031	382.6795
	−0.7564	−2.4453	0.1948	0.2576	2.4013	0.7044	−1.2345	3.3059	1.3551	−1.0712	1.1356
R-squared	0.0139	0.1244	0.0251	0.0004	0.0819	0.0078	0.0284	0.1470	0.0290	0.1381	0.0245

Panel B: June

Variables	Australia	Canada	Japan	New Zealand	Norway	Poland	South Africa	Sweden	Switzerland	Turkey	UK
x	76.4735	−156.7874	−12.6790	−26.0576	34.7639	12.5668	14.3792	48.2704	12.9601	17.6274	−193.2719
	0.8520	−1.7317	−1.1491	−0.5140	0.3243	0.1333	0.6495	1.3087	0.4799	1.7952	−1.8707
meanrf	−0.5821	2.2882	−0.7815	0.3593	−0.0072	−0.2439	1.1515	−0.2335	0.6083	3.3245	0.9203
	−0.5788	2.1683	−0.7306	0.3514	−0.0124	−0.4928	1.3424	−0.5214	0.7037	2.2954	1.3364
devrf	−83.9546	−172.2111	−105.4968	92.5648	112.5436	40.0546	−77.0663	236.0751	160.4772	−98.8793	505.8539
	−0.7752	−1.3773	−0.7930	0.7280	0.6321	0.2040	−0.8363	1.4133	0.6098	−1.6716	1.7797
R-squared	0.0112	0.0699	0.0107	0.0171	0.0065	0.0034	0.0279	0.0311	0.0085	0.0791	0.0479

Panel C: July

Variables	Australia	Canada	Japan	New Zealand	Norway	Poland	South Africa	Sweden	Switzerland	Turkey	UK
x	107.8385	−3.6165	−24.2887	48.0809	166.2304	207.7016	21.5500	93.4956	−46.9582	6.6292	−118.8391
	1.2566	−0.0382	−1.7074	1.1635	1.7897	1.6671	0.7759	2.2714	−1.3256	0.5061	−1.1244
meanrf	−1.1817	−0.2287	0.1407	−1.0243	−0.3826	−0.7045	0.7335	−0.6344	0.5360	0.4073	0.9858
	−1.6836	−0.3665	0.1465	−1.6331	−0.9482	−1.7141	0.8164	−1.6861	0.6790	0.3559	1.2939
devrf	−129.2768	47.5870	−104.5626	−98.5186	309.0229	423.7521	−59.3359	417.2511	−319.8440	−12.6134	286.4149
	−1.7497	0.4115	−1.2052	−1.3867	2.2291	1.8893	−0.6588	2.6935	−0.9922	−0.2049	1.0007
R-squared	0.0547	0.0082	0.0288	0.0420	0.0745	0.0595	0.0111	0.1078	0.0261	0.0027	0.0271

Panel D: August

Variables	Australia	Canada	Japan	New Zealand	Norway	Poland	South Africa	Sweden	Switzerland	Turkey	UK
x	43.2048	−17.6038	−26.1088	41.7597	−43.8944	63.1632	52.0156	56.0924	−26.0117	−2.7780	−120.4935
	0.5533	−0.1555	−1.3993	0.7745	−0.7111	0.8799	1.5413	1.1538	−0.8218	−0.1669	−1.4585
meanrf	−0.5585	−0.2442	−0.0170	−0.5363	−0.2925	−0.3295	0.9507	−0.0153	1.2639	−0.3469	1.4124
	−0.8280	−0.4437	−0.0213	−0.9368	−0.5648	−0.7803	1.1596	−0.0342	1.5155	−0.2925	1.8235
devrf	−71.8713	60.5872	−127.7084	−72.3844	33.2887	168.6434	−132.9491	220.7164	−120.3464	29.4524	273.3497
	−0.9984	0.5592	−1.2063	−0.8429	0.5150	1.5264	−1.2926	1.5006	−0.4478	0.3959	1.2160
R-squared	0.0185	0.0152	0.0248	0.0146	0.0051	0.0274	0.0290	0.0329	0.0379	0.0027	0.0593

5.7 Sudden Reversal for Japanese Yen: A Case Regression

Table 10: Sudden carry trade reversal of Japanese Yen

Panel A: without constant coefficient

Variables	10/01/1998 – 1/01/1999	5/01/2006 – 8/01/2006	2/01/2007 – 5/01/2007
x	−572.8937	−835.6291	−917.2908
	−2.7255	−1.7083	−2.0964
meanrf	−16.3630	−270.3607	−685.0517
	−0.7369	−2.1167	−2.7804
devrf	−1966.538	−4102.147	−1649.261
	−2.7373	−1.4707	−0.0390
R-squared	0.1108	0.0672	0.1128

Panel B: with other variables

Variables	10/01/1998 – 1/01/1999	5/01/2006 – 8/01/2006	2/01/2007 – 5/01/2007
x	−395.2462	−712.3993	−995.0325
	−2.1658	−1.4354	−2.3698
meanrf	−16.9365	−258.8899	−529.4194
	−0.8847	−1.9575	−2.1763
devrf	−1544.404	−3449.258	−3367.392
	−2.5014	−1.2040	−1.7999
bid-ask	−0.0073	0.0497	0.0258
	−0.8020	1.4287	1.0863
high-low	0.0018	−0.0006	0.0019
	5.1046	−0.7140	2.5575
R-squared	0.3753	0.0996	0.2144

The recent major financial crisis in 2008 is still not a perfect case to test our model. Investors can well predict the possible liquidity constraint and forecast the future carry trade reversal, which is revealed in the last part of the previous section. This fact may explain why the magnitudes of the negative coefficients are significantly large. Hence, an extension test I provide here is one for sudden Japanese Yen carry trade unwinding. During the sudden unwinding, the model with the generalized factor should capture a larger magnitude and the appreciation of the foreign exchange rate.

Japanese Yen is the most commonly traded carry trade currency. Market participants use Japanese Yen as a funding currency because it had the lowest interest rates in the world for more than 10 years. Chaboud and Gagnon (2007) show the evidence of substantial carry positions from bank loans and bond holdings of Japanese Yen. They document three sudden and rapid Japanese Yen carry trade unwinding in history, October 1998, May 2006, and February 2007. For example, in one week of 1998 (October $4-10$), Japanese yen rose 16% against the dollar. This sudden appreciation reversed profitable carry trade using Japanese yen as the funding currency.

I provide test results in Table 10 for these three unwinding. To involve enough observations, the test starts from the carry trade reversal and lasts for a 3-month period. Compared with the results in the major financial crisis, the generalized solution captures the large appreciation of sudden unwinding by large magnitude negative coefficients. For example, the first sudden reversal has coefficient -572.89 which is negative and significantly different from unity. The large magnitude is because we use log price but it is still much greater than the slopes of the financial crisis. The mean values of the generalized factor are significant for 2006 and 2007 unwinding.

The second regression still shows bid-ask spreads are still helpful to explain the loss. This indicates that conventional risks are not enough to generate unwinding and losses. What causes these carry trade unwinding? Since conventional events, like slow tightening monetary policy, cannot explain, the reversal should be triggered by unforeseen movement. Every once in a while, carry trade reverses. The reversal is not surprising but the timing when a sudden revaluation upward of the low interest rate currency happens is not predictable. The rejection of uncovered interest rate parity tells us carry trade is profitable but the risk is also large as shown in the model. There is no clue that which new information may cause investors suddenly to sell the high

Two of the three high-low spreads are significant. These signs are all consistent with the results from financial crisis expect that under sudden unwinding regression results show much greater R^2. It is also noticeable that even compared with the results in

Panel A and B, involving significant high-low spread largely increases R^2. For 1998 unwinding R^2 increases from 11% to 37% and for 2007 the empirical evidence shows a 10% increase in R^2. But for 2006 unwinding which has a non-significant high-low spread, R^2 does not change much. Compared with financial crisis results, the main difference is the magnitude of the interest rate differential coefficients. Our results provide evidence that sudden and rapid unwinding is much more painful to investors.

CHAPTER 6: REGIME TESTS

The first two dummy variables separate the interest rate differential (x) into periods of positive and negative values. Bansal (1997), the empirical evidence indicates an interest rate regime difference. When the interest rate differential is positive, the slope coefficient is negative which rejects the uncovered interest rate parity. However, the slope coefficient is positive when the interest rate differential is negative, and in this case the forward premium puzzle disappears.

$$\begin{cases} dummy1 = x \quad if\ x > 0 \\ dummy2 = x \quad if\ x < 0 \end{cases} \tag{33}$$

The regime test on the interest rate differential does not show that there are nonlinearities in relationship. In particular, the sign and magnitude of the slope coefficient do not depend on whether the interest rate differential is positive or not. Table 7 panel A reports this regression result. I also include bid ask spread and high low price differential in the model, but the results are very similar to the case without these variables.

The empirical test shows that the regime difference of interest rate differential does not exist after the model involving the generalized factor's mean and variance. Only Poland and Switzerland show similar coefficient signs as Bansal (1997). These two countries have negative coefficients when the interest rate differential is positive and positive coefficients when the differential is negative. But the magnitude is not close to one and the coefficients are not significant. Four countries, Canada, New Zealand, Norway and Sweden, show the opposite results with positive coefficients when the interest rate differential is positive and negative coefficients the other way around. Australia, Japan and United Kingdom show no regime difference in the test. These countries have the same coefficient signs for both positive and negative differentials. South Africa and Turkey both have significant positive coefficient even in the long run monthly regressions and these two countries have special regime test results. After adding generalized solution's mean and deviation, South Africa and Turkey both have only positive differential and the regime test is not applicable on these two countries.

Regime difference on interest rate differential disappears after the model including the generalized factor. The meaning of the generalized solution is that it captures whatever reason that causes forward premium puzzle. When the interest rate differential is positive, the slope coefficient is negative without generalized solution and the solution is proved to correct it to positive in previous sections. This could be caused by a carry trade holding. The slope coefficient is positive when the interest rate differential is negative when there is no carry trade. Thus, after adding the generalized solution, regime difference should disappear or not generate consistent result which is shown in the results.

The next two dummies, dummy 3 and 4, are designed to check whether there is a regime difference of the generalized factor's mean. Generalized factor's mean could be positive or negative. Since the both directions make the slope sign to be positive, there should be no regime difference.

$$\begin{cases} dummy3 = meanrf \quad if\, meanrf > 0 \\ \\ dummy4 = meanrf \quad if\, meanrf < 0 \end{cases} \tag{34}$$

The evidence confirms that there seems no difference between positive and negative mean values. All the countries show negative coefficients when the mean values are negative. Canada, Norway and South Africa have significant negative coefficients for negative mean regime. However, for the positive mean regime, the coefficients are mixed. Most countries have negative coefficients even for the positive mean regime except Canada and Norway. Since all the coefficients for the positive mean regime are not significant, there is no nonlinearity of this regime. Japan has all positive mean values of generalized factor while New Zealand, Poland and Turkey have almost all negative mean values. Thus, these four countries are not testable. From the magnitude of the coefficients, the negative mean values affect the model much more than the positive mean values, except Australia. This means that negative risk premium derived from the generalized factor will largely decrease the exchange rate differential while positive risk premium has mixed effect on the direction of the exchange rate differential.

As stated in Bilson (1981), any regression results are possible to be derived by the impact of a small number of outlying observations. This is also very likely to trigger positive coefficients in my model's regression since the generalized factor has positive skewness. For example, South Africa and Turkey both have significant positive coefficients on interest rate differential even for the long run monthly regression. Table 2 shows that both countries have very large positive skewness. Under the assumption that the errors are temporally uncorrelated, it is very likely that my results come from the extreme positive values of interest rate differential, mean value of generalized factor or volatility of the factor. Thus, I continue to design several dummies to check whether my results are biased because of outliers.

Followed Bilson (1981), Dummy 5 and 6 divide the interest rate differentials into two groups, those less than ten percent in absolute value and those greater than ten percent in absolute value. Dummy 7 and 8 divide the observations into two wider range groups, those less than twenty percent in absolute value and those greater than twenty percent in absolute value.

$$x_{diff} = x_{maximum} - x_{minimum} \tag{35}$$

$$\begin{cases} dummy5 = x \quad if\ x < x_{minimum} + 10\% * x_{diff} \\ dummy6 = x \quad if\ x > x_{maximum} - 10\% * x_{diff} \end{cases} \tag{36}$$

$$\begin{cases} dummy7 = x \quad if\ x < x_{minimum} + 20\% * x_{diff} \\ dummy8 = x \quad if\ x > x_{maximum} - 20\% * x_{diff} \end{cases} \tag{37}$$

Table 8 reports this regime test results. Some positive coefficients of interest rate differential are partially due to the large outlying observations. Norway, South Africa and Sweden's results provide evidence that the exchange rate differential is determined by 10% largest outlying interest rate differential while Canada and New Zealand show the same result in 20% largest outlying range. That is when interest rate differential increases, the exchange rate of foreign country to US will appreciate indicating that uncovered interest rate parity holds.

Table 11: Regime test on interest rate differential

Panel A: generalized factor

Variables	Australia	Canada	Japan	New Zealand	Norway	Poland	South Africa	Sweden	Switzerland	Turkey	UK
*dummy*1	3.7405	7.4433	564.2635	2.7474	1.2199	−0.0538	NA	3.0719	−123.5838	NA	0.4554
	0.9591	1.4780	1.6778	0.9602	0.5540	−0.0345	NA	0.6638	−1.2347	NA	0.2086
*dummy*2	186.0838	−7.5367	0.6123	−6.2613	−0.6851	6.7273	NA	−0.3353	1.4915	NA	8.4133
	1.3611	−1.2016	0.4044	−0.2076	−0.1299	0.5019	NA	−0.0852	0.6259	NA	0.5778
meanrf	−3.4682	−1.9598	−3.3646	−1.4553	−1.1297	−4.2702	NA	−1.0102	−0.8115	NA	−2.9937
	−1.8610	−1.6340	−1.9700	−1.5163	−1.2677	−2.2746	NA	−1.1324	−0.8799	NA	−1.7313
devrf	−25.9197	−18.3123	22.1949	−31.4284	0.6519	−37.7278	NA	4.4380	19.9502	NA	−17.1720
	−1.3378	−0.9945	2.3508	−1.7779	0.0529	−1.8435	NA	0.3286	2.0408	NA	−1.0808
R-squared	0.0373	0.0245	0.0477	0.0259	0.0108	0.0365	NA	0.0142	0.0214	NA	0.0193

Panel B: mean of generalized factor

Variables	Australia	Canada	Japan	New Zealand	Norway	Poland	South Africa	Sweden	Switzerland	Turkey	UK
x	4.8038	3.9390	NA	NA	1.1694	NA	7.9071	1.1197	0.8571	NA	0.9452
	1.2444	1.1450	NA	NA	0.7326	NA	3.1679	0.5835	0.3557	NA	0.4725
*dummy*3	−7.9956	1.5120	NA	NA	0.2413	NA	−2.3502	−0.7990	−0.5930	NA	−7.0818
	−1.3303	0.7181	NA	NA	0.1924	NA	−1.0510	−1.0080	−0.6269	NA	−0.3708
*dummy*4	−1.8388	−8.4893	NA	NA	−9.0457	NA	−13.3030	−11.1849	−11.1884	NA	−2.5343
	−0.6795	−1.9483	NA	NA	−1.7406	NA	−2.6922	−0.2294	−0.7154	NA	−1.3819
devrf	−22.1989	−50.9905	NA	NA	−20.8268	NA	−78.4021	8.4886	13.2111	NA	−17.2811
	−1.0132	−1.4710	NA	NA	−1.1785	NA	−3.1709	0.9361	1.2160	NA	−1.0005
R-squared	0.0296	0.0266	NA	NA	0.0249	NA	0.0830	0.0133	0.0145	NA	0.0179

Table 12: Regime test on extreme generalized factor values

Panel A: 10*percentage*

Variables	Australia	Canada	Japan	New Zealand	Norway	Poland	South Africa	Sweden	Switzerland	Turkey	UK
*dummy*5	230.8031	−2.7570	3.1803	2.1940	−1.2331	6.8478	−8.6277	−1.9262	0.4742	−0.8051	4.3892
	1.7457	−0.4394	1.6701	0.0774	−0.2360	0.5540	−1.2655	−0.5283	0.1427	−0.6930	0.3055
*dummy*6	5.7405	7.0957	65.9859	4.8215	4.7349	0.3676	3.8533	10.8587	−60.4503	−0.0782	1.3444
	1.6715	0.9422	1.5979	1.5046	2.0194	0.2363	2.2363	2.2438	−1.0847	−0.1669	0.3764
meanrf	−3.1126	−1.8083	−5.6667	−1.4739	−1.3139	−4.3465	−3.3361	−1.5005	−0.8002	−4.6532	−2.9211
	−1.9014	−1.3660	−2.9141	−1.6384	−1.5022	−2.3014	−2.5074	−1.8558	−0.9399	−3.7333	−1.6661
devrf	−11.1424	−1.1288	36.7663	−19.5561	1.9165	−39.0875	−8.5195	8.0852	11.8424	−54.3469	−16.8588
	−1.7307	−0.0839	3.1713	−2.1976	0.2595	−2.1049	−1.5606	0.9470	1.3084	−3.9573	−1.2297
R-squared	0.0546	0.0168	0.0541	0.0343	0.0337	0.0371	0.0618	0.0411	0.0178	0.1261	0.0177

Panel B: 20 percentage of generalized factor

Variables	Australia	Canada	Japan	New Zealand	Norway	Poland	South Africa	Sweden	Switzerland	Turkey	UK
*dummy*7	17.8534	−2.6943	2.2094	2.2069	0.0437	3.6003	−1.4697	−1.4565	−0.8279	−1.6828	9.0077
	0.6713	−0.4462	1.2884	0.0779	0.0093	0.3389	−0.4168	−0.4348	−0.3366	−1.4640	0.6433
*dummy*8	3.2802	9.6028	−9.4578	4.1696	3.1944	0.5189	3.6882	2.7596	−26.4573	0.0604	0.8559
	1.4214	1.7237	−1.1644	1.6955	1.5877	0.3611	2.3852	0.7374	−1.1823	0.1367	0.3570
meanrf	−3.3201	−1.9291	−4.4782	−1.5124	−1.3741	−4.1420	−3.1406	−1.1403	−1.0619	−5.9933	−3.1410
	−1.8652	−1.4656	−2.4937	−1.6266	−1.5315	−2.2892	−2.3824	−1.3511	−1.2624	−3.3061	−1.7771
devrf	−16.4848	−4.1432	26.6486	−21.1428	2.4111	−38.1129	−9.7608	5.8744	10.4034	−64.0371	−17.4218
	−2.0636	−0.3035	2.4561	−2.3186	0.3053	−2.0818	−1.6291	0.5708	1.1055	−3.5218	−1.2067
R-squared	0.0307	0.0300	0.0534	0.0380	0.0244	0.0363	0.0589	0.0141	0.0191	0.1366	0.0198

Compared with these countries, Australia has significant positive coefficients on both sides of the outlying observations. However, the magnitude on the smallest 10% group is much larger than the largest 10% group, indicating the exchange rate differential for Australia is largely due to the small interest rate differential. Japan yen, another popular carry trade currency, has the similar result as Australian dollar. However, the magnitude of the coefficient of Japan is not large and is significant only in 10% range. Poland, Switzerland, Turkey and United Kingdom's results are not much affected by the outlying results, under both 10% and 20% range.

The results from interest rate differentials are mixed. The mixed effect could be due to adding generalized factor into the model. It is interesting to check whether the puzzle is solved because of the outliers in the mean and volatility of generalized factor.

Followed the same procedure, dummy $9-12$ are designed to separate extreme values in the mean of generalized factor and dummy $13-16$ are help to check whether extreme volatility values have consistent effect on the model.

$$meanrf_{diff} = meanrf_{maximum} - meanrf_{minimum} \tag{38}$$

$$devrf_{diff} = devrf_{maximum} - devrf_{minimum} \tag{39}$$

$$\begin{cases} dummy9 = meanrf \quad if\ meanrf < meanrf_{minimum} + 10\% * meanrf_{diff} \\ dummy10 = meanrf \quad if\ meanrf > meanrf_{maximum} - 10\% * meanrf_{diff} \end{cases} \tag{40}$$

$$\begin{cases} dummy11 = meanrf \quad if\ meanrf < meanrf_{minimum} + 10\% * meanrf_{diff} \\ dummy12 = meanrf \quad if\ meanrf > meanrf_{maximum} - 10\% * meanrf_{diff} \end{cases} \tag{41}$$

$$\begin{cases} dummy13 = x \quad if\ devrf < devrf_{minimum} + 10\% * devrf_{diff} \\ dummy14 = x \quad if\ devrf > devrf_{maximum} - 10\% * devrf_{diff} \end{cases} \tag{42}$$

$$\begin{cases} dummy15 = x \quad if\ devrf < devrf_{minimum} + 20\% * devrf_{diff} \\ dummy16 = x \quad if\ devrf > devrf_{maximum} - 20\% * devrf_{diff} \end{cases} \tag{43}$$

The results are all attached in the appendix.[31] The generalized factor's mean value does not have regime difference. The coefficients are all negative for both the largest and smallest 20% mean values, except Poland and Turkey. Australia, Canada, New Zealand, South Africa, Turkey, and United Kingdom have significant negative coefficient when the mean of the generalized factor is within 20% smallest value. Japan and Switzerland have the opposite results. They show significant negative coefficients in the other regime, the 20% largest mean values. It seems when the generalized risk is high, the funding currencies, Japanese yen and Swiss franc, are not attractive and the exchange rate of foreign country to US will depreciate. When the generalized risk is low, the popular carry trade currencies, like New Zealand dollar, tend to appreciate. Thus, this fact indicates the generalized factor is a measure of the risk of carry trade reversal. Among the 11 tested countries, only Turkey provides evidence for the regime difference. The noticeable feature of Turkey's result is that the magnitude of the coefficient of largest mean regime is 20 times higher than the one of smallest mean regime. It seems that Turkey does not have carry trade reversal risk and forward premium puzzle.

Further, the volatility of the generalized factor also shows no evidence about the

[31]See Table 11 and 12.

regime difference. New Zealand, South Africa and United Kingdom have significant negative coefficients when volatility is within 20% largest values, indicating when generalized factor is more volatile, the exchange rate tend to depreciate. This result is not consistent on other countries.

CHAPTER 7: CONCLUSION AND POSSIBLE EXTENSIONS

The generalized factor proposed in the dissertation provides empirical correction for the UIP. Now the long-term risk premiums are measurable by the model. In the dissertation, I conclude that there are long-run deviations from parity conditions that appear to be caused by large, but infrequent, shocks to the monetary environment. There are two possible explanations of the large and infrequent shocks. First one is the market participant inability of forecasting that may systematically affect the change in exchange rates. Over the long run, the market participants are more likely to make accurate forecasting which cause a less violation of the UIP at the long horizon. Second explanation is the carry trade holding risk. Over the long run, the carry trade unwinding happens which reduce the violation of the UIP.

There are several possible extensions. For the generalized solution, I assume that it follows normal distribution. I find the evidence that generalized factor is related to the carry trade. In Brunnermeier et al. (2009), they document positive interest rate differential skewness for funding currencies, like JPY. While for investment currencies, especially NZD and AUD, the skewness is negative. My generalized solution may also have country difference on its distribution. Other distributions, besides normal, can be tested in the model. I also plan to involve more sudden unwinding case studies for NZD and AUD.

Another extension of the dissertation is the prediction of the model. From the financial crisis test, the generalized factor model cannot fit the data well. Since the generalized factor is related to the carry trade risk, it present weak prediction power when carry trade effect disappears and safe heaven currency effect dominates. However, this empirical finding motivates the possibility to use the data under certain episodes to predict similar future scenario analysis. For instance, generalized factor can be extracted from Asian crisis of 1997 to 1998 and the crisis following the Russian debt default in 1998 and then be used to replicate the crisis scenario.

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APPENDIX A: A MORE GENERAL EMPIRICAL REGRESSION FORM

From equation (14), we have

$$S_{ij,t}E_t\left(\frac{1+R_{j,t+T}}{\tilde{S}_{ij,t+T}}\right)E_t(\exp(\tilde{w}_{j,t+T}))=E_t(1+R_{i,t+T})E_t(\exp(\tilde{w}_{i,t+T})) \tag{44}$$

Then take log on both sides will derive

$$\log(S_{ij,t})+\log\left[E_t\left(\frac{1+R_{j,t+T}}{\tilde{S}_{ij,t+T}}\right)\right]+\log\left[\frac{E_t(\exp(\tilde{w}_{j,t+T}))}{E_t(\exp(\tilde{w}_{i,t+T}))}\right]=\log\left[E_t(1+R_{i,t+T})\right] \tag{45}$$

Then the generalized solution is expressed as

$$\begin{aligned}\log\left[\frac{E_t(\exp(\tilde{w}_{j,t+T}))}{E_t(\exp(\tilde{w}_{i,t+T}))}\right]&=\\ \log\left[E_t(1+R_{i,t+T})\right]-\log(S_{ij,t})&-\\ \log\left[E_t(1+R_{j,t+T})E_t\left(\frac{1}{\tilde{S}_{ij,t+T}}\right)+cov\left((1+R_{j,t+T}),(\frac{1}{\tilde{S}_{ij,t+T}})\right)\right]&\end{aligned} \tag{46}$$

Compared with the previous expression

$$\begin{aligned}\log\left[\frac{E_t(\exp(\tilde{w}_{j,t+T}))}{E_t(\exp(\tilde{w}_{i,t+T}))}\right]&=\\ \log\left[E_t(1+R_{i,t+T})\right]-\log(S_{ij,t})&-\\ \left[\log(E_t(1+R_{j,t+T}))-\log(E_t(\tilde{S}_{ij,t+T}))\right]&\end{aligned} \tag{47}$$

The last term of the right hand side of equation (42) and (43) is different due to the covariance. Now define $A = E_t(1+R_{j,t+T})E_t(\frac{1}{\tilde{S}_{ij,t+T}})$ and $B = cov\left[(1+R_{j,t+T}),(\frac{1}{\tilde{S}_{ij,t+T}})\right]$

$$\begin{aligned}\log(E_t(1+R_{j,t+T})E_t(\frac{1}{\tilde{S}_{ij,t+T}}) + cov\left[(1+R_{j,t+T}),(\frac{1}{\tilde{S}_{ij,t+T}})\right] &= \log(A+B) \\ &= \log\left[A\left(\frac{B}{A}+1\right)\right] = \log(A) + \log\left(\frac{B}{A}+1\right)\end{aligned} \tag{48}$$

We have

$$\begin{aligned}&\log\left[\frac{E_t(\exp(\tilde{w}_{j,t+T}))}{E_t(\exp(\tilde{w}_{i,t+T}))}\right] = \\ &\log(E_t(1+R_{i,t+T})) - \log(S_{ij,t}) - \log(E_t(1+R_{j,t+T})) + \\ &\log(E_t(\tilde{S}_{ij,t+T})) - \log\left(\frac{B}{A}+1\right)\end{aligned} \tag{49}$$

$$\begin{aligned}&\log(E_t(\tilde{S}_{ij,t+T})) - \log(S_{ij,t}) = \\ &\log(E_t(1+R_{j,t+T})) - \log(E_t(1+R_{i,t+T})) + \\ &\log\left[\frac{E_t(\exp(\tilde{w}_{j,t+T}))}{E_t(\exp(\tilde{w}_{i,t+T}))}\right] + \log\left(\frac{B}{A}+1\right)\end{aligned} \tag{50}$$

$$\begin{aligned}&\log(E_t(\tilde{S}_{ij,t+T})) - \log(S_{ij,t}) = \\ &r_{j,t+T} - r_{i,t+T} + \\ &\log\left[\frac{E_t(\exp(\tilde{w}_{j,t+T}))}{E_t(\exp(\tilde{w}_{i,t+T}))}\right] + \log\left[\frac{cov((1+R_{j,t+T}),(\frac{1}{\tilde{S}_{ij,t+T}}))}{E_t(1+R_{j,t+T})E_t(\frac{1}{\tilde{S}_{ij,t+T}})}+1\right]\end{aligned} \tag{51}$$

Now, we have the final testable expression:

$$\begin{aligned}&\log(E_t(\tilde{S}_{ij,t+T})) - \log(S_{ij,t}) = \\ &r_{j,t+T} - r_{i,t+T} + (\mu_{j,t+T} + .5\sigma^2_{j,t+T}) + \\ &\log\left[\frac{cov((1+R_{j,t+T}),(\frac{1}{\tilde{S}_{ij,t+T}}))}{E_t(1+R_{j,t+T})E_t(\frac{1}{\tilde{S}_{ij,t+T}})}+1\right]\end{aligned} \tag{52}$$

Compared with (28), we have two changes:

1) $(\mu_{j,t+T} + .5\sigma^2_{j,t+T})$ would be different, since it comes from a new expression, equation (51).

2) We also involve a new term in the regression due to the covariance.

APPENDIX B: STATIONARY TEST: AUSTRALIA

Sample: 5/13/1998 11/13/2012
Included observations: 3785

	AC	PAC	Q-Stat	Prob
1	0.995	0.995	3750.3	0.000
2	0.993	0.297	7486.5	0.000
3	0.992	0.172	11214.	0.000
4	0.990	0.017	14928.	0.000
5	0.988	0.069	18633.	0.000
6	0.987	0.002	22327.	0.000
7	0.986	0.066	26014.	0.000
8	0.984	-0.051	29689.	0.000
9	0.983	0.011	33354.	0.000
10	0.981	-0.036	37006.	0.000
11	0.979	-0.029	40646.	0.000
12	0.977	-0.018	44273.	0.000
13	0.975	-0.034	47887.	0.000
14	0.974	0.041	51490.	0.000
15	0.972	-0.045	55079.	0.000
16	0.969	-0.029	58654.	0.000
17	0.967	-0.063	62212.	0.000
18	0.965	0.015	65756.	0.000
19	0.963	-0.004	69286.	0.000
20	0.961	-0.010	72800.	0.000
21	0.959	-0.002	76301.	0.000
22	0.957	0.028	79789.	0.000
23	0.955	0.002	83262.	0.000
24	0.952	-0.033	86720.	0.000
25	0.951	0.029	90164.	0.000
26	0.948	-0.075	93590.	0.000
27	0.945	0.003	97000.	0.000
28	0.943	0.005	100395	0.000
29	0.941	-0.017	103773	0.000
30	0.939	-0.009	107136	0.000
31	0.936	-0.035	110480	0.000
32	0.933	0.004	113808	0.000
33	0.931	-0.030	117118	0.000
34	0.929	0.038	120412	0.000
35	0.926	0.002	123691	0.000
36	0.923	-0.031	126950	0.000

(a) Correlogram

Null Hypothesis: INTEREST has a unit root
Exogenous: None
Lag Length: 6 (Automatic - based on SIC, maxlag=29)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.730184	0.4005
Test critical values:	1% level	-2.565574	
	5% level	-1.940908	
	10% level	-1.616643	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(INTEREST)
Method: Least Squares
Date: 03/09/14 Time: 08:33
Sample (adjusted): 5/22/1998 11/13/2012
Included observations: 3778 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INTEREST(-1)	-0.000191	0.000262	-0.730184	0.4653
D(INTEREST(-1))	-0.412677	0.016219	-25.44351	0.0000
D(INTEREST(-2))	-0.250105	0.017536	-14.26231	0.0000
D(INTEREST(-3))	-0.083090	0.017902	-4.641337	0.0000
D(INTEREST(-4))	-0.116726	0.017902	-6.520166	0.0000
D(INTEREST(-5))	-0.052176	0.017536	-2.975308	0.0029
D(INTEREST(-6))	-0.087959	0.016220	-5.422856	0.0000

R-squared	0.162134	Mean dependent var	-0.000420
Adjusted R-squared	0.160801	S.D. dependent var	0.091528
S.E. of regression	0.083847	Akaike info criterion	-2.117791
Sum squared resid	26.51143	Schwarz criterion	-2.106235
Log likelihood	4007.508	Hannan-Quinn criter.	-2.113683
Durbin-Watson stat	1.992113		

(b) ADF test

Null Hypothesis: D(INTEREST) has a unit root
Exogenous: Constant
Lag Length: 5 (Automatic - based on SIC, maxlag=29)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-32.43561	0.0000
Test critical values:	1% level	-3.431895	
	5% level	-2.862108	
	10% level	-2.567116	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(INTEREST,2)
Method: Least Squares
Date: 03/09/14 Time: 08:35
Sample (adjusted): 5/22/1998 11/13/2012
Included observations: 3778 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(INTEREST(-1))	-2.003366	0.061764	-32.43561	0.0000
D(INTEREST(-1),2)	0.590542	0.055758	10.59109	0.0000
D(INTEREST(-2),2)	0.340310	0.047760	7.125407	0.0000
D(INTEREST(-3),2)	0.257109	0.038770	6.631647	0.0000
D(INTEREST(-4),2)	0.140280	0.028057	4.999727	0.0000
D(INTEREST(-5),2)	0.088019	0.016221	5.426243	0.0000
C	-0.000848	0.001364	-0.621419	0.5344

R-squared	0.685241	Mean dependent var	1.06E-05
Adjusted R-squared	0.684740	S.D. dependent var	0.149335
S.E. of regression	0.083849	Akaike info criterion	-2.117752
Sum squared resid	26.51247	Schwarz criterion	-2.106196
Log likelihood	4007.434	Hannan-Quinn criter.	-2.113644
F-statistic	1368.267	Durbin-Watson stat	1.992119
Prob(F-statistic)	0.000000		

(c) ADF test for 1st diff

Figure 2: Australia: interest rate stationary test

Sample: 5/13/1998 11/13/2012
Included observations: 3785

	AC	PAC	Q-Stat	Prob
1	0.999	0.999	3778.4	0.000
2	0.998	0.021	7548.5	0.000
3	0.996	-0.009	11310.	0.000
4	0.995	0.019	15064.	0.000
5	0.994	-0.032	18809.	0.000
6	0.993	0.009	22546.	0.000
7	0.991	0.025	26275.	0.000
8	0.990	-0.014	29996.	0.000
9	0.989	-0.019	33708.	0.000
10	0.988	0.021	37412.	0.000
11	0.987	0.005	41109.	0.000
12	0.985	-0.002	44797.	0.000
13	0.984	-0.003	48477.	0.000
14	0.983	-0.028	52149.	0.000
15	0.982	0.011	55813.	0.000
16	0.980	0.018	59468.	0.000
17	0.979	0.007	63116.	0.000
18	0.978	-0.032	66755.	0.000
19	0.977	-0.003	70386.	0.000
20	0.975	-0.003	74009.	0.000
21	0.974	0.019	77623.	0.000
22	0.973	0.015	81230.	0.000
23	0.972	0.001	84829.	0.000
24	0.971	-0.008	88420.	0.000
25	0.970	0.006	92003.	0.000
26	0.968	0.005	95579.	0.000
27	0.967	-0.000	99147.	0.000
28	0.966	-0.003	102707	0.000
29	0.965	-0.013	106260	0.000
30	0.964	-0.025	109804	0.000
31	0.962	-0.001	113340	0.000
32	0.961	-0.016	116867	0.000
33	0.960	-0.009	120386	0.000
34	0.958	0.006	123895	0.000
35	0.957	0.016	127397	0.000
36	0.956	-0.021	130890	0.000

(a) Correlogram

Null Hypothesis: SPOT has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=29)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		0.857933	0.8951
Test critical values:	1% level	-2.565573	
	5% level	-1.940908	
	10% level	-1.616643	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(SPOT)
Method: Least Squares
Date: 03/09/14 Time: 20:06
Sample (adjusted): 5/14/1998 11/13/2012
Included observations: 3784 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
SPOT(-1)	0.000118	0.000137	0.857933	0.3910

R-squared	-0.000085	Mean dependent var	0.000109
Adjusted R-squared	-0.000085	S.D. dependent var	0.006507
S.E. of regression	0.006507	Akaike info criterion	-7.231602
Sum squared resid	0.160178	Schwarz criterion	-7.229953
Log likelihood	13683.19	Hannan-Quinn criter.	-7.231016
Durbin-Watson stat	2.071749		

(b) ADF test

Null Hypothesis: D(SPOT) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=29)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-63.73524	0.0001
Test critical values:	1% level	-3.431893	
	5% level	-2.862107	
	10% level	-2.567115	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(SPOT,2)
Method: Least Squares
Date: 03/09/14 Time: 20:08
Sample (adjusted): 5/15/1998 11/13/2012
Included observations: 3783 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(SPOT(-1))	-1.035846	0.016252	-63.73524	0.0000
C	0.000113	0.000106	1.069153	0.2851

R-squared	0.517925	Mean dependent var	2.80E-07
Adjusted R-squared	0.517798	S.D. dependent var	0.009367
S.E. of regression	0.006504	Akaike info criterion	-7.232189
Sum squared resid	0.159957	Schwarz criterion	-7.228891
Log likelihood	13681.69	Hannan-Quinn criter.	-7.231016
F-statistic	4062.180	Durbin-Watson stat	1.998624
Prob(F-statistic)	0.000000		

(c) ADF test for 1st diff

Figure 3: Australia: exchange spot rate stationary test

Sample: 5/14/1998 11/13/2012
Included observations: 3784

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.997	0.997	3765.0	0.000
		2	0.996	0.304	7522.5	0.000
		3	0.995	0.136	11274.	0.000
		4	0.994	0.018	15017.	0.000
		5	0.993	0.008	18753.	0.000
		6	0.992	-0.010	22482.	0.000
		7	0.991	0.014	26203.	0.000
		8	0.989	-0.066	29915.	0.000
		9	0.988	0.030	33620.	0.000
		10	0.987	0.031	37318.	0.000
		11	0.986	-0.054	41006.	0.000
		12	0.984	-0.011	44686.	0.000
		13	0.983	-0.048	48356.	0.000
		14	0.982	0.041	52018.	0.000
		15	0.980	0.001	55672.	0.000
		16	0.979	-0.021	59317.	0.000
		17	0.978	-0.023	62952.	0.000
		18	0.976	0.028	66579.	0.000
		19	0.975	0.037	70198.	0.000
		20	0.974	-0.002	73810.	0.000
		21	0.973	0.056	77415.	0.000
		22	0.972	0.013	81014.	0.000
		23	0.971	0.028	84606.	0.000
		24	0.970	0.005	88191.	0.000
		25	0.969	0.036	91772.	0.000
		26	0.968	0.008	95348.	0.000
		27	0.967	-0.013	98917.	0.000
		28	0.967	-0.000	102480	0.000
		29	0.966	-0.033	106037	0.000
		30	0.965	0.014	109588	0.000
		31	0.964	-0.025	113132	0.000
		32	0.963	-0.017	116670	0.000
		33	0.962	-0.008	120201	0.000
		34	0.961	0.021	123726	0.000
		35	0.959	-0.049	127244	0.000
		36	0.958	0.010	130755	0.000

(a) Correlogram

Null Hypothesis: X has a unit root
Exogenous: None
Lag Length: 2 (Automatic - based on SIC, maxlag=29)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.442096	0.5234
Test critical values:	1% level	-2.565574	
	5% level	-1.940908	
	10% level	-1.616643	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(X)
Method: Least Squares
Date: 03/11/14 Time: 11:22
Sample (adjusted): 5/19/1998 11/13/2012
Included observations: 3781 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
X(-1)	-0.000288	0.000652	-0.442096	0.6584
D(X(-1))	-0.414293	0.016005	-25.88509	0.0000
D(X(-2))	-0.181759	0.016001	-11.35943	0.0000

R-squared	0.152006	Mean dependent var	1.17E-08
Adjusted R-squared	0.151557	S.D. dependent var	1.52E-06
S.E. of regression	1.40E-06	Akaike info criterion	-24.11460
Sum squared resid	7.44E-09	Schwarz criterion	-24.10965
Log likelihood	45591.65	Hannan-Quinn criter.	-24.11284
Durbin-Watson stat	2.015875		

(b) ADF test

Null Hypothesis: D(X) has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=29)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-60.72315	0.0001
Test critical values:	1% level	-3.431894	
	5% level	-2.862107	
	10% level	-2.567115	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(X,2)
Method: Least Squares
Date: 03/11/14 Time: 11:23
Sample (adjusted): 5/19/1998 11/13/2012
Included observations: 3781 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(X(-1))	-1.596699	0.026295	-60.72315	0.0000
D(X(-1),2)	0.182046	0.015998	11.37956	0.0000
C	1.87E-08	2.28E-08	0.820314	0.4121

R-squared	0.686147	Mean dependent var	-9.06E-11
Adjusted R-squared	0.685981	S.D. dependent var	2.50E-06
S.E. of regression	1.40E-06	Akaike info criterion	-24.11472
Sum squared resid	7.44E-09	Schwarz criterion	-24.10977
Log likelihood	45591.89	Hannan-Quinn criter.	-24.11296
F-statistic	4129.749	Durbin-Watson stat	2.016011
Prob(F-statistic)	0.000000		

(c) ADF test for 1st diff

Figure 4: Australia: log interest rate difference stationary test

Sample: 5/14/1998 11/13/2012
Included observations: 3784

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	-0.039	-0.039	5.8881	0.015
		2	-0.002	-0.003	5.9006	0.052
		3	-0.026	-0.026	8.3657	0.039
		4	0.049	0.047	17.547	0.002
		5	-0.023	-0.020	19.627	0.001
		6	-0.036	-0.038	24.444	0.000
		7	0.028	0.028	27.444	0.000
		8	0.011	0.010	27.914	0.000
		9	-0.026	-0.025	30.553	0.000
		10	-0.011	-0.008	30.998	0.001
		11	0.014	0.009	31.706	0.001
		12	0.005	0.004	31.812	0.001
		13	0.040	0.045	37.975	0.000
		14	-0.018	-0.014	39.188	0.000
		15	-0.009	-0.014	39.512	0.001
		16	-0.026	-0.024	42.055	0.000
		17	0.044	0.040	49.381	0.000
		18	-0.006	-0.001	49.528	0.000
		19	0.008	0.009	49.762	0.000
		20	-0.013	-0.012	50.425	0.000
		21	-0.015	-0.021	51.238	0.000
		22	-0.001	0.001	51.245	0.000
		23	-0.002	0.002	51.254	0.001
		24	-0.014	-0.018	52.037	0.001
		25	0.012	0.010	52.586	0.001
		26	0.016	0.016	53.611	0.001
		27	0.006	0.008	53.732	0.002
		28	-0.001	0.004	53.734	0.002
		29	0.046	0.047	61.732	0.000
		30	-0.002	-0.006	61.747	0.001
		31	0.008	0.011	62.009	0.001
		32	0.009	0.013	62.299	0.001
		33	-0.029	-0.031	65.496	0.001
		34	-0.005	-0.006	65.599	0.001
		35	0.017	0.021	66.742	0.001
		36	-0.016	-0.022	67.780	0.001

(a) Correlogram

Null Hypothesis: Y has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=29)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-63.95703	0.0001
Test critical values:	1% level	-2.565573	
	5% level	-1.940908	
	10% level	-1.616643	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(Y)
Method: Least Squares
Date: 03/11/14 Time: 11:30
Sample (adjusted): 5/15/1998 11/13/2012
Included observations: 3783 after adjustments

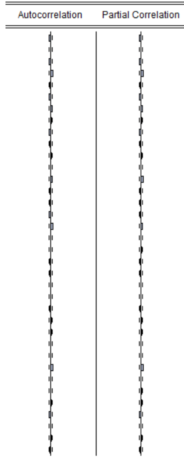
Variable	Coefficient	Std. Error	t-Statistic	Prob.
Y(-1)	-1.039182	0.016248	-63.95703	0.0000

R-squared	0.519594	Mean dependent var	-1.96E-07
Adjusted R-squared	0.519594	S.D. dependent var	0.005380
S.E. of regression	0.003729	Akaike info criterion	-8.345295
Sum squared resid	0.052580	Schwarz criterion	-8.343646
Log likelihood	15786.13	Hannan-Quinn criter.	-8.344709
Durbin-Watson stat	2.000242		

(b) ADF test

Figure 5: Australia: log exchange spot rate difference stationary test

Sample: 5/14/1998 11/13/2012
Included observations: 3784



	AC	PAC	Q-Stat	Prob
1	-0.040	-0.040	5.9266	0.015
2	-0.002	-0.003	5.9405	0.051
3	-0.026	-0.026	8.4294	0.038
4	0.049	0.047	17.567	0.001
5	-0.024	-0.020	19.669	0.001
6	-0.036	-0.038	24.516	0.000
7	0.028	0.028	27.491	0.000
8	0.011	0.010	27.951	0.000
9	-0.026	-0.025	30.611	0.000
10	-0.011	-0.008	31.065	0.001
11	0.014	0.009	31.761	0.001
12	0.005	0.004	31.863	0.001
13	0.040	0.045	37.997	0.000
14	-0.018	-0.015	39.224	0.000
15	-0.009	-0.014	39.553	0.001
16	-0.026	-0.024	42.114	0.000
17	0.044	0.040	49.428	0.000
18	-0.006	-0.001	49.579	0.000
19	0.008	0.009	49.807	0.000
20	-0.013	-0.012	50.476	0.000
21	-0.015	-0.021	51.295	0.000
22	-0.001	0.001	51.302	0.000
23	-0.002	0.001	51.312	0.001
24	-0.014	-0.018	52.105	0.001
25	0.012	0.010	52.646	0.001
26	0.016	0.016	53.658	0.001
27	0.006	0.008	53.775	0.002
28	-0.001	0.004	53.777	0.002
29	0.046	0.046	61.734	0.000
30	-0.002	-0.007	61.751	0.001
31	0.008	0.011	62.006	0.001
32	0.009	0.013	62.287	0.001
33	-0.029	-0.031	65.511	0.001
34	-0.005	-0.006	65.619	0.001
35	0.017	0.021	66.746	0.001
36	-0.017	-0.022	67.798	0.001

