# Unsecured Money Market Risk Premium and the Financial Crisis

## An Econometric Study of Influential Factors

Master Thesis for Master of Philosophy in Economics

Department of Economics

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# Unsecured Money Market Risk Premium and the Financial Crisis

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# Summary

The failure of the interbank market to redistribute liquidity became a key feature of the financial crisis of 2007-2009. Unsecured money market risk premiums, henceforth risk premiums, increased sharply with the financial turmoil that began unfolding in august 2007. Risk premiums turned more volatile and interbank interest rates were divorced from the key policy rate of the central bank, except in maybe the shortest of maturities like overnight. After the default of Lehman Brothers in September 2008 risk premiums increased to even higher levels, exceeding the previous levels in the period from August 2007 until mid- September 2008. Evidence suggests banks were hoarding liquidity and activity in the interbank market seized up at over the shortest term lengths. The extremely high premium levels and the liquidity hoarding caused a serious threat to the financial system, as interbank markets are vital for bank’s liquidity management and the implementation of monetary policy. Also, disturbances in interbank markets has consequences for the wider economy as the interbank interest rates determines rates on loans and securities for household and non-financial firms, and thus the availability of credit for the economy as a whole.

The financial turbulence starting from august 2007 influenced the perception of risk in the interbank market and causing the risk premiums to rise. The aim of this master thesis is to investigate which types of risk and possibly other factors contributed to the relatively high money market risk premiums. Increased risk premiums were observed in several markets under different currency regimes during the financial crisis, particularly in the Western economies. Furthermore, due to the origin of the crisis was in the United States financial markets and European banks held high US dollar assets holdings prior to the crisis; it is possible that spill-over effects from the USD money market had a positive and severe impact on risk premiums in money markets in other currency regimes. This master thesis attempts to decompose the risk premium into different components reflecting credit risk, liquidity funding risk and US money market contagion. In order to do so regression techniques will be applied. The risk premium of interbank markets in United States, Great Britain, Euro-Area, Norway, Sweden, Canada and Australia are investigated. Risk premiums contained in 3-month interbank lending and borrowing will be used in the econometric modeling. 3-month maturity is the most commonly used maturity in studies of similar nature (ECB 2008). All regressions has been made using PcGive in Oxmetrics ver. 6.01.

The econometric models will cover three separated parts. The first period will represent normal conditions in the interbank market. The crisis phase will be divided into two parts, with the Lehman Brothers collapse splitting the two. I believe it is of interest to make a division at the point of the Lehman Brothers bankruptcy for several reasons. Immediately after the collapse we observe a substantial increase in the all risk premiums in question, reaching the highest levels under the crisis. Further, following the collapse of Lehman Brothers, banks were hoarding liquidity as from the last part of September. The idea is to investigate whether key drivers of the risk premiums altered during the crisis. The Engle-Granger method and autoregressive distributed lag models are used to serve the purpose.

The analysis from econometric results offer some evidence of the importance of credit default risk, liquidity funding risk, expected exchange rate risk and influence from the USD interbank market tensions to explain the increasing risk premium in interbank market during the financial crisis that originated in August 2007. The influence of credit default and liquidity funding risk seems to have altered with the fall of Lehman Brothers. From only significance in few markets in the first part, the situation is quite different after mid-September 2008. Further, the results indicate that spillover effects from the US money market were consistent during the course of the crisis. The last part of the crisis can be characterized by cointegration; hence the variables are long-run dependent. The USD interbank market is found weakly exogenous, suggesting fairly strongly that the US influence went in a one way direction.

# Preface

Jeg vil benytte anledningen til å takke min alltid tilgjengelige og evig kloke veileder Asbjørn Rødseth. I tillegg fortjener Tom Bernhardsen i Norges bank en stor takk for gode ideer, og ikke minst et utmerket datasett. Jeg har også satt meget pris på den åpne døren til Ragnar Nymoen for utmerket økonometrisk veiledning. Min medstudent og gode venn Rasmus Bøgh Holmen skal ha stor honnør og takk for sin korrekturlesing.

All flaws and inaccuracies are mine, and mine alone.

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# 1 Introduction

The failure of the interbank market to redistribute liquidity became a key feature of the financial crisis of 2007-2009. Unsecured money market risk premiums, henceforth risk premiums, increased sharply with the financial turmoil that began unfolding in august 2007[1]. Risk premiums turned more volatile and interbank interest rates were divorced from the key policy rate of the central bank, except in maybe the shortest of maturities like overnight (Eisenschmidt, J.and Tapking, J. 2009).After the default of Lehman Brothers in September 2008 risk premiums increased to even higher levels, exceeding the previous levels in the period from August 2007 until mid- September 2008. Evidence suggests banks were hoarding liquidity and activity in the interbank market seized up at over the shortest term lengths (Heider et.al. 2008)[2]. The extremely high premium levels and the liquidity hoarding caused a serious threat to the financial system, as interbank markets are vital for bank's liquidity management and the implementation of monetary policy[3]. Also, disturbances in interbank markets has consequences for the wider economy as the interbank interest rates determines rates on loans and securities for household and non-financial firms, and thus the availability of credit for the economy as a whole.

A well functioning interbank market is important for the implementation of monetary policy. For central banks to meet their monetary policy objective they intervene in financial markets to control short-term interest rates, directly set or closely controlled. The process in which monetary policy affects the real economy is known as the transmission mechanism, and the first part of this transmission is the influence of monetary policy on financial markets[4]. Hence, financial markets are the link through which monetary policy affects the real economy. Given a floating exchange rate regime, as most central banks currently operate under, the monetary policy instrument is typically a short term interest rate[5] (Hildebrand (2006)). Short-term interest rates have limited direct impact on the real economy. Interest

[1] A notational remark: "Unsecured money market risk premium under curreny *j'* is referred to in the text as currency *j*`s risk premium. An example: NOK unsecured money market risk premium is referred to as the NOK risk premium. Also, in the literature the two terms *money market* and *interbank market* are used to describe the same market.
[2] For more details se section 3.2
[3] Further discussion will be provided in chapter 3.
[4] There are several channels in the transmission mechanism, for an overview see MPC, The Bank of England, "The transmission mechanism of monetary policy', please refer to Reference.
[5] Under fixed exchange rate regime, the exchange rate serves as the monetary policy instrument. The interest rate is now determined exogenously.

rates with longer maturity have a stronger effect on the economy as they affect investment and saving decisions[6], referring to the textbook neoclassical cost-of capital effect[7]. In order for monetary policy to impact the real economy, the short-term interest rates must be linked to the capital market, i.e. the long-term interest rates (Hildebrand (2006)). The two markets are linked by expectations. Ignoring transaction costs and risk premiums, the expectations theory views long-term interest rates as a simple average of current and expected future short-term rates until maturity (Hurn et.al. (1995))[8]. Hence, financial market prices incorporate market expectations of future development of short-term interest rates, i.e. expectations on future monetary policy, together with expectations of future development of other economic variables, such as inflation and output.

The monetary policy instrument is normally the key policy rate[9], given a floating exchange rate regime. In the interbank market each central bank aims for the overnight money market interest rate to materialize at or close to the key policy rate[10]. In interbank lending with maturities longer than overnight, short-term maturity like 3-month or 12- month[11], there will usually be a small wedge or spread between the short-term interest rate and expected key policy rate. The spread in question is referred to as the risk premium reflecting credit or/and liquidity risk and other factors[12]. In absence of financial stress this premium is stable and small, see table 2.1 in chapter 2 for average rates preceding the financial crisis. During the financial crisis there was a higher volatility in the money market risk premiums, which lead to a widening gap in the spread between the key policy rate and money market rates. This increasing volatility is likely to have been a disturbing element from the point of view of central banks. Moreover, increased risk premium volatility adds more noise in the

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[6] A puzzle is the early and fast decline in residential investment (a long-term investment) from a change in monetary policy (read change in short-term interest rates), see Bernanke and Gertler (1995).

[7] Interestingly, according to Bernanke and Gertler (1995) empirical studies have had great difficulty in identifying important effects of the neoclassical cost-of-capital variable on interest-sensitive components of aggregate spending.

[8] For a more detailed description of the expectations theory please refer to Hurn, et al (1995). It should be noted that the empirical study performed by Hurn et al (1995) finds considerable support for the expectations theory in the term structure of interest rates in the London Interbank Market (LIBOR rates) over the period 1975:1to 1991:12.

[9] The central bank is monopoly supplier of base money. Given perfect information, using the quantity of money as an instrument is equivalent to using a short-term interest rate, as the price of money is directly related to the quantity of money available.

[10] Please refer to chapter 3 for a further discussion.

[11] A notational remark: The term *short term maturity* is referring to interbank deposits with maturity longer than overnight. When referring to overnight maturity, it will read *overnight interest rates.*

[12] Please refer to section 2.1 for a more detailed explanation of the risk premium.

transmission mechanism, and consequently monetary policy becomes more difficult to implement (Bernhardsen et.al. (2009)).

The financial turbulence starting from august 2007 influenced the perception of risk in the interbank market and causing the risk premiums to rise. The aim of this master thesis is to investigate which types of risk contributed to the relatively high money market risk premiums. Increased risk premiums were observed in several different markets under different currency regimes during the financial crisis, particularly in the Western economies. Furthermore, due to the origin of the crisis was in the United States financial markets and European banks held high US dollar assets holdings prior to the crisis; it is possible that spill-over effects from the USD money market had a positive and severe impact on risk premiums in money markets in other currency regimes. This master thesis attempts to decompose the risk premium into different components reflecting credit risk, liquidity funding risk and a direct US contagion effect. In order to do so regression techniques will applied. The risk premium of interbank markets in United States, Great Britain, Euro-Area, Norway, Sweden, Canada and Australia are investigated. Risk premiums contained in 3-month interbank lending and borrowing will be used in the econometric modeling. 3-month maturity is the most commonly used maturity in studies of similar nature (ECB 2008).

This thesis is structured in seven parts. Part one is the introduction. Part two illustrates the development of the risk premium over the course of the financial crisis, and provides a brief background of the most important events that influenced risk premiums during the financial crisis. Summary statistics are included in order to illustrate the impact the crisis had on the risk premiums. In part three a measure of the unsecured money market risk premium is presented.  Actual data of interbank interest rates are notoriously hard to obtain because of the over-the-counter structure and asymmetric information characteristic of the interbank market, and risk premiums therefore have to be constructed from estimates of actual interbank rates. Part four gives a theoretical background on interbank markets. Part five describes proxies and variables indented to represent the different components of the risk premium. Arguments for the choice of econometric models used are given in the first part of chapter six. Analysis of the econometric results follows. Chapter seven concludes.

# 2 Volatility of the Unsecured Money Market Risk Premium during the Financial Crisis.

This section will briefly examine the development of the risk premium, before and during the financial crisis, and provide a brief background on the actual events that coincided with the risk premiums abnormal volatility. The risk premium is defined as the difference between the money market interest rate and the key policy rate expectations over the same time horizon (Soultanaeva and Stromqvist 2009); further definition is given in section 2.1. Graphs 2.1-2.3 below illustrate the behavior of the risk premiums for interbank lending with 3-months maturity for a number of money market under different currencies. Moreover, the risk premiums are divided into three separate figures in order to make it easier to distinguish between the actual series. Note that the premiums are estimates of actual ones. Estimates have to be constructed given the over-the-counter structure of the interbank-market; an elaboration follows in the next section (2.1).

## 2.1 Risk Premium Volatility

In the following I will focus on two important events that caused disturbances in the interbank money markets; market unrest regarding developments in the subprime market and the fall of Leman Brothers in mid-September. Before the turmoil sub-prime mortgage investment was set up through special investment vehicles (SIV)[13]. The SIV strategy was to issue short-term securities with low relative interest rate in order to invest in longer-term securities at a higher interest rate. These assets backed securities were sold to both US and Non-US investors, for a view over the size of European bank's total dollar assets holdings see section 4.1. As collateral for the short-term securities the SIV's had established bank credit lines. In August 2007, the negative developments in the subprime market lead to a serious impairment of further short-term financing. This triggered the SIVs to utilize their bank credit lines causing exposure of banks to the sub-prime crisis. The extent of exposure was unknown and it became difficult, if not impossible, to separate the safe banks from the risky ones (Heider et.al. 2008). In August 2007 there is a clear and sudden increase in the risk premium across markets (see

[13] A SIV was a separate financial company outside the banks balance sheet. See Fidjestøl (2007)(In Norwegian) ..

figures 2.1-2.3). Before August 2007 the risk premiums were at stable and relatively low levels in all markets. In the larger money markets, like the US and Eur-area, the mean for the pre-crisis period is around seven and five basis points respectively. For smaller money markets, like the ones in Norway, Sweden, Australia, New Zealand and Canada, the mean in pre-crisis period was also relatively small and stable, see table 2.1. However, in the first part of the crisis leading up to the default of Lehman Brothers in September 2008, the 3-month risk premium in the US interbank money market peaked at around 100 basis points, accompanied by the 3-month EUR and GBP risk premium (See table 2.1), clearly indicating higher perception of risk or higher dollar funding cost in the interbank markets.

| **Table 1 : Summary statistics** | | | | | | | |
|---|---|---|---|---|---|---|---|
| ***Market*** | ***US*** | ***Euro-area*** | ***UK*** | ***Norway*** | ***Sweden*** | ***Canada*** | ***Australia*** |
| *Pre-crisis period (Jan 07- Aug 2007)* | | | | | | | |
| Mean | 0.072 | 0.045 | No data | 0.26336 | 0.041 | 0.023 | 0.010 |
| Std | 0.0108 | 0.0070 | | 0.091 | 0.011 | 0.015 | 0.0098 |
| Max | 0.12866 | 1.305 | | 0.49 | 0.065 | 0.071 | 0.012 |
| Min | 0.035 | 0.028 | | 0.11 | 0.0100 | -0.050830 | -0.032 |
| *Before LB (Aug 07-17 Sep 08)* | | | | | | | |
| Mean | 0.67641 | 0.611 | 0.71 | 0.65842 | 0.354 | 0.45 | 0.386 |
| Std | 0.16725 | 0.15674 | 0.19623 | 0.154 | 0.115 | 0.15 | 0.12 |
| Max | 1.377 | 0.92300 | 1.1395 | 1.0300 | 1.377 | 0.88 | 0.710 |
| Min | 0.108 | 0.053 | 0.24650 | 0.20 | 0.108 | 0.018 | 0.0125 |
| *After LB (18 Sep 2008- Mar 2010)* | | | | | | | |
| Mean | 0.68700 | 0.66133 | 0.82725 | 0.87470 | 0.43218 | 0.52912 | 0.63244 |
| Std | 0.77494 | 0.46275 | 0.70820 | 0.49804 | 0.29600 | 0.40559 | 0.51582 |
| Max | 3.638 | 1.958 | 2.988 | 2.443 | 1.463 | 1.846 | 2.375 |
| Min | 0.0413 | 0.22100 | 0.12613 | 0.31425 | 0.173 | 0.02533 | 0.025 |

*Table 2.1: Summary statistics*

The event had the greatest impact on the risk premiums was the bankruptcy of Lehman Brothers. Heider et.al. (2008) views the use of public funds to rescue Bear Stearns on the 16th of March 2008 as initially placing a lower bound on the perceived probability of counterparty default. However, by letting Lehman Brothers fall led to a drastic revision of expected default probabilities. Risk premiums overall increased substantially following the news of Lehman Brothers. The 3-month US risk premium, which had the highest level of all during the length of the crisis, reached its maximum value at 363.9 basis points. The 3-month EUR risk premium had a maximum of 194.3 basis points, while the 3-month GBP risk premium peaked at 298 basis points.

| ***Market*** | ***US*** | ***Euro-area*** | ***UK(no dat*** | ***Norway*** | ***Sweden*** | ***Canada*** | ***Australia*** |
|---|---|---|---|---|---|---|---|
| *Pre-crisis period (Jan 07- Aug 2007)* | | | | | | | |
| US | 1 | | | | | | |
| Euro-area | 0.17994 | 1 | | | | | |
| UK | | | 1 | | | | |
| Norway | -0.24092 | -0.35201 | | 1 | | | |
| Sweden | 0.21601 | 0.18173 | | -0.24461 | 1 | | |
| Canada | 0.018348 | 0.28123 | | -0.017632 | -0.096139 | 1 | |
| Australia | 0.15684 | 0.12712 | | 0.044672 | 0.11412 | 0.11560 | 1 |
| ***Market*** | ***US*** | ***Euro-area*** | ***UK*** | ***Norway*** | ***Sweden*** | ***Canada*** | ***Australia*** |
| *Before L**B** (Aug 07-17 Sep 08)* | | | | | | | |
| US | 1 | | | | | | |
| Euro-area | 0.74023 | 1 | | | | | |
| UK | 0.80220 | 0.74760 | 1 | | | | |
| Norway | 0.57852 | 0.71174 | 0.56411 | 1 | | | |
| Sweden | 0.54878 | 0.70260 | 0.48321 | 0.83247 | 1 | | |
| Canada | 0.76343 | 0.69992 | 0.71836 | 0.42131 | 0.44656 | 1 | |
| Australia | 0.67818 | 0.53232 | 0.58332 | 0.60569 | 0.52301 | 0.41861 | 1 |
| Switerland | | | | | | | |
| ***Market*** | ***US*** | ***Euro-area*** | ***UK*** | ***Norway*** | ***Sweden*** | ***Canada*** | ***Australia*** |
| *After LB (18 Sep 2008- Mar 2010)* | | | | | | | |
| US | 1.000 | | | | | | |
| Euro-area | 0.93565 | 1,000 | | | | | |
| UK | 0.90632 | 0.96514 | 1,000 | | | | |
| Norway | 0.91721 | 0.91368 | 0.94225 | 1,000 | | | |
| Sweden | 0.85884 | 0.94151 | 0.89467 | 0.83885 | 1,000 | | |
| Canada | 0.94792 | 0.93059 | 0.92508 | 0.90706 | 0.84892 | 1,000 | |
| Australia | 0.93351 | 0.92385 | 0.94660 | 0.92379 | 0.83443 | 0.95523 | 1,000 |

Table 2.2: Risk premium correlation.

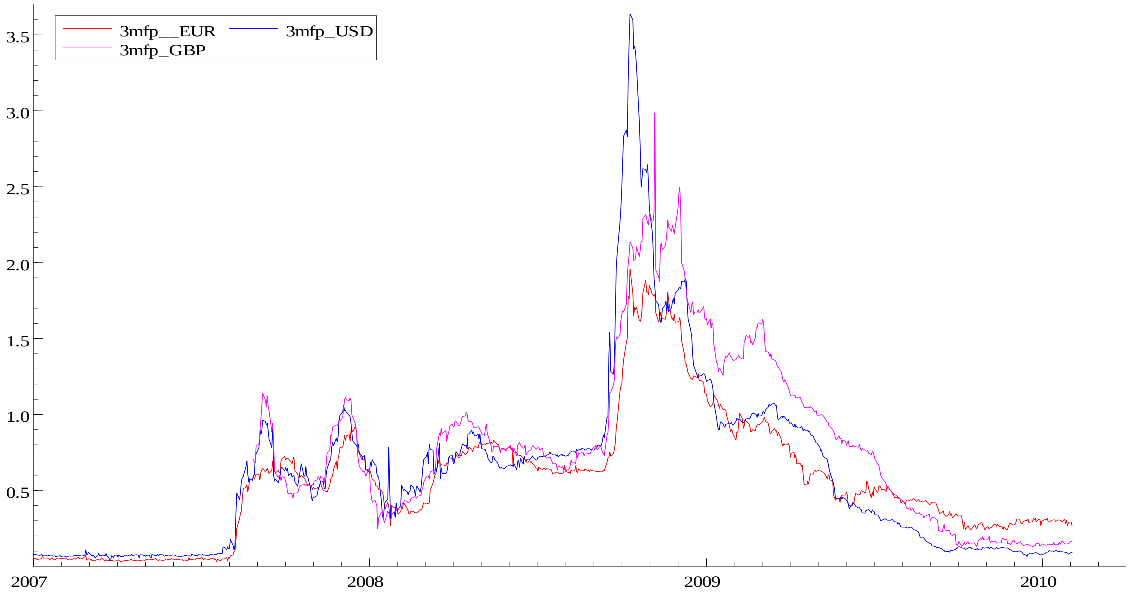


*Figure 2.1: Three month money market risk premium for the Euro area, United Kingdom and the United States from 1 Jan 2007-2. February 2010.*

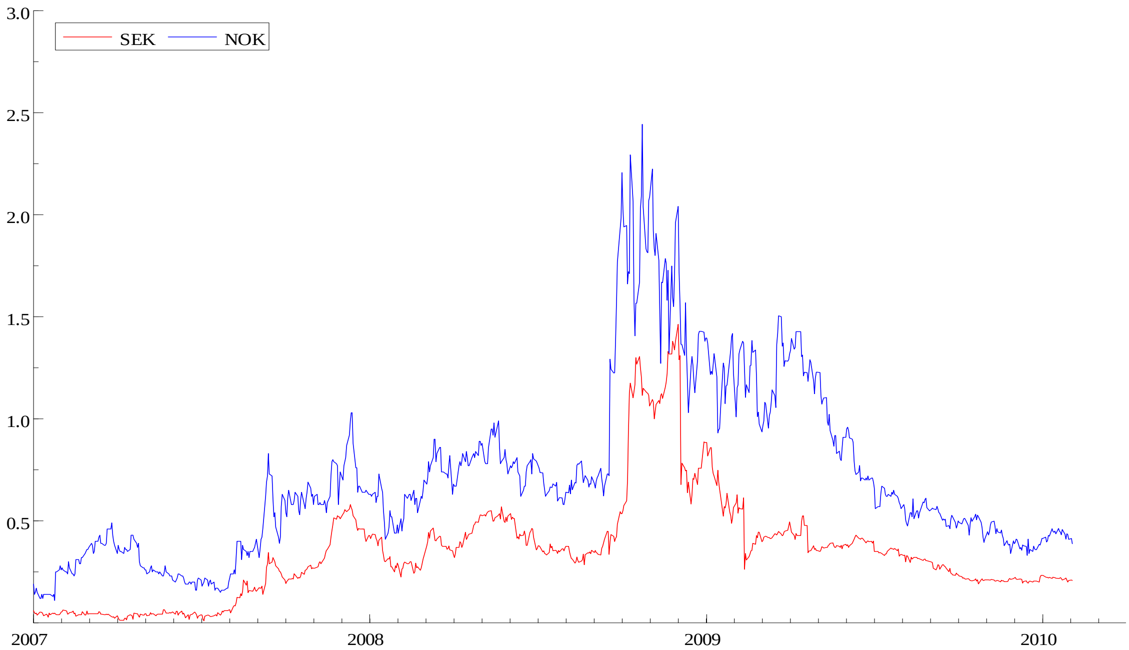


*Figure 2.3: Three month money market risk premiums for Norway and Sweden 1 Jan 2007-2 Feb 2010*


*Figure 2.3: Money market risk premiums for Canada and Australia 1 Jan 2007-2 Feb 2010*

# 3 A Measure of the Unsecured Money Market Risk Premium

The measurement of money market risk premiums can be based on domestic interest rates, reflecting interbank borrowing and lending within one currency, or alternatively on interest rates swapped from other currencies (Bernhardsen et.al. 2009)[14]. Risk premiums measured from domestic interest rates will be the focus here.

Short-term rates and revolving overnight rates are close substitutes. Hence, following an arbitrage argument, short-term rates and expected overnight rates should be closely related over the same time horizon. This relationship is referred to as the “expectations hypothesis’ or more formally the general expectations theory (Michaud et.al. 2008).However, elements of risk contribute to a wedge between the two, such as liquidity risk, credit default risk and a term premium related to the uncertainty about the expected future path of short-term interest rates and other factors (Michaud et.al. 2008).A bank lending in the unsecured money market normally demands compensation for bearing one or more of the mentioned risks[15], so the interbank interest rate contains a wedge between interbank rates and expected overnight rates over the same time horizon.

Following the description and notation of Hurn et.al. (1995) the general expectations theory can be represented as follows[16]:

$$(1) \qquad R_t^n = \frac{1}{k}\sum_{i=0}^{k-1} E[R_{t+mi}^m] + \gamma_{n,m} \quad , k = \frac{n}{m}$$

In (1) $R_t^n$ represents the continuously compounded interest rate of an *n*-period interbank deposit, while $R_t^m$ is the interest rate compounded over a shorter *m*-period. $E[.]$ is the expectations operator.

[14] See Section 5.1 for risk premiums measured from foreign exchange swap rates.
[15] See section 5, ‘*Decomposing the risk premium*’, for more information on types of risks.
[16] An empirical study performed by Hurn, A.S. et al (1995) finds considerable support for the expectations theory in the term structure of interest rates in the London Interbank Market (LIBOR rates) over the period 1975:1to 1991:12.

As (1) shows the *n*-period interest rate is an average of the current and future expected *m*-rates plus a constant γ-term which contains other factors. For our focus, liquidity funding risk and credit default risk are two factors that are expected to be captured in the γ-term together with spill-over effects from the USD money market. The *n*-period in focus here is the 3-month money market interest rate.

However, interbank interest rates are negotiated over-the-counter on a bilateral basis and this information is not required to be released to the financial market. The over-the-counter structure of the interbank market makes time series of actual interbank rates extremely hard to obtain, as the terms of transactions are kept between parties involved only[17]. In the absence of actual observed data a proxy has to be used to replace the actual money market rates. British Bankers` Association (BBA) publishes daily LIBOR rates for a wide range of currencies and maturities. LIBOR is short for London Interbank Offered Rate[18]. The LIBOR rates which will be used as proxy for a number of countries in the data set[19] can be described as an average rate in the inter-bank money market. LIBOR is defined as *'a benchmark; giving an indication of the average rate a leading bank, for a given currency, can obtain unsecured funding for a given period in a given currency. It therefore represents the lowest real-world cost of unsecured funding in the London market'* [20]. Each individual LIBOR rate is calculated from a submission of the most active and largest banks in each currency. The LIBOR rates is an offered rate, not bid, as the submission from panel banks are based on the following question: '*At what rate could you borrow funds, were you to do so by asking for and then accepting inter-bank offers in a reasonable market size just prior to 11 am* (GMT)*'*. However, because the LIBOR rates are based on non-binding quotes this can open up the possibility of strategic misrepresentation (Michaud et.al. 2008). In order to reduce such incentives and thereby increasing quotes accuracy, the top and bottom quartile is left out of the distribution, and then the average is calculated from the remaining quotes.

For similar reasons as above, Euro interbank Offered Rate (EURIBOR) will be used as a proxy for the Euro-Area money market interest rate. EURIBOR is constructed in much the

[17] The interbank market is characterized as incomplete markets and by asymmetric information, as the OTC-structure makes some counterparts better informed then others (Allen, F. and Carletti, E. (2008)).
[18] Please refer to http://www.bbaLIBOR.com/bba/jsp/polopoly.jsp?d=1627 for a more detailed explanation of the construction of BBA LIBOR rates.
[19] US, Canada, Australia, Great Britain, Switerland.
[20] http://www.bbaLIBOR.com/bba/jsp/polopoly.jsp?d=1627

same way as LIBOR[21]. For the money markets in Norway and Sweden, NIBOR and STIBOR will be used as proxies respectively.

Further on, the money market rate proxies are quoted as annualized rates, which means if the quoted interest rate is, say 2%. This rate is not the interest a bank pays on the value of the loan overnight; the actual overnight interest is converted by a division of 365.

To construct an estimate for the risk premium a proxy for expected overnight rates over the same given time horizon is needed. The expected overnight rates reflect the expected path of the key policy rate, i.e. the expected path of monetary policy. The determination of overnight interest rate in the interbank market is described in chapter 4. The overnight interest rates will be measured by overnight indexed swap rates (OIS)[22]. An OIS is an agreement between two counterparties to exchange the floating overnight rate for a fixed rate (or vice versa) over a given time horizon[23]. The fixed rate is determined by the average expected overnight rate over the horizon of the swap contract (Bernhardsen el at 2009). OIS will reflect the expected key policy rate to the extent the central bank manages to keep the overnight rate close to the key policy rate, again for further details on central bank intervention in the money market see chapter 4. I believe the OIS rates can serve a reasonably accurate measure of markets expectations based on the following reasons as given by Michaud and Upper (2008): First, the counterparty risk associated with these contracts are small since there is no exchange of any principal amount[24]. Accordingly, the corresponding residual risk is further reduced by collateral demands associated with the OIS contracts. Second, the liquidity risk premium in the OIS rates would be relatively small as there are no initial cash flows.

Thus, the estimate for the risk premium used in this analysis is the difference between the proxy for the money market interest rate and OIS, corresponding to a given time horizon and a given currency. Since the OIS rates can be assumed to contain very small risk premia, if any, our estimate for the risk premium should be able to capture all risk factors contained in the money market rates in a satisfactory manner. In other words, by subtracting OIS should separate the part of money market interest rate containing these risk factors. In accordance

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[21] Refer to http://www.EURIBOR.org/html/content/EURIBOR_tech.html for further details.
[22] '*OIS contracts have become one of the fastest growing – and in some countries, the most widely traded – derivative instruments globally since they were first introduced in the early to mid-1990s*'-Choy (2003).
[23] For a detailed description of OIS contracts please refer to Choy (2003).
[24] However, the contracts have an associated notional principal from which the interest rates are calculated (Choy (2003)).

with the general expectation theory presented in (1) earlier in this section, the risk premium can be solved for in the following way:

$$(2) \qquad \gamma_{n,m} = R_t^n - \frac{1}{k}\sum_{i=0}^{k-1} E[R_{t+mi}^m] = Libor_t^j - OIS_t$$

The right hand side of (2) represents the money market interest rate and the OIS respectively, and the econometric part of this thesis aims to model the risk premium in (2) in terms of different risk factors and spillover effects from US dollar interbank market.

# 4 Theoretical Background on Interbank Markets

## 4.1 Interbank markets

The following sections aim to provide an intuitive understanding of the interbank money market with focus on the determination of the overnight interest rate. An understanding of the latter rate is crucial as interest rates associated with interbank lending and borrowing with short-term maturity, such as three months, are based on future expectation of the overnight rate.

The basic role of interbank market is to redistribute liquidity and to hedge against liquidity (idiosyncratic and aggregate) shocks. Commercial banks hold liquidity or money reserves in their (sight) deposit account at the central bank. These reserves are held in order to meet intra-day transactions or clearing purposes with other banks and to provide payment services for depositors. Throughout a business day money is transferred between banks and at the end of the day transactions are netted out by adjusting the banks' deposit accounts at the central bank. Banks with a liquidity surplus are forced to place it in the deposit account, and banks with a liquidity deficit must borrow liquidity overnight. In addition, reserves are universally accepted assets and can so be used to exchange for less liquid assets, and therefore support the financial sector in allocating the latter assets

The inter-bank market is where monetary policy decisions taken by the central bank are implemented. Normally the objective is to materialize the overnight money market interest rate close to the key policy rate an by that make the risk portfolio approximately risk free. As supply and demand of money in the interbank market will determine the short term interest rate, the central bank can through liquidity operations guide the level of the market interest rate towards the target rate (Keister et.al. 2006) [25]. The liquidity operation framework and discrepancy in liquidity policy implementation can differ from one currency regime to another (Bernahrdsen et.al. 2009). However, the two most common in use are the so-called corridor and floor systems, which both come with their own advantages and disadvantages in regards

[25] The central bank supplies the monetary base, or base money.

to the implementation of monetary policy, as described by Keister et.al. (2006). The next section will give an theoretical outline of the latter frameworks.

### 4.1.1 A Model for the Liquidity Operation Framework: Floor and Corridor system.

This section is based on the intuitive and graphical presentation of the corridor and floor system carried out by Keister et.al. (2008) and Bernhardsen et.al. (2010)[26], which both are based on the mathematically rich model by Whitesell (2006). Furthermore, I will in the following discussion assume that banks are faced with reserves requirements[27], keeping in mind that this is not a universal requirement across all countries. Banks in the United States[28] and in the Euro Zone are subjects to such requirements, while in countries such as Australia, Canada and Norway banks are not. In the latter countries the only requirement is non-zero balance on the reserve account. One of the consequences for the model used here is the demand curve for reserves are shifted to the left, leaving the vertical axis as the line of required reserves (non-zero), see figure 4.2 below.

Intraday transactions between banks are many and the exact level of liquidity involved is uncertain. Unanticipated transactions in and out of the reserve account may occur after the interbank market has closed. These factors contribute to uncertainty regarding the final balance of the reserve account at the end of the day. After closing of the interbank market, a bank may experience the amount borrowed or lent in the market is higher or lower than actual needs, which make it difficult for a bank to satisfy the reserve requirement. Typically, a bank will hold a positive or negative excess of reserves at the end of the day. In the overnight money market the central bank has standing facilities that lend to and accept deposits from commercial banks. The standing facilities enable a bank with excess reserves to earn interest overnight by making a deposit at the central bank[29]. Similarly a bank experiencing liquidity deficit can use the lending facility. As illustrated in figure 3.1, the two standing interest rates creates a upper and lower bound for the overnight interest rate in the interbank market, which also makes the demand curve flat at the two standing rates: If the overnight interest rate in the

[26] A detailed analysis of the model is found in Whiteshell (2006).
[27] The level of reserves are proportional to amount of liabilities. These requirements of reserves are meant are meant to make the central bank more credible as a lender.
[28] For details see http://www.federalreserve.gov/monetarypolicy/reservereq.htm
[29] Expect for bank in the United States were the reserve account gave zero interest until October 2008, see http://www.federalreserve.gov/monetarypolicy/reservereq.htm

interbank market were higher than the standing lending rate arbitrage opportunity would arise. A bank could borrow from the lending facilities and make a risk free profit by lending in the interbank market. Hence arbitrage activity would ensure there is no demand for reserves at an interest rate higher than the lending facility. Likewise, an arbitrage opportunity would arise if the market interest rate were lower than the standing deposit rate. A bank could borrow in the interbank market and make a sure profit by making deposits at the central bank. In this case demand for reserves would be limitless so again arbitrage activity would raise the interest rate towards the deposit rate. The conclusion from the above arguments is that the overnight market interest rate will be in between the upper and lower bound set by the standing facilities of the central bank.

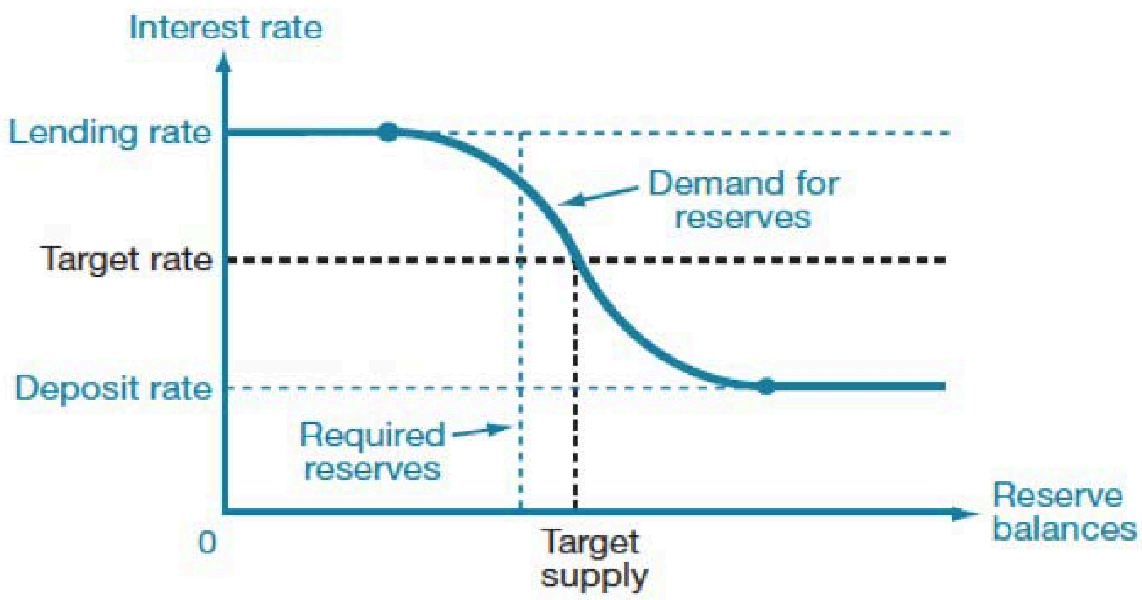


*Figure 4.1: The corridor system. Source: Keister et.al .(2008).*

The shape of the demand curve for reserves are decreasing with the overnight interest rate for market rates between the lower and upper bounds. This follows from the fact that the quantity of reserves demanded varies inversely with the overnight interest rate, since the latter interest rate represents an opportunity cost of holding excess reserves when the market closes. For the individual bank the demand for reserves at the end of the day are uncertain as explained before, and this uncertainty prevents the bank of meeting their reserve requirement (positive or non-zero) exactly. The results is each bank setting aside a precautionary reserve balance.

When a bank is choosing its level of reserves the potential costs of falling short of requirement has to be balanced against the cost of holding excess reserves. The opportunity cost of holding excess levels is the difference between the interest rate gained overnight in the central bank deposit account, and the overnight interest rate the bank alternatively could have gained by lending out its excess reserves. Similarly, the opportunity cost of falling short is the difference between the relatively higher interest rate charged by the central bank through its lending facility and the overnight market interest rate. Subsequently, when the interest rate is high the opportunity cost of using central bank deposit account is high as well. Therefore, at a high interest rate, it is more risky to hold excess reserves than falling short. More concrete, the difference of borrowing in the market or from the central bank is small, while the excess reserves has to be placed in the deposit account with a relatively low interest rate. The demand for reserves is low, when the overnight interest rate in the market is high, visa versa. The interest gained from lending to the central bank or lending in the market is small, but to fall short is more costly due to of the relatively higher difference between the market rate and the lending rate of the central bank. These features explain the falling shape of the demand curve in figure 3.1 between the lending and deposit rate.

The demand curve is flat at the standing deposit rate and the lending rate. If the prevailing market rate were equal to the deposit rate holding excess reserves would not represent an opportunity cost. The banks would be indifferent to lending reserves at the market rate or gain the deposit rate, which also implies indifference between any reserve quantities above the requirement level. Similarly, if the market interest rate were equal to the lending facility rate, a bank would be indifferent to holding reserves directly or borrowing from the central bank, given late-day transactions will not cause the bank to holding excess reserves.

Given some level of demand, the equilibrium interest rate in the overnight market is determined by the supply curve[30]. The supply curve is vertical, and therefore independent of the interest rate. It represents the total amount of supply determined by the central bank and independent factors outside of central bank control[31]. In a corridor system liquidity policy is carried out in such a way that the key policy rate is materialized in a mid-point between the lending and the deposit rate. The lending rate is set at a fixed number of basis point above the target rate, and the deposit rate correspondingly below the target rate[32]. Hence there is a unique level of reserves that will make the market clear at the key policy rate. Moreover, there

[30] Bernhardsen et al (2010).
[31] Ibid.
[32] The symmetric channel system around the target rate differ from country to country, see s 46 Keister et al (2006)

exsits a liquidity effect present on the market rate between the upper and lower bound. Higher supply of reserves will lower the equilibrium rate. It is in the positioning of the target rate that separates the corridor from the floor system. In a floor system the key policy rate is set equal to the standing deposit rate. These central banks targets the floor and not some point in the interior. One important consequence from a floor system is the removal of the opportunity cost of holding *excess* reserves, as explained in the section above, while the opportunity cost of falling short of reserves requirements or reserve needs still apply. The supply of reserves now intercepts the flat demand curve at the deposit rate, see figure 3.2.

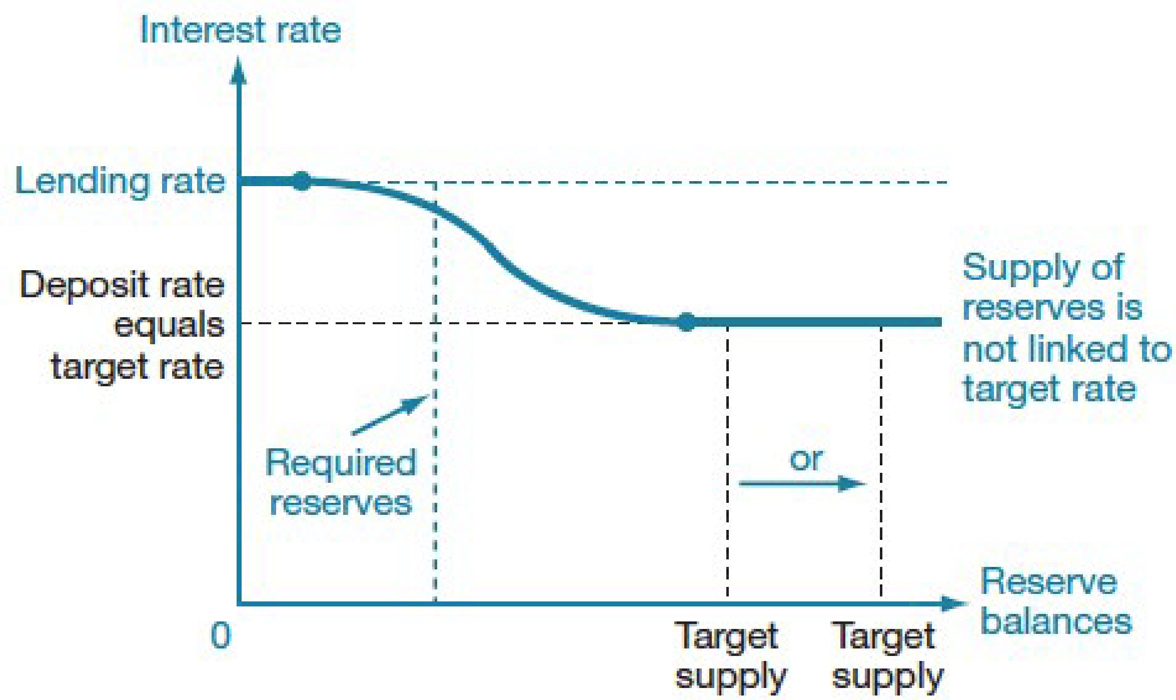


*Figure 4.2: The floor system. Source: Keister et.al. (2008)*

Thus, the central bank hold great control, given their liquidity provisions motivated by monetary policy, over the overnight money market interest rate. But the longer terms are determined in a highly competitive market where expectations of future monetary policy are of high importance.

### 4.1.2 Differences of Floor and Corridor

In Keister et.al. (2008) and Bernardsen et.al. (2010) there is a discussion on the pros and cons of the two different systems outlined in the previous sections; regarding the implementation of monetary policy, the ability to reduce financial stress, dead weight loss and reserve tax, see

Keister el at (2006). A complete and detailed discussion of the differences will not be attempted here, as it would be a digression, but some consideration on the issues regarding financial stability and measures that has been taken during the financial crisis is in order. The purpose is to give some insight towards how the central bank acted to counteract the financial instability, which then implicitly aimed to reduce the abnormal high levels of the risk premium as well.

According to Keister et.al. (2008) a floor system has the advantage of divorcing monetary policy from the supply of money. As we have seen the central bank targets the key policy rate to be close to the deposit rate, i.e. the supply curve is set such that it intercepts the demand curve. The direct consequence is apparent: The equilibrium interest rate is now independent of the amount of reserves or the quantity of money. Given demand and depending on the elasticity of demand, increased supply of reserves will lower the market interest rate in the interior. The divorce gives the central bank two separate policy instruments: The interest rate can be set to achieve monetary goals, while the level of reserves can be independently set in order to achieve other goals, like financial stability (Keister et.al. 2008). During the financial crisis central banks increased the supply of reserves[33].

A corridor system gives higher incentives for inter-bank trading of reserves than in a floor system. The reason lies within the difference in opportunity costs between the two systems. In a corridor system the amount of reserves supplied by the central bank has to equal the banks need for reserves, which follows from the determination of the equilibrium rate in the interior. At any given time if there is a deficit bank there must be one or more surplus bank, as the amount of reserves is given. The surplus bank will prefer to lend the excess reserves at the market interest rate rather then using the standing deposit facility. On the other hand, in a floor system it is less costly to use the deposit facilities and so the incentives to trade among banks are smaller. Rochet and Tirole (1996) argues that high interbank trading improves financial stability, since high levels of trading leads to high inter-bank monitoring. However, in the opinion of  Bernhardsen and Kloster (2010) interbank monitoring resulting from high inter-bank trading should have left a common understanding of what was going on in the banking sector during the financial crisis. The observed events of the crisis suggest otherwise.

[33] Sellin, P (2009).

In order for banks to meet their liquidity needs there are four sources available: Cash deposits, asset market, central bank and the most important one as argued by Nikolaou, K. (2009), the interbank market. There are several reasons for a bank to raise funds in the interbank market rather through the central bank. From the point of view of an individual bank, raising additional liquidity in the interbank is preferred because stigmatization can be escaped. A bank using the central bank standing lending facility can be considered by others as a risky bank; forced to borrow from the central bank after possibly being denied funding from interbank market. Another incentive for entering the interbank market is the acceptance of a broader range of collateral. Central bank normally restricts its lending rate to commercial banks only and accepts a limited range of collateral. Interbank interest rates are negotiated over-the-counter (OTC) on a bilateral basis and this information is not required to be released to the financial market. The interbank market is therefore characterized by incomplete markets and asymmetric information as some counterparts are better informed then others (Allen and Carletti 2008). Following Allen and Carletti (2008) the argument is that the incompleteness of the interbank market changes dramatically the possibility of hedging against liquidity risk, and the provision of liquidity is ineffective in the current financial market[34].

## 4.2 Interbank Markets Seized up

The failure of the interbank market to redistribute liquidity became one of the distinctive features of the financial crisis during 2007-2009. In September 2008, when the financial crisis deepened following the collapse of Lehman Brothers, the risk premiums increased substantially. This increase may result from further liquidity being withdrawn from the interbank market, as banks preferred hoarding cash. In other words banks preferred holding excess reserves rather than lending to other banks (Heider et.al. 2009).

As an example to illustrate the liquidity hoarding, the figure 4.3[35] below displays excess reserve holding at the European Central Bank from January 2007 until May 2009. The red line represents the risk premium in the Euro-Area, which is the spread between 3m EURIBOR and 3m Eonia. Before the financial turmoil started in August 2007, the risk premium is low and stable on a 5 basis points average and the excess holdings were virtually

[34] See Allen, F. and Carletti, E. (2008) for further details.
[35] From Heider et al (2009)

zero, reflecting “normal’ times. In the period between August 2007 and up to the collapse of Lehman Brothers, the risk premium levels were increased holding an average of 60 basis points. Nevertheless, the excess reserve holdings during the period remained at virtually the same levels as before; close to zero. As of the last weekend in September, after the collapse of Lehman Brothers, the risk premium increased to even higher levels. The interesting observation for this phase of the crisis is the dramatic increase in the level of excess reserves held by banks (see figure 4.3 below), i.e. liquidity hoarding. At the same time, the average daily volume in the overnight unsecured interbank market halved in the Euro-Area. (Heider et.al. 2009). Similar observation or patterns can be seen in the U.S banking system. Average excess holdings in September 2008 were around $45 billion, but by January 2009 the average holdings had increased to $900 billion (Keister and McAndrews 2009). Based on these observations of liquidity hoarding, together with the distinct increase in all risk premiums in the data set after Lehman Brothers collapse, indicates quite strongly that the perception of risk altered in mid-September 2008.

One of the main roles of the interbank market is to redistribute liquidity among banks that are facing idiosyncratic shocks. Conversely, if liquidity hoarding results in banks being able to cover their own idiosyncratic shock, the liquidity hoarding in itself is not a problem, and does not represent a threat to the stability of interbank markets. But, on the other side, if the liquidity hoarding prevents solvent bank to cover their idiosyncratic shock, then central bank intervention is called for (Allen, F. and Carletti, E. 2008).

Allen and Carcetti (2008) provide two different explanations for why the interbank market dried up. First, the banks could be hoarding liquidity from an anticipation of significant increase in liquidity needs following from treatment of SIV´s on the balance sheet. Also, as the real economy slowed down non-financial corporations might be relying more on their credit lines than normal, and uncertainty of future aggregate liquidity needs grew. These factors contributed to increase the funding liquidity risk. Second, it is argued that uncertainty over banks solvency grew, as it proved difficult to understand which banks held the subprime mortgages and the attributed value of these. The willingness of banks to engage in interbank lending was reduced, and by following above line of argument, liquidity was withdrawn from the market. Subsequently the risk premium increased as the perceived liquidity funding and counterparty risk increased.

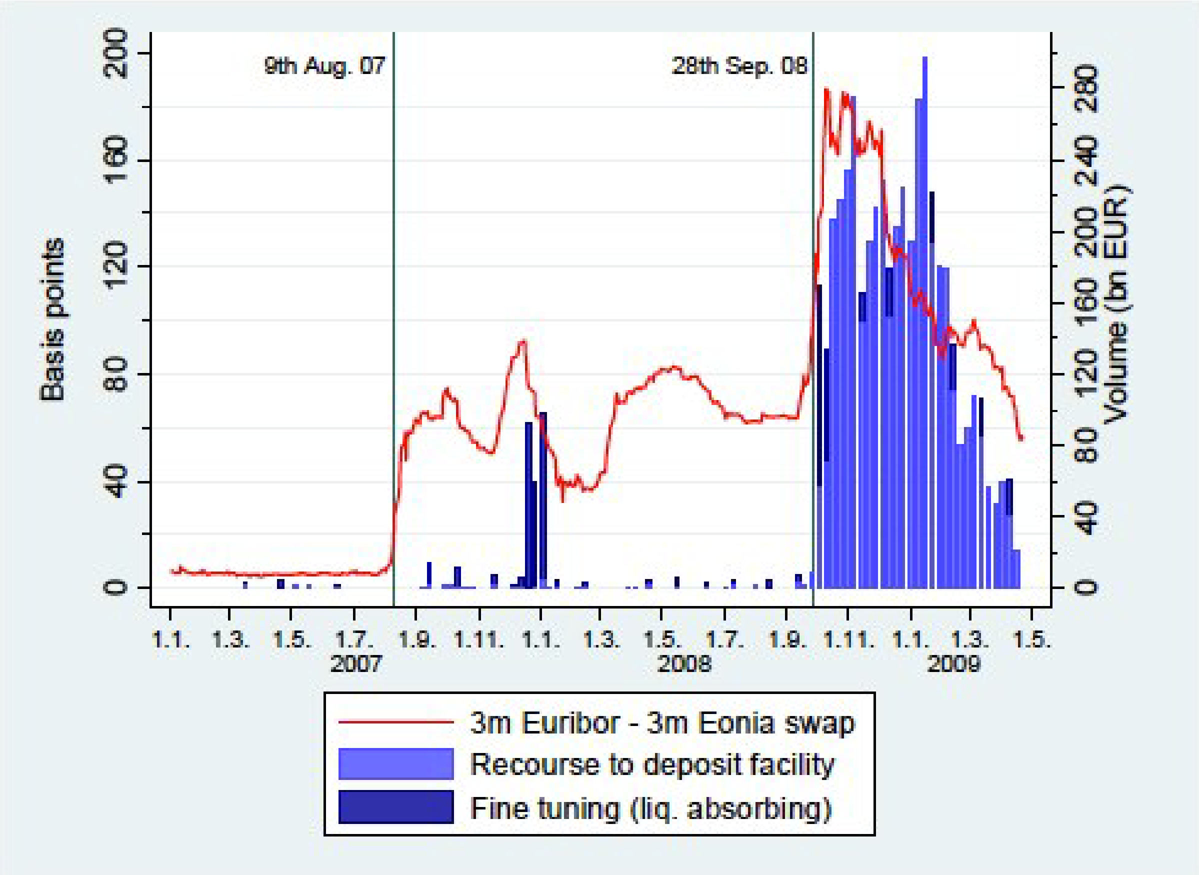


Figure 4.3:The figure displays interbank spread and excess reserves (recourses to the ECB deposit facility and liquidity-absorbing fine tuning operations), daily average per week, Jan 2007 – Apr 2009. Source: Heider et. al. (2008).

# 5 Decomposing the Risk Premium

Separating the different components of the risk premium is difficult, because there are no financial instruments whose payoffs are directly related to the individual risk factors. Once again proxies are needed to represent the different components of the risk premium, each is given a representation later in this chapter. In general the risk premium can be separated into two parts, credit risk and liquidity risk. However, during the crisis non-US banks experienced US dollar shortage. The supply of dollar loans decreased dramatically following the Lehman Brothers collapse (Bernhardsen et.al. 2009). In order for non-US banks to access US dollar they had to enter the foreign exchange swap market (ibid). The relatively excess demand for US dollar increased the cost of dollar funding. If this increased funding cost fed into non-US money markets it should manifest in the money market risk premium.

## 5.1 Increased US dollar funding costs

This section aims to offer an understanding of the link between US dollar liquidity shortage and the increased risk premiums in the non-US money markets. ECB (2008) claims the forward exchange swap market (henceforth FX swap market) was an important channel for the transmission of US money market tensions to Euro money market. Further, according to (ECB 2008), since august 2007 FX swap premiums has moved in generally the same direction as the spread between interbank rates and OIS rates. Baba et.al. (2008) found a significant lead-lag relationship between the US dollar FX swap and the short-tem risk premium for the Euro market. The measurement of money market risk premiums can be based on domestic interest rates, reflecting interbank borrowing and lending within one currency, or alternatively on interest rates swapped from other currencies (Bernhardsen et.al. 2009). To show the relationship between the two alternative measures of money market risk premiums, a simple model based on covered interest parity is presented. The first section below describes the asymmetry between European banks USD assets holdings compared to US banks asset holdings in European currency.

As figure 5.1 shows the European banks has increased their US dollar assets holding significantly during the past decade. This growth has gone beyond that of their retail dollar deposits, as a consequence the banks bid for dollars from non-banks and banks (Baba et.al. 2009). On the other side of the Atlantic, US banks have leveraged their domestic operations with foreign assets in a smaller degree, and so US banks need for foreign currency is much smaller (Ibid). Non-US banks (banks not headquartered in the United States) can refinance part of their balance sheet in US dollar in several ways (ECB 2008). A bank can borrow domestic currency, in the unsecured interbank market or from its central bank, and buy US dollar. This simple trade creates a substantial exchange risk on a bank`s balance sheet that needs to be hedged against. A FX swap is the equivalent of buying a currency and selling it forward. Hence, European banks with dollar liquidity exposure towards liabilities from US dollar assets holdings can enter the FX swap market in order to cover their US dollar needs. The US dollar assets during the crisis were primarily illiquid long-term assets and funded by short-term funding (Ossolinski and Zurawski 2010); This made European banks exposed to liquidity funding risk caused by the mismatch of maturity of assets and liabilities. Following the eruption of the crisis in 2007, the European banks were increasingly dependent on the FX swap market to access US dollar against European currencies. According to Bernhardsen et.al. (2009) the supply of dollar loans fell dramatically after the collapse of Lehman Brothers 18.september 2008. USD lending financial institutions wanted to secure their dollar holdings due to increased value of holding US dollar liquidity, and due to increased fear of credit default risk of their foreign counterparts. However, the European banks did not meet US banks with a complementary need for European currencies (Baba et.al. (2009). This asymmetry led to foreign exchange swap prices that increased the cost of dollars above the already elevated USD LIBOR rate (Baba et.al. 2009).

The increased swap premiums can also be due to asymmetric information across interbank markets. Banks operating in the same interbank market under currency *j* most likely are better informed about their domestic counterparts, compared to banks operating in foreign interbank markets. During the financial crisis with high market unrest overall, foreign banks seeking to swap for USD dollar in, say, the London Interbank Market most likely faced higher counterpart risk premiums due this asymmetric information.

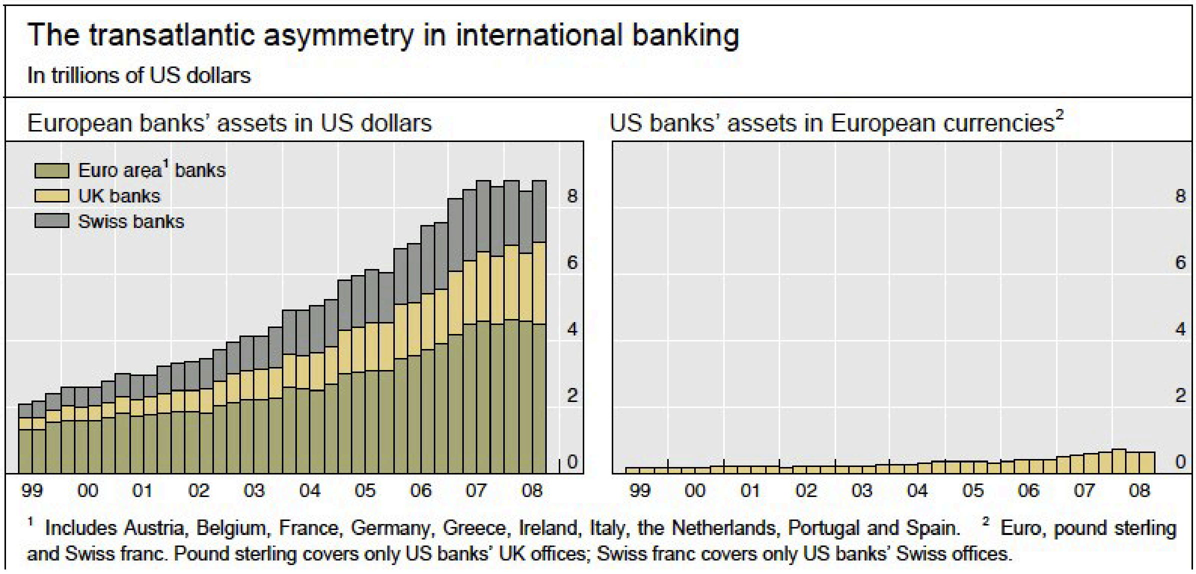


Figure 5.1: The figure displays European Bank US dollar assets versus US banks` assets in European currencies. Source: Baba et.al. (2009).

The relationship between risk premiums across currencies deserves to be commented upon. Theoretical arguments suggest that risk premium across currencies should be equal. In order to improve the understanding of how money market risk premiums may differ between currencies, a simple model based on covered interest parity (CIP) is presented. The model aims to provide understanding of the link between US dollar shortage and increased risk premiums in the non-US money markets. The exposition her follows Bernhardsen et.al. (2009). (5.1) gives the definition of swap rate on currency *j*:

(5.1) $i_{j,SWAP} = i_{USD} + (f - e)$

The dollar funding rate is represented by $i_{USD}$, *e* is the log of the exchange rate (units of currency *j* per unit of USD) , *f* is the log of the forward exchange rate and $i_{j,SWAP}$is the swap rate in currency *j*. Arbitrage will ensure the swap rate is independent of which currency the rate is swapped from, given absence of market frictions. Also, arbitrage activity equalizes the domestic interest rate, like LIBOR, EURIBOR and STIBOR, and the swap rate.

Further the risk premium under currency *j* can be written as:

(5.2) $rp_{j,SWAP} = i_{j,SWAP} - OIS_j$

(5.3) $rp_{USD=}i_{USD} - OIS_{USD}$

where $rp_{USD}$ is the money market risk premium in USD, $rp_{j,SWAP}$ the money market risk premium in currency. $OIS_j$ and $OIS_{USD}$ are the overnight indexed swap rates for currency j and USD money market respectively[36]. By substituting (5.1) and (5.3) into (5.2) we get:

$$(5.4) \quad rp_{j,SWAP} = rp_{USD} + (f - e) - (OIS_j - OIS_{USD})$$

The risk premium in currency $j$ is determined by the risk premium on USD, the forward premium and the difference between the two OIS rates. The latter difference is called the "theoretical forward premium'. Hence, we can see from equation (5.4) that risk premium under currency $j$ are equal to the US premium if and only if the forward premium is equal to the theoretical forward premium. Arbitrage arguments will ensure the forward premium is equal to the theoretical premium; hence risk premium across all currencies should be equal[37]. However, risk premiums during the financial crisis differed greatly. According to Bernhardsen et.al. (2009) the deviation can be related to the differences in the forward premium under different currencies; high excess demand for US dollar liquidity relative to excess demand for domestic currency causes the forward premium to move into negative values. Two important factors affect domestic demand of US dollar: First, demand for US dollar liquidity from the financial markets under a specific currency. Second, the supply of US term liquidity from the central bank[38]. Further, as can the model confirms, changes in the forward premium affects the swap rates and the risk premium under currency $j$[39].

The CIP relation was violated during the financial crisis, in the sense that swap rates based on USD LIBOR were lower than the domestic interbank rates, see figures 5.2-5.4. Nevertheless, evidence suggests swap rates based on USD LIBOR has understated the true cost of interbank borrowing in US dollar (Bernhardsen et.al. 2009) [40]. When using an alternative dollar rate quoted by broker Carl Kleim in Frankfurt the deviation from CIP is much smaller, as figures 5.2-5.4 confirms.

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[36] OIS as explained in chapter 2.1.

[37] The arbitrage arguments are not repeated here, as they are easily found on page 374 in Bernhardsen et al (2009).

[38] The establishment of US dollar swap lines between the Federal Reserve and foreign central banks are discussed in section 6.3.3.

[39]A comment: As mentioned, according to ECB (2008), the increased foreign exchange swap premiums lead to higher domestic money market premiums. However, given the direction of the deviation as shown in figures 4.2-4.4, this relationship is not immediately clear. Given the swap rate definition in (5.1), and the observed fact that swap rates based on USD LIBOR was lower than domestic interbank rates, suggests the forward premium was negative. A negative forward premium, all else equal, would give a lower swap rate and lower risk premium measured from the swap rate, and hence the relationship stands a bit unclear.

[40] recalling LIBOR rates are only estimates of actual rates.

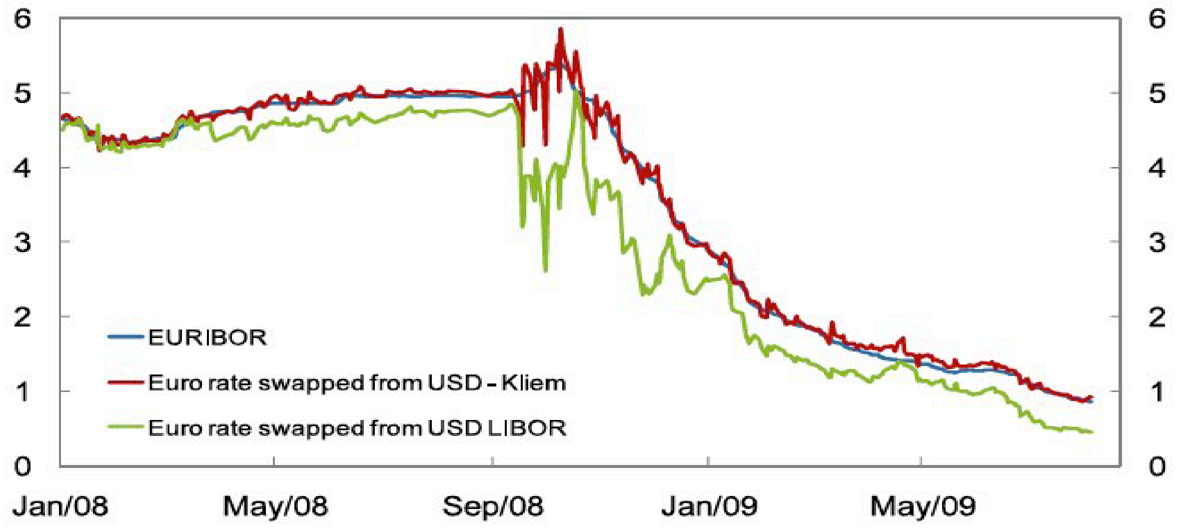
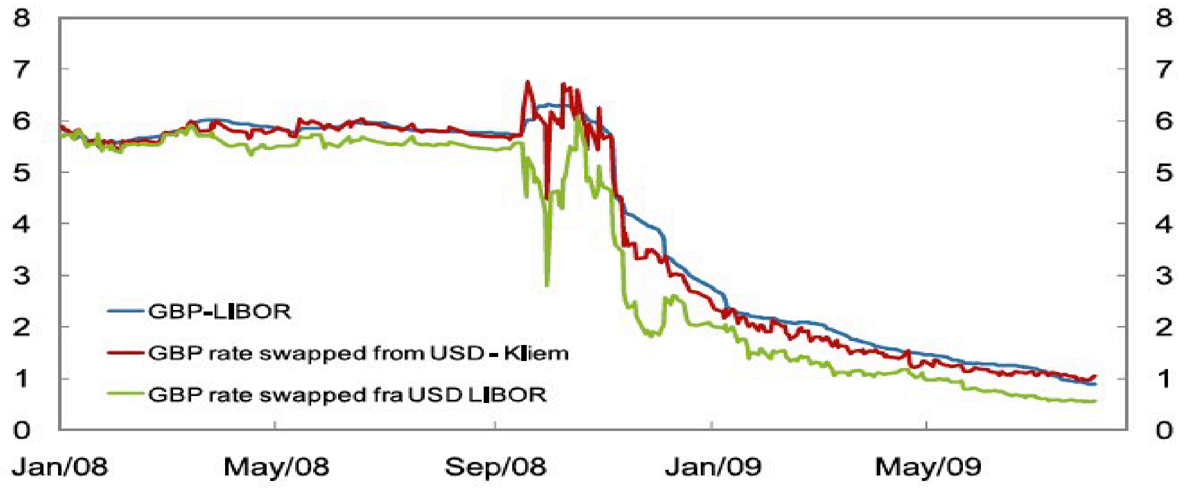



*Figure 4.2: CIP deviation in EURO. Source :Bernhardsen et.al. (2009)*



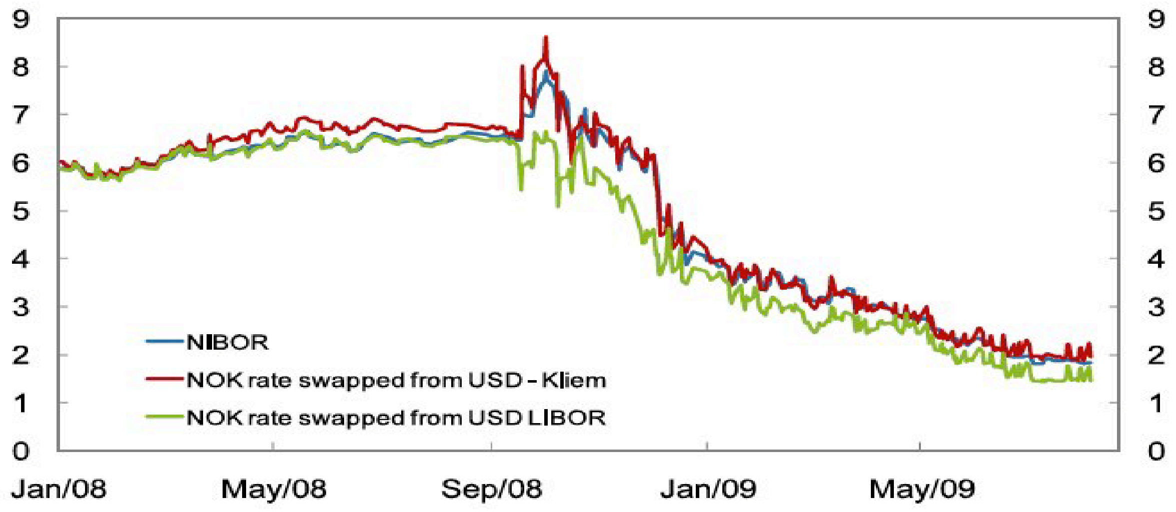




*Figure 5.3 and 5.4: CIP deviation in GBP and NOK respectively. Source :Bernhardsen et.al. (2009)*

The money market interest rate in Norway (the NIBOR) differs from the interest rates under the other currencies used in the econometric study. The LIBOR rates, EURIBOR and STIBOR rates are all domestic interest rates, reflecting interbank borrowing and lending within one currency. However, no domestic interest rate is officially announced in the Norwegian money market[41]. NIBOR are derived from the rates of interbank loans in USD swapped to NOK in the FX market, hence it is characterized as a US dollar swap market (Bernhardsen et.al. 2009). Hence, a key characteristic of the Norwegian money market is its close ties to the U.S money market.

To sum up, the internal conditions in the US money market may have elevated risk premium in non-US money markets through non-US banks increased use of the FX swap. To measure this effect the 3-month USD risk premium is used as an independent variable in the regressions of the non-US risk premiums.

## 5.2 Funding liquidity and funding liquidity risk

The financial contracts banks usually deal with, deposits and loans, cannot be easily resold opposed to financial securities like stocks and bonds. Financial securities are anonymous, in the sense that the identity of the holder is irrelevant and thus it is easily marketable. Banks allow customers to deposit funds which are allowed to be withdrawn whenever the customers experience liquidity needs. A bank uses the accumulated deposits to invest in long-term investments, hence bank assets (loans) are more illiquid then their liabilities (deposits)[42]. Each individual bank face a trade-off between minimizing the exposure to risk by holding liquid assets against increasing profits from holding a larger share of illiquid assets[43]. There is an opportunity cost for banks by holding to much of liquid assets because it yields lower returns then illiquid assets. The distinctive characteristics of banks in transforming short-term deposits into long-term loans make banks vulnerable to funding liquidity risk.

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[41] Transactions are carried out, however there is no announcement of official rates as the market is small and characterized by a few large agents.

[42] For more on banks role as liquidity providers and provider of risk sharing, see the standard model by Diamond and Dybvig (1983).

[43] Diamond & Dybvig (1983) defines an illiquid asset as "one in which the proceeds available from physical liquidation or a sale on some date are less than the present value of its payoff on some future date'.

To clarify the term funding liquidity risk, a definition of funding liquidity is needed. Drehman and Nikolaou (2009) define funding liquidity as "*the ability to settle obligations with immediacy.'* A bank is illiquid if the obligations cannot be settled in time, in which the bank defaults. Drehman and Nikolaou (2009) further define funding liquidity risk as "*driven by the possibility that over a specific horizon the bank will become unable to settle obligations with immediacy.'* The two concepts of funding liquidity and funding liquidity risk have important differences. Funding liquidity is a binary concept, either the bank is able to settle obligations or not. Funding liquidity risk is related to the future ability to settle obligations, i.e. future funding liquidity, and can take on infinite many values as it is related to the distribution of future outcomes. An individual bank faces two types of uncertainty concerning its liquidity needs (Allen, F. and Carletti, E. 2008). First, at any given time the costumers can decide to withdraw more or less funds than expected, called idiosyncratic liquidity risk. Second, each individual bank faces aggregate risk, where all banks are exposed to the same shock as aggregate liquidity can increase or decline, a stochastic variable. A smooth functioning of the interbank market is crucial for the ability of a bank to hedge oneself against liquidity shocks.

As an example, consider a bank with liquidity surplus; The bank can lend in the unsecured term market or lend in the overnight money market[44]. There is a certain probability of the bank being hit by a liquidity shock at some point in the future. If the reserves are lend in the term market and the bank experiences a liquidity shock before the loan matures, the bank will have to raise new funds. It may not have to do so if the money is lend on an overnight basis; the bank can take the repayment of the loan to cover its unforeseen liquidity liabilities. If the bank fears bad conditions when raising new funds in case of a shock (possessing low levels of collateral and/or the bank is perceived risky by other banks), the bank may be ready to lend in the term market only at elevated rates. In other words, the banks demands compensation for being exposed to liquidity funding risk. Thus, borrowing banks will then prefer to enter the overnight market which offer lower interest rates. As the number of trades in the term market are decreasing the rates will not be reflecting expected key policy rate anymore, but rather the rates that banks are willing to lend given compensation for liquidity funding risk.
The arguments given suggests, ceteris paribus, that money market risk premiums will rise if the probability of receiving a liquidity shock increases. Further elevation of rates if the lender are facing increased funding cost should such as shock occur. In addition, the future funding

[44] The arguments presented here are based on Eisenschmidt and Tapking (2009).

costs may increase if the lender's probability of default rises. Hence, the money market risk premium may not only rise from borrower's probability of default, but also the lender's.

### 5.2.1 VIX-index as a measure of liquidity funding risk

Information regarding liquidity funding in a given banking system would require liquidity ratios and the aggregated size of liquidity commitments. According to Michaud and Upper (2008) this information is not available on a systematic basis at relevant frequency. In order to measure funding liquidity risk other measures has to be used. The VIX-index is offered by Chicago Board Options Exchange (CBOE) and measures market`s expectation of the next 30-days volatility, based on S&P 500 index option prices[45]. The VIX-index is often referred to as the fear index. According to CBOE, the VIX-index is based on real-time option prices. Option prices will reflect market consensus view of future expected stock prices. In times of financial stress, which are often accompanied by steep market decline, option prices tend to rise[46]. As option prices rises so will the VIX-index, because increased fear (higher expected volatility) in the market leads to higher VIX levels. The VIX index is quoted in terms of percentage points on an annualized basis.

The idea behind using the VIX index as a proxy for liquidity funding risk is as follows: Volatile markets make it more difficult for banks to estimate their liquidity needs, as abrupt changes in the price levels increase the risk of the bank not being able to meet their obligations unless raising funds at a very high cost, i.e. increased funding liquidity risk. Banks  become reluctant to redistribute liquidity beyond overnight, causing scarcity in short-term funding and corresponding interest rates rise. Volatile markets increases funding liquidity risk, and the VIX-index is a measure of expected market volatility. Further, stock markets are highly correlated across countries, so the variable is assumed to give an indication over uncertainty over development in Non-US markets in question.

Expected stock market volatility increased around August 2007 follows the same pattern as the risk premiums. Expected volatility in the S&P 500 index reached over 80 percent in September 2008. The graph indicates the market's high ambiguity over future direction. This is assumed to be reflected in the interbank markets causing increased concerns about own liquidity coverage.

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[45] For more information on the VIX-index please refer to http://www.cboe.com/micro/vix.
[46] Ibid

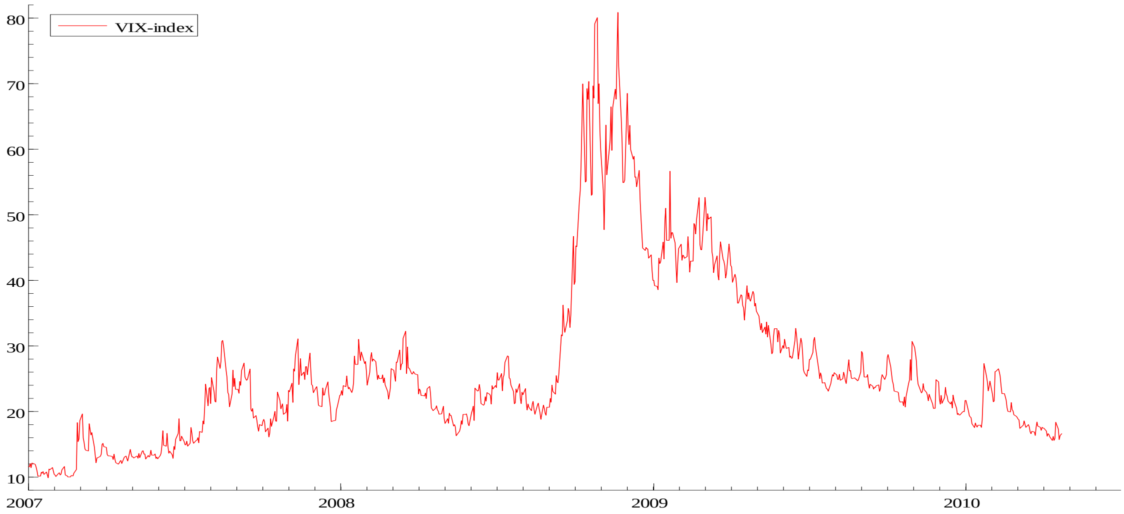

Figure 5.1: The VIX-index from January 2007 until March 2010. Source: Chicago Board Options Exchange.

## 5.3 Credit Default Risk

The credit risk premium in the interbank market is the compensation the lending bank demands for the risk that the borrower may default, which is related to the probability of default over a specific time horizon. Heider et.al. (2008) views the use of public funds to rescue Bear Stearns as initially placing a lower bound on the perceived probability of counterparty default. However, by letting Lehman Brothers fall led to a drastic revision of expected default probabilities. It challenged the widespread belief that any large bank ,considered to be too big or too interconnected to fail, would be saved by public authorities (ECB 2008). If this argument holds, we should expect to see a more profound effect of credit risk in the econometric model after the latter collapse.

Inter-bank lending and borrowing focus on the shortest maturity, from overnight to a maturity of 12 months. In addition, the larger scale of inter-bank trading focus on the very short end of the yield curve[47] where liquidity is restructured for overnight purposes. Under normal times, in the absence of financial stress, what matters for a creditor bank is that the debtor does not go bankrupt over the time a loan is extended. When the maturity is as short as overnight the incentives for a creditor bank do perform a thoroughly monitoring of the debtor`s long-term solvency are small. It is the long-term solvency that matters for financial stability (Bernhardsen et.al. (2010)). The risk premium analyzed in the econometric model has a

[47] The **yield curve** is the relation between the interest rate (or cost of borrowing) and the time to maturity of the debt for a given borrower in a given currency (Bernhardsen and Kloster (2010)).

maturity of three months, and it would be interesting to see if the incentive to monitor is present during short-term maturities.

### 5.3.1 Ted-spread as a measure of credit risk

TED-spread is difference between the 3-months USD LIBOR rate and 3-months interest rate on Treasury-bills (T-bills).

$$(4.1) \quad TED_t = 3month\ US\ Libor\ _t - 3month\ US\ T - Bill_t$$

The interest rate on T-bills is considered risk-free[48]and do not contain credit risk, while the USD LIBOR rate does. Thus, the difference between the two  can serve as a measure of credit risk. TED-spread serves as a common measure for credit risk within the commercial banking industry, and the general economy as a whole (Blankespoor et.al. (2009)), and from of its lack of country specific information it should be regarded as a more general perception of credit risk. However, using TED-spread as a measure of credit risk is not without its weaknesses, and therefore not fully satisfactory. One obvious weakness is the spread`s inability to confine credit risk alone. On the other side, the 3-month USD risk premium contains several factors reflecting the characteristics of market-wide conditions, including credit default risk and liquidity funding risk. By including the 3-month USD risk premium in the regression the coefficient coherent to USD premium measures the effect on the dependent risk premium after the TED-spread have been partialled out[49], thereby hoping to separate the credit risk. Another weakness is the lack of country-specific or market-specific information regarding credit default risk.

[48] or as close as you can get.
[49] See for example Woolrigde (2009) for more information regarding ‘partialling out’ interpretation of multiple regression.

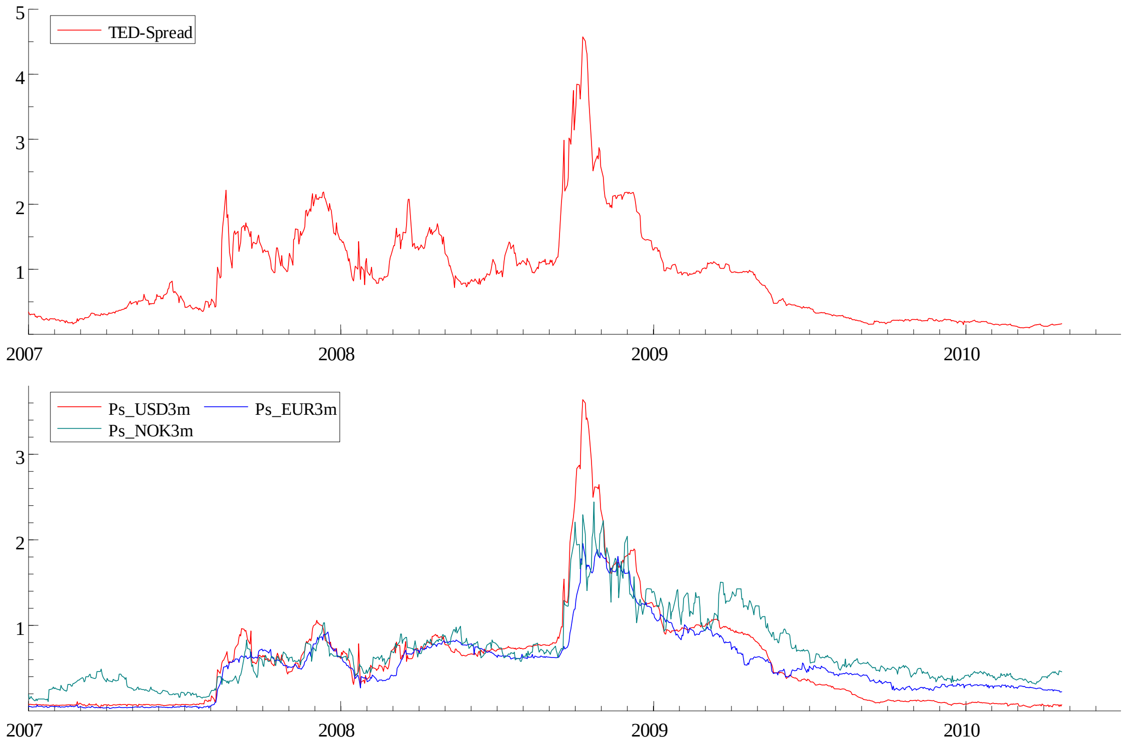


Figure 5.2: TED-spread from 01.01.2007 until 23.04.2010. Measured in percent.

## 5.3.2 The GRI index

The Global Risk Indicator (GRI) measures expected (implicit) volatility between the three largest currencies; USD, EUR and JPY[50](Norges bank 2008). The volatility is measured in percentage points. GRI is a measure of implicit volatility as it is calculated from 3-months currency options prices between EUR, USD and JPY (equally weighted)[51]. When GRI rises it can be interpreted as increased global exchange rate risk (Bernhardsen and Roisland 2000).

Figure 4.3 shows the development of the GRI over the course of the financial crisis. Global exchange rate risk has varied greatly, and large changes in GRI are corresponding to events in international finance markets. GRI as an independent variable in the regression models is indented to capture the following effect: increased volatility in the foreign exchange market can further be interpreted as market uncertainty over the future direction in the global real economy. This increases overall risk and can influence perception of risk in interbank borrowing and lending and thereby manifest itself in risk premiums.

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[50] JPY=Japanese Yen.

[51] The formula for GRI can be found at page 193-94 in Norges Bank (2008).

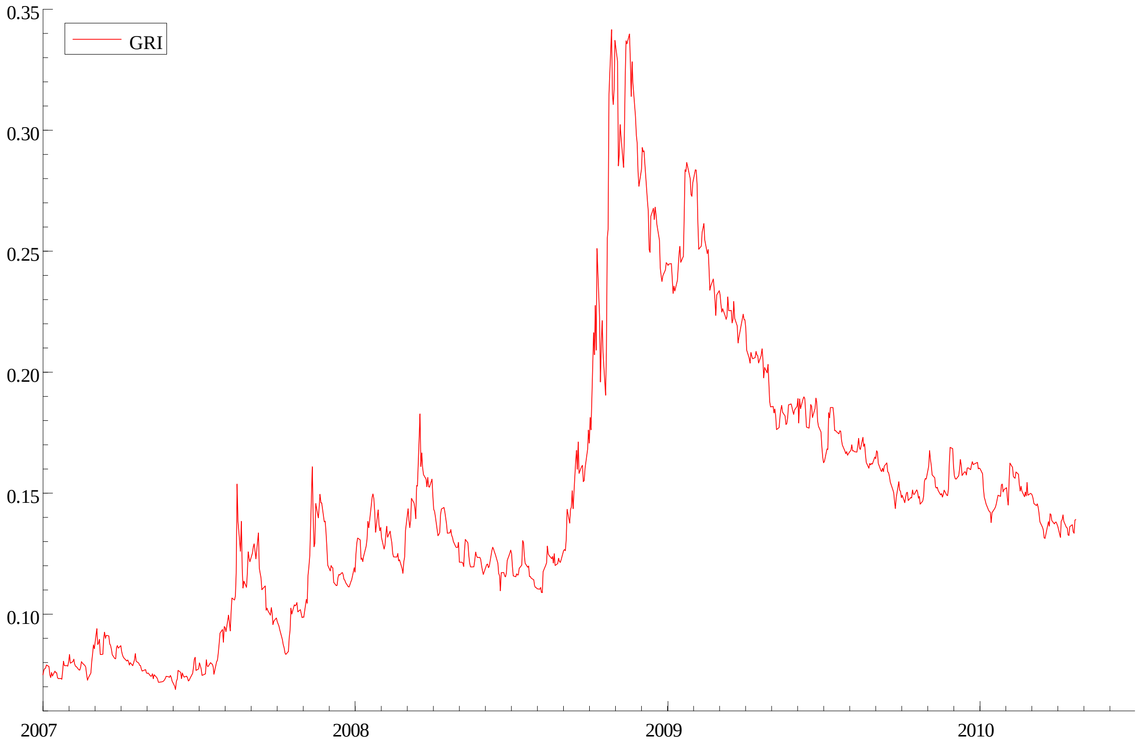

Figure 5.3: Development of global risk indicator from 01.01.2007 until 23.04.2010.

# 6 Econometric analysis

## 6.1 Variable descriptions

All variables described below are time series based on day to day quoting[52] and span over the time horizon from 01.01.2007 until 24.03.2010.

As explained in section 2.1 the risk premium estimate is constructed from the difference between the 3-month interbank money interest rate[53] and the corresponding overnight indexed swap rate (OIS). BBA LIBOR rates will be used for interbank interest rates under the currency regime in the following countries: USA, Great Britain, Australia and Canada. The original source for the BBA LIBOR, STIBOR and EURIBOR rates are Reuters, further given by Norges Bank. The source for overnight indexed swap rates for all currencies, except Norway, is also Reuters, given by Norges Bank. OIS for the Norwegian interbank market are not traded in the market, but is calculated by Norges Bank (Bernhardsen et.al. (2009))[54]. The source for NIBOR and the latter OIS is Norges Bank.

The proxy used for the liquidity funding risk is the VIX index. TED-spread is used as a proxy for credit risk, and GRI for global exchange rate risk. Domestic factors will appear in the residuals once the impact of all other factors has been taken account of.