(a) Correlogram

Null Hypothesis: RF has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=29)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-63.97688	0.0001
Test critical values:	1% level	-2.565573	
	5% level	-1.940908	
	10% level	-1.616643	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(RF)
Method: Least Squares
Date: 03/20/14 Time: 13:59
Sample (adjusted): 5/15/1998 11/13/2012
Included observations: 3783 after adjustments

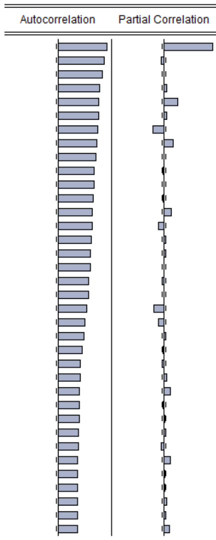
Variable	Coefficient	Std. Error	t-Statistic	Prob.
RF(-1)	-1.039492	0.016248	-63.97688	0.0000

R-squared	0.519749	Mean dependent var	1.84E-07
Adjusted R-squared	0.519749	S.D. dependent var	0.005380
S.E. of regression	0.003728	Akaike info criterion	-8.345614
Sum squared resid	0.052563	Schwarz criterion	-8.343965
Log likelihood	15786.73	Hannan-Quinn criter.	-8.345028
Durbin-Watson stat	2.000267		

(b) ADF test

Figure 6: Australia: the generalized risk factor stationary test

Sample: 5/14/1998 11/13/2012
Included observations: 3784



	AC	PAC	Q-Stat	Prob
1	0.952	0.952	3435.8	0.000
2	0.902	-0.051	6521.0	0.000
3	0.854	-0.006	9286.5	0.000
4	0.812	0.041	11788.	0.000
5	0.798	0.275	14205.	0.000
6	0.791	0.060	16580.	0.000
7	0.765	-0.217	18801.	0.000
8	0.752	0.186	20945.	0.000
9	0.732	0.008	22978.	0.000
10	0.711	-0.010	24897.	0.000
11	0.699	0.001	26755.	0.000
12	0.682	-0.012	28521.	0.000
13	0.672	0.139	30235.	0.000
14	0.660	-0.111	31891.	0.000
15	0.646	0.040	33478.	0.000
16	0.635	0.027	35011.	0.000
17	0.623	0.001	36487.	0.000
18	0.606	-0.039	37886.	0.000
19	0.595	-0.002	39235.	0.000
20	0.563	-0.191	40443.	0.000
21	0.526	-0.100	41497.	0.000
22	0.494	0.032	42424.	0.000
23	0.461	-0.024	43233.	0.000
24	0.439	-0.035	43966.	0.000
25	0.429	0.056	44667.	0.000
26	0.420	0.119	45340.	0.000
27	0.414	-0.011	45993.	0.000
28	0.410	0.022	46635.	0.000
29	0.401	0.041	47247.	0.000
30	0.388	-0.049	47820.	0.000
31	0.382	0.121	48379.	0.000
32	0.380	0.018	48930.	0.000
33	0.379	0.009	49478.	0.000
34	0.382	0.050	50036.	0.000
35	0.382	0.033	50593.	0.000
36	0.384	0.112	51156.	0.000

(a) Correlogram

Null Hypothesis: MEANRF has a unit root
Exogenous: None
Lag Length: 15 (Automatic - based on SIC, maxlag=15)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-12.45140	0.0000
Test critical values:	1% level	-2.565576	
	5% level	-1.940908	
	10% level	-1.616643	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(MEANRF)
Method: Least Squares
Date: 03/20/14 Time: 14:00
Sample (adjusted): 6/05/1998 11/13/2012
Included observations: 3768 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
MEANRF(-1)	-0.032472	0.002608	-12.45140	0.0000
D(MEANRF(-1))	0.028897	0.015787	1.830439	0.0673
D(MEANRF(-2))	0.181098	0.015196	11.91767	0.0000
D(MEANRF(-3))	0.134584	0.015260	8.819550	0.0000
D(MEANRF(-4))	-0.007943	0.014551	-0.545857	0.5852
D(MEANRF(-5))	-0.150955	0.014365	-10.50842	0.0000
D(MEANRF(-6))	-0.001111	0.014135	-0.078581	0.9374
D(MEANRF(-7))	-0.179092	0.013968	-12.82139	0.0000
D(MEANRF(-8))	-0.067806	0.013478	-5.030906	0.0000
D(MEANRF(-9))	0.145703	0.012233	11.91063	0.0000
D(MEANRF(-10))	0.113842	0.011709	9.722857	0.0000
D(MEANRF(-11))	-0.005788	0.010511	-0.550644	0.5819
D(MEANRF(-12))	-0.188231	0.008958	-21.01167	0.0000
D(MEANRF(-13))	0.064983	0.009172	7.084644	0.0000
D(MEANRF(-14))	-0.053047	0.009227	-5.749305	0.0000
D(MEANRF(-15))	-0.094957	0.009230	-10.28762	0.0000

R-squared	0.279082	Mean dependent var	2.53E-07
Adjusted R-squared	0.276200	S.D. dependent var	1.70E-05
S.E. of regression	1.45E-05	Akaike info criterion	-19.44569
Sum squared resid	7.85E-07	Schwarz criterion	-19.41922
Log likelihood	36651.68	Hannan-Quinn criter.	-19.43628
Durbin-Watson stat	2.068601		

(b) ADF test

Figure 7: Australia: the mean of the generalized risk factor stationary test

Sample: 5/14/1998 11/13/2012
Included observations: 3784

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.993	0.993	3736.1	0.000
		2	0.986	-0.062	7416.7	0.000
		3	0.978	-0.034	11039.	0.000
		4	0.970	0.012	14604.	0.000
		5	0.964	0.153	18129.	0.000
		6	0.961	0.154	21629.	0.000
		7	0.958	0.048	25112.	0.000
		8	0.955	-0.059	28574.	0.000
		9	0.952	0.017	32015.	0.000
		10	0.948	-0.057	35425.	0.000
		11	0.942	-0.012	38798.	0.000
		12	0.937	-0.030	42130.	0.000
		13	0.931	0.010	45424.	0.000
		14	0.926	0.033	48684.	0.000
		15	0.923	0.049	51920.	0.000
		16	0.919	-0.020	55133.	0.000
		17	0.916	0.026	58326.	0.000
		18	0.914	0.034	61500.	0.000
		19	0.910	-0.001	64654.	0.000
		20	0.905	-0.122	67773.	0.000
		21	0.899	-0.102	70848.	0.000
		22	0.892	0.018	73879.	0.000
		23	0.885	0.011	76865.	0.000
		24	0.880	0.028	79815.	0.000
		25	0.879	0.334	82763.	0.000
		26	0.879	-0.061	85709.	0.000
		27	0.879	0.010	88656.	0.000
		28	0.879	0.006	91602.	0.000
		29	0.878	0.076	94545.	0.000
		30	0.877	0.066	97478.	0.000
		31	0.875	0.041	100401	0.000
		32	0.873	-0.054	103314	0.000
		33	0.872	-0.002	106215	0.000
		34	0.871	0.040	109114	0.000
		35	0.871	-0.018	112011	0.000
		36	0.870	-0.030	114904	0.000

(a) Correlogram

Null Hypothesis: DEVRF has a unit root
Exogenous: None
Lag Length: 15 (Automatic - based on SIC, maxlag=15)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.049425	0.6663
Test critical values:	1% level	-2.565576	
	5% level	-1.940908	
	10% level	-1.616643	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DEVRF)
Method: Least Squares
Date: 03/20/14 Time: 14:01
Sample (adjusted): 6/05/1998 11/13/2012
Included observations: 3768 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DEVRF(-1)	-1.13E-05	0.000229	-0.049425	0.9606
D(DEVRF(-1))	0.074122	0.016208	4.573329	0.0000
D(DEVRF(-2))	0.014263	0.016205	0.880140	0.3788
D(DEVRF(-3))	0.050821	0.016109	3.154824	0.0016
D(DEVRF(-4))	-0.063504	0.015707	-4.043069	0.0001
D(DEVRF(-5))	-0.014895	0.015719	-0.947554	0.3434
D(DEVRF(-6))	-0.053483	0.015700	-3.406554	0.0007
D(DEVRF(-7))	-0.011533	0.015601	-0.739272	0.4598
D(DEVRF(-8))	0.031988	0.015390	2.078463	0.0377
D(DEVRF(-9))	0.106747	0.015305	6.974486	0.0000
D(DEVRF(-10))	0.057087	0.015345	3.720256	0.0002
D(DEVRF(-11))	0.000776	0.014901	0.052060	0.9585
D(DEVRF(-12))	0.131172	0.014447	9.079609	0.0000
D(DEVRF(-13))	-0.098386	0.014600	-6.738558	0.0000
D(DEVRF(-14))	-0.014786	0.014658	-1.008709	0.3132
D(DEVRF(-15))	-0.055364	0.014542	-3.807320	0.0001

R-squared	0.081747	Mean dependent var	1.35E-09
Adjusted R-squared	0.078076	S.D. dependent var	1.68E-07
S.E. of regression	1.61E-07	Akaike info criterion	-28.44331
Sum squared resid	9.71E-11	Schwarz criterion	-28.41684
Log likelihood	53603.21	Hannan-Quinn criter.	-28.43390
Durbin-Watson stat	1.960770		

(b) ADF test

Null Hypothesis: D(DEVRF) has a unit root
Exogenous: Constant
Lag Length: 9 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-17.52698	0.0000
Test critical values:	1% level	-3.431897	
	5% level	-2.862109	
	10% level	-2.567116	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DEVRF,2)
Method: Least Squares
Date: 03/20/14 Time: 14:02
Sample (adjusted): 5/29/1998 11/13/2012
Included observations: 3773 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(DEVRF(-1))	-0.798868	0.045579	-17.52698	0.0000
D(DEVRF(-1),2)	-0.159580	0.043614	-3.658905	0.0003
D(DEVRF(-2),2)	-0.113991	0.040750	-2.797330	0.0052
D(DEVRF(-3),2)	-0.092227	0.037343	-2.469719	0.0136
D(DEVRF(-4),2)	-0.125186	0.033146	-3.776775	0.0002
D(DEVRF(-5),2)	-0.190072	0.029143	-6.521954	0.0000
D(DEVRF(-6),2)	-0.245866	0.026116	-9.414453	0.0000
D(DEVRF(-7),2)	-0.257986	0.023234	-11.10388	0.0000
D(DEVRF(-8),2)	-0.167208	0.019830	-8.432110	0.0000
D(DEVRF(-9),2)	-0.051962	0.014886	-3.490656	0.0005
C	1.19E-09	2.73E-09	0.434839	0.6637

R-squared	0.487372	Mean dependent var	6.54E-11
Adjusted R-squared	0.486010	S.D. dependent var	2.34E-07
S.E. of regression	1.67E-07	Akaike info criterion	-28.36424
Sum squared resid	1.05E-10	Schwarz criterion	-28.34606
Log likelihood	53520.14	Hannan-Quinn criter.	-28.35778
F-statistic	357.6660	Durbin-Watson stat	1.997022
Prob(F-statistic)	0.000000		

(c) ADF test for 1st diff

Figure 8: Australia: the deviation of the generalized risk factor stationary test

APPENDIX C: STATIONARY TEST: CANADA

Sample: 8/20/1997 11/13/2012
Included observations: 3975

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.999	0.999	3969.1	0.000
		2	0.998	0.301	7935.6	0.000
		3	0.998	0.059	11899.	0.000
		4	0.997	-0.022	15859.	0.000
		5	0.997	-0.006	19815.	0.000
		6	0.996	0.009	23768.	0.000
		7	0.996	-0.002	27717.	0.000
		8	0.995	-0.011	31663.	0.000
		9	0.994	-0.049	35604.	0.000
		10	0.994	0.012	39542.	0.000
		11	0.993	-0.013	43476.	0.000
		12	0.993	-0.015	47406.	0.000
		13	0.992	-0.018	51331.	0.000
		14	0.991	0.035	55253.	0.000
		15	0.991	-0.030	59170.	0.000
		16	0.990	-0.004	63083.	0.000
		17	0.989	-0.038	66991.	0.000
		18	0.988	-0.003	70894.	0.000
		19	0.988	-0.019	74793.	0.000
		20	0.987	0.008	78687.	0.000
		21	0.986	-0.009	82576.	0.000
		22	0.986	0.007	86461.	0.000
		23	0.985	-0.025	90340.	0.000
		24	0.984	0.029	94215.	0.000
		25	0.983	0.018	98086.	0.000
		26	0.983	-0.016	101952	0.000
		27	0.982	-0.018	105812	0.000
		28	0.981	-0.020	109668	0.000
		29	0.980	-0.013	113518	0.000
		30	0.980	-0.011	117363	0.000
		31	0.979	-0.036	121203	0.000
		32	0.978	-0.003	125037	0.000
		33	0.977	-0.052	128864	0.000
		34	0.976	-0.041	132685	0.000
		35	0.975	-0.014	136499	0.000
		36	0.974	-0.010	140307	0.000

(a) Correlogram

Null Hypothesis: INTEREST has a unit root
Exogenous: None
Lag Length: 2 (Automatic - based on SIC, maxlag=30)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.945002	0.3076
Test critical values:	1% level	-2.565544	
	5% level	-1.940904	
	10% level	-1.616646	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(INTEREST)
Method: Least Squares
Date: 03/10/14 Time: 08:32
Sample (adjusted): 8/25/1997 11/13/2012
Included observations: 3972 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INTEREST(-1)	-0.000283	0.000300	-0.945002	0.3447
D(INTEREST(-1))	-0.398949	0.015792	-25.26316	0.0000
D(INTEREST(-2))	-0.100064	0.015792	-6.336559	0.0000

R-squared	0.140393	Mean dependent var	-0.000579
Adjusted R-squared	0.139960	S.D. dependent var	0.069721
S.E. of regression	0.064658	Akaike info criterion	-2.638663
Sum squared resid	16.59289	Schwarz criterion	-2.633915
Log likelihood	5243.385	Hannan-Quinn criter.	-2.636979
Durbin-Watson stat	1.997231		

(b) ADF test

Null Hypothesis: D(INTEREST) has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=30)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-57.50591	0.0001
Test critical values:	1% level	-3.431811	
	5% level	-2.862071	
	10% level	-2.567096	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(INTEREST,2)
Method: Least Squares
Date: 03/10/14 Time: 08:32
Sample (adjusted): 8/25/1997 11/13/2012
Included observations: 3972 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(INTEREST(-1))	-1.499386	0.026074	-57.50591	0.0000
D(INTEREST(-1),2)	0.100213	0.015793	6.345369	0.0000
C	-0.000868	0.001026	-0.846174	0.3975

R-squared	0.684607	Mean dependent var	4.40E-19
Adjusted R-squared	0.684448	S.D. dependent var	0.115105
S.E. of regression	0.064659	Akaike info criterion	-2.638619
Sum squared resid	16.59363	Schwarz criterion	-2.633870
Log likelihood	5243.297	Hannan-Quinn criter.	-2.636935
F-statistic	4307.643	Durbin-Watson stat	1.997256
Prob(F-statistic)	0.000000		

(c) ADF test for 1st diff

Figure 9: Canada: interest rate stationary test

Sample: 8/20/1997 11/13/2012
Included observations: 3975

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.999	0.999	3971.9	0.000
		2	0.999	0.026	7939.1	0.000
		3	0.998	-0.003	11902.	0.000
		4	0.997	-0.007	15859.	0.000
		5	0.996	-0.026	19812.	0.000
		6	0.996	0.030	23759.	0.000
		7	0.995	0.012	27702.	0.000
		8	0.994	0.014	31641.	0.000
		9	0.993	-0.015	35575.	0.000
		10	0.993	0.042	39504.	0.000
		11	0.992	-0.001	43430.	0.000
		12	0.991	-0.001	47351.	0.000
		13	0.991	0.017	51268.	0.000
		14	0.990	-0.036	55181.	0.000
		15	0.990	0.018	59090.	0.000
		16	0.989	-0.003	62995.	0.000
		17	0.988	0.010	66895.	0.000
		18	0.988	-0.031	70791.	0.000
		19	0.987	0.002	74683.	0.000
		20	0.986	0.008	78570.	0.000
		21	0.985	-0.001	82453.	0.000
		22	0.985	-0.013	86331.	0.000
		23	0.984	0.023	90205.	0.000
		24	0.983	0.008	94075.	0.000
		25	0.983	0.016	97941.	0.000
		26	0.982	0.005	101803	0.000
		27	0.982	0.004	105661	0.000
		28	0.981	-0.016	109516	0.000
		29	0.980	-0.010	113366	0.000
		30	0.980	-0.006	117212	0.000
		31	0.979	-0.032	121054	0.000
		32	0.978	-0.020	124890	0.000
		33	0.977	-0.014	128722	0.000
		34	0.977	0.018	132549	0.000
		35	0.976	-0.013	136371	0.000
		36	0.975	-0.005	140189	0.000

(a) Correlogram

Null Hypothesis: SPOT has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=30)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.009262	0.2815
Test critical values:	1% level	-2.565544	
	5% level	-1.940904	
	10% level	-1.616646	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(SPOT)
Method: Least Squares
Date: 03/10/14 Time: 09:31
Sample (adjusted): 8/21/1997 11/13/2012
Included observations: 3974 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
SPOT(-1)	-8.53E-05	8.45E-05	-1.009262	0.3129

R-squared	0.000051	Mean dependent var	-9.80E-05
Adjusted R-squared	0.000051	S.D. dependent var	0.006841
S.E. of regression	0.006841	Akaike info criterion	-7.131481
Sum squared resid	0.185940	Schwarz criterion	-7.129898
Log likelihood	14171.25	Hannan-Quinn criter.	-7.130920
Durbin-Watson stat	2.086162		

(b) ADF test

Null Hypothesis: D(SPOT) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=30)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-65.79638	0.0001
Test critical values:	1% level	-3.431811	
	5% level	-2.862071	
	10% level	-2.567096	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(SPOT,2)
Method: Least Squares
Date: 03/10/14 Time: 09:31
Sample (adjusted): 8/22/1997 11/13/2012
Included observations: 3973 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(SPOT(-1))	-1.043151	0.015854	-65.79638	0.0000
C	-0.000103	0.000108	-0.948496	0.3429

R-squared	0.521576	Mean dependent var	-1.51E-08
Adjusted R-squared	0.521455	S.D. dependent var	0.009883
S.E. of regression	0.006837	Akaike info criterion	-7.132572
Sum squared resid	0.185597	Schwarz criterion	-7.129407
Log likelihood	14170.85	Hannan-Quinn criter.	-7.131449
F-statistic	4329.163	Durbin-Watson stat	1.999363
Prob(F-statistic)	0.000000		

(c) ADF test for 1st diff

Figure 10: Canada: exchange spot rate stationary test

Sample: 8/21/1997 11/13/2012
Included observations: 3974

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.993	0.993	3918.2	0.000
		2	0.990	0.345	7819.5	0.000
		3	0.988	0.109	11701.	0.000
		4	0.985	0.002	15560.	0.000
		5	0.982	-0.020	19396.	0.000
		6	0.979	0.004	23211.	0.000
		7	0.976	-0.022	27002.	0.000
		8	0.972	-0.012	30770.	0.000
		9	0.969	-0.009	34514.	0.000
		10	0.966	0.004	38235.	0.000
		11	0.963	-0.007	41932.	0.000
		12	0.960	-0.001	45607.	0.000
		13	0.957	0.004	49258.	0.000
		14	0.954	0.045	52892.	0.000
		15	0.951	-0.029	56500.	0.000
		16	0.948	0.011	60089.	0.000
		17	0.945	-0.042	63652.	0.000
		18	0.942	-0.001	67194.	0.000
		19	0.939	0.042	70716.	0.000
		20	0.936	0.002	74217.	0.000
		21	0.934	0.063	77704.	0.000
		22	0.931	0.003	81171.	0.000
		23	0.929	0.013	84623.	0.000
		24	0.927	0.060	88063.	0.000
		25	0.925	-0.020	91485.	0.000
		26	0.923	0.020	94895.	0.000
		27	0.921	-0.031	98289.	0.000
		28	0.919	-0.001	101667	0.000
		29	0.916	-0.001	105031	0.000
		30	0.914	0.002	108381	0.000
		31	0.912	-0.023	111713	0.000
		32	0.910	0.024	115033	0.000
		33	0.907	-0.034	118334	0.000
		34	0.905	0.010	121620	0.000
		35	0.903	0.004	124891	0.000
		36	0.901	0.015	128149	0.000

(a) Correlogram

Null Hypothesis: X has a unit root
Exogenous: None
Lag Length: 2 (Automatic - based on SIC, maxlag=30)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.626238	0.0084
Test critical values:	1% level	-2.565544	
	5% level	-1.940904	
	10% level	-1.616646	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(X)
Method: Least Squares
Date: 03/11/14 Time: 13:45
Sample (adjusted): 8/26/1997 11/13/2012
Included observations: 3971 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
X(-1)	-0.004333	0.001650	-2.626238	0.0087
D(X(-1))	-0.449813	0.015708	-28.63574	0.0000
D(X(-2))	-0.149346	0.015687	-9.520190	0.0000

R-squared	0.175069	Mean dependent var	9.10E-09
Adjusted R-squared	0.174653	S.D. dependent var	1.25E-06
S.E. of regression	1.14E-06	Akaike info criterion	-24.53351
Sum squared resid	5.14E-09	Schwarz criterion	-24.52876
Log likelihood	48714.28	Hannan-Quinn criter.	-24.53183
Durbin-Watson stat	2.006315		

(b) ADF test

Figure 11: Canada: log interest rate difference stationary test

Sample: 8/21/1997 11/13/2012
Included observations: 3974

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	-0.048	-0.048	9.0413	0.003
		2	0.013	0.010	9.6709	0.008
		3	0.003	0.004	9.7156	0.021
		4	0.034	0.034	14.197	0.007
		5	-0.045	-0.042	22.344	0.000
		6	-0.006	-0.011	22.483	0.001
		7	-0.021	-0.021	24.267	0.001
		8	0.032	0.030	28.440	0.000
		9	-0.069	-0.063	47.224	0.000
		10	0.000	-0.007	47.224	0.000
		11	-0.001	0.001	47.226	0.000
		12	-0.029	-0.033	50.682	0.000
		13	0.050	0.054	60.512	0.000
		14	-0.033	-0.033	64.727	0.000
		15	0.002	-0.002	64.745	0.000
		16	-0.018	-0.020	66.104	0.000
		17	0.047	0.045	75.101	0.000
		18	-0.022	-0.016	77.035	0.000
		19	-0.020	-0.027	78.708	0.000
		20	0.007	0.009	78.878	0.000
		21	0.024	0.012	81.101	0.000
		22	-0.045	-0.030	89.158	0.000
		23	-0.012	-0.020	89.715	0.000
		24	-0.015	-0.016	90.589	0.000
		25	-0.007	-0.012	90.800	0.000
		26	-0.017	-0.012	91.942	0.000
		27	0.024	0.025	94.283	0.000
		28	0.012	0.008	94.867	0.000
		29	0.023	0.026	96.965	0.000
		30	0.036	0.035	102.12	0.000
		31	0.035	0.034	106.94	0.000
		32	0.009	0.012	107.27	0.000
		33	-0.033	-0.037	111.77	0.000
		34	0.028	0.019	114.83	0.000
		35	0.004	0.009	114.89	0.000
		36	-0.020	-0.013	116.47	0.000

(a) Correlogram

Null Hypothesis: Y has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=30)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-66.08868	0.0001
Test critical values:	1% level	-2.565544	
	5% level	-1.940904	
	10% level	-1.616646	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(Y)
Method: Least Squares
Date: 03/11/14 Time: 13:53
Sample (adjusted): 8/22/1997 11/13/2012
Included observations: 3973 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Y(-1)	-1.047459	0.015849	-66.08868	0.0000

R-squared	0.523725	Mean dependent var	-6.72E-08
Adjusted R-squared	0.523725	S.D. dependent var	0.003580
S.E. of regression	0.002471	Akaike info criterion	-9.168473
Sum squared resid	0.024244	Schwarz criterion	-9.166891
Log likelihood	18214.17	Hannan-Quinn criter.	-9.167912
Durbin-Watson stat	1.998900		

(b) ADF test

Figure 12: Canada: log exchange spot rate difference stationary test

Sample: 8/21/1997 11/13/2012
Included observations: 3974

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	-0.048	-0.048	8.9759	0.003
		2	0.013	0.011	9.6211	0.008
		3	0.004	0.005	9.6701	0.022
		4	0.034	0.034	14.196	0.007
		5	-0.045	-0.042	22.273	0.000
		6	-0.006	-0.011	22.404	0.001
		7	-0.021	-0.021	24.156	0.001
		8	0.033	0.030	28.365	0.000
		9	-0.068	-0.063	47.061	0.000
		10	0.001	-0.007	47.063	0.000
		11	-0.000	0.001	47.064	0.000
		12	-0.029	-0.032	50.484	0.000
		13	0.050	0.054	60.354	0.000
		14	-0.032	-0.033	64.537	0.000
		15	0.002	-0.001	64.557	0.000
		16	-0.018	-0.020	65.901	0.000
		17	0.048	0.045	74.929	0.000
		18	-0.022	-0.016	76.845	0.000
		19	-0.020	-0.027	78.501	0.000
		20	0.007	0.009	78.676	0.000
		21	0.024	0.012	80.909	0.000
		22	-0.045	-0.030	88.942	0.000
		23	-0.012	-0.020	89.492	0.000
		24	-0.015	-0.016	90.358	0.000
		25	-0.007	-0.012	90.566	0.000
		26	-0.017	-0.011	91.699	0.000
		27	0.024	0.025	94.050	0.000
		28	0.012	0.008	94.643	0.000
		29	0.023	0.026	96.754	0.000
		30	0.036	0.035	101.93	0.000
		31	0.035	0.034	106.78	0.000
		32	0.009	0.012	107.11	0.000
		33	-0.033	-0.037	111.58	0.000
		34	0.028	0.019	114.67	0.000
		35	0.004	0.010	114.74	0.000
		36	-0.020	-0.013	116.30	0.000

(a) Correlogram

Null Hypothesis: RF has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=30)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-66.07646	0.0001
Test critical values:	1% level	-2.565544	
	5% level	-1.940904	
	10% level	-1.616646	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(RF)
Method: Least Squares
Date: 03/20/14 Time: 14:11
Sample (adjusted): 8/22/1997 11/13/2012
Included observations: 3973 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RF(-1)	-1.047273	0.015849	-66.07646	0.0000

R-squared	0.523632	Mean dependent var	5.80E-08
Adjusted R-squared	0.523632	S.D. dependent var	0.003580
S.E. of regression	0.002471	Akaike info criterion	-9.168264
Sum squared resid	0.024249	Schwarz criterion	-9.166681
Log likelihood	18213.76	Hannan-Quinn criter.	-9.167703
Durbin-Watson stat	1.998889		

(b) ADF test

Figure 13: Canada: the generalized risk factor stationary test

Sample: 8/21/1997 11/13/2012
Included observations: 3974

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.949	0.949	3585.4	0.000
		2	0.941	0.405	7111.1	0.000
		3	0.945	0.353	10668.	0.000
		4	0.922	-0.081	14050.	0.000
		5	0.915	0.030	17384.	0.000
		6	0.909	0.009	20671.	0.000
		7	0.903	0.117	23915.	0.000
		8	0.890	-0.057	27068.	0.000
		9	0.887	0.077	30207.	0.000
		10	0.887	0.091	33346.	0.000
		11	0.880	0.067	36435.	0.000
		12	0.881	0.058	39530.	0.000
		13	0.885	0.107	42651.	0.000
		14	0.886	0.110	45786.	0.000
		15	0.890	0.105	48947.	0.000
		16	0.890	0.004	52109.	0.000
		17	0.890	-0.001	55271.	0.000
		18	0.885	-0.063	58398.	0.000
		19	0.886	0.045	61532.	0.000
		20	0.889	0.094	64693.	0.000
		21	0.886	0.064	67834.	0.000
		22	0.885	-0.000	70964.	0.000
		23	0.885	0.024	74096.	0.000
		24	0.880	-0.023	77194.	0.000
		25	0.873	-0.056	80243.	0.000
		26	0.869	-0.049	83268.	0.000
		27	0.864	-0.025	86256.	0.000
		28	0.859	-0.000	89209.	0.000
		29	0.852	-0.063	92114.	0.000
		30	0.846	-0.067	94978.	0.000
		31	0.841	-0.021	97809.	0.000
		32	0.837	0.038	100617	0.000
		33	0.833	0.015	103403	0.000
		34	0.831	0.000	106172	0.000
		35	0.828	-0.042	108922	0.000
		36	0.827	-0.007	111669	0.000

(a) Correlogram

Null Hypothesis: MEANRF has a unit root
Exogenous: None
Lag Length: 15 (Automatic - based on SIC, maxlag=15)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.154085	0.0301
Test critical values:	1% level	-2.565546	
	5% level	-1.940904	
	10% level	-1.616646	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(MEANRF)
Method: Least Squares
Date: 03/20/14 Time: 14:13
Sample (adjusted): 9/12/1997 11/13/2012
Included observations: 3958 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
MEANRF(-1)	-0.002519	0.001170	-2.154085	0.0313
D(MEANRF(-1))	-0.048649	0.015186	-3.203459	0.0014
D(MEANRF(-2))	-0.089892	0.014528	-6.187615	0.0000
D(MEANRF(-3))	0.037277	0.014338	2.599898	0.0094
D(MEANRF(-4))	0.027887	0.014213	1.962035	0.0498
D(MEANRF(-5))	-0.047908	0.013823	-3.465871	0.0005
D(MEANRF(-6))	-0.006323	0.013700	-0.461499	0.6445
D(MEANRF(-7))	0.039950	0.013516	2.955753	0.0031
D(MEANRF(-8))	0.021282	0.013305	1.599549	0.1098
D(MEANRF(-9))	-0.042823	0.012894	-3.321208	0.0009
D(MEANRF(-10))	0.009382	0.012618	0.743585	0.4572
D(MEANRF(-11))	-0.006697	0.012206	-0.548675	0.5833
D(MEANRF(-12))	-0.042880	0.011358	-3.775282	0.0002
D(MEANRF(-13))	0.050279	0.009923	5.066930	0.0000
D(MEANRF(-14))	0.045761	0.009550	4.791449	0.0000
D(MEANRF(-15))	-0.029007	0.006664	-4.352557	0.0000

R-squared	0.070956	Mean dependent var	-1.79E-08
Adjusted R-squared	0.067420	S.D. dependent var	4.26E-06
S.E. of regression	4.11E-06	Akaike info criterion	-21.96085
Sum squared resid	6.67E-08	Schwarz criterion	-21.93545
Log likelihood	43476.52	Hannan-Quinn criter.	-21.95184
Durbin-Watson stat	1.897408		

(b) ADF test

Null Hypothesis: D(MEANRF) has a unit root
Exogenous: Constant
Lag Length: 10 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-30.21642	0.0000
Test critical values:	1% level	-3.431815	
	5% level	-2.862073	
	10% level	-2.567097	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(MEANRF,2)
Method: Least Squares
Date: 03/20/14 Time: 14:14
Sample (adjusted): 9/08/1997 11/13/2012
Included observations: 3962 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(MEANRF(-1))	-1.264966	0.041864	-30.21642	0.0000
D(MEANRF(-1),2)	0.393357	0.038410	10.24114	0.0000
D(MEANRF(-2),2)	0.340443	0.035160	9.682658	0.0000
D(MEANRF(-3),2)	0.362315	0.031876	11.36654	0.0000
D(MEANRF(-4),2)	0.366992	0.029097	12.61278	0.0000
D(MEANRF(-5),2)	0.307483	0.026228	11.72362	0.0000
D(MEANRF(-6),2)	0.297542	0.024539	12.12508	0.0000
D(MEANRF(-7),2)	0.251890	0.020823	12.09646	0.0000
D(MEANRF(-8),2)	0.247106	0.019228	12.85121	0.0000
D(MEANRF(-9),2)	0.123143	0.013414	9.180424	0.0000
D(MEANRF(-10),2)	0.091810	0.007074	12.97765	0.0000
C	3.17E-08	7.37E-08	0.429618	0.6675

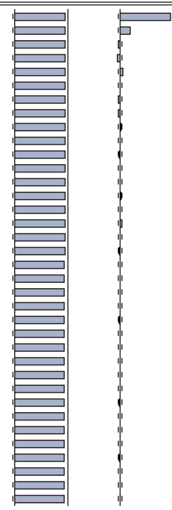
R-squared	0.509174	Mean dependent var	1.91E-08
Adjusted R-squared	0.507807	S.D. dependent var	6.61E-06
S.E. of regression	4.64E-06	Akaike info criterion	-21.72068
Sum squared resid	8.50E-08	Schwarz criterion	-21.70165
Log likelihood	43040.67	Hannan-Quinn criter.	-21.71393
F-statistic	372.5142	Durbin-Watson stat	2.067663
Prob(F-statistic)	0.000000		

(c) ADF test for 1st diff

Figure 14: Canada: the mean of the generalized risk factor stationary test

Sample: 8/21/1997 11/13/2012
Included observations: 3974

Autocorrelation | Partial Correlation



	AC	PAC	Q-Stat	Prob
1	0.999	0.999	3968.4	0.000
2	0.998	0.195	7932.6	0.000
3	0.997	-0.038	11891.	0.000
4	0.997	-0.055	15844.	0.000
5	0.996	0.049	19792.	0.000
6	0.995	-0.001	23734.	0.000
7	0.994	-0.027	27671.	0.000
8	0.993	-0.032	31601.	0.000
9	0.992	0.010	35526.	0.000
10	0.992	-0.003	39445.	0.000
11	0.991	-0.013	43358.	0.000
12	0.990	-0.005	47265.	0.000
13	0.989	-0.005	51165.	0.000
14	0.988	0.010	55060.	0.000
15	0.987	-0.008	58948.	0.000
16	0.986	0.025	62831.	0.000
17	0.985	0.005	66707.	0.000
18	0.984	-0.015	70578.	0.000
19	0.984	0.004	74443.	0.000
20	0.983	0.000	78303.	0.000
21	0.982	0.001	82156.	0.000
22	0.981	-0.002	86003.	0.000
23	0.980	-0.009	89845.	0.000
24	0.979	-0.004	93681.	0.000
25	0.978	-0.005	97510.	0.000
26	0.977	0.007	101334	0.000
27	0.977	-0.002	105152	0.000
28	0.976	-0.006	108963	0.000
29	0.975	-0.009	112769	0.000
30	0.974	0.001	116568	0.000
31	0.973	0.002	120362	0.000
32	0.972	-0.003	124149	0.000
33	0.971	-0.011	127930	0.000
34	0.970	-0.007	131704	0.000
35	0.969	-0.002	135473	0.000
36	0.968	-0.006	139235	0.000

(a) Correlogram

Null Hypothesis: DEVRF has a unit root
Exogenous: None
Lag Length: 11 (Automatic - based on SIC, maxlag=30)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		3.134965	0.9996
Test critical values:	1% level	-2.565546	
	5% level	-1.940904	
	10% level	-1.616646	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DEVRF)
Method: Least Squares
Date: 03/20/14 Time: 14:15
Sample (adjusted): 9/08/1997 11/13/2012
Included observations: 3962 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DEVRF(-1)	0.000143	4.57E-05	3.134965	0.0017
D(DEVRF(-1))	0.077265	0.015788	4.893884	0.0000
D(DEVRF(-2))	0.016591	0.015782	1.051318	0.2932
D(DEVRF(-3))	0.114513	0.015776	7.258899	0.0000
D(DEVRF(-4))	0.063687	0.015799	4.031194	0.0001
D(DEVRF(-5))	0.101283	0.015755	6.428594	0.0000
D(DEVRF(-6))	0.003819	0.015673	0.243642	0.8075
D(DEVRF(-7))	0.008810	0.015174	0.580605	0.5615
D(DEVRF(-8))	-0.091161	0.014854	-6.137015	0.0000
D(DEVRF(-9))	0.100564	0.013673	7.355183	0.0000
D(DEVRF(-10))	0.043282	0.012659	3.419050	0.0006
D(DEVRF(-11))	0.067616	0.009240	7.317645	0.0000

R-squared	0.068447	Mean dependent var	1.42E-09
Adjusted R-squared	0.065853	S.D. dependent var	1.13E-08
S.E. of regression	1.09E-08	Akaike info criterion	-33.83238
Sum squared resid	4.67E-13	Schwarz criterion	-33.81334
Log likelihood	67033.94	Hannan-Quinn criter.	-33.82563
Durbin-Watson stat	1.999997		

(b) ADF test

Figure 15: Canada: the deviation of the generalized risk factor stationary test

APPENDIX D: STATIONARY TEST: JAPAN

Sample: 11/25/1996 11/13/2012
Included observations: 4167

	AC	PAC	Q-Stat	Prob
1	0.981	0.981	4013.5	0.000
2	0.974	0.317	7973.5	0.000
3	0.968	0.124	11883.	0.000
4	0.965	0.142	15769.	0.000
5	0.959	0.008	19608.	0.000
6	0.955	0.032	23412.	0.000
7	0.950	0.035	27184.	0.000
8	0.944	-0.065	30904.	0.000
9	0.940	0.037	34592.	0.000
10	0.934	-0.029	38235.	0.000
11	0.929	-0.007	41840.	0.000
12	0.923	0.010	45405.	0.000
13	0.918	-0.013	48932.	0.000
14	0.914	0.029	52426.	0.000
15	0.908	-0.039	55873.	0.000
16	0.904	0.038	59294.	0.000
17	0.899	0.004	62677.	0.000
18	0.897	0.066	66044.	0.000
19	0.892	-0.010	69374.	0.000
20	0.887	-0.040	72667.	0.000
21	0.881	-0.024	75920.	0.000
22	0.876	-0.027	79134.	0.000
23	0.872	0.025	82321.	0.000
24	0.868	0.031	85481.	0.000
25	0.865	0.026	88618.	0.000
26	0.859	-0.029	91717.	0.000
27	0.857	0.047	94797.	0.000
28	0.854	0.044	97859.	0.000
29	0.851	0.027	100903	0.000
30	0.849	0.035	103931	0.000
31	0.845	-0.040	106930	0.000
32	0.843	0.029	109917	0.000
33	0.840	0.014	112883	0.000
34	0.837	-0.020	115830	0.000
35	0.835	0.020	118760	0.000
36	0.833	0.010	121676	0.000

(a) Correlogram

Null Hypothesis: INTEREST has a unit root
Exogenous: None
Lag Length: 3 (Automatic - based on SIC, maxlag=30)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.765789	0.0055
Test critical values:	1% level	-2.565518	
	5% level	-1.940900	
	10% level	-1.616648	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(INTEREST)
Method: Least Squares
Date: 03/10/14 Time: 09:43
Sample (adjusted): 11/29/1996 11/13/2012
Included observations: 4163 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INTEREST(-1)	-0.005951	0.002152	-2.765789	0.0057
D(INTEREST(-1))	-0.382865	0.015385	-24.88503	0.0000
D(INTEREST(-2))	-0.180190	0.016237	-11.09785	0.0000
D(INTEREST(-3))	-0.145810	0.015334	-9.508795	0.0000

R-squared	0.141719	Mean dependent var	-9.97E-05
Adjusted R-squared	0.141100	S.D. dependent var	0.054924
S.E. of regression	0.050902	Akaike info criterion	-3.116875
Sum squared resid	10.77596	Schwarz criterion	-3.110789
Log likelihood	6491.776	Hannan-Quinn criter.	-3.114722
Durbin-Watson stat	2.003132		

(b) ADF test

Null Hypothesis: D(INTEREST) has a unit root
Exogenous: Constant
Lag Length: 2 (Automatic - based on SIC, maxlag=30)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-50.87173	0.0001
Test critical values:	1% level	-3.431737	
	5% level	-2.862038	
	10% level	-2.567078	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(INTEREST,2)
Method: Least Squares
Date: 03/10/14 Time: 09:44
Sample (adjusted): 11/29/1996 11/13/2012
Included observations: 4163 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(INTEREST(-1))	-1.717540	0.033762	-50.87173	0.0000
D(INTEREST(-1),2)	0.330783	0.025905	12.76891	0.0000
D(INTEREST(-2),2)	0.147714	0.015333	9.633751	0.0000
C	-0.000166	0.000790	-0.210363	0.8334

R-squared	0.675762	Mean dependent var	-1.32E-05
Adjusted R-squared	0.675528	S.D. dependent var	0.089442
S.E. of regression	0.050948	Akaike info criterion	-3.115048
Sum squared resid	10.79566	Schwarz criterion	-3.108962
Log likelihood	6487.973	Hannan-Quinn criter.	-3.112895
F-statistic	2889.334	Durbin-Watson stat	2.003632
Prob(F-statistic)	0.000000		

(c) ADF test for 1st diff

Figure 16: Japan: interest rate stationary test

Sample: 11/25/1996 11/13/2012
Included observations: 4167

	AC	PAC	Q-Stat	Prob
1	0.998	0.998	4156.3	0.000
2	0.997	0.001	8300.0	0.000
3	0.995	0.003	12431.	0.000
4	0.993	-0.003	16550.	0.000
5	0.992	0.028	20657.	0.000
6	0.990	-0.011	24752.	0.000
7	0.989	0.008	28835.	0.000
8	0.987	-0.002	32906.	0.000
9	0.986	-0.003	36965.	0.000
10	0.984	-0.004	41013.	0.000
11	0.982	-0.040	45047.	0.000
12	0.981	0.026	49070.	0.000
13	0.979	-0.012	53080.	0.000
14	0.978	-0.003	57077.	0.000
15	0.976	0.017	61062.	0.000
16	0.974	0.007	65036.	0.000
17	0.973	0.011	68997.	0.000
18	0.971	-0.003	72948.	0.000
19	0.970	-0.019	76886.	0.000
20	0.968	-0.011	80813.	0.000
21	0.967	0.010	84727.	0.000
22	0.965	0.007	88629.	0.000
23	0.963	-0.001	92520.	0.000
24	0.962	0.004	96399.	0.000
25	0.960	0.000	100267	0.000
26	0.959	0.003	104123	0.000
27	0.957	-0.019	107967	0.000
28	0.956	-0.006	111799	0.000
29	0.954	0.002	115620	0.000
30	0.952	-0.016	119428	0.000
31	0.951	0.006	123224	0.000
32	0.949	0.017	127008	0.000
33	0.947	-0.013	130780	0.000
34	0.946	0.008	134541	0.000
35	0.944	-0.004	138290	0.000
36	0.943	-0.016	142026	0.000

(a) Correlogram

Null Hypothesis: SPOT has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=30)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.808531	0.3659
Test critical values:	1% level	-2.565517	
	5% level	-1.940900	
	10% level	-1.616648	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(SPOT)
Method: Least Squares
Date: 03/10/14 Time: 09:54
Sample (adjusted): 11/26/1996 11/13/2012
Included observations: 4166 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
SPOT(-1)	-8.84E-05	0.000109	-0.808531	0.4188

R-squared	0.000051	Mean dependent var	-0.007955
Adjusted R-squared	0.000051	S.D. dependent var	0.774006
S.E. of regression	0.773986	Akaike info criterion	2.325714
Sum squared resid	2495.062	Schwarz criterion	2.327235
Log likelihood	-4843.463	Hannan-Quinn criter.	2.326252
Durbin-Watson stat	2.004360		

(b) ADF test

Null Hypothesis: D(SPOT) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=30)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-64.66493	0.0001
Test critical values:	1% level	-3.431736	
	5% level	-2.862037	
	10% level	-2.567078	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(SPOT,2)
Method: Least Squares
Date: 03/10/14 Time: 09:55
Sample (adjusted): 11/27/1996 11/13/2012
Included observations: 4165 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(SPOT(-1))	-1.002221	0.015499	-64.66493	0.0000
C	-0.007943	0.011997	-0.662117	0.5079

R-squared	0.501112	Mean dependent var	1.68E-05
Adjusted R-squared	0.500992	S.D. dependent var	1.095954
S.E. of regression	0.774188	Akaike info criterion	2.326475
Sum squared resid	2495.163	Schwarz criterion	2.329517
Log likelihood	-4842.884	Hannan-Quinn criter.	2.327551
F-statistic	4181.553	Durbin-Watson stat	1.999720
Prob(F-statistic)	0.000000		