### 6.1.1 Before and after Lehman Brothers

The time horizon will be divided in three parts. The first period will represent normal conditions in the interbank market, and will be defined as the period between 1.January until 31.July 2007. The crisis phase will be divided into two parts, with the Lehman Brothers collapse splitting the two. More specifically: the first phase of the crisis will be defined from August 2007 until 17.September 2008[55], while the second phase dates from 18.september 2008 until the end of the data set, 23. April 2010. I believe it is of interest to make a division at the point of the collapse of Lehman Brothers for several reasons. Immediately after the collapse we observe a substantial increase in the all risk premiums in question, reaching the

[52] Five business days a week.
[53] LIBOR, EURIBOR, NIBOR and STIBOR rates
[54] Norges Bank`s OIS calculation is based on other interest rates in the market and jugdement, and not actual swap rates.
[55] Most literature refer to this phase as the turmoil phase.

highest levels under the crisis. Further, following the collapse of Lehman Brothers, banks were hoarding liquidity as from the last part of September, as explained in section 4.4. The idea is to investigate whether key drivers of the risk premiums altered during the crisis. In addition, the supply of dollar loans to non-US banks were reduced significantly after the Lehman Brothers collapse and it can be interesting to see if the USD money market influence changed over the course of the crisis.

## 6.2 Single equation or system?

Since we are dealing with time series a natural first step is too test for stationary of the variables. If the time series in question are non-stationary caution should be made when running a standard OLS regression (or any kind of model for that matter).Whenever the variables are characterized as non-stationary, the risk of running spurious regression is highly present. The exception is if the variables are co-integrated. If the variables are integrated of order one, the non-stationary can be removed by taking first differences. However, by doing such a differentiation the econometric model will suffer from information loss[56], given the variables co-integrate. Taking first differences remove the long-run equilibrium present between the variables in such an econometric model. If the variables co-integrate an error correcting model will be superior, too say an ARIMA or ADL model or any other model with first difference variables. Also, the possibility of multiple co-integration vectors is present in the case of multiple independent variables. Normal practice for investigating presence of co-integration, and for number of co-integrating vectors, is to test within the framework of a vector autoregressive model (VAR-model) using a Johansen test. However, the data set at hand is day to day quoting of 3-month inter-bank money interest rates. The daily observations make the specifications of a VAR model complicating, especially in relation to specification of number of lags and to satisfy a number of tests in order for the model to be well specified[57]. The number of lags included in a VAR-model should be such that the residuals are characterized as Gaussian residuals. However, the dataset at hand very likely holds complicated dynamic structure due to the day to day quoting of all the variables. Due to the complicated structure, the number of lags needed in order to produce Gaussian residuals could in practice be unmanageable.

[56] Kennedy s 300 ,Veerbek
[57] To test for heteroskedasticity, normality of residuals density, autoregressive resiudals, Arch-effects etc.

As an example, monthly data is, but not necessarily, treated in a VAR model with twelve lags for good results. Therefore daily data is be given 365 lags, which is hardly optimal in practice. One possibility could be to average the daily data into weekly averages. This would give 52 lags in a VAR following the argument above, which is better than 365 lags, but the number of lags is still too large. Another possibility would be to construct monthly averages and working with twelve lags, which is an acceptable number, but it would come with a serious drawback as valuable information is lost; First, the length of the crisis is not long enough to produce enough monthly data or observations to consistently identify inter-variable relations[58]. Also, this would make the division of the time series into three parts more difficult or impossible due to lacking observations[59]. Further, the investigation of whether some types of risk were more profound before or after the Lehman Brothers collapse would then also be lost. Second, by observing the graphs of the risk premium time series (see figures in section 2), the premiums exhibit high volatility in relatively short time, and thus taking average over a month or a week much of this volatility is lost, hence information on what causes the volatility is lost. This is not to say that working with daily data does not come with its own drawbacks. It is expected that the data will contain more noise compared to data with longer maturity, and also longer time dependence compared to data with longer intervals.

Given the problems above I find it hard to trust the results from a Johansen test, and also any results from a Granger test to determine exogeneity[60]. Also, if a Johansen test indicates multiple co-integrating vectors, identifying these are very complicated, especially in the absence of solid economic theory on the long-run solution (Kennedy 2009). Based on these arguments, modeling with single one-equation methods seems more appealing compared to system modeling (VAR's). Therefore, given the variables co-integrate, the Engle-Granger method will be applied[61], i.e. retrieving the long-run solution from a single co-integration regression, and further constructing an error correction model (henceforth ECM). On the other hand, if the risk premium is characterized as stationary in a given phase, an autoregressive distributed lag model (henceforth ADL) is used for the econometric analysis in that specific

[58] Normal approximation of the crisis time span in the literature is from August 2007 until spring 2009.
[59] For example, the first part of the crisis, with monthly averages, would only consist of 13 or so observations.
[60] In the attempts made, the number of significant co-integrating vectors from a Johansen test was highly dependent on number of lags included in the VAR-model. Also, the Granger causality tests displayed several counterintuitive results. The attempts to produce Gaussian residuals had little success.
[61] A full theoretical analysis of the Engle-Granger method will not be outlined here, but rather a simple intuitive approach. The Engle-Granger method is well known, and is usually described in any econometric text-book which includes topics on time-series. For example see Verbeek, M. (2008) or Kennedy (2009).

phase and risk premium. The goal for the econometric modeling is to find significant variables.

### 6.2.1 ADL or Engle Granger?

The econometric modeling will be done in an ADL-model setting or using the Engle-Granger method. It will depend on the stationary characteristics of the risk premium in a given phase. This section aims to explain which arguments are used when deciding for an econometric model.

To be more specific, for each single phase and risk premium, the following procedure will be met: First, an augmented Dickey-Fuller test (ADF test) is performed on the risk premium itself in order to establish if the risk premium can be characterized as stationary or not[62]. An ADL-model will be constructed given stationarity. If the ADF-test concludes with non-stationarity, the Engle-Granger method will be applied[63]. In a short and intuitive way, the Engle-Granger method involves running a single (static) co-integration regression as in (5.1)[64]:

$$(5.1) \quad rp_{i,t} = \beta_{0,i} + \beta_{1,i} VIX_t + \beta_{2,i} GRI_t + \beta_{3,i} TED_t + \beta_{4,i} rp_{us,t} + \varepsilon_{i,t}$$

$$i = EUR, GBP, NOK, SEK, CAD, AUD$$

If the residuals from the OLS regression in *(5.1)* are I(0)[65] the risk premium under currency *i* is cointegrated with the right hand side variables, given the endogenous variable and the exogenous variables are integrated of order one I(1). Again, ADF-tests are used to determine if the residuals are I(1) or I(0)[66]. In the following the subscript *i* has been dropped.

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[62] All non-stationary time series in the data set are found by ADF-tests to be integrated by order 1, I(1),

[63] An ADF-test with 5 lags is set as standard. The number of significant lags can be determined by standard t-test.

[64] The description of Engle-Granger method is based on Verbeek (2008).

[65] A times series that become stationary after first differencing is said to be integrated of order one, I(1) (Verbeek 2008)

[66] There is an additional complication in testing for unitroots in residuals rather than in times series. The OLS estimator will make the residuals in the cointegrating regression (5.1) to have a small sample variance as possible, even if the variables are not cointegrated. The OLS estimator will make the residuals look as stationary as possible (Verbeek (2008)). Therefore, the critical values for standard DF or ADF test cannot be used, as it may lead to a rejection of the null hypothesis of unitroot too often. The critical values of MacKinnon (see references) are used, which are more negative than the critical values for standard DF and ADF tests. With 5 variables in the ADF-test the significance at 1% level the critical value is -4.96, and for 5% significance level, -4.42.

Cointegration means there exists a unique vector of the coefficients, $(1, -\beta_1, -\beta_2, -\beta_3, -\beta_4)'$, such that $Z_t$ in *(5.2)* is I(0) even though all the variables in question are I(1):

$$(5.2)\quad rp_t - \beta_1 VIX_t - \beta_2 GRI_t - \beta_3 TED_t - \beta_4 rp_{us,t} = Z_t \sim I(0)$$

If the residuals were to be I(1) the regression in (5.1) would simply be spurious, i.e. nonsense. The idea of cointegration is related to the existence of a long-run equilibrium between the variables. In our case, suppose the long-run equilibrium is defined as

$$(5.3)\quad rp_t \; = \beta_0 + \beta_1 VIX_t + \beta_2 GRI_t + \beta_3 TED_t + \beta_4 rp_{us,t}$$

Then the equilibrium error would be $\varepsilon_t = Z_t - \beta_0$, which measures how much $rp_t$ deviates from its equilibrium value given in (5.2). If $\varepsilon_t$ is I(0), the equilibrium error will fluctuate around zero, and the cointegrated variables will on average be in equilibrium. The coefficient of the regressors reflects their long-term effect on the endogenous variable, in this case the risk premium in currency *j*. On the other side, if $\varepsilon_t$ is I(1), the equilibrium error can take on any value and will rarely be zero.

Given cointegration, OLS on (5.1) produces a superconsistent estimator of the cointegrating vector, even if the short-run dynamics are incorrectly omitted (Verbeek 2008).The reason is that, as given by Verbeek (2008), the non-stationarity asymptotically dominates all forms of misspecification in the stationary part of (5.1). Hence, autocorrelated residuals, omitted variables and endogeneity of the regressors are all part of the stationary part of (5.1), and can therefore neglected (Verbeek 2008).The superconsitency comes about as a parameter different from the true one would case the error term to be I(1), which would have infinite variance and a high sum of squared errors. On the other side a parameter that causes a I(0) error term, whose variance is finite, and therefore produces a smaller sum of squared residuals. The OLS is effective is producing the true parameter(s) as the procedure minimizes the sum of squared errors (Kennedy 2008). Also, correlation between TED-spread and the 3-month US LIBOR in the third phase are highly correlated, with a correlation of 0,9, indicating presence of multicollinearity. However, in general I(1) variables are highly correlated but cointegration leads to identification of the cointegration vector and away from multicollinearity, so it can also be neglected.

The Granger representation theorem states that if a set of variables are cointegrated there exists a valid error correction representation of the data (Verbeek 2008).Hence, the Error Correction Model is the long-run solution rewritten:

(5.4):

$$\vartheta(L)\,\Delta rp_t = \delta + \theta_1(L)\Delta VIX_t + \theta_2(L)\Delta GRI_t + \theta_3(L)\Delta TED_t + \theta_4(L)\Delta rp_{us,t} - \gamma Z_{t-1} + \alpha(L)\varepsilon_t$$

where $\vartheta(L)$,$\theta_i(L)$, $\alpha(L)$ are polynomials in the lag operator. If the regressand and the regressors are I(1) but have a long-run relationship, there must be some forces that pulls the equilibrium error back to zero. The ECM estimates the short-term and the long-run effects of the independent variables. The coefficient $\gamma$ (henceforth the equilibrium adjustment coefficient, or simply the adjustment coefficient) measures the error correction adjustment performed by the endogenous variable. All the term in the ECM is now I(0) and when the cointegrating vector is known the ECM can be estimated by OLS.

In the literature the Engle-Granger method is normally applied for co-integration between two variables. However, it can be used for testing co-integration between more than two variables. The drawback in this case, given the existence of multiple co-integration vectors rather than just a single one, is that the single co-integration vector will be produced in reduced form. Optimally, the EG-method should be used in cases with more than two variables, when it is known that there exists only one cointegrating vector. Also, in some of the actual cointegration test undertaken in the econometric analysis, the critical values came in close range of the critical values, i.e. the null hypothesis of non-stationarity of the residuals could "almost' be rejected. However, the problem with ADF-tests is low power(Lopez 1997), particularly against alternatives that are close to I(0). As a result, when the test values are close to rejection of the null, one should be careful to make a firm and decisive rejection of cointegration. When this issue is met upon in the analysis a 'specific to general' method is applied to the cointegration regression Hence, in an attempt to improve the readings of the ADF-test, cointegration between only $rp_i$ and $rp_{us}$ are examined.

As explained an ADL-model will be constructed given stationarity of the risk premium in a given phase. An ADL-model can describe the dynamic effects of a change in the exogenous variable on current and future values of the endogenous variable. To show this the following example is given (from Verbeek (2008)):

$$(A.1)\ Y_t = \delta + \theta Y_{t-1} + \alpha_1 X_t + \alpha_2 X_{t-1} + \varepsilon_t$$

Taking partial derivatives the impact multiplier is given by:

$$(A.2)\ \frac{\partial Y_t}{\partial x_t} = \alpha_1$$

The effect after one period is given by (A.3), and the effect after two periods by (A.4):

$$(A.3)\ \frac{\partial Y_{t+1}}{\partial x_t} = \theta \frac{\partial Y_t}{\partial x_t} + \alpha_2 = \theta\alpha_1 + \alpha_2$$

$$(A.4)\ \frac{\partial Y_{t+2}}{\partial x_t} = \theta \frac{\partial Y_{t+1}}{\partial x_t} = \theta(\theta\alpha_1 + \alpha_2)$$

and so on. After the first period the effect is decreasing, given $|\theta| < 1$. If the marginal change in X is permanent the long run effect on Y can easily be derived as:

$$\frac{\alpha_1 + \alpha_2}{1 - \theta}$$

Also, if $\alpha_1 > 0$ and $\alpha_2 < 0$ the positive effect in the following periods are decreasing depending of the value of $\alpha_2$, indicating the effect on the endogenous variables is transitory. The effect is zero in *t+1* if $\alpha_1 = \alpha_2$, given $\alpha_1 > 0$ and $\alpha_2 < 0$ .In the analysis results from the ADL models in section 5.3.3 the method just shown is used to understand if an effect of a variable is positive or negative. A calculation of the total effect on every single exogenous variable in every regression is not performed.

There are two issues worth mentioning regarding the use of ADL-model. Verbeek (2008) demands all the variables in an ADL-model to be stationary ( I(0)). The risk premiums were, with two exceptions, concluded to be I(0) in the first and second phase, and hence ADL models were applied. The independent variables however, seem to be non-stationary in the first period, with small negative t-adf values and therefore pretty far from the critical values

(See “*Stationary tests’* in Attachments). But in phase two, the t-adf values are very close to the critical values, and if the ADF test is to be taken literary, the null hypothesis of unitroot cannot be rejected. In general when analyzing ADF-test results and the actual values are in range of the critical values, one should be careful to conclude the variables are in fact non-stationary or I(1), because of the low test power. Whenever the right hand side variable is I(0), and the independent variables are I(1), one should expect the I(1) variables to have zero effect on the I(0) variable, i.e. the coefficents estimator are zero. This is as expected in the regressions results from phase one, i.e. the risk premiums follow an AR-process with different lags. In phase two, the t-adf values from the stationary test are in range of the critical values, and a literally interpretation would conclude with I(1) regressors. All the same, several of the independent variables are in fact significant in the econometric models in phase two. This strengthens the argument of ADF-test lows test power, and indicates stationarity of the independent variables even though the ADF-tests states non-stationarity.

All regressions has been made using PcGive in Oxmetrics ver. 6.01. The regression models are estimated parallel with Autometrics, in order to have some kind of robust check of the lag reductions in the ADL and ECM model. Autometrics is a tool available in PcGive and features an automatic model selection based on the use of algorithms. In short, a general unrestricted model (GUM) is given to PcGive from which Autometrics eliminates insignificant variables. The elimination process is based on a number of diagnostic checks on the validity of the reductions to ensure congruence of the final model (Doornik & Hendry (2007)). For a more detailed explanation of the working of Autometrics, please refer to Doornik & Hendry (2007). The Autometrics models are enclosed together with the author’s models and marked “Autometrics’. In general, the parallel estimation has led to the same conclusions, i.e. finding the same significant variables. But, there are cases where the two specify different dynamics and significant variables, but the two models surprisingly concord well. Sometimes I have chosen to prefer the Autometrics` model simply because the test results are better so the model appears better specified.

### 6.2.2 Liquidity provision from Norges Bank

In the econometric modeling of the Norwegian risk premium a variable measuring Norges Bank`s provision of liquidity to the money market is included. The background for the latter variable is the following: The relationship between the key policy rate and its effects on inflation and real economy was disturbed by the conditions prevailing in the money market during the financial crisis. In the attempt to improve liquidity conditions and to lower the money markets rates, due to the high risk premiums, Norges bank increased the amount of liquidity to levels higher than normal. As explained in chapter three, the role of central bank liquidity management is to provide liquidity to the banking system such that the overnight money market interest rate is close to the key policy rate. In order to do so, Norges Bank produces estimates of the liquidity prevailing in the banking system in absence of liquidity provisions from Norges Bank[67]. This estimate is known as structural liquidity (Bernhardsen et.al. 2009).Based on these estimates, Norges Bank decides if additional liquidity is necessary. These liquidity provisions are normally provided through F-loans[68]. Total liquidity in the banking system is structural liquidity plus any liquidity provision by Norges Bank. Total liquidity in the Norwegian banking system has normally been around NOK 20 billion (Bernhardsen et.al. 2009).However, during the last quarter of 2008 and the two first quarters in 2009, total liquidity varied around NOK 100 billion (See figure 5.1). The difference between total and structural liquidity, after scaling into billions, has been included in the econometric modeling of the risk premium in the Norwegian money market. The purpose of this inclusion is to see if the increased liquidity provision worked after its intensions: to improve liquidity conditions for the banking system and reduce banks unwillingness to lend to each other, i.e. to lower the risk premium.

[67] For a more detailed explanation of structural and total liquidity, see Fidjestøl (2007)
[68] In short, F-loans are collateral based loans given with varying maturity. The allocation and interest rate are determined through competitive multi-price auctions, and the interest rate on F-loans is normally higher than the key policy rate. For further details see Fidjestøl (2007).

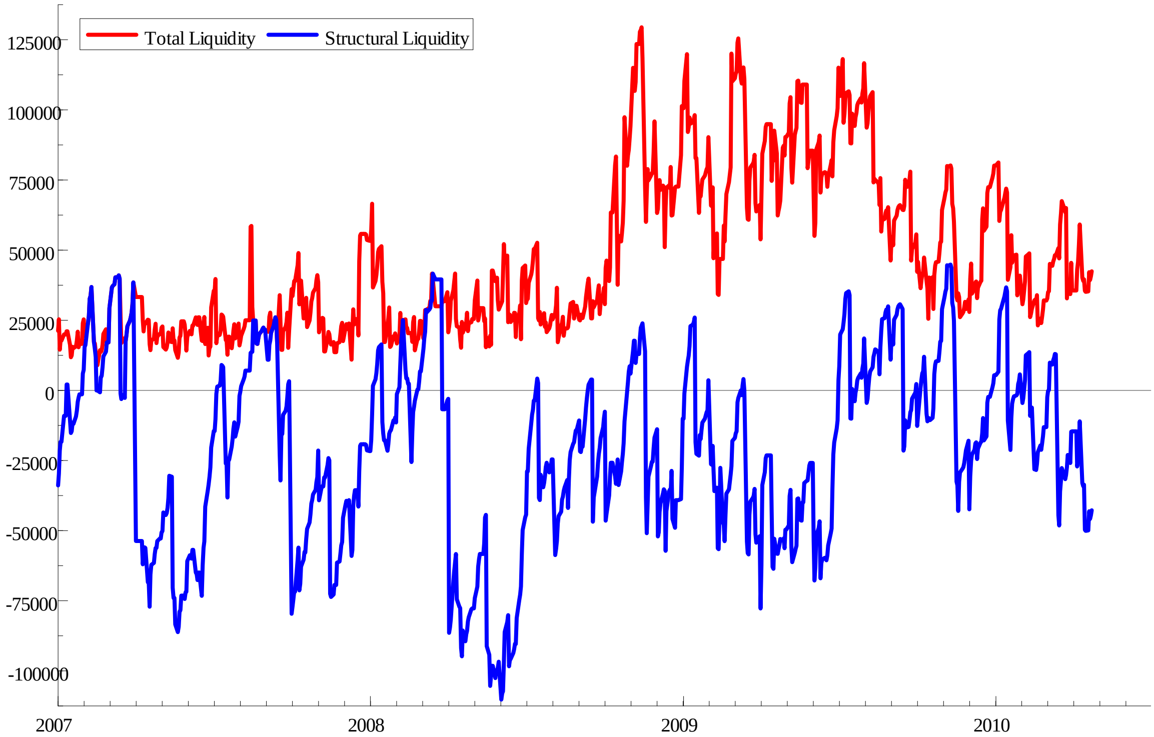


*Figure 6.1: Development of total and structural liquidity from Jan 2007 until April 2010 in the banking system in Norway. The y- axis is in NOK millions.*

## 6.3 Analysis of Econometric Results

The time horizon will be divided in three parts. Regression techniques are applied on each period separately. The first period will represent normal conditions in the interbank market, and will be defined as the period between 1.January until 31.July 2007. The crisis phase will be divided into two parts, with the Lehman Brothers collapse on the 18th of September 2008 splitting the two. In general the focus will be on significance of variables that has affected the risk premiums. Appendix A includes comments and issues regarding the econometric models. The regressions, which the discussion below are based on, can be found in Attachments. The error term is assumed independent. Hence the domestic factors and any influence from interbank money markets other than US will be captured by the error term in the models. Much emphasis has been made in making sure the residuals are not autoregressive. Non-US interbank markets are the main focus.

### 6.3.1 The Normal Phase

An ADL-model was applied for each of the risk premiums in the first phase, except for the NOK risk premium for which the Engle-Granger method was applied[69]. In the first phase, representing normal conditions in the interbank market, the risk premiums are stable and displaying small volatility, as seen in the summary statistics table 2.1. Based on the small and stable risk premiums in table 2.1, we would expect the premiums in the first phase to be little affected by liquidity funding risk, credit risk and US contagion.

| *Money market under currency j* | *GRI* | *VIX* | *TED-spread* | *3-month USD premium* | *Disequilibrium Adjustment Coefficient* | *Norges Bank`s liquidity provision* |
|---|---|---|---|---|---|---|
| NOK[70] | - | - | ** (2.53) | - | - | - |
| SEK | * (-2.17) | - | - | * (2.22) | | |
| EUR | - | - | - | - | | |
| GBP | No data | No data | No data | No data | | |
| CAD | - | - | - | - | | |
| AUD | - | - | **(-3.18) | - | | |

*Table 6.1: The table display significant coefficients and are marked with asterisks. (* ) indicates the coefficient is significant different from zero at 5% level, while (**) indicates significance at 1% level (critical values: 1.96 for 5% and 2.31 for 1% ). T-values are reported in parenthesis, if several lags are reported significant the t-value referring to the highest lag is used (lag one over lag two) The estimated coefficients are not reported in the table. The regressions can be found in Attachments under phase 1.*

As expected, the result summarized in table 5.1 illustrates that liquidity funding risk, credit default risk and US contagion seems general seem to have played a minor role. It appears the risk premiums has been driven by domestic factors, which are captured in the error term. The EUR risk premium was in the end found to follow an AR(3) –process (EQ 1.6). Further on, the final model of CAD risk premium basically follows an AR(1) process[71](EQ 1.9). Consequently, AUD[72], CAD and EUR premium is a function of past values and the error term. The US premium is only found significant in the Swedish interbank market (EQ1.4), and it appears to have had some positive effect. The coefficient of the lagged SEK premiums and US premium are all positive, and they are therefore indicating a positive tendency. Nevertheless, this tendency appears to be minor as USD premium is significant with the

[69] For a discussion of ADF-test regarding stationarity in the first phase, refer to appendix A.
[70] An ADF-test cannot reject the null hypothesis of a unit-root in the NOK risk premium time series, and the values are not in range of the critical ones. The graph of the NOK risk premium in the first phase strengthens the argument of non-stationarity. Please refer to Appendix A.
[71] See relevant note in Appendix A and the regression in Attachments, both under the "*First phase*' section.
[72] EQ (1.10)

fourth lag. The TED-spread is found significant in both the AUD and NOK risk premium, but the estimated coefficient is so small that it can be neglected. The times series appear to be independent and domestic factors seem to play a dominant role in determining the risk premiums.

The NOK premium is I(1) and the EG-method was applied. However, ADF-test performed on the residuals failed to reject the null hypothesis of a unitroot (EQ 1.1). Even when taking into account the test weak power, the t-adf values come out too small in actual value to conclude with co-integration. The residuals are very persistent as shown by Figure A.1 in Appendix A. In accordance with ECM (EQ 1.2), a standard t-test based on robust standard errors fails to reject the null hypothesis of the adjustment coefficient equal to zero. Based on these arguments, it appears a long-term dependence between the variables is not present. Furthermore, liquidity provision by Norges Bank is not found significant, which can be interpreted as the interbank market is stable and the liquidity provision are at “normal levels’. As explained in chapter 3, the liquidity framework set by Norges Bank is a floor system, where liquidity is set such that the demand curve intercepts the lower bound, i.e. key policy rate (see figure 3.2). Finally, despite the dollar dependency of the NOK money market, the NOK risk premium in normal times is unaffected of US risk premium and rather driven by domestic factors.

| | *GRI* | VIX | TED-spread | 3-month USD risk premium |
|---|---|---|---|---|
| Mean | 7.8 | 13.7 | 0.38 | 0.073 |
| Std | 0.53 | 2.6 | 0.14 | 0.011 |
| Max | 9 | 24.2 | 0.82 | 0.035 |
| Min | 7 | 9.9 | 0.16 | 0.128 |

Table 6.2: Summary statistics of exogenous variables (01-01-2007 until 07-31-2007). All variables are measured in percent.

It should be noted the results here drawn from a short sample. Due to the corresponding uncertainty, they should be considered with a critical eye.

### 6.3.2 The Crisis: Before Lehman Brothers

An ADL model was applied on all the risk premiums in the financial turmoil leading up to the collapse of Lehman Brothers, except for the GBP premium where the Engle-Granger method was applied.  The risk premiums are considered to be stationary, backed up by ADF-tests and observing graphs. This implies that the premiums are mean reverting and thereby only exposed for temporary shocks. The ADL models suggest at times complex dynamics are present in the interbank markets, as expected given daily data and these dynamics deserves to be commented upon. However, an in-depth analysis of the dynamics in each interbank market will not be given.

| ***Money market under currency j*** | ***GRI*** | ***VIX*** | ***TED-spread*** | ***3-month USD premium*** | ***Norges Bank`s liquidity provision*** | ***Error Correction Term*** |
|---|---|---|---|---|---|---|
| *NOK*[73] | - | - | - | **(5.57) | **(2.47) | |
| *SEK* | **(3.56) | *(-2.30) | - | **(2.50) | | |
| *EUR* | **(5.40) | - | - | **(4.14) | | |
| *AUD*[74] | **(3.50) | - | **(-5.00) | **(-5.53) | | |
| *CAD*[75] | **(-2.46) | - | * (2,19) | **(5.39) | | |

*Table 6.4: The table display significant coefficients which are marked with asterisks. (* ) indicates the coefficient is significant different from zero at 5% level, while (**) indicates significance at 1% level. T-values are reported in parenthesis, if several lags are reported significant the t-value referring to the first significant lag is used. The estimated coefficients are not reported in the table. The regressions can be found in Attachments under phase 2.*

The influence from the USD premium has clearly made its entry in this phase. When only significant in one risk premium before, it now influences all the risk premiums. However, the exogeneity of USD premium is not immediately certain. It could be that the USD money markets are disturbed by internal conditions in the Euro-Area money market. On the other side, to claim isolated domestic conditions in smaller market like the Norwegian and the Swedish causing risk premium in the USD money market to rise is less obvious. One factor indicating a one way effect from the USD markets is asymmetry in European asset holdings in US dollar contra US banks asset holdings in European currency, as shown in figure 4.1. In other words, the European banks` need for US dollar was not matched by the US banks need for European currency (Baba et.al. 2009)). As argument goes in section 4.1, this asymmetry increased the US dollar funding cost and the European money market premiums grew larger. The Federal Reserve established foreign currency swap lines with European Central Bank, Bank of England and the Swiss National Bank on 6.april 2009, designed to facilitate US financial institutions with European currency (Goldberg et.al. 2010)[76]. These lines were never drawn on by the Federal Reserve (Ibid). Considering the late establishment of the lines, one

[73] The Autometrics model disagrees on the significance of VIX and GRI. The estimated coefficient on VIX is considered to small so it can be neglected, and in addition the coefficient is negative.
[74] The effect from the VIX variables is considered to small to be reported. The variable is only significant in its fifth lag, and a coefficient indicating a unit index increase causing 0.17 basis point increase.
[75] The model from Autometrics is used.
[76] A discussion on US dollar swap lines can be found in section 6.3.3.

can speculate if the lines would have been established earlier if US financial institutions experienced great difficulty retrieving foreign currency in earlier stages of the crisis. Arguments above suggest a transmission mechanism from European money market to the US market did not occur. Further analysis of (weaker) exogeneity of the US market can be found in next section, 5.3.3, the relationship with GBP money market is analyzed below.

The effect of USD premium is consistently positive across the interbank markets in question. Yet the effect is somewhat varying. For the EUR and CAD (EQ 2.5 and EQ 2.11) interbank market the results suggest a positive direct effect of between 10-15 basis points, given one percentage increase (or 100 basis points increase) in USD premium. Nonetheless, as the first USD premium lag is negative in the Euro-Area market, the effect in the following periods is diminishing rather quickly. Information reflecting domestic factors seem to be more persistent, given two positive lags of the EUR premium, while effects from the US interbank money market is rather transitory. The effects are similar in the CAD money market. For the Australian interbank market, on the other hand, the information regarding conditions in the US interbank market seems to be more persistent. This happens as the effect from the USD premium is given through a single positive direct effect, which slowly diminishes in the next periods (EQ 2.12). Next, the differences between the smaller money markets of NOK and SEK are worth commenting (EQ(2.1) and EQ(2.3)). For the Swedish market the USD premium is only significant in its first lag, and only so with a small coefficient of around 3 basis point. The effect in the Norwegian market looks much stronger. The direct effect indicates an increase of 17. 5 basis point following one percentage increase of the USD premium[77], which is one of the highest direct effect across all markets in this phase. The diminishing effect does not occur until the four days after the impact. The effect we are observing can be related to NIBOR definition as a dollar swap rate, while the STIBOR is domestic.

| | *GRI* | VIX | TED-spread | 3-month USD risk premium |
|---|---|---|---|---|
| Mean | 12.3 | 23.10 | 1.27 | 0.68 |
| Std | 1.6 | 3.44 | 0.38 | 0.17 |
| Max | 18 | 36.2 | 2.50 | 1.38 |
| Min | 8 | 16.1 | 0.42 | 0.108 |

Table 6.5: Summary statistics of exogenous variables (01-08-2007 until 17-09-2007). Measured in percent.

[77] 95% confidence interval: (0.115, 0.24)

The findings of credit default risk and liquidity funding risk in the current phase are rather dispersed. TED-spread is found significant in three interbank markets (GBP[78], CAD[79] and AUD[80] interbank money markets), while the VIX index is only significant in SEK (EQ 2.3) and GBP markets[81]. At this point in time the sincerity and depth of the crisis were still in evolvement. Moreover, the evaluation and perception of risk in interbank markets across countries may have differed, which can help explain the different findings of risk indicators in the models. The results indicate that of all markets the GBP and CAD interbank money market has been most affected by credit default risk leading up to the collapse Lehman Brothers collapse. In the Canadian market, the TED-spread has an impact multiplier (direct effect) of 0.067, implying that one percentage increase in the TED-spread increases the CAD premium by 6.7 basis points, ceteris paribus. The first lagged of the TED-spread is significant but with a negative estimated coefficient, meaning the positive effect is somewhat reduced in the following periods, indicating again transitory effects.

Global risk indicator is significant in all except the NOK money market. Banks appear to use expected (implicit) volatility in foreign exchange market as an indicator of general risk in the (global) real economy, which interprets as future economy outlook deteriorated from August 2007 on onwards.

| ***Long-run effect*** | ***GRI*** | ***VIX*** | ***TED-spread*** | ***3-month USD premium*** | ***Disequilibrium Adjustment Coefficient*** |
|---|---|---|---|---|---|
| ***GBP*** | 0.035 | -0.0157 | 0.055 | 0.921 | - |
| ***Short-run effect*** | $\Delta GRI$ | $\Delta VIX$ | $\Delta TED$ | $\Delta 3m\ USD\ premium$ | |
| $\Delta$***GBP***[82] | *(2.15) | - | *(2.1) | **(2.32) | **(-3.03) |

*Table 6.6: The table displays the cointegrating vector together with the error correction term in the last column. The super consistent coefficients reflect the long-term effect of the independent variable on the GBP risk premium, confined in the given phase. The coefficient of "Error Correction Term' reflects the daily error correcting adjustment process by the GBP risk premium.*

The econometric modeling of GBP risk premium suggests the global risk indicator, credit risk liquidity risk and USD premium have influenced the longer term movements in the GBP risk premium during the course of the period. Still, liquidity risk does not explain day to day

[78] EQ (2.7) and EQ(2.8)
[79] EQ 2.11
[80] EQ 2.12
[81] The VIX coefficient is small and negative in the Swedish interbank market.
[82]The Autometrics model have been chosen over the Author`s model, judging by tests results the Autometrics model appears better specified.

variation. The long-run dependence of the GBP premium on the USD premium is at a very high level, the super consistent estimate is closing in on unity (EQ 2.7). A long-run increase of one unit basis point in the USD risk premium correspond to an increase in the GBP premium by around 0.9 basis points. To investigate a cause and effect relationship between GBP interbank market and the US dollar interbank market, an ECM is constructed containing the cointegrating vector, i.e. the same residuals as before, but with the USD premium as the endogenous variable[83]. If the disequilibrium adjustment coefficient is zero by ordinary t-test, the USD risk premium does not adjust to the equilibrium error, and is consequently weakly exogenous to the cointegrating vector (Verbeek 2008). The null hypothesis of the adjustment coefficient equal to zero cannot be rejected. As a result, the model indicates strongly that in the first part of the crisis tensions in the US money market have fed in the GBP market. And is attracting a vector on which the GBP premium converges. The USD premium does appear to have the strongest effect of the variables, both in long-term movements and day to day variation. Credit risk has influenced both in the short and long term also, but the coherent coefficients are noticeably smaller compared to coefficients measuring USD premium effects.

### 6.3.3 The Crisis: After Lehman Brothers

The ADF tests in this phase are relatively clear in its outcome, both when testing for stationarity and cointegration.  The failure of all ADF-test to reject the presence of a unit root in all the risk premiums suggest that shocks are non-temporary, and will thus not dissipate over time[84], see "*Stationary test'*[85]. Further on, the results are suggesting fairly strongly that cointegration is present between the variables; see Attachments under *"cointegration tests'*[86]. We can reject the presence of a unit root in the OLS residuals at least at a 5% level in each of the risk premiums. Accordingly, we can conclude that the third phase is characterized by cointegration, which is an upside in relation to testing for weak exogeneity.

[83]See 'exogeneity test for USD in 2nd phase'
[84]The t-adf values are low in absolute value and not considered to be near enough the critical values to justify a reconsideration of test conclusion based on low test power.
[85] Trend stationarity is not tested for. The risk premium may look trend stationary in the current period of time by observing the graphs of all risk premiums. However, when conditioning on the USD premium in the cointegrating regression (which is weakly exogenous detrmined by tests in "*exogeneity of USD premium')*, the proceedings followed in this chapter should be of conflict with trend stationarity.

Cointegration interprets as the existence of a long-run relationship between the variables. The coefficients of the independent variables can interpreted as a long-run effect; given a permanent change or a change in the mean of, say the USD premium, the coefficient will give the marginal long run change in the dependent variable. The short term effects of the independent variables, i.e. their effect on day to day variation of a given risk premium, are read from the corresponding ECM. Long-term relationship in this case is confined to the given, relatively short sample of interbank market history, so a long-term equilibrium should not be interpreted as a forever withstanding relationship. However, within this period of time there are equilibrium forces that will pull risk premium *j* towards the long-run equilibrium in case of deviation. The point estimates of the adjustment coefficient are around ten percent on average (see Table 5.7), not very large at face value, but considering this adjustment is done on a daily basis the speed of adjustment is relatively fast. Given an adjustment coefficient of 10 percent, it will take around 7 days to cover half the gap[87] (For 95% confidence intervals see Table A.1 in Appendix A). Besides, it is of interest to note that cointegration did not appear in the sample prior to the beginning of the financial turmoil in August 2007. The same goes for in the following period leading up to the collapse of Lehman Brothers, with the GBP risk premium as the only exception[88]. As seen, the analyses of phase one (normal times) suggest the risk premiums were in general determined by domestic factors. Further, neither of the risk premiums, except maybe in some degree the SEK premium, were influenced of the USD risk premium. When we have reached this part of the crisis, after the Lehman brothers collapse, it is relatively safe to state the premiums are, in addition to domestic factors, influenced by forces outside domestic borders both in the long-run and short-run.

Table 5.7 displays the cointegrating vector for each of the interbank markets[89]. The general picture overall is that expected exchange rate volatility, credit default risk, liquidity funding risk and USD money market tensions all caused long-term movements in the risk premiums. Before moving forward with the analysis the direction of causality is important to establish. Exogeneity (weaker) is tested for the independent variables within the framework of an

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$$0.9^t = \frac{1}{2} \;\; => t = {}^{\log 0.5}/_{\log 0.9} \approx 6.6$$

88 Cointegration could be possible given a different division of time periods.

89 The cointegrating vectors can be found under “3 phase’, and in the same order as in the table: EQ (3.1), EQ(3.5 ), EQ(3.8), EQ(3.11), EQ(3.10), EQ(3.14 ), EQ(3.18).

ECM[90]. The exogeneity test for USD risk premium can be found under "*USD premium exogeneity test'*. The findings are unanimous, in none of the error correction models were the disequilibrium adjustment coefficient found significant, i.e. the USD risk premium is weakly exogenous. Moreover, the results are implying a very strong interdependency between USD interbank market and Non-US interbank markets have occurred in one direction. In other words the tensions in US dollar market have influenced risk premiums in Non-US interbank markets, while tensions in Non-US market have not influenced USD risk premiums.

| ***Money market under currency j*** | ***GRI*** | ***VIX*** | ***TED-spread*** | ***3-month US premium*** | ***Disequilibrium Adjustment Coefficient*** | ***Norges Bank`s liquidity provision*** |
|---|---|---|---|---|---|---|
| *NOK* | *0.0335* | *-0.0041* | *0.05* | *0.411* | *-0.13* | 0.00186 |
| *SEK* | *0.0220* | *0.0025* | *0.0054* | *0.176* | *-0.099* | |
| *EUR* | *0.0364* | *0.0029* | *0.041* | *0.29* | *-0.068* | |
| *GBP*[91] | *0.0631* | *0.0051* | *-0.0517* | *0.51* | *-0.12* | |
| *USD* | *0.005* | *0.01* | *0.68* | *-* | *-0.12* | |
| *CAD* | *0.0233* | *-0.0021* | *0.21* | *0.172* | *-0.06* | |
| *AUD* | *0.0299* | *-0.0027* | *-0.24* | *0.81* | *-0.07* | |

*Table 6.7: The cointegrating vector for each risk premium is displayed in the rows.*

It is now established that money market tensions from US markets fed into all the Non-US money markets in question causing long-term movements with considerable impact across these markets. As outlined in 4.1, the shortage of US dollar liquidity in European banks can help explain the transmission of US dollar money market tensions into Non-USD risk premiums primarily through the foreign exchange market. Non-Us banks, with a need for short-term US dollar funding, in addition sought to borrow in third-currency market in order to swap into US dollar, even in currencies with a banking sector characterized as having low exposure towards US dollar liquidity needs (Ossolinski and Zurawski 2010). The Australian money market seems to have been affected the most of all markets from the USD risk premium, with a 0.8 basis point increase from a long-run increase of one basis point in the USD risk premium (EQ(3.17). Australian banks are funded primarily through longer-dated bonds issuance and have, according to Ossolinski and Zurawski (2010), net liability positions in US dollar. Hence, the high US influence on the AUD risk premium can rather be explained by international banks using Australian dollar market as a source of funds by and thereby causing the premium in the AUD/USD swap market to move in the same direction of other

[90] The coefficient of the cointegrating vector is tested with a null hypothesis of equal to zero, within an ECM were the former regressor now is acts as endogenous. See Verbeek 2008.
[91] The Autometrics model is used because of difficulties in removing autoregressive residuals.

markets (ibid). Although, the long-run effect on the CAD risk premium is not as high as the AUD premium, the same mechanisms might have been at work, considering Canadian banks low exposure to the sub-prime market (DBRS 2007).

The long-term effect on a change in the USD premium on the GBP premium has decreased by half compared to the part of the crisis leading up Lehman Brothers, according to table 5.7. One possible explanation of this reduction is the set up of USD swap lines between the Fed Reserve and foregin central banks. The purpose of the establishment of these swap lines was to improve dollar funding stresses particularly in Europe (Goldberg et.al. .2010). In December 2007 the first swap line was established with the European Central Bank (ECB). Lines are not established with Bank of England (BoE) until the 18th September 2008(Authorization of $40 billion) (Ibid), meaning all else equal the US dollar supply improved in the UK interbank market. The swap line with BoE can explain the reduced coefficient in the second cointegrated vector for GBP risk premium. However to conclude in that matter is less obvious as the global US dollar shortage intensified extremely after the Lehman Brothers collapse, which can have offset any effects from the US dollar supply increase from BoE. At the aggregate level the authorization grew from a total amount of $24 billion in December 2007 to a total of $620 billion immediately following the bankruptcy of Lehman Brothers. The authorization was further expanded to *"accommodate demand'* on the 13th of October a few weeks later, when market pressure reached extreme levels (ibid)[92]. The influence of tensions US money market is lower in the EURO interbank market compared to the GBP interbank market, which is somewhat surprising considering the banking system in both markets had high level of dollar liquidity exposure towards liabilities from US dollar assets holdings at the time. Turning to Scandinavia, the difference of the NOK and SEK interbank market in regard to influence from US tension is continuous during the crisis. The influence on long-term movements in the NOK premium is twice as high as in the SEK interbank market[93]. Sveriges Riksbank and Norges Bank established swap lines on 24th of September 2008.

Exogeneity tests of the GRI variable can be found under *"Exogeneity test for GRI'* regressions. Findings are unanimous, in none of the error correction models were the disequilibrium adjustment coefficient found significant, i.e. GRI is weakly exogenous to all

[92] The Federal Reserve established on April 6th 2009 swap lines with ECB, Bank of Japan, the Swiss National Bank and BoE to enable the Fed to supply foreign currency to US institutions. The lines were never drawn on (Goldberg et al. 2010).
[93] Referring to the cointegrating vectors.

the risk premiums in the study. Whenever expected volatility of exchange rate markets increased during the crisis, the banking system in the respectable countries observed so and interpreted it as increased general risk in the development of the real economy, and it fed into money market premiums.