(c) ADF test for 1st diff

Figure 17: Japan: exchange spot rate stationary test

Sample: 11/26/1996 11/13/2012
Included observations: 4166

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.997	0.997	4143.4	0.000
		2	0.996	0.374	8281.5	0.000
		3	0.995	0.179	12415.	0.000
		4	0.995	0.075	16543.	0.000
		5	0.995	0.136	20670.	0.000
		6	0.994	-0.015	24792.	0.000
		7	0.993	-0.054	28906.	0.000
		8	0.992	-0.043	33015.	0.000
		9	0.991	-0.052	37115.	0.000
		10	0.990	-0.064	41208.	0.000
		11	0.989	-0.012	45295.	0.000
		12	0.988	-0.023	49374.	0.000
		13	0.987	0.005	53446.	0.000
		14	0.986	0.011	57511.	0.000
		15	0.985	0.010	61569.	0.000
		16	0.984	-0.006	65619.	0.000
		17	0.983	0.017	69663.	0.000
		18	0.982	0.005	73699.	0.000
		19	0.981	0.029	77729.	0.000
		20	0.980	0.004	81753.	0.000
		21	0.979	0.026	85770.	0.000
		22	0.978	-0.008	89781.	0.000
		23	0.977	0.001	93785.	0.000
		24	0.977	0.017	97784.	0.000
		25	0.976	0.036	101778	0.000
		26	0.975	0.029	105767	0.000
		27	0.974	0.010	109751	0.000
		28	0.974	0.003	113730	0.000
		29	0.973	-0.001	117703	0.000
		30	0.972	-0.017	121671	0.000
		31	0.971	-0.023	125633	0.000
		32	0.971	0.007	129591	0.000
		33	0.970	-0.000	133544	0.000
		34	0.969	0.002	137492	0.000
		35	0.968	-0.033	141433	0.000
		36	0.968	0.010	145370	0.000

(a) Correlogram

Null Hypothesis: X has a unit root
Exogenous: None
Lag Length: 4 (Automatic - based on SIC, maxlag=30)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.720347	0.4048
Test critical values:	1% level	-2.565518	
	5% level	-1.940900	
	10% level	-1.616648	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(X)
Method: Least Squares
Date: 03/11/14 Time: 15:14
Sample (adjusted): 12/03/1996 11/13/2012
Included observations: 4161 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
X(-1)	-0.000341	0.000473	-0.720347	0.4714
D(X(-1))	-0.547664	0.012151	-45.07111	0.0000
D(X(-2))	-0.295566	0.013767	-21.46843	0.0000
D(X(-3))	-0.133592	0.013764	-9.705634	0.0000
D(X(-4))	-0.035454	0.012146	-2.918875	0.0035

R-squared	0.329530	Mean dependent var	-1.54E-09
Adjusted R-squared	0.328885	S.D. dependent var	1.56E-06
S.E. of regression	1.28E-06	Akaike info criterion	-24.30021
Sum squared resid	6.80E-09	Schwarz criterion	-24.29260
Log likelihood	50561.59	Hannan-Quinn criter.	-24.29752
Durbin-Watson stat	1.267039		

(b) ADF test

Null Hypothesis: D(X) has a unit root
Exogenous: Constant
Lag Length: 3 (Automatic - based on SIC, maxlag=30)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-53.61243	0.0001
Test critical values:	1% level	-3.431737	
	5% level	-2.862038	
	10% level	-2.567078	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(X,2)
Method: Least Squares
Date: 03/11/14 Time: 15:16
Sample (adjusted): 12/03/1996 11/13/2012
Included observations: 4161 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(X(-1))	-2.013075	0.037549	-53.61243	0.0000
D(X(-1),2)	0.465133	0.031239	14.88946	0.0000
D(X(-2),2)	0.169337	0.022329	7.583648	0.0000
D(X(-3),2)	0.035566	0.012148	2.927611	0.0034
C	1.29E-08	1.98E-08	0.648327	0.5168

R-squared	0.815185	Mean dependent var	-1.58E-08
Adjusted R-squared	0.815007	S.D. dependent var	2.97E-06
S.E. of regression	1.28E-06	Akaike info criterion	-24.30019
Sum squared resid	6.80E-09	Schwarz criterion	-24.29258
Log likelihood	50561.54	Hannan-Quinn criter.	-24.29750
F-statistic	4582.845	Durbin-Watson stat	1.267102
Prob(F-statistic)	0.000000		

(c) ADF test for 1st diff

Figure 18: Japan: log interest rate difference stationary test

Sample: 11/26/1996 11/13/2012
Included observations: 4166

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	-0.013	-0.013	0.7102	0.399
		2	-0.011	-0.011	1.1866	0.553
		3	0.001	0.001	1.1900	0.755
		4	-0.032	-0.032	5.4486	0.244
		5	0.009	0.008	5.7514	0.331
		6	-0.012	-0.013	6.3813	0.382
		7	0.015	0.015	7.3783	0.391
		8	-0.000	-0.001	7.3783	0.496
		9	-0.010	-0.009	7.7718	0.557
		10	0.049	0.048	17.879	0.057
		11	-0.032	-0.030	22.217	0.023
		12	0.016	0.016	23.243	0.026
		13	0.019	0.018	24.690	0.025
		14	-0.036	-0.033	30.238	0.007
		15	-0.007	-0.011	30.460	0.010
		16	-0.017	-0.015	31.700	0.011
		17	-0.006	-0.007	31.827	0.016
		18	0.023	0.021	33.994	0.013
		19	0.015	0.016	34.902	0.014
		20	-0.017	-0.021	36.043	0.015
		21	-0.017	-0.013	37.199	0.016
		22	-0.002	-0.003	37.213	0.022
		23	-0.015	-0.016	38.163	0.024
		24	-0.006	-0.003	38.309	0.032
		25	-0.001	-0.005	38.314	0.043
		26	0.022	0.023	40.385	0.036
		27	0.011	0.013	40.912	0.042
		28	-0.006	-0.008	41.087	0.053
		29	0.017	0.016	42.267	0.053
		30	-0.010	-0.008	42.727	0.062
		31	-0.030	-0.032	46.580	0.036
		32	0.014	0.014	47.406	0.039
		33	-0.017	-0.014	48.664	0.039
		34	-0.001	-0.003	48.672	0.049
		35	0.015	0.014	49.595	0.052
		36	0.005	0.003	49.692	0.064

(a) Correlogram

Null Hypothesis: Y has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=30)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-65.36742	0.0001
Test critical values:	1% level	-2.565517	
	5% level	-1.940900	
	10% level	-1.616648	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(Y)
Method: Least Squares
Date: 03/11/14 Time: 15:27
Sample (adjusted): 11/27/1996 11/13/2012
Included observations: 4165 after adjustments

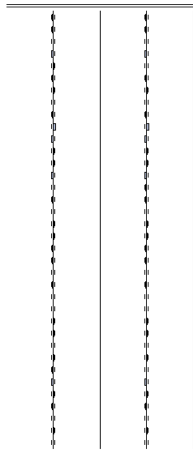
Variable	Coefficient	Std. Error	t-Statistic	Prob.
Y(-1)	-1.012906	0.015496	-65.36742	0.0000

R-squared	0.506454	Mean dependent var	-4.18E-08
Adjusted R-squared	0.506454	S.D. dependent var	0.004301
S.E. of regression	0.003022	Akaike info criterion	-8.765874
Sum squared resid	0.038016	Schwarz criterion	-8.764353
Log likelihood	18255.93	Hannan-Quinn criter.	-8.765336
Durbin-Watson stat	1.999976		

(b) ADF test

Figure 19: Japan: log exchange spot rate difference stationary test

Sample: 11/26/1996 11/13/2012
Included observations: 4166



	AC	PAC	Q-Stat	Prob
1	-0.013	-0.013	0.6771	0.411
2	-0.010	-0.011	1.1264	0.569
3	0.001	0.001	1.1321	0.769
4	-0.032	-0.032	5.3153	0.256
5	0.009	0.008	5.6379	0.343
6	-0.012	-0.012	6.2383	0.397
7	0.016	0.016	7.2722	0.401
8	0.000	-0.001	7.2725	0.508
9	-0.009	-0.009	7.6406	0.571
10	0.049	0.048	17.875	0.057
11	-0.032	-0.030	22.127	0.023
12	0.016	0.016	23.192	0.026
13	0.019	0.018	24.688	0.025
14	-0.036	-0.033	30.139	0.007
15	-0.007	-0.010	30.341	0.011
16	-0.017	-0.015	31.534	0.011
17	-0.005	-0.007	31.646	0.017
18	0.023	0.022	33.876	0.013
19	0.015	0.016	34.826	0.015
20	-0.016	-0.021	35.920	0.016
21	-0.016	-0.012	37.027	0.017
22	-0.001	-0.003	37.037	0.023
23	-0.015	-0.016	37.945	0.026
24	-0.006	-0.003	38.075	0.034
25	-0.001	-0.004	38.077	0.045
26	0.023	0.023	40.210	0.037
27	0.012	0.013	40.770	0.043
28	-0.006	-0.008	40.927	0.055
29	0.017	0.017	42.154	0.054
30	-0.010	-0.007	42.585	0.064
31	-0.030	-0.031	46.357	0.038
32	0.014	0.014	47.222	0.041
33	-0.017	-0.013	48.433	0.041
34	-0.001	-0.003	48.437	0.052
35	0.015	0.014	49.401	0.054
36	0.005	0.003	49.512	0.066

(a) Correlogram

Null Hypothesis: RF has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=30)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-65.35677	0.0001
Test critical values:	1% level	-2.565517	
	5% level	-1.940900	
	10% level	-1.616648	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(RF)
Method: Least Squares
Date: 03/20/14 Time: 14:29
Sample (adjusted): 11/27/1996 11/13/2012
Included observations: 4165 after adjustments

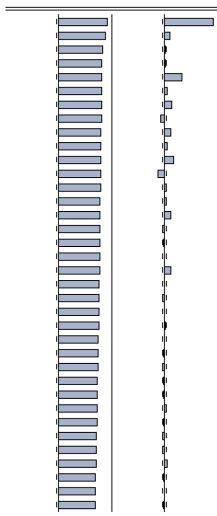
Variable	Coefficient	Std. Error	t-Statistic	Prob.
RF(-1)	-1.012743	0.015496	-65.35677	0.0000

R-squared	0.506372	Mean dependent var	2.80E-08
Adjusted R-squared	0.506372	S.D. dependent var	0.004301
S.E. of regression	0.003022	Akaike info criterion	-8.765706
Sum squared resid	0.038022	Schwarz criterion	-8.764185
Log likelihood	18255.58	Hannan-Quinn criter.	-8.765168
Durbin-Watson stat	1.999967		

(b) ADF test

Figure 20: Japan: the generalized risk factor stationary test

Sample: 11/26/1996 11/13/2012
Included observations: 4166



	AC	PAC	Q-Stat	Prob
1	0.949	0.949	3753.9	0.000
2	0.910	0.100	7209.7	0.000
3	0.875	0.023	10400.	0.000
4	0.841	0.010	13350.	0.000
5	0.841	0.337	16305.	0.000
6	0.839	0.060	19239.	0.000
7	0.845	0.141	22219.	0.000
8	0.838	-0.072	25154.	0.000
9	0.832	0.128	28048.	0.000
10	0.830	0.064	30923.	0.000
11	0.833	0.185	33823.	0.000
12	0.828	-0.119	36690.	0.000
13	0.821	0.031	39506.	0.000
14	0.817	0.040	42299.	0.000
15	0.813	0.130	45062.	0.000
16	0.811	-0.040	47815.	0.000
17	0.806	-0.016	50532.	0.000
18	0.804	0.007	53237.	0.000
19	0.804	0.124	55941.	0.000
20	0.802	0.007	58634.	0.000
21	0.798	-0.042	61301.	0.000
22	0.796	-0.007	63954.	0.000
23	0.790	0.023	66568.	0.000
24	0.781	-0.000	69125.	0.000
25	0.775	-0.022	71641.	0.000
26	0.767	-0.046	74109.	0.000
27	0.761	-0.012	76541.	0.000
28	0.753	-0.010	78923.	0.000
29	0.750	0.032	81283.	0.000
30	0.748	-0.013	83632.	0.000
31	0.745	-0.027	85960.	0.000
32	0.739	-0.037	88253.	0.000
33	0.735	0.044	90520.	0.000
34	0.729	-0.018	92754.	0.000
35	0.724	-0.001	94956.	0.000
36	0.721	-0.014	97143.	0.000

(a) Correlogram

Null Hypothesis: MEANRF has a unit root
Exogenous: None
Lag Length: 15 (Automatic - based on SIC, maxlag=15)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.317980	0.0009
Test critical values:	1% level	-2.565519	
	5% level	-1.940900	
	10% level	-1.616648	

*MacKinnon (1996) one-sided p-values.

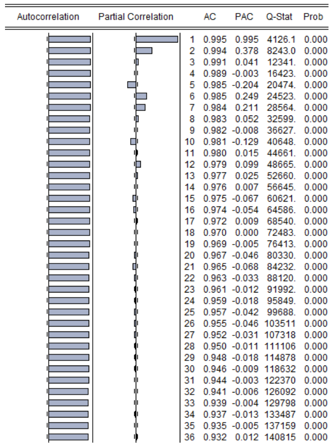
Augmented Dickey-Fuller Test Equation
Dependent Variable: D(MEANRF)
Method: Least Squares
Date: 03/20/14 Time: 14:30
Sample (adjusted): 12/18/1996 11/13/2012
Included observations: 4150 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
MEANRF(-1)	-0.003559	0.001073	-3.317980	0.0009
D(MEANRF(-1))	-0.013279	0.015306	-0.867551	0.3857
D(MEANRF(-2))	-0.075979	0.015244	-4.984289	0.0000
D(MEANRF(-3))	0.052415	0.015164	3.456497	0.0006
D(MEANRF(-4))	0.108559	0.015163	7.159380	0.0000
D(MEANRF(-5))	0.029650	0.014988	1.978249	0.0480
D(MEANRF(-6))	0.022578	0.014855	1.519821	0.1286
D(MEANRF(-7))	0.091065	0.014137	6.441589	0.0000
D(MEANRF(-8))	-0.020983	0.013989	-1.499942	0.1337
D(MEANRF(-9))	-0.025429	0.013330	-1.907647	0.0565
D(MEANRF(-10))	-0.058815	0.012293	-4.784341	0.0000
D(MEANRF(-11))	0.060454	0.008871	6.814541	0.0000
D(MEANRF(-12))	-0.086888	0.007557	-11.49803	0.0000
D(MEANRF(-13))	-0.031724	0.007152	-4.435917	0.0000
D(MEANRF(-14))	0.064214	0.007100	9.043969	0.0000
D(MEANRF(-15))	-0.033613	0.005146	-6.531390	0.0000

R-squared	0.106319	Mean dependent var	-8.80E-08
Adjusted R-squared	0.103076	S.D. dependent var	8.99E-06
S.E. of regression	8.51E-06	Akaike info criterion	-20.50650
Sum squared resid	2.99E-07	Schwarz criterion	-20.48209
Log likelihood	42566.99	Hannan-Quinn criter.	-20.49786
Durbin-Watson stat	2.001709		

(b) ADF test

Figure 21: Japan: the mean of the generalized risk factor stationary test



Sample: 11/26/1996 11/13/2012
Included observations: 4166

Lag	AC	PAC	Q-Stat	Prob
1	0.995	0.995	4126.1	0.000
2	0.994	0.378	8243.0	0.000
3	0.991	0.041	12341.	0.000
4	0.989	-0.003	16423.	0.000
5	0.985	-0.204	20474.	0.000
6	0.985	0.249	24523.	0.000
7	0.984	0.211	28564.	0.000
8	0.983	0.052	32599.	0.000
9	0.982	-0.008	36627.	0.000
10	0.981	-0.129	40648.	0.000
11	0.980	0.015	44661.	0.000
12	0.979	0.099	48665.	0.000
13	0.977	0.025	52660.	0.000
14	0.976	0.007	56645.	0.000
15	0.975	-0.067	60621.	0.000
16	0.974	-0.054	64586.	0.000
17	0.972	0.009	68540.	0.000
18	0.970	0.000	72483.	0.000
19	0.969	-0.005	76413.	0.000
20	0.967	-0.046	80330.	0.000
21	0.965	-0.068	84232.	0.000
22	0.963	-0.033	88120.	0.000
23	0.961	-0.012	91992.	0.000
24	0.959	-0.018	95849.	0.000
25	0.957	-0.042	99688.	0.000
26	0.955	-0.046	103511	0.000
27	0.952	-0.031	107318	0.000
28	0.950	-0.011	111106	0.000
29	0.948	-0.018	114878	0.000
30	0.946	-0.009	118632	0.000
31	0.944	-0.003	122370	0.000
32	0.941	-0.006	126092	0.000
33	0.939	-0.004	129798	0.000
34	0.937	-0.013	133487	0.000
35	0.935	-0.005	137159	0.000
36	0.932	0.012	140815	0.000

(a) Correlogram

Null Hypothesis: DEVRF has a unit root
Exogenous: None
Lag Length: 7 (Automatic - based on SIC, maxlag=30)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		0.069217	0.7048
Test critical values:	1% level	-2.565518	
	5% level	-1.940900	
	10% level	-1.616648	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DEVRF)
Method: Least Squares
Date: 03/20/14 Time: 14:32
Sample (adjusted): 12/06/1996 11/13/2012
Included observations: 4158 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DEVRF(-1)	5.96E-06	8.61E-05	0.069217	0.9448
D(DEVRF(-1))	0.135669	0.015499	8.753480	0.0000
D(DEVRF(-2))	0.081265	0.015386	5.281570	0.0000
D(DEVRF(-3))	0.037323	0.009884	3.776038	0.0002
D(DEVRF(-4))	-0.027466	0.008674	-3.166345	0.0016
D(DEVRF(-5))	-0.054966	0.008445	-6.508370	0.0000
D(DEVRF(-6))	0.032557	0.008154	3.992840	0.0001
D(DEVRF(-7))	0.005468	0.007623	0.717246	0.4733

R-squared	0.046008	Mean dependent var	4.30E-10
Adjusted R-squared	0.044399	S.D. dependent var	6.15E-08
S.E. of regression	6.01E-08	Akaike info criterion	-30.41401
Sum squared resid	1.50E-11	Schwarz criterion	-30.40183
Log likelihood	63238.74	Hannan-Quinn criter.	-30.40970
Durbin-Watson stat	2.005893		

(b) ADF test

Null Hypothesis: D(DEVRF) has a unit root
Exogenous: Constant
Lag Length: 6 (Automatic - based on SIC, maxlag=30)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-27.82324	0.0000
Test critical values:	1% level	-3.431738	
	5% level	-2.862039	
	10% level	-2.567079	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DEVRF,2)
Method: Least Squares
Date: 03/20/14 Time: 14:32
Sample (adjusted): 12/06/1996 11/13/2012
Included observations: 4158 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(DEVRF(-1))	-0.790416	0.028408	-27.82324	0.0000
D(DEVRF(-1),2)	-0.073944	0.025464	-2.903807	0.0037
D(DEVRF(-2),2)	0.007300	0.020210	0.361224	0.7180
D(DEVRF(-3),2)	0.044591	0.019037	2.342359	0.0192
D(DEVRF(-4),2)	0.017067	0.015311	1.114740	0.2650
D(DEVRF(-5),2)	-0.037946	0.011933	-3.180016	0.0015
D(DEVRF(-6),2)	-0.005429	0.007623	-0.712104	0.4764
C	3.65E-10	9.33E-10	0.391745	0.6953

R-squared	0.441667	Mean dependent var	-6.49E-11
Adjusted R-squared	0.440725	S.D. dependent var	8.04E-08
S.E. of regression	6.01E-08	Akaike info criterion	-30.41405
Sum squared resid	1.50E-11	Schwarz criterion	-30.40187
Log likelihood	63238.81	Hannan-Quinn criter.	-30.40974
F-statistic	468.9774	Durbin-Watson stat	2.005895
Prob(F-statistic)	0.000000		

(c) ADF test for 1st diff

Figure 22: Japan: the deviation of the generalized risk factor stationary test

APPENDIX E: STATIONARY TEST: NEW ZEALAND

Sample: 1/17/1997 11/13/2012
Included observations: 4128

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.998	0.998	4113.7	0.000
		2	0.997	0.231	8219.1	0.000
		3	0.996	0.029	12315.	0.000
		4	0.994	-0.015	16402.	0.000
		5	0.993	0.024	20480.	0.000
		6	0.992	-0.004	24549.	0.000
		7	0.991	0.003	28609.	0.000
		8	0.989	-0.026	32660.	0.000
		9	0.988	0.029	36701.	0.000
		10	0.987	-0.008	40734.	0.000
		11	0.986	0.007	44758.	0.000
		12	0.985	0.003	48774.	0.000
		13	0.983	-0.035	52780.	0.000
		14	0.982	-0.031	56775.	0.000
		15	0.980	-0.030	60759.	0.000
		16	0.979	-0.008	64733.	0.000
		17	0.978	0.030	68697.	0.000
		18	0.976	-0.006	72651.	0.000
		19	0.975	0.014	76595.	0.000
		20	0.974	-0.005	80529.	0.000
		21	0.972	0.013	84453.	0.000
		22	0.971	-0.007	88368.	0.000
		23	0.970	-0.021	92272.	0.000
		24	0.968	-0.003	96166.	0.000
		25	0.967	0.041	100051	0.000
		26	0.966	-0.021	103926	0.000
		27	0.964	-0.015	107791	0.000
		28	0.963	0.009	111646	0.000
		29	0.961	-0.004	115490	0.000
		30	0.960	0.003	119325	0.000
		31	0.959	-0.006	123150	0.000
		32	0.957	0.018	126966	0.000
		33	0.956	-0.045	130770	0.000
		34	0.954	-0.013	134564	0.000
		35	0.953	0.004	138348	0.000
		36	0.951	-0.039	142119	0.000

(a) Correlogram

Null Hypothesis: INTEREST has a unit root
Exogenous: None
Lag Length: 1 (Automatic - based on SIC, maxlag=30)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.121870	0.2386
Test critical values:	1% level	-2.565523	
	5% level	-1.940901	
	10% level	-1.616648	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(INTEREST)
Method: Least Squares
Date: 03/10/14 Time: 10:10
Sample (adjusted): 1/21/1997 11/13/2012
Included observations: 4126 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INTEREST(-1)	-0.000320	0.000286	-1.121870	0.2620
D(INTEREST(-1))	-0.280154	0.014946	-18.74448	0.0000

R-squared	0.078702	Mean dependent var	-0.001067
Adjusted R-squared	0.078479	S.D. dependent var	0.113334
S.E. of regression	0.108796	Akaike info criterion	-1.598205
Sum squared resid	48.81375	Schwarz criterion	-1.595139
Log likelihood	3299.097	Hannan-Quinn criter.	-1.597120
Durbin-Watson stat	2.024106		

(b) ADF test

Null Hypothesis: D(INTEREST) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=30)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-85.65189	0.0001
Test critical values:	1% level	-3.431750	
	5% level	-2.862044	
	10% level	-2.567081	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(INTEREST,2)
Method: Least Squares
Date: 03/10/14 Time: 10:10
Sample (adjusted): 1/21/1997 11/13/2012
Included observations: 4126 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(INTEREST(-1))	-1.280299	0.014948	-85.65189	0.0000
C	-0.001367	0.001694	-0.807262	0.4196

R-squared	0.640147	Mean dependent var	4.85E-06
Adjusted R-squared	0.640060	S.D. dependent var	0.181355
S.E. of regression	0.108804	Akaike info criterion	-1.598058
Sum squared resid	48.82093	Schwarz criterion	-1.594992
Log likelihood	3298.794	Hannan-Quinn criter.	-1.596973
F-statistic	7336.246	Durbin-Watson stat	2.024173
Prob(F-statistic)	0.000000		

(c) ADF test for 1st diff

Figure 23: New Zealand: interest rate stationary test

Sample: 1/17/1997 11/13/2012
Included observations: 4128

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.999	0.999	4120.1	0.000
		2	0.997	0.007	8230.4	0.000
		3	0.996	-0.005	12331.	0.000
		4	0.995	0.025	16422.	0.000
		5	0.994	-0.010	20504.	0.000
		6	0.992	-0.014	24576.	0.000
		7	0.991	0.016	28638.	0.000
		8	0.990	0.004	32692.	0.000
		9	0.988	-0.017	36735.	0.000
		10	0.987	0.036	40770.	0.000
		11	0.986	-0.003	44796.	0.000
		12	0.985	-0.015	48813.	0.000
		13	0.983	-0.010	52820.	0.000
		14	0.982	0.002	56818.	0.000
		15	0.981	0.005	60807.	0.000
		16	0.980	0.010	64787.	0.000
		17	0.979	0.013	68759.	0.000
		18	0.977	-0.016	72721.	0.000
		19	0.976	0.003	76675.	0.000
		20	0.975	-0.008	80619.	0.000
		21	0.974	0.024	84555.	0.000
		22	0.973	-0.006	88483.	0.000
		23	0.971	-0.001	92402.	0.000
		24	0.970	0.012	96312.	0.000
		25	0.969	-0.017	100214	0.000
		26	0.968	-0.011	104107	0.000
		27	0.967	0.020	107992	0.000
		28	0.966	0.022	111868	0.000
		29	0.964	-0.006	115737	0.000
		30	0.963	-0.032	119597	0.000
		31	0.962	-0.008	123448	0.000
		32	0.961	-0.014	127290	0.000
		33	0.959	-0.018	131122	0.000
		34	0.958	0.004	134945	0.000
		35	0.957	0.007	138759	0.000
		36	0.956	-0.025	142563	0.000

(a) Correlogram

Null Hypothesis: SPOT has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=30)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		0.114712	0.7189
Test critical values:	1% level	-2.565522	
	5% level	-1.940901	
	10% level	-1.616648	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(SPOT)
Method: Least Squares
Date: 03/10/14 Time: 10:11
Sample (adjusted): 1/20/1997 11/13/2012
Included observations: 4127 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
SPOT(-1)	1.50E-05	0.000131	0.114712	0.9087

R-squared	-0.000022	Mean dependent var	2.70E-05
Adjusted R-squared	-0.000022	S.D. dependent var	0.005378
S.E. of regression	0.005378	Akaike info criterion	-7.612886
Sum squared resid	0.119321	Schwarz criterion	-7.611353
Log likelihood	15710.19	Hannan-Quinn criter.	-7.612343
Durbin-Watson stat	2.010131		

(b) ADF test

Null Hypothesis: D(SPOT) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=30)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-64.55058	0.0001
Test critical values:	1% level	-3.431750	
	5% level	-2.862044	
	10% level	-2.567081	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(SPOT,2)
Method: Least Squares
Date: 03/10/14 Time: 10:12
Sample (adjusted): 1/21/1997 11/13/2012
Included observations: 4126 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(SPOT(-1))	-1.005133	0.015571	-64.55058	0.0000
C	2.79E-05	8.37E-05	0.333034	0.7391

R-squared	0.502580	Mean dependent var	1.27E-06
Adjusted R-squared	0.502459	S.D. dependent var	0.007625
S.E. of regression	0.005379	Akaike info criterion	-7.612294
Sum squared resid	0.119304	Schwarz criterion	-7.609228
Log likelihood	15706.16	Hannan-Quinn criter.	-7.611209
F-statistic	4166.778	Durbin-Watson stat	1.999835
Prob(F-statistic)	0.000000		

(c) ADF test for 1st diff

Figure 24: New Zealand: exchange spot rate stationary test

Sample: 1/20/1997 11/13/2012
Included observations: 4127

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.996	0.996	4099.8	0.000
		2	0.995	0.337	8190.7	0.000
		3	0.994	0.146	12274.	0.000
		4	0.993	0.031	16347.	0.000
		5	0.992	0.020	20412.	0.000
		6	0.990	0.001	24468.	0.000
		7	0.989	0.006	28516.	0.000
		8	0.988	-0.011	32554.	0.000
		9	0.987	0.050	36585.	0.000
		10	0.986	-0.013	40608.	0.000
		11	0.985	0.015	44623.	0.000
		12	0.984	0.010	48631.	0.000
		13	0.983	-0.020	52630.	0.000
		14	0.981	-0.026	56620.	0.000
		15	0.980	-0.019	60600.	0.000
		16	0.979	-0.003	64572.	0.000
		17	0.978	0.055	68537.	0.000
		18	0.977	-0.021	72493.	0.000
		19	0.976	0.032	76443.	0.000
		20	0.975	-0.008	80384.	0.000
		21	0.974	0.006	84318.	0.000
		22	0.972	-0.028	88243.	0.000
		23	0.971	-0.042	92158.	0.000
		24	0.970	0.008	96065.	0.000
		25	0.969	0.026	99964.	0.000
		26	0.968	0.027	103857	0.000
		27	0.967	-0.022	107739	0.000
		28	0.966	0.036	111616	0.000
		29	0.964	-0.024	115484	0.000
		30	0.964	0.032	119346	0.000
		31	0.962	-0.017	123200	0.000
		32	0.962	0.029	127048	0.000
		33	0.960	-0.035	130887	0.000
		34	0.959	-0.009	134718	0.000
		35	0.958	-0.036	138539	0.000
		36	0.956	-0.051	142349	0.000

(a) Correlogram

Null Hypothesis: X has a unit root
Exogenous: None
Lag Length: 2 (Automatic - based on SIC, maxlag=30)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.770991	0.3824
Test critical values:	1% level	-2.565523	
	5% level	-1.940901	
	10% level	-1.616648	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(X)
Method: Least Squares
Date: 03/11/14 Time: 20:18
Sample (adjusted): 1/23/1997 11/13/2012
Included observations: 4124 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
X(-1)	-0.000514	0.000666	-0.770991	0.4408
D(X(-1))	-0.395040	0.015398	-25.65487	0.0000
D(X(-2))	-0.152305	0.015394	-9.893718	0.0000

R-squared	0.138369	Mean dependent var	3.02E-09
Adjusted R-squared	0.137951	S.D. dependent var	1.68E-06
S.E. of regression	1.56E-06	Akaike info criterion	-23.90359
Sum squared resid	1.00E-08	Schwarz criterion	-23.89899
Log likelihood	49292.20	Hannan-Quinn criter.	-23.90196
Durbin-Watson stat	2.010215		

(b) ADF test

Null Hypothesis: D(X) has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=30)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-61.35799	0.0001
Test critical values:	1% level	-3.431751	
	5% level	-2.862044	
	10% level	-2.567082	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(X,2)
Method: Least Squares
Date: 03/11/14 Time: 20:18
Sample (adjusted): 1/23/1997 11/13/2012
Included observations: 4124 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(X(-1))	-1.547905	0.025227	-61.35799	0.0000
D(X(-1),2)	0.152519	0.015393	9.908448	0.0000
C	4.43E-09	2.43E-08	0.182407	0.8553

R-squared	0.679227	Mean dependent var	4.27E-10
Adjusted R-squared	0.679071	S.D. dependent var	2.75E-06
S.E. of regression	1.56E-06	Akaike info criterion	-23.90345
Sum squared resid	1.00E-08	Schwarz criterion	-23.89885
Log likelihood	49291.92	Hannan-Quinn criter.	-23.90183
F-statistic	4363.044	Durbin-Watson stat	2.010292
Prob(F-statistic)	0.000000		

(c) ADF test for 1st diff

Figure 25: New Zealand: log interest rate difference stationary test

Sample: 1/20/1997 11/13/2012
Included observations: 4127

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	-0.008	-0.008	0.2710	0.603
		2	-0.000	-0.000	0.2717	0.873
		3	-0.023	-0.023	2.5098	0.474
		4	0.016	0.016	3.6076	0.462
		5	0.007	0.007	3.7876	0.580
		6	-0.020	-0.020	5.4486	0.488
		7	-0.005	-0.005	5.5694	0.591
		8	0.019	0.019	7.1183	0.524
		9	-0.026	-0.027	9.8950	0.359
		10	0.003	0.003	9.9237	0.447
		11	0.019	0.021	11.453	0.406
		12	0.012	0.010	12.017	0.444
		13	0.006	0.006	12.155	0.515
		14	-0.014	-0.012	12.923	0.533
		15	0.010	0.009	13.334	0.577
		16	-0.026	-0.027	16.179	0.441
		17	0.025	0.026	18.813	0.339
		18	-0.004	-0.003	18.892	0.399
		19	0.001	-0.001	18.897	0.463
		20	-0.019	-0.017	20.383	0.434
		21	0.004	0.004	20.461	0.492
		22	-0.006	-0.007	20.635	0.543
		23	-0.019	-0.020	22.091	0.515
		24	0.011	0.013	22.615	0.543
		25	0.010	0.008	23.049	0.575
		26	-0.019	-0.019	24.600	0.542
		27	-0.024	-0.022	26.953	0.466
		28	-0.001	-0.001	26.956	0.521
		29	0.058	0.055	41.067	0.068
		30	-0.005	-0.005	41.163	0.084
		31	0.009	0.013	41.488	0.099
		32	0.020	0.020	43.109	0.091
		33	-0.009	-0.010	43.467	0.105
		34	0.001	0.001	43.470	0.128
		35	0.027	0.031	46.485	0.093
		36	-0.015	-0.018	47.413	0.097

(a) Correlogram

Null Hypothesis: Y has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=30)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-64.74901	0.0001
Test critical values:	1% level	-2.565523	
	5% level	-1.940901	
	10% level	-1.616648	

*MacKinnon (1996) one-sided p-values.

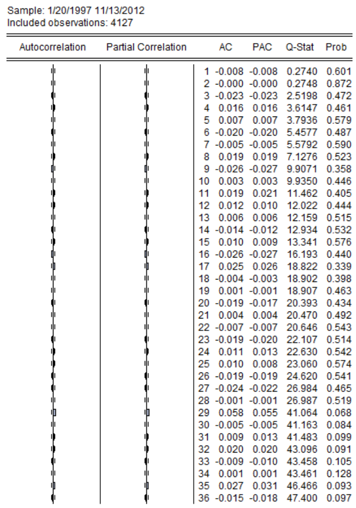
Augmented Dickey-Fuller Test Equation
Dependent Variable: D(Y)
Method: Least Squares
Date: 03/11/14 Time: 21:58
Sample (adjusted): 1/21/1997 11/13/2012
Included observations: 4126 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Y(-1)	-1.008084	0.015569	-64.74901	0.0000

R-squared	0.504054	Mean dependent var	-7.39E-07
Adjusted R-squared	0.504054	S.D. dependent var	0.005233
S.E. of regression	0.003685	Akaike info criterion	-8.368803
Sum squared resid	0.056017	Schwarz criterion	-8.367270
Log likelihood	17265.84	Hannan-Quinn criter.	-8.368260
Durbin-Watson stat	1.999978		

(b) ADF test

Figure 26: New Zealand: log exchange spot rate difference stationary test



Sample: 1/20/1997 11/13/2012
Included observations: 4127

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	-0.008	-0.008	0.2740	0.601
		2	-0.000	-0.000	0.2748	0.872
		3	-0.023	-0.023	2.5198	0.472
		4	0.016	0.016	3.6147	0.461
		5	0.007	0.007	3.7936	0.579
		6	-0.020	-0.020	5.4577	0.487
		7	-0.005	-0.005	5.5792	0.590
		8	0.019	0.019	7.1276	0.523
		9	-0.026	-0.027	9.9071	0.358
		10	0.003	0.003	9.9350	0.446
		11	0.019	0.021	11.462	0.405
		12	0.012	0.010	12.022	0.444
		13	0.006	0.006	12.159	0.515
		14	-0.014	-0.012	12.934	0.532
		15	0.010	0.009	13.341	0.576
		16	-0.026	-0.027	16.193	0.440
		17	0.025	0.026	18.822	0.339
		18	-0.004	-0.003	18.902	0.398
		19	0.001	-0.001	18.907	0.463
		20	-0.019	-0.017	20.393	0.434
		21	0.004	0.004	20.470	0.492
		22	-0.007	-0.007	20.646	0.543
		23	-0.019	-0.020	22.107	0.514
		24	0.011	0.013	22.630	0.542
		25	0.010	0.008	23.060	0.574
		26	-0.019	-0.019	24.620	0.541
		27	-0.024	-0.022	26.984	0.465
		28	-0.001	-0.001	26.987	0.519
		29	0.058	0.055	41.064	0.068
		30	-0.005	-0.005	41.163	0.084
		31	0.009	0.013	41.483	0.099
		32	0.020	0.020	43.096	0.091
		33	-0.009	-0.010	43.458	0.105
		34	0.001	0.001	43.461	0.128
		35	0.027	0.031	46.466	0.093
		36	-0.015	-0.018	47.400	0.097

(a) Correlogram

Null Hypothesis: RF has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=30)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-64.75200	0.0001
Test critical values:	1% level	-2.565523	
	5% level	-1.940901	
	10% level	-1.616648	

*MacKinnon (1996) one-sided p-values.

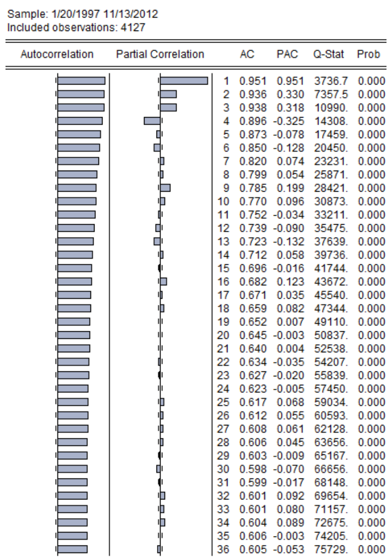
Augmented Dickey-Fuller Test Equation
Dependent Variable: D(RF)
Method: Least Squares
Date: 03/20/14 Time: 14:59
Sample (adjusted): 1/21/1997 11/13/2012
Included observations: 4126 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RF(-1)	-1.008129	0.015569	-64.75200	0.0000

R-squared	0.504077	Mean dependent var	7.36E-07
Adjusted R-squared	0.504077	S.D. dependent var	0.005233
S.E. of regression	0.003685	Akaike info criterion	-8.368842
Sum squared resid	0.056015	Schwarz criterion	-8.367309
Log likelihood	17265.92	Hannan-Quinn criter.	-8.368300
Durbin-Watson stat	1.999981		

(b) ADF test

Figure 27: New Zealand: the generalized risk factor stationary test



Sample: 1/20/1997 11/13/2012
Included observations: 4127

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.951	0.951	3736.7	0.000
		2	0.936	0.330	7357.5	0.000
		3	0.938	0.318	10990.	0.000
		4	0.896	-0.325	14308.	0.000
		5	0.873	-0.078	17459.	0.000
		6	0.850	-0.128	20450.	0.000
		7	0.820	0.074	23231.	0.000
		8	0.799	0.054	25871.	0.000
		9	0.785	0.199	28421.	0.000
		10	0.770	0.096	30873.	0.000
		11	0.752	-0.034	33211.	0.000
		12	0.739	-0.090	35475.	0.000
		13	0.723	-0.132	37639.	0.000
		14	0.712	0.058	39736.	0.000
		15	0.696	-0.016	41744.	0.000
		16	0.682	0.123	43672.	0.000
		17	0.671	0.035	45540.	0.000
		18	0.659	0.082	47344.	0.000
		19	0.652	0.007	49110.	0.000
		20	0.645	-0.003	50837.	0.000
		21	0.640	0.004	52538.	0.000
		22	0.634	-0.035	54207.	0.000
		23	0.627	-0.020	55839.	0.000
		24	0.623	-0.005	57450.	0.000
		25	0.617	0.068	59034.	0.000
		26	0.612	0.055	60593.	0.000
		27	0.608	0.061	62128.	0.000
		28	0.606	0.045	63656.	0.000
		29	0.603	-0.009	65167.	0.000
		30	0.598	-0.070	66656.	0.000
		31	0.599	-0.017	68148.	0.000
		32	0.601	0.092	69654.	0.000
		33	0.601	0.080	71157.	0.000
		34	0.604	0.089	72675.	0.000
		35	0.606	-0.003	74205.	0.000
		36	0.605	-0.053	75729.	0.000

(a) Correlogram

Null Hypothesis: MEANRF has a unit root
Exogenous: None
Lag Length: 15 (Automatic - based on SIC, maxlag=15)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.118839	0.0018
Test critical values:	1% level	-2.565525	
	5% level	-1.940901	
	10% level	-1.616648	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(MEANRF)
Method: Least Squares
Date: 03/20/14 Time: 15:00
Sample (adjusted): 2/11/1997 11/13/2012
Included observations: 4111 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
MEANRF(-1)	-0.002223	0.000713	-3.118839	0.0018
D(MEANRF(-1))	0.016581	0.015275	1.085516	0.2778
D(MEANRF(-2))	-0.049838	0.015205	-3.277827	0.0011
D(MEANRF(-3))	0.041785	0.015039	2.778480	0.0055
D(MEANRF(-4))	-0.102527	0.014585	-7.029859	0.0000
D(MEANRF(-5))	0.057936	0.012619	4.591131	0.0000
D(MEANRF(-6))	0.138041	0.012488	11.05428	0.0000
D(MEANRF(-7))	0.210737	0.012164	17.32524	0.0000
D(MEANRF(-8))	-0.013713	0.012217	-1.122390	0.2618
D(MEANRF(-9))	0.041180	0.010346	3.980291	0.0001
D(MEANRF(-10))	0.025800	0.010104	2.553437	0.0107
D(MEANRF(-11))	0.065718	0.009839	6.679443	0.0000
D(MEANRF(-12))	0.139380	0.009025	15.44442	0.0000
D(MEANRF(-13))	-0.053334	0.006507	-8.196170	0.0000
D(MEANRF(-14))	0.000767	0.006165	0.124460	0.9010
D(MEANRF(-15))	-0.061485	0.005866	-10.48108	0.0000

R-squared	0.352129	Mean dependent var	2.36E-07
Adjusted R-squared	0.349756	S.D. dependent var	8.39E-06
S.E. of regression	6.76E-06	Akaike info criterion	-20.96635
Sum squared resid	1.87E-07	Schwarz criterion	-20.94175
Log likelihood	43112.34	Hannan-Quinn criter.	-20.95764
Durbin-Watson stat	2.008480		

(b) ADF test

Figure 28: New Zealand: the mean of the generalized risk factor stationary test

Sample: 1/20/1997 11/13/2012
Included observations: 4127

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.996	0.996	4099.4	0.000
		2	0.994	0.206	8181.9	0.000
		3	0.991	-0.055	12242.	0.000
		4	0.991	0.395	16304.	0.000
		5	0.991	0.057	20362.	0.000
		6	0.990	-0.095	24413.	0.000
		7	0.989	0.112	28455.	0.000
		8	0.988	0.102	32494.	0.000
		9	0.987	-0.130	36524.	0.000
		10	0.986	-0.022	40545.	0.000
		11	0.984	0.057	44556.	0.000
		12	0.983	-0.029	48560.	0.000
		13	0.982	-0.043	52557.	0.000
		14	0.981	0.000	56545.	0.000
		15	0.980	0.031	60524.	0.000
		16	0.978	-0.109	64492.	0.000
		17	0.977	-0.022	68449.	0.000
		18	0.976	0.039	72396.	0.000
		19	0.975	0.007	76335.	0.000
		20	0.973	-0.021	80266.	0.000
		21	0.972	-0.008	84188.	0.000
		22	0.971	0.040	88100.	0.000
		23	0.969	-0.044	92002.	0.000
		24	0.968	-0.013	95894.	0.000
		25	0.967	0.040	99777.	0.000
		26	0.966	-0.007	103650	0.000
		27	0.964	-0.040	107514	0.000
		28	0.963	-0.029	111366	0.000
		29	0.961	0.007	115206	0.000
		30	0.959	-0.037	119034	0.000
		31	0.958	0.015	122852	0.000
		32	0.957	0.022	126661	0.000
		33	0.955	-0.014	130460	0.000
		34	0.954	-0.003	134249	0.000
		35	0.952	0.002	138027	0.000
		36	0.951	-0.012	141793	0.000

(a) Correlogram

Null Hypothesis: DEVRF has a unit root
Exogenous: None
Lag Length: 9 (Automatic - based on SIC, maxlag=30)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		1.865948	0.9856
Test critical values:	1% level	-2.565524	
	5% level	-1.940901	
	10% level	-1.616648	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DEVRF)
Method: Least Squares
Date: 03/20/14 Time: 15:01
Sample (adjusted): 2/03/1997 11/13/2012
Included observations: 4117 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DEVRF(-1)	0.000109	5.82E-05	1.865948	0.0621
D(DEVRF(-1))	-0.008962	0.015350	-0.583884	0.5593
D(DEVRF(-2))	0.133057	0.014669	9.070612	0.0000
D(DEVRF(-3))	-0.035231	0.014750	-2.388535	0.0170
D(DEVRF(-4))	0.015489	0.014375	1.077452	0.2813
D(DEVRF(-5))	0.138308	0.013394	10.32575	0.0000
D(DEVRF(-6))	-0.067018	0.012788	-5.240568	0.0000
D(DEVRF(-7))	0.053564	0.007500	7.142132	0.0000
D(DEVRF(-8))	0.127976	0.007264	17.61810	0.0000
D(DEVRF(-9))	-0.060102	0.006442	-9.329884	0.0000

R-squared	0.165440	Mean dependent var	2.18E-09
Adjusted R-squared	0.163611	S.D. dependent var	4.41E-08
S.E. of regression	4.03E-08	Akaike info criterion	-31.21227
Sum squared resid	6.68E-12	Schwarz criterion	-31.19691
Log likelihood	64260.45	Hannan-Quinn criter.	-31.20683
Durbin-Watson stat	2.029510		

(b) ADF test

Null Hypothesis: D(DEVRF) has a unit root
Exogenous: Constant
Lag Length: 2 (Automatic - based on SIC, maxlag=30)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-110.1270	0.0001
Test critical values:	1% level	-3.431752	
	5% level	-2.862044	
	10% level	-2.567082	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DEVRF,2)
Method: Least Squares
Date: 03/20/14 Time: 15:02
Sample (adjusted): 1/24/1997 11/13/2012
Included observations: 4123 after adjustments

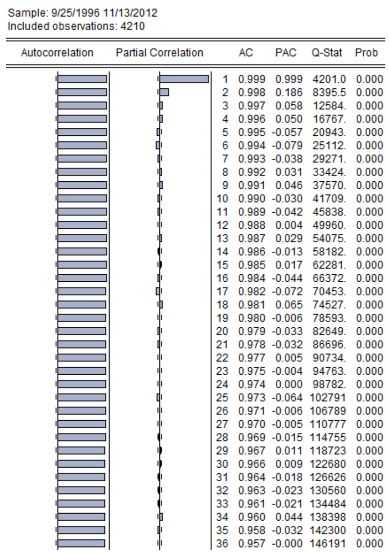
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(DEVRF(-1))	-1.492420	0.013552	-110.1270	0.0000
D(DEVRF(-1),2)	0.362609	0.010880	33.32907	0.0000
D(DEVRF(-2),2)	0.147233	0.006703	21.96652	0.0000
C	2.96E-09	7.85E-10	3.765160	0.0002

R-squared	0.867509	Mean dependent var	-1.55E-09
Adjusted R-squared	0.867412	S.D. dependent var	1.38E-07
S.E. of regression	5.03E-08	Akaike info criterion	-30.77023
Sum squared resid	1.04E-11	Schwarz criterion	-30.76409
Log likelihood	63436.82	Hannan-Quinn criter.	-30.76805
F-statistic	8989.935	Durbin-Watson stat	1.853764
Prob(F-statistic)	0.000000		

(c) ADF test for 1st diff

Figure 29: New Zealand: the deviation of the generalized risk factor stationary test

APPENDIX F: STATIONARY TEST: NORWAY



Sample: 9/25/1996 11/13/2012
Included observations: 4210

	AC	PAC	Q-Stat	Prob
1	0.999	0.999	4201.0	0.000
2	0.998	0.186	8395.5	0.000
3	0.997	0.058	12584.	0.000
4	0.996	0.050	16767.	0.000
5	0.995	-0.057	20943.	0.000
6	0.994	-0.079	25112.	0.000
7	0.993	-0.038	29271.	0.000
8	0.992	0.031	33424.	0.000
9	0.991	0.046	37570.	0.000
10	0.990	-0.030	41709.	0.000
11	0.989	-0.042	45838.	0.000
12	0.988	0.004	49960.	0.000
13	0.987	0.029	54075.	0.000
14	0.986	-0.013	58182.	0.000
15	0.985	0.017	62281.	0.000
16	0.984	-0.044	66372.	0.000
17	0.982	-0.072	70453.	0.000
18	0.981	0.065	74527.	0.000
19	0.980	-0.006	78593.	0.000
20	0.979	-0.033	82649.	0.000
21	0.978	-0.032	86696.	0.000
22	0.977	0.005	90734.	0.000
23	0.975	-0.004	94763.	0.000
24	0.974	0.000	98782.	0.000
25	0.973	-0.064	102791	0.000
26	0.971	-0.006	106789	0.000
27	0.970	-0.005	110777	0.000
28	0.969	-0.015	114755	0.000
29	0.967	0.011	118723	0.000
30	0.966	0.009	122680	0.000
31	0.964	-0.018	126626	0.000
32	0.963	-0.023	130560	0.000
33	0.961	-0.021	134484	0.000
34	0.960	0.044	138398	0.000
35	0.958	-0.032	142300	0.000
36	0.957	-0.000	146191	0.000

(a) Correlogram

Null Hypothesis: INTEREST has a unit root
Exogenous: None
Lag Length: 17 (Automatic - based on SIC, maxlag=30)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.983319	0.2919
Test critical values:	1% level	-2.565514	
	5% level	-1.940900	
	10% level	-1.616649	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(INTEREST)
Method: Least Squares
Date: 03/10/14 Time: 10:39
Sample (adjusted): 10/21/1996 11/13/2012
Included observations: 4192 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INTEREST(-1)	-0.000329	0.000335	-0.983319	0.3255
D(INTEREST(-1))	-0.234186	0.015442	-15.16547	0.0000
D(INTEREST(-2))	-0.065842	0.015825	-4.160735	0.0000
D(INTEREST(-3))	-0.028698	0.015827	-1.813224	0.0699
D(INTEREST(-4))	0.084726	0.015833	5.351115	0.0000
D(INTEREST(-5))	0.089788	0.015884	5.652610	0.0000
D(INTEREST(-6))	0.027198	0.015938	1.706511	0.0880
D(INTEREST(-7))	-0.038871	0.015940	-2.438649	0.0148
D(INTEREST(-8))	-0.035061	0.015941	-2.199499	0.0279
D(INTEREST(-9))	0.039725	0.015938	2.492467	0.0127
D(INTEREST(-10))	0.036827	0.015940	2.310341	0.0209
D(INTEREST(-11))	-0.018283	0.015938	-1.147111	0.2514
D(INTEREST(-12))	-0.029764	0.015935	-1.867805	0.0619
D(INTEREST(-13))	0.017743	0.015882	1.117163	0.2640
D(INTEREST(-14))	-0.007343	0.015830	-0.463898	0.6427
D(INTEREST(-15))	0.061286	0.015824	3.872959	0.0001
D(INTEREST(-16))	0.070212	0.015819	4.438425	0.0000
D(INTEREST(-17))	-0.066611	0.015437	-4.314939	0.0000

R-squared	0.088412	Mean dependent var	-0.000723
Adjusted R-squared	0.084699	S.D. dependent var	0.105647
S.E. of regression	0.101074	Akaike info criterion	-1.741641
Sum squared resid	42.64149	Schwarz criterion	-1.714413
Log likelihood	3668.479	Hannan-Quinn criter.	-1.732012
Durbin-Watson stat	1.999411		

(b) ADF test

Null Hypothesis: D(INTEREST) has a unit root
Exogenous: Constant
Lag Length: 16 (Automatic - based on SIC, maxlag=30)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-14.80024	0.0000
Test critical values:	1% level	-3.431726	
	5% level	-2.862033	
	10% level	-2.567076	

*MacKinnon (1996) one-sided p-values.