The marginal effect of one long-run percentage increase in expected exchange rate volatility corresponds to an average of 0.03 percentage increase (or 3 basis points) across the risk premiums. While one long-run percentage increase in expected volatility in stock market prices (S&P 500) gives on average a 0.0042 percentage increase (or 0.42 basis points). Hence, on the margin expected volatility in exchange rates has a larger effect on the risk premiums compared to expected volatility in the stock prices. Next, expected volatility in foreign exchange markets appears to have the greatest influence of the two given the on-the-margin argument. On the other side from observing the graphs in figure 5.2, the VIX-index has consistently throughout the crisis displayed higher values and greater volatility then GRI, especially from mid-September 2008. To determine the greatest total effect would for that reason be difficult.

| | ***GRI*** | ***VIX*** | ***TED-spread*** | ***3-month USD risk premium*** |
|---|---|---|---|---|
| *Mean* | *19.201* | *33.504* | *0.81824* | *0.68700* |
| *Std* | *5.0495* | *14.434* | *0.92081* | *0.77401* |
| *Max* | *34.157* | *80.860* | *4.5752* | *3.6387* |
| *Min* | *13.131* | *15.580* | *0.098300* | *0.041380* |

*Table 6.10: Summary statistics*

The long-run coefficient of liquidity from Norges Bank is positive (0.00186), see table 6.7, which is the opposite sign of what would be expected. Higher supply of liquidity should have a negative effect on the risk premium. It could be the estimated effect is revealing a reversed causation. In order words the liquidity provision has been executed when the NOK risk premium was high.

| ***Money market under currency j*** | ***ΔGRI*** | ***ΔVIX*** | ***ΔTED*** | ***Δ3m USD premium*** | ***ΔNorges Bank's liquidity provision*** |
|---|---|---|---|---|---|
| *ΔNOK* | ***(-2.94)* | ***(-2.88)* | **(-1.99)* | ***(4.12)* | ***(-2.56)* |
| *ΔSEK* | - | - | **(2.18)* | **(-2.18)* | |
| *ΔEUR* | ***(3.32)* | ***(2.48)* | **(-2.13)* | ***(4.31)* | |
| *ΔGBP* | ***(2.46)* | **(2.12)* | - | **(2.10)* | |
| *ΔUSD* | ***(2.56)* | ***(-3.05)* | ***(11.80)* | - | |
| *ΔCAD* | **(-2.22)* | **(-2.03)* | ***(3.91)* | - | |

| | | | | |
|---|---|---|---|---|
| ΔAUD | *(-2.06) | *(2.14) | **(2.35) | **(2.30) |

*Table 6.9: Short-term effect of the exogenous variables. The table display significant coefficients which are marked with asterisks. (* ) indicates the coefficient is significant different from zero at 5% level, while (**) indicates significance at 1% level. T-values are reported in parenthesis, if several lags are reported significant the t-value referring to the first significant lag is used here. The estimated coefficients are not reported in the table. The regressions can be found in Attachments under Phase 3.*

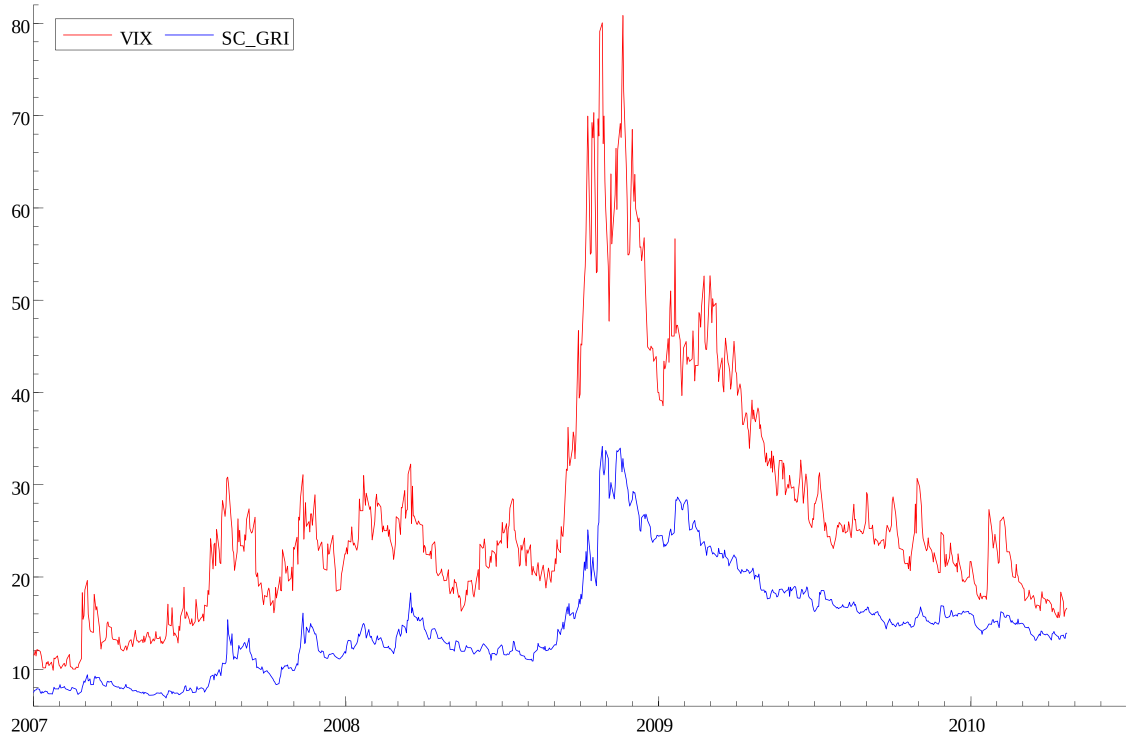


Figure 6.2: Development of VIX-index and GRI (Global Risk Indicator) from January 2007 until April 2010.

## 6.3.4 Comparisons

When comparing significant independent factors before and after the bankruptcy of Lehman Brothers, the two periods display both differences and share some similarities. First, in both periods US dollar shortage, particularly in Europe, resulted in the end to elevate risk premiums across markets. This observation fits data, as the foreign exchange swap market displayed sign of stress already from the start of the financial turmoil in August 2007 (Goldman 2010). Second, during the course of the crisis banks appear to use expected volatility in foreign exchange market as an indicator of general risk in the global real economy. This argument seems plausible as future economy outlook deteriorated from August 2007 and onwards, which can explain the early significance of the GRI variable.

Where the two periods differ is regarding the influence of credit default and liquidity funding risk. From only significance in few markets in the first part, the situation is quite different after mid-September 2008. Credit default risk and liquidity funding risk are now found as influencing factors in all markets[94]. Both are responsible for long-term movements and causing day to day variations (See table 5.9). Heider et.al. (2008) argues through a theoretical model why counterparty risk can be seen as one of the most important reasons behind the elevated risk premiums. Their model analyzes theoretically the effect of asymmetric information regarding credit default risk on the functioning of the interbank market, or more specifically how asymmetric information on counterparty risk increases the probability of liquidity hoarding occurring in an interbank market. In short, the extent of asymmetric information on counterparty risk and adverse selection can become so great that increased interest rates are not enough to compensate lenders anymore, hence banks with liquidity surplus decides not to lend in the interbank market anymore. Both safe and risky banks exit the market causing a complete breakdown of the interbank market. Heider et.al. . 2008 highlights credit risk as the main reason for the observed liquidity hoarding following the fall of Lehman Brothers, as the latter bankruptcy led to a drastic revision of expected default probabilities. The findings here of a change in credit default risk after Lehman Brothers support in some degree Heider et.al. (2008), and the results further suggest credit risk and *in addition* liquidity funding risk as having a more significant role after the Lehman Brothers collapse, in which both can be attributed as reasons for the liquidity hoarding.

Given the emphasis in the literature[95]on credit default risk and liquidity funding causing increased money market risk premiums during the financial crisis, I find the results from the econometric models a bit surprising. Across risk premiums and the different phases, tensions from US dollar money market appear to be dominating over the influence from credit default risk with a relative safe margin, suggesting the US dollar shortage in Non-US money market was one of the key drivers of increased risk premiums. However, it should be noticed that the quality of TED-spread and VIX-index serving as a proxies for credit default and liquidity funding risk respectively is not without its weaknesses, which the author is fully aware of. Therefore the proxies might not be so successful in estimating any influence as hoped for. One might argue that using premiums paid on Credit Default Swaps (CDS) would have

[94] Considering the low exposure of Canadian and Australian market toward the US subprime market, the high significance of credit risk in the long-run is bit puzzling.
[95] Heider et al. (2008), Eisenschmidt and Tapking (2009), Michaud and Upper (2008)

served as a better proxy for credit risk in econometric modeling of risk premiums, and maybe they are. On the other side, CDS premiums are not bullet proof for serving as a proxy either. One apparent mismatch is the sizeable difference in maturity (five year to three months). In order to minimizing or possibly eliminating the liquidity funding risk contained in a CDS, a maturity of five years should be used (Michaud and Upper 2008). Michaud and Upper (2008) finds CDS premium to lead LIBOR-OIS spreads. The leading behavior is somewhat confusing as it makes it difficult to relate credit default risk directly to variation in the LIBOR-OIS spread. The “correct’ way would be for a change in the LIBOR risk premium to be followed by movements in the CDS premium, as investors would first notice increased risk premiums caused by credit default risk and hedge against it by purchasing credit default swaps. Michaud and Upper (2008) point to the maturity mismatch, and to the importance of funding liquidity, as an explanation for the lead behavior of CDS. In their study they find little evidence for counterparty risk causing risk premium in LIBOR rates to increase. But rather liquidity funding risk as the main driver. The result here agrees partly with the findings of Michaud and Upper (2008). To be exact, the result agree regarding contribution of liquidity risk to increasing spreads. However, the results contradict Michaud and Upper (2008) findings that credit default risk has to be attributed little explanatory power.

# 7 Conclusion

Unsecured money market risk increased to unforeseen levels during the financial crisis. Regression techniques applied attempts to explain what factors contributed to the elevated spreads. Interbank markets under seven different interbank markets were in focus. The course of the financial crisis were divided into two parts, were the bankruptcy of Lehman Brothers splitting the two. In addition, econometric models were applied for a short period of time leading up to August 2007. The analysis from econometric results offer some evidence of the importance of credit default risk, liquidity funding risk, expected exchange rate risk and influence from the USD interbank market tensions to explain the increasing risk premium in interbank market during the financial crisis that originated in August 2007. In the normal times leading up to the beginning of the crisis data suggest the risk premiums were independent of each other. In the turmoil phase leading up to the fall of Lehman Brothers the main factor pushing the spreads seems to be transmission of tension in the US dollar money market, together with foreign exchange market tensions. Increased foreign exchange swap rates, resulting from asymmetric demand/supply of US dollar, carried through to Non-US interbank money markets. Credit default risk and liquidity funding were not found overall significant in explaining the premiums increase. The collapse of Lehman Brothers challenged the widespread belief that a bank considered to be too big to fail would be saved by public authorities, and default probabilities were revised. Evidence suggests banks were now hoarding liquidity. These elements are reflected in the distinctive increase in risk premiums across all markets in question, and backed up the findings in the econometric research. Credit default risk and liquidity funding risk are now found more decisive in explaining the increased spreads, and when taking account of all other effects, each type of risk can be attributed for a substantial increase. Tensions from US dollar money markets continue to effects risk premiums in Non-US money markets. The last part of the crisis can be characterized by cointegration; hence the variables are long-run dependent. The USD interbank market is found weakly exogenous, suggesting fairly strongly that the US influence went in a one way direction.

# Appendix A

Appendix A includes comments regarding the regression underlying the results.

All regressions has been made using PcGive in Oxmetrics ver. 6.01.

All regression can be given in Oxmetrics files(.out) from author upon request.

Notation regarding equation reference: For a reference to the regressions the notation EQ(i.j) is used. i=1 (Normal times),2 (Before Lehman Brothers), 3 (After Lehman Brothers). j refers to the specific equation.

The coefficients of GRI have in the text been scaled differently than in regression printout. The reason was to achieve an elasticity interpretation of the coefficient, in line with accompanying coefficients. The scaling has been done by dividing the GRI coefficients in the regression printout by 100.

In general, both the ADL and the ECM have been specified using the “General-to-specific’ method. As a standard, both the latter models have in the first step been included with 5 lags for both the endogenous variable and the exogenous variables. I have chosen to eliminate insignificant lags (using robust standard errors when necessary) rather than using a lag structure analysis, because it provided better test results and were more compliable with the specification done by Autometrics. Only “final’ models are enclosed. The organizational structure of the enclosed regressions is period by period as the analysis in the text.

When specifying a model it is important to satisfy a number of tests, such as test for heteroskedasticity, autoregressive residuals and normal density of the residuals. However, the daily data has made it difficult to satisfy all of them. Throughout the regressions the residuals seldom display a normal density. Any outliners affect the outcome of the test towards non-normality density of the residuals. One way of improving the residuals density could be to create dummies for the outliners. However, two arguments speak against doing so. First, the outliners contain valuable information and by creating dummies this information is lost. Also, the observations are of such a number that the estimated coefficients are not expected to be affected. Whenever heteroskedasticity where present robust standards errors were used to perform t-tests. I have put much emphasis on making sure residuals are not autoregressive, the test for autoregressive residuals are named AR 1-2 test in the outprint. If autoregressive residuals are present the t-values cannot be used for inference.

*Comments on 1st phase*: All the risk premiums were considered to be I(0) in the first phase, except for the Norwegian. The ADF tests (see Stationarity tests in Attachments), to determine the order of integration, rejected the null hypothesis of unit root for the EUR, SEK, CAD and USD risk premium. For the AUD risk premium, when taken into consideration ADF`s weak test power and observing the actual graph in the given phase, was decided to be modeled as I(0). The t-adf values for AUD risk premium are close to critical values. See out print "stationarity test' and graphs.

CAD follows an AR(1) process: The final model and the Autometrics model contains exogenous variables, but the t-values are to small to be considered significant.

*Comments on 3rd phase:* Critical values used in the cointegration tests are from MacKinnon (See register). With 5 variables including the endogenous, critical values are at 1% : -4.96, and for 5%: -4.42. In the cointegration case for the NOK risk premium, there are 6 variables, and hence the critical values are for 1%: -5.24, and for 5%: -4.70.

A 95% confidence interval for each of disequilibrium adjustment coefficients is constructed to investigate the precision of the point estimates, see table A.1[96]. The table suggests the intervals are rather wide, indicating the point estimate of the adjustment rates are somewhat sluggish, and have to be considered with some care. However, the most intervals are in a negative range such that equilibrium errors are adjusted.

| ***Disequilibrium Adjustment Coefficient for Risk premium j*** | ***Confidence interval*** $(\boldsymbol{coeff} \pm \mathbf{1.96}(\boldsymbol{std.error}))$ |
|---|---|
| *NOK* | *(-0.055, -0.21)* |
| *SEK* | *(0.003, -0.20)* |
| *EUR* | *(-0.024, -0.11)* |
| *GBP* | *(-0.015, -0.22)* |
| *USD* | *(* |
| *CAD* | *(-0.007, -0.12)* |
| *AUD* | *(-0.021, -0.12)* |

Table A.1: Confidence intervals of the adjustment coefficients.

[96] Robust standard errors were used .

*Comments on exogeneity tests:* There was some difficulty in removing the autoregressive in the ECM when USD risk premium acted as the endogenous variable. As a consequence the number of lags was increased up to 10 as a standard. Autometrics did not prove successful in removing autoregressive residuals.

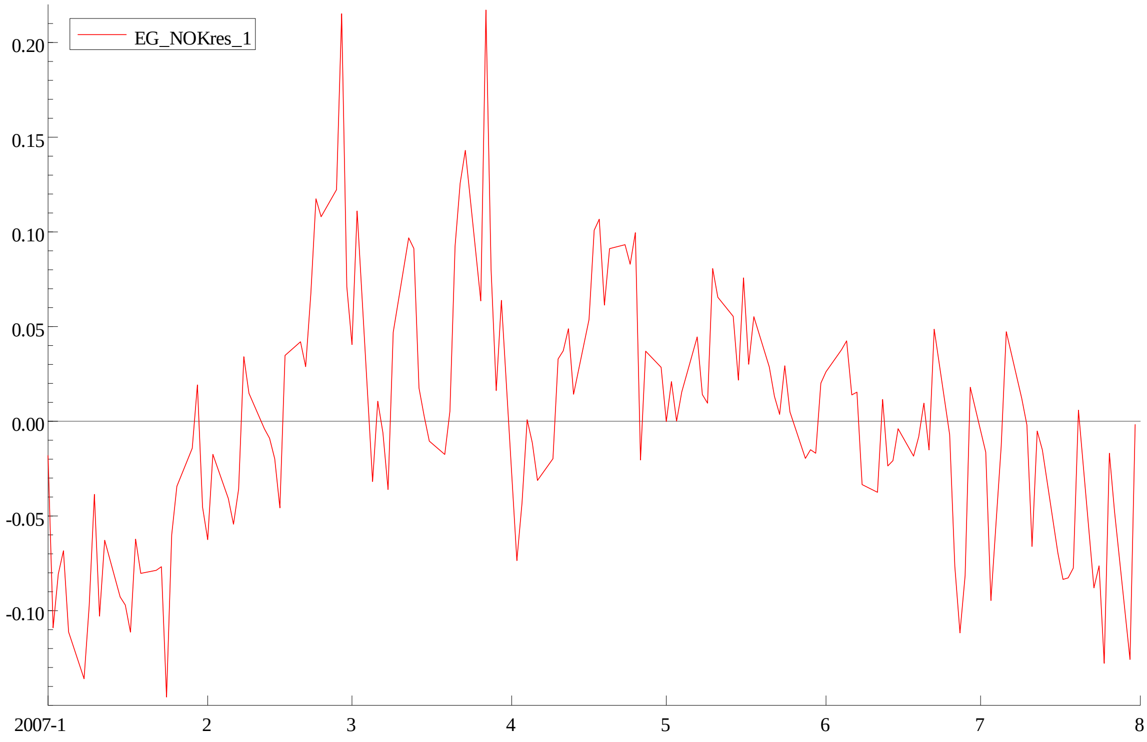


Figure A.1: The residuals from the “cointegration regression’ on NOK premium in the first phase.

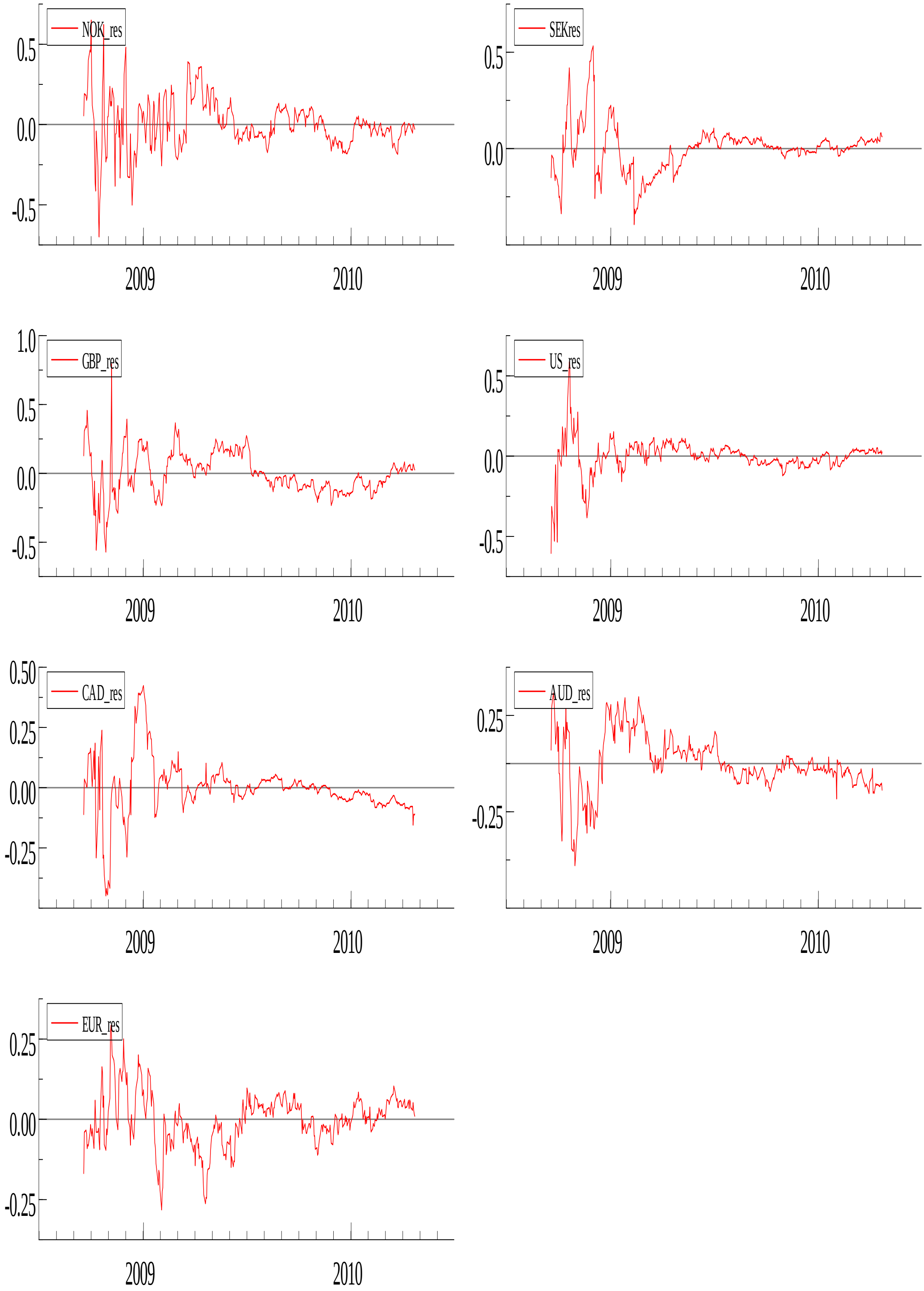


Figure A.2: Residuals from cointegration tests.

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# Attachments

Stationarity tests:
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Stationarity tests for the risk premiums for each phase:

1st Phase (2007-01-01 until 2007-07-31)

Unit-root tests

The sample is: 2007-01-09 - 2007-07-31

EUR3m: ADF tests (T=146, Constant; 5%=-2.88 1%=-3.48)

| D-lag | t-adf | beta Y_1 | sigma | t-DY_lag | t-prob | AIC | F-prob |
|---|---|---|---|---|---|---|---|
| 5 | -2.992* | 0.69151 | 0.006212 | -0.3983 | 0.6911 | -10.12 | |
| 4 | -3.208* | 0.68108 | 0.006193 | 0.3525 | 0.7250 | -10.13 | 0.6911 |
| 3 | -3.234* | 0.68999 | 0.006174 | -0.8257 | 0.4104 | -10.14 | 0.8686 |
| 2 | -3.633** | 0.66706 | 0.006167 | -2.621 | 0.0097 | -10.15 | 0.8120 |
| 1 | -4.890** | 0.57648 | 0.006292 | -3.063 | 0.0026 | -10.12 | 0.1084 |
| 0 | -7.440** | 0.43666 | 0.006473 | | | -10.07 | 0.0055 |

USD3m: ADF tests (T=146, Constant; 5%=-2.88 1%=-3.48)

| D-lag | t-adf | beta Y_1 | sigma | t-DY_lag | t-prob | AIC | F-prob |
|---|---|---|---|---|---|---|---|
| 5 | 0.2731 | 1.0381 | 0.008272 | -1.003 | 0.3175 | -9.543 | |
| 4 | -0.1388 | 0.98221 | 0.008272 | 0.9964 | 0.3208 | -9.550 | 0.3175 |
| 3 | 0.3403 | 1.0390 | 0.008271 | -0.7018 | 0.4840 | -9.556 | 0.3707 |
| 2 | -0.07144 | 0.99327 | 0.008257 | -4.103 | 0.0001 | -9.566 | 0.4792 |
| 1 | -2.504 | 0.78893 | 0.008702 | -3.186 | 0.0018 | -9.468 | 0.0011 |
| 0 | -4.717** | 0.64956 | 0.008974 | | | -9.413 | 0.0000 |

CAD_3m: ADF tests (T=146, Constant; 5%=-2.88 1%=-3.48)

| D-lag | t-adf | beta Y_1 | sigma | t-DY_lag | t-prob | AIC | F-prob |
|---|---|---|---|---|---|---|---|
| 5 | -2.365 | 0.84340 | 0.01003 | 0.6564 | 0.5127 | -9.158 | |
| 4 | -2.286 | 0.85169 | 0.01001 | -0.9253 | 0.3564 | -9.168 | 0.5127 |
| 3 | -2.538 | 0.83911 | 0.01000 | -1.658 | 0.0996 | -9.176 | 0.5279 |
| 2 | -3.021* | 0.81325 | 0.01007 | -1.612 | 0.1092 | -9.170 | 0.2642 |
| 1 | -3.620** | 0.78452 | 0.01012 | -2.296 | 0.0231 | -9.166 | 0.1631 |
| 0 | -4.698** | 0.73527 | 0.01027 | | | -9.143 | 0.0401 |

NOK3m: ADF tests (T=146, Constant; 5%=-2.88 1%=-3.48)

| D-lag | t-adf | beta Y_1 | sigma | t-DY_lag | t-prob | AIC | F-prob |
|---|---|---|---|---|---|---|---|
| 5 | -1.611 | 0.96173 | 0.02505 | 0.5157 | 0.6069 | -7.327 | |
| 4 | -1.564 | 0.96322 | 0.02498 | -1.211 | 0.2280 | -7.339 | 0.6069 |
| 3 | -1.714 | 0.95989 | 0.02502 | 0.1715 | 0.8640 | -7.342 | 0.4245 |
| 2 | -1.712 | 0.96038 | 0.02494 | -0.4446 | 0.6573 | -7.356 | 0.6261 |
| 1 | -1.792 | 0.95900 | 0.02487 | -0.6333 | 0.5275 | -7.368 | 0.7449 |
| 0 | -1.896 | 0.95709 | 0.02481 | | | -7.379 | 0.7988 |

SEK3m: ADF tests (T=146, Constant; 5%=-2.88 1%=-3.48)

| D-lag | t-adf | beta Y_1 | sigma | t-DY_lag | t-prob | AIC | F-prob |
|---|---|---|---|---|---|---|---|
| 5 | -2.414 | 0.80703 | 0.008152 | 0.9094 | 0.3647 | -9.572 | |
| 4 | -2.274 | 0.82258 | 0.008147 | -2.225 | 0.0277 | -9.580 | 0.3647 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 3 | -2.985* | 0.77345 | 0.008260 | -0.1253 | 0.9005 | -9.559 | 0.0592 |
| 2 | -3.170* | 0.77068 | 0.008231 | -1.729 | 0.0859 | -9.573 | 0.1277 |
| 1 | -3.997** | 0.72706 | 0.008288 | -1.925 | 0.0563 | -9.565 | 0.0711 |
| 0 | -5.266** | 0.67134 | 0.008366 | | | -9.554 | 0.0315 |

AUD3m: ADF tests (T=146, Constant; 5%=-2.88 1%=-3.48)

| D-lag | t-adf | beta Y_1 | sigma | t-DY_lag | t-prob | AIC | F-prob |
|---|---|---|---|---|---|---|---|
| 5 | -1.663 | 0.90330 | 0.005744 | -1.019 | 0.3099 | -10.27 | |
| 4 | -1.825 | 0.89493 | 0.005745 | -1.191 | 0.2357 | -10.28 | 0.3099 |
| 3 | -2.107 | 0.88103 | 0.005754 | 0.1202 | 0.9045 | -10.28 | 0.2958 |
| 2 | -2.132 | 0.88236 | 0.005734 | -2.251 | 0.0259 | -10.30 | 0.4828 |
| 1 | -2.777 | 0.84996 | 0.005815 | -3.629 | 0.0004 | -10.27 | 0.1173 |
| 0 | -4.120** | 0.78237 | 0.006055 | | | -10.20 | 0.0014 |

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Second Phase (2007-08-01 til 2008-09-17)

Unit-root tests

The sample is: 2007-08-01 - 2008-09-17

EUR3m: ADF tests (T=296, Constant; 5%=-2.87 1%=-3.45)

| D-lag | t-adf | beta Y_1 | sigma | t-DY_lag | t-prob | AIC | F-prob |
|---|---|---|---|---|---|---|---|
| 5 | -3.828** | 0.96240 | 0.02698 | 2.261 | 0.0245 | -7.202 | |
| 4 | -3.706** | 0.96338 | 0.02717 | 2.820 | 0.0051 | -7.191 | 0.0245 |
| 3 | -3.620** | 0.96381 | 0.02749 | 2.313 | 0.0214 | -7.171 | 0.0016 |
| 2 | -3.623** | 0.96351 | 0.02769 | 1.119 | 0.2643 | -7.160 | 0.0004 |
| 1 | -3.649** | 0.96325 | 0.02771 | 0.2138 | 0.8309 | -7.162 | 0.0006 |
| 0 | -3.660** | 0.96320 | 0.02766 | | | -7.169 | 0.0015 |

USD3m: ADF tests (T=296, Constant; 5%=-2.87 1%=-3.45)

| D-lag | t-adf | beta Y_1 | sigma | t-DY_lag | t-prob | AIC | F-prob |
|---|---|---|---|---|---|---|---|
| 5 | -2.672 | 0.94084 | 0.06087 | 0.2159 | 0.8292 | -5.575 | |
| 4 | -2.669 | 0.94133 | 0.06077 | 0.6062 | 0.5449 | -5.581 | 0.8292 |
| 3 | -2.623 | 0.94270 | 0.06071 | 0.9275 | 0.3544 | -5.587 | 0.8136 |
| 2 | -2.543 | 0.94475 | 0.06069 | 0.8705 | 0.3847 | -5.590 | 0.7368 |
| 1 | -2.458 | 0.94699 | 0.06067 | -1.294 | 0.1968 | -5.595 | 0.7318 |
| 0 | -2.650 | 0.94328 | 0.06074 | | | -5.596 | 0.5964 |

CAD_3m: ADF tests (T=296, Constant; 5%=-2.87 1%=-3.45)

| D-lag | t-adf | beta Y_1 | sigma | t-DY_lag | t-prob | AIC | F-prob |
|---|---|---|---|---|---|---|---|
| 5 | -3.271* | 0.93886 | 0.04672 | 1.730 | 0.0848 | -6.104 | |
| 4 | -3.097* | 0.94224 | 0.04688 | 1.120 | 0.2635 | -6.100 | 0.0848 |
| 3 | -3.005* | 0.94416 | 0.04690 | -0.3413 | 0.7331 | -6.103 | 0.1210 |
| 2 | -3.065* | 0.94348 | 0.04683 | 1.728 | 0.0851 | -6.109 | 0.2263 |
| 1 | -2.871* | 0.94723 | 0.04698 | -1.199 | 0.2317 | -6.106 | 0.1207 |
| 0 | -3.056* | 0.94429 | 0.04702 | | | -6.108 | 0.1200 |

NOK3m: ADF tests (T=296, Constant; 5%=-2.87 1%=-3.45)

| D-lag | t-adf | beta Y_1 | sigma | t-DY_lag | t-prob | AIC | F-prob |
|---|---|---|---|---|---|---|---|
| 5 | -3.510** | 0.93348 | 0.04977 | -0.6319 | 0.5280 | -5.977 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 4 | -3.588** | 0.93237 | 0.04972 | -0.8038 | 0.4222 | -5.983 | 0.5280 |
| 3 | -3.695** | 0.93078 | 0.04969 | -0.08906 | 0.9291 | -5.987 | 0.5939 |
| 2 | -3.734** | 0.93059 | 0.04960 | 0.3840 | 0.7012 | -5.994 | 0.7887 |
| 1 | -3.720** | 0.93139 | 0.04953 | 0.5181 | 0.6047 | -6.000 | 0.8781 |
| 0 | -3.690** | 0.93245 | 0.04947 | | | -6.006 | 0.9167 |

SEK3m: ADF tests (T=296, Constant; 5%=-2.87 1%=-3.45)

| D-lag | t-adf | beta Y_1 | sigma | t-DY_lag | t-prob | AIC | F-prob |
|---|---|---|---|---|---|---|---|
| 5 | -2.683 | 0.96837 | 0.02344 | 1.726 | 0.0854 | -7.483 | |
| 4 | -2.618 | 0.96904 | 0.02352 | -0.7157 | 0.4748 | -7.480 | 0.0854 |
| 3 | -2.655 | 0.96866 | 0.02350 | 0.02540 | 0.9798 | -7.485 | 0.1761 |
| 2 | -2.661 | 0.96868 | 0.02346 | 0.2341 | 0.8151 | -7.492 | 0.3234 |
| 1 | -2.658 | 0.96880 | 0.02342 | -0.3696 | 0.7119 | -7.498 | 0.4718 |
| 0 | -2.683 | 0.96859 | 0.02339 | | | -7.505 | 0.5961 |

AUD3m: ADF tests (T=296, Constant; 5%=-2.87 1%=-3.45)

| D-lag | t-adf | beta Y_1 | sigma | t-DY_lag | t-prob | AIC | F-prob |
|---|---|---|---|---|---|---|---|
| 5 | -3.145* | 0.94386 | 0.03664 | 1.214 | 0.2256 | -6.590 | |
| 4 | -3.050* | 0.94572 | 0.03667 | 0.2923 | 0.7702 | -6.591 | 0.2256 |
| 3 | -3.041* | 0.94617 | 0.03661 | 0.005222 | 0.9958 | -6.598 | 0.4593 |
| 2 | -3.058* | 0.94618 | 0.03655 | -0.8187 | 0.4136 | -6.605 | 0.6688 |
| 1 | -3.198* | 0.94425 | 0.03653 | 2.322 | 0.0209 | -6.609 | 0.6942 |
| 0 | -2.885* | 0.94981 | 0.03680 | | | -6.598 | 0.1844 |

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3rd phase (2008-09-18 until 2010-04-23)

Unit-root tests

The sample is: 2008-09-18 - 2010-04-23

EUR3m: ADF tests (T=417, Constant; 5%=-2.87 1%=-3.45)

| D-lag | t-adf | beta Y_1 | sigma | t-DY_lag | t-prob | AIC | F-prob |
|---|---|---|---|---|---|---|---|
| 5 | -1.097 | 0.99585 | 0.03538 | 3.422 | 0.0007 | -6.666 | |
| 4 | -0.8731 | 0.99666 | 0.03584 | 1.436 | 0.1517 | -6.643 | 0.0007 |
| 3 | -0.7872 | 0.99699 | 0.03589 | -0.7096 | 0.4784 | -6.643 | 0.0011 |
| 2 | -0.8327 | 0.99682 | 0.03587 | 3.410 | 0.0007 | -6.646 | 0.0028 |
| 1 | -0.6340 | 0.99755 | 0.03632 | 1.982 | 0.0481 | -6.623 | 0.0000 |
| 0 | -0.5277 | 0.99796 | 0.03645 | | | -6.619 | 0.0000 |

USD3m: ADF tests (T=417, Constant; 5%=-2.87 1%=-3.45)

| D-lag | t-adf | beta Y_1 | sigma | t-DY_lag | t-prob | AIC | F-prob |
|---|---|---|---|---|---|---|---|
| 5 | -2.221 | 0.99350 | 0.04571 | 4.264 | 0.0000 | -6.154 | |
| 4 | -1.821 | 0.99458 | 0.04665 | 3.581 | 0.0004 | -6.116 | 0.0000 |
| 3 | -1.541 | 0.99536 | 0.04732 | 0.8685 | 0.3856 | -6.090 | 0.0000 |
| 2 | -1.480 | 0.99556 | 0.04730 | 0.1193 | 0.9051 | -6.093 | 0.0000 |
| 1 | -1.477 | 0.99558 | 0.04725 | 12.30 | 0.0000 | -6.098 | 0.0000 |
| 0 | -0.7801 | 0.99728 | 0.05514 | | | -5.791 | 0.0000 |

CAD_3m: ADF tests (T=417, Constant; 5%=-2.87 1%=-3.45)

| D-lag | t-adf | beta Y_1 | sigma | t-DY_lag | t-prob | AIC | F-prob |
|---|---|---|---|---|---|---|---|
| 5 | -1.534 | 0.99110 | 0.04728 | 2.387 | 0.0174 | -6.087 | |
| 4 | -1.333 | 0.99225 | 0.04755 | 2.454 | 0.0145 | -6.078 | 0.0174 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 3 | -1.143 | 0.99334 | 0.04784 | 0.7360 | 0.4622 | -6.068 | 0.0030 |
| 2 | -1.089 | 0.99367 | 0.04781 | 2.280 | 0.0231 | -6.071 | 0.0068 |
| 1 | -0.9349 | 0.99455 | 0.04805 | -1.818 | 0.0699 | -6.064 | 0.0017 |
| 0 | -1.061 | 0.99381 | 0.04819 | | | -6.061 | 0.0010 |

NOK3m: ADF tests (T=417, Constant; 5%=-2.87 1%=-3.45)

| D-lag | t-adf | beta Y_1 | sigma | t-DY_lag | t-prob | AIC | F-prob |
|---|---|---|---|---|---|---|---|
| 5 | -1.316 | 0.98704 | 0.09780 | 0.6621 | 0.5083 | -4.633 | |
| 4 | -1.272 | 0.98752 | 0.09773 | -2.261 | 0.0243 | -4.637 | 0.5083 |
| 3 | -1.453 | 0.98572 | 0.09822 | -4.807 | 0.0000 | -4.629 | 0.0637 |
| 2 | -1.892 | 0.98100 | 0.1008 | -0.4583 | 0.6470 | -4.579 | 0.0000 |
| 1 | -1.952 | 0.98053 | 0.1007 | -0.3610 | 0.7183 | -4.584 | 0.0000 |
| 0 | -2.003 | 0.98015 | 0.1006 | | | -4.588 | 0.0000 |

SEK3m: ADF tests (T=417, Constant; 5%=-2.87 1%=-3.45)

| D-lag | t-adf | beta Y_1 | sigma | t-DY_lag | t-prob | AIC | F-prob |
|---|---|---|---|---|---|---|---|
| 5 | -1.902 | 0.98504 | 0.04657 | 3.807 | 0.0002 | -6.117 | |
| 4 | -1.561 | 0.98757 | 0.04733 | -1.693 | 0.0911 | -6.087 | 0.0002 |
| 3 | -1.719 | 0.98633 | 0.04744 | -0.2191 | 0.8267 | -6.085 | 0.0002 |
| 2 | -1.749 | 0.98617 | 0.04738 | 3.770 | 0.0002 | -6.089 | 0.0007 |
| 1 | -1.436 | 0.98850 | 0.04814 | -2.058 | 0.0402 | -6.060 | 0.0000 |
| 0 | -1.613 | 0.98708 | 0.04832 | | | -6.055 | 0.0000 |

AUD3m: ADF tests (T=417, Constant; 5%=-2.87 1%=-3.45)

| D-lag | t-adf | beta Y_1 | sigma | t-DY_lag | t-prob | AIC | F-prob |
|---|---|---|---|---|---|---|---|
| 5 | -1.084 | 0.99399 | 0.05752 | 1.209 | 0.2273 | -5.695 | |
| 4 | -0.9961 | 0.99448 | 0.05755 | 1.857 | 0.0640 | -5.696 | 0.2273 |
| 3 | -0.8661 | 0.99520 | 0.05772 | -2.374 | 0.0181 | -5.692 | 0.0869 |
| 2 | -1.043 | 0.99421 | 0.05805 | -0.3496 | 0.7268 | -5.683 | 0.0150 |
| 1 | -1.074 | 0.99406 | 0.05798 | 2.736 | 0.0065 | -5.688 | 0.0314 |
| 0 | -0.8794 | 0.99511 | 0.05844 | | | -5.675 | 0.0030 |

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Stationarity tests for VIX, GRI and TED-spread

1 phase

Unit-root tests

The sample is: 2007-01-09 - 2007-07-31

GRI: ADF tests (T=146, Constant; 5%=-2.88 1%=-3.48)

| D-lag | t-adf | beta Y_1 | sigma | t-DY_lag | t-prob | AIC | F-prob |
|---|---|---|---|---|---|---|---|
| 5 | -1.649 | 0.93261 | 0.002245 | -1.813 | 0.0720 | -12.15 | |
| 4 | -2.036 | 0.91782 | 0.002263 | -1.184 | 0.2382 | -12.14 | 0.0720 |
| 3 | -2.372 | 0.90672 | 0.002267 | 0.9554 | 0.3410 | -12.15 | 0.0986 |
| 2 | -2.207 | 0.91583 | 0.002266 | -0.1390 | 0.8896 | -12.15 | 0.1356 |
| 1 | -2.341 | 0.91439 | 0.002258 | 0.4710 | 0.6384 | -12.17 | 0.2320 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 0 | -2.306 | 0.91911 | 0.002252 | | | -12.18 | 0.3234 |

TED-Spread: ADF tests (T=146, Constant; 5%=-2.88 1%=-3.48)

| D-lag | t-adf | beta Y_1 | sigma | t-DY_lag | t-prob | AIC | F-prob |
|---|---|---|---|---|---|---|---|
| 5 | -1.376 | 0.97350 | 0.03314 | 1.879 | 0.0624 | -6.768 | |
| 4 | -1.192 | 0.97695 | 0.03343 | 0.7743 | 0.4400 | -6.756 | 0.0624 |
| 3 | -1.130 | 0.97826 | 0.03339 | -1.514 | 0.1322 | -6.766 | 0.1301 |
| 2 | -1.286 | 0.97527 | 0.03354 | -0.8392 | 0.4027 | -6.763 | 0.0960 |
| 1 | -1.396 | 0.97336 | 0.03350 | -0.01578 | 0.9874 | -6.772 | 0.1328 |
| 0 | -1.413 | 0.97333 | 0.03339 | | | -6.786 | 0.2144 |

VIX: ADF tests (T=146, Constant; 5%=-2.88 1%=-3.48)

| D-lag | t-adf | beta Y_1 | sigma | t-DY_lag | t-prob | AIC | F-prob |
|---|---|---|---|---|---|---|---|
| 5 | -0.6503 | 0.96753 | 1.219 | -2.205 | 0.0291 | 0.4420 | |
| 4 | -1.263 | 0.93838 | 1.235 | 0.9602 | 0.3386 | 0.4627 | 0.0291 |
| 3 | -1.050 | 0.95052 | 1.235 | 1.525 | 0.1296 | 0.4556 | 0.0581 |
| 2 | -0.6317 | 0.97139 | 1.241 | -1.281 | 0.2022 | 0.4582 | 0.0462 |
| 1 | -1.147 | 0.95120 | 1.243 | -1.995 | 0.0479 | 0.4560 | 0.0472 |
| 0 | -1.810 | 0.92576 | 1.256 | | | 0.4698 | 0.0190 |

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2 phase:

Unit-root tests

The sample is: 2007-08-01 - 2008-09-17

GRI: ADF tests (T=296, Constant; 5%=-2.87 1%=-3.45)

| D-lag | t-adf | beta Y_1 | sigma | t-DY_lag | t-prob | AIC | F-prob |
|---|---|---|---|---|---|---|---|
| 5 | -2.796 | 0.93640 | 0.006019 | -0.3758 | 0.7074 | -10.20 | |
| 4 | -2.885* | 0.93515 | 0.006010 | 0.6448 | 0.5196 | -10.21 | 0.7074 |
| 3 | -2.823 | 0.93737 | 0.006004 | 1.424 | 0.1556 | -10.21 | 0.7576 |
| 2 | -2.641 | 0.94190 | 0.006014 | -0.5765 | 0.5647 | -10.21 | 0.4635 |
| 1 | -2.793 | 0.93963 | 0.006007 | -1.743 | 0.0825 | -10.22 | 0.5746 |
| 0 | -3.203* | 0.93196 | 0.006028 | | | -10.22 | 0.3160 |

TED-Spread: ADF tests (T=296, Constant; 5%=-2.87 1%=-3.45)

| D-lag | t-adf | beta Y_1 | sigma | t-DY_lag | t-prob | AIC | F-prob |
|---|---|---|---|---|---|---|---|
| 5 | -2.771 | 0.94099 | 0.1316 | -0.1786 | 0.8583 | -4.032 | |
| 4 | -2.822 | 0.94050 | 0.1314 | -0.5818 | 0.5611 | -4.039 | 0.8583 |
| 3 | -2.937* | 0.93877 | 0.1313 | 0.9814 | 0.3272 | -4.044 | 0.8315 |
| 2 | -2.825 | 0.94172 | 0.1313 | 0.7381 | 0.4611 | -4.048 | 0.7229 |
| 1 | -2.738 | 0.94450 | 0.1312 | 1.372 | 0.1711 | -4.053 | 0.7598 |
| 0 | -2.528 | 0.94953 | 0.1314 | | | -4.053 | 0.5885 |

VIX: ADF tests (T=296, Constant; 5%=-2.87 1%=-3.45)

| D-lag | t-adf | beta Y_1 | sigma | t-DY_lag | t-prob | AIC | F-prob |
|---|---|---|---|---|---|---|---|
| 5 | -2.585 | 0.91526 | 1.673 | 0.4563 | 0.6485 | 1.052 | |
| 4 | -2.548 | 0.91800 | 1.670 | 0.1575 | 0.8750 | 1.046 | 0.6485 |
| 3 | -2.568 | 0.91895 | 1.667 | 0.9654 | 0.3352 | 1.039 | 0.8901 |
| 2 | -2.426 | 0.92495 | 1.667 | -0.6771 | 0.4989 | 1.036 | 0.7629 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | -2.667 | 0.91996 | 1.666 | -3.143 | 0.0018 | 1.031 | 0.8059 |
| 0 | -3.616** | 0.89407 | 1.691 | | | 1.057 | 0.0466 |

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3 phase:

Unit-root tests

The sample is: 2008-09-18 - 2010-04-23

GRI: ADF tests (T=417, Constant; 5%=-2.87 1%=-3.45)

| D-lag | t-adf | beta Y_1 | sigma | t-DY_lag | t-prob | AIC | F-prob |
|---|---|---|---|---|---|---|---|
| 5 | -1.511 | 0.98840 | 0.007768 | -1.452 | 0.1474 | -9.699 | |
| 4 | -1.643 | 0.98742 | 0.007779 | 2.744 | 0.0063 | -9.698 | 0.1474 |
| 3 | -1.417 | 0.98910 | 0.007840 | -0.4182 | 0.6760 | -9.685 | 0.0085 |
| 2 | -1.456 | 0.98884 | 0.007832 | -1.142 | 0.2539 | -9.689 | 0.0210 |
| 1 | -1.564 | 0.98806 | 0.007835 | 1.084 | 0.2788 | -9.691 | 0.0261 |
| 0 | -1.477 | 0.98876 | 0.007837 | | | -9.693 | 0.0319 |

TED-Spread: ADF tests (T=417, Constant; 5%=-2.87 1%=-3.45)

| D-lag | t-adf | beta Y_1 | sigma | t-DY_lag | t-prob | AIC | F-prob |
|---|---|---|---|---|---|---|---|
| 5 | -2.076 | 0.98905 | 0.09843 | 1.562 | 0.1191 | -4.620 | |
| 4 | -1.954 | 0.98971 | 0.09861 | -0.2127 | 0.8317 | -4.619 | 0.1191 |
| 3 | -1.981 | 0.98961 | 0.09849 | 1.878 | 0.0612 | -4.624 | 0.2897 |
| 2 | -1.841 | 0.99034 | 0.09879 | 1.890 | 0.0594 | -4.620 | 0.1127 |
| 1 | -1.754 | 0.99078 | 0.09910 | 0.4732 | 0.6363 | -4.616 | 0.0492 |
| 0 | -1.739 | 0.99087 | 0.09901 | | | -4.620 | 0.0823 |

VIX: ADF tests (T=417, Constant; 5%=-2.87 1%=-3.45)

| D-lag | t-adf | beta Y_1 | sigma | t-DY_lag | t-prob | AIC | F-prob |
|---|---|---|---|---|---|---|---|
| 5 | -1.248 | 0.98715 | 2.960 | 1.457 | 0.1460 | 2.187 | |
| 4 | -1.136 | 0.98832 | 2.964 | -2.809 | 0.0052 | 2.188 | 0.1460 |
| 3 | -1.378 | 0.98578 | 2.989 | 0.05657 | 0.9549 | 2.202 | 0.0070 |
| 2 | -1.380 | 0.98583 | 2.985 | -3.724 | 0.0002 | 2.197 | 0.0192 |
| 1 | -1.749 | 0.98186 | 3.032 | -2.298 | 0.0221 | 2.225 | 0.0001 |
| 0 | -2.014 | 0.97914 | 3.047 | | | 2.233 | 0.0000 |

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1 phase (01-01-2007-31-07-2007)

THe NOK riskpremium:

Cointegration regression:

EQ( 1.1) Modelling Ps_NOK3m by OLS

The estimation sample is: 2007-01-01 - 2007-07-31

| | Coefficient | Std.Error | t-value | t-prob | Part.R^2 |
|---|---|---|---|---|---|
| Constant | -0.442711 | 0.1198 | -3.69 | 0.0003 | 0.0855 |
| GRI | 12.3355 | 1.583 | 7.79 | 0.0000 | 0.2938 |
| TED-Spread | -0.137924 | 0.07391 | -1.87 | 0.0640 | 0.0233 |
| VIX | -0.000835006 | 0.003846 | -0.217 | 0.8284 | 0.0003 |
| Ps_USD3m | -3.36503 | 0.6471 | -5.20 | 0.0000 | 0.1563 |
| Sc_Add_Liq | 0.000951951 | 0.0002440 | 3.90 | 0.0001 | 0.0944 |

sigma 0.0670494 RSS 0.656360457
R^2 0.482524 F(5,146) = 27.23 [0.000]**
Adj.R^2 0.464802 log-likelihood 198.136
no. of observations 152 no. of parameters 6
mean(Ps_NOK3m) 0.263355 se(Ps_NOK3m) 0.0916511

AR 1-2 test: F(2,144) = 102.84 [0.0000]**
ARCH 1-1 test: F(1,150) = 12.632 [0.0005]**
Normality test: Chi^2(2) = 3.8647 [0.1448]
Hetero test: F(10,141) = 3.2323 [0.0009]**
Hetero-X test: F(20,131) = 2.8707 [0.0002]**
RESET23 test: F(2,144) = 17.173 [0.0000]**

EG_NOKres_1 [ 1 - 152] saved to Cointegration datasett.in7

Unit-root tests

The sample is: 2007-01-09 - 2007-07-31

EG_NOKres_1: ADF tests (T=146, Constant; 5%=-2.88 1%=-3.48)

| D-lag | t-adf | beta Y_1 | sigma | t-DY_lag | t-prob | AIC | F-prob |
|---|---|---|---|---|---|---|---|
| 5 | -3.148* | 0.77400 | 0.04548 | 0.5642 | 0.5735 | -6.134 | |
| 4 | -3.110* | 0.78356 | 0.04537 | -1.126 | 0.2620 | -6.145 | 0.5735 |
| 3 | -3.497** | 0.76405 | 0.04542 | 0.9382 | 0.3497 | -6.150 | 0.4557 |
| 2 | -3.372* | 0.77888 | 0.04540 | -2.160 | 0.0324 | -6.158 | 0.4852 |
| 1 | -4.168** | 0.73615 | 0.04598 | -2.270 | 0.0247 | -6.139 | 0.1370 |
| 0 | -5.389** | 0.68071 | 0.04663 | | | -6.117 | 0.0351 |

EQ(1.2) Modelling DPs_NOK3m by OLS

The estimation sample is: 2007-01-09 - 2007-07-31

| | Coefficient | Std.Error | t-value | t-prob | Part.R^2 |
|---|---|---|---|---|---|
| Constant | 0.000555874 | 0.001999 | 0.278 | 0.7814 | 0.0005 |
| DTEDspread_5 | 0.159147 | 0.06294 | 2.53 | 0.0125 | 0.0428 |
| EG_NOKres_1_1 | -0.0833778 | 0.03072 | -2.71 | 0.0075 | 0.0490 |

sigma 0.0241366 RSS 0.0833079662
R^2 0.083348 F(2,143) = 6.501 [0.002]**
Adj.R^2 0.0705277 log-likelihood 338.059
no. of observations 146 no. of parameters 3

mean(DPs_NOK3m)   0.000342466  se(DPs_NOK3m)       0.0250355

AR 1-2 test:      F(2,141)  =  0.13927 [0.8701]
ARCH 1-1 test:    F(1,144)  = 0.016387 [0.8983]
Normality test:   Chi^2(2)  =   38.864 [0.0000]**
Hetero test:      F(4,141)  =   2.7588 [0.0302]*
Hetero-X test:    F(5,140)  =   2.1974 [0.0579]
RESET23 test:     F(2,141)  =  0.70893 [0.4939]

| | Coefficients | t-SE | t-HACSE | t-HCSE | t-JHCSE |
|---|---|---|---|---|---|
| Constant | 0.00055587 | 0.27804 | 0.29055 | 0.27646 | 0.27314 |
| DTEDspread_5 | 0.15915 | 2.5287 | 4.0866 | 3.6317 | 3.4715 |
| EG_NOKres_1_1 | -0.083378 | -2.7143 | -1.8214 | -1.8639 | -1.8109 |

Autometrics:

EQ(1.3) Modelling DPs_NOK3m by OLS

The estimation sample is: 2007-01-09 - 2007-07-31

| | Coefficient | Std.Error | t-value | t-prob | Part.R^2 |
|---|---|---|---|---|---|
| DTEDspread_5 | 0.159136 | 0.06273 | 2.54 | 0.0123 | 0.0428 |
| EG_NOKres_1_1 | -0.0830289 | 0.03059 | -2.71 | 0.0075 | 0.0487 |

sigma              0.0240591  RSS             0.0833530043
log-likelihood       338.019
no. of observations       146  no. of parameters           2
mean(DPs_NOK3m)   0.000342466  se(DPs_NOK3m)       0.0250355

AR 1-2 test:      F(2,142)  =  0.13873 [0.8706]
ARCH 1-1 test:    F(1,144)  = 0.019967 [0.8878]
Normality test:   Chi^2(2)  =   38.940 [0.0000]**
Hetero test:      F(4,141)  =   2.7713 [0.0296]*
Hetero-X test:    F(5,140)  =   2.2083 [0.0568]
RESET23 test:     F(2,142)  =  0.66312 [0.5168]

| | Coefficients | t-SE | t-HACSE | t-HCSE | t-JHCSE |
|---|---|---|---|---|---|
| DTEDspread_5 | 0.15914 | 2.5367 | 4.1426 | 3.6748 | 3.5318 |
| EG_NOKres_1_1 | -0.083029 | -2.7140 | -1.7976 | -1.8638 | -1.8178 |

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THE SEK PRMEIUM:

EQ(1.4) Modelling Ps_SEK3m by OLS

The estimation sample is: 2007-01-08 - 2007-07-31

| | Coefficient | Std.Error | t-value | t-prob | Part.R^2 |
|---|---|---|---|---|---|
| Ps_SEK3m_1 | 0.627002 | 0.06295 | 9.96 | 0.0000 | 0.4096 |
| Constant | 0.0241697 | 0.01311 | 1.84 | 0.0672 | 0.0232 |
| GRI_4 | -0.301587 | 0.1391 | -2.17 | 0.0318 | 0.0318 |
| Ps_USD3m_4 | 0.211916 | 0.09533 | 2.22 | 0.0278 | 0.0334 |

sigma 0.00821595 RSS 0.00965275877
R^2 0.472698 F(3,143) = 42.73 [0.000]**
Adj.R^2 0.461635 log-likelihood 499.29
no. of observations 147 no. of parameters 4
mean(Ps_SEK3m) 0.0415744 se(Ps_SEK3m) 0.0111975

AR 1-2 test: F(2,141) = 2.0616 [0.1311]
ARCH 1-1 test: F(1,145) = 2.7755 [0.0979]
Normality test: Chi^2(2) = 1.2932 [0.5238]
Hetero test: F(6,140) = 1.2131 [0.3031]
Hetero-X test: F(9,137) = 1.1131 [0.3576]
RESET23 test: F(2,141) = 0.47642 [0.6220]

AUTOMETRICS:

EQ(1.5) Modelling Ps_SEK3m by OLS

The estimation sample is: 2007-01-08 - 2007-07-31

| | Coefficient | Std.Error | t-value | t-prob | Part.R^2 |
|---|---|---|---|---|---|
| Ps_SEK3m_1 | 0.558428 | 0.06414 | 8.71 | 0.0000 | 0.3464 |
| Ps_SEK3m_5 | 0.240748 | 0.06408 | 3.76 | 0.0002 | 0.0898 |
| GRI_4 | -0.159180 | 0.07466 | -2.13 | 0.0347 | 0.0308 |
| Ps_USD3m_4 | 0.293947 | 0.08231 | 3.57 | 0.0005 | 0.0819 |

sigma 0.00793089 RSS 0.00899455537
log-likelihood 504.481
no. of observations 147 no. of parameters 4
mean(Ps_SEK3m) 0.0415744 se(Ps_SEK3m) 0.0111975

AR 1-2 test: F(2,141) = 0.13389 [0.8748]
ARCH 1-1 test: F(1,145) = 0.22298 [0.6375]
Normality test: Chi^2(2) = 2.6836 [0.2614]
Hetero test: F(8,138) = 1.1723 [0.3202]
Hetero-X test: F(14,132) = 1.2170 [0.2704]
RESET23 test: F(2,141) = 0.88148 [0.4164]

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THE EUR risk PREMIUM:

EQ(1.6) Modelling Ps_EUR3m by OLS

The estimation sample is: 2007-01-04 - 2007-07-31

| | Coefficient | Std.Error | t-value | t-prob | Part.R^2 |
|---|---|---|---|---|---|
| Ps_EUR3m_1 | 0.240350 | 0.08431 | 2.85 | 0.0050 | 0.0534 |
| Ps_EUR3m_2 | 0.190879 | 0.08563 | 2.23 | 0.0274 | 0.0334 |
| Ps_EUR3m_3 | 0.212611 | 0.08318 | 2.56 | 0.0116 | 0.0434 |
| Constant | 0.0112609 | 0.004974 | 2.26 | 0.0251 | 0.0344 |
| Ps_USD3m | 0.0658220 | 0.04675 | 1.41 | 0.1613 | 0.0136 |

| | | | |
|---|---|---|---|
| sigma | 0.00610455 | RSS | 0.00536624334 |
| R^2 | 0.281654 | F(4,144) = | 14.12 [0.000]** |
| Adj.R^2 | 0.2617 | log-likelihood | 550.83 |
| no. of observations | 149 | no. of parameters | 5 |
| mean(Ps_EUR3m) | 0.0452161 | se(Ps_EUR3m) | 0.00710457 |

AR 1-2 test: F(2,142) =0.0048053 [0.9952]
ARCH 1-1 test: F(1,147) = 1.2009 [0.2749]
Normality test: Chi^2(2) = 28.620 [0.0000]**
Hetero test: F(8,140) = 2.5323 [0.0132]*
Hetero-X test: F(14,134) = 3.0255 [0.0005]**
RESET23 test: F(2,142) = 3.0039 [0.0528]

Robust standard errors

| | Coefficients | SE | HACSE | HCSE | JHCSE |
|---|---|---|---|---|---|
| Ps_EUR3m_1 | 0.24035 | 0.084315 | 0.070028 | 0.098539 | 0.10856 |
| Ps_EUR3m_2 | 0.19088 | 0.085631 | 0.10969 | 0.089932 | 0.097684 |
| Ps_EUR3m_3 | 0.21261 | 0.083185 | 0.069249 | 0.071037 | 0.074340 |
| Constant | 0.011261 | 0.0049738 | 0.0055919 | 0.0071759 | 0.0081398 |
| Ps_USD3m | 0.065822 | 0.046745 | 0.057765 | 0.072379 | 0.084650 |

| | Coefficients | t-SE | t-HACSE | t-HCSE | t-JHCSE |
|---|---|---|---|---|---|
| Ps_EUR3m_1 | 0.24035 | 2.8506 | 3.4322 | 2.4391 | 2.2141 |
| Ps_EUR3m_2 | 0.19088 | 2.2291 | 1.7401 | 2.1225 | 1.9540 |
| Ps_EUR3m_3 | 0.21261 | 2.5559 | 3.0702 | 2.9930 | 2.8600 |
| Constant | 0.011261 | 2.2641 | 2.0138 | 1.5693 | 1.3834 |
| Ps_USD3m | 0.065822 | 1.4081 | 1.1395 | 0.90941 | 0.77758 |

EQ(1.7) Modelling Ps_EUR3m by OLS

The estimation sample is: 2007-01-04 - 2007-07-31

| | Coefficient | Std.Error | t-value | t-prob | Part.R^2 |
|---|---|---|---|---|---|
| Ps_EUR3m_1 | 0.262527 | 0.08311 | 3.16 | 0.0019 | 0.0644 |
| Ps_EUR3m_2 | 0.186596 | 0.08587 | 2.17 | 0.0314 | 0.0315 |
| Ps_EUR3m_3 | 0.212876 | 0.08347 | 2.55 | 0.0118 | 0.0429 |
| Constant | 0.0152204 | 0.004117 | 3.70 | 0.0003 | 0.0862 |

| | | | |
|---|---|---|---|
| sigma | 0.00612521 | RSS | 0.00544013216 |
| R^2 | 0.271763 | F(3,145) = | 18.04 [0.000]** |
| Adj.R^2 | 0.256696 | log-likelihood | 549.812 |
| no. of observations | 149 | no. of parameters | 4 |
| mean(Ps_EUR3m) | 0.0452161 | se(Ps_EUR3m) | 0.00710457 |

AR 1-2 test: F(2,143) = 0.38513 [0.6811]
ARCH 1-1 test: F(1,147) = 2.4958 [0.1163]
Normality test: Chi^2(2) = 22.341 [0.0000]**
Hetero test: F(6,142) = 1.8624 [0.0913]
Hetero-X test: F(9,139) = 1.2930 [0.2459]
RESET23 test: F(2,143) = 2.8183 [0.0630]

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THE CAD RISK PREMIUM:

EQ(1.8) Modelling PsCAD_3m by OLS

The estimation sample is: 2007-01-05 - 2007-07-31

| | Coefficient | Std.Error | t-value | t-prob | Part.R^2 |
|---|---|---|---|---|---|
| PsCAD_3m_1 | 0.736117 | 0.05633 | 13.1 | 0.0000 | 0.5443 |
| Constant | 0.00268776 | 0.006868 | 0.391 | 0.6961 | 0.0011 |
| VIX_3 | -0.00102904 | 0.0007771 | -1.32 | 0.1875 | 0.0121 |
| VIX_4 | 0.00112811 | 0.0007666 | 1.47 | 0.1433 | 0.0149 |
| Ps_USD3m | 0.0292903 | 0.08489 | 0.345 | 0.7306 | 0.0008 |

sigma 0.010279 RSS 0.0151091479
R^2 0.54717 F(4,143) = 43.2 [0.000]**
Adj.R^2 0.534503 log-likelihood 470.032
no. of observations 148 no. of parameters 5
mean(PsCAD_3m) 0.0231305 se(PsCAD_3m) 0.0150659

AR 1-2 test: F(2,141) = 2.9198 [0.0572]
ARCH 1-1 test: F(1,146) = 32.521 [0.0000]**
Normality test: Chi^2(2) = 169.97 [0.0000]**
Hetero test: F(8,139) = 6.8705 [0.0000]**
Hetero-X test: F(14,133) = 4.1868 [0.0000]**
RESET23 test: F(2,141) = 15.766 [0.0000]**

Robust standard errors

| | Coefficients | SE | HACSE | HCSE | JHCSE |
|---|---|---|---|---|---|
| PsCAD_3m_1 | 0.73612 | 0.056329 | 0.10508 | 0.12701 | 0.14599 |
| Constant | 0.0026878 | 0.0068679 | 0.0053723 | 0.0063592 | 0.0072035 |
| VIX_3 | -0.0010290 | 0.00077710 | 0.00074589 | 0.00070831 | 0.00075786 |
| VIX_4 | 0.0011281 | 0.00076658 | 0.00064175 | 0.00066857 | 0.00073153 |
| Ps_USD3m | 0.029290 | 0.084885 | 0.069258 | 0.079128 | 0.090400 |

| | Coefficients | t-SE | t-HACSE | t-HCSE | t-JHCSE |
|---|---|---|---|---|---|
| PsCAD_3m_1 | 0.73612 | 13.068 | 7.0054 | 5.7956 | 5.0423 |
| Constant | 0.0026878 | 0.39135 | 0.50030 | 0.42265 | 0.37312 |
| VIX_3 | -0.0010290 | -1.3242 | -1.3796 | -1.4528 | -1.3578 |
| VIX_4 | 0.0011281 | 1.4716 | 1.7579 | 1.6873 | 1.5421 |
| Ps_USD3m | 0.029290 | 0.34506 | 0.42292 | 0.37016 | 0.32401 |

AUTOMETRICS:

EQ(1.9) Modelling PsCAD_3m by OLS

The estimation sample is: 2007-01-08 - 2007-07-31

| | Coefficient | Std.Error | t-value | t-prob | Part.R^2 |
|---|---|---|---|---|---|
| PsCAD_3m_1 | 0.549190 | 0.08267 | 6.64 | 0.0000 | 0.2397 |
| PsCAD_3m_2 | 0.112261 | 0.08701 | 1.29 | 0.1991 | 0.0118 |
| PsCAD_3m_4 | 0.161490 | 0.07298 | 2.21 | 0.0285 | 0.0338 |
| GRI | 0.362675 | 0.2299 | 1.58 | 0.1170 | 0.0175 |
| GRI_4 | -0.242549 | 0.1972 | -1.23 | 0.2209 | 0.0107 |
| TED-Spread_4 | 0.00499653 | 0.005495 | 0.909 | 0.3647 | 0.0059 |
| Ps_USD3m_1 | -0.100650 | 0.09308 | -1.08 | 0.2814 | 0.0083 |

sigma 0.00995502 RSS 0.0138743322
log-likelihood 472.625
no. of observations 147 no. of parameters 7
mean(PsCAD_3m) 0.0232085 se(PsCAD_3m) 0.0150874

AR 1-2 test: F(2,138) = 0.87686 [0.4184]
ARCH 1-1 test: F(1,145) = 15.414 [0.0001]**
Normality test: Chi^2(2) = 97.597 [0.0000]**
Hetero test: F(14,132) = 2.0145 [0.0211]*
Hetero-X test: F(35,111) = 1.0422 [0.4214]
RESET23 test: F(2,138) = 9.7978 [0.0001]**

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THE AUD PREMIUM:

EQ(1.10) Modelling Ps_AUD3m by OLS

The estimation sample is: 2007-01-08 - 2007-07-31

| | Coefficient | Std.Error | t-value | t-prob | Part.R^2 |
|---|---|---|---|---|---|
| Ps_AUD3m_1 | 0.494893 | 0.08056 | 6.14 | 0.0000 | 0.2111 |
| Ps_AUD3m_2 | 0.246167 | 0.07929 | 3.10 | 0.0023 | 0.0640 |
| Constant | -0.0201716 | 0.008611 | -2.34 | 0.0206 | 0.0375 |
| GRI_4 | 0.214659 | 0.09938 | 2.16 | 0.0325 | 0.0320 |
| VIX_2 | -0.000722670 | 0.0002594 | -2.79 | 0.0061 | 0.0522 |
| Ps_USD3m_2 | 0.143561 | 0.06220 | 2.31 | 0.0224 | 0.0364 |

sigma 0.00566139 RSS 0.00451923168
R^2 0.662599 F(5,141) = 55.38 [0.000]**
Adj.R^2 0.650635 log-likelihood 555.07
no. of observations 147 no. of parameters 6
mean(Ps_AUD3m) -0.0108418 se(Ps_AUD3m) 0.00957818

AR 1-2 test: F(2,139) = 0.86080 [0.4251]
ARCH 1-1 test: F(1,145) = 0.28261 [0.5958]
Normality test: Chi^2(2) = 7.6328 [0.0220]*
Hetero test: F(10,136) = 1.6378 [0.1022]
Hetero-X test: F(20,126) = 1.2048 [0.2613]

RESET23 test: F(2,139) = 1.8207 [0.1658]

AUTOMETRICS:

EQ(1.11) Modelling Ps_AUD3m by OLS
The estimation sample is: 2007-01-08 - 2007-07-31

| | Coefficient | Std.Error | t-value | t-prob | Part.R^2 |
|---|---|---|---|---|---|
| Ps_AUD3m_1 | 0.535546 | 0.07377 | 7.26 | 0.0000 | 0.2680 |
| Ps_AUD3m_3 | 0.212234 | 0.07465 | 2.84 | 0.0051 | 0.0532 |
| TED-Spread_2 | -0.00760335 | 0.002392 | -3.18 | 0.0018 | 0.0656 |

sigma 0.00567164 RSS 0.00463211565
log-likelihood 553.256
no. of observations 147 no. of parameters 3
mean(Ps_AUD3m) -0.0108418 se(Ps_AUD3m) 0.00957818

AR 1-2 test: F(2,142) = 1.3479 [0.2631]
ARCH 1-1 test: F(1,145) =4.7162e-005 [0.9945]
Normality test: Chi^2(2) = 8.3595 [0.0153]*
Hetero test: F(6,140) = 2.3046 [0.0375]*
Hetero-X test: F(9,137) = 1.8006 [0.0734]
RESET23 test: F(2,142) = 1.7943 [0.1700]

Robust standard errors

| | Coefficients | SE | HACSE | HCSE | JHCSE |
|---|---|---|---|---|---|
| Ps_AUD3m_1 | 0.53555 | 0.073766 | 0.089365 | 0.083001 | 0.085268 |
| Ps_AUD3m_3 | 0.21223 | 0.074648 | 0.075571 | 0.077123 | 0.078688 |
| TED-Spread_2 | -0.0076034 | 0.0023923 | 0.0022755 | 0.0020897 | 0.0021345 |

| | Coefficients | t-SE | t-HACSE | t-HCSE | t-JHCSE |
|---|---|---|---|---|---|
| Ps_AUD3m_1 | 0.53555 | 7.2601 | 5.9928 | 6.4523 | 6.2808 |
| Ps_AUD3m_3 | 0.21223 | 2.8432 | 2.8084 | 2.7519 | 2.6972 |
| TED-Spread_2 | -0.0076034 | -3.1783 | -3.3413 | -3.6386 | -3.5621 Basically zero! |

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Second phase 01-08-2007 until 09-17-2008

TWO MODELS ARE REPRESENTED FOR EACH RSIK PREMIUM, THE FIRST IS AUTHOR'S MODEL, AND THE SECOND IS AUTOMETRICS.

ADL-models:

NOK RISK Premium:

EQ(2.1) Modelling Ps_NOK3m by OLS

The estimation sample is: 2007-08-01 - 2008-09-17

| | Coefficient | Std.Error | t-value | t-prob | Part.R^2 |
|---|---|---|---|---|---|
| Ps_NOK3m_1 | 0.890914 | 0.02578 | 34.6 | 0.0000 | 0.8047 |
| Constant | 0.0222353 | 0.01285 | 1.73 | 0.0845 | 0.0102 |
| Ps_USD3m_1 | 0.176950 | 0.03178 | 5.57 | 0.0000 | 0.0966 |
| Ps_USD3m_4 | -0.109850 | 0.03311 | -3.32 | 0.0010 | 0.0366 |
| Sc_Add_Liq_3 | 0.000537624 | 0.0002179 | 2.47 | 0.0142 | 0.0206 |
| Sc_Add_Liq_4 | -0.000447997 | 0.0002173 | -2.06 | 0.0401 | 0.0145 |

sigma 0.046743 RSS 0.63362344
R^2 0.910354 F(5,290) = 589 [0.000]**
Adj.R^2 0.908809 log-likelihood 489.7
no. of observations 296 no. of parameters 6
mean(Ps_NOK3m) 0.658418 se(Ps_NOK3m) 0.154789

AR 1-2 test: F(2,288) = 0.027188 [0.9732]
ARCH 1-1 test: F(1,294) = 0.017992 [0.8934]
Normality test: Chi^2(2) = 23.054 [0.0000]**
Hetero test: F(10,285) = 1.8368 [0.0542]
Hetero-X test: F(20,275) = 1.1962 [0.2566]
RESET23 test: F(2,288) = 0.90088 [0.4074]
Model saved to C:\Users\Eier\Litteratur Hovedoppgave\Masterthesis\Illustrasjoner\Engle-Granger metoden\ADL_NOK_per2.gwg

Autometrics:

EQ(2.2) Modelling Ps_NOK3m by OLS

The estimation sample is: 2007-08-01 - 2008-09-17

| | Coefficient | Std.Error | t-value | t-prob | Part.R^2 |
|---|---|---|---|---|---|
| Ps_NOK3m_1 | 0.876454 | 0.03651 | 24.0 | 0.0000 | 0.6676 |
| Ps_NOK3m_4 | -0.0553212 | 0.03348 | -1.65 | 0.0995 | 0.0094 |
| GRI_1 | 0.859219 | 0.2589 | 3.32 | 0.0010 | 0.0369 |
| VIX_2 | -0.00262292 | 0.001066 | -2.46 | 0.0144 | 0.0207 |
| Ps_USD3m_1 | 0.0933311 | 0.02058 | 4.53 | 0.0000 | 0.0669 |
| Sc_Add_Liq_1 | -0.000190583 | 0.0002208 | -0.863 | 0.3887 | 0.0026 |
| Sc_Add_Liq_2 | 0.000514739 | 0.0002529 | 2.04 | 0.0428 | 0.0142 |
| Sc_Add_Liq_4 | -0.000588482 | 0.0002540 | -2.32 | 0.0212 | 0.0184 |
| Sc_Add_Liq_5 | 0.000440742 | 0.0002190 | 2.01 | 0.0451 | 0.0139 |

sigma 0.0468727 RSS 0.630553338
log-likelihood 490.419
no. of observations 296 no. of parameters 9
mean(Ps_NOK3m) 0.658418 se(Ps_NOK3m) 0.154789

AR 1-2 test: F(2,285) = 0.22489 [0.7987]
ARCH 1-1 test: F(1,294) = 0.038343 [0.8449]
Normality test: Chi^2(2) = 12.995 [0.0015]**
Hetero test: F(18,277) = 1.9779 [0.0111]*
Hetero-X test: F(54,241) = 1.4287 [0.0376]*
RESET23 test: F(2,285) = 0.94689 [0.3892]

Robust standard errors

| Coefficients | SE | HACSE | HCSE | JHCSE |
|---|---|---|---|---|

| | | | | | |
|---|---|---|---|---|---|
| Ps_NOK3m_1 | 0.87645 | 0.036508 | 0.037798 | 0.039262 | 0.040652 |
| Ps_NOK3m_4 | -0.055321 | 0.033476 | 0.039621 | 0.035510 | 0.037118 |
| GRI_1 | 0.85922 | 0.25893 | 0.29960 | 0.28417 | 0.29642 |
| VIX_2 | -0.0026229 | 0.0010657 | 0.0011182 | 0.0010972 | 0.0011404 |
| Ps_USD3m_1 | 0.093331 | 0.020582 | 0.025165 | 0.022343 | 0.023040 |
| Sc_Add_Liq_1 | -0.00019058 | 0.00022077 | 0.00021468 | 0.00021941 | 0.00023894 |
| Sc_Add_Liq_2 | 0.00051474 | 0.00025293 | 0.00022244 | 0.00026108 | 0.00028314 |
| Sc_Add_Liq_4 | -0.00058848 | 0.00025399 | 0.00029814 | 0.00032219 | 0.00035897 |
| Sc_Add_Liq_5 | 0.00044074 | 0.00021905 | 0.00031806 | 0.00030068 | 0.00033811 |

| | Coefficients | t-SE | t-HACSE | t-HCSE | t-JHCSE |
|---|---|---|---|---|---|
| Ps_NOK3m_1 | 0.87645 | 24.007 | 23.188 | 22.323 | 21.560 |
| Ps_NOK3m_4 | -0.055321 | -1.6526 | -1.3962 | -1.5579 | -1.4904 |
| GRI_1 | 0.85922 | 3.3183 | 2.8679 | 3.0237 | 2.8987 |
| VIX_2 | -0.0026229 | -2.4612 | -2.3457 | -2.3906 | -2.3000 |
| Ps_USD3m_1 | 0.093331 | 4.5347 | 3.7087 | 4.1773 | 4.0509 |
| Sc_Add_Liq_1 | -0.00019058 | -0.86326 | -0.88775 | -0.86863 | -0.79762 |
| Sc_Add_Liq_2 | 0.00051474 | 2.0351 | 2.3141 | 1.9715 | 1.8180 |
| Sc_Add_Liq_4 | -0.00058848 | -2.3169 | -1.9738 | -1.8265 | -1.6394 |
| Sc_Add_Liq_5 | 0.00044074 | 2.0121 | 1.3857 | 1.4658 | 1.3035 |

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SEK RISK PREMIUM:

Endeelig model
EQ(2.3) Modelling Ps_SEK3m by OLS

The estimation sample is: 2007-08-01 - 2008-09-17

| | Coefficient | Std.Error | t-value | t-prob | Part.R^2 |
|---|---|---|---|---|---|
| Ps_SEK3m_1 | 0.932394 | 0.01625 | 57.4 | 0.0000 | 0.9198 |
| Constant | -0.0108394 | 0.01222 | -0.887 | 0.3759 | 0.0027 |
| GRI | 0.554679 | 0.1672 | 3.32 | 0.0010 | 0.0369 |
| GRI_2 | -0.472758 | 0.2288 | -2.07 | 0.0397 | 0.0147 |
| GRI_4 | -0.643638 | 0.2712 | -2.37 | 0.0183 | 0.0193 |
| GRI_5 | 0.813454 | 0.2362 | 3.44 | 0.0007 | 0.0397 |
| VIX_4 | 0.00123888 | 0.0008789 | 1.41 | 0.1597 | 0.0069 |
| VIX_5 | -0.00185493 | 0.0008912 | -2.08 | 0.0383 | 0.0149 |
| Ps_USD3m_1 | 0.0279145 | 0.009786 | 2.85 | 0.0047 | 0.0276 |

| | | | |
|---|---|---|---|
| sigma | 0.022413 | RSS | 0.144172107 |
| R^2 | 0.963064 | F(8,287) = | 935.4 [0.000]** |
| Adj.R^2 | 0.962034 | log-likelihood | 708.806 |
| no. of observations | 296 | no. of parameters | 9 |
| mean(Ps_SEK3m) | 0.354072 | se(Ps_SEK3m) | 0.115028 |

AR 1-2 test: F(2,285) = 0.16760 [0.8458]
ARCH 1-1 test: F(1,294) = 0.64336 [0.4231]
Normality test: Chi^2(2) = 49.836 [0.0000]**
Hetero test: F(16,279) = 1.8293 [0.0274]*
Hetero-X test: F(44,251) = 1.9230 [0.0010]**
RESET23 test: F(2,285) = 0.42593 [0.6536]

Robust standard errors

| | Coefficients | SE | HACSE | HCSE | JHCSE |
|---|---|---|---|---|---|
| Ps_SEK3m_1 | 0.93239 | 0.016251 | 0.019391 | 0.019464 | 0.019905 |
| Constant | -0.010839 | 0.012222 | 0.012244 | 0.011157 | 0.011414 |
| GRI | 0.55468 | 0.16719 | 0.14473 | 0.15586 | 0.16661 |
| GRI_2 | -0.47276 | 0.22881 | 0.25745 | 0.29251 | 0.32053 |
| GRI_4 | -0.64364 | 0.27115 | 0.24258 | 0.28657 | 0.32018 |
| GRI_5 | 0.81345 | 0.23623 | 0.22283 | 0.25319 | 0.27657 |
| VIX_4 | 0.0012389 | 0.00087888 | 0.00071426 | 0.00078118 | 0.00080587 |
| VIX_5 | -0.0018549 | 0.00089125 | 0.00080905 | 0.00082240 | 0.00085585 |
| Ps_USD3m_1 | 0.027915 | 0.0097857 | 0.011165 | 0.012318 | 0.012657 |

| | Coefficients | t-SE | t-HACSE | t-HCSE | t-JHCSE |
|---|---|---|---|---|---|
| Ps_SEK3m_1 | 0.93239 | 57.373 | 48.084 | 47.903 | 46.842 |
| Constant | -0.010839 | -0.88688 | -0.88526 | -0.97155 | -0.94968 |
| GRI | 0.55468 | 3.3177 | 3.8324 | 3.5588 | 3.3292 |
| GRI_2 | -0.47276 | -2.0662 | -1.8363 | -1.6162 | -1.4749 |
| GRI_4 | -0.64364 | -2.3737 | -2.6533 | -2.2460 | -2.0102 |
| GRI_5 | 0.81345 | 3.4435 | 3.6506 | 3.2129 | 2.9412 |
| VIX_4 | 0.0012389 | 1.4096 | 1.7345 | 1.5859 | 1.5373 |
| VIX_5 | -0.0018549 | -2.0813 | -2.2927 | -2.2555 | -2.1674 |
| Ps_USD3m_1 | 0.027915 | 2.8526 | 2.5003 | 2.2661 | 2.2055 |

Autometrics

EQ(2.4) Modelling Ps_SEK3m by OLS

The estimation sample is: 2007-08-01 - 2008-09-17

| | Coefficient | Std.Error | t-value | t-prob | Part.R^2 |
|---|---|---|---|---|---|
| Ps_SEK3m_1 | 0.927638 | 0.01615 | 57.4 | 0.0000 | 0.9192 |
| GRI | 0.333876 | 0.1222 | 2.73 | 0.0067 | 0.0251 |
| GRI_4 | -0.722998 | 0.2524 | -2.86 | 0.0045 | 0.0275 |
| GRI_5 | 0.664712 | 0.2253 | 2.95 | 0.0034 | 0.0291 |
| VIX_5 | -0.00107966 | 0.0005363 | -2.01 | 0.0450 | 0.0138 |
| Ps_USD3m_1 | 0.0259036 | 0.009422 | 2.75 | 0.0063 | 0.0254 |

sigma 0.0225177 RSS 0.147043256
log-likelihood 705.888
no. of observations 296 no. of parameters 6
mean(Ps_SEK3m) 0.354072 se(Ps_SEK3m) 0.115028

AR 1-2 test: F(2,288) = 0.11727 [0.8894]
ARCH 1-1 test: F(1,294) = 0.32104 [0.5714]
Normality test: Chi^2(2) = 49.753 [0.0000]**
Hetero test: F(12,283) = 1.5791 [0.0970]
Hetero-X test: F(27,268) = 1.9904 [0.0033]**
RESET23 test: F(2,288) = 0.67717 [0.5089]

Robust standard errors

| | Coefficients | SE | HACSE | HCSE | JHCSE |
|---|---|---|---|---|---|
| Ps_SEK3m_1 | 0.92764 | 0.016148 | 0.019458 | 0.019816 | 0.020244 |
| GRI | 0.33388 | 0.12225 | 0.12012 | 0.11885 | 0.12311 |
| GRI_4 | -0.72300 | 0.25245 | 0.22768 | 0.27911 | 0.30640 |

| | | | | | |
|---|---|---|---|---|---|
| GRI_5 | 0.66471 | 0.22529 | 0.20583 | 0.24287 | 0.26477 |
| VIX_5 | -0.0010797 | 0.00053631 | 0.00051667 | 0.00056378 | 0.00057344 |
| Ps_USD3m_1 | 0.025904 | 0.0094217 | 0.010503 | 0.011506 | 0.011773 |

| | Coefficients | t-SE | t-HACSE | t-HCSE | t-JHCSE |
|---|---|---|---|---|---|
| Ps_SEK3m_1 | 0.92764 | 57.444 | 47.673 | 46.814 | 45.823 |
| GRI | 0.33388 | 2.7312 | 2.7796 | 2.8093 | 2.7121 |
| GRI_4 | -0.72300 | -2.8640 | -3.1755 | -2.5904 | -2.3597 |
| GRI_5 | 0.66471 | 2.9504 | 3.2294 | 2.7370 | 2.5105 |
| VIX_5 | -0.0010797 | -2.0131 | -2.0897 | -1.9150 | -1.8828 |
| Ps_USD3m_1 | 0.025904 | 2.7494 | 2.4663 | 2.2513 | 2.2003 |

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EUR RISK PREMIUM:

EQ(2.5) Modelling Ps_EUR3m by OLS

The estimation sample is: 2007-08-01 - 2008-09-17

| | Coefficient | Std.Error | t-value | t-prob | Part.R^2 |
|---|---|---|---|---|---|
| Ps_EUR3m_1 | 0.869815 | 0.05720 | 15.2 | 0.0000 | 0.4445 |
| Ps_EUR3m_2 | 0.149422 | 0.06406 | 2.33 | 0.0204 | 0.0185 |
| Ps_EUR3m_5 | -0.0863168 | 0.03061 | -2.82 | 0.0051 | 0.0268 |
| Constant | -0.00533674 | 0.01171 | -0.456 | 0.6490 | 0.0007 |
| GRI_5 | 0.156912 | 0.09520 | 1.65 | 0.1004 | 0.0093 |
| Ps_USD3m | 0.137465 | 0.02471 | 5.56 | 0.0000 | 0.0967 |
| Ps_USD3m_1 | -0.0953001 | 0.02713 | -3.51 | 0.0005 | 0.0410 |

sigma 0.0255277 RSS 0.188331178
R^2 0.974015 F(6,289) = 1805 [0.000]**
Adj.R^2 0.973476 log-likelihood 669.261
no. of observations 296 no. of parameters 7
mean(Ps_EUR3m) 0.611839 se(Ps_EUR3m) 0.156745

AR 1-2 test: F(2,287) = 1.2817 [0.2792]
ARCH 1-1 test: F(1,294) = 22.244 [0.0000]**
Normality test: Chi^2(2) = 58.300 [0.0000]**
Hetero test: F(12,283) = 1.1095 [0.3519]
Hetero-X test: F(27,268) = 4.9066 [0.0000]**
RESET23 test: F(2,287) = 0.96637 [0.3817]