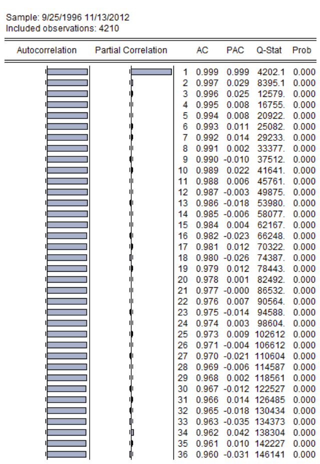
Augmented Dickey-Fuller Test Equation
Dependent Variable: D(INTEREST,2)
Method: Least Squares
Date: 03/10/14 Time: 10:39
Sample (adjusted): 10/21/1996 11/13/2012
Included observations: 4192 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(INTEREST(-1))	-1.099535	0.074292	-14.80024	0.0000
D(INTEREST(-1),2)	-0.134801	0.072568	-1.857593	0.0633
D(INTEREST(-2),2)	-0.200763	0.070562	-2.845183	0.0045
D(INTEREST(-3),2)	-0.229580	0.068295	-3.361590	0.0008
D(INTEREST(-4),2)	-0.144966	0.066003	-2.196361	0.0281
D(INTEREST(-5),2)	-0.055307	0.063491	-0.871097	0.3838
D(INTEREST(-6),2)	-0.028247	0.060976	-0.463253	0.6432
D(INTEREST(-7),2)	-0.067258	0.058432	-1.151037	0.2498
D(INTEREST(-8),2)	-0.102456	0.055600	-1.842739	0.0654
D(INTEREST(-9),2)	-0.062867	0.052415	-1.199396	0.2304
D(INTEREST(-10),2)	-0.026179	0.049214	-0.531946	0.5948
D(INTEREST(-11),2)	-0.044603	0.046015	-0.969322	0.3324
D(INTEREST(-12),2)	-0.074509	0.042407	-1.757005	0.0790
D(INTEREST(-13),2)	-0.056916	0.037800	-1.505707	0.1322
D(INTEREST(-14),2)	-0.064424	0.031729	-2.030420	0.0424
D(INTEREST(-15),2)	-0.003297	0.024556	-0.134269	0.8932
D(INTEREST(-16),2)	0.066754	0.015439	4.323788	0.0000
C	-0.000795	0.001562	-0.509071	0.6107

R-squared	0.623726	Mean dependent var	7.06E-06
Adjusted R-squared	0.622193	S.D. dependent var	0.164453
S.E. of regression	0.101083	Akaike info criterion	-1.741471
Sum squared resid	42.64872	Schwarz criterion	-1.714244
Log likelihood	3668.123	Hannan-Quinn criter.	-1.731843
F-statistic	406.9981	Durbin-Watson stat	1.999430
Prob(F-statistic)	0.000000		

(c) ADF test for 1st diff

Figure 30: Norway: interest rate stationary test



Sample: 9/25/1996 11/13/2012
Included observations: 4210

	AC	PAC	Q-Stat	Prob
1	0.999	0.999	4202.1	0.000
2	0.997	0.029	8395.1	0.000
3	0.996	0.025	12579.	0.000
4	0.995	0.008	16755.	0.000
5	0.994	0.008	20922.	0.000
6	0.993	0.011	25082.	0.000
7	0.992	0.014	29233.	0.000
8	0.991	0.002	33377.	0.000
9	0.990	-0.010	37512.	0.000
10	0.989	0.022	41641.	0.000
11	0.988	0.006	45761.	0.000
12	0.987	-0.003	49875.	0.000
13	0.986	-0.018	53980.	0.000
14	0.985	-0.006	58077.	0.000
15	0.984	0.004	62167.	0.000
16	0.982	-0.023	66248.	0.000
17	0.981	0.012	70322.	0.000
18	0.980	-0.026	74387.	0.000
19	0.979	0.012	78443.	0.000
20	0.978	0.001	82492.	0.000
21	0.977	-0.000	86532.	0.000
22	0.976	0.007	90564.	0.000
23	0.975	-0.014	94588.	0.000
24	0.974	0.003	98604.	0.000
25	0.973	0.009	102612	0.000
26	0.971	-0.004	106612	0.000
27	0.970	-0.021	110604	0.000
28	0.969	-0.006	114587	0.000
29	0.968	0.002	118561	0.000
30	0.967	-0.012	122527	0.000
31	0.966	0.014	126485	0.000
32	0.965	-0.018	130434	0.000
33	0.963	-0.035	134373	0.000
34	0.962	0.042	138304	0.000
35	0.961	0.010	142227	0.000
36	0.960	-0.031	146141	0.000

(a) Correlogram

Null Hypothesis: SPOT has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=30)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.424301	0.5304
Test critical values:	1% level	-2.565512	
	5% level	-1.940899	
	10% level	-1.616649	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(SPOT)
Method: Least Squares
Date: 03/10/14 Time: 21:08
Sample (adjusted): 9/26/1996 11/13/2012
Included observations: 4209 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
SPOT(-1)	-4.92E-05	0.000116	-0.424301	0.6714

R-squared	0.000033	Mean dependent var	-0.000166
Adjusted R-squared	0.000033	S.D. dependent var	0.052485
S.E. of regression	0.052485	Akaike info criterion	-3.056359
Sum squared resid	11.59147	Schwarz criterion	-3.054851
Log likelihood	6433.107	Hannan-Quinn criter.	-3.055826
Durbin-Watson stat	2.069306		

(b) ADF test

Null Hypothesis: D(SPOT) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=30)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-67.14585	0.0001
Test critical values:	1% level	-3.431720	
	5% level	-2.862030	
	10% level	-2.567074	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(SPOT,2)
Method: Least Squares
Date: 03/10/14 Time: 21:09
Sample (adjusted): 9/27/1996 11/13/2012
Included observations: 4208 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(SPOT(-1))	-1.034727	0.015410	-67.14585	0.0000
C	-0.000178	0.000809	-0.219529	0.8262

R-squared	0.517360	Mean dependent var	8.20E-07
Adjusted R-squared	0.517245	S.D. dependent var	0.075510
S.E. of regression	0.052465	Akaike info criterion	-3.056867
Sum squared resid	11.57732	Schwarz criterion	-3.053851
Log likelihood	6433.648	Hannan-Quinn criter.	-3.055801
F-statistic	4508.565	Durbin-Watson stat	2.001935
Prob(F-statistic)	0.000000		

(c) ADF test for 1st diff

Figure 31: Norway: exchange spot rate stationary test

Sample: 9/26/1996 11/13/2012
Included observations: 4209

	AC	PAC	Q-Stat	Prob
1	0.995	0.995	4169.8	0.000
2	0.993	0.268	8321.4	0.000
3	0.991	0.097	12456.	0.000
4	0.988	0.014	16573.	0.000
5	0.986	-0.007	20670.	0.000
6	0.985	0.166	24763.	0.000
7	0.983	-0.062	28837.	0.000
8	0.981	-0.029	32895.	0.000
9	0.980	0.154	36950.	0.000
10	0.979	0.064	40999.	0.000
11	0.979	0.065	45043.	0.000
12	0.978	-0.022	49081.	0.000
13	0.977	0.035	53115.	0.000
14	0.975	-0.104	57132.	0.000
15	0.974	0.023	61142.	0.000
16	0.973	0.035	65145.	0.000
17	0.972	0.013	69139.	0.000
18	0.971	0.058	73128.	0.000
19	0.970	-0.057	77107.	0.000
20	0.969	0.026	81078.	0.000
21	0.967	-0.019	85039.	0.000
22	0.966	-0.060	88989.	0.000
23	0.965	0.020	92931.	0.000
24	0.964	-0.006	96864.	0.000
25	0.962	0.016	100786	0.000
26	0.961	0.023	104702	0.000
27	0.960	0.010	108609	0.000
28	0.959	-0.030	112506	0.000
29	0.958	-0.021	116395	0.000
30	0.956	-0.018	120273	0.000
31	0.955	-0.035	124140	0.000
32	0.953	-0.006	127995	0.000
33	0.952	-0.020	131839	0.000
34	0.950	0.009	135671	0.000
35	0.949	0.044	139494	0.000
36	0.948	0.016	143309	0.000

(a) Correlogram

Null Hypothesis: X has a unit root
Exogenous: None
Lag Length: 13 (Automatic - based on SIC, maxlag=30)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.406599	0.1488
Test critical values:	1% level	-2.565513	
	5% level	-1.940900	
	10% level	-1.616649	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(X)
Method: Least Squares
Date: 03/12/14 Time: 20:19
Sample (adjusted): 10/16/1996 11/13/2012
Included observations: 4195 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
X(-1)	-0.001781	0.001266	-1.406599	0.1596
D(X(-1))	-0.297473	0.015409	-19.30476	0.0000
D(X(-2))	-0.103215	0.016081	-6.418510	0.0000
D(X(-3))	-0.041803	0.016157	-2.587252	0.0097
D(X(-4))	-0.046822	0.016142	-2.900712	0.0037
D(X(-5))	-0.148121	0.016106	-9.196364	0.0000
D(X(-6))	0.055677	0.016060	3.466838	0.0005
D(X(-7))	-0.035298	0.016072	-2.196228	0.0281
D(X(-8))	-0.166035	0.016060	-10.33848	0.0000
D(X(-9))	-0.081393	0.016097	-5.056310	0.0000
D(X(-10))	-0.060044	0.016129	-3.722777	0.0002
D(X(-11))	0.020860	0.016141	1.292315	0.1963
D(X(-12))	-0.005342	0.016063	-0.332602	0.7395
D(X(-13))	0.103762	0.015382	6.745832	0.0000

R-squared	0.156509	Mean dependent var	5.92E-09
Adjusted R-squared	0.153887	S.D. dependent var	2.57E-06
S.E. of regression	2.36E-06	Akaike info criterion	-23.07067
Sum squared resid	2.33E-08	Schwarz criterion	-23.04951
Log likelihood	48404.74	Hannan-Quinn criter.	-23.06319
Durbin-Watson stat	1.995381		

(b) ADF test

Null Hypothesis: D(X) has a unit root
Exogenous: Constant
Lag Length: 12 (Automatic - based on SIC, maxlag=30)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-20.40789	0.0000
Test critical values:	1% level	-3.431725	
	5% level	-2.862033	
	10% level	-2.567075	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(X,2)
Method: Least Squares
Date: 03/12/14 Time: 20:20
Sample (adjusted): 10/16/1996 11/13/2012
Included observations: 4195 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(X(-1))	-1.817491	0.089058	-20.40789	0.0000
D(X(-1),2)	0.518635	0.084905	6.108442	0.0000
D(X(-2),2)	0.414175	0.079976	5.178752	0.0000
D(X(-3),2)	0.371165	0.074442	4.985977	0.0000
D(X(-4),2)	0.323187	0.068806	4.697069	0.0000
D(X(-5),2)	0.173976	0.063175	2.753858	0.0059
D(X(-6),2)	0.228718	0.058024	3.941808	0.0001
D(X(-7),2)	0.192480	0.052684	3.653496	0.0003
D(X(-8),2)	0.025493	0.046244	0.551266	0.5815
D(X(-9),2)	-0.056698	0.040059	-1.415363	0.1570
D(X(-10),2)	-0.117478	0.033247	-3.533509	0.0004
D(X(-11),2)	-0.097303	0.025254	-3.852968	0.0001
D(X(-12),2)	-0.103284	0.015382	-6.714634	0.0000
C	1.06E-08	3.65E-08	0.290944	0.7711

R-squared	0.668924	Mean dependent var	-1.53E-11
Adjusted R-squared	0.667895	S.D. dependent var	4.10E-06
S.E. of regression	2.36E-06	Akaike info criterion	-23.07022
Sum squared resid	2.33E-08	Schwarz criterion	-23.04906
Log likelihood	48403.79	Hannan-Quinn criter.	-23.06274
F-statistic	649.8106	Durbin-Watson stat	1.995295
Prob(F-statistic)	0.000000		

(c) ADF test for 1st diff

Figure 32: Norway: log interest rate difference stationary test

Sample: 9/26/1996 11/13/2012
Included observations: 4209

	AC	PAC	Q-Stat	Prob
1	-0.026	-0.026	2.9480	0.086
2	-0.027	-0.028	6.1259	0.047
3	-0.014	-0.016	6.9979	0.072
4	-0.005	-0.007	7.1116	0.130
5	-0.015	-0.016	8.0554	0.153
6	-0.010	-0.011	8.4726	0.205
7	-0.000	-0.002	8.4736	0.293
8	0.004	0.003	8.5580	0.381
9	-0.029	-0.029	12.070	0.209
10	0.001	-0.000	12.079	0.280
11	0.013	0.011	12.803	0.306
12	0.022	0.021	14.784	0.253
13	0.008	0.010	15.075	0.303
14	-0.008	-0.007	15.348	0.355
15	0.021	0.021	17.130	0.311
16	-0.019	-0.017	18.641	0.288
17	0.026	0.027	21.428	0.208
18	-0.017	-0.016	22.638	0.205
19	-0.007	-0.007	22.860	0.244
20	-0.004	-0.004	22.931	0.292
21	-0.010	-0.010	23.349	0.326
22	0.016	0.016	24.487	0.322
23	0.002	0.001	24.501	0.377
24	-0.007	-0.007	24.735	0.420
25	0.007	0.005	24.926	0.467
26	0.010	0.011	25.309	0.502
27	-0.000	-0.001	25.310	0.557
28	0.003	0.003	25.339	0.609
29	0.021	0.022	27.285	0.556
30	-0.016	-0.016	28.437	0.547
31	0.010	0.014	28.894	0.575
32	0.039	0.039	35.329	0.314
33	-0.054	-0.051	47.878	0.045
34	-0.008	-0.009	48.128	0.055
35	0.033	0.033	52.883	0.027
36	-0.001	-0.000	52.886	0.034

(a) Correlogram

Null Hypothesis: Y has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=30)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-66.59873	0.0001
Test critical values:	1% level	-2.565512	
	5% level	-1.940899	
	10% level	-1.616649	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(Y)
Method: Least Squares
Date: 03/12/14 Time: 20:33
Sample (adjusted): 9/27/1996 11/13/2012
Included observations: 4208 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Y(-1)	-1.026444	0.015412	-66.59873	0.0000

R-squared	0.513213	Mean dependent var	-1.08E-07
Adjusted R-squared	0.513213	S.D. dependent var	0.004778
S.E. of regression	0.003334	Akaike info criterion	-8.569212
Sum squared resid	0.046756	Schwarz criterion	-8.567705
Log likelihood	18030.62	Hannan-Quinn criter.	-8.568679
Durbin-Watson stat	2.001409		

(b) ADF test

Figure 33: Norway: log exchange spot rate difference stationary test

Sample: 9/26/1996 11/13/2012
Included observations: 4209

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	-0.026	-0.026	2.9034	0.088
		2	-0.027	-0.028	6.0369	0.049
		3	-0.014	-0.016	6.8834	0.076
		4	-0.005	-0.007	6.9872	0.137
		5	-0.015	-0.016	7.9019	0.162
		6	-0.010	-0.011	8.3003	0.217
		7	-0.000	-0.002	8.3006	0.307
		8	0.005	0.004	8.3935	0.396
		9	-0.029	-0.029	11.850	0.222
		10	0.002	-0.000	11.862	0.294
		11	0.013	0.012	12.614	0.319
		12	0.022	0.022	14.638	0.262
		13	0.009	0.010	14.945	0.311
		14	-0.008	-0.006	15.202	0.365
		15	0.021	0.021	17.025	0.317
		16	-0.019	-0.017	18.497	0.296
		17	0.026	0.027	21.332	0.212
		18	-0.017	-0.016	22.508	0.210
		19	-0.007	-0.007	22.715	0.250
		20	-0.004	-0.004	22.778	0.300
		21	-0.010	-0.010	23.175	0.335
		22	0.017	0.016	24.345	0.329
		23	0.002	0.001	24.363	0.384
		24	-0.007	-0.006	24.583	0.429
		25	0.007	0.005	24.786	0.474
		26	0.010	0.011	25.187	0.508
		27	-0.000	-0.000	25.187	0.564
		28	0.003	0.003	25.221	0.616
		29	0.022	0.022	27.210	0.560
		30	-0.016	-0.016	28.329	0.553
		31	0.011	0.014	28.806	0.579
		32	0.039	0.039	35.321	0.314
		33	-0.054	-0.051	47.755	0.047
		34	-0.007	-0.008	47.989	0.056
		35	0.034	0.033	52.813	0.027
		36	-0.001	0.000	52.814	0.035

(a) Correlogram

Null Hypothesis: RF has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=30)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-66.58240	0.0001
Test critical values:	1% level	-2.565512	
	5% level	-1.940899	
	10% level	-1.616649	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(RF)
Method: Least Squares
Date: 03/20/14 Time: 15:13
Sample (adjusted): 9/27/1996 11/13/2012
Included observations: 4208 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RF(-1)	-1.026198	0.015412	-66.58240	0.0000

R-squared	0.513091	Mean dependent var	1.02E-07
Adjusted R-squared	0.513091	S.D. dependent var	0.004778
S.E. of regression	0.003334	Akaike info criterion	-8.568916
Sum squared resid	0.046769	Schwarz criterion	-8.567408
Log likelihood	18030.00	Hannan-Quinn criter.	-8.568383
Durbin-Watson stat	2.001384		

(b) ADF test

Figure 34: Norway: the generalized risk factor stationary test

Sample: 9/26/1996 11/13/2012
Included observations: 4209

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.950	0.950	3801.4	0.000
		2	0.927	0.255	7425.0	0.000
		3	0.921	0.242	10997.	0.000
		4	0.910	0.092	14490.	0.000
		5	0.892	-0.030	17845.	0.000
		6	0.886	0.101	21156.	0.000
		7	0.874	-0.015	24382.	0.000
		8	0.865	0.044	27539.	0.000
		9	0.858	0.039	30645.	0.000
		10	0.850	0.012	33694.	0.000
		11	0.845	0.067	36709.	0.000
		12	0.839	0.009	39681.	0.000
		13	0.837	0.073	42638.	0.000
		14	0.826	-0.055	45522.	0.000
		15	0.816	-0.029	48338.	0.000
		16	0.800	-0.104	51045.	0.000
		17	0.785	-0.076	53654.	0.000
		18	0.773	-0.011	56182.	0.000
		19	0.765	0.022	58659.	0.000
		20	0.758	0.062	61091.	0.000
		21	0.755	0.072	63501.	0.000
		22	0.748	0.017	65870.	0.000
		23	0.742	0.024	68204.	0.000
		24	0.740	0.030	70523.	0.000
		25	0.738	0.042	72833.	0.000
		26	0.736	0.027	75129.	0.000
		27	0.736	0.056	77426.	0.000
		28	0.738	0.067	79733.	0.000
		29	0.736	0.043	82032.	0.000
		30	0.732	0.007	84304.	0.000
		31	0.727	-0.009	86547.	0.000
		32	0.728	0.050	88798.	0.000
		33	0.733	0.085	91081.	0.000
		34	0.735	0.024	93376.	0.000
		35	0.738	0.042	95690.	0.000
		36	0.741	0.004	98020.	0.000

(a) Correlogram

Null Hypothesis: MEANRF has a unit root
Exogenous: None
Lag Length: 15 (Automatic - based on SIC, maxlag=15)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.029782	0.0000
Test critical values:	1% level	-2.565514	
	5% level	-1.940900	
	10% level	-1.616649	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(MEANRF)
Method: Least Squares
Date: 03/20/14 Time: 15:14
Sample (adjusted): 10/18/1996 11/13/2012
Included observations: 4193 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
MEANRF(-1)	-0.006637	0.001320	-5.029782	0.0000
D(MEANRF(-1))	0.014997	0.014980	1.001167	0.3168
D(MEANRF(-2))	0.014400	0.014867	0.968610	0.3328
D(MEANRF(-3))	-0.027641	0.014402	-1.919223	0.0550
D(MEANRF(-4))	0.007007	0.014294	0.490189	0.6240
D(MEANRF(-5))	-0.070024	0.014280	-4.903643	0.0000
D(MEANRF(-6))	-0.041585	0.014316	-2.904754	0.0037
D(MEANRF(-7))	0.069165	0.014121	4.897971	0.0000
D(MEANRF(-8))	0.049987	0.014155	3.531437	0.0004
D(MEANRF(-9))	0.074097	0.013786	5.374962	0.0000
D(MEANRF(-10))	-0.032271	0.013786	-2.340831	0.0193
D(MEANRF(-11))	-0.025559	0.013093	-1.952046	0.0510
D(MEANRF(-12))	0.102665	0.012675	8.099597	0.0000
D(MEANRF(-13))	0.166543	0.012611	13.20594	0.0000
D(MEANRF(-14))	0.087593	0.011513	7.607919	0.0000
D(MEANRF(-15))	0.085930	0.008204	10.47407	0.0000

R-squared	0.129040	Mean dependent var	-7.94E-08
Adjusted R-squared	0.125912	S.D. dependent var	8.39E-06
S.E. of regression	7.84E-06	Akaike info criterion	-20.67036
Sum squared resid	2.57E-07	Schwarz criterion	-20.64616
Log likelihood	43351.41	Hannan-Quinn criter.	-20.66180
Durbin-Watson stat	2.041080		

(b) ADF test

Figure 35: Norway: the mean of the generalized risk factor stationary test

Sample: 9/26/1996 11/13/2012
Included observations: 4209

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.996	0.996	4175.2	0.000
		2	0.992	0.104	8322.5	0.000
		3	0.989	-0.012	12440.	0.000
		4	0.985	-0.037	16527.	0.000
		5	0.981	-0.029	20580.	0.000
		6	0.977	0.020	24602.	0.000
		7	0.973	-0.004	28593.	0.000
		8	0.969	-0.002	32553.	0.000
		9	0.965	-0.010	36481.	0.000
		10	0.961	-0.014	40376.	0.000
		11	0.957	-0.007	44240.	0.000
		12	0.952	-0.012	48070.	0.000
		13	0.948	-0.011	51867.	0.000
		14	0.944	0.020	55632.	0.000
		15	0.940	-0.009	59366.	0.000
		16	0.936	-0.012	63066.	0.000
		17	0.931	-0.004	66734.	0.000
		18	0.927	0.010	70370.	0.000
		19	0.923	0.025	73977.	0.000
		20	0.919	-0.006	77553.	0.000
		21	0.915	-0.002	81099.	0.000
		22	0.911	-0.011	84614.	0.000
		23	0.907	0.002	88100.	0.000
		24	0.903	0.001	91556.	0.000
		25	0.899	-0.013	94982.	0.000
		26	0.895	-0.012	98377.	0.000
		27	0.891	-0.018	101741	0.000
		28	0.887	-0.013	105073	0.000
		29	0.882	0.006	108374	0.000
		30	0.878	-0.015	111643	0.000
		31	0.873	-0.012	114879	0.000
		32	0.869	0.045	118087	0.000
		33	0.865	0.001	121265	0.000
		34	0.862	0.034	124417	0.000
		35	0.858	-0.008	127541	0.000
		36	0.854	-0.010	130637	0.000

(a) Correlogram

Null Hypothesis: DEVRF has a unit root
Exogenous: None
Lag Length: 15 (Automatic - based on SIC, maxlag=15)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		1.116501	0.9320
Test critical values:	1% level	-2.565514	
	5% level	-1.940900	
	10% level	-1.616649	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DEVRF)
Method: Least Squares
Date: 03/20/14 Time: 15:16
Sample (adjusted): 10/18/1996 11/13/2012
Included observations: 4193 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DEVRF(-1)	6.68E-05	5.98E-05	1.116501	0.2643
D(DEVRF(-1))	0.108304	0.015419	7.024225	0.0000
D(DEVRF(-2))	0.024315	0.015442	1.574643	0.1154
D(DEVRF(-3))	0.057074	0.015315	3.726679	0.0002
D(DEVRF(-4))	0.022432	0.015302	1.466003	0.1427
D(DEVRF(-5))	0.042805	0.015291	2.799420	0.0051
D(DEVRF(-6))	-0.038902	0.015296	-2.543322	0.0110
D(DEVRF(-7))	0.013007	0.015295	0.850384	0.3952
D(DEVRF(-8))	-0.005018	0.015289	-0.328183	0.7428
D(DEVRF(-9))	0.048147	0.015278	3.151484	0.0016
D(DEVRF(-10))	0.001814	0.015271	0.118815	0.9054
D(DEVRF(-11))	0.060375	0.015149	3.985378	0.0001
D(DEVRF(-12))	0.000905	0.015085	0.059975	0.9522
D(DEVRF(-13))	0.061330	0.014999	4.088876	0.0000
D(DEVRF(-14))	0.082366	0.014882	5.534489	0.0000
D(DEVRF(-15))	0.068867	0.013359	5.155200	0.0000

R-squared	0.058061	Mean dependent var	2.47E-09
Adjusted R-squared	0.054679	S.D. dependent var	3.52E-08
S.E. of regression	3.42E-08	Akaike info criterion	-31.54088
Sum squared resid	4.88E-12	Schwarz criterion	-31.51668
Log likelihood	66141.45	Hannan-Quinn criter.	-31.53232
Durbin-Watson stat	2.003225		

(b) ADF test

Null Hypothesis: D(DEVRF) has a unit root
Exogenous: Constant
Lag Length: 14 (Automatic - based on SIC, maxlag=15)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-11.05631	0.0000
Test critical values:	1% level	-3.431725	
	5% level	-2.862033	
	10% level	-2.567075	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DEVRF,2)
Method: Least Squares
Date: 03/20/14 Time: 15:16
Sample (adjusted): 10/18/1996 11/13/2012
Included observations: 4193 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(DEVRF(-1))	-0.462759	0.041855	-11.05631	0.0000
D(DEVRF(-1),2)	-0.429673	0.041826	-10.27298	0.0000
D(DEVRF(-2),2)	-0.406055	0.041191	-9.857950	0.0000
D(DEVRF(-3),2)	-0.349720	0.040466	-8.642380	0.0000
D(DEVRF(-4),2)	-0.328018	0.039333	-8.339548	0.0000
D(DEVRF(-5),2)	-0.285958	0.037924	-7.540345	0.0000
D(DEVRF(-6),2)	-0.325553	0.036419	-8.939002	0.0000
D(DEVRF(-7),2)	-0.313281	0.034767	-9.010768	0.0000
D(DEVRF(-8),2)	-0.319018	0.032934	-9.686599	0.0000
D(DEVRF(-9),2)	-0.271602	0.031089	-8.736418	0.0000
D(DEVRF(-10),2)	-0.270458	0.029012	-9.322221	0.0000
D(DEVRF(-11),2)	-0.210798	0.026851	-7.850665	0.0000
D(DEVRF(-12),2)	-0.210602	0.023617	-8.917188	0.0000
D(DEVRF(-13),2)	-0.149965	0.019388	-7.734950	0.0000
D(DEVRF(-14),2)	-0.068187	0.013359	-5.104219	0.0000
C	1.13E-09	5.38E-10	2.096630	0.0361

R-squared	0.453653	Mean dependent var	-4.40E-13
Adjusted R-squared	0.451691	S.D. dependent var	4.62E-08
S.E. of regression	3.42E-08	Akaike info criterion	-31.54163
Sum squared resid	4.88E-12	Schwarz criterion	-31.51744
Log likelihood	66143.03	Hannan-Quinn criter.	-31.53308
F-statistic	231.2216	Durbin-Watson stat	2.003104
Prob(F-statistic)	0.000000		

(c) ADF test for 1st diff

Figure 36: Norway: the deviation of the generalized risk factor stationary test

APPENDIX G: STATIONARY TEST: POLAND

Sample: 7/21/1998 11/13/2012
Included observations: 3736

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.998	0.998	3725.3	0.000
		2	0.997	0.177	7442.8	0.000
		3	0.996	0.056	11153.	0.000
		4	0.995	-0.052	14855.	0.000
		5	0.993	0.011	18548.	0.000
		6	0.992	0.053	22235.	0.000
		7	0.991	0.024	25915.	0.000
		8	0.990	-0.012	29587.	0.000
		9	0.989	0.063	33255.	0.000
		10	0.988	-0.061	36915.	0.000
		11	0.987	0.039	40569.	0.000
		12	0.986	-0.041	44216.	0.000
		13	0.985	0.034	47857.	0.000
		14	0.984	-0.015	51490.	0.000
		15	0.983	0.006	55118.	0.000
		16	0.982	-0.016	58738.	0.000
		17	0.981	0.006	62352.	0.000
		18	0.980	-0.001	65959.	0.000
		19	0.979	-0.011	69559.	0.000
		20	0.978	0.034	73153.	0.000
		21	0.977	-0.050	76739.	0.000
		22	0.976	0.026	80319.	0.000
		23	0.975	-0.008	83893.	0.000
		24	0.973	-0.044	87458.	0.000
		25	0.972	-0.003	91016.	0.000
		26	0.971	0.026	94567.	0.000
		27	0.970	-0.021	98110.	0.000
		28	0.969	-0.016	101646	0.000
		29	0.968	0.045	105175	0.000
		30	0.967	-0.013	108697	0.000
		31	0.966	-0.023	112211	0.000
		32	0.964	-0.011	115718	0.000
		33	0.963	0.014	119218	0.000
		34	0.962	-0.010	122710	0.000
		35	0.961	0.022	126195	0.000
		36	0.960	-0.003	129673	0.000

(a) Correlogram

Null Hypothesis: INTEREST has a unit root
Exogenous: None
Lag Length: 11 (Automatic - based on SIC, maxlag=29)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.638123	0.0081
Test critical values:	1% level	-2.565583	
	5% level	-1.940909	
	10% level	-1.616642	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(INTEREST)
Method: Least Squares
Date: 03/10/14 Time: 12:26
Sample (adjusted): 8/06/1998 11/13/2012
Included observations: 3724 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INTEREST(-1)	-0.001007	0.000382	-2.638123	0.0084
D(INTEREST(-1))	-0.325688	0.016279	-20.00641	0.0000
D(INTEREST(-2))	-0.161693	0.017118	-9.445767	0.0000
D(INTEREST(-3))	0.029587	0.017299	1.710346	0.0873
D(INTEREST(-4))	-0.018651	0.017221	-1.083042	0.2789
D(INTEREST(-5))	-0.113541	0.017216	-6.594913	0.0000
D(INTEREST(-6))	-0.009893	0.017250	-0.573530	0.5663
D(INTEREST(-7))	-0.027845	0.017157	-1.622924	0.1047
D(INTEREST(-8))	-0.102517	0.017152	-5.976907	0.0000
D(INTEREST(-9))	0.052551	0.017229	3.050159	0.0023
D(INTEREST(-10))	-0.005578	0.017045	-0.327267	0.7435
D(INTEREST(-11))	0.114335	0.016173	7.069672	0.0000

R-squared	0.156137	Mean dependent var	-0.003931
Adjusted R-squared	0.153636	S.D. dependent var	0.236996
S.E. of regression	0.218032	Akaike info criterion	-0.205134
Sum squared resid	176.4606	Schwarz criterion	-0.185083
Log likelihood	393.9601	Hannan-Quinn criter.	-0.198001
Durbin-Watson stat	1.991798		

(b) ADF test

Null Hypothesis: D(INTEREST) has a unit root
Exogenous: Constant
Lag Length: 10 (Automatic - based on SIC, maxlag=29)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-19.06007	0.0000
Test critical values:	1% level	-3.431920	
	5% level	-2.862119	
	10% level	-2.567122	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(INTEREST,2)
Method: Least Squares
Date: 03/10/14 Time: 12:26
Sample (adjusted): 8/06/1998 11/13/2012
Included observations: 3724 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(INTEREST(-1))	-1.561138	0.081906	-19.06007	0.0000
D(INTEREST(-1),2)	0.235616	0.077715	3.031804	0.0024
D(INTEREST(-2),2)	0.074481	0.072856	1.022308	0.3067
D(INTEREST(-3),2)	0.104818	0.067181	1.560235	0.1188
D(INTEREST(-4),2)	0.086826	0.061753	1.406020	0.1598
D(INTEREST(-5),2)	-0.026065	0.055971	-0.465691	0.6415
D(INTEREST(-6),2)	-0.035103	0.049605	-0.707657	0.4792
D(INTEREST(-7),2)	-0.062133	0.043340	-1.433608	0.1518
D(INTEREST(-8),2)	-0.163783	0.036203	-4.524033	0.0000
D(INTEREST(-9),2)	-0.110242	0.026983	-4.085641	0.0000
D(INTEREST(-10),2)	-0.114998	0.016179	-7.107826	0.0000
C	-0.006174	0.003591	-1.719314	0.0856

R-squared	0.673765	Mean dependent var	3.76E-05
Adjusted R-squared	0.672799	S.D. dependent var	0.381370
S.E. of regression	0.218149	Akaike info criterion	-0.204057
Sum squared resid	176.6508	Schwarz criterion	-0.184006
Log likelihood	391.9545	Hannan-Quinn criter.	-0.196924
F-statistic	696.9376	Durbin-Watson stat	1.991953
Prob(F-statistic)	0.000000		

(c) ADF test for 1st diff

Figure 37: Poland: interest rate stationary test

Sample: 7/21/1998 11/13/2012
Included observations: 3736

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.999	0.999	3728.8	0.000
		2	0.997	-0.037	7447.5	0.000
		3	0.996	0.003	11156.	0.000
		4	0.994	0.038	14856.	0.000
		5	0.993	0.021	18547.	0.000
		6	0.992	0.015	22230.	0.000
		7	0.991	0.034	25906.	0.000
		8	0.989	-0.012	29574.	0.000
		9	0.988	-0.026	33233.	0.000
		10	0.987	0.030	36885.	0.000
		11	0.986	-0.005	40528.	0.000
		12	0.985	-0.033	44164.	0.000
		13	0.983	-0.003	47790.	0.000
		14	0.982	-0.029	51408.	0.000
		15	0.980	-0.026	55016.	0.000
		16	0.979	-0.015	58614.	0.000
		17	0.977	-0.015	62202.	0.000
		18	0.976	-0.025	65780.	0.000
		19	0.974	0.006	69347.	0.000
		20	0.973	-0.017	72903.	0.000
		21	0.971	-0.009	76449.	0.000
		22	0.970	-0.001	79984.	0.000
		23	0.968	0.007	83509.	0.000
		24	0.966	-0.014	87023.	0.000
		25	0.965	-0.002	90526.	0.000
		26	0.963	0.030	94020.	0.000
		27	0.962	0.031	97503.	0.000
		28	0.960	-0.024	100977	0.000
		29	0.959	0.031	104441	0.000
		30	0.957	-0.021	107896	0.000
		31	0.956	-0.015	111340	0.000
		32	0.954	-0.002	114774	0.000
		33	0.953	0.005	118198	0.000
		34	0.951	0.009	121611	0.000
		35	0.950	0.014	125015	0.000
		36	0.948	-0.032	128409	0.000

(a) Correlogram

Null Hypothesis: SPOT has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=29)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.331429	0.5662
Test critical values:	1% level	-2.565581	
	5% level	-1.940909	
	10% level	-1.616643	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(SPOT)
Method: Least Squares
Date: 03/10/14 Time: 12:33
Sample (adjusted): 7/22/1998 11/13/2012
Included observations: 3735 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
SPOT(-1)	-4.76E-05	0.000144	-0.331429	0.7403

R-squared	0.000028	Mean dependent var	-3.27E-05
Adjusted R-squared	0.000028	S.D. dependent var	0.030487
S.E. of regression	0.030486	Akaike info criterion	-4.142824
Sum squared resid	3.470388	Schwarz criterion	-4.141157
Log likelihood	7737.724	Hannan-Quinn criter.	-4.142231
Durbin-Watson stat	1.929124		

(b) ADF test

Null Hypothesis: D(SPOT) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=29)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-58.96561	0.0001
Test critical values:	1% level	-3.431915	
	5% level	-2.862117	
	10% level	-2.567121	

*MacKinnon (1996) one-sided p-values.

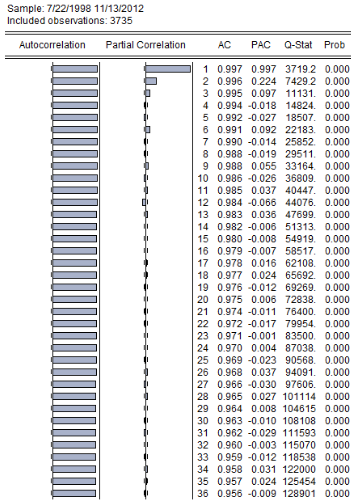
Augmented Dickey-Fuller Test Equation
Dependent Variable: D(SPOT,2)
Method: Least Squares
Date: 03/10/14 Time: 12:33
Sample (adjusted): 7/23/1998 11/13/2012
Included observations: 3734 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(SPOT(-1))	-0.964642	0.016359	-58.96561	0.0000
C	-3.46E-05	0.000499	-0.069477	0.9446

R-squared	0.482310	Mean dependent var	1.43E-06
Adjusted R-squared	0.482171	S.D. dependent var	0.042350
S.E. of regression	0.030475	Akaike info criterion	-4.143285
Sum squared resid	3.466002	Schwarz criterion	-4.139951
Log likelihood	7737.513	Hannan-Quinn criter.	-4.142099
F-statistic	3476.944	Durbin-Watson stat	1.999605
Prob(F-statistic)	0.000000		

(c) ADF test for 1st diff

Figure 38: Poland: exchange spot rate stationary test



Sample: 7/22/1998 11/13/2012
Included observations: 3735

Lag	AC	PAC	Q-Stat	Prob
1	0.997	0.997	3719.2	0.000
2	0.996	0.224	7429.2	0.000
3	0.995	0.097	11131.	0.000
4	0.994	-0.018	14824.	0.000
5	0.992	-0.027	18507.	0.000
6	0.991	0.092	22183.	0.000
7	0.990	-0.014	25852.	0.000
8	0.988	-0.019	29511.	0.000
9	0.988	0.055	33164.	0.000
10	0.986	-0.026	36809.	0.000
11	0.985	0.037	40447.	0.000
12	0.984	-0.066	44076.	0.000
13	0.983	0.036	47699.	0.000
14	0.982	-0.006	51313.	0.000
15	0.980	-0.008	54919.	0.000
16	0.979	-0.007	58517.	0.000
17	0.978	0.016	62108.	0.000
18	0.977	0.024	65692.	0.000
19	0.976	-0.012	69269.	0.000
20	0.975	0.006	72838.	0.000
21	0.974	-0.011	76400.	0.000
22	0.972	-0.017	79954.	0.000
23	0.971	-0.001	83500.	0.000
24	0.970	0.004	87038.	0.000
25	0.969	-0.023	90568.	0.000
26	0.968	0.037	94091.	0.000
27	0.966	-0.030	97606.	0.000
28	0.965	0.027	101114	0.000
29	0.964	0.008	104615	0.000
30	0.963	-0.010	108108	0.000
31	0.962	-0.029	111593	0.000
32	0.960	-0.003	115070	0.000
33	0.959	-0.012	118538	0.000
34	0.958	0.031	122000	0.000
35	0.957	0.024	125454	0.000
36	0.956	-0.009	128901	0.000

(a) Correlogram

Null Hypothesis: X has a unit root
Exogenous: None
Lag Length: 11 (Automatic - based on SIC, maxlag=29)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.061906	0.0377
Test critical values:	1% level	-2.565583	
	5% level	-1.940909	
	10% level	-1.616642	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(X)
Method: Least Squares
Date: 03/17/14 Time: 15:14
Sample (adjusted): 8/07/1998 11/13/2012
Included observations: 3723 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
X(-1)	-0.001215	0.000589	-2.061906	0.0393
D(X(-1))	-0.366961	0.016321	-22.48386	0.0000
D(X(-2))	-0.173906	0.017388	-10.00137	0.0000
D(X(-3))	0.009338	0.017596	0.530704	0.5957
D(X(-4))	0.004877	0.017543	0.278005	0.7810
D(X(-5))	-0.071140	0.017543	-4.055162	0.0001
D(X(-6))	0.001097	0.017581	0.062389	0.9503
D(X(-7))	-0.007076	0.017496	-0.404453	0.6859
D(X(-8))	-0.082162	0.017494	-4.696545	0.0000
D(X(-9))	0.038865	0.017536	2.216271	0.0267
D(X(-10))	0.008835	0.017319	0.510149	0.6100
D(X(-11))	0.100270	0.016229	6.178460	0.0000

R-squared	0.157045	Mean dependent var	-2.99E-08
Adjusted R-squared	0.154547	S.D. dependent var	3.06E-06
S.E. of regression	2.82E-06	Akaike info criterion	-22.71956
Sum squared resid	2.94E-08	Schwarz criterion	-22.69950
Log likelihood	42304.46	Hannan-Quinn criter.	-22.71242
Durbin-Watson stat	1.991702		

(b) ADF test

Null Hypothesis: D(X) has a unit root
Exogenous: Constant
Lag Length: 10 (Automatic - based on SIC, maxlag=29)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-18.60331	0.0000
Test critical values:	1% level	-3.431920	
	5% level	-2.862119	
	10% level	-2.567122	

*MacKinnon (1996) one-sided p-values.