Robust standard errors

| | Coefficients | SE | HACSE | HCSE | JHCSE |
|---|---|---|---|---|---|
| Ps_EUR3m_1 | 0.86982 | 0.057196 | 0.073898 | 0.086617 | 0.090338 |
| Ps_EUR3m_2 | 0.14942 | 0.064061 | 0.074947 | 0.086865 | 0.091186 |
| Ps_EUR3m_5 | -0.086317 | 0.030614 | 0.029933 | 0.033448 | 0.035249 |
| Constant | -0.0053367 | 0.011713 | 0.013041 | 0.011168 | 0.011631 |
| GRI_5 | 0.15691 | 0.095202 | 0.093911 | 0.10006 | 0.10309 |
| Ps_USD3m | 0.13746 | 0.024710 | 0.036355 | 0.042332 | 0.048004 |
| Ps_USD3m_1 | -0.095300 | 0.027125 | 0.038699 | 0.042454 | 0.047153 |

| | Coefficients | t-SE | t-HACSE | t-HCSE | t-JHCSE |
|---|---|---|---|---|---|

| | | | | | |
|---|---|---|---|---|---|
| Ps_EUR3m_1 | 0.86982 | 15.208 | 11.771 | 10.042 | 9.6284 |
| Ps_EUR3m_2 | 0.14942 | 2.3325 | 1.9937 | 1.7202 | 1.6387 |
| Ps_EUR3m_5 | -0.086317 | -2.8195 | -2.8837 | -2.5806 | -2.4488 |
| Constant | -0.0053367 | -0.45564 | -0.40922 | -0.47788 | -0.45885 |
| GRI_5 | 0.15691 | 1.6482 | 1.6709 | 1.5681 | 1.5221 |
| Ps_USD3m | 0.13746 | 5.5632 | 3.7811 | 3.2473 | 2.8636 |
| Ps_USD3m_1 | -0.095300 | -3.5134 | -2.4626 | -2.2448 | -2.0211 |

AUTOMETRICS:

EQ(2.6) Modelling Ps_EUR3m by OLS

The estimation sample is: 2007-08-01 - 2008-09-17

| | Coefficient | Std.Error | t-value | t-prob | Part.R^2 |
|---|---|---|---|---|---|
| Ps_EUR3m_1 | 0.896760 | 0.04295 | 20.9 | 0.0000 | 0.6014 |
| Ps_EUR3m_3 | 0.161738 | 0.05624 | 2.88 | 0.0043 | 0.0278 |
| Ps_EUR3m_5 | -0.131536 | 0.03768 | -3.49 | 0.0006 | 0.0405 |
| GRI_3 | -0.538558 | 0.1877 | -2.87 | 0.0044 | 0.0277 |
| GRI_5 | 0.652795 | 0.1928 | 3.39 | 0.0008 | 0.0382 |
| Ps_USD3m | 0.140969 | 0.02437 | 5.79 | 0.0000 | 0.1038 |
| Ps_USD3m_1 | -0.0933546 | 0.02669 | -3.50 | 0.0005 | 0.0406 |

sigma 0.025142 RSS 0.182683142
log-likelihood 673.768
no. of observations 296 no. of parameters 7
mean(Ps_EUR3m) 0.611839 se(Ps_EUR3m) 0.156745

AR 1-2 test: F(2,287) = 1.5197 [0.2205]
ARCH 1-1 test: F(1,294) = 18.919 [0.0000]**
Normality test: Chi^2(2) = 67.439 [0.0000]**
Hetero test: F(14,281) = 1.4062 [0.1492]
Hetero-X test: F(35,260) = 3.8892 [0.0000]**
RESET23 test: F(2,287) = 0.17261 [0.8416]

Robust standard errors

| | Coefficients | SE | HACSE | HCSE | JHCSE |
|---|---|---|---|---|---|
| Ps_EUR3m_1 | 0.89676 | 0.042945 | 0.054160 | 0.062224 | 0.064878 |
| Ps_EUR3m_3 | 0.16174 | 0.056236 | 0.066097 | 0.071431 | 0.075150 |
| Ps_EUR3m_5 | -0.13154 | 0.037681 | 0.039401 | 0.039853 | 0.041972 |
| GRI_3 | -0.53856 | 0.18767 | 0.12021 | 0.16250 | 0.17140 |
| GRI_5 | 0.65280 | 0.19279 | 0.12099 | 0.14635 | 0.15330 |
| Ps_USD3m | 0.14097 | 0.024367 | 0.034008 | 0.040515 | 0.045909 |
| Ps_USD3m_1 | -0.093355 | 0.026690 | 0.036858 | 0.040693 | 0.045216 |

| | Coefficients | t-SE | t-HACSE | t-HCSE | t-JHCSE |
|---|---|---|---|---|---|
| Ps_EUR3m_1 | 0.89676 | 20.881 | 16.558 | 14.412 | 13.822 |
| Ps_EUR3m_3 | 0.16174 | 2.8761 | 2.4470 | 2.2643 | 2.1522 |
| Ps_EUR3m_5 | -0.13154 | -3.4907 | -3.3384 | -3.3005 | -3.1339 |
| GRI_3 | -0.53856 | -2.8697 | -4.4801 | -3.3142 | -3.1422 |
| GRI_5 | 0.65280 | 3.3861 | 5.3955 | 4.4605 | 4.2582 |
| Ps_USD3m | 0.14097 | 5.7853 | 4.1452 | 3.4794 | 3.0706 |
| Ps_USD3m_1 | -0.093355 | -3.4977 | -2.5328 | -2.2941 | -2.0646 |

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GBP premium:

Cointegration regression

EQ(2.7) Modelling Ps_GBR3m by OLS

The estimation sample is: 2007-08-28 - 2008-09-17

| | Coefficient | Std.Error | t-value | t-prob | Part.R^2 |
|---|---|---|---|---|---|
| Constant | -0.0736201 | 0.06018 | -1.22 | 0.2223 | 0.0055 |
| GRI | 3.50022 | 0.5540 | 6.32 | 0.0000 | 0.1280 |
| TED-Spread | 0.0545679 | 0.02358 | 2.31 | 0.0214 | 0.0193 |
| VIX | -0.0156931 | 0.002724 | -5.76 | 0.0000 | 0.1087 |
| Ps_USD3m | 0.920513 | 0.05766 | 16.0 | 0.0000 | 0.4838 |

| | | | |
|---|---|---|---|
| sigma | 0.109335 | RSS | 3.25152737 |
| R^2 | 0.695168 | F(4,272) = | 155.1 [0.000]** |
| Adj.R^2 | 0.690685 | log-likelihood | 222.572 |
| no. of observations | 277 | no. of parameters | 5 |
| mean(Ps_GBR3m) | 0.710167 | se(Ps_GBR3m) | 0.196589 |

AR 1-2 test: F(2,270) = 356.90 [0.0000]**
ARCH 1-1 test: F(1,275) = 105.17 [0.0000]**
Normality test: Chi^2(2) = 12.034 [0.0024]**
Hetero test: F(8,268) = 6.5938 [0.0000]**
Hetero-X test: F(14,262) = 7.2141 [0.0000]**
RESET23 test: F(2,270) = 7.9468 [0.0004]**

Test on residuals:

EG_GBPres_per1: ADF tests (T=271, Constant; 5%=-2.87 1%=-3.46)

| D-lag | t-adf | beta Y_1 | sigma | t-DY_lag | t-prob | AIC | F-prob |
|---|---|---|---|---|---|---|---|
| 5 | -2.977* | 0.88561 | 0.05771 | -0.2665 | 0.7900 | -5.679 | |
| 4 | -3.126* | 0.88326 | 0.05761 | 0.7083 | 0.4794 | -5.686 | 0.7900 |
| 3 | -3.048* | 0.88948 | 0.05756 | -0.8270 | 0.4090 | -5.692 | 0.7519 |
| 2 | -3.352* | 0.88218 | 0.05752 | -0.2533 | 0.8002 | -5.696 | 0.7409 |
| 1 | -3.535** | 0.87994 | 0.05742 | -1.341 | 0.1812 | -5.704 | 0.8585 |
| 0 | -4.063** | 0.86726 | 0.05751 | | | -5.704 | 0.6856 |

Final model:

EQ(2.8) Modelling DPs_GBR3m by OLS

The estimation sample is: 2007-09-05 - 2008-09-17

| | Coefficient | Std.Error | t-value | t-prob | Part.R^2 |
|---|---|---|---|---|---|
| DPs_GBR3m_1 | 0.111545 | 0.05698 | 1.96 | 0.0513 | 0.0145 |

| | | | | | |
|---|---|---|---|---|---|
| DPs_GBR3m_4 | 0.151166 | 0.05586 | 2.71 | 0.0073 | 0.0273 |
| Constant | -0.000500091 | 0.001997 | -0.250 | 0.8024 | 0.0002 |
| DGRI | 0.984998 | 0.3733 | 2.64 | 0.0088 | 0.0260 |
| DTEDspread | 0.0445202 | 0.02060 | 2.16 | 0.0316 | 0.0176 |
| DPs_USD3m | 0.164480 | 0.04038 | 4.07 | 0.0001 | 0.0598 |
| DPs_USD3m_1 | 0.0828369 | 0.03923 | 2.11 | 0.0357 | 0.0168 |
| DPs_USD3m_3 | 0.0857130 | 0.03647 | 2.35 | 0.0195 | 0.0207 |
| DPs_USD3m_5 | 0.0873612 | 0.03691 | 2.37 | 0.0187 | 0.0210 |
| EG_GBPres_per1_1 | -0.0607761 | 0.01971 | -3.08 | 0.0023 | 0.0351 |

sigma 0.0328256 RSS 0.281233107
R^2 0.283626 F(9,261) = 11.48 [0.000]**
Adj.R^2 0.258923 log-likelihood 546.446
no. of observations 271 no. of parameters 10
mean(DPs_GBR3m) 0.000349631 se(DPs_GBR3m) 0.0381313

AR 1-2 test: F(2,259) = 0.41310 [0.6620]
ARCH 1-1 test: F(1,269) = 4.6049 [0.0328]*
Normality test: Chi^2(2) = 37.557 [0.0000]**
Hetero test: F(18,252) = 2.3994 [0.0015]**
Hetero-X test: F(54,216) = 1.7976 [0.0018]**
RESET23 test: F(2,259) = 7.8023 [0.0005]**

Robust standard errors

| | Coefficients | SE | HACSE | HCSE |
|---|---|---|---|---|
| DPs_GBR3m_1 | 0.11155 | 0.056975 | 0.073274 | 0.074031 |
| DPs_GBR3m_4 | 0.15117 | 0.055860 | 0.061427 | 0.061850 |
| Constant | -0.00050009 | 0.0019966 | 0.0020589 | 0.0019955 |
| DGRI | 0.98500 | 0.37326 | 0.48458 | 0.45133 |
| DTEDspread | 0.044520 | 0.020602 | 0.019671 | 0.023444 |
| DPs_USD3m | 0.16448 | 0.040377 | 0.069282 | 0.058603 |
| DPs_USD3m_1 | 0.082837 | 0.039226 | 0.053507 | 0.052053 |
| DPs_USD3m_3 | 0.085713 | 0.036468 | 0.043638 | 0.043117 |
| DPs_USD3m_5 | 0.087361 | 0.036908 | 0.029887 | 0.033999 |
| EG_GBPres_per1_1 | -0.060776 | 0.019712 | 0.022352 | 0.026021 |

| | Coefficients | t-SE | t-HACSE | t-HCSE |
|---|---|---|---|---|
| DPs_GBR3m_1 | 0.11155 | 1.9578 | 1.5223 | 1.5067 |
| DPs_GBR3m_4 | 0.15117 | 2.7061 | 2.4609** | 2.4441 |
| Constant | -0.00050009 | -0.25047 | -0.24289 | -0.25061 |
| DGRI | 0.98500 | 2.6389 | 2.0327* | 2.1824 |
| DTEDspread | 0.044520 | 2.1609 | 2.2633* | 1.8990 |
| DPs_USD3m | 0.16448 | 4.0736 | 2.3741* | 2.8067 |
| DPs_USD3m_1 | 0.082837 | 2.1118 | 1.5481 | 1.5914 |
| DPs_USD3m_3 | 0.085713 | 2.3504 | 1.9642* | 1.9879 |
| DPs_USD3m_5 | 0.087361 | 2.3670 | 2.9231** | 2.5695 |
| EG_GBPres_per1_1 | -0.060776 | -3.0832 | -2.7190** | -2.3357 |

Autometrics:

EQ(2.9) Modelling DPs_GBR3m by OLS

The estimation sample is: 2007-09-05 - 2008-09-18

| | Coefficient | Std.Error | t-value | t-prob | Part.R^2 |
|---|---|---|---|---|---|
| DPs_GBR3m_1 | 0.126496 | 0.05847 | 2.16 | 0.0314 | 0.0175 |
| DPs_GBR3m_2 | 0.119975 | 0.05616 | 2.14 | 0.0336 | 0.0171 |
| DPs_GBR3m_4 | 0.156297 | 0.05532 | 2.83 | 0.0051 | 0.0295 |
| DGRI | 0.911762 | 0.3788 | 2.41 | 0.0168 | 0.0216 |
| DGRI_1 | -0.920227 | 0.3862 | -2.38 | 0.0179 | 0.0211 |
| DPs_USD3m | 0.202743 | 0.03419 | 5.93 | 0.0000 | 0.1179 |
| DPs_USD3m_1 | 0.110646 | 0.03700 | 2.99 | 0.0031 | 0.0329 |
| DPs_USD3m_3 | 0.0833901 | 0.03641 | 2.29 | 0.0228 | 0.0196 |
| EG_GBPres_per1_1 | -0.0720407 | 0.01973 | -3.65 | 0.0003 | 0.0482 |

sigma 0.0327977 RSS 0.282905995
log-likelihood 548.157
no. of observations 272 no. of parameters 9
mean(DPs_GBR3m) 0.000977941 se(DPs_GBR3m) 0.0394463

AR 1-2 test: F(2,261) = 1.0248 [0.3603]
ARCH 1-1 test: F(1,270) = 3.7453 [0.0540]
Normality test: Chi^2(2) = 49.736 [0.0000]**
Hetero test: F(18,253) = 2.4740 [0.0010]**
Hetero-X test: F(54,217) = 2.4890 [0.0000]**
RESET23 test: F(2,261) = 2.6479 [0.0727]

Robust standard errors

| | Coefficients | SE | HACSE | HCSE |
|---|---|---|---|---|
| DPs_GBR3m_1 | 0.12650 | 0.058467 | 0.073613 | 0.078656 |
| DPs_GBR3m_2 | 0.11998 | 0.056160 | 0.065338 | 0.071033 |
| DPs_GBR3m_4 | 0.15630 | 0.055325 | 0.060103 | 0.060401 |
| DGRI | 0.91176 | 0.37879 | 0.49579 | 0.44338 |
| DGRI_1 | -0.92023 | 0.38615 | 0.38939 | 0.43334 |
| DPs_USD3m | 0.20274 | 0.034188 | 0.057850 | 0.051021 |
| DPs_USD3m_1 | 0.11065 | 0.037002 | 0.051873 | 0.048472 |
| DPs_USD3m_3 | 0.083390 | 0.036409 | 0.042972 | 0.045471 |
| EG_GBPres_per1_1 | -0.072041 | 0.019735 | 0.021008 | 0.025852 |

| | Coefficients | t-SE | t-HACSE | t-HCSE |
|---|---|---|---|---|
| DPs_GBR3m_1 | 0.12650 | 2.1636 | 1.7184 | 1.6082 |
| DPs_GBR3m_2 | 0.11998 | 2.1363 | 1.8362 | 1.6890 |
| DPs_GBR3m_4 | 0.15630 | 2.8251 | 2.6005 | 2.5877 |
| DGRI | 0.91176 | 2.4071 | 1.8390 | 2.0564 |
| DGRI_1 | -0.92023 | -2.3831 | -2.3633 | -2.1236 |
| DPs_USD3m | 0.20274 | 5.9302 | 3.5047 | 3.9737 |
| DPs_USD3m_1 | 0.11065 | 2.9903 | 2.1330 | 2.2827 |
| DPs_USD3m_3 | 0.083390 | 2.2904 | 1.9406 | 1.8339 |
| EG_GBPres_per1_1 | -0.072041 | -3.6504 | -3.4292 | -2.7866 |

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EQ(2.10) Modelling PsCAD_3m by OLS

The estimation sample is: 2007-08-01 - 2008-09-17

| | Coefficient | Std.Error | t-value | t-prob | Part.R^2 |
|---|---|---|---|---|---|
| PsCAD_3m_1 | 0.703462 | 0.05995 | 11.7 | 0.0000 | 0.3250 |
| PsCAD_3m_2 | 0.124756 | 0.07248 | 1.72 | 0.0863 | 0.0103 |
| PsCAD_3m_4 | 0.0934866 | 0.07383 | 1.27 | 0.2065 | 0.0056 |
| PsCAD_3m_3 | -0.0626244 | 0.07385 | -0.848 | 0.3971 | 0.0025 |
| PsCAD_3m_5 | -0.0385140 | 0.05593 | -0.689 | 0.4916 | 0.0017 |
| Constant | -0.0394070 | 0.02655 | -1.48 | 0.1388 | 0.0076 |
| GRI_2 | -0.463576 | 0.1881 | -2.46 | 0.0143 | 0.0208 |
| TED-Spread | 0.0243263 | 0.01112 | 2.19 | 0.0294 | 0.0165 |
| VIX | 0.00279622 | 0.001080 | 2.59 | 0.0101 | 0.0229 |
| Ps_USD3m | 0.126958 | 0.02353 | 5.39 | 0.0000 | 0.0924 |

sigma 0.0432173 RSS 0.53417333
R^2 0.918862 F(9,286) = 359.9 [0.000]**
Adj.R^2 0.916309 log-likelihood 514.969
no. of observations 296 no. of parameters 10
mean(PsCAD_3m) 0.459211 se(PsCAD_3m) 0.149389

AR 1-2 test: F(2,284) = 3.4991 [0.0315]*
ARCH 1-1 test: F(1,294) = 6.8057 [0.0096]**
Normality test: Chi^2(2) = 111.86 [0.0000]**
Hetero test: F(18,277) = 2.0916 [0.0064]**
Hetero-X test: F(54,241) = 1.9655 [0.0003]**
RESET23 test: F(2,284) = 0.41670 [0.6596]

AUtometrics

EQ(2.11) Modelling PsCAD_3m by OLS

The estimation sample is: 2007-08-01 - 2008-09-17

| | Coefficient | Std.Error | t-value | t-prob | Part.R^2 |
|---|---|---|---|---|---|
| PsCAD_3m_1 | 0.699598 | 0.05845 | 12.0 | 0.0000 | 0.3337 |
| PsCAD_3m_2 | 0.165497 | 0.05751 | 2.88 | 0.0043 | 0.0281 |
| Constant | -0.0313229 | 0.02491 | -1.26 | 0.2095 | 0.0055 |
| GRI_2 | -1.30140 | 0.4340 | -3.00 | 0.0029 | 0.0305 |
| GRI_3 | 1.06820 | 0.4261 | 2.51 | 0.0127 | 0.0215 |
| TED-Spread | 0.0672178 | 0.02201 | 3.05 | 0.0025 | 0.0316 |
| TED-Spread_1 | -0.0502231 | 0.02120 | -2.37 | 0.0185 | 0.0192 |
| VIX | 0.00188845 | 0.001045 | 1.81 | 0.0718 | 0.0113 |
| Ps_USD3m | 0.159001 | 0.03108 | 5.12 | 0.0000 | 0.0839 |
| Ps_USD3m_3 | -0.0722880 | 0.03340 | -2.16 | 0.0313 | 0.0161 |

sigma 0.0422856 RSS 0.511387722
R^2 0.922323 F(9,286) = 377.3 [0.000]**
Adj.R^2 0.919879 log-likelihood 521.42
no. of observations 296 no. of parameters 10
mean(PsCAD_3m) 0.459211 se(PsCAD_3m) 0.149389

AR 1-2 test: F(2,284) = 0.28077 [0.7554]
ARCH 1-1 test: F(1,294) = 6.6942 [0.0102]*
Normality test: Chi^2(2) = 130.68 [0.0000]**
Hetero test: F(18,277) = 2.0259 [0.0088]**
Hetero-X test: F(54,241) = 1.6649 [0.0052]**
RESET23 test: F(2,284) = 0.12811 [0.8798]

Robust standard errors

| | Coefficients | SE | HACSE | HCSE | JHCSE |
|---|---|---|---|---|---|
| PsCAD_3m_1 | 0.69960 | 0.058453 | 0.058583 | 0.073516 | 0.081012 |
| PsCAD_3m_2 | 0.16550 | 0.057510 | 0.051575 | 0.072428 | 0.079265 |
| Constant | -0.031323 | 0.024905 | 0.023434 | 0.024210 | 0.025339 |
| GRI_2 | -1.3014 | 0.43399 | 0.51914 | 0.58661 | 0.67008 |
| GRI_3 | 1.0682 | 0.42612 | 0.47548 | 0.56909 | 0.63828 |
| TED-Spread | 0.067218 | 0.022009 | 0.028034 | 0.030238 | 0.032572 |
| TED-Spread_1 | -0.050223 | 0.021203 | 0.024536 | 0.027484 | 0.029451 |
| VIX | 0.0018885 | 0.0010449 | 0.0014876 | 0.0011575 | 0.0012238 |
| Ps_USD3m | 0.15900 | 0.031077 | 0.034510 | 0.030534 | 0.033171 |
| Ps_USD3m_3 | -0.072288 | 0.033398 | 0.034834 | 0.030179 | 0.031710 |

| | Coefficients | t-SE | t-HACSE | t-HCSE | t-JHCSE |
|---|---|---|---|---|---|
| PsCAD_3m_1 | 0.69960 | 11.969 | 11.942 | 9.5162 | 8.6358 |
| PsCAD_3m_2 | 0.16550 | 2.8777 | 3.2089 | 2.2850 | 2.0879 |
| Constant | -0.031323 | -1.2577 | -1.3366 | -1.2938 | -1.2362 |
| GRI_2 | -1.3014 | -2.9987 | -2.5068 | -2.2185 | -1.9421 |
| GRI_3 | 1.0682 | 2.5068 | 2.2466 | 1.8770 | 1.6736 |
| TED-Spread | 0.067218 | 3.0541 | 2.3977 | 2.2230 | 2.0637 |
| TED-Spread_1 | -0.050223 | -2.3687 | -2.0469 | -1.8274 | -1.7053 |
| VIX | 0.0018885 | 1.8073 | 1.2694 | 1.6315 | 1.5431 |
| Ps_USD3m | 0.15900 | 5.1164 | 4.6074 | 5.2073 | 4.7933 |
| Ps_USD3m_3 | -0.072288 | -2.1645 | -2.0752 | -2.3953 | -2.2797 |

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AUD RISK PREMIUM:

EQ(2.11) Modelling Ps_AUD3m by OLS

The estimation sample is: 2007-08-01 - 2008-09-17

| | Coefficient | Std.Error | t-value | t-prob | Part.R^2 |
|---|---|---|---|---|---|
| Ps_AUD3m_1 | 0.846308 | 0.02390 | 35.4 | 0.0000 | 0.8132 |
| Constant | -0.0729175 | 0.01783 | -4.09 | 0.0001 | 0.0549 |
| GRI | 1.16988 | 0.2496 | 4.69 | 0.0000 | 0.0708 |
| GRI_2 | -1.65978 | 0.3710 | -4.47 | 0.0000 | 0.0650 |
| GRI_3 | 0.951510 | 0.3300 | 2.88 | 0.0042 | 0.0281 |
| TED-Spread_3 | -0.0308174 | 0.006507 | -4.74 | 0.0000 | 0.0722 |
| VIX_5 | 0.00178577 | 0.0007545 | 2.37 | 0.0186 | 0.0191 |
| Ps_USD3m | 0.110472 | 0.01867 | 5.92 | 0.0000 | 0.1084 |

| | | | |
|---|---|---|---|
| sigma | 0.0324597 | RSS | 0.303445248 |
| R^2 | 0.931591 | F(7,288) = | 560.3 [0.000]** |
| Adj.R^2 | 0.929928 | log-likelihood | 598.665 |

no. of observations 296 no. of parameters 8
mean(Ps_AUD3m) 0.386913 se(Ps_AUD3m) 0.122623

AR 1-2 test: F(2,286) = 1.2519 [0.2875]
ARCH 1-1 test: F(1,294) = 0.86023 [0.3544]
Normality test: Chi^2(2) = 77.384 [0.0000]**
Hetero test: F(14,281) = 0.95072 [0.5046]
Hetero-X test: F(35,260) = 1.7025 [0.0109]*
RESET23 test: F(2,286) = 0.43622 [0.6469]

| | Coefficients | t-SE | t-HACSE | t-HCSE | t-JHCSE |
|---|---|---|---|---|---|
| Ps_AUD3m_1 | 0.84631 | 35.410 | 29.133 | 27.523 | 26.651 |
| Constant | -0.072918 | -4.0886 | -3.6726 | -3.8317 | -3.7228 |
| GRI | 1.1699 | 4.6862 | 3.4919 | 4.1341 | 3.9193 |
| GRI_2 | -1.6598 | -4.4740 | -3.3079 | -3.5599 | -3.1859 |
| GRI_3 | 0.95151 | 2.8835 | 2.8979 | 2.5261 | 2.2940 |
| TED-Spread_3 | -0.030817 | -4.7358 | -5.0009 | -4.4048 | -4.2913 |
| VIX_5 | 0.0017858 | 2.3669 | 2.2173 | 2.1830 | 2.1375 |
| Ps_USD3m | 0.11047 | 5.9158 | 5.5318 | 4.8898 | 4.7233 |

AUTOMETRICS:

EQ(2.12) Modelling Ps_AUD3m by OLS

The estimation sample is: 2007-08-01 - 2008-09-17

| | Coefficient | Std.Error | t-value | t-prob | Part.R^2 |
|---|---|---|---|---|---|
| Ps_AUD3m_1 | 0.846121 | 0.02409 | 35.1 | 0.0000 | 0.8102 |
| Constant | -0.0553620 | 0.01635 | -3.39 | 0.0008 | 0.0382 |
| GRI | 1.20817 | 0.2511 | 4.81 | 0.0000 | 0.0742 |
| GRI_2 | -1.64516 | 0.3739 | -4.40 | 0.0000 | 0.0628 |
| GRI_3 | 1.11600 | 0.3251 | 3.43 | 0.0007 | 0.0392 |
| TED-Spread_3 | -0.0264043 | 0.006284 | -4.20 | 0.0000 | 0.0576 |
| Ps_USD3m | 0.0975721 | 0.01800 | 5.42 | 0.0000 | 0.0923 |

sigma 0.0327171 RSS 0.309347837
R^2 0.93026 F(6,289) = 642.5 [0.000]**
Adj.R^2 0.928812 log-likelihood 595.814
no. of observations 296 no. of parameters 7
mean(Ps_AUD3m) 0.386913 se(Ps_AUD3m) 0.122623

AR 1-2 test: F(2,287) = 1.5633 [0.2112]
ARCH 1-1 test: F(1,294) = 0.77377 [0.3798]
Normality test: Chi^2(2) = 82.472 [0.0000]**
Hetero test: F(12,283) = 0.95323 [0.4941]
Hetero-X test: F(27,268) = 1.7024 [0.0190]*
RESET23 test: F(2,287) = 0.42420 [0.6547]

| | Coefficients | t-SE | t-HACSE | t-HCSE | t-JHCSE |
|---|---|---|---|---|---|
| Ps_AUD3m_1 | 0.84612 | 35.123 | 28.858 | 27.542 | 26.703 |

| | | | | | |
|---|---|---|---|---|---|
| Constant | -0.055362 | -3.3865 | -2.9903 | -3.1114 | -3.0190 |
| GRI | 1.2082 | 4.8116 | 3.5052 | 4.1566 | 3.9524 |
| GRI_2 | -1.6452 | -4.4003 | -3.2486 | -3.4178 | -3.0529 |
| GRI_3 | 1.1160 | 3.4323 | 3.2858 | 2.9226 | 2.6557 |
| TED-Spread_3 | -0.026404 | -4.2018 | -4.5085 | -3.9244 | -3.8302 |
| Ps_USD3m | 0.097572 | 5.4199 | 5.0625 | 4.4606 | 4.3205 |

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the USD PREMIUM:

EQ(2.13) Modelling Ps_USD3m by OLS

The estimation sample is: 2007-08-01 - 2008-09-17

| | Coefficient | Std.Error | t-value | t-prob | Part.R^2 |
|---|---|---|---|---|---|
| Ps_USD3m_1 | 0.884545 | 0.02651 | 33.4 | 0.0000 | 0.7951 |
| Constant | 0.0259155 | 0.02999 | 0.864 | 0.3883 | 0.0026 |
| GRI_1 | -1.35275 | 0.3840 | -3.52 | 0.0005 | 0.0415 |
| GRI_4 | 1.98515 | 0.4023 | 4.93 | 0.0000 | 0.0782 |
| TED-Spread | 0.225722 | 0.02421 | 9.32 | 0.0000 | 0.2325 |
| TED-Spread_1 | -0.160307 | 0.02645 | -6.06 | 0.0000 | 0.1135 |
| TED-Spread_5 | -0.0344075 | 0.01368 | -2.52 | 0.0124 | 0.0216 |
| VIX | 0.00415897 | 0.001413 | 2.94 | 0.0035 | 0.0293 |
| VIX_4 | -0.00687820 | 0.001510 | -4.56 | 0.0000 | 0.0675 |

| | | | |
|---|---|---|---|
| sigma | 0.049768 | RSS | 0.710857937 |
| R^2 | 0.913854 | F(8,287) = | 380.6 [0.000]** |
| Adj.R^2 | 0.911453 | log-likelihood | 472.677 |
| no. of observations | 296 | no. of parameters | 9 |
| mean(Ps_USD3m) | 0.676408 | se(Ps_USD3m) | 0.167249 |

AR 1-2 test: F(2,285) = 0.83404 [0.4354]
ARCH 1-1 test: F(1,294) = 46.482 [0.0000]**
Normality test: Chi^2(2) = 188.77 [0.0000]**
Hetero test: F(16,279) = 9.0397 [0.0000]**
Hetero-X test: F(44,251) = 9.7622 [0.0000]**
RESET23 test: F(2,285) = 1.2392 [0.2912]

Robust standard errors

| | Coefficients | SE | HACSE | HCSE | JHCSE |
|---|---|---|---|---|---|
| Ps_USD3m_1 | 0.88454 | 0.026507 | 0.031106 | 0.030479 | 0.031719 |
| Constant | 0.025916 | 0.029992 | 0.033835 | 0.033835 | 0.036029 |
| GRI_1 | -1.3528 | 0.38398 | 0.64461 | 0.61514 | 0.68052 |
| GRI_4 | 1.9852 | 0.40230 | 0.57630 | 0.60283 | 0.66200 |
| TED-Spread | 0.22572 | 0.024210 | 0.056517 | 0.039629 | 0.041738 |
| TED-Spread_1 | -0.16031 | 0.026446 | 0.051538 | 0.039471 | 0.042272 |
| TED-Spread_5 | -0.034408 | 0.013677 | 0.014036 | 0.018136 | 0.019889 |
| VIX | 0.0041590 | 0.0014127 | 0.0023875 | 0.0022008 | 0.0024035 |
| VIX_4 | -0.0068782 | 0.0015096 | 0.0024104 | 0.0024903 | 0.0027069 |

| | Coefficients | t-SE | t-HACSE | t-HCSE | t-JHCSE |
|---|---|---|---|---|---|

| | | | | | |
|---|---|---|---|---|---|
| Ps_USD3m_1 | 0.88454 | 33.371 | 28.436 | 29.021 | 27.887 |
| Constant | 0.025916 | 0.86408 | 0.76593 | 0.76593 | 0.71929 |
| GRI_1 | -1.3528 | -3.5230 | -2.0986 | -2.1991 | -1.9878 |
| GRI_4 | 1.9852 | 4.9345 | 3.4446 | 3.2930 | 2.9987 |
| TED-Spread | 0.22572 | 9.3236 | 3.9939 | 5.6958 | 5.4080 |
| TED-Spread_1 | -0.16031 | -6.0617 | -3.1105 | -4.0614 | -3.7923 |
| TED-Spread_5 | -0.034408 | -2.5156 | -2.4514 | -1.8972 | -1.7299 |
| VIX | 0.0041590 | 2.9440 | 1.7420 | 1.8897 | 1.7304 |
| VIX_4 | -0.0068782 | -4.5564 | -2.8535 | -2.7620 | -2.5410 |

Autometrics:

EQ(2.14) Modelling Ps_USD3m by OLS

The estimation sample is: 2007-08-01 - 2008-09-17

| | Coefficient | Std.Error | t-value | t-prob | Part.R^2 |
|---|---|---|---|---|---|
| Ps_USD3m_1 | 0.896772 | 0.02345 | 38.2 | 0.0000 | 0.8360 |
| GRI_1 | -0.813670 | 0.4059 | -2.00 | 0.0459 | 0.0138 |
| GRI_4 | 1.49539 | 0.4077 | 3.67 | 0.0003 | 0.0448 |
| TED-Spread | 0.203995 | 0.02437 | 8.37 | 0.0000 | 0.1962 |
| TED-Spread_1 | -0.141802 | 0.02788 | -5.09 | 0.0000 | 0.0827 |
| TED-Spread_4 | -0.0328356 | 0.01475 | -2.23 | 0.0268 | 0.0170 |
| VIX | 0.00815260 | 0.001850 | 4.41 | 0.0000 | 0.0634 |
| VIX_1 | -0.00638600 | 0.002209 | -2.89 | 0.0041 | 0.0283 |
| VIX_4 | -0.00390183 | 0.001637 | -2.38 | 0.0178 | 0.0194 |

sigma 0.0493056 RSS 0.697709307
log-likelihood 475.44
no. of observations 296 no. of parameters 9
mean(Ps_USD3m) 0.676408 se(Ps_USD3m) 0.167249

AR 1-2 test: F(2,285) = 1.3444 [0.2624]
ARCH 1-1 test: F(1,294) = 58.893 [0.0000]**
Normality test: Chi^2(2) = 214.38 [0.0000]**
Hetero test: F(18,277) = 6.5997 [0.0000]**
Hetero-X test: F(54,241) = 7.5733 [0.0000]**
RESET23 test: F(2,285) = 1.6429 [0.1953]

Robust standard errors

| | Coefficients | SE | HACSE | HCSE | JHCSE |
|---|---|---|---|---|---|
| Ps_USD3m_1 | 0.89677 | 0.023448 | 0.025422 | 0.028539 | 0.029876 |
| GRI_1 | -0.81367 | 0.40585 | 0.58149 | 0.53253 | 0.58918 |
| GRI_4 | 1.4954 | 0.40770 | 0.56640 | 0.54011 | 0.59236 |
| TED-Spread | 0.20399 | 0.024369 | 0.057092 | 0.040717 | 0.043133 |
| TED-Spread_1 | -0.14180 | 0.027878 | 0.057367 | 0.044813 | 0.048052 |
| TED-Spread_4 | -0.032836 | 0.014747 | 0.017901 | 0.021228 | 0.023252 |
| VIX | 0.0081526 | 0.0018500 | 0.0035578 | 0.0031510 | 0.0034532 |
| VIX_1 | -0.0063860 | 0.0022094 | 0.0036277 | 0.0032656 | 0.0035038 |
| VIX_4 | -0.0039018 | 0.0016371 | 0.0023609 | 0.0024072 | 0.0025747 |

| | Coefficients | t-SE | t-HACSE | t-HCSE | t-JHCSE |
|---|---|---|---|---|---|
| Ps_USD3m_1 | 0.89677 | 38.245 | 35.276 | 31.423 | 30.017 |
| GRI_1 | -0.81367 | -2.0048 | -1.3993 | -1.5279 | -1.3810 |

| | | | | | |
|---|---|---|---|---|---|
| GRI_4 | 1.4954 | 3.6679 | 2.6402 | 2.7687 | 2.5245 |
| TED-Spread | 0.20399 | 8.3709 | 3.5731 | 5.0101 | 4.7294 |
| TED-Spread_1 | -0.14180 | -5.0865 | -2.4719 | -3.1643 | -2.9510 |
| TED-Spread_4 | -0.032836 | -2.2266 | -1.8343 | -1.5468 | -1.4121 |
| VIX | 0.0081526 | 4.4068 | 2.2915 | 2.5873 | 2.3609 |
| VIX_1 | -0.0063860 | -2.8904 | -1.7603 | -1.9555 | -1.8226 |
| VIX_4 | -0.0039018 | -2.3833 | -1.6527 | -1.6209 | -1.5155 |

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3 phase:

AFTER LEHMAN BROTHERS.

ADF TEST FOR RESIDUAL ARE INCLUDED HERE. THEY CAN ALSO BE FOUND SEPARATELY IN COINTEGRATION TESTS.

THE NOK PREMIUM:
Cointegrationequation

EQ(3.1) Modelling Ps_NOK3m by OLS

The estimation sample is: 2008-09-18 - 2010-04-23

| | Coefficient | Std.Error | t-value | t-prob | Part.R^2 |
|---|---|---|---|---|---|
| Constant | -0.108569 | 0.04489 | -2.42 | 0.0160 | 0.0140 |
| GRI | 3.35347 | 0.4295 | 7.81 | 0.0000 | 0.1292 |
| TED-Spread | 0.0501417 | 0.05453 | 0.919 | 0.3584 | 0.0021 |
| VIX | -0.00413261 | 0.002150 | -1.92 | 0.0552 | 0.0089 |
| Ps_USD3m | 0.410917 | 0.07578 | 5.42 | 0.0000 | 0.0668 |
| Sc_Add_Liq | 0.00185566 | 0.0002683 | 6.92 | 0.0000 | 0.1042 |

| | | | |
|---|---|---|---|
| sigma | 0.157216 | RSS | 10.1586534 |
| R^2 | 0.901551 | F(5,411) = | 752.8 [0.000]** |
| Adj.R^2 | 0.900353 | log-likelihood | 182.83 |
| no. of observations | 417 | no. of parameters | 6 |
| mean(Ps_NOK3m) | 0.874695 | se(Ps_NOK3m) | 0.498042 |

AR 1-2 test: F(2,409) = 363.95 [0.0000]**
ARCH 1-1 test: F(1,415) = 228.52 [0.0000]**
Normality test: Chi^2(2) = 79.987 [0.0000]**
Hetero test: F(10,406) = 29.771 [0.0000]**
Hetero-X test: F(20,396) = 20.541 [0.0000]**
RESET23 test: F(2,409) = 56.493 [0.0000]**

EG_NOKres_3 [ 449 - 865] saved to Cointegration datasett.in7

Unit-root tests

The sample is: 2008-09-26 - 2010-04-23

EG_NOKres_3: ADF tests (T=411, Constant; 5%=-2.87 1%=-3.45)

| D-lag | t-adf | beta Y_1 | sigma | t-DY_lag | t-prob | AIC | F-prob |
|---|---|---|---|---|---|---|---|
| 5 | -5.658** | 0.78105 | 0.09365 | 0.6077 | 0.5437 | -4.719 | |
| 4 | -5.705** | 0.78729 | 0.09358 | -2.250 | 0.0250 | -4.723 | 0.5437 |
| 3 | -6.675** | 0.76176 | 0.09405 | -1.746 | 0.0815 | -4.716 | 0.0676 |
| 2 | -7.764** | 0.73989 | 0.09429 | 1.700 | 0.0900 | -4.713 | 0.0381 |
| 1 | -7.631** | 0.75965 | 0.09450 | 2.943 | 0.0034 | -4.711 | 0.0234 |
| 0 | -6.996** | 0.78933 | 0.09538 | | | -4.695 | 0.0013 |

FINAL ECM:

ENDELIG MODEL:

EQ(3.2) Modelling DPs_NOK3m by OLS

The estimation sample is: 2008-09-19 - 2010-04-23

| | Coefficient | Std.Error | t-value | t-prob | Part.R^2 |
|---|---|---|---|---|---|
| DPs_NOK3m_3 | -0.143132 | 0.04404 | -3.25 | 0.0012 | 0.0255 |
| DPs_NOK3m_4 | -0.151667 | 0.04188 | -3.62 | 0.0003 | 0.0314 |
| Constant | -0.00116765 | 0.004056 | -0.288 | 0.7736 | 0.0002 |
| DGRI_3 | -2.02667 | 0.5514 | -3.68 | 0.0003 | 0.0324 |
| DTEDspread_3 | -0.235932 | 0.04504 | -5.24 | 0.0000 | 0.0636 |
| DTEDspread_5 | 0.242326 | 0.05456 | 4.44 | 0.0000 | 0.0465 |
| DVIX_2 | -0.00586946 | 0.001410 | -4.16 | 0.0000 | 0.0411 |
| DPs_USD3m | 0.538328 | 0.08459 | 6.36 | 0.0000 | 0.0911 |
| DPs_USD3m_2 | 0.202373 | 0.07840 | 2.58 | 0.0102 | 0.0162 |
| DPs_USD3m_5 | -0.350122 | 0.1026 | -3.41 | 0.0007 | 0.0280 |
| DSc_Add_Liq_3 | -0.000969435 | 0.0003724 | -2.60 | 0.0096 | 0.0165 |
| EG_NOKres_3_1 | -0.131270 | 0.02822 | -4.65 | 0.0000 | 0.0508 |

| | | | |
|---|---|---|---|
| sigma | 0.0824761 | RSS | 2.74813273 |
| R^2 | 0.29782 | F(11,404) = | 15.58 [0.000]** |
| Adj.R^2 | 0.278702 | log-likelihood | 453.832 |
| no. of observations | 416 | no. of parameters | 12 |
| mean(DPs_NOK3m) | -0.00200703 | se(DPs_NOK3m) | 0.0971115 |

AR 1-2 test: F(2,402) = 0.18008 [0.8353]
ARCH 1-1 test: F(1,414) = 50.478 [0.0000]**
Normality test: Chi^2(2) = 154.12 [0.0000]**
Hetero test: F(22,393) = 6.2338 [0.0000]**
Hetero-X test: F(77,338) = 11.928 [0.0000]**
RESET23 test: F(2,402) = 2.8527 [0.0589]

Robust standard errors

| | Coefficients | SE | HACSE | HCSE | JHCSE |
|---|---|---|---|---|---|
| DPs_NOK3m_3 | -0.14313 | 0.044037 | 0.062576 | 0.062895 | 0.070913 |
| DPs_NOK3m_4 | -0.15167 | 0.041881 | 0.051883 | 0.063589 | 0.071748 |
| Constant | -0.0011677 | 0.0040563 | 0.0041241 | 0.0040350 | 0.0043897 |

| | | | | | |
|---|---|---|---|---|---|
| DGRI_3 | -2.0267 | 0.55138 | 0.68773 | 0.81683 | 0.94299 |
| DTEDspread_3 | -0.23593 | 0.045039 | 0.11806 | 0.096477 | 0.11801 |
| DTEDspread_5 | 0.24233 | 0.054565 | 0.069384 | 0.089511 | 0.11098 |
| DVIX_2 | -0.0058695 | 0.0014103 | 0.0020319 | 0.0022840 | 0.0026096 |
| DPs_USD3m | 0.53833 | 0.084591 | 0.13062 | 0.14039 | 0.16473 |
| DPs_USD3m_2 | 0.20237 | 0.078402 | 0.11968 | 0.15709 | 0.19286 |
| DPs_USD3m_5 | -0.35012 | 0.10265 | 0.11935 | 0.15300 | 0.18146 |
| DSc_Add_Liq_3 | -0.00096943 | 0.00037236 | 0.00037773 | 0.00048118 | 0.00051908 |
| EG_NOKres_3_1 | -0.13127 | 0.028220 | 0.039549 | 0.042507 | 0.047827 |

| | Coefficients | t-SE | t-HACSE | t-HCSE | t-JHCSE |
|---|---|---|---|---|---|
| DPs_NOK3m_3 | -0.14313 | -3.2502 | -2.2873 | -2.2757 | -2.0184 |
| DPs_NOK3m_4 | -0.15167 | -3.6214 | -2.9233 | -2.3851 | -2.1139 |
| Constant | -0.0011677 | -0.28786 | -0.28313 | -0.28938 | -0.26600 |
| DGRI_3 | -2.0267 | -3.6756 | -2.9469 | -2.4811 | -2.1492 |
| DTEDspread_3 | -0.23593 | -5.2384 | -1.9983 | -2.4455 | -1.9993 |
| DTEDspread_5 | 0.24233 | 4.4411 | 3.4925 | 2.7072 | 2.1836 |
| DVIX_2 | -0.0058695 | -4.1619 | -2.8886 | -2.5698 | -2.2492 |
| DPs_USD3m | 0.53833 | 6.3639 | 4.1212 | 3.8346 | 3.2679 |
| DPs_USD3m_2 | 0.20237 | 2.5812 | 1.6910 | 1.2882 | 1.0493 |
| DPs_USD3m_5 | -0.35012 | -3.4110 | -2.9336 | -2.2884 | -1.9295 |
| DSc_Add_Liq_3 | -0.00096943 | -2.6035 | -2.5665 | -2.0147 | -1.8676 |
| EG_NOKres_3_1 | -0.13127 | -4.6516 | -3.3192 | -3.0882 | -2.7447 |

AUTOMETRICS:

EQ(3.4) Modelling DPs_NOK3m by OLS
The estimation sample is: 2008-09-19 - 2010-04-23

| | Coefficient | Std.Error | t-value | t-prob | Part.R^2 |
|---|---|---|---|---|---|
| DPs_NOK3m_3 | -0.168353 | 0.04319 | -3.90 | 0.0001 | 0.0366 |
| DPs_NOK3m_4 | -0.144861 | 0.04123 | -3.51 | 0.0005 | 0.0299 |
| DGRI_3 | -1.88569 | 0.5401 | -3.49 | 0.0005 | 0.0296 |
| DGRI_4 | 1.12357 | 0.5499 | 2.04 | 0.0417 | 0.0103 |
| DGRI_5 | 1.58680 | 0.5694 | 2.79 | 0.0056 | 0.0190 |
| DTEDspread_1 | -0.116339 | 0.04565 | -2.55 | 0.0112 | 0.0160 |
| DTEDspread_2 | -0.228571 | 0.06451 | -3.54 | 0.0004 | 0.0304 |
| DTEDspread_3 | -0.285095 | 0.04654 | -6.13 | 0.0000 | 0.0858 |
| DTEDspread_5 | 0.247418 | 0.05516 | 4.49 | 0.0000 | 0.0479 |
| DVIX_2 | -0.00457530 | 0.001427 | -3.21 | 0.0015 | 0.0251 |
| DVIX_5 | -0.00314748 | 0.001554 | -2.03 | 0.0435 | 0.0102 |
| DPs_USD3m | 0.578966 | 0.08497 | 6.81 | 0.0000 | 0.1040 |
| DPs_USD3m_2 | 0.490725 | 0.1219 | 4.03 | 0.0001 | 0.0389 |
| DPs_USD3m_5 | -0.335498 | 0.1009 | -3.33 | 0.0010 | 0.0269 |
| DSc_Add_Liq_3 | -0.000861812 | 0.0003723 | -2.31 | 0.0211 | 0.0132 |
| EG_NOKres_3_1 | -0.116419 | 0.02788 | -4.18 | 0.0000 | 0.0418 |

sigma 0.0803088 RSS 2.57980314
log-likelihood 466.98
no. of observations 416 no. of parameters 16
mean(DPs_NOK3m) -0.00200703 se(DPs_NOK3m) 0.0971115

AR 1-2 test: F(2,398) = 0.92110 [0.3989]
ARCH 1-1 test: F(1,414) = 29.398 [0.0000]**
Normality test: Chi^2(2) = 162.10 [0.0000]**
Hetero test: F(32,383) = 6.5725 [0.0000]**
Hetero-X test: F(152,263)= 11.581 [0.0000]**
RESET23 test: F(2,398) = 2.9808 [0.0519]

Robust standard errors

| | Coefficients | SE | HACSE | HCSE | JHCSE |
|---|---|---|---|---|---|
| DPs_NOK3m_3 | -0.16835 | 0.043194 | 0.063143 | 0.061778 | 0.078037 |
| DPs_NOK3m_4 | -0.14486 | 0.041230 | 0.052504 | 0.063301 | 0.076326 |
| DGRI_3 | -1.8857 | 0.54012 | 0.61105 | 0.79881 | 1.0504 |
| DGRI_4 | 1.1236 | 0.54991 | 0.82529 | 0.89034 | 1.1418 |
| DGRI_5 | 1.5868 | 0.56937 | 0.98336 | 0.90757 | 1.1691 |
| DTEDspread_1 | -0.11634 | 0.045652 | 0.077827 | 0.094001 | 0.13982 |
| DTEDspread_2 | -0.22857 | 0.064510 | 0.13939 | 0.13664 | 0.20100 |
| DTEDspread_3 | -0.28509 | 0.046539 | 0.10154 | 0.096781 | 0.12438 |
| DTEDspread_5 | 0.24742 | 0.055162 | 0.082682 | 0.099863 | 0.13878 |
| DVIX_2 | -0.0045753 | 0.0014268 | 0.0018593 | 0.0023270 | 0.0030067 |
| DVIX_5 | -0.0031475 | 0.0015540 | 0.0021368 | 0.0024210 | 0.0029566 |
| DPs_USD3m | 0.57897 | 0.084972 | 0.11937 | 0.13809 | 0.17761 |
| DPs_USD3m_2 | 0.49072 | 0.12188 | 0.20379 | 0.22672 | 0.30507 |
| DPs_USD3m_5 | -0.33550 | 0.10086 | 0.11311 | 0.14610 | 0.18769 |
| DSc_Add_Liq_3 | -0.00086181 | 0.00037231 | 0.00042998 | 0.00047852 | 0.00055888 |
| EG_NOKres_3_1 | -0.11642 | 0.027877 | 0.037133 | 0.041834 | 0.050851 |

| | Coefficients | t-SE | t-HACSE | t-HCSE | t-JHCSE |
|---|---|---|---|---|---|
| DPs_NOK3m_3 | -0.16835 | -3.8976 | -2.6662 | -2.7251 | -2.1573 |
| DPs_NOK3m_4 | -0.14486 | -3.5134 | -2.7590 | -2.2884 | -1.8979 |
| DGRI_3 | -1.8857 | -3.4912 | -3.0860 | -2.3606 | -1.7953 |
| DGRI_4 | 1.1236 | 2.0432 | 1.3614 | 1.2620 | 0.98406 |
| DGRI_5 | 1.5868 | 2.7869 | 1.6137 | 1.7484 | 1.3573 |
| DTEDspread_1 | -0.11634 | -2.5484 | -1.4948 | -1.2376 | -0.83204 |
| DTEDspread_2 | -0.22857 | -3.5432 | -1.6398 | -1.6728 | -1.1371 |
| DTEDspread_3 | -0.28509 | -6.1259 | -2.8077 | -2.9458 | -2.2921 |
| DTEDspread_5 | 0.24742 | 4.4853 | 2.9924 | 2.4776 | 1.7828 |
| DVIX_2 | -0.0045753 | -3.2066 | -2.4608 | -1.9661 | -1.5217 |
| DVIX_5 | -0.0031475 | -2.0254 | -1.4730 | -1.3001 | -1.0646 |
| DPs_USD3m | 0.57897 | 6.8136 | 4.8500 | 4.1928 | 3.2597 |
| DPs_USD3m_2 | 0.49072 | 4.0262 | 2.4079 | 2.1645 | 1.6086 |
| DPs_USD3m_5 | -0.33550 | -3.3264 | -2.9661 | -2.2964 | -1.7875 |
| DSc_Add_Liq_3 | -0.00086181 | -2.3148 | -2.0043 | -1.8010 | -1.5420 |
| EG_NOKres_3_1 | -0.11642 | -4.1762 | -3.1352 | -2.7829 | -2.2894 |

SEK PREMIUM:

EQ(3.5) Modelling Ps_SEK3m by OLS

The estimation sample is: 2008-09-18 - 2010-04-23

| | Coefficient | Std.Error | t-value | t-prob | Part.R^2 |
|---|---|---|---|---|---|
| Constant | -0.201266 | 0.03329 | -6.05 | 0.0000 | 0.0815 |
| GRI | 2.20332 | 0.3292 | 6.69 | 0.0000 | 0.0980 |
| TED-Spread | 0.00542912 | 0.04060 | 0.134 | 0.8937 | 0.0000 |
| VIX | 0.00252679 | 0.001658 | 1.52 | 0.1283 | 0.0056 |
| Ps_USD3m | 0.176559 | 0.05656 | 3.12 | 0.0019 | 0.0231 |

| | | | |
|---|---|---|---|
| sigma | 0.121277 | RSS | 6.05974481 |
| R^2 | 0.833744 | F(4,412) = | 516.5 [0.000]** |
| Adj.R^2 | 0.83213 | log-likelihood | 290.553 |
| no. of observations | 417 | no. of parameters | 5 |
| mean(Ps_SEK3m) | 0.432185 | se(Ps_SEK3m) | 0.296 |

AR 1-2 test: F(2,410) = 988.18 [0.0000]**
ARCH 1-1 test: F(1,415) = 1326.5 [0.0000]**
Normality test: Chi^2(2) = 81.236 [0.0000]**
Hetero test: F(8,408) = 20.329 [0.0000]**
Hetero-X test: F(14,402) = 15.166 [0.0000]**
RESET23 test: F(2,410) = 39.129 [0.0000]**
EG_SEKres_3 [ 449 - 865] saved to Cointegration datasett.in7

---- Descriptive Statistics 1.0 session started at 18:58:05 on 4-08-2010 ----

Unit-root tests

The sample is: 2008-09-26 - 2010-04-23

EG_SEKres_3: ADF tests (T=411, Constant; 5%=-2.87 1%=-3.45)

| D-lag | t-adf | beta Y_1 | sigma | t-DY_lag | t-prob | AIC | F-prob |
|---|---|---|---|---|---|---|---|
| 5 | -4.986** | 0.88772 | 0.04908 | 2.985 | 0.0030 | -6.012 | |
| 4 | -4.426** | 0.90150 | 0.04956 | -1.245 | 0.2139 | -5.995 | 0.0030 |
| 3 | -4.840** | 0.89512 | 0.04959 | 0.8245 | 0.4101 | -5.996 | 0.0056 |
| 2 | -4.780** | 0.89919 | 0.04957 | 3.698 | 0.0002 | -5.999 | 0.0115 |
| 1 | -4.082** | 0.91421 | 0.05034 | -1.612 | 0.1076 | -5.971 | 0.0001 |
| 0 | -4.516** | 0.90705 | 0.05044 | | | -5.969 | 0.0001 |

fINAL MODEL:

EQ(3.6) Modelling DPs_SEK3m by OLS
The estimation sample is: 2008-09-19 - 2010-04-23

| | Coefficient | Std.Error | t-value | t-prob | Part.R^2 |
|---|---|---|---|---|---|
| DPs_SEK3m_2 | 0.210818 | 0.04530 | 4.65 | 0.0000 | 0.0505 |
| DPs_SEK3m_5 | 0.198200 | 0.04579 | 4.33 | 0.0000 | 0.0440 |
| Constant | 0.000355679 | 0.002185 | 0.163 | 0.8708 | 0.0001 |
| DGRI | 0.453977 | 0.2926 | 1.55 | 0.1215 | 0.0059 |
| DTEDspread_3 | 0.0401109 | 0.02348 | 1.71 | 0.0884 | 0.0071 |

| | | | | | |
|---|---|---|---|---|---|
| DTEDspread_4 | 0.0885366 | 0.03083 | 2.87 | 0.0043 | 0.0199 |
| DPs_USD3m | 0.112447 | 0.04233 | 2.66 | 0.0082 | 0.0170 |
| DPs_USD3m_4 | -0.147715 | 0.05769 | -2.56 | 0.0108 | 0.0159 |
| EG_SEKres_3_1 | -0.0985820 | 0.01908 | -5.17 | 0.0000 | 0.0616 |

sigma 0.0444218 RSS 0.803133311
R^2 0.173079 F(8,407) = 10.65 [0.000]**
Adj.R^2 0.156825 log-likelihood 709.705
no. of observations 416 no. of parameters 9
mean(DPs_SEK3m) -0.000420673 se(DPs_SEK3m) 0.0483769

AR 1-2 test: F(2,405) = 1.3764 [0.2537]
ARCH 1-1 test: F(1,414) = 0.11951 [0.7297]
Normality test: Chi^2(2) = 633.13 [0.0000]**
Hetero test: F(16,399) = 3.9705 [0.0000]**
Hetero-X test: F(44,371) = 10.999 [0.0000]**
RESET23 test: F(2,405) = 0.53233 [0.5876]

Robust standard errors

| | Coefficients | SE | HACSE | HCSE | JHCSE |
|---|---|---|---|---|---|
| DPs_SEK3m_2 | 0.21082 | 0.045299 | 0.085137 | 0.13259 | 0.16200 |
| DPs_SEK3m_5 | 0.19820 | 0.045788 | 0.064149 | 0.068877 | 0.079802 |
| Constant | 0.00035568 | 0.0021854 | 0.0022036 | 0.0023025 | 0.0024510 |
| DGRI | 0.45398 | 0.29259 | 0.25020 | 0.32698 | 0.37083 |
| DTEDspread_3 | 0.040111 | 0.023485 | 0.018353 | 0.022801 | 0.026905 |
| DTEDspread_4 | 0.088537 | 0.030832 | 0.027087 | 0.031609 | 0.036665 |
| DPs_USD3m | 0.11245 | 0.042328 | 0.071814 | 0.067150 | 0.076713 |
| DPs_USD3m_4 | -0.14772 | 0.057687 | 0.065290 | 0.078281 | 0.087008 |
| EG_SEKres_3_1 | -0.098582 | 0.019076 | 0.051798 | 0.052538 | 0.055995 |

| | Coefficients | t-SE | t-HACSE | t-HCSE | t-JHCSE |
|---|---|---|---|---|---|
| DPs_SEK3m_2 | 0.21082 | 4.6539 | 2.4762 | 1.5900 | 1.3014 |
| DPs_SEK3m_5 | 0.19820 | 4.3286 | 3.0897 | 2.8776 | 2.4837 |
| Constant | 0.00035568 | 0.16275 | 0.16141 | 0.15448 | 0.14512 |
| DGRI | 0.45398 | 1.5516 | 1.8144 | 1.3884 | 1.2242 |
| DTEDspread_3 | 0.040111 | 1.7079 | 2.1855 | 1.7591 | 1.4908 |
| DTEDspread_4 | 0.088537 | 2.8716 | 3.2686 | 2.8010 | 2.4147 |
| DPs_USD3m | 0.11245 | 2.6566 | 1.5658 | 1.6746 | 1.4658 |
| DPs_USD3m_4 | -0.14772 | -2.5606 | -2.2625 | -1.8870 | -1.6977 |
| EG_SEKres_3_1 | -0.098582 | -5.1679 | -1.9032 | -1.8764 | -1.7606 |

aUTOMETRICS:

EQ(3.7) Modelling DPs_SEK3m by OLS

The estimation sample is: 2008-09-19 - 2010-04-23

| | Coefficient | Std.Error | t-value | t-prob | Part.R^2 |
|---|---|---|---|---|---|
| DPs_SEK3m_2 | 0.231626 | 0.04552 | 5.09 | 0.0000 | 0.0599 |
| DPs_SEK3m_5 | 0.202736 | 0.04541 | 4.46 | 0.0000 | 0.0468 |
| DTEDspread_3 | 0.0583629 | 0.02454 | 2.38 | 0.0179 | 0.0137 |
| DTEDspread_4 | 0.103321 | 0.03062 | 3.37 | 0.0008 | 0.0273 |

| | | | | | |
|---|---|---|---|---|---|
| DVIX | 0.00149360 | 0.0007493 | 1.99 | 0.0469 | 0.0097 |
| DVIX_2 | 0.00151086 | 0.0007484 | 2.02 | 0.0442 | 0.0099 |
| DPs_USD3m | 0.113882 | 0.04339 | 2.62 | 0.0090 | 0.0167 |
| DPs_USD3m_2 | -0.101882 | 0.04332 | -2.35 | 0.0192 | 0.0134 |
| DPs_USD3m_4 | -0.162250 | 0.05758 | -2.82 | 0.0051 | 0.0192 |
| EG_SEKres_3_1 | -0.104323 | 0.01910 | -5.46 | 0.0000 | 0.0684 |

sigma 0.0439916 RSS 0.785716389
log-likelihood 714.265
no. of observations 416 no. of parameters 10
mean(DPs_SEK3m) -0.000420673 se(DPs_SEK3m) 0.0483769

AR 1-2 test: F(2,404) = 0.71642 [0.4891]
ARCH 1-1 test: F(1,414) = 0.088507 [0.7662]
Normality test: Chi^2(2) = 625.67 [0.0000]**
Hetero test: F(20,395) = 3.3535 [0.0000]**
Hetero-X test: F(65,350) = 13.199 [0.0000]**
RESET23 test: F(2,404) = 4.5852 [0.0107]*

Robust standard errors

| | Coefficients | SE | HACSE | HCSE | JHCSE |
|---|---|---|---|---|---|
| DPs_SEK3m_2 | 0.23163 | 0.045523 | 0.088872 | 0.13504 | 0.16810 |
| DPs_SEK3m_5 | 0.20274 | 0.045413 | 0.064165 | 0.070213 | 0.083480 |
| DTEDspread_3 | 0.058363 | 0.024542 | 0.022384 | 0.025061 | 0.030642 |
| DTEDspread_4 | 0.10332 | 0.030619 | 0.031013 | 0.035974 | 0.043536 |
| DVIX | 0.0014936 | 0.00074925 | 0.00091015 | 0.00091441 | 0.0010187 |
| DVIX_2 | 0.0015109 | 0.00074844 | 0.0010993 | 0.0010296 | 0.0011268 |
| DPs_USD3m | 0.11388 | 0.043392 | 0.068961 | 0.067201 | 0.079057 |
| DPs_USD3m_2 | -0.10188 | 0.043320 | 0.071189 | 0.068706 | 0.081553 |
| DPs_USD3m_4 | -0.16225 | 0.057583 | 0.074133 | 0.082718 | 0.095949 |
| EG_SEKres_3_1 | -0.10432 | 0.019101 | 0.053801 | 0.052353 | 0.056320 |

| | Coefficients | t-SE | t-HACSE | t-HCSE | t-JHCSE |
|---|---|---|---|---|---|
| DPs_SEK3m_2 | 0.23163 | 5.0881 | 2.6063 | 1.7152 | 1.3779 |
| DPs_SEK3m_5 | 0.20274 | 4.4643 | 3.1596 | 2.8874 | 2.4286 |
| DTEDspread_3 | 0.058363 | 2.3780 | 2.6073 | 2.3289 | 1.9047 |
| DTEDspread_4 | 0.10332 | 3.3744 | 3.3315 | 2.8721 | 2.3732 |
| DVIX | 0.0014936 | 1.9935 | 1.6410 | 1.6334 | 1.4662 |
| DVIX_2 | 0.0015109 | 2.0187 | 1.3744 | 1.4675 | 1.3408 |
| DPs_USD3m | 0.11388 | 2.6245 | 1.6514 | 1.6946 | 1.4405 |
| DPs_USD3m_2 | -0.10188 | -2.3518 | -1.4312 | -1.4829 | -1.2493 |
| DPs_USD3m_4 | -0.16225 | -2.8177 | -2.1886 | -1.9615 | -1.6910 |
| EG_SEKres_3_1 | -0.10432 | -5.4618 | -1.9391 | -1.9927 | -1.8523 |

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THE EUR PREMIUM:

CONTEGRATION REGRESSION:

EQ(3.8) Modelling Ps_EUR3m by OLS

The estimation sample is: 2008-09-18 - 2010-04-23

| | Coefficient | Std.Error | t-value | t-prob | Part.R^2 |
|---|---|---|---|---|---|
| Constant | -0.368833 | 0.02263 | -16.3 | 0.0000 | 0.3920 |
| GRI | 3.63816 | 0.2238 | 16.3 | 0.0000 | 0.3907 |
| TED-Spread | 0.0408558 | 0.02760 | 1.48 | 0.1396 | 0.0053 |
| VIX | 0.00291120 | 0.001127 | 2.58 | 0.0101 | 0.0159 |
| Ps_USD3m | 0.292057 | 0.03845 | 7.60 | 0.0000 | 0.1228 |

sigma 0.0824443 RSS 2.80039185
R^2 0.968563 F(4,412) = 3173 [0.000]**
Adj.R^2 0.968258 log-likelihood 451.496
no. of observations 417 no. of parameters 5
mean(Ps_EUR3m) 0.661335 se(Ps_EUR3m) 0.462747

AR 1-2 test: F(2,410) = 914.80 [0.0000]**
ARCH 1-1 test: F(1,415) = 823.80 [0.0000]**
Normality test: Chi^2(2) = 27.967 [0.0000]**
Hetero test: F(8,408) = 16.175 [0.0000]**
Hetero-X test: F(14,402) = 10.227 [0.0000]**
RESET23 test: F(2,410) = 63.881 [0.0000]**
EG_EURres_4 [ 449 - 865] saved to Cointegration datasett.in7

obust standard errors

| | Coefficients | SE | HACSE | HCSE | JHCSE |
|---|---|---|---|---|---|
| DPs_EUR3m_5 | 0.065319 | 0.038850 | 0.050293 | 0.046887 | 0.051100 |
| Constant | -0.00052320 | 0.0013797 | 0.0014521 | 0.0013861 | 0.0014541 |
| DGRI | 1.4944 | 0.20004 | 0.44910 | 0.35438 | 0.39604 |
| DTEDspread_1 | -0.055924 | 0.015890 | 0.026206 | 0.024508 | 0.029855 |
| DTEDspread_2 | -0.091465 | 0.020432 | 0.018769 | 0.026481 | 0.033278 |
| DVIX | 0.0016175 | 0.00052332 | 0.00065083 | 0.00068572 | 0.00075828 |
| DPs_USD3m | 0.24635 | 0.027854 | 0.057700 | 0.061025 | 0.072871 |
| DPs_USD3m_2 | 0.18482 | 0.036888 | 0.034965 | 0.049558 | 0.061605 |
| EG_EURres_4_1 | -0.067955 | 0.017401 | 0.020909 | 0.020975 | 0.021566 |

| | Coefficients | t-SE | t-HACSE | t-HCSE | t-JHCSE |
|---|---|---|---|---|---|
| DPs_EUR3m_5 | 0.065319 | 1.6813 | 1.2988 | 1.3931 | 1.2783 |
| Constant | -0.00052320 | -0.37921 | -0.36031 | -0.37746 | -0.35982 |
| DGRI | 1.4944 | 7.4703 | 3.3275 | 4.2168 | 3.7733 |
| DTEDspread_1 | -0.055924 | -3.5194 | -2.1340 | -2.2818 | -1.8732 |
| DTEDspread_2 | -0.091465 | -4.4765 | -4.8732 | -3.4540 | -2.7485 |
| DVIX | 0.0016175 | 3.0908 | 2.4853 | 2.3588 | 2.1331 |
| DPs_USD3m | 0.24635 | 8.8443 | 4.2695 | 4.0369 | 3.3806 |
| DPs_USD3m_2 | 0.18482 | 5.0102 | 5.2858 | 3.7293 | 3.0000 |
| EG_EURres_4_1 | -0.067955 | -3.9052 | -3.2500 | -3.2397 | -3.1510 |

Kritisk verdi med 5 variabler på 1%-nivå er: -4,96, 5%-nivå: -4,42

Unit-root tests

The sample is: 2008-09-26 - 2010-04-23

EG_EURres_4: ADF tests (T=411, Constant; 5%=-2.87 1%=-3.45)

| D-lag | t-adf | beta Y_1 | sigma | t-DY_lag | t-prob | AIC | F-prob |
|---|---|---|---|---|---|---|---|
| 5 | -4.446** | 0.89509 | 0.03464 | 1.040 | 0.2987 | -6.708 | |
| 4 | -4.326** | 0.89994 | 0.03465 | -0.5501 | 0.5826 | -6.711 | 0.2987 |
| 3 | -4.559** | 0.89717 | 0.03462 | 0.07677 | 0.9388 | -6.715 | 0.5008 |
| 2 | -4.665** | 0.89755 | 0.03457 | -1.156 | 0.2484 | -6.720 | 0.7078 |
| 1 | -5.094** | 0.89141 | 0.03459 | 2.780 | 0.0057 | -6.721 | 0.6058 |
| 0 | -4.567** | 0.90411 | 0.03487 | | | -6.707 | 0.0663 |

ECM:

Final model:

EQ(3.9) Modelling DPs_EUR3m by OLS

The estimation sample is: 2008-09-19 - 2010-04-23

| | Coefficient | Std.Error | t-value | t-prob | Part.R^2 |
|---|---|---|---|---|---|
| DPs_EUR3m_5 | 0.0653187 | 0.03885 | 1.68 | 0.0935 | 0.0069 |
| Constant | -0.000523203 | 0.001380 | -0.379 | 0.7047 | 0.0004 |
| DGRI | 1.49437 | 0.2000 | 7.47 | 0.0000 | 0.1206 |
| DTEDspread_1 | -0.0559236 | 0.01589 | -3.52 | 0.0005 | 0.0295 |
| DTEDspread_2 | -0.0914649 | 0.02043 | -4.48 | 0.0000 | 0.0469 |
| DVIX | 0.00161750 | 0.0005233 | 3.09 | 0.0021 | 0.0229 |
| DPs_USD3m | 0.246349 | 0.02785 | 8.84 | 0.0000 | 0.1612 |
| DPs_USD3m_2 | 0.184817 | 0.03689 | 5.01 | 0.0000 | 0.0581 |
| EG_EURres_4_1 | -0.0679549 | 0.01740 | -3.91 | 0.0001 | 0.0361 |

| | | | |
|---|---|---|---|
| sigma | 0.0280257 | RSS | 0.319673025 |
| R^2 | 0.41886 | F(8,407) = | 36.67 [0.000]** |
| Adj.R^2 | 0.407437 | log-likelihood | 901.319 |
| no. of observations | 416 | no. of parameters | 9 |
| mean(DPs_EUR3m) | -0.00127404 | se(DPs_EUR3m) | 0.0364073 |

AR 1-2 test: F(2,405) = 1.7810 [0.1698]
ARCH 1-1 test: F(1,414) = 17.348 [0.0000]**
Normality test: Chi^2(2) = 74.485 [0.0000]**
Hetero test: F(16,399) = 8.5401 [0.0000]**
Hetero-X test: F(44,371) = 7.9840 [0.0000]**
RESET23 test: F(2,405) = 15.979 [0.0000]**

Autometrics:

EQ(3.10) Modelling DPs_EUR3m by OLS
The estimation sample is: 2008-09-19 - 2010-04-23

| | Coefficient | Std.Error | t-value | t-prob | Part.R^2 |
|---|---|---|---|---|---|
| DPs_EUR3m_5 | 0.108802 | 0.04121 | 2.64 | 0.0086 | 0.0169 |
| DGRI | 1.52993 | 0.1984 | 7.71 | 0.0000 | 0.1280 |
| DGRI_2 | 0.387428 | 0.1860 | 2.08 | 0.0378 | 0.0106 |
| DTEDspread_1 | -0.0538646 | 0.01572 | -3.43 | 0.0007 | 0.0282 |
| DTEDspread_2 | -0.0980250 | 0.02040 | -4.80 | 0.0000 | 0.0539 |
| DVIX | 0.00186931 | 0.0005214 | 3.59 | 0.0004 | 0.0308 |
| DVIX_3 | -0.00158284 | 0.0004796 | -3.30 | 0.0011 | 0.0262 |

| | | | | | |
|---|---|---|---|---|---|
| DVIX_5 | -0.00114826 | 0.0004868 | -2.36 | 0.0188 | 0.0136 |
| DPs_USD3m | 0.225665 | 0.02826 | 7.98 | 0.0000 | 0.1360 |
| DPs_USD3m_2 | 0.205808 | 0.03738 | 5.51 | 0.0000 | 0.0696 |
| EG_EURres_4_1 | -0.0668505 | 0.01724 | -3.88 | 0.0001 | 0.0358 |

sigma 0.0275768 RSS 0.307993796
log-likelihood 909.061
no. of observations 416 no. of parameters 11
mean(DPs_EUR3m) -0.00127404 se(DPs_EUR3m) 0.0364073

AR 1-2 test: F(2,403) = 2.0658 [0.1281]
ARCH 1-1 test: F(1,414) = 10.023 [0.0017]**
Normality test: Chi^2(2) = 62.473 [0.0000]**
Hetero test: F(22,393) = 4.8115 [0.0000]**
Hetero-X test: F(77,338) = 4.2803 [0.0000]**
RESET23 test: F(2,403) = 15.915 [0.0000]**

Robust standard errors

| | Coefficients | SE | HACSE | HCSE | JHCSE |
|---|---|---|---|---|---|
| DPs_EUR3m_5 | 0.10880 | 0.041209 | 0.048186 | 0.044542 | 0.047954 |
| DGRI | 1.5299 | 0.19843 | 0.40156 | 0.31010 | 0.35977 |
| DGRI_2 | 0.38743 | 0.18597 | 0.25346 | 0.29795 | 0.35843 |
| DTEDspread_1 | -0.053865 | 0.015721 | 0.022268 | 0.021191 | 0.026370 |
| DTEDspread_2 | -0.098025 | 0.020402 | 0.018907 | 0.024885 | 0.031678 |
| DVIX | 0.0018693 | 0.00052138 | 0.00058800 | 0.00068899 | 0.00078410 |
| DVIX_3 | -0.0015828 | 0.00047955 | 0.00065684 | 0.00067694 | 0.00075916 |
| DVIX_5 | -0.0011483 | 0.00048679 | 0.00057457 | 0.00062279 | 0.00069148 |
| DPs_USD3m | 0.22566 | 0.028263 | 0.052240 | 0.055123 | 0.067768 |
| DPs_USD3m_2 | 0.20581 | 0.037382 | 0.033423 | 0.046062 | 0.057465 |
| EG_EURres_4_1 | -0.066850 | 0.017237 | 0.021807 | 0.021758 | 0.022560 |

| | Coefficients | t-SE | t-HACSE | t-HCSE | t-JHCSE |
|---|---|---|---|---|---|
| DPs_EUR3m_5 | 0.10880 | 2.6402 | 2.2579 | 2.4427 | 2.2689 |
| DGRI | 1.5299 | 7.7100 | 3.8100 | 4.9336 | 4.2526 |
| DGRI_2 | 0.38743 | 2.0833 | 1.5286 | 1.3003 | 1.0809 |
| DTEDspread_1 | -0.053865 | -3.4263 | -2.4190 | -2.5419 | -2.0426 |
| DTEDspread_2 | -0.098025 | -4.8046 | -5.1847 | -3.9392 | -3.0945 |
| DVIX | 0.0018693 | 3.5853 | 3.1791 | 2.7131 | 2.3840 |
| DVIX_3 | -0.0015828 | -3.3007 | -2.4098 | -2.3382 | -2.0850 |
| DVIX_5 | -0.0011483 | -2.3588 | -1.9985 | -1.8437 | -1.6606 |
| DPs_USD3m | 0.22566 | 7.9846 | 4.3198 | 4.0938 | 3.3300 |
| DPs_USD3m_2 | 0.20581 | 5.5055 | 6.1578 | 4.4681 | 3.5815 |
| EG_EURres_4_1 | -0.066850 | -3.8783 | -3.0655 | -3.0725 | -2.9632 |

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THE GBP PREMIUM:

COINTEGRATION REGRESSION:

:

EQ(3.11) Modelling Ps_GBR3m by OLS

The estimation sample is: 2008-09-18 - 2010-04-23

| | Coefficient | Std.Error | t-value | t-prob | Part.R^2 |
|---|---|---|---|---|---|
| Constant | -0.861175 | 0.04285 | -20.1 | 0.0000 | 0.4951 |
| GRI | 6.30595 | 0.4237 | 14.9 | 0.0000 | 0.3496 |
| TED-Spread | -0.0517571 | 0.05226 | -0.990 | 0.3226 | 0.0024 |
| VIX | 0.00509077 | 0.002134 | 2.39 | 0.0175 | 0.0136 |
| Ps_USD3m | 0.508606 | 0.07279 | 6.99 | 0.0000 | 0.1059 |

| | | | |
|---|---|---|---|
| sigma | 0.156088 | RSS | 10.0376911 |
| R^2 | 0.951891 | F(4,412) = | 2038 [0.000]** |
| Adj.R^2 | 0.951424 | log-likelihood | 185.328 |
| no. of observations | 417 | no. of parameters | 5 |
| mean(Ps_GBR3m) | 0.827245 | se(Ps_GBR3m) | 0.708202 |

AR 1-2 test: F(2,410) = 597.39 [0.0000]**
ARCH 1-1 test: F(1,415) = 95.668 [0.0000]**
Normality test: Chi^2(2) = 37.442 [0.0000]**
Hetero test: F(8,408) = 16.774 [0.0000]**
Hetero-X test: F(14,402) = 15.580 [0.0000]**
RESET23 test: F(2,410) = 107.58 [0.0000]**

EG_GBPres_per3 [ 449 - 865] saved to Cointegration datasett.in7

Unit-root tests

The sample is: 2008-09-26 - 2010-04-23

EG_GBPres_per3: ADF tests (T=411, Constant; 5%=-2.87 1%=-3.45)

| D-lag | t-adf | beta Y_1 | sigma | t-DY_lag | t-prob | AIC | F-prob |
|---|---|---|---|---|---|---|---|
| 5 | -5.541** | 0.84207 | 0.07687 | 2.650 | 0.0084 | -5.114 | |
| 4 | -5.046** | 0.85869 | 0.07744 | 1.080 | 0.2807 | -5.102 | 0.0084 |
| 3 | -4.928** | 0.86474 | 0.07745 | -2.685 | 0.0076 | -5.104 | 0.0172 |
| 2 | -5.700** | 0.84700 | 0.07804 | 2.117 | 0.0348 | -5.091 | 0.0016 |
| 1 | -5.340** | 0.85967 | 0.07837 | -1.907 | 0.0572 | -5.085 | 0.0006 |
| 0 | -5.984** | 0.84720 | 0.07863 | | | -5.081 | 0.0003 |

FINAL ECM:

EQ( 3.12) Modelling DPs_GBR3m by OLS

The estimation sample is: 2008-09-19 - 2010-04-23

| | Coefficient | Std.Error | t-value | t-prob | Part.R^2 |
|---|---|---|---|---|---|
| DPs_GBR3m_5 | 0.0460960 | 0.04773 | 0.966 | 0.3348 | 0.0023 |
| Constant | -0.00213875 | 0.003214 | -0.665 | 0.5062 | 0.0011 |
| DGRI | 0.596777 | 0.4881 | 1.22 | 0.2222 | 0.0037 |
| DGRI_4 | 0.710205 | 0.5008 | 1.42 | 0.1570 | 0.0050 |

| | | | | | |
|---|---|---|---|---|---|
| DGRI_5 | -0.991396 | 0.4455 | -2.23 | 0.0266 | 0.0122 |
| DTEDspread | -0.104792 | 0.04932 | -2.12 | 0.0342 | 0.0111 |
| DTEDspread_2 | -0.110353 | 0.05016 | -2.20 | 0.0284 | 0.0119 |
| DTEDspread_3 | -0.102368 | 0.04971 | -2.06 | 0.0401 | 0.0105 |
| DVIX | 0.00657907 | 0.001292 | 5.09 | 0.0000 | 0.0608 |
| DVIX_4 | -0.00237771 | 0.001307 | -1.82 | 0.0695 | 0.0082 |
| DPs_USD3m | 0.274811 | 0.08840 | 3.11 | 0.0020 | 0.0235 |
| DPs_USD3m_2 | 0.251070 | 0.09322 | 2.69 | 0.0074 | 0.0178 |
| DPs_USD3m_3 | 0.0908040 | 0.09612 | 0.945 | 0.3454 | 0.0022 |
| DPs_USD3m_4 | -0.0370644 | 0.06576 | -0.564 | 0.5733 | 0.0008 |
| EG_GBPres_per3_1 | -0.122433 | 0.02179 | -5.62 | 0.0000 | 0.0730 |

sigma 0.065216 RSS 1.70550325
R^2 0.200963 F(14,401) = 7.204 [0.000]**
Adj.R^2 0.173067 log-likelihood 553.061
no. of observations 416 no. of parameters 15
mean(DPs_GBR3m) -0.0023768 se(DPs_GBR3m) 0.0717165

AR 1-2 test: F(2,399) = 8.7619 [0.0002]**
ARCH 1-1 test: F(1,414) = 84.754 [0.0000]**
Normality test: Chi^2(2) = 2512.7 [0.0000]**
Hetero test: F(28,387) = 13.834 [0.0000]**
Hetero-X test: F(119,296)= 122.21 [0.0000]**
RESET23 test: F(2,399) = 130.13 [0.0000]**

| | Coefficients | t-SE | t-HACSE | t-HCSE |
|---|---|---|---|---|
| DPs_GBR3m_5 | 0.046096 | 0.96572 | 1.1740 | 1.3698 |
| Constant | -0.0021388 | -0.66542 | -0.78661 | -0.73488 |
| DGRI | 0.59678 | 1.2226 | 1.0844 | 1.0738 |
| DGRI_4 | 0.71021 | 1.4180 | 0.84895 | 0.75542 |
| DGRI_5 | -0.99140 | -2.2254 | -1.2639 | -0.89097 |
| DTEDspread | -0.10479 | -2.1245 | -2.0430* | -2.1210 |
| DTEDspread_2 | -0.11035 | -2.2001 | -1.3186 | -1.5801 |
| DTEDspread_3 | -0.10237 | -2.0593 | -2.4364** | -1.8124 |
| DVIX | 0.0065791 | 5.0929 | 1.6151 | 2.1030 |
| DVIX_4 | -0.0023777 | -1.8198 | -1.3291 | -1.2190 |
| DPs_USD3m | 0.27481 | 3.1086 | 3.5287** | 3.2785 |
| DPs_USD3m_2 | 0.25107 | 2.6934 | 1.3592 | 1.3670 |
| DPs_USD3m_3 | 0.090804 | 0.94468 | 1.2801 | 1.0333 |
| DPs_USD3m_4 | -0.037064 | -0.56363 | -0.50859 | -0.35469 |
| EG_GBPres_per3_1 | -0.12243 | -5.6183 | -1.7512 | -1.3994 |

Autometrics:

EQ(3.13) Modelling DPs_GBR3m by OLS

The estimation sample is: 2008-09-19 - 2010-04-23

| | Coefficient | Std.Error | t-value | t-prob | Part.R^2 |
|---|---|---|---|---|---|
| DPs_GBR3m_1 | -0.166970 | 0.04573 | -3.65 | 0.0003 | 0.0321 |
| DPs_GBR3m_3 | -0.138359 | 0.04346 | -3.18 | 0.0016 | 0.0246 |
| DGRI | 1.11552 | 0.4535 | 2.46 | 0.0143 | 0.0148 |
| DGRI_2 | -1.96319 | 0.4202 | -4.67 | 0.0000 | 0.0515 |

| | | | | | |
|---|---|---|---|---|---|
| DGRI_3 | 1.19167 | 0.4361 | 2.73 | 0.0066 | 0.0182 |
| DGRI_4 | 1.43561 | 0.4707 | 3.05 | 0.0024 | 0.0226 |
| DGRI_5 | -1.27827 | 0.4155 | -3.08 | 0.0022 | 0.0230 |
| DTEDspread | -0.138835 | 0.04674 | -2.97 | 0.0032 | 0.0215 |
| DVIX | 0.00382350 | 0.001225 | 3.12 | 0.0019 | 0.0237 |
| DVIX_4 | -0.00510494 | 0.001232 | -4.14 | 0.0000 | 0.0409 |
| DPs_USD3m | 0.521075 | 0.09384 | 5.55 | 0.0000 | 0.0712 |
| DPs_USD3m_1 | -0.265551 | 0.07774 | -3.42 | 0.0007 | 0.0282 |
| DPs_USD3m_2 | 0.225718 | 0.06317 | 3.57 | 0.0004 | 0.0308 |
| EG_GBPres_per3_1 | -0.115118 | 0.02266 | -5.08 | 0.0000 | 0.0603 |

sigma 0.0610725 RSS 1.49939966
log-likelihood 579.851
no. of observations 416 no. of parameters 14
mean(DPs_GBR3m) -0.0023768 se(DPs_GBR3m) 0.0717165

AR 1-2 test: F(2,400) = 0.70789 [0.4933]
ARCH 1-1 test: F(1,414) = 122.76 [0.0000]**
Normality test: Chi^2(2) = 2099.5 [0.0000]**
Hetero test: F(28,387) = 34.466 [0.0000]**
Hetero-X test: F(119,296)= 346.74 [0.0000]**
RESET23 test: F(2,400) = 199.12 [0.0000]**

Robust standard errors

| | Coefficients | SE | HACSE | HCSE |
|---|---|---|---|---|
| DPs_GBR3m_1 | -0.16697 | 0.045734 | 0.12985 | 0.22000 |
| DPs_GBR3m_3 | -0.13836 | 0.043456 | 0.052947 | 0.051112 |
| DGRI | 1.1155 | 0.45355 | 0.45183 | 0.58156 |
| DGRI_2 | -1.9632 | 0.42022 | 1.5609 | 1.1814 |
| DGRI_3 | 1.1917 | 0.43612 | 1.0747 | 0.95725 |
| DGRI_4 | 1.4356 | 0.47070 | 1.3256 | 1.0314 |
| DGRI_5 | -1.2783 | 0.41550 | 0.92263 | 0.82720 |
| DTEDspread | -0.13884 | 0.046737 | 0.074925 | 0.070693 |
| DVIX | 0.0038235 | 0.0012252 | 0.0017974 | 0.0017460 |
| DVIX_4 | -0.0051049 | 0.0012323 | 0.0029631 | 0.0025679 |
| DPs_USD3m | 0.52108 | 0.093839 | 0.24684 | 0.19018 |
| DPs_USD3m_1 | -0.26555 | 0.077738 | 0.23209 | 0.17688 |
| DPs_USD3m_2 | 0.22572 | 0.063165 | 0.16015 | 0.15025 |
| EG_GBPres_per3_1 | -0.11512 | 0.022663 | 0.051473 | 0.048012 |

| | Coefficients | t-SE | t-HACSE | t-HCSE |
|---|---|---|---|---|
| DPs_GBR3m_1 | -0.16697 | -3.6509 | -1.2859 | -0.75897 |
| DPs_GBR3m_3 | -0.13836 | -3.1839 | -2.6131** | -2.7069 |
| DGRI | 1.1155 | 2.4595 | 2.4689** | 1.9182 |
| DGRI_2 | -1.9632 | -4.6718 | -1.2577 | -1.6617 |
| DGRI_3 | 1.1917 | 2.7324 | 1.1089 | 1.2449 |
| DGRI_4 | 1.4356 | 3.0499 | 1.0830 | 1.3919 |
| DGRI_5 | -1.2783 | -3.0765 | -1.3855 | -1.5453 |
| DTEDspread | -0.13884 | -2.9706 | -1.8530* | -1.9639 |
| DVIX | 0.0038235 | 3.1208 | 2.1272* | 2.1898 |
| DVIX_4 | -0.0051049 | -4.1426 | -1.7229 | -1.9879 |
| DPs_USD3m | 0.52108 | 5.5528 | 2.1110* | 2.7399 |
| DPs_USD3m_1 | -0.26555 | -3.4160 | -1.1442 | -1.5013 |

| | | | | |
|---|---|---|---|---|
| DPs_USD3m_2 | 0.22572 | 3.5734 | 1.4094 | 1.5023 |
| EG_GBPres_per3_1 | -0.11512 | -5.0796 | -2.2365* | -2.3977 |