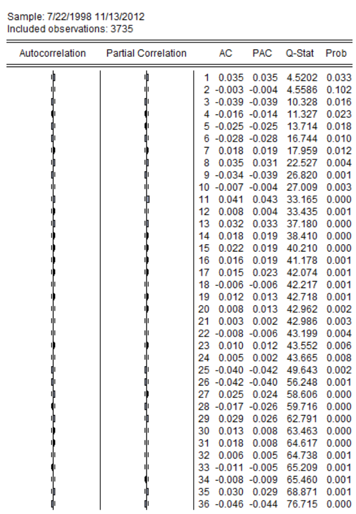
Augmented Dickey-Fuller Test Equation
Dependent Variable: D(X,2)
Method: Least Squares
Date: 03/17/14 Time: 15:15
Sample (adjusted): 8/07/1998 11/13/2012
Included observations: 3723 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(X(-1))	-1.535619	0.082545	-18.60331	0.0000
D(X(-1),2)	0.168349	0.078551	2.143194	0.0322
D(X(-2),2)	-0.005512	0.073835	-0.074653	0.9405
D(X(-3),2)	0.004068	0.068506	0.059384	0.9526
D(X(-4),2)	0.009154	0.063303	0.144600	0.8850
D(X(-5),2)	-0.061786	0.057666	-1.071445	0.2840
D(X(-6),2)	-0.060436	0.051389	-1.176057	0.2396
D(X(-7),2)	-0.067204	0.044908	-1.496485	0.1346
D(X(-8),2)	-0.149038	0.037269	-3.998975	0.0001
D(X(-9),2)	-0.109740	0.027576	-3.979566	0.0001
D(X(-10),2)	-0.100538	0.016237	-6.192005	0.0000
C	-4.57E-08	4.62E-08	-0.987512	0.3235

R-squared	0.680675	Mean dependent var	-2.91E-10
Adjusted R-squared	0.679729	S.D. dependent var	4.98E-06
S.E. of regression	2.82E-06	Akaike info criterion	-22.71868
Sum squared resid	2.94E-08	Schwarz criterion	-22.69862
Log likelihood	42302.81	Hannan-Quinn criter.	-22.71154
F-statistic	719.1273	Durbin-Watson stat	1.991736
Prob(F-statistic)	0.000000		

(c) ADF test for 1st diff

Figure 39: Poland: log interest rate difference stationary test



Sample: 7/22/1998 11/13/2012
Included observations: 3735

Lag	AC	PAC	Q-Stat	Prob
1	0.035	0.035	4.5202	0.033
2	-0.003	-0.004	4.5586	0.102
3	-0.039	-0.039	10.328	0.016
4	-0.016	-0.014	11.327	0.023
5	-0.025	-0.025	13.714	0.018
6	-0.028	-0.028	16.744	0.010
7	0.018	0.019	17.959	0.012
8	0.035	0.031	22.527	0.004
9	-0.034	-0.039	26.820	0.001
10	-0.007	-0.004	27.009	0.003
11	0.041	0.043	33.165	0.000
12	0.008	0.004	33.435	0.001
13	0.032	0.033	37.180	0.000
14	0.018	0.019	38.410	0.000
15	0.022	0.019	40.210	0.000
16	0.016	0.019	41.178	0.001
17	0.015	0.023	42.074	0.001
18	-0.006	-0.006	42.217	0.001
19	0.012	0.013	42.718	0.001
20	0.008	0.013	42.962	0.002
21	0.003	0.002	42.986	0.003
22	-0.008	-0.006	43.199	0.004
23	0.010	0.012	43.552	0.006
24	0.005	0.002	43.665	0.008
25	-0.040	-0.042	49.643	0.002
26	-0.042	-0.040	56.248	0.001
27	0.025	0.024	58.606	0.000
28	-0.017	-0.026	59.716	0.000
29	0.029	0.026	62.791	0.000
30	0.013	0.008	63.463	0.000
31	0.018	0.008	64.617	0.000
32	0.006	0.005	64.738	0.001
33	-0.011	-0.005	65.209	0.001
34	-0.008	-0.009	65.460	0.001
35	0.030	0.029	68.871	0.001
36	-0.046	-0.044	76.715	0.000

(a) Correlogram

Null Hypothesis: Y has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=29)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-59.00761	0.0001
Test critical values:	1% level	-2.565581	
	5% level	-1.940909	
	10% level	-1.616643	

*MacKinnon (1996) one-sided p-values.

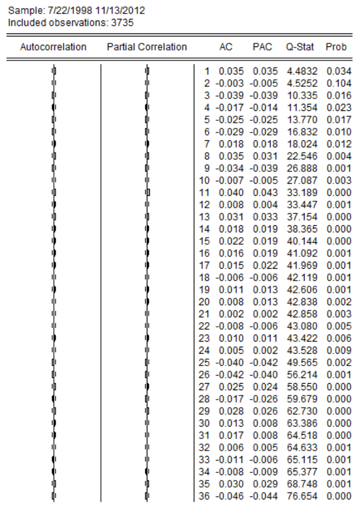
Augmented Dickey-Fuller Test Equation
Dependent Variable: D(Y)
Method: Least Squares
Date: 03/17/14 Time: 15:24
Sample (adjusted): 7/23/1998 11/13/2012
Included observations: 3734 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Y(-1)	-0.965221	0.016358	-59.00761	0.0000

R-squared	0.482598	Mean dependent var	-2.06E-07
Adjusted R-squared	0.482598	S.D. dependent var	0.005562
S.E. of regression	0.004001	Akaike info criterion	-8.204504
Sum squared resid	0.059744	Schwarz criterion	-8.202837
Log likelihood	15318.81	Hannan-Quinn criter.	-8.203911
Durbin-Watson stat	1.999596		

(b) ADF test

Figure 40: Poland: log exchange spot rate difference stationary test



Sample: 7/22/1998 11/13/2012
Included observations: 3735

Lag	AC	PAC	Q-Stat	Prob
1	0.035	0.035	4.4832	0.034
2	-0.003	-0.005	4.5252	0.104
3	-0.039	-0.039	10.335	0.016
4	-0.017	-0.014	11.354	0.023
5	-0.025	-0.025	13.770	0.017
6	-0.029	-0.029	16.832	0.010
7	0.018	0.018	18.024	0.012
8	0.035	0.031	22.546	0.004
9	-0.034	-0.039	26.888	0.001
10	-0.007	-0.005	27.087	0.003
11	0.040	0.043	33.189	0.000
12	0.008	0.004	33.447	0.001
13	0.031	0.033	37.154	0.000
14	0.018	0.019	38.365	0.000
15	0.022	0.019	40.144	0.000
16	0.016	0.019	41.092	0.001
17	0.015	0.022	41.969	0.001
18	-0.006	-0.006	42.119	0.001
19	0.011	0.013	42.606	0.001
20	0.008	0.013	42.838	0.002
21	0.002	0.002	42.858	0.003
22	-0.008	-0.006	43.080	0.005
23	0.010	0.011	43.422	0.006
24	0.005	0.002	43.528	0.009
25	-0.040	-0.042	49.565	0.002
26	-0.042	-0.040	56.214	0.001
27	0.025	0.024	58.550	0.000
28	-0.017	-0.026	59.679	0.000
29	0.028	0.026	62.730	0.000
30	0.013	0.008	63.386	0.000
31	0.017	0.008	64.518	0.000
32	0.006	0.005	64.633	0.001
33	-0.011	-0.006	65.115	0.001
34	-0.008	-0.009	65.377	0.001
35	0.030	0.029	68.748	0.001
36	-0.046	-0.044	76.654	0.000

(a) Correlogram

Null Hypothesis: RF has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=29)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-59.00084	0.0001
Test critical values:	1% level	-2.565581	
	5% level	-1.940909	
	10% level	-1.616643	

*MacKinnon (1996) one-sided p-values.

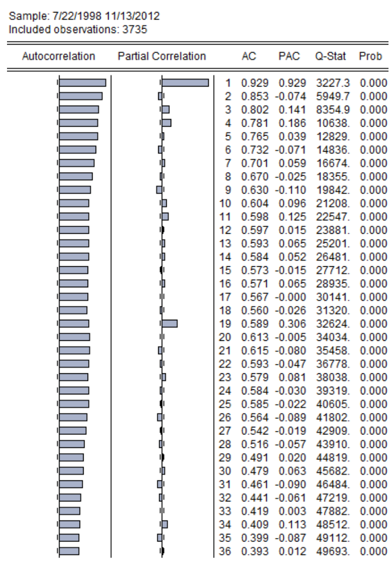
Augmented Dickey-Fuller Test Equation
Dependent Variable: D(RF)
Method: Least Squares
Date: 03/20/14 Time: 15:22
Sample (adjusted): 7/23/1998 11/13/2012
Included observations: 3734 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RF(-1)	-0.965109	0.016358	-59.00084	0.0000

R-squared	0.482541	Mean dependent var	2.39E-07
Adjusted R-squared	0.482541	S.D. dependent var	0.005562
S.E. of regression	0.004001	Akaike info criterion	-8.204343
Sum squared resid	0.059754	Schwarz criterion	-8.202676
Log likelihood	15318.51	Hannan-Quinn criter.	-8.203750
Durbin-Watson stat	1.999599		

(b) ADF test

Figure 41: Poland: the generalized risk factor stationary test



Sample: 7/22/1998 11/13/2012
Included observations: 3735

Lag	AC	PAC	Q-Stat	Prob
1	0.929	0.929	3227.3	0.000
2	0.853	-0.074	5949.7	0.000
3	0.802	0.141	8354.9	0.000
4	0.781	0.186	10638.	0.000
5	0.765	0.039	12829.	0.000
6	0.732	-0.071	14836.	0.000
7	0.701	0.059	16674.	0.000
8	0.670	-0.025	18355.	0.000
9	0.630	-0.110	19842.	0.000
10	0.604	0.096	21208.	0.000
11	0.598	0.125	22547.	0.000
12	0.597	0.015	23881.	0.000
13	0.593	0.065	25201.	0.000
14	0.584	0.052	26481.	0.000
15	0.573	-0.015	27712.	0.000
16	0.571	0.065	28935.	0.000
17	0.567	-0.000	30141.	0.000
18	0.560	-0.026	31320.	0.000
19	0.589	0.306	32624.	0.000
20	0.613	-0.005	34034.	0.000
21	0.615	-0.080	35458.	0.000
22	0.593	-0.047	36778.	0.000
23	0.579	0.081	38038.	0.000
24	0.584	-0.030	39319.	0.000
25	0.585	-0.022	40605.	0.000
26	0.564	-0.089	41802.	0.000
27	0.542	-0.019	42909.	0.000
28	0.516	-0.057	43910.	0.000
29	0.491	0.020	44819.	0.000
30	0.479	0.063	45682.	0.000
31	0.461	-0.090	46484.	0.000
32	0.441	-0.061	47219.	0.000
33	0.419	0.003	47882.	0.000
34	0.409	0.113	48512.	0.000
35	0.399	-0.087	49112.	0.000
36	0.393	0.012	49693.	0.000

(a) Correlogram

Null Hypothesis: MEANRF has a unit root
Exogenous: None
Lag Length: 14 (Automatic - based on SIC, maxlag=15)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.713004	0.0000
Test critical values:	1% level	-2.565584	
	5% level	-1.940909	
	10% level	-1.616642	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(MEANRF)
Method: Least Squares
Date: 03/20/14 Time: 15:23
Sample (adjusted): 8/12/1998 11/13/2012
Included observations: 3720 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
MEANRF(-1)	-0.020563	0.003063	-6.713004	0.0000
D(MEANRF(-1))	-0.231470	0.015914	-14.54535	0.0000
D(MEANRF(-2))	-0.331964	0.016077	-20.64839	0.0000
D(MEANRF(-3))	-0.050733	0.016354	-3.102191	0.0019
D(MEANRF(-4))	0.033151	0.015669	2.115621	0.0344
D(MEANRF(-5))	0.382100	0.014863	25.70831	0.0000
D(MEANRF(-6))	0.190318	0.015738	12.09277	0.0000
D(MEANRF(-7))	0.174238	0.015310	11.38032	0.0000
D(MEANRF(-8))	0.238261	0.015334	15.53826	0.0000
D(MEANRF(-9))	-0.135329	0.014711	-9.199349	0.0000
D(MEANRF(-10))	-0.119318	0.014268	-8.362373	0.0000
D(MEANRF(-11))	-0.150065	0.013121	-11.43670	0.0000
D(MEANRF(-12))	-0.102228	0.012438	-8.219345	0.0000
D(MEANRF(-13))	-0.166459	0.011513	-14.45874	0.0000
D(MEANRF(-14))	-0.071996	0.010978	-6.558397	0.0000

R-squared	0.333474	Mean dependent var	-1.38E-07
Adjusted R-squared	0.330955	S.D. dependent var	2.64E-05
S.E. of regression	2.16E-05	Akaike info criterion	-18.64113
Sum squared resid	1.73E-06	Schwarz criterion	-18.61605
Log likelihood	34687.51	Hannan-Quinn criter.	-18.63221
Durbin-Watson stat	1.938414		

(b) ADF test

Figure 42: Poland: the mean of the generalized risk factor stationary test

Sample: 7/22/1998 11/13/2012
Included observations: 3735

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.995	0.995	3702.7	0.000
		2	0.990	-0.063	7366.9	0.000
		3	0.983	-0.149	10983.	0.000
		4	0.974	-0.215	14534.	0.000
		5	0.965	-0.007	18021.	0.000
		6	0.955	-0.027	21436.	0.000
		7	0.942	-0.272	24761.	0.000
		8	0.929	0.012	27997.	0.000
		9	0.916	0.042	31140.	0.000
		10	0.902	0.027	34189.	0.000
		11	0.888	0.054	37147.	0.000
		12	0.875	0.023	40017.	0.000
		13	0.861	0.047	42797.	0.000
		14	0.847	-0.058	45489.	0.000
		15	0.834	0.095	48099.	0.000
		16	0.821	-0.060	50626.	0.000
		17	0.807	-0.082	53071.	0.000
		18	0.795	0.142	55444.	0.000
		19	0.783	0.086	57749.	0.000
		20	0.771	-0.134	59983.	0.000
		21	0.760	0.039	62155.	0.000
		22	0.749	0.011	64265.	0.000
		23	0.739	0.127	66318.	0.000
		24	0.732	0.219	68332.	0.000
		25	0.725	-0.061	70308.	0.000
		26	0.718	0.020	72249.	0.000
		27	0.712	-0.154	74157.	0.000
		28	0.706	-0.000	76032.	0.000
		29	0.699	-0.087	77873.	0.000
		30	0.694	0.008	79690.	0.000
		31	0.690	0.046	81481.	0.000
		32	0.685	-0.026	83249.	0.000
		33	0.680	0.012	84992.	0.000
		34	0.675	0.032	86712.	0.000
		35	0.671	0.089	88411.	0.000
		36	0.666	-0.034	90087.	0.000

(a) Correlogram

Null Hypothesis: DEVRF has a unit root
Exogenous: None
Lag Length: 13 (Automatic - based on SIC, maxlag=15)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.328042	0.1708
Test critical values:	1% level	-2.565584	
	5% level	-1.940909	
	10% level	-1.616642	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DEVRF)
Method: Least Squares
Date: 03/20/14 Time: 15:24
Sample (adjusted): 8/11/1998 11/13/2012
Included observations: 3721 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DEVRF(-1)	-0.000474	0.000357	-1.328042	0.1842
D(DEVRF(-1))	0.051442	0.016196	3.176289	0.0015
D(DEVRF(-2))	0.315568	0.016085	19.61906	0.0000
D(DEVRF(-3))	0.167398	0.016861	9.928075	0.0000
D(DEVRF(-4))	-0.084631	0.017082	-4.954391	0.0000
D(DEVRF(-5))	0.043824	0.017123	2.559285	0.0105
D(DEVRF(-6))	0.486902	0.016844	28.90726	0.0000
D(DEVRF(-7))	-0.134018	0.018407	-7.280990	0.0000
D(DEVRF(-8))	-0.190970	0.016803	-11.36503	0.0000
D(DEVRF(-9))	-0.018124	0.017087	-1.060706	0.2889
D(DEVRF(-10))	-0.017545	0.016983	-1.033104	0.3016
D(DEVRF(-11))	-0.075640	0.016716	-4.525088	0.0000
D(DEVRF(-12))	-0.116896	0.015745	-7.424201	0.0000
D(DEVRF(-13))	0.157349	0.015763	9.982230	0.0000

R-squared	0.336560	Mean dependent var	3.03E-09
Adjusted R-squared	0.334234	S.D. dependent var	3.11E-07
S.E. of regression	2.54E-07	Akaike info criterion	-27.53225
Sum squared resid	2.39E-10	Schwarz criterion	-27.50884
Log likelihood	51237.76	Hannan-Quinn criter.	-27.52392
Durbin-Watson stat	1.991021		

(b) ADF test

Null Hypothesis: D(DEVRF) has a unit root
Exogenous: Constant
Lag Length: 8 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-16.54366	0.0000
Test critical values:	1% level	-3.431919	
	5% level	-2.862119	
	10% level	-2.567122	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DEVRF,2)
Method: Least Squares
Date: 03/20/14 Time: 15:25
Sample (adjusted): 8/05/1998 11/13/2012
Included observations: 3725 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(DEVRF(-1))	-0.419412	0.025352	-16.54366	0.0000
D(DEVRF(-1),2)	-0.540541	0.026467	-20.42358	0.0000
D(DEVRF(-2),2)	-0.219798	0.027753	-7.919726	0.0000
D(DEVRF(-3),2)	-0.038694	0.027781	-1.392801	0.1638
D(DEVRF(-4),2)	-0.119481	0.026250	-4.551660	0.0000
D(DEVRF(-5),2)	-0.113543	0.024701	-4.596661	0.0000
D(DEVRF(-6),2)	0.315464	0.023654	13.33639	0.0000
D(DEVRF(-7),2)	0.248724	0.021772	11.42399	0.0000
D(DEVRF(-8),2)	0.060914	0.015957	3.817514	0.0001
C	1.53E-09	4.25E-09	0.359756	0.7190

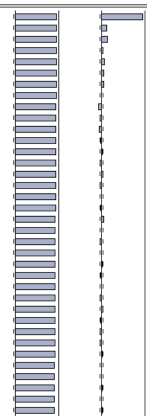
R-squared	0.601088	Mean dependent var	9.99E-11
Adjusted R-squared	0.600122	S.D. dependent var	4.10E-07
S.E. of regression	2.59E-07	Akaike info criterion	-27.49089
Sum squared resid	2.50E-10	Schwarz criterion	-27.47418
Log likelihood	51211.77	Hannan-Quinn criter.	-27.48494
F-statistic	621.9822	Durbin-Watson stat	2.004480
Prob(F-statistic)	0.000000		

(c) ADF test for 1st diff

Figure 43: Poland: the deviation of the generalized risk factor stationary test

APPENDIX H: STATIONARY TEST: SOUTH AFRICA

Sample: 10/13/1997 11/13/2012
Included observations: 3937



Lag	AC	PAC	Q-Stat	Prob
1	0.996	0.996	3912.4	0.000
2	0.994	0.119	7804.9	0.000
3	0.992	0.137	11684.	0.000
4	0.990	0.039	15551.	0.000
5	0.989	0.071	19407.	0.000
6	0.988	0.055	23255.	0.000
7	0.987	0.056	27095.	0.000
8	0.985	0.006	30927.	0.000
9	0.984	-0.076	34746.	0.000
10	0.982	-0.025	38552.	0.000
11	0.980	-0.053	42344.	0.000
12	0.978	-0.019	46120.	0.000
13	0.976	0.024	49885.	0.000
14	0.974	-0.030	53637.	0.000
15	0.973	0.033	57378.	0.000
16	0.971	-0.026	61106.	0.000
17	0.969	0.001	64822.	0.000
18	0.967	-0.012	68523.	0.000
19	0.966	0.042	72214.	0.000
20	0.964	0.006	75892.	0.000
21	0.962	-0.034	79558.	0.000
22	0.960	0.003	83210.	0.000
23	0.959	0.023	86851.	0.000
24	0.957	-0.009	90480.	0.000
25	0.955	0.008	94097.	0.000
26	0.953	-0.035	97700.	0.000
27	0.952	0.040	101292	0.000
28	0.950	-0.008	104873	0.000
29	0.948	-0.029	108440	0.000
30	0.946	-0.042	111993	0.000
31	0.944	0.018	115532	0.000
32	0.942	-0.007	119059	0.000
33	0.941	0.007	122573	0.000
34	0.939	0.024	126075	0.000
35	0.937	-0.008	129566	0.000
36	0.935	0.011	133044	0.000

(a) Correlogram

Null Hypothesis: INTEREST has a unit root
Exogenous: None
Lag Length: 3 (Automatic - based on SIC, maxlag=30)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.394998	0.1519
Test critical values:	1% level	-2.565550	
	5% level	-1.940905	
	10% level	-1.616645	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(INTEREST)
Method: Least Squares
Date: 03/10/14 Time: 12:43
Sample (adjusted): 10/17/1997 11/13/2012
Included observations: 3933 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INTEREST(-1)	-0.000689	0.000494	-1.394998	0.1631
D(INTEREST(-1))	-0.164735	0.015893	-10.36554	0.0000
D(INTEREST(-2))	-0.166194	0.015888	-10.46059	0.0000
D(INTEREST(-3))	-0.063212	0.015892	-3.977674	0.0001

R-squared	0.046421	Mean dependent var	-0.003019
Adjusted R-squared	0.045693	S.D. dependent var	0.355726
S.E. of regression	0.347504	Akaike info criterion	0.724937
Sum squared resid	474.4632	Schwarz criterion	0.731321
Log likelihood	-1421.589	Hannan-Quinn criter.	0.727202
Durbin-Watson stat	2.003603		

(b) ADF test

Null Hypothesis: D(INTEREST) has a unit root
Exogenous: Constant
Lag Length: 2 (Automatic - based on SIC, maxlag=30)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-44.24947	0.0000
Test critical values:	1% level	-3.431828	
	5% level	-2.862078	
	10% level	-2.567100	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(INTEREST,2)
Method: Least Squares
Date: 03/10/14 Time: 12:43
Sample (adjusted): 10/17/1997 11/13/2012
Included observations: 3933 after adjustments

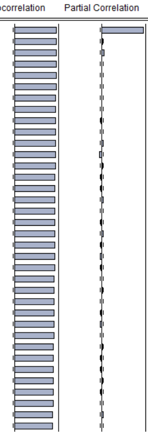
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(INTEREST(-1))	-1.394919	0.031524	-44.24947	0.0000
D(INTEREST(-1),2)	0.229843	0.024156	9.514836	0.0000
D(INTEREST(-2),2)	0.063389	0.015895	3.987900	0.0001
C	-0.004084	0.005543	-0.736903	0.4612

R-squared	0.580195	Mean dependent var	-0.000318
Adjusted R-squared	0.579875	S.D. dependent var	0.536227
S.E. of regression	0.347566	Akaike info criterion	0.725294
Sum squared resid	474.6326	Schwarz criterion	0.731678
Log likelihood	-1422.291	Hannan-Quinn criter.	0.727559
F-statistic	1810.039	Durbin-Watson stat	2.003610
Prob(F-statistic)	0.000000		

(c) ADF test for 1st diff

Figure 44: South Africa: interest rate stationary test

Sample: 10/13/1997 11/13/2012
Included observations: 3937



Lag	AC	PAC	Q-Stat	Prob
1	0.997	0.997	3917.7	0.000
2	0.994	0.023	7815.4	0.000
3	0.992	0.042	11695.	0.000
4	0.990	0.006	15556.	0.000
5	0.987	-0.001	19400.	0.000
6	0.985	0.005	23226.	0.000
7	0.982	0.007	27035.	0.000
8	0.980	-0.001	30826.	0.000
9	0.978	-0.019	34599.	0.000
10	0.975	-0.007	38354.	0.000
11	0.973	0.029	42093.	0.000
12	0.970	-0.057	45812.	0.000
13	0.968	0.009	49512.	0.000
14	0.965	-0.015	53194.	0.000
15	0.962	-0.013	56856.	0.000
16	0.960	0.025	60499.	0.000
17	0.957	0.002	64125.	0.000
18	0.955	-0.011	67732.	0.000
19	0.952	0.034	71322.	0.000
20	0.950	-0.024	74894.	0.000
21	0.947	-0.031	78447.	0.000
22	0.944	-0.013	81980.	0.000
23	0.942	-0.000	85494.	0.000
24	0.939	0.019	88989.	0.000
25	0.937	0.004	92466.	0.000
26	0.934	-0.015	95925.	0.000
27	0.931	-0.026	99363.	0.000
28	0.928	0.006	102783	0.000
29	0.926	0.012	106184	0.000
30	0.923	-0.013	109565	0.000
31	0.920	-0.011	112928	0.000
32	0.918	0.022	116272	0.000
33	0.915	-0.016	119596	0.000
34	0.912	0.006	122902	0.000
35	0.910	0.025	126191	0.000
36	0.907	-0.006	129462	0.000

(a) Correlogram

Null Hypothesis: SPOT has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=30)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		0.264068	0.7626
Test critical values:	1% level	-2.565550	
	5% level	-1.940904	
	10% level	-1.616645	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(SPOT)
Method: Least Squares
Date: 03/10/14 Time: 12:49
Sample (adjusted): 10/14/1997 11/13/2012
Included observations: 3936 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
SPOT(-1)	5.13E-05	0.000194	0.264068	0.7917

R-squared	-0.000114	Mean dependent var	0.001049
Adjusted R-squared	-0.000114	S.D. dependent var	0.091391
S.E. of regression	0.091396	Akaike info criterion	-1.946974
Sum squared resid	32.87003	Schwarz criterion	-1.945379
Log likelihood	3832.644	Hannan-Quinn criter.	-1.946408
Durbin-Watson stat	2.058173		

(b) ADF test

Null Hypothesis: D(SPOT) has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=30)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-47.52682	0.0001
Test critical values:	1% level	-3.431827	
	5% level	-2.862078	
	10% level	-2.567100	

*MacKinnon (1996) one-sided p-values.

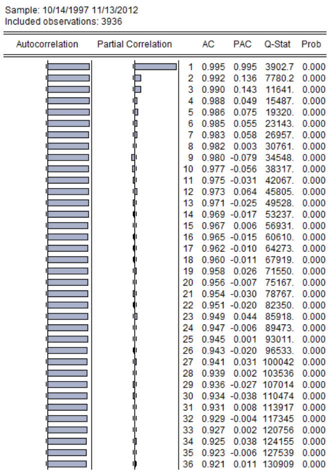
Augmented Dickey-Fuller Test Equation
Dependent Variable: D(SPOT,2)
Method: Least Squares
Date: 03/10/14 Time: 12:50
Sample (adjusted): 10/16/1997 11/13/2012
Included observations: 3934 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(SPOT(-1))	-1.085977	0.022850	-47.52682	0.0000
D(SPOT(-1),2)	0.055171	0.015926	3.464169	0.0005
C	0.001138	0.001455	0.782223	0.4341

R-squared	0.516054	Mean dependent var	1.49E-05
Adjusted R-squared	0.515808	S.D. dependent var	0.131150
S.E. of regression	0.091259	Akaike info criterion	-1.949465
Sum squared resid	32.73827	Schwarz criterion	-1.944678
Log likelihood	3837.598	Hannan-Quinn criter.	-1.947767
F-statistic	2095.904	Durbin-Watson stat	2.000892
Prob(F-statistic)	0.000000		

(c) ADF test for 1st diff

Figure 45: South Africa: exchange spot rate stationary test



Sample: 10/14/1997 11/13/2012
Included observations: 3936

	AC	PAC	Q-Stat	Prob
1	0.995	0.995	3902.7	0.000
2	0.992	0.136	7780.2	0.000
3	0.990	0.143	11641.	0.000
4	0.988	0.049	15487.	0.000
5	0.986	0.075	19320.	0.000
6	0.985	0.055	23143.	0.000
7	0.983	0.058	26957.	0.000
8	0.982	0.003	30761.	0.000
9	0.980	-0.079	34548.	0.000
10	0.977	-0.056	38317.	0.000
11	0.975	-0.031	42067.	0.000
12	0.973	0.064	45805.	0.000
13	0.971	-0.025	49528.	0.000
14	0.969	-0.017	53237.	0.000
15	0.967	0.006	56931.	0.000
16	0.965	-0.015	60610.	0.000
17	0.962	-0.010	64273.	0.000
18	0.960	-0.011	67919.	0.000
19	0.958	0.026	71550.	0.000
20	0.956	-0.007	75167.	0.000
21	0.954	-0.030	78767.	0.000
22	0.951	-0.020	82350.	0.000
23	0.949	0.044	85918.	0.000
24	0.947	-0.006	89473.	0.000
25	0.945	0.001	93011.	0.000
26	0.943	-0.020	96533.	0.000
27	0.941	0.031	100042	0.000
28	0.939	0.002	103536	0.000
29	0.936	-0.027	107014	0.000
30	0.934	-0.038	110474	0.000
31	0.931	0.008	113917	0.000
32	0.929	-0.004	117345	0.000
33	0.927	0.002	120756	0.000
34	0.925	0.038	124155	0.000
35	0.923	-0.006	127539	0.000
36	0.921	0.011	130909	0.000

(a) Correlogram

Null Hypothesis: X has a unit root
Exogenous: None
Lag Length: 3 (Automatic - based on SIC, maxlag=30)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.277324	0.1861
Test critical values:	1% level	-2.565550	
	5% level	-1.940905	
	10% level	-1.616645	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(X)
Method: Least Squares
Date: 03/17/14 Time: 15:33
Sample (adjusted): 10/20/1997 11/13/2012
Included observations: 3932 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
X(-1)	-0.000871	0.000682	-1.277324	0.2016
D(X(-1))	-0.168735	0.015924	-10.59628	0.0000
D(X(-2))	-0.161954	0.015921	-10.17220	0.0000
D(X(-3))	-0.048724	0.015897	-3.064984	0.0022

R-squared	0.045673	Mean dependent var	-1.64E-08
Adjusted R-squared	0.044945	S.D. dependent var	4.33E-06
S.E. of regression	4.23E-06	Akaike info criterion	-21.90835
Sum squared resid	7.02E-08	Schwarz criterion	-21.90197
Log likelihood	43075.82	Hannan-Quinn criter.	-21.90609
Durbin-Watson stat	2.008902		

(b) ADF test

Null Hypothesis: D(X) has a unit root
Exogenous: Constant
Lag Length: 2 (Automatic - based on SIC, maxlag=30)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-43.56512	0.0000
Test critical values:	1% level	-3.431828	
	5% level	-2.862078	
	10% level	-2.567100	

*MacKinnon (1996) one-sided p-values.

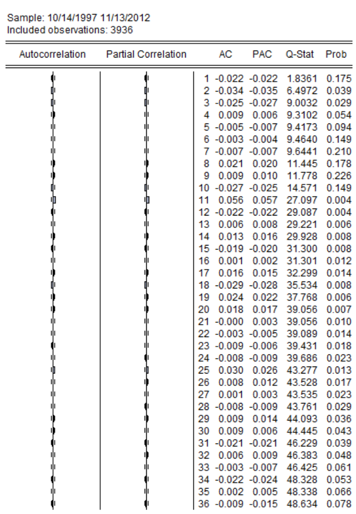
Augmented Dickey-Fuller Test Equation
Dependent Variable: D(X,2)
Method: Least Squares
Date: 03/17/14 Time: 15:33
Sample (adjusted): 10/20/1997 11/13/2012
Included observations: 3932 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(X(-1))	-1.380512	0.031688	-43.56512	0.0000
D(X(-1),2)	0.211315	0.024271	8.706499	0.0000
D(X(-2),2)	0.048991	0.015899	3.081358	0.0021
C	-2.31E-08	6.75E-08	-0.342486	0.7320

R-squared	0.581687	Mean dependent var	3.33E-09
Adjusted R-squared	0.581367	S.D. dependent var	6.54E-06
S.E. of regression	4.23E-06	Akaike info criterion	-21.90797
Sum squared resid	7.03E-08	Schwarz criterion	-21.90158
Log likelihood	43075.06	Hannan-Quinn criter.	-21.90570
F-statistic	1820.699	Durbin-Watson stat	2.008990
Prob(F-statistic)	0.000000		

(c) ADF test for 1st diff

Figure 46: South Africa: log interest rate difference stationary test



Sample: 10/14/1997 11/13/2012
Included observations: 3936

	AC	PAC	Q-Stat	Prob
1	-0.022	-0.022	1.8361	0.175
2	-0.034	-0.035	6.4972	0.039
3	-0.025	-0.027	9.0032	0.029
4	0.009	0.006	9.3102	0.054
5	-0.005	-0.007	9.4173	0.094
6	-0.003	-0.004	9.4640	0.149
7	-0.007	-0.007	9.6441	0.210
8	0.021	0.020	11.445	0.178
9	0.009	0.010	11.778	0.226
10	-0.027	-0.025	14.571	0.149
11	0.056	0.057	27.097	0.004
12	-0.022	-0.022	29.087	0.004
13	0.006	0.008	29.221	0.006
14	0.013	0.016	29.928	0.008
15	-0.019	-0.020	31.300	0.008
16	0.001	0.002	31.301	0.012
17	0.016	0.015	32.299	0.014
18	-0.029	-0.028	35.534	0.008
19	0.024	0.022	37.768	0.006
20	0.018	0.017	39.056	0.007
21	-0.000	0.003	39.056	0.010
22	-0.003	-0.005	39.089	0.014
23	-0.009	-0.006	39.431	0.018
24	-0.008	-0.009	39.686	0.023
25	0.030	0.026	43.277	0.013
26	0.008	0.012	43.528	0.017
27	0.001	0.003	43.535	0.023
28	-0.008	-0.009	43.761	0.029
29	0.009	0.014	44.093	0.036
30	0.009	0.006	44.445	0.043
31	-0.021	-0.021	46.229	0.039
32	0.006	0.009	46.383	0.048
33	-0.003	-0.007	46.425	0.061
34	-0.022	-0.024	48.328	0.053
35	0.002	0.005	48.338	0.066
36	-0.009	-0.015	48.634	0.078

(a) Correlogram

Null Hypothesis: Y has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=30)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-64.07498	0.0001
Test critical values:	1% level	-2.565550	
	5% level	-1.940904	
	10% level	-1.616645	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(Y)
Method: Least Squares
Date: 03/17/14 Time: 15:42
Sample (adjusted): 10/15/1997 11/13/2012
Included observations: 3935 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Y(-1)	-1.021380	0.015940	-64.07498	0.0000

R-squared	0.510672	Mean dependent var	-5.42E-07
Adjusted R-squared	0.510672	S.D. dependent var	0.006908
S.E. of regression	0.004832	Akaike info criterion	-7.826822
Sum squared resid	0.091855	Schwarz criterion	-7.825227
Log likelihood	15400.27	Hannan-Quinn criter.	-7.826256
Durbin-Watson stat	2.001398		

(b) ADF test

Figure 47: South Africa: log exchange spot rate difference stationary test

Sample: 10/14/1997 11/13/2012
Included observations: 3936

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	-0.021	-0.021	1.7911	0.181
		2	-0.034	-0.035	6.3736	0.041
		3	-0.025	-0.026	8.8215	0.032
		4	0.009	0.007	9.1478	0.058
		5	-0.005	-0.006	9.2440	0.100
		6	-0.003	-0.004	9.2831	0.158
		7	-0.006	-0.007	9.4485	0.222
		8	0.022	0.021	11.295	0.186
		9	0.009	0.010	11.647	0.234
		10	-0.026	-0.025	14.380	0.156
		11	0.057	0.057	27.026	0.005
		12	-0.022	-0.021	28.966	0.004
		13	0.006	0.008	29.112	0.006
		14	0.014	0.016	29.848	0.008
		15	-0.018	-0.019	31.178	0.008
		16	0.001	0.002	31.180	0.013
		17	0.016	0.015	32.213	0.014
		18	-0.028	-0.027	35.379	0.008
		19	0.024	0.023	37.668	0.007
		20	0.018	0.017	38.991	0.007
		21	0.000	0.004	38.991	0.010
		22	-0.003	-0.005	39.018	0.014
		23	-0.009	-0.005	39.340	0.018
		24	-0.008	-0.008	39.578	0.024
		25	0.030	0.027	43.238	0.013
		26	0.008	0.013	43.507	0.017
		27	0.002	0.003	43.518	0.023
		28	-0.007	-0.009	43.727	0.030
		29	0.009	0.014	44.084	0.036
		30	0.010	0.006	44.460	0.043
		31	-0.021	-0.021	46.189	0.039
		32	0.007	0.010	46.359	0.048
		33	-0.003	-0.007	46.393	0.061
		34	-0.022	-0.023	48.238	0.054
		35	0.002	0.005	48.252	0.067
		36	-0.008	-0.015	48.529	0.079

(a) Correlogram

Null Hypothesis: RF has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=30)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-64.07059	0.0001
Test critical values:	1% level	-2.565550	
	5% level	-1.940904	
	10% level	-1.616645	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(RF)
Method: Least Squares
Date: 03/20/14 Time: 15:29
Sample (adjusted): 10/15/1997 11/13/2012
Included observations: 3935 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RF(-1)	-1.021311	0.015940	-64.07059	0.0000

R-squared	0.510638	Mean dependent var	5.58E-07
Adjusted R-squared	0.510638	S.D. dependent var	0.006908
S.E. of regression	0.004832	Akaike info criterion	-7.826762
Sum squared resid	0.091861	Schwarz criterion	-7.825166
Log likelihood	15400.15	Hannan-Quinn criter.	-7.826196
Durbin-Watson stat	2.001391		

(b) ADF test

Figure 48: South Africa: the generalized risk factor stationary test

Sample: 10/14/1997 11/13/2012
Included observations: 3936

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.986	0.986	3830.0	0.000
		2	0.981	0.310	7621.2	0.000
		3	0.976	0.111	11374.	0.000
		4	0.966	-0.139	15056.	0.000
		5	0.956	-0.156	18659.	0.000
		6	0.952	0.197	22235.	0.000
		7	0.942	-0.085	25735.	0.000
		8	0.930	-0.170	29148.	0.000
		9	0.922	0.026	32505.	0.000
		10	0.911	-0.035	35785.	0.000
		11	0.901	0.079	38991.	0.000
		12	0.893	0.026	42142.	0.000
		13	0.886	0.082	45246.	0.000
		14	0.877	-0.005	48283.	0.000
		15	0.871	0.042	51280.	0.000
		16	0.862	-0.081	54217.	0.000
		17	0.853	-0.009	57098.	0.000
		18	0.847	0.042	59933.	0.000
		19	0.840	0.002	62724.	0.000
		20	0.833	0.028	65468.	0.000
		21	0.827	0.009	68177.	0.000
		22	0.821	0.012	70847.	0.000
		23	0.816	0.071	73482.	0.000
		24	0.810	-0.008	76085.	0.000
		25	0.805	-0.007	78654.	0.000
		26	0.800	-0.002	81191.	0.000
		27	0.795	0.002	83699.	0.000
		28	0.790	-0.027	86175.	0.000
		29	0.785	-0.013	88620.	0.000
		30	0.780	-0.030	91031.	0.000
		31	0.775	0.045	93413.	0.000
		32	0.769	0.008	95764.	0.000
		33	0.764	-0.031	98082.	0.000
		34	0.759	0.013	100370	0.000
		35	0.754	0.020	102628	0.000
		36	0.748	-0.007	104854	0.000

(a) Correlogram

Null Hypothesis: MEANRF has a unit root
Exogenous: None
Lag Length: 15 (Automatic - based on SIC, maxlag=15)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.584339	0.0000
Test critical values:	1% level	-2.565552	
	5% level	-1.940905	
	10% level	-1.616645	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(MEANRF)
Method: Least Squares
Date: 03/20/14 Time: 15:30
Sample (adjusted): 11/05/1997 11/13/2012
Included observations: 3920 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
MEANRF(-1)	-0.005993	0.001073	-5.584339	0.0000
D(MEANRF(-1))	0.034851	0.015854	2.198189	0.0280
D(MEANRF(-2))	-0.032540	0.014760	-2.204603	0.0275
D(MEANRF(-3))	-0.088101	0.014335	-6.145754	0.0000
D(MEANRF(-4))	0.102226	0.014114	7.243058	0.0000
D(MEANRF(-5))	0.090334	0.014001	6.452148	0.0000
D(MEANRF(-6))	0.119478	0.013686	8.730139	0.0000
D(MEANRF(-7))	-0.074970	0.012621	-5.940193	0.0000
D(MEANRF(-8))	-0.011333	0.012165	-0.931625	0.3516
D(MEANRF(-9))	0.100164	0.012109	8.271566	0.0000
D(MEANRF(-10))	-0.058383	0.011487	-5.082427	0.0000
D(MEANRF(-11))	-0.018957	0.010663	-1.777730	0.0755
D(MEANRF(-12))	-0.000499	0.010611	-0.047062	0.9625
D(MEANRF(-13))	0.033539	0.010479	3.200735	0.0014
D(MEANRF(-14))	0.002042	0.009100	0.224370	0.8225
D(MEANRF(-15))	0.054606	0.008786	6.215281	0.0000

R-squared	0.126983	Mean dependent var	-1.88E-07
Adjusted R-squared	0.123629	S.D. dependent var	7.93E-06
S.E. of regression	7.42E-06	Akaike info criterion	-20.78059
Sum squared resid	2.15E-07	Schwarz criterion	-20.75499
Log likelihood	40745.96	Hannan-Quinn criter.	-20.77151
Durbin-Watson stat	2.016052		

(b) ADF test

Figure 49: South Africa: the mean of the generalized risk factor stationary test

Sample: 10/14/1997 11/13/2012
Included observations: 3936

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.998	0.998	3924.3	0.000
		2	0.996	0.004	7835.1	0.000
		3	0.995	0.029	11733.	0.000
		4	0.993	-0.047	15617.	0.000
		5	0.991	-0.043	19486.	0.000
		6	0.988	-0.035	23339.	0.000
		7	0.986	0.006	27176.	0.000
		8	0.984	-0.036	30996.	0.000
		9	0.982	-0.012	34799.	0.000
		10	0.979	0.042	38586.	0.000
		11	0.977	-0.016	42357.	0.000
		12	0.975	-0.023	46110.	0.000
		13	0.972	-0.022	49846.	0.000
		14	0.970	-0.006	53564.	0.000
		15	0.968	0.027	57265.	0.000
		16	0.965	0.004	60949.	0.000
		17	0.963	-0.012	64615.	0.000
		18	0.960	-0.018	68265.	0.000
		19	0.958	-0.015	71896.	0.000
		20	0.955	-0.004	75509.	0.000
		21	0.953	-0.002	79104.	0.000
		22	0.950	-0.007	82681.	0.000
		23	0.948	-0.006	86240.	0.000
		24	0.945	-0.004	89781.	0.000
		25	0.943	-0.006	93302.	0.000
		26	0.940	-0.011	96805.	0.000
		27	0.937	-0.009	100289	0.000
		28	0.935	-0.004	103755	0.000
		29	0.932	-0.002	107201	0.000
		30	0.929	-0.008	110627	0.000
		31	0.927	-0.009	114035	0.000
		32	0.924	-0.005	117423	0.000
		33	0.921	-0.006	120791	0.000
		34	0.918	-0.006	124140	0.000
		35	0.915	-0.010	127469	0.000
		36	0.912	-0.005	130777	0.000

(a) Correlogram

Null Hypothesis: DEVRF has a unit root
Exogenous: None
Lag Length: 14 (Automatic - based on SIC, maxlag=15)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		0.440669	0.8091
Test critical values:	1% level	-2.565552	
	5% level	-1.940905	
	10% level	-1.616645	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DEVRF)
Method: Least Squares
Date: 03/20/14 Time: 15:32
Sample (adjusted): 11/04/1997 11/13/2012
Included observations: 3921 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DEVRF(-1)	3.36E-05	7.63E-05	0.440669	0.6595
D(DEVRF(-1))	0.071916	0.015812	4.548318	0.0000
D(DEVRF(-2))	-0.011695	0.015820	-0.739288	0.4598
D(DEVRF(-3))	0.139980	0.015811	8.853202	0.0000
D(DEVRF(-4))	0.245878	0.015950	15.41540	0.0000
D(DEVRF(-5))	0.128015	0.016389	7.811234	0.0000
D(DEVRF(-6))	-0.030281	0.016280	-1.860024	0.0630
D(DEVRF(-7))	0.264968	0.016264	16.29185	0.0000
D(DEVRF(-8))	-0.075288	0.016135	-4.666117	0.0000
D(DEVRF(-9))	0.022390	0.016160	1.385551	0.1660
D(DEVRF(-10))	-0.038714	0.015917	-2.432208	0.0151
D(DEVRF(-11))	0.023779	0.015528	1.531323	0.1258
D(DEVRF(-12))	-0.026495	0.015363	-1.724557	0.0847
D(DEVRF(-13))	0.036635	0.015310	2.392904	0.0168
D(DEVRF(-14))	-0.110296	0.015238	-7.238248	0.0000

R-squared	0.234784	Mean dependent var	5.26E-09
Adjusted R-squared	0.232041	S.D. dependent var	1.05E-07
S.E. of regression	9.20E-08	Akaike info criterion	-29.56103
Sum squared resid	3.31E-11	Schwarz criterion	-29.53703
Log likelihood	57969.40	Hannan-Quinn criter.	-29.55252
Durbin-Watson stat	2.010885		

(b) ADF test

Null Hypothesis: D(DEVRF) has a unit root
Exogenous: Constant
Lag Length: 13 (Automatic - based on SIC, maxlag=15)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-12.88183	0.0000
Test critical values:	1% level	-3.431833	
	5% level	-2.862080	
	10% level	-2.567101	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DEVRF,2)
Method: Least Squares
Date: 03/20/14 Time: 15:32
Sample (adjusted): 11/04/1997 11/13/2012
Included observations: 3921 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(DEVRF(-1))	-0.361819	0.028088	-12.88183	0.0000
D(DEVRF(-1),2)	-0.566554	0.029652	-19.10669	0.0000
D(DEVRF(-2),2)	-0.578520	0.030675	-18.85997	0.0000
D(DEVRF(-3),2)	-0.438803	0.031753	-13.81945	0.0000
D(DEVRF(-4),2)	-0.193133	0.032176	-6.002361	0.0000
D(DEVRF(-5),2)	-0.065218	0.032006	-2.037660	0.0417
D(DEVRF(-6),2)	-0.095595	0.031804	-3.005797	0.0027
D(DEVRF(-7),2)	0.169280	0.031708	5.338776	0.0000
D(DEVRF(-8),2)	0.093895	0.030901	3.038599	0.0024
D(DEVRF(-9),2)	0.116167	0.030129	3.855654	0.0001
D(DEVRF(-10),2)	0.077317	0.028703	2.693741	0.0071
D(DEVRF(-11),2)	0.100887	0.025679	3.928797	0.0001
D(DEVRF(-12),2)	0.074168	0.020929	3.543840	0.0004
D(DEVRF(-13),2)	0.110562	0.015236	7.256708	0.0000
C	1.82E-09	1.48E-09	1.229620	0.2189

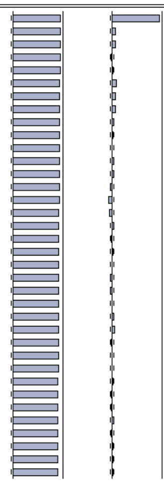
R-squared	0.540058	Mean dependent var	-1.77E-10
Adjusted R-squared	0.538409	S.D. dependent var	1.35E-07
S.E. of regression	9.20E-08	Akaike info criterion	-29.56137
Sum squared resid	3.31E-11	Schwarz criterion	-29.53737
Log likelihood	57970.07	Hannan-Quinn criter.	-29.55285
F-statistic	327.5980	Durbin-Watson stat	2.010929
Prob(F-statistic)	0.000000		

(c) ADF test for 1st diff

Figure 50: South Africa: the deviation of the generalized risk factor stationary test

APPENDIX I: STATIONARY TEST: SWEDEN

Sample: 9/25/1996 11/13/2012
Included observations: 4210



Lag	AC	PAC	Q-Stat	Prob
1	0.996	0.996	4179.3	0.000
2	0.993	0.066	8330.7	0.000
3	0.990	0.081	12459.	0.000
4	0.987	-0.010	16564.	0.000
5	0.984	0.016	20645.	0.000
6	0.982	0.088	24710.	0.000
7	0.980	0.066	28760.	0.000
8	0.979	0.080	32801.	0.000
9	0.977	0.031	36832.	0.000
10	0.976	0.016	40854.	0.000
11	0.975	0.001	44866.	0.000
12	0.973	0.034	48869.	0.000
13	0.972	0.035	52864.	0.000
14	0.971	-0.038	56847.	0.000
15	0.969	-0.080	60813.	0.000
16	0.966	-0.057	64759.	0.000
17	0.964	0.036	68690.	0.000
18	0.962	-0.009	72604.	0.000
19	0.960	0.013	76502.	0.000
20	0.958	0.001	80386.	0.000
21	0.956	-0.048	84254.	0.000
22	0.954	-0.031	88106.	0.000
23	0.952	-0.005	91941.	0.000
24	0.950	0.034	95762.	0.000
25	0.948	0.046	99571.	0.000
26	0.946	-0.019	103367	0.000
27	0.945	-0.004	107151	0.000
28	0.943	-0.001	110921	0.000
29	0.941	0.015	114678	0.000
30	0.939	-0.013	118421	0.000
31	0.937	-0.010	122148	0.000
32	0.935	0.032	125862	0.000
33	0.934	-0.009	129562	0.000
34	0.932	0.010	133249	0.000
35	0.930	0.015	136924	0.000
36	0.929	0.012	140587	0.000

(a) Correlogram

Null Hypothesis: INTEREST has a unit root
Exogenous: None
Lag Length: 15 (Automatic - based on SIC, maxlag=30)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.975966	0.0461
Test critical values:	1% level	-2.565514	
	5% level	-1.940900	
	10% level	-1.616649	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(INTEREST)
Method: Least Squares
Date: 03/10/14 Time: 12:58
Sample (adjusted): 10/17/1996 11/13/2012
Included observations: 4194 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INTEREST(-1)	-0.000990	0.000501	-1.975966	0.0482
D(INTEREST(-1))	-0.136427	0.015420	-8.847308	0.0000
D(INTEREST(-2))	-0.132004	0.015483	-8.525981	0.0000
D(INTEREST(-3))	-0.020733	0.015595	-1.329451	0.1838
D(INTEREST(-4))	-0.055450	0.015584	-3.558056	0.0004
D(INTEREST(-5))	-0.144846	0.015587	-9.292653	0.0000
D(INTEREST(-6))	-0.114513	0.015747	-7.272202	0.0000
D(INTEREST(-7))	-0.115216	0.015843	-7.272177	0.0000
D(INTEREST(-8))	-0.038466	0.015933	-2.414291	0.0158
D(INTEREST(-9))	-0.018775	0.015844	-1.184951	0.2361
D(INTEREST(-10))	-0.010933	0.015748	-0.694256	0.4876
D(INTEREST(-11))	-0.052574	0.015589	-3.372447	0.0008
D(INTEREST(-12))	-0.043443	0.015587	-2.787089	0.0053
D(INTEREST(-13))	0.052547	0.015598	3.368757	0.0008
D(INTEREST(-14))	0.102251	0.015486	6.602976	0.0000
D(INTEREST(-15))	0.074600	0.015422	4.837227	0.0000

R-squared	0.076725	Mean dependent var	-0.001166
Adjusted R-squared	0.073411	S.D. dependent var	0.110722
S.E. of regression	0.106581	Akaike info criterion	-1.636019
Sum squared resid	47.45985	Schwarz criterion	-1.611827
Log likelihood	3446.732	Hannan-Quinn criter.	-1.627464
Durbin-Watson stat	1.993724		

(b) ADF test

Null Hypothesis: D(INTEREST) has a unit root
Exogenous: Constant
Lag Length: 14 (Automatic - based on SIC, maxlag=30)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-17.67772	0.0000
Test critical values:	1% level	-3.431725	
	5% level	-2.862033	
	10% level	-2.567075	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(INTEREST,2)
Method: Least Squares
Date: 03/10/14 Time: 12:59
Sample (adjusted): 10/17/1996 11/13/2012
Included observations: 4194 after adjustments

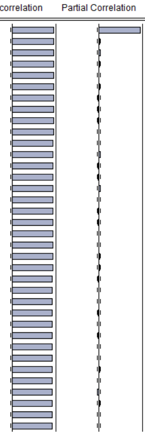
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(INTEREST(-1))	-1.654563	0.093596	-17.67772	0.0000
D(INTEREST(-1),2)	0.517757	0.090261	5.736218	0.0000
D(INTEREST(-2),2)	0.385457	0.086071	4.478341	0.0000
D(INTEREST(-3),2)	0.364510	0.081204	4.488822	0.0000
D(INTEREST(-4),2)	0.308857	0.076254	4.050356	0.0001
D(INTEREST(-5),2)	0.163842	0.071218	2.300570	0.0215
D(INTEREST(-6),2)	0.049248	0.065743	0.749107	0.4538
D(INTEREST(-7),2)	-0.065979	0.059851	-1.102390	0.2704
D(INTEREST(-8),2)	-0.104388	0.053616	-1.946958	0.0516
D(INTEREST(-9),2)	-0.123082	0.047544	-2.588816	0.0097
D(INTEREST(-10),2)	-0.133925	0.041619	-3.217918	0.0013
D(INTEREST(-11),2)	-0.186405	0.036096	-5.164168	0.0000
D(INTEREST(-12),2)	-0.229722	0.030213	-7.603431	0.0000
D(INTEREST(-13),2)	-0.177023	0.023236	-7.618629	0.0000
D(INTEREST(-14),2)	-0.074654	0.015428	-4.838766	0.0000
C	-0.001921	0.001650	-1.164334	0.2444

R-squared	0.574393	Mean dependent var	-6.15E-19
Adjusted R-squared	0.572865	S.D. dependent var	0.163128
S.E. of regression	0.106613	Akaike info criterion	-1.635409
Sum squared resid	47.48880	Schwarz criterion	-1.611217
Log likelihood	3445.454	Hannan-Quinn criter.	-1.626854
F-statistic	375.9039	Durbin-Watson stat	1.993724
Prob(F-statistic)	0.000000		

(c) ADF test for 1st diff

Figure 51: Sweden: interest rate stationary test

Sample: 9/25/1996 11/13/2012
Included observations: 4210



Lag	AC	PAC	Q-Stat	Prob
1	0.998	0.998	4199.2	0.000
2	0.997	0.024	8386.2	0.000
3	0.995	0.030	12562.	0.000
4	0.994	0.009	16727.	0.000
5	0.992	-0.005	20880.	0.000
6	0.991	0.012	25023.	0.000
7	0.990	-0.012	29154.	0.000
8	0.988	-0.013	33274.	0.000
9	0.987	-0.022	37382.	0.000
10	0.985	0.007	41478.	0.000
11	0.983	0.003	45563.	0.000
12	0.982	0.025	49636.	0.000
13	0.981	-0.012	53699.	0.000
14	0.979	-0.021	57750.	0.000
15	0.978	0.031	61789.	0.000
16	0.976	0.005	65818.	0.000
17	0.975	-0.011	69836.	0.000
18	0.973	-0.018	73843.	0.000
19	0.972	-0.003	77838.	0.000
20	0.970	-0.000	81822.	0.000
21	0.969	0.014	85794.	0.000
22	0.967	0.009	89756.	0.000
23	0.966	-0.009	93707.	0.000
24	0.964	0.006	97647.	0.000
25	0.963	0.002	101576	0.000
26	0.962	-0.016	105494	0.000
27	0.960	-0.002	109401	0.000
28	0.959	-0.011	113297	0.000
29	0.957	-0.004	117181	0.000
30	0.955	-0.004	121054	0.000
31	0.954	0.015	124916	0.000
32	0.953	-0.004	128766	0.000
33	0.951	-0.039	132605	0.000
34	0.949	0.013	136432	0.000
35	0.948	0.002	140247	0.000
36	0.946	-0.001	144051	0.000

(a) Correlogram

Null Hypothesis: SPOT has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=30)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.215722	0.6087
Test critical values:	1% level	-2.565512	
	5% level	-1.940899	
	10% level	-1.616649	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(SPOT)
Method: Least Squares
Date: 03/10/14 Time: 13:05
Sample (adjusted): 9/26/1996 11/13/2012
Included observations: 4209 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
SPOT(-1)	-2.59E-05	0.000120	-0.215722	0.8292

R-squared	0.000011	Mean dependent var	4.15E-05
Adjusted R-squared	0.000011	S.D. dependent var	0.061442
S.E. of regression	0.061442	Akaike info criterion	-2.741211
Sum squared resid	15.88567	Schwarz criterion	-2.739703
Log likelihood	5769.878	Hannan-Quinn criter.	-2.740678
Durbin-Watson stat	2.054152		

(b) ADF test

Null Hypothesis: D(SPOT) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=30)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-66.64361	0.0001
Test critical values:	1% level	-3.431720	
	5% level	-2.862030	
	10% level	-2.567074	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(SPOT,2)
Method: Least Squares
Date: 03/10/14 Time: 13:06
Sample (adjusted): 9/27/1996 11/13/2012
Included observations: 4208 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(SPOT(-1))	-1.027188	0.015413	-66.64361	0.0000
C	3.18E-05	0.000947	0.033592	0.9732

R-squared	0.513609	Mean dependent var	-3.04E-06
Adjusted R-squared	0.513494	S.D. dependent var	0.088072
S.E. of regression	0.061430	Akaike info criterion	-2.741352
Sum squared resid	15.87210	Schwarz criterion	-2.738337
Log likelihood	5769.805	Hannan-Quinn criter.	-2.740286
F-statistic	4441.370	Durbin-Watson stat	2.001788
Prob(F-statistic)	0.000000		

(c) ADF test for 1st diff

Figure 52: Sweden: exchange spot rate stationary test

Sample: 9/26/1996 11/13/2012
Included observations: 4209

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.992	0.992	4144.2	0.000
		2	0.987	0.207	8250.2	0.000
		3	0.983	0.097	12325.	0.000
		4	0.979	-0.013	16364.	0.000
		5	0.975	0.005	20368.	0.000
		6	0.973	0.169	24358.	0.000
		7	0.969	-0.042	28321.	0.000
		8	0.966	-0.011	32255.	0.000
		9	0.964	0.121	36180.	0.000
		10	0.963	0.067	40094.	0.000
		11	0.962	0.060	43998.	0.000
		12	0.960	0.005	47894.	0.000
		13	0.959	0.023	51782.	0.000
		14	0.956	-0.124	55641.	0.000
		15	0.954	0.046	59485.	0.000
		16	0.952	0.003	63313.	0.000
		17	0.949	0.034	67124.	0.000
		18	0.947	0.009	70920.	0.000
		19	0.946	-0.012	74703.	0.000
		20	0.944	0.052	78471.	0.000
		21	0.942	0.004	82228.	0.000
		22	0.940	-0.023	85971.	0.000
		23	0.939	0.002	89702.	0.000
		24	0.938	0.050	93426.	0.000
		25	0.937	0.061	97145.	0.000
		26	0.936	0.036	100860	0.000
		27	0.936	0.022	104571	0.000
		28	0.935	-0.001	108276	0.000
		29	0.934	0.035	111978	0.000
		30	0.934	0.005	115675	0.000
		31	0.933	-0.002	119367	0.000
		32	0.932	0.032	123055	0.000
		33	0.932	0.028	126741	0.000
		34	0.931	0.022	130423	0.000
		35	0.930	-0.018	134097	0.000
		36	0.929	-0.004	137766	0.000

(a) Correlogram

Null Hypothesis: X has a unit root
Exogenous: None
Lag Length: 14 (Automatic - based on SIC, maxlag=30)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.134453	0.0316
Test critical values:	1% level	-2.565514	
	5% level	-1.940900	
	10% level	-1.616649	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(X)
Method: Least Squares
Date: 03/17/14 Time: 16:59
Sample (adjusted): 10/17/1996 11/13/2012
Included observations: 4194 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
X(-1)	-0.003956	0.001853	-2.134453	0.0329
D(X(-1))	-0.229180	0.015500	-14.78612	0.0000
D(X(-2))	-0.098073	0.015809	-6.203674	0.0000
D(X(-3))	-0.020194	0.015881	-1.271545	0.2036
D(X(-4))	-0.052809	0.015885	-3.324588	0.0009
D(X(-5))	-0.161057	0.015870	-10.14844	0.0000
D(X(-6))	0.023906	0.016005	1.493628	0.1353
D(X(-7))	-0.035233	0.015889	-2.217370	0.0267
D(X(-8))	-0.122684	0.015887	-7.722232	0.0000
D(X(-9))	-0.084909	0.015997	-5.307765	0.0000
D(X(-10))	-0.064527	0.015847	-4.072003	0.0000
D(X(-11))	0.000543	0.015854	0.034229	0.9727
D(X(-12))	0.001587	0.015849	0.100114	0.9203
D(X(-13))	0.113878	0.015770	7.221000	0.0000
D(X(-14))	-0.045982	0.015453	-2.975617	0.0029

R-squared	0.124440	Mean dependent var	5.11E-10
Adjusted R-squared	0.121507	S.D. dependent var	2.66E-06
S.E. of regression	2.49E-06	Akaike info criterion	-22.96318
Sum squared resid	2.60E-08	Schwarz criterion	-22.94050
Log likelihood	48168.78	Hannan-Quinn criter.	-22.95516
Durbin-Watson stat	2.000320		

(b) ADF test

Figure 53: Sweden: log interest rate difference stationary test

Sample: 9/26/1996 11/13/2012
Included observations: 4209

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	-0.029	-0.029	3.5652	0.059
		2	-0.036	-0.037	9.0225	0.011
		3	-0.019	-0.022	10.602	0.014
		4	0.010	0.007	10.995	0.027
		5	-0.014	-0.015	11.846	0.037
		6	0.010	0.009	12.265	0.056
		7	0.017	0.017	13.512	0.061
		8	0.023	0.024	15.770	0.046
		9	-0.018	-0.015	17.196	0.046
		10	-0.002	-0.001	17.211	0.070
		11	-0.021	-0.022	19.085	0.060
		12	0.020	0.018	20.702	0.055
		13	0.023	0.023	22.873	0.043
		14	-0.028	-0.027	26.107	0.025
		15	-0.005	-0.004	26.195	0.036
		16	0.016	0.013	27.220	0.039
		17	0.016	0.017	28.357	0.041
		18	-0.002	0.001	28.370	0.057
		19	0.000	0.001	28.370	0.077
		20	-0.020	-0.021	29.982	0.070
		21	-0.014	-0.014	30.766	0.078
		22	0.013	0.013	31.467	0.087
		23	-0.001	-0.003	31.474	0.112
		24	-0.006	-0.006	31.627	0.137
		25	0.017	0.014	32.813	0.136
		26	-0.010	-0.009	33.239	0.155
		27	0.002	0.006	33.257	0.189
		28	0.008	0.009	33.527	0.217
		29	0.017	0.015	34.697	0.215
		30	-0.021	-0.020	36.647	0.188
		31	-0.001	-0.001	36.654	0.223
		32	0.040	0.039	43.420	0.086
		33	-0.017	-0.015	44.593	0.086
		34	0.001	0.003	44.598	0.106
		35	0.009	0.006	44.913	0.122
		36	0.006	0.007	45.081	0.143

(a) Correlogram

Null Hypothesis: Y has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=30)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-66.77988	0.0001
Test critical values:	1% level	-2.565512	
	5% level	-1.940899	
	10% level	-1.616649	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(Y)
Method: Least Squares
Date: 03/17/14 Time: 17:29
Sample (adjusted): 9/27/1996 11/13/2012
Included observations: 4208 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Y(-1)	-1.029096	0.015410	-66.77988	0.0000

R-squared	0.514571	Mean dependent var	2.09E-07
Adjusted R-squared	0.514571	S.D. dependent var	0.004861
S.E. of regression	0.003387	Akaike info criterion	-8.537793
Sum squared resid	0.048248	Schwarz criterion	-8.536286
Log likelihood	17964.52	Hannan-Quinn criter.	-8.537260
Durbin-Watson stat	2.001681		

(b) ADF test

Figure 54: Sweden: log exchange spot rate difference stationary test

Sample: 9/26/1996 11/13/2012
Included observations: 4209

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	-0.029	-0.029	3.5193	0.061
		2	-0.036	-0.037	8.9235	0.012
		3	-0.019	-0.021	10.473	0.015
		4	0.010	0.007	10.881	0.028
		5	-0.014	-0.015	11.712	0.039
		6	0.010	0.010	12.145	0.059
		7	0.017	0.017	13.415	0.063
		8	0.023	0.024	15.702	0.047
		9	-0.018	-0.015	17.108	0.047
		10	-0.002	-0.001	17.119	0.072
		11	-0.021	-0.021	18.964	0.062
		12	0.020	0.018	20.605	0.056
		13	0.023	0.023	22.806	0.044
		14	-0.028	-0.027	26.002	0.026
		15	-0.004	-0.004	26.083	0.037
		16	0.016	0.014	27.131	0.040
		17	0.017	0.018	28.289	0.042
		18	-0.002	0.002	28.299	0.058
		19	0.000	0.001	28.299	0.078
		20	-0.019	-0.021	29.888	0.072
		21	-0.013	-0.014	30.653	0.080
		22	0.013	0.013	31.373	0.089
		23	-0.001	-0.003	31.379	0.114
		24	-0.006	-0.006	31.523	0.139
		25	0.017	0.014	32.731	0.138
		26	-0.010	-0.009	33.142	0.158
		27	0.002	0.006	33.163	0.192
		28	0.008	0.009	33.445	0.220
		29	0.017	0.015	34.639	0.217
		30	-0.021	-0.020	36.558	0.190
		31	-0.001	-0.001	36.564	0.226
		32	0.040	0.039	43.398	0.086
		33	-0.016	-0.014	44.543	0.087
		34	0.001	0.003	44.551	0.106
		35	0.009	0.006	44.880	0.122
		36	0.006	0.008	45.058	0.143

(a) Correlogram

Null Hypothesis: RF has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=30)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-66.76727	0.0001
Test critical values:	1% level	-2.565512	
	5% level	-1.940899	
	10% level	-1.616649	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(RF)
Method: Least Squares
Date: 03/20/14 Time: 15:44
Sample (adjusted): 9/27/1996 11/13/2012
Included observations: 4208 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RF(-1)	-1.028907	0.015410	-66.76727	0.0000

R-squared	0.514476	Mean dependent var	-2.09E-07
Adjusted R-squared	0.514476	S.D. dependent var	0.004861
S.E. of regression	0.003387	Akaike info criterion	-8.537589
Sum squared resid	0.048258	Schwarz criterion	-8.536081
Log likelihood	17964.09	Hannan-Quinn criter.	-8.537056
Durbin-Watson stat	2.001656		

(b) ADF test

Figure 55: Sweden: the generalized risk factor stationary test

Sample: 9/26/1996 11/13/2012
Included observations: 4209

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.842	0.842	2985.4	0.000
		2	0.846	0.471	6001.2	0.000
		3	0.829	0.244	8895.4	0.000
		4	0.822	0.168	11741.	0.000
		5	0.806	0.084	14480.	0.000
		6	0.807	0.111	17226.	0.000
		7	0.805	0.110	19959.	0.000
		8	0.787	0.013	22574.	0.000
		9	0.795	0.085	25238.	0.000
		10	0.793	0.084	27893.	0.000
		11	0.798	0.102	30585.	0.000
		12	0.793	0.059	33241.	0.000
		13	0.804	0.099	35969.	0.000
		14	0.804	0.090	38704.	0.000
		15	0.803	0.062	41432.	0.000
		16	0.798	0.019	44121.	0.000
		17	0.788	-0.020	46748.	0.000
		18	0.777	-0.042	49302.	0.000
		19	0.777	0.010	51859.	0.000
		20	0.772	0.001	54381.	0.000
		21	0.773	0.031	56912.	0.000
		22	0.770	0.019	59420.	0.000
		23	0.762	-0.017	61880.	0.000
		24	0.763	0.007	64345.	0.000
		25	0.763	0.017	66812.	0.000
		26	0.758	-0.012	69250.	0.000
		27	0.764	0.029	71722.	0.000
		28	0.764	0.023	74194.	0.000
		29	0.760	0.006	76644.	0.000
		30	0.759	0.013	79090.	0.000
		31	0.755	-0.002	81507.	0.000
		32	0.751	0.001	83902.	0.000
		33	0.756	0.050	86330.	0.000
		34	0.754	0.025	88741.	0.000
		35	0.748	-0.009	91115.	0.000
		36	0.745	-0.007	93474.	0.000

(a) Correlogram

Null Hypothesis: MEANRF has a unit root
Exogenous: None
Lag Length: 14 (Automatic - based on SIC, maxlag=15)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.496902	0.1261
Test critical values:	1% level	-2.565514	
	5% level	-1.940900	
	10% level	-1.616649	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(MEANRF)
Method: Least Squares
Date: 03/20/14 Time: 15:45
Sample (adjusted): 10/17/1996 11/13/2012
Included observations: 4194 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
MEANRF(-1)	-0.001496	0.000999	-1.496902	0.1345
D(MEANRF(-1))	-0.158827	0.015304	-10.37834	0.0000
D(MEANRF(-2))	0.021728	0.015217	1.427896	0.1534
D(MEANRF(-3))	-0.084142	0.014648	-5.744469	0.0000
D(MEANRF(-4))	-0.181006	0.014345	-12.61793	0.0000
D(MEANRF(-5))	-0.018683	0.014530	-1.285814	0.1986
D(MEANRF(-6))	0.108791	0.014499	7.503493	0.0000
D(MEANRF(-7))	-0.115853	0.013990	-8.281365	0.0000
D(MEANRF(-8))	-0.020709	0.012883	-1.607548	0.1080
D(MEANRF(-9))	0.021351	0.012875	1.658318	0.0973
D(MEANRF(-10))	-0.070465	0.012679	-5.557825	0.0000
D(MEANRF(-11))	-0.007169	0.012103	-0.592334	0.5537
D(MEANRF(-12))	0.024431	0.011904	2.052305	0.0402
D(MEANRF(-13))	0.069804	0.011352	6.149195	0.0000
D(MEANRF(-14))	0.015162	0.004033	3.759837	0.0002

R-squared	0.112948	Mean dependent var	-2.16E-08
Adjusted R-squared	0.109976	S.D. dependent var	8.74E-06
S.E. of regression	8.24E-06	Akaike info criterion	-20.57041
Sum squared resid	2.84E-07	Schwarz criterion	-20.54773
Log likelihood	43151.16	Hannan-Quinn criter.	-20.56239
Durbin-Watson stat	2.062598		

(b) ADF test

Null Hypothesis: D(MEANRF) has a unit root
Exogenous: Constant
Lag Length: 10 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-32.75226	0.0000
Test critical values:	1% level	-3.431724	
	5% level	-2.862032	
	10% level	-2.567075	

*MacKinnon (1996) one-sided p-values.

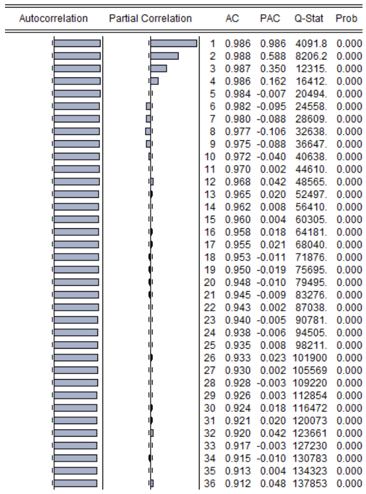
Augmented Dickey-Fuller Test Equation
Dependent Variable: D(MEANRF,2)
Method: Least Squares
Date: 03/20/14 Time: 15:46
Sample (adjusted): 10/14/1996 11/13/2012
Included observations: 4197 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(MEANRF(-1))	-1.883191	0.057498	-32.75226	0.0000
D(MEANRF(-1),2)	0.727107	0.053207	13.66552	0.0000
D(MEANRF(-2),2)	0.708336	0.047905	14.78614	0.0000
D(MEANRF(-3),2)	0.622787	0.042294	14.72534	0.0000
D(MEANRF(-4),2)	0.474950	0.036998	12.83711	0.0000
D(MEANRF(-5),2)	0.357377	0.032875	10.87086	0.0000
D(MEANRF(-6),2)	0.354103	0.028027	12.63457	0.0000
D(MEANRF(-7),2)	0.254435	0.023228	10.95402	0.0000
D(MEANRF(-8),2)	0.175937	0.018678	9.419716	0.0000
D(MEANRF(-9),2)	0.097616	0.013200	7.395253	0.0000
D(MEANRF(-10),2)	-0.046160	0.004074	-11.32993	0.0000
C	3.18E-08	1.36E-07	0.233994	0.8150

R-squared	0.633381	Mean dependent var	-2.02E-08
Adjusted R-squared	0.632417	S.D. dependent var	1.45E-05
S.E. of regression	8.79E-06	Akaike info criterion	-20.44288
Sum squared resid	3.23E-07	Schwarz criterion	-20.42475
Log likelihood	42911.38	Hannan-Quinn criter.	-20.43647
F-statistic	657.2840	Durbin-Watson stat	1.949527
Prob(F-statistic)	0.000000		

(c) ADF test for 1st diff

Figure 56: Sweden: the mean of the generalized risk factor stationary test



Sample: 9/26/1996 11/13/2012
Included observations: 4209

	AC	PAC	Q-Stat	Prob
1	0.986	0.986	4091.8	0.000
2	0.988	0.588	8206.2	0.000
3	0.987	0.350	12315.	0.000
4	0.986	0.162	16412.	0.000
5	0.984	-0.007	20494.	0.000
6	0.982	-0.095	24558.	0.000
7	0.980	-0.088	28609.	0.000
8	0.977	-0.106	32638.	0.000
9	0.975	-0.088	36647.	0.000
10	0.972	-0.040	40638.	0.000
11	0.970	0.002	44610.	0.000
12	0.968	0.042	48565.	0.000
13	0.965	0.020	52497.	0.000
14	0.962	0.008	56410.	0.000
15	0.960	0.004	60305.	0.000
16	0.958	0.018	64181.	0.000
17	0.955	0.021	68040.	0.000
18	0.953	-0.011	71876.	0.000
19	0.950	-0.019	75695.	0.000
20	0.948	-0.010	79495.	0.000
21	0.945	-0.009	83276.	0.000
22	0.943	0.002	87038.	0.000
23	0.940	-0.005	90781.	0.000
24	0.938	-0.006	94505.	0.000
25	0.935	0.008	98211.	0.000
26	0.933	0.023	101900	0.000
27	0.930	0.002	105569	0.000
28	0.928	-0.003	109220	0.000
29	0.926	0.003	112854	0.000
30	0.924	0.018	116472	0.000
31	0.921	0.020	120073	0.000
32	0.920	0.042	123661	0.000
33	0.917	-0.003	127230	0.000
34	0.915	-0.010	130783	0.000
35	0.913	0.004	134323	0.000
36	0.912	0.048	137853	0.000

(a) Correlogram

Null Hypothesis: DEVRF has a unit root
Exogenous: None
Lag Length: 11 (Automatic - based on SIC, maxlag=15)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		2.386857	0.9963
Test critical values:	1% level	-2.565513	
	5% level	-1.940899	
	10% level	-1.616649	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DEVRF)
Method: Least Squares
Date: 03/20/14 Time: 15:47
Sample (adjusted): 10/14/1996 11/13/2012
Included observations: 4197 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DEVRF(-1)	0.000135	5.65E-05	2.386857	0.0170
D(DEVRF(-1))	0.123644	0.015390	8.033973	0.0000
D(DEVRF(-2))	0.030788	0.015480	1.988882	0.0468
D(DEVRF(-3))	-0.080427	0.015463	-5.201289	0.0000
D(DEVRF(-4))	0.068262	0.015408	4.430228	0.0000
D(DEVRF(-5))	0.115185	0.014970	7.694218	0.0000
D(DEVRF(-6))	0.027977	0.014695	1.903826	0.0570
D(DEVRF(-7))	0.012651	0.014587	0.867273	0.3858
D(DEVRF(-8))	-0.045430	0.014421	-3.150322	0.0016
D(DEVRF(-9))	0.025625	0.013997	1.830685	0.0672
D(DEVRF(-10))	-0.020466	0.007692	-2.660558	0.0078
D(DEVRF(-11))	-0.017247	0.002793	-6.174837	0.0000

R-squared	0.058180	Mean dependent var	2.19E-09
Adjusted R-squared	0.055704	S.D. dependent var	3.33E-08
S.E. of regression	3.23E-08	Akaike info criterion	-31.65286
Sum squared resid	4.38E-12	Schwarz criterion	-31.63472
Log likelihood	66435.52	Hannan-Quinn criter.	-31.64644
Durbin-Watson stat	1.976688		

(b) ADF test

Null Hypothesis: D(DEVRF) has a unit root
Exogenous: Constant
Lag Length: 10 (Automatic - based on SIC, maxlag=15)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-21.65845	0.0000
Test critical values:	1% level	-3.431724	
	5% level	-2.862032	
	10% level	-2.567075	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DEVRF,2)
Method: Least Squares
Date: 03/20/14 Time: 15:48
Sample (adjusted): 10/14/1996 11/13/2012
Included observations: 4197 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(DEVRF(-1))	-0.765899	0.035363	-21.65845	0.0000
D(DEVRF(-1),2)	-0.111538	0.033649	-3.314724	0.0009
D(DEVRF(-2),2)	-0.081618	0.031912	-2.557597	0.0106
D(DEVRF(-3),2)	-0.162885	0.030145	-5.403309	0.0000
D(DEVRF(-4),2)	-0.095663	0.027658	-3.458838	0.0005
D(DEVRF(-5),2)	0.018463	0.023143	0.797796	0.4250
D(DEVRF(-6),2)	0.045633	0.019591	2.329242	0.0199
D(DEVRF(-7),2)	0.057647	0.016206	3.557041	0.0004
D(DEVRF(-8),2)	0.011717	0.012088	0.969331	0.3324
D(DEVRF(-9),2)	0.037028	0.009432	3.925699	0.0001
D(DEVRF(-10),2)	0.017177	0.002791	6.153263	0.0000
C	1.65E-09	5.05E-10	3.269156	0.0011

R-squared	0.461546	Mean dependent var	3.16E-11
Adjusted R-squared	0.460130	S.D. dependent var	4.40E-08
S.E. of regression	3.23E-08	Akaike info criterion	-31.65405
Sum squared resid	4.37E-12	Schwarz criterion	-31.63591
Log likelihood	66438.02	Hannan-Quinn criter.	-31.64763
F-statistic	326.1135	Durbin-Watson stat	1.976263
Prob(F-statistic)	0.000000		

(c) ADF test for 1st diff

Figure 57: Sweden: the deviation of the generalized risk factor stationary test

APPENDIX J: STATIONARY TEST: SWITZERLAND

Sample: 11/26/1996 11/13/2012
Included observations: 4166

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.998	0.998	4151.9	0.000
		2	0.997	0.215	8295.1	0.000
		3	0.996	0.080	12431.	0.000
		4	0.995	0.022	16558.	0.000
		5	0.994	0.007	20678.	0.000
		6	0.992	-0.048	24789.	0.000
		7	0.991	-0.084	28889.	0.000
		8	0.990	0.008	32978.	0.000
		9	0.988	-0.046	37057.	0.000
		10	0.987	-0.041	41123.	0.000
		11	0.985	-0.017	45177.	0.000
		12	0.983	-0.041	49218.	0.000
		13	0.982	0.006	53247.	0.000
		14	0.980	-0.023	57262.	0.000
		15	0.978	-0.032	61263.	0.000
		16	0.976	0.025	65251.	0.000
		17	0.974	-0.027	69225.	0.000
		18	0.973	0.068	73187.	0.000
		19	0.971	-0.016	77135.	0.000
		20	0.969	0.025	81071.	0.000
		21	0.968	-0.017	84992.	0.000
		22	0.966	-0.038	88900.	0.000
		23	0.964	0.040	92795.	0.000
		24	0.962	0.012	96677.	0.000
		25	0.961	0.052	100547	0.000
		26	0.959	0.017	104407	0.000
		27	0.958	0.035	108255	0.000
		28	0.956	0.023	112093	0.000
		29	0.955	0.004	115920	0.000
		30	0.953	-0.016	119736	0.000
		31	0.952	0.022	123543	0.000
		32	0.951	-0.010	127340	0.000
		33	0.949	-0.015	131126	0.000
		34	0.948	-0.019	134903	0.000
		35	0.947	0.002	138669	0.000
		36	0.945	0.008	142425	0.000

(a) Correlogram

Null Hypothesis: INTEREST has a unit root
Exogenous: None
Lag Length: 17 (Automatic - based on SIC, maxlag=30)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.564987	0.1107
Test critical values:	1% level	-2.565520	
	5% level	-1.940900	
	10% level	-1.616648	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(INTEREST)
Method: Least Squares
Date: 03/10/14 Time: 13:20
Sample (adjusted): 12/20/1996 11/13/2012
Included observations: 4148 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INTEREST(-1)	-0.000873	0.000558	-1.564987	0.1177
D(INTEREST(-1))	-0.295090	0.015485	-19.05610	0.0000
D(INTEREST(-2))	-0.130051	0.016151	-8.052092	0.0000
D(INTEREST(-3))	-0.045859	0.016274	-2.817948	0.0049
D(INTEREST(-4))	0.013402	0.016283	0.823060	0.4105
D(INTEREST(-5))	0.073160	0.016260	4.499272	0.0000
D(INTEREST(-6))	0.095221	0.016308	5.838941	0.0000
D(INTEREST(-7))	0.027751	0.016330	1.699330	0.0893
D(INTEREST(-8))	0.066302	0.016317	4.063449	0.0000
D(INTEREST(-9))	0.044316	0.016364	2.708160	0.0068
D(INTEREST(-10))	0.054407	0.016376	3.322426	0.0009
D(INTEREST(-11))	0.082714	0.016406	5.041696	0.0000
D(INTEREST(-12))	0.025645	0.016391	1.564567	0.1178
D(INTEREST(-13))	0.044205	0.016352	2.703386	0.0069
D(INTEREST(-14))	0.038820	0.016365	2.372123	0.0177
D(INTEREST(-15))	-0.022044	0.016363	-1.347183	0.1780
D(INTEREST(-16))	0.009813	0.016258	0.603552	0.5462
D(INTEREST(-17))	-0.096211	0.015619	-6.159827	0.0000

R-squared	0.110372	Mean dependent var	-0.000548
Adjusted R-squared	0.106710	S.D. dependent var	0.058988
S.E. of regression	0.055752	Akaike info criterion	-2.931487
Sum squared resid	12.83709	Schwarz criterion	-2.904017
Log likelihood	6097.905	Hannan-Quinn criter.	-2.921768
Durbin-Watson stat	1.997888		

(b) ADF test

Null Hypothesis: D(INTEREST) has a unit root
Exogenous: Constant
Lag Length: 16 (Automatic - based on SIC, maxlag=30)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-13.77364	0.0000
Test critical values:	1% level	-3.431742	
	5% level	-2.862040	
	10% level	-2.567079	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(INTEREST,2)
Method: Least Squares
Date: 03/10/14 Time: 13:20
Sample (adjusted): 12/20/1996 11/13/2012
Included observations: 4148 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(INTEREST(-1))	-1.019526	0.074020	-13.77364	0.0000
D(INTEREST(-1),2)	-0.275909	0.072612	-3.799777	0.0001
D(INTEREST(-2),2)	-0.406164	0.071277	-5.698360	0.0000
D(INTEREST(-3),2)	-0.452161	0.070147	-6.445936	0.0000
D(INTEREST(-4),2)	-0.438882	0.068942	-6.365985	0.0000
D(INTEREST(-5),2)	-0.365854	0.067535	-5.417270	0.0000
D(INTEREST(-6),2)	-0.270817	0.065901	-4.109446	0.0000
D(INTEREST(-7),2)	-0.243323	0.063790	-3.814461	0.0001
D(INTEREST(-8),2)	-0.177315	0.061332	-2.891067	0.0039
D(INTEREST(-9),2)	-0.133357	0.058523	-2.278733	0.0227
D(INTEREST(-10),2)	-0.079346	0.055185	-1.437820	0.1506
D(INTEREST(-11),2)	0.002939	0.051411	0.057163	0.9544
D(INTEREST(-12),2)	0.028078	0.046670	0.601621	0.5475
D(INTEREST(-13),2)	0.071723	0.040787	1.758462	0.0787
D(INTEREST(-14),2)	0.109957	0.033772	3.255886	0.0011
D(INTEREST(-15),2)	0.087336	0.025539	3.419767	0.0006
D(INTEREST(-16),2)	0.096632	0.015622	6.185651	0.0000
C	-0.000555	0.000867	-0.640864	0.5216

R-squared	0.646103	Mean dependent var	3.62E-06
Adjusted R-squared	0.644646	S.D. dependent var	0.093548
S.E. of regression	0.055765	Akaike info criterion	-2.930994
Sum squared resid	12.84342	Schwarz criterion	-2.903524
Log likelihood	6096.881	Hannan-Quinn criter.	-2.921274
F-statistic	443.5326	Durbin-Watson stat	1.997954
Prob(F-statistic)	0.000000		

(c) ADF test for 1st diff

Figure 58: Switzerland: interest rate stationary test

Sample: 11/26/1996 11/13/2012
Included observations: 4166

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.999	0.999	4161.3	0.000
		2	0.998	0.036	8316.5	0.000
		3	0.997	-0.005	12465.	0.000
		4	0.997	0.013	16608.	0.000
		5	0.996	-0.001	20745.	0.000
		6	0.995	-0.017	24876.	0.000
		7	0.994	-0.009	29000.	0.000
		8	0.993	-0.017	33118.	0.000
		9	0.992	-0.017	37228.	0.000
		10	0.991	0.021	41333.	0.000
		11	0.990	-0.011	45430.	0.000
		12	0.989	0.007	49521.	0.000
		13	0.988	-0.017	53605.	0.000
		14	0.987	0.004	57683.	0.000
		15	0.987	0.022	61754.	0.000
		16	0.986	0.018	65818.	0.000
		17	0.985	0.003	69877.	0.000
		18	0.984	-0.015	73929.	0.000
		19	0.983	-0.016	77975.	0.000
		20	0.982	-0.022	82014.	0.000
		21	0.981	-0.002	86046.	0.000
		22	0.980	0.001	90071.	0.000
		23	0.979	0.006	94090.	0.000
		24	0.978	-0.000	98101.	0.000
		25	0.977	0.006	102106	0.000
		26	0.976	0.000	106105	0.000
		27	0.975	-0.011	110097	0.000
		28	0.974	-0.002	114081	0.000
		29	0.974	0.013	118060	0.000
		30	0.973	0.017	122031	0.000
		31	0.972	0.023	125997	0.000
		32	0.971	-0.017	129957	0.000
		33	0.970	0.009	133910	0.000
		34	0.969	0.011	137858	0.000
		35	0.968	-0.000	141799	0.000
		36	0.967	-0.013	145735	0.000

(a) Correlogram

Null Hypothesis: SPOT has a unit root
Exogenous: None
Lag Length: 1 (Automatic - based on SIC, maxlag=30)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.734932	0.3984
Test critical values:	1% level	-2.565517	
	5% level	-1.940900	
	10% level	-1.616648	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(SPOT)
Method: Least Squares
Date: 03/10/14 Time: 13:27
Sample (adjusted): 11/28/1996 11/13/2012
Included observations: 4164 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
SPOT(-1)	-7.84E-05	0.000107	-0.734932	0.4624
D(SPOT(-1))	-0.048167	0.015482	-3.111212	0.0019

R-squared	0.002362	Mean dependent var	-8.25E-05
Adjusted R-squared	0.002123	S.D. dependent var	0.009072
S.E. of regression	0.009062	Akaike info criterion	-6.568972
Sum squared resid	0.341783	Schwarz criterion	-6.565929
Log likelihood	13678.60	Hannan-Quinn criter.	-6.567896
Durbin-Watson stat	1.999333		

(b) ADF test

Null Hypothesis: D(SPOT) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=30)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-67.70245	0.0001
Test critical values:	1% level	-3.431736	
	5% level	-2.862038	
	10% level	-2.567078	

*MacKinnon (1996) one-sided p-values.

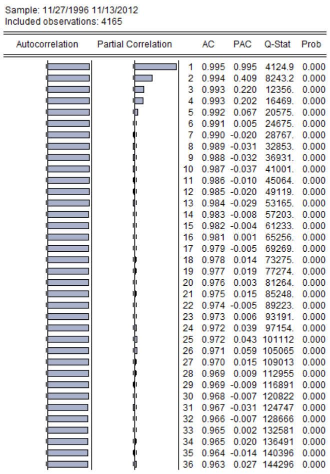
Augmented Dickey-Fuller Test Equation
Dependent Variable: D(SPOT,2)
Method: Least Squares
Date: 03/10/14 Time: 13:27
Sample (adjusted): 11/28/1996 11/13/2012
Included observations: 4164 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(SPOT(-1))	-1.048205	0.015483	-67.70245	0.0000
C	-8.65E-05	0.000140	-0.615817	0.5380

R-squared	0.524105	Mean dependent var	-6.96E-07
Adjusted R-squared	0.523990	S.D. dependent var	0.013135
S.E. of regression	0.009062	Akaike info criterion	-6.568933
Sum squared resid	0.341797	Schwarz criterion	-6.565891
Log likelihood	13678.52	Hannan-Quinn criter.	-6.567857
F-statistic	4583.622	Durbin-Watson stat	1.999336
Prob(F-statistic)	0.000000		

(c) ADF test for 1st diff

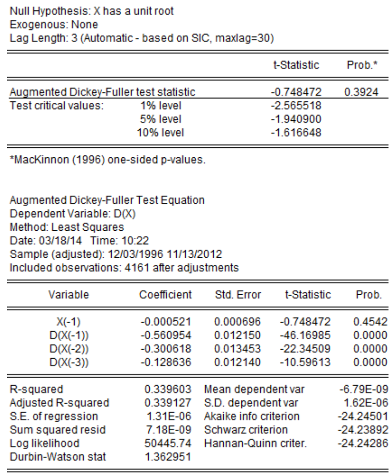
Figure 59: Switzerland: exchange spot rate stationary test



Sample: 11/27/1996 11/13/2012
Included observations: 4165

Lag	AC	PAC	Q-Stat	Prob
1	0.995	0.995	4124.9	0.000
2	0.994	0.409	8243.2	0.000
3	0.993	0.220	12356.	0.000
4	0.993	0.202	16469.	0.000
5	0.992	0.067	20575.	0.000
6	0.991	0.005	24675.	0.000
7	0.990	-0.020	28767.	0.000
8	0.989	-0.031	32853.	0.000
9	0.988	-0.032	36931.	0.000
10	0.987	-0.037	41001.	0.000
11	0.986	-0.010	45064.	0.000
12	0.985	-0.020	49119.	0.000
13	0.984	-0.029	53165.	0.000
14	0.983	-0.008	57203.	0.000
15	0.982	-0.004	61233.	0.000
16	0.981	0.001	65256.	0.000
17	0.979	-0.005	69269.	0.000
18	0.978	0.014	73275.	0.000
19	0.977	0.019	77274.	0.000
20	0.976	0.003	81264.	0.000
21	0.975	0.015	85248.	0.000
22	0.974	-0.005	89223.	0.000
23	0.973	0.006	93191.	0.000
24	0.972	0.039	97154.	0.000
25	0.972	0.043	101112	0.000
26	0.971	0.059	105065	0.000
27	0.970	0.015	109013	0.000
28	0.969	0.009	112955	0.000
29	0.969	-0.009	116891	0.000
30	0.968	-0.007	120822	0.000
31	0.967	-0.031	124747	0.000
32	0.966	-0.007	128666	0.000
33	0.965	0.002	132581	0.000
34	0.965	0.020	136491	0.000
35	0.964	-0.014	140396	0.000
36	0.963	0.027	144296	0.000

(a) Correlogram



Null Hypothesis: X has a unit root
Exogenous: None
Lag Length: 3 (Automatic - based on SIC, maxlag=30)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.748472	0.3924
Test critical values:	1% level	-2.565518	
	5% level	-1.940900	
	10% level	-1.616648	

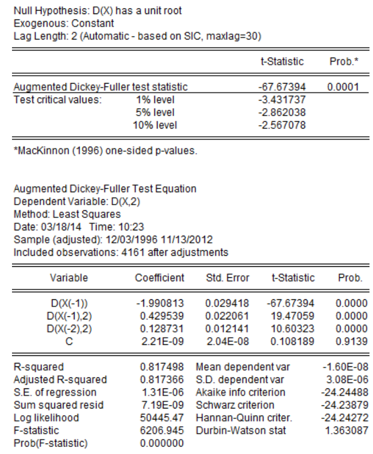
*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(X)
Method: Least Squares
Date: 03/18/14 Time: 10:22
Sample (adjusted): 12/03/1996 11/13/2012
Included observations: 4161 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
X(-1)	-0.000521	0.000696	-0.748472	0.4542
D(X(-1))	-0.560954	0.012150	-46.16985	0.0000
D(X(-2))	-0.300618	0.013453	-22.34509	0.0000
D(X(-3))	-0.128636	0.012140	-10.59613	0.0000

R-squared	0.339603	Mean dependent var	-6.79E-09
Adjusted R-squared	0.339127	S.D. dependent var	1.62E-06
S.E. of regression	1.31E-06	Akaike info criterion	-24.24501
Sum squared resid	7.18E-09	Schwarz criterion	-24.23892
Log likelihood	50445.74	Hannan-Quinn criter.	-24.24286
Durbin-Watson stat	1.362951		

(b) ADF test



Null Hypothesis: D(X) has a unit root
Exogenous: Constant
Lag Length: 2 (Automatic - based on SIC, maxlag=30)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-67.67394	0.0001
Test critical values:	1% level	-3.431737	
	5% level	-2.862038	
	10% level	-2.567078	

*MacKinnon (1996) one-sided p-values.

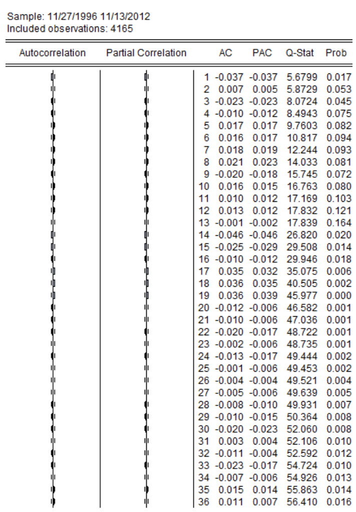
Augmented Dickey-Fuller Test Equation
Dependent Variable: D(X,2)
Method: Least Squares
Date: 03/18/14 Time: 10:23
Sample (adjusted): 12/03/1996 11/13/2012
Included observations: 4161 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(X(-1))	-1.990813	0.029418	-67.67394	0.0000
D(X(-1),2)	0.429539	0.022061	19.47059	0.0000
D(X(-2),2)	0.128731	0.012141	10.60323	0.0000
C	2.21E-09	2.04E-08	0.108189	0.9139

R-squared	0.817498	Mean dependent var	-1.60E-08
Adjusted R-squared	0.817366	S.D. dependent var	3.08E-06
S.E. of regression	1.31E-06	Akaike info criterion	-24.24488
Sum squared resid	7.19E-09	Schwarz criterion	-24.23879
Log likelihood	50445.47	Hannan-Quinn criter.	-24.24272
F-statistic	6206.945	Durbin-Watson stat	1.363087
Prob(F-statistic)	0.000000		

(c) ADF test for 1st diff

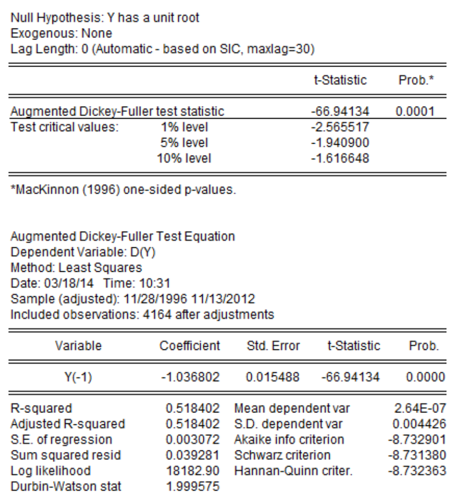
Figure 60: Switzerland: log interest rate difference stationary test



Sample: 11/27/1996 11/13/2012
Included observations: 4165

Lag	AC	PAC	Q-Stat	Prob
1	-0.037	-0.037	5.6799	0.017
2	0.007	0.005	5.8729	0.053
3	-0.023	-0.023	8.0724	0.045
4	-0.010	-0.012	8.4943	0.075
5	0.017	0.017	9.7603	0.082
6	0.016	0.017	10.817	0.094
7	0.018	0.019	12.244	0.093
8	0.021	0.023	14.033	0.081
9	-0.020	-0.018	15.745	0.072
10	0.016	0.015	16.763	0.080
11	0.010	0.012	17.169	0.103
12	0.013	0.012	17.832	0.121
13	-0.001	-0.002	17.839	0.164
14	-0.046	-0.046	26.820	0.020
15	-0.025	-0.029	29.508	0.014
16	-0.010	-0.012	29.946	0.018
17	0.035	0.032	35.075	0.006
18	0.036	0.035	40.505	0.002
19	0.036	0.039	45.977	0.000
20	-0.012	-0.006	46.582	0.001
21	-0.010	-0.006	47.036	0.001
22	-0.020	-0.017	48.722	0.001
23	-0.002	-0.006	48.735	0.001
24	-0.013	-0.017	49.444	0.002
25	-0.001	-0.006	49.453	0.002
26	-0.004	-0.004	49.521	0.004
27	-0.005	-0.006	49.639	0.005
28	-0.008	-0.010	49.931	0.007
29	-0.010	-0.015	50.364	0.008
30	-0.020	-0.023	52.060	0.008
31	0.003	0.004	52.106	0.010
32	-0.011	-0.004	52.592	0.012
33	-0.023	-0.017	54.724	0.010
34	-0.007	-0.006	54.926	0.013
35	0.015	0.014	55.863	0.014
36	0.011	0.007	56.410	0.016

(a) Correlogram



Null Hypothesis: Y has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=30)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-66.94134	0.0001
Test critical values:	1% level	-2.565517	
	5% level	-1.940900	
	10% level	-1.616648	

*MacKinnon (1996) one-sided p-values.

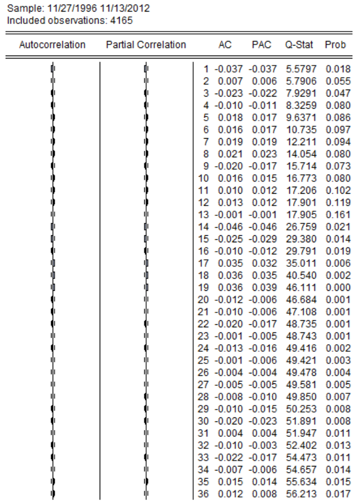
Augmented Dickey-Fuller Test Equation
Dependent Variable: D(Y)
Method: Least Squares
Date: 03/18/14 Time: 10:31
Sample (adjusted): 11/28/1996 11/13/2012
Included observations: 4164 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Y(-1)	-1.036802	0.015488	-66.94134	0.0000

R-squared	0.518402	Mean dependent var	2.64E-07
Adjusted R-squared	0.518402	S.D. dependent var	0.004426
S.E. of regression	0.003072	Akaike info criterion	-8.732901
Sum squared resid	0.039281	Schwarz criterion	-8.731380
Log likelihood	18182.90	Hannan-Quinn criter.	-8.732363
Durbin-Watson stat	1.999575		

(b) ADF test

Figure 61: Switzerland: log exchange spot rate difference stationary test



Sample: 11/27/1996 11/13/2012
Included observations: 4165

	AC	PAC	Q-Stat	Prob
1	-0.037	-0.037	5.5797	0.018
2	0.007	0.006	5.7906	0.055
3	-0.023	-0.022	7.9291	0.047
4	-0.010	-0.011	8.3259	0.080
5	0.018	0.017	9.6371	0.086
6	0.016	0.017	10.735	0.097
7	0.019	0.019	12.211	0.094
8	0.021	0.023	14.054	0.080
9	-0.020	-0.017	15.714	0.073
10	0.016	0.015	16.773	0.080
11	0.010	0.012	17.206	0.102
12	0.013	0.012	17.901	0.119
13	-0.001	-0.001	17.905	0.161
14	-0.046	-0.046	26.759	0.021
15	-0.025	-0.029	29.380	0.014
16	-0.010	-0.012	29.791	0.019
17	0.035	0.032	35.011	0.006
18	0.036	0.035	40.540	0.002
19	0.036	0.039	46.111	0.000
20	-0.012	-0.006	46.684	0.001
21	-0.010	-0.006	47.108	0.001
22	-0.020	-0.017	48.735	0.001
23	-0.001	-0.005	48.743	0.001
24	-0.013	-0.016	49.416	0.002
25	-0.001	-0.006	49.421	0.003
26	-0.004	-0.004	49.478	0.004
27	-0.005	-0.005	49.581	0.005
28	-0.008	-0.010	49.850	0.007
29	-0.010	-0.015	50.253	0.008
30	-0.020	-0.023	51.891	0.008
31	0.004	0.004	51.947	0.011
32	-0.010	-0.003	52.402	0.013
33	-0.022	-0.017	54.473	0.011
34	-0.007	-0.006	54.657	0.014
35	0.015	0.014	55.634	0.015
36	0.012	0.008	56.213	0.017

(a) Correlogram

Null Hypothesis: RF has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=30)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-66.92635	0.0001
Test critical values:	1% level	-2.565517	
	5% level	-1.940900	
	10% level	-1.616648	

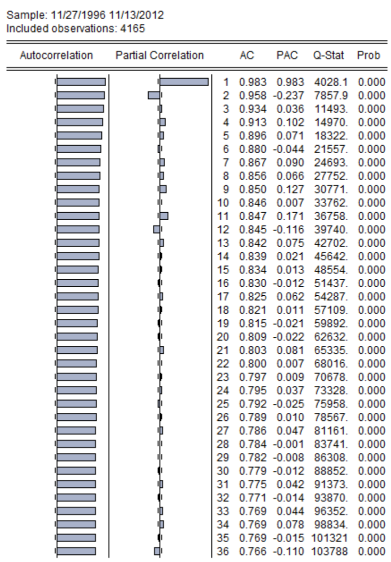
*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(RF)
Method: Least Squares
Date: 03/20/14 Time: 15:53
Sample (adjusted): 11/28/1996 11/13/2012
Included observations: 4164 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RF(-1)	-1.036578	0.015488	-66.92635	0.0000
R-squared	0.518290	Mean dependent var		-2.72E-07
Adjusted R-squared	0.518290	S.D. dependent var		0.004426
S.E. of regression	0.003072	Akaike info criterion		-8.732671
Sum squared resid	0.039290	Schwarz criterion		-8.731149
Log likelihood	18182.42	Hannan-Quinn criter.		-8.732132
Durbin-Watson stat	1.999562			

(b) ADF test

Figure 62: Switzerland: the generalized risk factor stationary test



Sample: 11/27/1996 11/13/2012
Included observations: 4165

	AC	PAC	Q-Stat	Prob
1	0.983	0.983	4028.1	0.000
2	0.958	-0.237	7857.9	0.000
3	0.934	0.036	11493.	0.000
4	0.913	0.102	14970.	0.000
5	0.896	0.071	18322.	0.000
6	0.880	-0.044	21557.	0.000
7	0.867	0.090	24693.	0.000
8	0.856	0.066	27752.	0.000
9	0.850	0.127	30771.	0.000
10	0.846	0.007	33762.	0.000
11	0.847	0.171	36758.	0.000
12	0.845	-0.116	39740.	0.000
13	0.842	0.075	42702.	0.000
14	0.839	0.021	45642.	0.000
15	0.834	0.013	48554.	0.000
16	0.830	-0.012	51437.	0.000
17	0.825	0.062	54287.	0.000
18	0.821	0.011	57109.	0.000
19	0.815	-0.021	59892.	0.000
20	0.809	-0.022	62632.	0.000
21	0.803	0.081	65335.	0.000
22	0.800	0.007	68016.	0.000
23	0.797	0.009	70678.	0.000
24	0.795	0.037	73328.	0.000
25	0.792	-0.025	75958.	0.000
26	0.789	0.010	78567.	0.000
27	0.786	0.047	81161.	0.000
28	0.784	-0.001	83741.	0.000
29	0.782	-0.008	86308.	0.000
30	0.779	-0.012	88852.	0.000
31	0.775	0.042	91373.	0.000
32	0.771	-0.014	93870.	0.000
33	0.769	0.044	96352.	0.000
34	0.769	0.078	98834.	0.000
35	0.769	-0.015	101321	0.000
36	0.766	-0.110	103788	0.000

(a) Correlogram

Null Hypothesis: MEANRF has a unit root
Exogenous: None
Lag Length: 15 (Automatic - based on SIC, maxlag=15)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.867537	0.0000
Test critical values:	1% level	-2.565519	
	5% level	-1.940900	
	10% level	-1.616648	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(MEANRF)
Method: Least Squares
Date: 03/20/14 Time: 15:54
Sample (adjusted): 12/19/1996 11/13/2012
Included observations: 4149 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
MEANRF(-1)	-0.004941	0.000842	-5.867537	0.0000
D(MEANRF(-1))	-0.068604	0.015447	-4.441125	0.0000
D(MEANRF(-2))	-0.074043	0.015269	-4.849131	0.0000
D(MEANRF(-3))	-0.049345	0.015075	-3.273402	0.0011
D(MEANRF(-4))	-0.096150	0.014514	-6.624721	0.0000
D(MEANRF(-5))	-0.032143	0.014236	-2.257889	0.0240
D(MEANRF(-6))	-0.003756	0.012105	-0.310255	0.7564
D(MEANRF(-7))	0.058341	0.011989	4.866379	0.0000
D(MEANRF(-8))	-0.046325	0.010777	-4.298355	0.0000
D(MEANRF(-9))	-0.125283	0.010383	-12.06600	0.0000
D(MEANRF(-10))	-0.121865	0.009211	-13.23034	0.0000
D(MEANRF(-11))	0.121375	0.009293	13.06151	0.0000
D(MEANRF(-12))	-0.028409	0.008342	-3.405668	0.0007
D(MEANRF(-13))	0.051592	0.006795	7.592904	0.0000
D(MEANRF(-14))	0.049212	0.006322	7.784584	0.0000
D(MEANRF(-15))	0.026211	0.006251	4.192848	0.0000
R-squared	0.229206	Mean dependent var		-2.09E-07
Adjusted R-squared	0.226408	S.D. dependent var		9.80E-06
S.E. of regression	8.62E-06	Akaike info criterion		-20.48163
Sum squared resid	3.07E-07	Schwarz criterion		-20.45722
Log likelihood	42505.14	Hannan-Quinn criter.		-20.47299
Durbin-Watson stat	1.973216			

(b) ADF test

Figure 63: Switzerland: the mean of the generalized risk factor stationary test

Sample: 11/27/1996 11/13/2012
Included observations: 4165

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.952	0.952	3780.3	0.000
		2	0.910	0.036	7234.9	0.000
		3	0.872	0.017	10402.	0.000
		4	0.849	0.159	13409.	0.000
		5	0.822	-0.041	16228.	0.000
		6	0.796	0.002	18870.	0.000
		7	0.785	0.192	21444.	0.000
		8	0.762	-0.154	23866.	0.000
		9	0.737	-0.011	26136.	0.000
		10	0.711	0.029	28248.	0.000
		11	0.713	0.237	30372.	0.000
		12	0.711	-0.013	32482.	0.000
		13	0.716	0.144	34623.	0.000
		14	0.722	0.079	36801.	0.000
		15	0.725	-0.031	38997.	0.000
		16	0.726	0.044	41202.	0.000
		17	0.728	0.132	43419.	0.000
		18	0.731	-0.083	45653.	0.000
		19	0.730	0.024	47883.	0.000
		20	0.731	0.053	50119.	0.000
		21	0.730	0.017	52348.	0.000
		22	0.728	-0.007	54568.	0.000
		23	0.725	0.107	56771.	0.000
		24	0.723	-0.000	58959.	0.000
		25	0.721	0.000	61138.	0.000
		26	0.718	0.046	63298.	0.000
		27	0.715	0.046	65445.	0.000
		28	0.712	-0.055	67572.	0.000
		29	0.709	0.049	69681.	0.000
		30	0.706	0.023	71772.	0.000
		31	0.706	0.010	73863.	0.000
		32	0.699	-0.065	75918.	0.000
		33	0.692	0.044	77931.	0.000
		34	0.682	-0.081	79884.	0.000
		35	0.669	-0.048	81767.	0.000
		36	0.655	-0.026	83568.	0.000

(a) Correlogram

Null Hypothesis: DEVRF has a unit root
Exogenous: None
Lag Length: 15 (Automatic - based on SIC, maxlag=15)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		0.626541	0.8516
Test critical values:	1% level	-2.565519	
	5% level	-1.940900	
	10% level	-1.616648	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DEVRF)
Method: Least Squares
Date: 03/20/14 Time: 15:55
Sample (adjusted): 12/19/1996 11/13/2012
Included observations: 4149 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DEVRF(-1)	4.81E-05	7.68E-05	0.626541	0.5310
D(DEVRF(-1))	0.061916	0.015426	4.013830	0.0001
D(DEVRF(-2))	0.072506	0.015365	4.719073	0.0000
D(DEVRF(-3))	-0.007093	0.015275	-0.464330	0.6424
D(DEVRF(-4))	0.091405	0.015065	6.067230	0.0000
D(DEVRF(-5))	0.060626	0.015010	4.038985	0.0001
D(DEVRF(-6))	0.070399	0.010722	6.565673	0.0000
D(DEVRF(-7))	-0.013261	0.010757	-1.232754	0.2177
D(DEVRF(-8))	-0.065959	0.010408	-6.337406	0.0000
D(DEVRF(-9))	-0.015947	0.009591	-1.662608	0.0965
D(DEVRF(-10))	-0.075274	0.009243	-8.144290	0.0000
D(DEVRF(-11))	-0.015510	0.009176	-1.690305	0.0910
D(DEVRF(-12))	-0.048331	0.008604	-5.617091	0.0000
D(DEVRF(-13))	-0.038098	0.008345	-4.565203	0.0000
D(DEVRF(-14))	0.033320	0.008152	4.087203	0.0000
D(DEVRF(-15))	-0.036730	0.007975	-4.605536	0.0000

R-squared	0.103772	Mean dependent var	3.30E-10
Adjusted R-squared	0.100519	S.D. dependent var	4.54E-08
S.E. of regression	4.30E-08	Akaike info criterion	-31.08139
Sum squared resid	7.65E-12	Schwarz criterion	-31.05697
Log likelihood	64494.34	Hannan-Quinn criter.	-31.07275
Durbin-Watson stat	2.015308		

(b) ADF test

Null Hypothesis: D(DEVRF) has a unit root
Exogenous: Constant
Lag Length: 10 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-33.06431	0.0000
Test critical values:	1% level	-3.431740	
	5% level	-2.862039	
	10% level	-2.567079	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DEVRF,2)
Method: Least Squares
Date: 03/20/14 Time: 15:56
Sample (adjusted): 12/13/1996 11/13/2012
Included observations: 4153 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(DEVRF(-1))	-0.918400	0.027776	-33.06431	0.0000
D(DEVRF(-1),2)	-0.002794	0.022945	-0.121779	0.9031
D(DEVRF(-2),2)	0.159658	0.022458	7.109350	0.0000
D(DEVRF(-3),2)	0.175974	0.022111	7.958794	0.0000
D(DEVRF(-4),2)	0.198792	0.021136	9.405580	0.0000
D(DEVRF(-5),2)	0.159222	0.018923	8.414227	0.0000
D(DEVRF(-6),2)	0.220287	0.017352	12.69546	0.0000
D(DEVRF(-7),2)	0.260559	0.016231	16.05308	0.0000
D(DEVRF(-8),2)	0.159176	0.014023	11.35136	0.0000
D(DEVRF(-9),2)	0.103312	0.011782	8.768716	0.0000
D(DEVRF(-10),2)	0.043412	0.008094	5.363751	0.0000
C	3.58E-10	6.93E-10	0.516327	0.6057

R-squared	0.545698	Mean dependent var	2.10E-10
Adjusted R-squared	0.544492	S.D. dependent var	6.61E-08
S.E. of regression	4.46E-08	Akaike info criterion	-31.00926
Sum squared resid	8.25E-12	Schwarz criterion	-30.99096
Log likelihood	64402.73	Hannan-Quinn criter.	-31.00279
F-statistic	452.1901	Durbin-Watson stat	1.994023
Prob(F-statistic)	0.000000		

(c) ADF test for 1st diff

Figure 64: Switzerland: the deviation of the generalized risk factor stationary test

APPENDIX K: STATIONARY TEST: TURKEY

Sample: 7/20/1998 11/13/2012
Included observations: 3737

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.998	0.998	3728.6	0.000
		2	0.997	0.024	7447.4	0.000
		3	0.995	-0.029	11156.	0.000
		4	0.994	-0.010	14853.	0.000
		5	0.993	0.065	18542.	0.000
		6	0.991	-0.038	22221.	0.000
		7	0.990	0.014	25890.	0.000
		8	0.988	-0.021	29549.	0.000
		9	0.987	-0.012	33197.	0.000
		10	0.985	0.044	36836.	0.000
		11	0.984	-0.028	40466.	0.000
		12	0.982	-0.037	44085.	0.000
		13	0.981	-0.010	47692.	0.000
		14	0.979	0.039	51290.	0.000
		15	0.977	-0.039	54877.	0.000
		16	0.976	-0.013	58453.	0.000
		17	0.974	0.001	62018.	0.000
		18	0.973	-0.026	65572.	0.000
		19	0.971	-0.005	69114.	0.000
		20	0.969	-0.012	72644.	0.000
		21	0.967	0.048	76163.	0.000
		22	0.966	0.033	79673.	0.000
		23	0.964	0.012	83172.	0.000
		24	0.963	-0.035	86661.	0.000
		25	0.961	-0.099	90138.	0.000
		26	0.959	0.012	93602.	0.000
		27	0.957	-0.009	97054.	0.000
		28	0.956	0.009	100494	0.000
		29	0.954	-0.010	103921	0.000
		30	0.952	0.034	107336	0.000
		31	0.950	-0.012	110740	0.000
		32	0.948	-0.013	114131	0.000
		33	0.947	0.025	117511	0.000
		34	0.945	-0.008	120880	0.000
		35	0.943	0.005	124237	0.000
		36	0.941	0.037	127583	0.000

(a) Correlogram

Null Hypothesis: INTEREST has a unit root
Exogenous: None
Lag Length: 2 (Automatic - based on SIC, maxlag=29)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.554664	0.1129
Test critical values:	1% level	-2.565581	
	5% level	-1.940909	
	10% level	-1.616643	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(INTEREST)
Method: Least Squares
Date: 03/10/14 Time: 13:58
Sample (adjusted): 7/23/1998 11/13/2012
Included observations: 3734 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INTEREST(-1)	-0.000796	0.000512	-1.554664	0.1201
D(INTEREST(-1))	-0.041020	0.016353	-2.508374	0.0122
D(INTEREST(-2))	0.038652	0.016344	2.364871	0.0181

R-squared	0.003828	Mean dependent var	-0.014395
Adjusted R-squared	0.003294	S.D. dependent var	1.236400
S.E. of regression	1.234362	Akaike info criterion	3.259788
Sum squared resid	5684.734	Schwarz criterion	3.264790
Log likelihood	-6083.025	Hannan-Quinn criter.	3.261567
Durbin-Watson stat	2.001058		

(b) ADF test

Null Hypothesis: D(INTEREST) has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=29)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-42.45379	0.0000
Test critical values:	1% level	-3.431915	
	5% level	-2.862117	
	10% level	-2.567121	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(INTEREST,2)
Method: Least Squares
Date: 03/10/14 Time: 13:59
Sample (adjusted): 7/23/1998 11/13/2012
Included observations: 3734 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(INTEREST(-1))	-1.002933	0.023624	-42.45379	0.0000
D(INTEREST(-1),2)	-0.038379	0.016349	-2.347450	0.0190
C	-0.014463	0.020208	-0.715723	0.4742

R-squared	0.522237	Mean dependent var	0.000268
Adjusted R-squared	0.521981	S.D. dependent var	1.785791
S.E. of regression	1.234677	Akaike info criterion	3.260299
Sum squared resid	5687.636	Schwarz criterion	3.265300
Log likelihood	-6083.977	Hannan-Quinn criter.	3.262078
F-statistic	2039.156	Durbin-Watson stat	2.001038
Prob(F-statistic)	0.000000		

(c) ADF test for 1st diff

Figure 65: Turkey: interest rate stationary test

Sample: 7/20/1998 11/13/2012
Included observations: 3737

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.998	0.998	3727.6	0.000
		2	0.997	0.001	7443.8	0.000
		3	0.995	0.009	11149.	0.000
		4	0.994	0.018	14844.	0.000
		5	0.992	-0.005	18527.	0.000
		6	0.990	-0.001	22201.	0.000
		7	0.989	0.011	25863.	0.000
		8	0.987	0.002	29516.	0.000
		9	0.986	-0.006	33158.	0.000
		10	0.984	0.004	36789.	0.000
		11	0.983	-0.006	40411.	0.000
		12	0.981	-0.008	44021.	0.000
		13	0.979	-0.013	47621.	0.000
		14	0.978	-0.009	51210.	0.000
		15	0.976	-0.019	54787.	0.000
		16	0.974	-0.009	58353.	0.000
		17	0.973	0.000	61907.	0.000
		18	0.971	-0.001	65449.	0.000
		19	0.969	-0.003	68980.	0.000
		20	0.968	-0.002	72499.	0.000
		21	0.966	-0.007	76007.	0.000
		22	0.964	-0.008	79503.	0.000
		23	0.962	0.009	82987.	0.000
		24	0.961	0.014	86460.	0.000
		25	0.959	-0.011	89922.	0.000
		26	0.957	-0.000	93372.	0.000
		27	0.956	0.005	96811.	0.000
		28	0.954	-0.019	100238	0.000
		29	0.952	-0.017	103653	0.000
		30	0.950	-0.009	107056	0.000
		31	0.948	0.001	110447	0.000
		32	0.947	0.010	113826	0.000
		33	0.945	-0.016	117192	0.000
		34	0.943	0.017	120546	0.000
		35	0.941	0.006	123889	0.000
		36	0.939	0.004	127221	0.000

(a) Correlogram

Null Hypothesis: SPOT has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=29)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		0.947080	0.9092
Test critical values:	1% level	-2.565581	
	5% level	-1.940909	
	10% level	-1.616643	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(SPOT)
Method: Least Squares
Date: 03/10/14 Time: 14:06
Sample (adjusted): 7/21/1998 11/13/2012
Included observations: 3736 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
SPOT(-1)	0.000170	0.000180	0.947080	0.3437

R-squared	-0.000518	Mean dependent var	0.000412
Adjusted R-squared	-0.000518	S.D. dependent var	0.014961
S.E. of regression	0.014965	Akaike info criterion	-5.565952
Sum squared resid	0.836446	Schwarz criterion	-5.564286
Log likelihood	10398.20	Hannan-Quinn criter.	-5.565359
Durbin-Watson stat	2.001090		

(b) ADF test

Null Hypothesis: D(SPOT) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=29)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-61.15283	0.0001
Test critical values:	1% level	-3.431915	
	5% level	-2.862117	
	10% level	-2.567120	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(SPOT,2)
Method: Least Squares
Date: 03/10/14 Time: 14:07
Sample (adjusted): 7/22/1998 11/13/2012
Included observations: 3735 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(SPOT(-1))	-1.000913	0.016367	-61.15283	0.0000
C	0.000412	0.000245	1.683075	0.0924

R-squared	0.500446	Mean dependent var	1.61E-06
Adjusted R-squared	0.500312	S.D. dependent var	0.021170
S.E. of regression	0.014965	Akaike info criterion	-5.565667
Sum squared resid	0.836012	Schwarz criterion	-5.562334
Log likelihood	10395.88	Hannan-Quinn criter.	-5.564482
F-statistic	3739.668	Durbin-Watson stat	1.999995
Prob(F-statistic)	0.000000		

(c) ADF test for 1st diff

Figure 66: Turkey: exchange spot rate stationary test

Sample: 7/21/1998 11/13/2012
Included observations: 3736

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.998	0.998	3726.9	0.000
		2	0.997	0.039	7443.6	0.000
		3	0.995	-0.032	11149.	0.000
		4	0.994	-0.015	14844.	0.000
		5	0.992	0.076	18529.	0.000
		6	0.991	-0.033	22205.	0.000
		7	0.989	-0.001	25870.	0.000
		8	0.988	-0.009	29524.	0.000
		9	0.986	-0.010	33168.	0.000
		10	0.985	0.027	36803.	0.000
		11	0.983	-0.029	40427.	0.000
		12	0.982	-0.018	44040.	0.000
		13	0.980	-0.017	47641.	0.000
		14	0.978	0.017	51232.	0.000
		15	0.977	0.010	54813.	0.000
		16	0.975	-0.020	58382.	0.000
		17	0.973	-0.019	61941.	0.000
		18	0.972	-0.031	65487.	0.000
		19	0.970	-0.028	69020.	0.000
		20	0.968	0.075	72543.	0.000
		21	0.967	-0.007	76055.	0.000
		22	0.965	0.018	79556.	0.000
		23	0.963	0.007	83047.	0.000
		24	0.961	-0.114	86525.	0.000
		25	0.960	-0.022	89990.	0.000
		26	0.958	0.031	93442.	0.000
		27	0.956	-0.012	96881.	0.000
		28	0.954	-0.005	100307	0.000
		29	0.952	0.015	103721	0.000
		30	0.950	0.019	107122	0.000
		31	0.948	-0.010	110512	0.000
		32	0.946	-0.020	113888	0.000
		33	0.945	0.028	117253	0.000
		34	0.943	0.004	120606	0.000
		35	0.941	0.002	123947	0.000
		36	0.939	0.035	127276	0.000

(a) Correlogram

Null Hypothesis: X has a unit root
Exogenous: None
Lag Length: 2 (Automatic - based on SIC, maxlag=29)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.553220	0.1132
Test critical values:	1% level	-2.565582	
	5% level	-1.940909	
	10% level	-1.616643	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(X)
Method: Least Squares
Date: 03/18/14 Time: 10:45
Sample (adjusted): 7/24/1998 11/13/2012
Included observations: 3733 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
X(-1)	-0.000855	0.000551	-1.553220	0.1205
D(X(-1))	-0.041486	0.016357	-2.536215	0.0112
D(X(-2))	0.037942	0.016356	2.319825	0.0204

R-squared	0.003837	Mean dependent var	-1.54E-07
Adjusted R-squared	0.003303	S.D. dependent var	1.47E-05
S.E. of regression	1.47E-05	Akaike info criterion	-19.41871
Sum squared resid	8.04E-07	Schwarz criterion	-19.41371
Log likelihood	36248.03	Hannan-Quinn criter.	-19.41693
Durbin-Watson stat	1.999836		

(b) ADF test

Null Hypothesis: D(X) has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=29)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-42.48493	0.0000
Test critical values:	1% level	-3.431916	
	5% level	-2.862117	
	10% level	-2.567121	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(X,2)
Method: Least Squares
Date: 03/18/14 Time: 10:46
Sample (adjusted): 7/24/1998 11/13/2012
Included observations: 3733 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(X(-1))	-1.004165	0.023636	-42.48493	0.0000
D(X(-1),2)	-0.037652	0.016361	-2.301378	0.0214
C	-1.55E-07	2.40E-07	-0.643113	0.5202

R-squared	0.522405	Mean dependent var	2.71E-11
Adjusted R-squared	0.522149	S.D. dependent var	2.12E-05
S.E. of regression	1.47E-05	Akaike info criterion	-19.41818
Sum squared resid	8.05E-07	Schwarz criterion	-19.41317
Log likelihood	36247.03	Hannan-Quinn criter.	-19.41640
F-statistic	2039.979	Durbin-Watson stat	1.999808
Prob(F-statistic)	0.000000		

(c) ADF test for 1st diff

Figure 67: Turkey: log interest rate difference stationary test

Sample: 7/21/1998 11/13/2012
Included observations: 3736

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.042	0.042	6.6866	0.010
		2	-0.036	-0.038	11.590	0.003
		3	-0.036	-0.033	16.499	0.001
		4	-0.013	-0.011	17.104	0.002
		5	0.008	0.007	17.372	0.004
		6	-0.031	-0.034	21.008	0.002
		7	-0.054	-0.052	31.865	0.000
		8	0.000	0.003	31.865	0.000
		9	0.003	-0.003	31.910	0.000
		10	-0.005	-0.010	32.012	0.000
		11	0.044	0.044	39.131	0.000
		12	0.040	0.036	45.065	0.000
		13	0.036	0.033	49.930	0.000
		14	0.071	0.072	68.595	0.000
		15	0.036	0.038	73.499	0.000
		16	-0.005	0.000	73.599	0.000
		17	-0.001	0.009	73.605	0.000
		18	-0.019	-0.009	75.001	0.000
		19	0.010	0.017	75.415	0.000
		20	0.004	0.009	75.471	0.000
		21	0.006	0.016	75.604	0.000
		22	-0.018	-0.016	76.764	0.000
		23	-0.038	-0.039	82.152	0.000
		24	0.029	0.027	85.319	0.000
		25	-0.011	-0.027	85.816	0.000
		26	0.016	0.008	86.791	0.000
		27	0.076	0.070	108.50	0.000
		28	0.087	0.077	136.84	0.000
		29	0.015	0.008	137.70	0.000
		30	-0.008	0.001	137.97	0.000
		31	-0.028	-0.018	140.92	0.000
		32	0.046	0.048	149.05	0.000
		33	-0.024	-0.027	151.19	0.000
		34	-0.027	-0.009	153.86	0.000
		35	-0.006	0.003	154.01	0.000
		36	-0.041	-0.042	160.51	0.000

(a) Correlogram

Null Hypothesis: Y has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=29)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-58.46715	0.0001
Test critical values:	1% level	-2.565581	
	5% level	-1.940909	
	10% level	-1.616643	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(Y)
Method: Least Squares
Date: 03/18/14 Time: 10:52
Sample (adjusted): 7/22/1998 11/13/2012
Included observations: 3735 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Y(-1)	-0.955887	0.016349	-58.46715	0.0000

R-squared	0.477938	Mean dependent var	-3.06E-07
Adjusted R-squared	0.477938	S.D. dependent var	0.007016
S.E. of regression	0.005069	Akaike info criterion	-7.731083
Sum squared resid	0.095944	Schwarz criterion	-7.729416
Log likelihood	14438.80	Hannan-Quinn criter.	-7.730490
Durbin-Watson stat	1.996781		

(b) ADF test

Figure 68: Turkey: log exchange spot rate difference stationary test

Sample: 7/21/1998 11/13/2012
Included observations: 3736

Lag	AC	PAC	Q-Stat	Prob
1	0.040	0.040	5.8820	0.015
2	-0.039	-0.041	11.580	0.003
3	-0.039	-0.036	17.292	0.001
4	-0.015	-0.014	18.181	0.001
5	0.006	0.004	18.307	0.003
6	-0.034	-0.037	22.648	0.001
7	-0.057	-0.055	34.743	0.000
8	-0.003	-0.001	34.770	0.000
9	0.001	-0.006	34.771	0.000
10	-0.008	-0.014	35.013	0.000
11	0.041	0.040	41.242	0.000
12	0.037	0.033	46.415	0.000
13	0.034	0.030	50.685	0.000
14	0.068	0.069	68.251	0.000
15	0.034	0.036	72.564	0.000
16	-0.007	-0.002	72.773	0.000
17	-0.004	0.007	72.822	0.000
18	-0.022	-0.011	74.580	0.000
19	0.008	0.015	74.830	0.000
20	0.001	0.006	74.834	0.000
21	0.003	0.013	74.870	0.000
22	-0.021	-0.019	76.488	0.000
23	-0.041	-0.042	82.831	0.000
24	0.026	0.025	85.391	0.000
25	-0.015	-0.030	86.203	0.000
26	0.013	0.005	86.829	0.000
27	0.073	0.067	106.79	0.000
28	0.084	0.074	133.08	0.000
29	0.012	0.005	133.60	0.000
30	-0.012	-0.002	134.13	0.000
31	-0.031	-0.021	137.87	0.000
32	0.043	0.046	144.88	0.000
33	-0.028	-0.030	147.73	0.000
34	-0.030	-0.012	151.20	0.000
35	-0.010	0.001	151.58	0.000
36	-0.045	-0.045	159.37	0.000

(a) Correlogram

Null Hypothesis: RF has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=29)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-58.70194	0.0001
Test critical values:	1% level	-2.565581	
	5% level	-1.940909	
	10% level	-1.616643	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(RF)
Method: Least Squares
Date: 03/20/14 Time: 15:59
Sample (adjusted): 7/22/1998 11/13/2012
Included observations: 3735 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RF(-1)	-0.959887	0.016352	-58.70194	0.0000

R-squared	0.479938	Mean dependent var	4.64E-07
Adjusted R-squared	0.479938	S.D. dependent var	0.007016
S.E. of regression	0.005059	Akaike info criterion	-7.734915
Sum squared resid	0.095577	Schwarz criterion	-7.733249
Log likelihood	14445.95	Hannan-Quinn criter.	-7.734323
Durbin-Watson stat	1.996754		

(b) ADF test

Figure 69: Turkey: the generalized risk factor stationary test

Sample: 7/21/1998 11/13/2012
Included observations: 3736

Lag	AC	PAC	Q-Stat	Prob
1	0.983	0.983	3614.7	0.000
2	0.971	0.127	7140.8	0.000
3	0.972	0.418	10675.	0.000
4	0.974	0.188	14223.	0.000
5	0.967	-0.065	17721.	0.000
6	0.959	-0.020	21165.	0.000
7	0.955	-0.035	24583.	0.000
8	0.950	-0.107	27966.	0.000
9	0.943	-0.034	31301.	0.000
10	0.938	-0.006	34599.	0.000
11	0.937	0.147	37892.	0.000
12	0.933	0.006	41157.	0.000
13	0.929	0.105	44393.	0.000
14	0.924	-0.033	47596.	0.000
15	0.919	-0.059	50768.	0.000
16	0.916	0.021	53920.	0.000
17	0.915	0.032	57061.	0.000
18	0.915	0.131	60203.	0.000
19	0.912	0.049	63330.	0.000
20	0.908	-0.028	66426.	0.000
21	0.906	0.072	69515.	0.000
22	0.906	-0.058	72599.	0.000
23	0.903	-0.011	75669.	0.000
24	0.900	-0.042	78718.	0.000
25	0.898	-0.045	81751.	0.000
26	0.895	0.013	84768.	0.000
27	0.891	-0.070	87755.	0.000
28	0.885	-0.036	90706.	0.000
29	0.881	-0.057	93628.	0.000
30	0.877	-0.032	96529.	0.000
31	0.873	0.002	99398.	0.000
32	0.867	-0.018	102233	0.000
33	0.862	0.013	105033	0.000
34	0.856	-0.021	107798	0.000
35	0.852	0.014	110534	0.000
36	0.847	0.006	113242	0.000

(a) Correlogram

Null Hypothesis: MEANRF has a unit root
Exogenous: None
Lag Length: 5 (Automatic - based on SIC, maxlag=15)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.010463	0.0426
Test critical values:	1% level	-2.565582	
	5% level	-1.940909	
	10% level	-1.616642	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(MEANRF)
Method: Least Squares
Date: 03/20/14 Time: 16:01
Sample (adjusted): 7/29/1998 11/13/2012
Included observations: 3730 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
MEANRF(-1)	-0.002925	0.001455	-2.010463	0.0445
D(MEANRF(-1))	0.040277	0.016000	2.517381	0.0119
D(MEANRF(-2))	-0.407100	0.015009	-27.12412	0.0000
D(MEANRF(-3))	-0.148521	0.014611	-10.16478	0.0000
D(MEANRF(-4))	0.156331	0.013471	11.60522	0.0000
D(MEANRF(-5))	-0.069903	0.013305	-5.254019	0.0000

R-squared	0.286608	Mean dependent var	8.47E-09
Adjusted R-squared	0.285650	S.D. dependent var	1.66E-05
S.E. of regression	1.41E-05	Akaike info criterion	-19.50374
Sum squared resid	7.37E-07	Schwarz criterion	-19.49373
Log likelihood	36380.47	Hannan-Quinn criter.	-19.50018
Durbin-Watson stat	2.057039		

(b) ADF test

Null Hypothesis: D(MEANRF) has a unit root
Exogenous: Constant
Lag Length: 10 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-24.25399	0.0000
Test critical values:	1% level	-3.431920	
	5% level	-2.862119	
	10% level	-2.567122	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(MEANRF,2)
Method: Least Squares
Date: 03/20/14 Time: 16:01
Sample (adjusted): 8/06/1998 11/13/2012
Included observations: 3724 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(MEANRF(-1))	-1.150117	0.047420	-24.25399	0.0000
D(MEANRF(-1),2)	0.191934	0.043955	4.366627	0.0000
D(MEANRF(-2),2)	0.098781	0.041378	2.387317	0.0170
D(MEANRF(-3),2)	0.083437	0.039927	2.089731	0.0367
D(MEANRF(-4),2)	0.067301	0.036137	1.862355	0.0626
D(MEANRF(-5),2)	0.370063	0.032678	11.32467	0.0000
D(MEANRF(-6),2)	0.209897	0.030193	6.951822	0.0000
D(MEANRF(-7),2)	0.198017	0.026578	7.450459	0.0000
D(MEANRF(-8),2)	0.118239	0.020018	5.906681	0.0000
D(MEANRF(-9),2)	0.033529	0.014352	2.336204	0.0195
D(MEANRF(-10),2)	-0.059395	0.009093	-6.531853	0.0000
C	1.25E-07	1.45E-07	0.857348	0.3913

R-squared	0.701348	Mean dependent var	1.01E-07
Adjusted R-squared	0.700463	S.D. dependent var	1.62E-05
S.E. of regression	8.87E-06	Akaike info criterion	-20.42476
Sum squared resid	2.92E-07	Schwarz criterion	-20.40471
Log likelihood	38042.91	Hannan-Quinn criter.	-20.41763
F-statistic	792.4720	Durbin-Watson stat	1.829569
Prob(F-statistic)	0.000000		

(c) ADF test for 1st diff

Figure 70: Turkey: the mean of the generalized risk factor stationary test

Sample: 7/21/1998 11/13/2012
Included observations: 3736

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.999	0.999	3729.3	0.000
		2	0.997	-0.040	7449.2	0.000
		3	0.996	-0.019	11159.	0.000
		4	0.994	0.006	14860.	0.000
		5	0.993	-0.007	18550.	0.000
		6	0.991	-0.015	22231.	0.000
		7	0.990	0.003	25901.	0.000
		8	0.988	-0.011	29561.	0.000
		9	0.987	0.014	33212.	0.000
		10	0.985	-0.019	36852.	0.000
		11	0.984	-0.023	40481.	0.000
		12	0.982	0.004	44100.	0.000
		13	0.981	-0.009	47708.	0.000
		14	0.979	0.022	51306.	0.000
		15	0.978	-0.015	54893.	0.000
		16	0.976	-0.006	58470.	0.000
		17	0.974	-0.002	62035.	0.000
		18	0.973	-0.007	65590.	0.000
		19	0.971	-0.009	69134.	0.000
		20	0.970	-0.003	72667.	0.000
		21	0.968	0.001	76189.	0.000
		22	0.966	-0.006	79700.	0.000
		23	0.965	-0.004	83200.	0.000
		24	0.963	-0.003	86689.	0.000
		25	0.961	-0.001	90166.	0.000
		26	0.960	-0.005	93632.	0.000
		27	0.958	-0.007	97087.	0.000
		28	0.956	-0.017	100530	0.000
		29	0.954	-0.084	103960	0.000
		30	0.952	0.010	107377	0.000
		31	0.950	0.002	110781	0.000
		32	0.948	-0.004	114172	0.000
		33	0.946	-0.011	117550	0.000
		34	0.944	0.000	120914	0.000
		35	0.942	-0.009	124265	0.000
		36	0.940	-0.001	127602	0.000

(a) Correlogram

Null Hypothesis: DEVRF has a unit root
Exogenous: None
Lag Length: 1 (Automatic - based on SIC, maxlag=29)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.321830	0.5698
Test critical values:	1% level	-2.565581	
	5% level	-1.940909	
	10% level	-1.616643	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DEVRF)
Method: Least Squares
Date: 03/20/14 Time: 16:02
Sample (adjusted): 7/23/1998 11/13/2012
Included observations: 3734 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DEVRF(-1)	-9.23E-05	0.000287	-0.321830	0.7476
D(DEVRF(-1))	0.069365	0.016331	4.247440	0.0000

R-squared	0.004696	Mean dependent var	6.83E-09
Adjusted R-squared	0.004429	S.D. dependent var	5.90E-07
S.E. of regression	5.88E-07	Akaike info criterion	-25.85349
Sum squared resid	1.29E-09	Schwarz criterion	-25.85015
Log likelihood	48270.46	Hannan-Quinn criter.	-25.85230
Durbin-Watson stat	2.004435		

(b) ADF test

Null Hypothesis: D(DEVRF) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=29)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-57.00120	0.0001
Test critical values:	1% level	-3.431915	
	5% level	-2.862117	
	10% level	-2.567121	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DEVRF,2)
Method: Least Squares
Date: 03/20/14 Time: 16:03
Sample (adjusted): 7/23/1998 11/13/2012
Included observations: 3734 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(DEVRF(-1))	-0.930830	0.016330	-57.00120	0.0000
C	6.36E-09	9.63E-09	0.660495	0.5090

R-squared	0.465417	Mean dependent var	-2.84E-11
Adjusted R-squared	0.465273	S.D. dependent var	8.05E-07
S.E. of regression	5.88E-07	Akaike info criterion	-25.85358
Sum squared resid	1.29E-09	Schwarz criterion	-25.85024
Log likelihood	48270.63	Hannan-Quinn criter.	-25.85239
F-statistic	3249.136	Durbin-Watson stat	2.004396
Prob(F-statistic)	0.000000		

(c) ADF test for 1st diff

Figure 71: Turkey: the deviation of the generalized risk factor stationary test

APPENDIX L: STATIONARY TEST: UNITED KINGDOM

Sample: 11/26/1996 11/13/2012
Included observations: 4166

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.995	0.995	4130.2	0.000
		2	0.993	0.298	8245.9	0.000
		3	0.993	0.232	12357.	0.000
		4	0.994	0.370	16478.	0.000
		5	0.993	0.076	20595.	0.000
		6	0.991	-0.126	24696.	0.000
		7	0.991	0.135	28797.	0.000
		8	0.990	-0.077	32893.	0.000
		9	0.990	-0.084	36983.	0.000
		10	0.989	0.075	41067.	0.000
		11	0.988	-0.041	45146.	0.000
		12	0.987	-0.044	49219.	0.000
		13	0.986	0.050	53286.	0.000
		14	0.985	-0.046	57347.	0.000
		15	0.985	-0.017	61402.	0.000
		16	0.984	0.022	65451.	0.000
		17	0.983	-0.024	69494.	0.000
		18	0.982	-0.030	73530.	0.000
		19	0.981	0.032	77560.	0.000
		20	0.980	-0.026	81584.	0.000
		21	0.979	-0.013	85601.	0.000
		22	0.978	0.008	89611.	0.000
		23	0.977	-0.016	93614.	0.000
		24	0.976	-0.017	97611.	0.000
		25	0.975	0.006	101601	0.000
		26	0.974	-0.014	105583	0.000
		27	0.974	-0.003	109559	0.000
		28	0.973	0.005	113528	0.000
		29	0.972	-0.008	117490	0.000
		30	0.971	-0.005	121445	0.000
		31	0.970	0.003	125393	0.000
		32	0.969	-0.009	129333	0.000
		33	0.968	-0.001	133267	0.000
		34	0.967	-0.006	137193	0.000
		35	0.966	-0.001	141112	0.000
		36	0.965	0.021	145025	0.000

(a) Correlogram

Null Hypothesis: INTEREST has a unit root
Exogenous: None
Lag Length: 12 (Automatic - based on SIC, maxlag=30)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.662878	0.0911
Test critical values:	1% level	-2.565519	
	5% level	-1.940900	
	10% level	-1.616648	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(INTEREST)
Method: Least Squares
Date: 03/10/14 Time: 14:15
Sample (adjusted): 12/13/1996 11/13/2012
Included observations: 4153 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INTEREST(-1)	-0.000324	0.000195	-1.662878	0.0964
D(INTEREST(-1))	-0.236873	0.015427	-15.35421	0.0000
D(INTEREST(-2))	-0.055064	0.015860	-3.471924	0.0005
D(INTEREST(-3))	0.053252	0.015880	3.353325	0.0008
D(INTEREST(-4))	0.025193	0.015868	1.587617	0.1124
D(INTEREST(-5))	0.087602	0.015568	5.626996	0.0000
D(INTEREST(-6))	0.080986	0.011255	7.195215	0.0000
D(INTEREST(-7))	-0.028775	0.010435	-2.757382	0.0059
D(INTEREST(-8))	0.031994	0.008797	3.636762	0.0003
D(INTEREST(-9))	-0.002278	0.008736	-0.260748	0.7943
D(INTEREST(-10))	0.027438	0.007786	3.524187	0.0004
D(INTEREST(-11))	-0.015144	0.007027	-2.154980	0.0312
D(INTEREST(-12))	0.035508	0.006120	5.802331	0.0000

R-squared	0.078744	Mean dependent var	-0.001440
Adjusted R-squared	0.076074	S.D. dependent var	0.060812
S.E. of regression	0.058453	Akaike info criterion	-2.838067
Sum squared resid	14.14528	Schwarz criterion	-2.818248
Log likelihood	5906.247	Hannan-Quinn criter.	-2.831055
Durbin-Watson stat	1.999491		

(b) ADF test

Null Hypothesis: D(INTEREST) has a unit root
Exogenous: Constant
Lag Length: 11 (Automatic - based on SIC, maxlag=30)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-19.57560	0.0000
Test critical values:	1% level	-3.431740	
	5% level	-2.862039	
	10% level	-2.567079	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(INTEREST,2)
Method: Least Squares
Date: 03/10/14 Time: 14:16
Sample (adjusted): 12/13/1996 11/13/2012
Included observations: 4153 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(INTEREST(-1))	-0.999809	0.051074	-19.57560	0.0000
D(INTEREST(-1),2)	-0.237406	0.048050	-4.940783	0.0000
D(INTEREST(-2),2)	-0.292805	0.045030	-6.502380	0.0000
D(INTEREST(-3),2)	-0.239889	0.041800	-5.739026	0.0000
D(INTEREST(-4),2)	-0.215044	0.038255	-5.621298	0.0000
D(INTEREST(-5),2)	-0.127805	0.034602	-3.693625	0.0002
D(INTEREST(-6),2)	-0.047187	0.030260	-1.559403	0.1190
D(INTEREST(-7),2)	-0.076255	0.026098	-2.921895	0.0035
D(INTEREST(-8),2)	-0.044608	0.021097	-2.114459	0.0345
D(INTEREST(-9),2)	-0.047207	0.015486	-3.048325	0.0023
D(INTEREST(-10),2)	-0.020030	0.010550	-1.898543	0.0577
D(INTEREST(-11),2)	-0.035367	0.006121	-5.778220	0.0000
C	-0.001499	0.000909	-1.648518	0.0993

R-squared	0.624497	Mean dependent var	-2.04E-05
Adjusted R-squared	0.623409	S.D. dependent var	0.095252
S.E. of regression	0.058453	Akaike info criterion	-2.838056
Sum squared resid	14.14545	Schwarz criterion	-2.818236
Log likelihood	5906.223	Hannan-Quinn criter.	-2.831044
F-statistic	573.7679	Durbin-Watson stat	1.999421
Prob(F-statistic)	0.000000		

(c) ADF test for 1st diff

Figure 72: United Kingdom: interest rate stationary test

Sample: 11/26/1996 11/13/2012
Included observations: 4166

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.998	0.998	4155.6	0.000
		2	0.997	-0.030	8298.1	0.000
		3	0.995	0.021	12428.	0.000
		4	0.993	0.008	16546.	0.000
		5	0.992	0.001	20651.	0.000
		6	0.990	0.011	24744.	0.000
		7	0.989	-0.015	28825.	0.000
		8	0.987	-0.015	32894.	0.000
		9	0.985	-0.007	36950.	0.000
		10	0.984	0.009	40993.	0.000
		11	0.982	0.023	45024.	0.000
		12	0.981	0.024	49044.	0.000
		13	0.979	0.006	53053.	0.000
		14	0.978	-0.021	57051.	0.000
		15	0.976	-0.018	61037.	0.000
		16	0.974	-0.024	65010.	0.000
		17	0.973	0.004	68970.	0.000
		18	0.971	-0.033	72917.	0.000
		19	0.969	0.001	76852.	0.000
		20	0.968	0.006	80773.	0.000
		21	0.966	-0.014	84681.	0.000
		22	0.964	0.010	88576.	0.000
		23	0.962	0.012	92458.	0.000
		24	0.961	0.024	96328.	0.000
		25	0.959	0.002	100187	0.000
		26	0.958	0.016	104033	0.000
		27	0.956	-0.025	107868	0.000
		28	0.955	0.027	111692	0.000
		29	0.953	0.014	115505	0.000
		30	0.952	-0.012	119307	0.000
		31	0.950	0.010	123097	0.000
		32	0.949	-0.007	126877	0.000
		33	0.947	-0.014	130645	0.000
		34	0.945	-0.014	134402	0.000
		35	0.944	-0.027	138146	0.000
		36	0.942	-0.007	141877	0.000

(a) Correlogram

Null Hypothesis: SPOT has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=30)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.316903	0.5716
Test critical values:	1% level	-2.565517	
	5% level	-1.940900	
	10% level	-1.616648	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(SPOT)
Method: Least Squares
Date: 03/10/14 Time: 14:24
Sample (adjusted): 11/27/1996 11/13/2012
Included observations: 4165 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
SPOT(-1)	-2.73E-05	8.63E-05	-0.316903	0.7513

R-squared	0.000019	Mean dependent var	-2.04E-05
Adjusted R-squared	0.000019	S.D. dependent var	0.009331
S.E. of regression	0.009331	Akaike info criterion	-6.510731
Sum squared resid	0.362541	Schwarz criterion	-6.509210
Log likelihood	13559.60	Hannan-Quinn criter.	-6.510193
Durbin-Watson stat	1.941479		

(b) ADF test

Null Hypothesis: D(SPOT) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=30)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-62.65934	0.0001
Test critical values:	1% level	-3.431736	
	5% level	-2.862038	
	10% level	-2.567078	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(SPOT,2)
Method: Least Squares
Date: 03/10/14 Time: 14:24
Sample (adjusted): 11/28/1996 11/13/2012
Included observations: 4164 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(SPOT(-1))	-0.970796	0.015493	-62.65934	0.0000
C	-2.12E-05	0.000145	-0.146836	0.8833

R-squared	0.485423	Mean dependent var	-1.45E-06
Adjusted R-squared	0.485299	S.D. dependent var	0.013003
S.E. of regression	0.009329	Akaike info criterion	-6.510943
Sum squared resid	0.362203	Schwarz criterion	-6.507901
Log likelihood	13557.78	Hannan-Quinn criter.	-6.509867
F-statistic	3926.193	Durbin-Watson stat	1.998767
Prob(F-statistic)	0.000000		

(c) ADF test for 1st diff

Figure 73: United Kingdom: exchange spot rate stationary test

Sample: 11/27/1996 11/13/2012
Included observations: 4165

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.967	0.967	3897.4	0.000
		2	0.959	0.361	7727.8	0.000
		3	0.957	0.278	11547.	0.000
		4	0.970	0.461	15468.	0.000
		5	0.968	0.216	19373.	0.000
		6	0.958	-0.004	23200.	0.000
		7	0.956	0.087	27015.	0.000
		8	0.955	-0.041	30821.	0.000
		9	0.953	-0.102	34613.	0.000
		10	0.950	-0.011	38385.	0.000
		11	0.948	-0.014	42141.	0.000
		12	0.947	-0.008	45887.	0.000
		13	0.945	0.046	49619.	0.000
		14	0.943	0.031	53334.	0.000
		15	0.942	0.039	57042.	0.000
		16	0.939	0.022	60734.	0.000
		17	0.938	0.004	64411.	0.000
		18	0.935	-0.011	68072.	0.000
		19	0.934	0.001	71726.	0.000
		20	0.933	0.003	75371.	0.000
		21	0.931	0.013	79004.	0.000
		22	0.929	0.005	82621.	0.000
		23	0.928	0.007	86226.	0.000
		24	0.927	0.018	89825.	0.000
		25	0.925	0.012	93415.	0.000
		26	0.925	0.038	97002.	0.000
		27	0.924	0.050	100585	0.000
		28	0.924	0.044	104164	0.000
		29	0.923	0.044	107738	0.000
		30	0.922	0.034	111308	0.000
		31	0.921	-0.000	114871	0.000
		32	0.921	0.002	118430	0.000
		33	0.920	-0.005	121986	0.000
		34	0.920	-0.004	125540	0.000
		35	0.919	0.003	129089	0.000
		36	0.919	0.034	132641	0.000

(a) Correlogram

Null Hypothesis: X has a unit root
Exogenous: None
Lag Length: 2 (Automatic - based on SIC, maxlag=30)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.906056	0.0036
Test critical values:	1% level	-2.565518	
	5% level	-1.940900	
	10% level	-1.616648	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(X)
Method: Least Squares
Date: 03/18/14 Time: 10:57
Sample (adjusted): 12/02/1996 11/13/2012
Included observations: 4162 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
X(-1)	-0.006710	0.002309	-2.906056	0.0037
D(X(-1))	-0.407649	0.014915	-27.33237	0.0000
D(X(-2))	-0.242419	0.013906	-17.43299	0.0000

R-squared	0.172435	Mean dependent var	-8.18E-10
Adjusted R-squared	0.172037	S.D. dependent var	2.97E-06
S.E. of regression	2.71E-06	Akaike info criterion	-22.80190
Sum squared resid	3.04E-08	Schwarz criterion	-22.79734
Log likelihood	47453.76	Hannan-Quinn criter.	-22.80029
Durbin-Watson stat	2.080985		

(b) ADF test

Figure 74: United Kingdom: log interest rate difference stationary test

Sample: 11/27/1996 11/13/2012
Included observations: 4165

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.032	0.032	4.3220	0.038
		2	-0.022	-0.023	6.3539	0.042
		3	-0.014	-0.012	7.1158	0.068
		4	-0.002	-0.002	7.1387	0.129
		5	-0.014	-0.014	7.9377	0.160
		6	0.017	0.017	9.1049	0.168
		7	0.017	0.015	10.309	0.172
		8	0.002	0.002	10.331	0.243
		9	-0.011	-0.010	10.807	0.289
		10	-0.031	-0.030	14.804	0.139
		11	-0.030	-0.028	18.593	0.069
		12	-0.009	-0.008	18.904	0.091
		13	0.026	0.024	21.725	0.060
		14	0.020	0.017	23.356	0.055
		15	0.024	0.023	25.770	0.041
		16	0.000	0.001	25.771	0.057
		17	0.033	0.037	30.437	0.023
		18	-0.003	-0.003	30.486	0.033
		19	-0.004	-0.002	30.543	0.045
		20	0.016	0.014	31.567	0.048
		21	-0.007	-0.012	31.786	0.062
		22	-0.015	-0.015	32.790	0.065
		23	-0.030	-0.029	36.544	0.036
		24	-0.011	-0.009	37.070	0.043
		25	-0.024	-0.022	39.490	0.033
		26	0.020	0.021	41.112	0.030
		27	-0.023	-0.025	43.388	0.024
		28	-0.015	-0.013	44.288	0.026
		29	0.012	0.013	44.907	0.030
		30	-0.008	-0.012	45.201	0.037
		31	0.010	0.012	45.639	0.044
		32	0.023	0.018	47.812	0.036
		33	0.018	0.014	49.220	0.034
		34	0.034	0.032	54.199	0.015
		35	0.006	0.003	54.336	0.020
		36	-0.014	-0.010	55.135	0.022

(a) Correlogram

Null Hypothesis: Y has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=30)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-62.47868	0.0001
Test critical values:	1% level	-2.565517	
	5% level	-1.940900	
	10% level	-1.616648	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(Y)
Method: Least Squares
Date: 03/18/14 Time: 11:03
Sample (adjusted): 11/28/1996 11/13/2012
Included observations: 4164 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Y(-1)	-0.967793	0.015490	-62.47868	0.0000

R-squared	0.483920	Mean dependent var	3.75E-07
Adjusted R-squared	0.483920	S.D. dependent var	0.003415
S.E. of regression	0.002454	Akaike info criterion	-9.182300
Sum squared resid	0.025061	Schwarz criterion	-9.180779
Log likelihood	19118.55	Hannan-Quinn criter.	-9.181762
Durbin-Watson stat	1.998557		

(b) ADF test

Figure 75: United Kingdom: log exchange spot rate difference stationary test

Sample: 11/27/1996 11/13/2012
Included observations: 4165

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.032	0.032	4.3423	0.037
		2	-0.022	-0.023	6.3541	0.042
		3	-0.013	-0.012	7.1068	0.069
		4	-0.002	-0.002	7.1290	0.129
		5	-0.014	-0.014	7.9193	0.161
		6	0.017	0.017	9.0954	0.168
		7	0.017	0.015	10.314	0.171
		8	0.002	0.002	10.338	0.242
		9	-0.011	-0.010	10.807	0.289
		10	-0.031	-0.030	14.790	0.140
		11	-0.030	-0.028	18.569	0.069
		12	-0.009	-0.008	18.876	0.092
		13	0.026	0.024	21.711	0.060
		14	0.020	0.017	23.352	0.055
		15	0.024	0.023	25.770	0.041
		16	0.000	0.001	25.770	0.057
		17	0.033	0.037	30.453	0.023
		18	-0.003	-0.003	30.501	0.033
		19	-0.004	-0.002	30.558	0.045
		20	0.016	0.014	31.589	0.048
		21	-0.007	-0.012	31.808	0.061
		22	-0.015	-0.015	32.812	0.065
		23	-0.030	-0.029	36.566	0.036
		24	-0.011	-0.009	37.091	0.043
		25	-0.024	-0.022	39.514	0.033
		26	0.020	0.021	41.128	0.030
		27	-0.023	-0.025	43.408	0.024
		28	-0.015	-0.013	44.314	0.026
		29	0.012	0.013	44.929	0.030
		30	-0.008	-0.012	45.225	0.037
		31	0.010	0.012	45.664	0.043
		32	0.023	0.018	47.821	0.036
		33	0.018	0.014	49.225	0.034
		34	0.034	0.032	54.198	0.015
		35	0.006	0.003	54.334	0.020
		36	-0.014	-0.010	55.135	0.022

(a) Correlogram

Null Hypothesis: RF has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=30)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-62.47117	0.0001
Test critical values:	1% level	-2.565517	
	5% level	-1.940900	
	10% level	-1.616648	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(RF)
Method: Least Squares
Date: 03/20/14 Time: 16:06
Sample (adjusted): 11/28/1996 11/13/2012
Included observations: 4164 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RF(-1)	-0.967669	0.015490	-62.47117	0.0000

R-squared	0.483860	Mean dependent var	-3.91E-07
Adjusted R-squared	0.483860	S.D. dependent var	0.003415
S.E. of regression	0.002454	Akaike info criterion	-9.182260
Sum squared resid	0.025062	Schwarz criterion	-9.180739
Log likelihood	19118.47	Hannan-Quinn criter.	-9.181722
Durbin-Watson stat	1.998563		

(b) ADF test

Figure 76: United Kingdom: the generalized risk factor stationary test

Sample: 11/27/1996 11/13/2012
Included observations: 4165

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.770	0.770	2473.9	0.000
		2	0.587	-0.015	3911.7	0.000
		3	0.355	-0.228	4436.6	0.000
		4	0.146	-0.130	4525.6	0.000
		5	0.138	0.364	4604.9	0.000
		6	0.134	0.047	4679.5	0.000
		7	0.165	-0.085	4792.9	0.000
		8	0.158	-0.122	4897.0	0.000
		9	0.151	0.186	4991.9	0.000
		10	0.155	0.133	5092.7	0.000
		11	0.165	-0.001	5207.0	0.000
		12	0.172	-0.129	5330.1	0.000
		13	0.174	0.073	5456.5	0.000
		14	0.163	0.112	5567.5	0.000
		15	0.151	0.037	5662.3	0.000
		16	0.119	-0.167	5721.1	0.000
		17	0.110	0.042	5772.0	0.000
		18	0.086	0.065	5803.1	0.000
		19	0.085	0.087	5833.0	0.000
		20	0.092	-0.084	5868.8	0.000
		21	0.129	0.097	5938.5	0.000
		22	0.170	0.084	6060.3	0.000
		23	0.178	-0.019	6192.9	0.000
		24	0.190	-0.050	6344.5	0.000
		25	0.184	0.120	6486.0	0.000
		26	0.182	0.099	6624.3	0.000
		27	0.183	-0.044	6764.7	0.000
		28	0.209	0.012	6947.6	0.000
		29	0.207	0.057	7127.9	0.000
		30	0.203	0.069	7301.6	0.000
		31	0.205	0.018	7478.5	0.000
		32	0.205	0.021	7655.6	0.000
		33	0.219	0.056	7856.6	0.000
		34	0.232	0.057	8082.5	0.000
		35	0.251	0.046	8346.9	0.000
		36	0.258	0.023	8627.6	0.000

(a) Correlogram

Null Hypothesis: MEANRF has a unit root
Exogenous: None
Lag Length: 15 (Automatic - based on SIC, maxlag=15)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-9.650355	0.0000
Test critical values:	1% level	-2.565519	
	5% level	-1.940900	
	10% level	-1.616648	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(MEANRF)
Method: Least Squares
Date: 03/20/14 Time: 16:07
Sample (adjusted): 12/19/1996 11/13/2012
Included observations: 4149 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
MEANRF(-1)	-0.028280	0.002930	-9.650355	0.0000
D(MEANRF(-1))	-0.018699	0.014349	-1.303181	0.1926
D(MEANRF(-2))	0.029383	0.014209	2.067997	0.0387
D(MEANRF(-3))	-0.002916	0.014028	-0.207853	0.8354
D(MEANRF(-4))	0.017696	0.013796	1.282723	0.1997
D(MEANRF(-5))	-0.071711	0.013475	-5.321901	0.0000
D(MEANRF(-6))	0.057172	0.013368	4.276637	0.0000
D(MEANRF(-7))	0.208543	0.012504	16.67764	0.0000
D(MEANRF(-8))	-0.188877	0.012504	-15.10529	0.0000
D(MEANRF(-9))	-0.027405	0.012168	-2.252159	0.0244
D(MEANRF(-10))	0.062181	0.012149	5.118133	0.0000
D(MEANRF(-11))	0.212228	0.011921	17.80275	0.0000
D(MEANRF(-12))	0.066460	0.005250	12.65965	0.0000
D(MEANRF(-13))	-0.068895	0.005124	-13.44591	0.0000
D(MEANRF(-14))	0.017042	0.004495	3.791321	0.0002
D(MEANRF(-15))	0.082454	0.003991	20.65972	0.0000

R-squared	0.288388	Mean dependent var	-1.30E-08
Adjusted R-squared	0.285805	S.D. dependent var	9.52E-06
S.E. of regression	8.05E-06	Akaike info criterion	-20.61831
Sum squared resid	2.68E-07	Schwarz criterion	-20.59390
Log likelihood	42788.68	Hannan-Quinn criter.	-20.60967
Durbin-Watson stat	1.915956		

(b) ADF test

Figure 77: United Kingdom: the mean of the generalized risk factor stationary test

Sample: 11/27/1996 11/13/2012
Included observations: 4165

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.917	0.917	3503.1	0.000
		2	0.857	0.101	6562.2	0.000
		3	0.813	0.090	9317.4	0.000
		4	0.758	-0.067	11711.	0.000
		5	0.749	0.263	14051.	0.000
		6	0.738	0.047	16324.	0.000
		7	0.728	0.080	18539.	0.000
		8	0.725	0.033	20732.	0.000
		9	0.723	0.120	22916.	0.000
		10	0.717	0.016	25065.	0.000
		11	0.712	0.052	27185.	0.000
		12	0.709	0.042	29287.	0.000
		13	0.706	0.063	31367.	0.000
		14	0.703	0.031	33436.	0.000
		15	0.703	0.051	35501.	0.000
		16	0.703	0.047	37570.	0.000
		17	0.706	0.064	39657.	0.000
		18	0.711	0.059	41775.	0.000
		19	0.713	0.031	43903.	0.000
		20	0.717	0.059	46053.	0.000
		21	0.713	-0.001	48183.	0.000
		22	0.711	0.052	50303.	0.000
		23	0.706	-0.007	52395.	0.000
		24	0.702	0.040	54459.	0.000
		25	0.699	0.007	56508.	0.000
		26	0.698	0.045	58548.	0.000
		27	0.698	0.018	60592.	0.000
		28	0.699	0.037	62641.	0.000
		29	0.694	-0.020	64664.	0.000
		30	0.691	0.027	66668.	0.000
		31	0.689	0.015	68660.	0.000
		32	0.686	0.022	70636.	0.000
		33	0.686	0.013	72610.	0.000
		34	0.684	0.011	74576.	0.000
		35	0.684	0.025	76541.	0.000
		36	0.686	0.030	78521.	0.000

(a) Correlogram

Null Hypothesis: DEVRF has a unit root
Exogenous: None
Lag Length: 15 (Automatic - based on SIC, maxlag=15)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.010470	0.2810
Test critical values:	1% level	-2.565519	
	5% level	-1.940900	
	10% level	-1.616648	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DEVRF)
Method: Least Squares
Date: 03/20/14 Time: 16:09
Sample (adjusted): 12/19/1996 11/13/2012
Included observations: 4149 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DEVRF(-1)	-0.000100	9.91E-05	-1.010470	0.3123
D(DEVRF(-1))	-0.218640	0.015423	-14.17616	0.0000
D(DEVRF(-2))	0.172538	0.015684	11.00114	0.0000
D(DEVRF(-3))	-0.040283	0.015762	-2.555799	0.0106
D(DEVRF(-4))	-0.123260	0.014406	-8.556352	0.0000
D(DEVRF(-5))	-0.053794	0.014242	-3.777145	0.0002
D(DEVRF(-6))	-0.107773	0.014246	-7.565190	0.0000
D(DEVRF(-7))	-0.158544	0.013841	-11.45445	0.0000
D(DEVRF(-8))	0.214930	0.013668	15.72467	0.0000
D(DEVRF(-9))	0.128155	0.013685	9.364536	0.0000
D(DEVRF(-10))	0.005063	0.012278	0.412402	0.6801
D(DEVRF(-11))	0.031548	0.011908	2.649293	0.0081
D(DEVRF(-12))	-0.011333	0.002693	-4.207614	0.0000
D(DEVRF(-13))	-0.004541	0.002247	-2.020388	0.0434
D(DEVRF(-14))	-0.020313	0.002083	-9.749570	0.0000
D(DEVRF(-15))	-0.010075	0.001818	-5.542476	0.0000

R-squared	0.249397	Mean dependent var	-5.94E-10
Adjusted R-squared	0.246672	S.D. dependent var	3.84E-08
S.E. of regression	3.33E-08	Akaike info criterion	-31.59184
Sum squared resid	4.59E-12	Schwarz criterion	-31.56743
Log likelihood	65553.27	Hannan-Quinn criter.	-31.58320
Durbin-Watson stat	1.981132		

(b) ADF test

Null Hypothesis: D(DEVRF) has a unit root
Exogenous: Constant
Lag Length: 10 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-28.67849	0.0000
Test critical values:	1% level	-3.431740	
	5% level	-2.862039	
	10% level	-2.567079	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DEVRF,2)
Method: Least Squares
Date: 03/20/14 Time: 16:10
Sample (adjusted): 12/13/1996 11/13/2012
Included observations: 4153 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(DEVRF(-1))	-0.709702	0.024747	-28.67849	0.0000
D(DEVRF(-1),2)	-0.395911	0.023785	-16.64566	0.0000
D(DEVRF(-2),2)	-0.116392	0.023463	-4.960622	0.0000
D(DEVRF(-3),2)	-0.063740	0.020757	-3.070848	0.0021
D(DEVRF(-4),2)	-0.109032	0.018616	-5.856771	0.0000
D(DEVRF(-5),2)	-0.125435	0.017691	-7.090271	0.0000
D(DEVRF(-6),2)	-0.035552	0.014816	-2.399633	0.0165
D(DEVRF(-7),2)	0.011903	0.005608	2.122370	0.0339
D(DEVRF(-8),2)	0.007554	0.004431	1.704865	0.0883
D(DEVRF(-9),2)	0.026633	0.003235	8.233811	0.0000
D(DEVRF(-10),2)	0.021097	0.001988	10.61013	0.0000
C	-3.51E-10	5.78E-10	-0.606259	0.5444

R-squared	0.637853	Mean dependent var	2.18E-10
Adjusted R-squared	0.636891	S.D. dependent var	6.17E-08
S.E. of regression	3.72E-08	Akaike info criterion	-31.37268
Sum squared resid	5.73E-12	Schwarz criterion	-31.35438
Log likelihood	65157.37	Hannan-Quinn criter.	-31.36621
F-statistic	663.0535	Durbin-Watson stat	2.078916
Prob(F-statistic)	0.000000		

(c) ADF test for 1st diff

Figure 78: United Kingdom: the deviation of the generalized risk factor stationary test

APPENDIX M: OTHER TEST RESULTS TABLES

Table 13: Monthly data sample statistics

PanelA: Monthly Exchange Rate mid price

Country	Mean	Std	Max	Min	Skew	Kurt	Obs
Australia	0.75	0.17	1.10	0.49	0.34	2.09	174
Canada	1.28	0.19	1.60	0.94	−0.10	1.83	258
Japan	109.26	15.44	144.66	76.27	−0.36	2.58	258
New Zealand	0.63	0.12	0.88	0.39	−0.20	1.97	190
Norway	6.87	1.10	9.37	5.08	0.58	2.52	198
Poland	3.43	0.59	4.65	2.06	−0.10	2.13	172
South Africa	7.35	1.36	11.96	4.82	0.98	4.18	181
Sweden	7.63	1.13	10.85	5.15	0.84	3.71	249
Switzerland	1.31	0.22	1.80	0.79	−0.03	2.40	258
Turkey	1.29	0.42	1.89	0.27	−1.17	3.31	172
United Kingdom	1.67	0.17	2.08	1.41	0.62	2.54	192

PanelB: Monthly Deposit Rate mid price

Country	Mean	Std	Max	Min	Skew	Kurt	Obs
Australia	5.13	0.99	8.45	3.03	0.39	3.56	174
Canada	3.03	1.62	5.81	0.20	−0.10	1.86	183
Japan	0.24	0.29	1.50	−0.13	1.32	4.58	192
New Zealand	5.61	1.93	9.75	2.55	−0.13	1.93	190
Norway	4.19	2.10	8.93	1.34	0.41	1.81	198
Poland	7.82	5.24	19.83	2.54	1.14	2.76	172
South Africa	10.26	4.49	24.25	4.90	1.60	5.30	181
Sweden	3.08	1.45	6.23	0.28	0.01	2.59	198
Switzerland	1.19	1.00	3.44	−0.39	0.62	2.29	192
Turkey	31.00	25.57	97.00	5.30	1.06	2.83	172
United Kingdom	4.13	2.21	7.56	0.45	−0.56	2.10	192
United States	3.09	2.24	6.72	0.13	0.00	1.39	194

PanelC: Monthly Future mid price

Country	Mean	Std	Max	Min	Skew	Kurt	Obs
Australia	0.75	0.17	1.09	0.49	0.33	2.09	174
Canada	1.27	0.21	1.60	0.94	0.07	1.48	183
Japan	109.00	15.38	144.03	76.24	−0.34	2.57	258
New Zealand	0.63	0.12	0.88	0.39	−0.20	1.97	190
Norway	6.88	1.10	9.39	5.10	0.60	2.52	198
Poland	3.44	0.60	4.70	2.06	−0.07	2.11	172
South Africa	7.39	1.38	12.05	4.86	1.00	4.19	181
Sweden	7.76	1.16	10.85	5.95	0.91	3.28	198
Switzerland	1.29	0.25	1.80	0.79	0.11	2.15	192
Turkey	1.31	0.42	1.90	0.28	−1.16	3.26	172
United Kingdom	1.67	0.17	2.08	1.41	0.62	2.55	192

Table 14: Overall daily regression result

PanelA: without constant coefficient

Variables	Australia	Canada	Japan	New Zealand	Norway	Poland	South Africa	Sweden	Switzerland	Turkey	UK
x	2.2748	3.2767	−0.2328	3.6712	0.8022	0.6669	5.3444	0.4288	0.1807	−1.0740	1.4333
	0.7099	0.8608	−0.1022	1.2026	0.3916	0.4670	2.3984	0.1656	0.0637	−4.1590	0.5083
meanrf	−2.3904	−1.0895	1.2087	−1.4781	−1.3707	−1.2829	−3.9729	−1.1456	−0.8158	−1.1754	−3.1315
	−2.4169	−1.5024	−2.3103	−2.9012	−2.2641	−1.5854	−3.4925	−2.2598	−2.0103	−1.8865	−2.8431
devrf	−13.3222	5.5893	10.5454	−26.6242	5.6607	−7.3469	−19.7613	10.2063	12.0692	1.8609	−17.2309
	−1.3800	0.5325	1.3663	−2.2464	0.7976	−0.6892	−2.0799	1.4359	1.4903	0.5496	−1.4866
R-squared	0.0018	0.0010	0.0016	0.0022	0.0014	0.0007	0.0030	0.0014	0.0014	0.0039	0.0020

PanelB: with constant coefficient

Variables	Australia	Canada	Japan	New Zealand	Norway	Poland	South Africa	Sweden	Switzerland	Turkey	UK
c	0.0004	0.0002	0.0001	−0.0002	0.0001	−0.0003	−0.0003	0.0002	0.0017	−0.0009	0.0000
	1.3455	1.3786	0.4470	−0.4046	0.1719	−1.0818	−0.6305	0.3592	1.6593	−2.7104	0.0307
x	2.2529	4.2500	−0.5390	4.4835	0.8290	1.7522	5.4010	0.7006	2.1263	−0.6057	1.3952
	0.7031	1.0979	−0.2266	1.2270	0.4034	1.0041	2.4217	0.2597	0.6924	−1.9504	0.4528
meanrf	−2.3852	−1.9989	−1.3072	−1.7575	−1.4146	−2.0142	−3.5620	−1.3307	−0.9491	−3.0479	−3.1345
	−2.4118	−2.0392	−2.3025	−2.0479	−2.1527	−1.9102	−2.7168	−1.8409	−2.2947	−3.2775	−2.8349
devrf	−49.0502	−42.3556	−0.3089	−14.8530	−1.0289	9.5421	−7.8546	−6.4641	−182.1368	17.3616	−19.0278
	−1.7361	−1.1659	−0.0121	−0.4728	−0.0260	0.5048	−0.3715	−0.1377	−1.5525	2.6128	−0.3191
R-squared	0.0022	0.0015	0.0017	0.0023	0.0014	0.0010	0.0031	0.0014	0.0020	0.0059	0.0020

PanelC: with other variables

Variables	Australia	Canada	Japan	New Zealand	Norway	Poland	South Africa	Sweden	Switzerland	Turkey	UK
x	−3.2300	3.5973	0.0608	1.6176	1.6841	1.7391	4.9307	0.5484	0.4324	−0.3960	−0.5409
	−0.9856	0.9434	0.0270	0.4646	0.8080	1.2113	2.2250	0.2114	0.1521	−1.4875	−0.1903
meanrf	−2.8498	−1.3575	−2.4733	−1.7517	−1.0091	−2.1645	−2.3241	−1.0272	−0.9137	2.0411	−3.8356
	−2.8907	−1.5985	−4.5697	−2.4820	−1.5976	−2.6293	−2.0113	−1.9206	−2.2021	2.8114	−3.4529
devrf	−67.1443	11.6742	−53.2786	−74.3699	28.1098	29.3439	16.5519	18.6379	−2.5505	63.0022	−86.8574
	−4.6997	0.5464	−5.0976	−4.0563	−2.1822	2.3514	1.4964	1.4003	−0.1834	13.4444	−4.7226
bid-ask	−0.1162	0.1329	−0.0007	−0.1194	0.0023	−0.0010	0.0022	0.0010	−0.0614	−0.0362	0.0111
	−0.5819	1.4183	−0.7776	−0.7382	0.3942	−0.4017	0.7163	0.0990	−0.6648	−4.4732	0.8462
high-low	0.0888	−0.0094	0.0007	0.0779	−0.0030	−0.0121	−0.0059	−0.0010	0.0130	−0.0897	0.0256
	7.7389	−1.3463	10.2516	5.4248	−2.2832	−5.4793	−6.8547	−0.8543	1.7454	−17.1796	4.8029
R-squared	0.0175	0.0017	0.0264	0.0088	0.0026	0.0091	0.0153	0.0016	0.0022	0.1027	0.0077

Table 15: Regime test on extreme mean values of the generalized factor

PanelA: 10 percentage

Variables	Australia	Canada	Japan	New Zealand	Norway	Poland	South Africa	Sweden	Switzerland	Turkey	UK
x	NA	0.8087	2.7019	1.7206	−0.0810	−0.1247	3.1369	1.3000	0.5388	−0.4533	0.8793
	NA	0.2551	1.6689	0.6474	−0.0526	−0.0827	1.7091	0.7017	0.2381	−1.1220	0.4401
*dummy*9	NA	−4.3389	−11.5740	−3.5932	−5.5870	−3.7207	−5.7377	1.8784	−13.4477	−0.8103	−3.6757
	NA	−1.1450	−1.0179	−1.5632	−1.6163	−1.9054	−2.2450	0.1166	−0.8742	−1.1389	−1.4127
*dummy*10	NA	−3.4849	−5.6155	0.8809	−2.4439	3.1631	−6.7010	−2.0506	−1.5634	8.7596	−10.0466
	NA	−1.3214	−2.8479	0.1953	−1.3748	0.4603	−1.8341	−1.5989	−1.3137	1.5921	−0.5576
devrf	NA	9.4726	17.6410	−15.6401	−0.7939	0.4803	−21.2854	5.8822	9.9136	0.2484	−4.0246
	NA	0.8069	2.2828	−1.0121	−0.0835	0.0497	−1.8936	0.7460	0.9655	0.0381	−0.3303
R-squared	NA	0.0206	0.0577	0.0210	0.0309	0.0273	0.0580	0.0223	0.0228	0.0727	0.0155

PanelB: 20 percentage

Variables	Australia	Canada	Japan	New Zealand	Norway	Poland	South Africa	Sweden	Switzerland	Turkey	UK
x	5.9088	2.1061	1.7466	2.5192	1.0090	0.1020	6.9579	0.0797	0.4091	0.9266	0.8469
	1.5751	0.6538	1.0757	0.9278	0.6254	0.0719	2.8858	0.0394	0.1818	2.1227	0.4254
*dummy*11	−7.4174	−4.9153	0.6097	−2.2177	−6.2104	−1.3859	−10.5154	−5.7517	−0.4291	−0.9271	−2.7498
	−2.0653	−1.9538	0.1051	−2.2789	−1.3425	−0.9126	−2.8155	−1.0229	−0.0518	−1.8635	−1.6089
*dummy*12	−8.3204	−1.3271	−3.0937	−7.3927	−0.8799	3.8774	−4.7101	−1.8441	−1.5949	21.7736	−8.2620
	−1.6383	−0.6684	−2.0846	−1.5670	−0.7030	1.1774	−1.8274	−2.0241	−1.7057	5.3524	−0.5267
devrf	−26.9265	−12.9093	13.0414	−47.3004	−10.9231	2.4777	−64.2020	15.8800	14.1350	−16.3172	−6.6842
	−1.5018	−0.7302	1.5971	−2.2087	−0.6854	0.2595	−3.0409	1.4883	1.5469	−2.3406	−0.5458
R-squared	0.0528	0.0344	0.0346	0.0375	0.0241	0.0171	0.0798	0.0320	0.0258	0.2328	0.0191

Table 16: Regime test on extreme volatility of the generalized factor

PanelA: 10 percentage

Variables	Australia	Canada	Japan	New Zealand	Norway	Poland	South Africa	Sweden	Switzerland	Turkey	UK
x	−1.1368	2.7550	0.4524	−0.9975	0.7786	−0.4498	0.5389	0.4147	−0.8823	−0.7986	−0.5195
	−0.8021	0.8493	0.3122	−0.6599	0.5245	−0.3685	0.6018	0.1833	−0.4050	−2.8111	−0.3027
meanrf	−1.8935	−3.9365	−0.5235	−0.3063	−1.5134	0.0230	−0.9596	0.0893	0.0376	−0.7361	−2.4777
	−1.1074	−2.1005	−0.4331	−0.3359	−1.4165	0.0223	−0.7521	0.1056	0.0384	−1.7693	−1.2141
*dummy*13	−4.7944	75.9970	13.3043	32.1518	24.6765	30.8098	−50.9594	−42.4241	−38.3197	−7.7414	−15.3417
	−0.2122	1.2678	1.7923	0.6534	0.6574	1.7308	−1.5052	−0.9001	−0.9912	0.6964	−0.3641
*dummy*14	−1.6901	−21.9839	37.9432	−12.9214	0.2281	−6.3092	−5.0226	7.0195	−22.7139	−7.3799	−20.1089
	−0.0996	−1.1051	2.7026	−0.8845	0.0130	−0.3957	−0.5766	0.4664	−1.1858	−0.5525	−1.1557
R-squared	0.0073	0.0252	0.0512	0.0135	0.0120	0.0352	0.0281	0.0120	0.0072	0.0644	0.0166

PanelB: 20 percentage

Variables	Australia	Canada	Japan	New Zealand	Norway	Poland	South Africa	Sweden	Switzerland	Turkey	UK
x	−1.0605	0.6547	1.5976	0.3609	0.6413	−0.4451	2.2770	0.8975	−0.8530	−0.9394	0.7979
	−0.5802	0.1993	0.9406	0.2146	0.4331	−0.3452	2.1357	0.4438	−0.3621	−2.7658	0.4489
meanrf	−2.0067	−4.0202	0.1343	0.4589	−3.6957	0.1794	−4.1842	0.1564	−0.3257	−0.9353	−5.5258
	−1.1086	−2.3114	0.1071	0.4237	−2.0284	0.1234	−2.4194	0.1145	−0.3554	−1.9173	−2.5825
*dummy*15	4.2211	99.1458	11.2301	66.2676	64.9311	21.2126	−28.1864	−23.2219	−3.7087	−7.0810	−76.1099
	0.2381	1.8957	1.5391	1.3526	1.5772	1.0638	−1.1237	−0.4828	−0.1671	0.8618	2.1550
*dummy*16	−3.3847	−12.5593	23.9087	−17.6928	−9.5950	−0.3249	−26.2867	8.8635	−22.9052	1.6980	−34.7429
	−0.2350	−0.6717	2.0877	−1.6622	−0.6061	−0.0220	−2.7700	0.7381	−1.1922	0.1668	−1.9601
R-squared	0.0082	0.0356	0.0263	0.0330	0.0249	0.0203	0.0734	0.0112	0.0012	0.0645	0.0431