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THE CAD PREMIUM

COINTEGRAION REGRESSION

EQ(3.14) Modelling PsCAD_3m by OLS

The estimation sample is: 2008-09-18 - 2010-04-23

| | Coefficient | Std.Error | t-value | t-prob | Part.R^2 |
|---|---|---|---|---|---|
| Constant | -0.142078 | 0.03144 | -4.52 | 0.0000 | 0.0472 |
| GRI | 2.33941 | 0.3109 | 7.52 | 0.0000 | 0.1208 |
| TED-Spread | 0.212534 | 0.03835 | 5.54 | 0.0000 | 0.0694 |
| VIX | -0.00209663 | 0.001566 | -1.34 | 0.1813 | 0.0043 |
| Ps_USD3m | 0.172267 | 0.05341 | 3.23 | 0.0014 | 0.0246 |

| | | | |
|---|---|---|---|
| sigma | 0.114532 | RSS | 5.40442325 |
| R^2 | 0.921028 | F(4,412) = | 1201 [0.000]** |
| Adj.R^2 | 0.920261 | log-likelihood | 314.416 |
| no. of observations | 417 | no. of parameters | 5 |
| mean(PsCAD_3m) | 0.529115 | se(PsCAD_3m) | 0.405593 |

AR 1-2 test: F(2,410) = 986.54 [0.0000]**
ARCH 1-1 test: F(1,415) = 2428.3 [0.0000]**
Normality test: Chi^2(2) = 186.30 [0.0000]**
Hetero test: F(8,408) = 31.760 [0.0000]**
Hetero-X test: F(14,402) = 32.190 [0.0000]**
RESET23 test: F(2,410) = 82.315 [0.0000]**
EG_CADres_per3 [ 449 - 865] saved to Cointegration datasett.in7

Unit-root tests

The sample is: 2008-09-26 - 2010-04-23

EG_CADres_per3: ADF tests (T=411, Constant; 5%=-2.87 1%=-3.45)

| D-lag | t-adf | beta Y_1 | sigma | t-DY_lag | t-prob | AIC | F-prob |
|---|---|---|---|---|---|---|---|
| 5 | -4.729** | 0.89439 | 0.04581 | -0.5916 | 0.5544 | -6.150 | |
| 4 | -5.035** | 0.89113 | 0.04577 | 4.494 | 0.0000 | -6.154 | 0.5544 |
| 3 | -4.112** | 0.91091 | 0.04684 | 1.140 | 0.2551 | -6.110 | 0.0000 |
| 2 | -3.962** | 0.91587 | 0.04686 | -2.315 | 0.0211 | -6.111 | 0.0001 |
| 1 | -4.580** | 0.90477 | 0.04711 | 1.638 | 0.1022 | -6.103 | 0.0000 |
| 0 | -4.321** | 0.91205 | 0.04721 | | | -6.102 | 0.0000 |

FINAL MODEL:

EQ( 3.15) Modelling DPsCAD_3m by OLS

The estimation sample is: 2008-09-19 - 2010-04-23

| | Coefficient | Std.Error | t-value | t-prob | Part.R^2 |
|---|---|---|---|---|---|
| DPsCAD_3m_1 | -0.110494 | 0.04450 | -2.48 | 0.0134 | 0.0151 |
| DPsCAD_3m_4 | 0.125709 | 0.04032 | 3.12 | 0.0020 | 0.0237 |
| DPsCAD_3m_5 | 0.161759 | 0.04040 | 4.00 | 0.0001 | 0.0384 |
| DGRI_1 | -1.28639 | 0.2774 | -4.64 | 0.0000 | 0.0509 |
| DGRI_2 | 1.47511 | 0.2621 | 5.63 | 0.0000 | 0.0732 |
| DTEDspread | 0.157945 | 0.02054 | 7.69 | 0.0000 | 0.1285 |
| DTEDspread_1 | 0.157531 | 0.03054 | 5.16 | 0.0000 | 0.0622 |
| DTEDspread_2 | 0.150601 | 0.02212 | 6.81 | 0.0000 | 0.1036 |
| DTEDspread_3 | 0.139887 | 0.02792 | 5.01 | 0.0000 | 0.0589 |
| DVIX_1 | 0.00215927 | 0.0007194 | 3.00 | 0.0029 | 0.0220 |
| DVIX_3 | -0.00186902 | 0.0006608 | -2.83 | 0.0049 | 0.0196 |
| DVIX_4 | -0.00204890 | 0.0006191 | -3.31 | 0.0010 | 0.0266 |
| DPs_USD3m_1 | -0.208739 | 0.05912 | -3.53 | 0.0005 | 0.0302 |
| DPs_USD3m_3 | -0.172073 | 0.05016 | -3.43 | 0.0007 | 0.0285 |
| EG_CADres_per3_1 | -0.0638830 | 0.01718 | -3.72 | 0.0002 | 0.0333 |

sigma 0.0369529 RSS 0.547573408
log-likelihood 789.374
no. of observations 416 no. of parameters 15
mean(DPsCAD_3m) -0.00214344 se(DPsCAD_3m) 0.0474865

AR 1-2 test: F(2,399) = 1.5326 [0.2173]
ARCH 1-1 test: F(1,414) = 164.14 [0.0000]**
Normality test: Chi^2(2) = 247.28 [0.0000]**
Hetero test: F(30,385) = 11.783 [0.0000]**
Hetero-X test: F(135,280)= 32.022 [0.0000]**
RESET23 test: F(2,399) = 4.7345 [0.0093]**

Robust standard errors

| | Coefficients | SE | HACSE | HCSE |
|---|---|---|---|---|
| DPsCAD_3m_1 | -0.11049 | 0.044500 | 0.098036 | 0.11899 |
| DPsCAD_3m_4 | 0.12571 | 0.040319 | 0.077486 | 0.072382 |
| DPsCAD_3m_5 | 0.16176 | 0.040402 | 0.064976 | 0.074091 |
| DGRI_1 | -1.2864 | 0.27744 | 0.57855 | 0.56234 |
| DGRI_2 | 1.4751 | 0.26206 | 0.47740 | 0.49588 |
| DTEDspread | 0.15795 | 0.020538 | 0.040393 | 0.044686 |
| DTEDspread_1 | 0.15753 | 0.030539 | 0.045073 | 0.066830 |
| DTEDspread_2 | 0.15060 | 0.022118 | 0.039181 | 0.047011 |
| DTEDspread_3 | 0.13989 | 0.027916 | 0.042144 | 0.051116 |
| DVIX_1 | 0.0021593 | 0.00071945 | 0.0013215 | 0.0011829 |
| DVIX_3 | -0.0018690 | 0.00066081 | 0.0010291 | 0.00097194 |
| DVIX_4 | -0.0020489 | 0.00061907 | 0.0010092 | 0.0010433 |
| DPs_USD3m_1 | -0.20874 | 0.059120 | 0.12568 | 0.13496 |
| DPs_USD3m_3 | -0.17207 | 0.050163 | 0.094860 | 0.087030 |
| EG_CADres_per3_1 | -0.063883 | 0.017177 | 0.028954 | 0.025179 |

| | Coefficients | t-SE | t-HACSE | t-HCSE |
|---|---|---|---|---|
| DPsCAD_3m_1 | -0.11049 | -2.4830 | -1.1271 | -0.92859 |
| DPsCAD_3m_4 | 0.12571 | 3.1179 | 1.6223 | 1.7367 |
| DPsCAD_3m_5 | 0.16176 | 4.0037 | 2.4895* | 2.1832 |

| | | | | |
|---|---|---|---|---|
| DGRI_1 | -1.2864 | -4.6367 | -2.2235* | -2.2876 |
| DGRI_2 | 1.4751 | 5.6289 | 3.0899* | 2.9747 |
| DTEDspread | 0.15795 | 7.6905 | 3.9102* | 3.5346 |
| DTEDspread_1 | 0.15753 | 5.1584 | 3.4951* | 2.3572 |
| DTEDspread_2 | 0.15060 | 6.8091 | 3.8438* | 3.2036 |
| DTEDspread_3 | 0.13989 | 5.0109 | 3.3192* | 2.7366 |
| DVIX_1 | 0.0021593 | 3.0013 | 1.6339 | 1.8254 |
| DVIX_3 | -0.0018690 | -2.8284 | -1.8162* | -1.9230 |
| DVIX_4 | -0.0020489 | -3.3096 | -2.0302* | -1.9639 |
| DPs_USD3m_1 | -0.20874 | -3.5307 | -1.6609 | -1.5467 |
| DPs_USD3m_3 | -0.17207 | -3.4303 | -1.8140 | -1.9772 |
| EG_CADres_per3_1 | -0.063883 | -3.7191 | -2.2064 | -2.5372 |

AUTOMETRICS:

EQ(3.16) Modelling DPsCAD_3m by OLS

The estimation sample is: 2008-09-19 - 2010-04-23

| | Coefficient | Std.Error | t-value | t-prob | Part.R^2 |
|---|---|---|---|---|---|
| DPsCAD_3m_1 | -0.110494 | 0.04450 | -2.48 | 0.0134 | 0.0151 |
| DPsCAD_3m_4 | 0.125709 | 0.04032 | 3.12 | 0.0020 | 0.0237 |
| DPsCAD_3m_5 | 0.161759 | 0.04040 | 4.00 | 0.0001 | 0.0384 |
| DGRI_1 | -1.28639 | 0.2774 | -4.64 | 0.0000 | 0.0509 |
| DGRI_2 | 1.47511 | 0.2621 | 5.63 | 0.0000 | 0.0732 |
| DTEDspread | 0.157945 | 0.02054 | 7.69 | 0.0000 | 0.1285 |
| DTEDspread_1 | 0.157531 | 0.03054 | 5.16 | 0.0000 | 0.0622 |
| DTEDspread_2 | 0.150601 | 0.02212 | 6.81 | 0.0000 | 0.1036 |
| DTEDspread_3 | 0.139887 | 0.02792 | 5.01 | 0.0000 | 0.0589 |
| DVIX_1 | 0.00215927 | 0.0007194 | 3.00 | 0.0029 | 0.0220 |
| DVIX_3 | -0.00186902 | 0.0006608 | -2.83 | 0.0049 | 0.0196 |
| DVIX_4 | -0.00204890 | 0.0006191 | -3.31 | 0.0010 | 0.0266 |
| DPs_USD3m_1 | -0.208739 | 0.05912 | -3.53 | 0.0005 | 0.0302 |
| DPs_USD3m_3 | -0.172073 | 0.05016 | -3.43 | 0.0007 | 0.0285 |
| EG_CADres_per3_1 | -0.0638830 | 0.01718 | -3.72 | 0.0002 | 0.0333 |

sigma 0.0369529 RSS 0.547573408
log-likelihood 789.374
no. of observations 416 no. of parameters 15
mean(DPsCAD_3m) -0.00214344 se(DPsCAD_3m) 0.0474865

AR 1-2 test: F(2,399) = 1.5326 [0.2173]
ARCH 1-1 test: F(1,414) = 164.14 [0.0000]**
Normality test: Chi^2(2) = 247.28 [0.0000]**
Hetero test: F(30,385) = 11.783 [0.0000]**
Hetero-X test: F(135,280)= 32.022 [0.0000]**
RESET23 test: F(2,399) = 4.7345 [0.0093]**

| | Coefficients | t-SE | t-HACSE | t-HCSE |
|---|---|---|---|---|
| DPsCAD_3m_1 | -0.11049 | -2.4830 | -1.1271 | -0.92859 |

| | | | | |
|---|---|---|---|---|
| DPsCAD_3m_4 | 0.12571 | 3.1179 | 1.6223 | 1.7367 |
| DPsCAD_3m_5 | 0.16176 | 4.0037 | 2.4895 | 2.1832 |
| DGRI_1 | -1.2864 | -4.6367 | -2.2235 | -2.2876 |
| DGRI_2 | 1.4751 | 5.6289 | 3.0899 | 2.9747 |
| DTEDspread | 0.15795 | 7.6905 | 3.9102 | 3.5346 |
| DTEDspread_1 | 0.15753 | 5.1584 | 3.4951 | 2.3572 |
| DTEDspread_2 | 0.15060 | 6.8091 | 3.8438 | 3.2036 |
| DTEDspread_3 | 0.13989 | 5.0109 | 3.3192 | 2.7366 |
| DVIX_1 | 0.0021593 | 3.0013 | 1.6339 | 1.8254 |
| DVIX_3 | -0.0018690 | -2.8284 | -1.8162 | -1.9230 |
| DVIX_4 | -0.0020489 | -3.3096 | -2.0302 | -1.9639 |
| DPs_USD3m_1 | -0.20874 | -3.5307 | -1.6609 | -1.5467 |
| DPs_USD3m_3 | -0.17207 | -3.4303 | -1.8140 | -1.9772 |
| EG_CADres_per3_1 | -0.063883 | -3.7191 | -2.2064 | -2.5372 |

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AUD RISK PREMIUM

COINTEGRAION REGRESSION

EQ(3.17) Modelling Ps_AUD3m by OLS

The estimation sample is: 2008-09-18 - 2010-04-23

| | Coefficient | Std.Error | t-value | t-prob | Part.R^2 |
|---|---|---|---|---|---|
| Constant | -0.210815 | 0.03955 | -5.33 | 0.0000 | 0.0645 |
| GRI | 2.99834 | 0.3911 | 7.67 | 0.0000 | 0.1248 |
| TED-Spread | -0.241391 | 0.04824 | -5.00 | 0.0000 | 0.0573 |
| VIX | -0.00265147 | 0.001970 | -1.35 | 0.1790 | 0.0044 |
| Ps_USD3m | 0.806261 | 0.06719 | 12.0 | 0.0000 | 0.2590 |

| | | | |
|---|---|---|---|
| sigma | 0.144074 | RSS | 8.55198153 |
| R^2 | 0.922736 | F(4,412) = | 1230 [0.000]** |
| Adj.R^2 | 0.921986 | log-likelihood | 218.726 |
| no. of observations | 417 | no. of parameters | 5 |
| mean(Ps_AUD3m) | 0.632443 | se(Ps_AUD3m) | 0.51582 |

AR 1-2 test: F(2,410) = 1061.8 [0.0000]**
ARCH 1-1 test: F(1,415) = 879.64 [0.0000]**
Normality test: Chi^2(2) = 21.712 [0.0000]**
Hetero test: F(8,408) = 48.857 [0.0000]**
Hetero-X test: F(14,402) = 42.575 [0.0000]**
RESET23 test: F(2,410) = 177.96 [0.0000]**
EG_AUDres_3 [ 449 - 865] saved to Cointegration datasett.in7

EG_AUDres_3: ADF tests (T=411, Constant; 5%=-2.87 1%=-3.45)

| D-lag | t-adf | beta Y_1 | sigma | t-DY_lag | t-prob | AIC | F-prob |
|---|---|---|---|---|---|---|---|
| 5 | -4.030** | 0.91155 | 0.05676 | -0.8282 | 0.4081 | -5.721 | |
| 4 | -4.294** | 0.90781 | 0.05674 | 0.9114 | 0.3627 | -5.724 | 0.4081 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 3 | -4.198** | 0.91147 | 0.05673 | -1.346 | 0.1792 | -5.727 | 0.4693 |
| 2 | -4.554** | 0.90580 | 0.05679 | 2.399 | 0.0169 | -5.727 | 0.3456 |
| 1 | -4.163** | 0.91485 | 0.05712 | -0.5713 | 0.5681 | -5.718 | 0.0610 |
| 0 | -4.364** | 0.91255 | 0.05707 | | | -5.722 | 0.0962 |

FINAL MODELS

EQ(3.18) Modelling DPs_AUD3m by OLS

The estimation sample is: 2008-09-19 - 2010-04-23

| | Coefficient | Std.Error | t-value | t-prob | Part.R^2 |
|---|---|---|---|---|---|
| DPs_AUD3m_3 | -0.158005 | 0.04495 | -3.52 | 0.0005 | 0.0295 |
| Constant | -0.000149846 | 0.002431 | -0.0616 | 0.9509 | 0.0000 |
| DTEDspread_4 | 0.124937 | 0.02447 | 5.10 | 0.0000 | 0.0602 |
| DTEDspread_5 | 0.211877 | 0.03393 | 6.24 | 0.0000 | 0.0874 |
| DVIX_1 | 0.00222220 | 0.0008441 | 2.63 | 0.0088 | 0.0167 |
| DVIX_5 | -0.00141514 | 0.0008303 | -1.70 | 0.0891 | 0.0071 |
| DPs_USD3m | 0.355688 | 0.04753 | 7.48 | 0.0000 | 0.1210 |
| DPs_USD3m_5 | -0.190546 | 0.06383 | -2.99 | 0.0030 | 0.0214 |
| EG_AUDres_3_1 | -0.0697077 | 0.01745 | -3.99 | 0.0001 | 0.0377 |

sigma 0.0494498 RSS 0.995228846
R^2 0.294126 F(8,407) = 21.2 [0.000]**
Adj.R^2 0.280251 log-likelihood 665.099
no. of observations 416 no. of parameters 9
mean(DPs_AUD3m) -0.00183293 se(DPs_AUD3m) 0.0582873

AR 1-2 test: F(2,405) = 0.15120 [0.8597]
ARCH 1-1 test: F(1,414) = 74.893 [0.0000]**
Normality test: Chi^2(2) = 100.70 [0.0000]**
Hetero test: F(16,399) = 11.692 [0.0000]**
Hetero-X test: F(44,371) = 13.066 [0.0000]**
RESET23 test: F(2,405) = 27.092 [0.0000]**

Robust standard errors

| | Coefficients | SE | HACSE | HCSE | JHCSE |
|---|---|---|---|---|---|
| DPs_AUD3m_3 | -0.15800 | 0.044949 | 0.072924 | 0.085611 | 0.10103 |
| Constant | -0.00014985 | 0.0024308 | 0.0025942 | 0.0025432 | 0.0027540 |
| DTEDspread_4 | 0.12494 | 0.024474 | 0.051347 | 0.053792 | 0.067907 |
| DTEDspread_5 | 0.21188 | 0.033933 | 0.025702 | 0.058948 | 0.073295 |
| DVIX_1 | 0.0022222 | 0.00084414 | 0.0010956 | 0.0012087 | 0.0013631 |
| DVIX_5 | -0.0014151 | 0.00083026 | 0.0010924 | 0.0011866 | 0.0013297 |
| DPs_USD3m | 0.35569 | 0.047526 | 0.11846 | 0.10583 | 0.12394 |
| DPs_USD3m_5 | -0.19055 | 0.063833 | 0.066746 | 0.092081 | 0.10714 |
| EG_AUDres_3_1 | -0.069708 | 0.017450 | 0.024799 | 0.026589 | 0.029024 |

| | Coefficients | t-SE | t-HACSE | t-HCSE | t-JHCSE |
|---|---|---|---|---|---|
| DPs_AUD3m_3 | -0.15800 | -3.5152 | -2.1667 | -1.8456 | -1.5639 |
| Constant | -0.00014985 | -0.061645 | -0.057762 | -0.058921 | -0.054410 |
| DTEDspread_4 | 0.12494 | 5.1049 | 2.4332 | 2.3226 | 1.8398 |

| | | | | | |
|---|---|---|---|---|---|
| DTEDspread_5 | 0.21188 | 6.2440 | 8.2436 | 3.5943 | 2.8907 |
| DVIX_1 | 0.0022222 | 2.6325 | 2.0284 | 1.8385 | 1.6302 |
| DVIX_5 | -0.0014151 | -1.7045 | -1.2955 | -1.1926 | -1.0643 |
| DPs_USD3m | 0.35569 | 7.4841 | 3.0027 | 3.3608 | 2.8700 |
| DPs_USD3m_5 | -0.19055 | -2.9851 | -2.8548 | -2.0693 | -1.7785 |
| EG_AUDres_3_1 | -0.069708 | -3.9946 | -2.8109 | -2.6217 | -2.4017 |

AUTOMETRICS:

EQ(3.19) Modelling DPs_AUD3m by OLS

The estimation sample is: 2008-09-19 - 2010-04-23

| | Coefficient | Std.Error | t-value | t-prob | Part.R^2 |
|---|---|---|---|---|---|
| DPs_AUD3m_3 | -0.178360 | 0.04310 | -4.14 | 0.0000 | 0.0405 |
| DGRI_3 | -0.874859 | 0.3184 | -2.75 | 0.0063 | 0.0183 |
| DGRI_4 | 0.762405 | 0.3197 | 2.38 | 0.0175 | 0.0138 |
| DTEDspread_4 | 0.112767 | 0.02421 | 4.66 | 0.0000 | 0.0507 |
| DTEDspread_5 | 0.198674 | 0.03318 | 5.99 | 0.0000 | 0.0812 |
| DVIX_5 | -0.00240502 | 0.0008291 | -2.90 | 0.0039 | 0.0203 |
| DPs_USD3m | 0.293945 | 0.05210 | 5.64 | 0.0000 | 0.0727 |
| DPs_USD3m_1 | 0.204057 | 0.05111 | 3.99 | 0.0001 | 0.0378 |
| DPs_USD3m_5 | -0.178491 | 0.06220 | -2.87 | 0.0043 | 0.0199 |
| EG_AUDres_3_1 | -0.0655028 | 0.01745 | -3.75 | 0.0002 | 0.0336 |

sigma 0.0482476 RSS 0.945099911
log-likelihood 675.849
no. of observations 416 no. of parameters 10
mean(DPs_AUD3m) -0.00183293 se(DPs_AUD3m) 0.0582873

AR 1-2 test: F(2,404) = 0.70571 [0.4944]
ARCH 1-1 test: F(1,414) = 50.835 [0.0000]**
Normality test: Chi^2(2) = 133.64 [0.0000]**
Hetero test: F(20,395) = 11.056 [0.0000]**
Hetero-X test: F(65,350) = 13.012 [0.0000]**
RESET23 test: F(2,404) = 39.617 [0.0000]**

Robust standard errors

| | Coefficients | SE | HACSE | HCSE | JHCSE |
|---|---|---|---|---|---|
| DPs_AUD3m_3 | -0.17836 | 0.043099 | 0.072799 | 0.078939 | 0.095252 |
| DGRI_3 | -0.87486 | 0.31840 | 0.42309 | 0.53112 | 0.64312 |
| DGRI_4 | 0.76240 | 0.31968 | 0.60275 | 0.62583 | 0.73856 |
| DTEDspread_4 | 0.11277 | 0.024208 | 0.047937 | 0.049091 | 0.065065 |
| DTEDspread_5 | 0.19867 | 0.033178 | 0.037251 | 0.053775 | 0.070462 |
| DVIX_5 | -0.0024050 | 0.00082914 | 0.0011265 | 0.0011817 | 0.0013481 |
| DPs_USD3m | 0.29395 | 0.052103 | 0.12764 | 0.11636 | 0.14489 |
| DPs_USD3m_1 | 0.20406 | 0.051110 | 0.092399 | 0.10976 | 0.13724 |
| DPs_USD3m_5 | -0.17849 | 0.062200 | 0.083766 | 0.087860 | 0.10554 |
| EG_AUDres_3_1 | -0.065503 | 0.017448 | 0.025182 | 0.026770 | 0.030415 |

| | Coefficients | t-SE | t-HACSE | t-HCSE | t-JHCSE |
|---|---|---|---|---|---|
| DPs_AUD3m_3 | -0.17836 | -4.1383 | -2.4500** | -2.2595 | -1.8725 |
| DGRI_3 | -0.87486 | -2.7476 | -2.0678** | -1.6472 | -1.3603 |
| DGRI_4 | 0.76240 | 2.3849 | 1.2649 | 1.2182 | 1.0323 |
| DTEDspread_4 | 0.11277 | 4.6583 | 2.3524** | 2.2971 | 1.7331 |
| DTEDspread_5 | 0.19867 | 5.9881 | 5.3334** | 3.6945 | 2.8196 |
| DVIX_5 | -0.0024050 | -2.9006 | -2.1349** | -2.0352 | -1.7840 |
| DPs_USD3m | 0.29395 | 5.6417 | 2.3030** | 2.5261 | 2.0288 |
| DPs_USD3m_1 | 0.20406 | 3.9925 | 2.2084** | 1.8591 | 1.4869 |
| DPs_USD3m_5 | -0.17849 | -2.8696 | -2.1308** | -2.0315 | -1.6912 |
| EG_AUDres_3_1 | -0.065503 | -3.7543 | -2.6012** | -2.4469 | -2.1536 |

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THE USD RISK PREMIUM

COINTEGRATION EQUATION

EQ(3.10) Modelling Ps_USD3m by OLS

The estimation sample is: 2008-09-18 - 2010-04-23

| | Coefficient | Std.Error | t-value | t-prob | Part.R^2 |
|---|---|---|---|---|---|
| Constant | -0.298433 | 0.02496 | -12.0 | 0.0000 | 0.2571 |
| GRI | 0.503991 | 0.2854 | 1.77 | 0.0781 | 0.0075 |
| TED-Spread | 0.679757 | 0.01136 | 59.8 | 0.0000 | 0.8966 |
| VIX | 0.00992299 | 0.001357 | 7.31 | 0.0000 | 0.1146 |

| | | | |
|---|---|---|---|
| sigma | 0.105513 | RSS | 4.5979569 |
| R^2 | 0.981595 | F(3,413) = | 7342 [0.000]** |
| Adj.R^2 | 0.981462 | log-likelihood | 348.111 |
| no. of observations | 417 | no. of parameters | 4 |
| mean(Ps_USD3m) | 0.686999 | se(Ps_USD3m) | 0.774944 |

AR 1-2 test: F(2,411) = 357.01 [0.0000]**
ARCH 1-1 test: F(1,415) = 237.98 [0.0000]**
Normality test: Chi^2(2) = 390.68 [0.0000]**
Hetero test: F(6,410) = 38.335 [0.0000]**
Hetero-X test: F(9,407) = 32.370 [0.0000]**
RESET23 test: F(2,411) = 13.721 [0.0000]**

EG_USres_3 [ 449 - 865] saved to Cointegration datasett.in7

Unit-root tests

The sample is: 2008-10-03 - 2010-04-23

EG_USres_3: ADF tests (T=406, Constant; 5%=-2.87 1%=-3.45)

| D-lag | t-adf | beta Y_1 | sigma | t-DY_lag | t-prob | AIC | F-prob |
|---|---|---|---|---|---|---|---|
| 10 | -4.748** | 0.85961 | 0.04239 | -1.293 | 0.1968 | -6.292 | |
| 9 | -5.101** | 0.85203 | 0.04243 | 3.998 | 0.0001 | -6.293 | 0.1968 |
| 8 | -4.352** | 0.87364 | 0.04322 | 2.507 | 0.0126 | -6.258 | 0.0002 |
| 7 | -3.974** | 0.88538 | 0.04351 | -1.143 | 0.2536 | -6.248 | 0.0000 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 6 | -4.226** | 0.87981 | 0.04353 | -0.2501 | 0.8026 | -6.249 | 0.0001 |
| 5 | -4.360** | 0.87845 | 0.04348 | 2.421 | 0.0159 | -6.254 | 0.0001 |
| 4 | -3.951** | 0.89116 | 0.04374 | -2.713 | 0.0070 | -6.244 | 0.0000 |
| 3 | -4.639** | 0.87446 | 0.04409 | 0.7476 | 0.4551 | -6.231 | 0.0000 |
| 2 | -4.584** | 0.87847 | 0.04406 | -1.977 | 0.0487 | -6.235 | 0.0000 |
| 1 | -5.232** | 0.86527 | 0.04422 | 0.1420 | 0.8871 | -6.230 | 0.0000 |
| 0 | -5.384** | 0.86622 | 0.04417 | | | -6.235 | 0.0000 |

AUTOMETRICS:

AUTHOR'S FINAL MODEL IS NOT ENCLOSED WHEN THERE WAS GREAT DIFFICULTY SPECIFING THE MODEL

EQ(3.21) Modelling DPs_USD3m by OLS

The estimation sample is: 2008-09-19 - 2010-04-23

| | Coefficient | Std.Error | t-value | t-prob | Part.R^2 |
|---|---|---|---|---|---|
| DPs_USD3m_1 | 0.246915 | 0.02759 | 8.95 | 0.0000 | 0.1696 |
| DPs_USD3m_5 | 0.113709 | 0.03192 | 3.56 | 0.0004 | 0.0314 |
| DPs_USD3m_6 | 0.298253 | 0.03432 | 8.69 | 0.0000 | 0.1615 |
| DPs_USD3m_7 | -0.142831 | 0.02667 | -5.36 | 0.0000 | 0.0682 |
| DPs_USD3m_8 | -0.124042 | 0.03302 | -3.76 | 0.0002 | 0.0348 |
| DPs_USD3m_9 | 0.145281 | 0.02500 | 5.81 | 0.0000 | 0.0793 |
| DGRI | 0.499098 | 0.1616 | 3.09 | 0.0022 | 0.0238 |
| DGRI_1 | -0.581862 | 0.1619 | -3.59 | 0.0004 | 0.0319 |
| DGRI_2 | 1.20681 | 0.1623 | 7.44 | 0.0000 | 0.1236 |
| DGRI_3 | 0.503755 | 0.1696 | 2.97 | 0.0032 | 0.0220 |
| DGRI_5 | 0.468104 | 0.1712 | 2.73 | 0.0065 | 0.0187 |
| DGRI_8 | -0.650428 | 0.1575 | -4.13 | 0.0000 | 0.0417 |
| DGRI_9 | 0.780487 | 0.1658 | 4.71 | 0.0000 | 0.0535 |
| DGRI_10 | -0.501777 | 0.1729 | -2.90 | 0.0039 | 0.0210 |
| DTEDspread | 0.338984 | 0.01376 | 24.6 | 0.0000 | 0.6076 |
| DTEDspread_2 | -0.0336527 | 0.01442 | -2.33 | 0.0201 | 0.0137 |
| DTEDspread_5 | -0.0374780 | 0.01695 | -2.21 | 0.0276 | 0.0123 |
| DTEDspread_6 | -0.0647552 | 0.01782 | -3.63 | 0.0003 | 0.0326 |
| DTEDspread_8 | 0.0798195 | 0.01701 | 4.69 | 0.0000 | 0.0532 |
| DTEDspread_10 | 0.0701618 | 0.01279 | 5.49 | 0.0000 | 0.0713 |
| DVIX_3 | -0.00164616 | 0.0004584 | -3.59 | 0.0004 | 0.0318 |
| DVIX_5 | -0.00222503 | 0.0004509 | -4.93 | 0.0000 | 0.0585 |
| DVIX_10 | -0.00137913 | 0.0004651 | -2.97 | 0.0032 | 0.0219 |
| EG_USres_3_1 | -0.122736 | 0.01297 | -9.47 | 0.0000 | 0.1861 |

sigma 0.0226439 RSS 0.200996615
log-likelihood 997.833
no. of observations 416 no. of parameters 24
mean(DPs_USD3m) -0.00352673 se(DPs_USD3m) 0.054568

AR 1-2 test: F(2,390) = 1.5778 [0.2077]
ARCH 1-1 test: F(1,414) = 3.4355 [0.0645]

Normality test:   Chi^2(2)  =   153.36 [0.0000]**
Hetero test:      F(48,367) =   11.124 [0.0000]**
RESET23 test:     F(2,390)  =   11.227 [0.0000]**

Robust standard errors

| | Coefficients | SE | HACSE | HCSE | JHCSE |
|---|---|---|---|---|---|
| DPs_USD3m_1 | 0.24691 | 0.027594 | 0.041567 | 0.041439 | 0.069147 |
| DPs_USD3m_5 | 0.11371 | 0.031921 | 0.035169 | 0.033148 | 0.050644 |
| DPs_USD3m_6 | 0.29825 | 0.034319 | 0.064838 | 0.070079 | 0.11655 |
| DPs_USD3m_7 | -0.14283 | 0.026666 | 0.044484 | 0.046839 | 0.081364 |
| DPs_USD3m_8 | -0.12404 | 0.033018 | 0.062806 | 0.049094 | 0.087194 |
| DPs_USD3m_9 | 0.14528 | 0.025002 | 0.056549 | 0.049592 | 0.084408 |
| DGRI | 0.49910 | 0.16161 | 0.26136 | 0.21849 | 0.32454 |
| DGRI_1 | -0.58186 | 0.16190 | 0.23433 | 0.25647 | 0.37549 |
| DGRI_2 | 1.2068 | 0.16229 | 0.28661 | 0.29429 | 0.46852 |
| DGRI_3 | 0.50376 | 0.16958 | 0.23727 | 0.24962 | 0.34812 |
| DGRI_5 | 0.46810 | 0.17124 | 0.23632 | 0.24513 | 0.34174 |
| DGRI_8 | -0.65043 | 0.15748 | 0.22168 | 0.21561 | 0.32741 |
| DGRI_9 | 0.78049 | 0.16584 | 0.21468 | 0.22622 | 0.31011 |
| DGRI_10 | -0.50178 | 0.17292 | 0.24101 | 0.23886 | 0.31562 |
| DTEDspread | 0.33898 | 0.013759 | 0.028626 | 0.025355 | 0.042429 |
| DTEDspread_2 | -0.033653 | 0.014423 | 0.024171 | 0.019831 | 0.031486 |
| DTEDspread_5 | -0.037478 | 0.016945 | 0.020930 | 0.021160 | 0.034342 |
| DTEDspread_6 | -0.064755 | 0.017818 | 0.043104 | 0.043815 | 0.075154 |
| DTEDspread_8 | 0.079819 | 0.017005 | 0.033539 | 0.025082 | 0.040617 |
| DTEDspread_10 | 0.070162 | 0.012791 | 0.018777 | 0.025000 | 0.041303 |
| DVIX_3 | -0.0016462 | 0.00045843 | 0.00053855 | 0.00062868 | 0.00078764 |
| DVIX_5 | -0.0022250 | 0.00045094 | 0.00064574 | 0.00064401 | 0.00087305 |
| DVIX_10 | -0.0013791 | 0.00046508 | 0.00057371 | 0.00072103 | 0.00092361 |
| EG_USres_3_1 | -0.12274 | 0.012966 | 0.020901 | 0.022300 | 0.033683 |

| | Coefficients | t-SE | t-HACSE | t-HCSE | t-JHCSE |
|---|---|---|---|---|---|
| DPs_USD3m_1 | 0.24691 | 8.9481 | 5.9402 | 5.9585 | 3.5708 |
| DPs_USD3m_5 | 0.11371 | 3.5622 | 3.2332 | 3.4303 | 2.2453 |
| DPs_USD3m_6 | 0.29825 | 8.6905 | 4.6000 | 4.2560 | 2.5590 |
| DPs_USD3m_7 | -0.14283 | -5.3563 | -3.2108 | -3.0494 | -1.7555 |
| DPs_USD3m_8 | -0.12404 | -3.7568 | -1.9750 | -2.5266 | -1.4226 |
| DPs_USD3m_9 | 0.14528 | 5.8108 | 2.5691 | 2.9295 | 1.7212 |
| DGRI | 0.49910 | 3.0883 | 1.9096 | 2.2843 | 1.5379 |
| DGRI_1 | -0.58186 | -3.5939 | -2.4831 | -2.2687 | -1.5496 |
| DGRI_2 | 1.2068 | 7.4362 | 4.2107 | 4.1007 | 2.5758 |
| DGRI_3 | 0.50376 | 2.9705 | 2.1232 | 2.0181 | 1.4471 |
| DGRI_5 | 0.46810 | 2.7337 | 1.9808 | 1.9096 | 1.3698 |
| DGRI_8 | -0.65043 | -4.1303 | -2.9341 | -3.0168 | -1.9866 |
| DGRI_9 | 0.78049 | 4.7061 | 3.6355 | 3.4502 | 2.5168 |
| DGRI_10 | -0.50178 | -2.9018 | -2.0820 | -2.1007 | -1.5898 |
| DTEDspread | 0.33898 | 24.637 | 11.842 | 13.370 | 7.9895 |
| DTEDspread_2 | -0.033653 | -2.3333 | -1.3923 | -1.6969 | -1.0688 |
| DTEDspread_5 | -0.037478 | -2.2117 | -1.7907 | -1.7712 | -1.0913 |
| DTEDspread_6 | -0.064755 | -3.6342 | -1.5023 | -1.4779 | -0.86163 |
| DTEDspread_8 | 0.079819 | 4.6938 | 2.3799 | 3.1824 | 1.9652 |
| DTEDspread_10 | 0.070162 | 5.4853 | 3.7365 | 2.8064 | 1.6987 |
| DVIX_3 | -0.0016462 | -3.5909 | -3.0566 | -2.6184 | -2.0900 |
| DVIX_5 | -0.0022250 | -4.9343 | -3.4457 | -3.4550 | -2.5486 |

| | | | | | |
|---|---|---|---|---|---|
| DVIX_10 | -0.0013791 | -2.9654 | -2.4039 | -1.9127 | -1.4932 |
| EG_USres_3_1 | -0.12274 | -9.4663 | -5.8721 | -5.5039 | -3.6439 |

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"COINTEGRATION TESTS"

3 phase:

Notation: EG_Xres_3:EG=Engle Granger. X is risk premium under currency j. res
is the residuals from the cointegration equation.

The critical values of MacKinnon (see references) are used, which are more negative than the critical values for standard DF and ADF tests. With 5 variables in the ADF-test the significance at 1% level the critical value is -4.96, and
for 5% significance level, -4.42.

Unit-root tests

The sample is: 2008-09-26 - 2010-04-23

EG_NOKres_3: ADF tests (T=411, Constant; 5%=-2.87 1%=-3.45)

| D-lag | t-adf | beta Y_1 | sigma | t-DY_lag | t-prob | AIC | F-prob |
|---|---|---|---|---|---|---|---|
| 5 | -5.658** | 0.78105 | 0.09365 | 0.6077 | 0.5437 | -4.719 | |
| 4 | -5.705** | 0.78729 | 0.09358 | -2.250 | 0.0250 | -4.723 | 0.5437 |
| 3 | -6.675** | 0.76176 | 0.09405 | -1.746 | 0.0815 | -4.716 | 0.0676 |
| 2 | -7.764** | 0.73989 | 0.09429 | 1.700 | 0.0900 | -4.713 | 0.0381 |
| 1 | -7.631** | 0.75965 | 0.09450 | 2.943 | 0.0034 | -4.711 | 0.0234 |
| 0 | -6.996** | 0.78933 | 0.09538 | | | -4.695 | 0.0013 |

Unit-root tests

The sample is: 2008-09-26 - 2010-04-23

EG_SEKres_3: ADF tests (T=411, Constant; 5%=-2.87 1%=-3.45)

| D-lag | t-adf | beta Y_1 | sigma | t-DY_lag | t-prob | AIC | F-prob |
|---|---|---|---|---|---|---|---|
| 5 | -4.986** | 0.88772 | 0.04908 | 2.985 | 0.0030 | -6.012 | |
| 4 | -4.426** | 0.90150 | 0.04956 | -1.245 | 0.2139 | -5.995 | 0.0030 |
| 3 | -4.840** | 0.89512 | 0.04959 | 0.8245 | 0.4101 | -5.996 | 0.0056 |
| 2 | -4.780** | 0.89919 | 0.04957 | 3.698 | 0.0002 | -5.999 | 0.0115 |
| 1 | -4.082** | 0.91421 | 0.05034 | -1.612 | 0.1076 | -5.971 | 0.0001 |
| 0 | -4.516** | 0.90705 | 0.05044 | | | -5.969 | 0.0001 |

Unit-root tests

The sample is: 2008-09-26 - 2010-04-23

EG_EURres_4: ADF tests (T=411, Constant; 5%=-2.87 1%=-3.45)

| D-lag | t-adf | beta Y_1 | sigma | t-DY_lag | t-prob | AIC | F-prob |
|---|---|---|---|---|---|---|---|

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 5 | -4.446** | 0.89509 | 0.03464 | 1.040 | 0.2987 | -6.708 | |
| 4 | -4.326** | 0.89994 | 0.03465 | -0.5501 | 0.5826 | -6.711 | 0.2987 |
| 3 | -4.559** | 0.89717 | 0.03462 | 0.07677 | 0.9388 | -6.715 | 0.5008 |
| 2 | -4.665** | 0.89755 | 0.03457 | -1.156 | 0.2484 | -6.720 | 0.7078 |
| 1 | -5.094** | 0.89141 | 0.03459 | 2.780 | 0.0057 | -6.721 | 0.6058 |
| 0 | -4.567** | 0.90411 | 0.03487 | | | -6.707 | 0.0663 |

Unit-root tests

The sample is: 2008-09-26 - 2010-04-23

EG_GBPres_per3: ADF tests (T=411, Constant; 5%=-2.87 1%=-3.45)

| D-lag | t-adf | beta Y_1 | sigma | t-DY_lag | t-prob | AIC | F-prob |
|---|---|---|---|---|---|---|---|
| 5 | -5.541** | 0.84207 | 0.07687 | 2.650 | 0.0084 | -5.114 | |
| 4 | -5.046** | 0.85869 | 0.07744 | 1.080 | 0.2807 | -5.102 | 0.0084 |
| 3 | -4.928** | 0.86474 | 0.07745 | -2.685 | 0.0076 | -5.104 | 0.0172 |
| 2 | -5.700** | 0.84700 | 0.07804 | 2.117 | 0.0348 | -5.091 | 0.0016 |
| 1 | -5.340** | 0.85967 | 0.07837 | -1.907 | 0.0572 | -5.085 | 0.0006 |
| 0 | -5.984** | 0.84720 | 0.07863 | | | -5.081 | 0.0003 |

Unit-root tests

The sample is: 2008-09-26 - 2010-04-23

EG_CADres_per3: ADF tests (T=411, Constant; 5%=-2.87 1%=-3.45)

| D-lag | t-adf | beta Y_1 | sigma | t-DY_lag | t-prob | AIC | F-prob |
|---|---|---|---|---|---|---|---|
| 5 | -4.729** | 0.89439 | 0.04581 | -0.5916 | 0.5544 | -6.150 | |
| 4 | -5.035** | 0.89113 | 0.04577 | 4.494 | 0.0000 | -6.154 | 0.5544 |
| 3 | -4.112** | 0.91091 | 0.04684 | 1.140 | 0.2551 | -6.110 | 0.0000 |
| 2 | -3.962** | 0.91587 | 0.04686 | -2.315 | 0.0211 | -6.111 | 0.0001 |
| 1 | -4.580** | 0.90477 | 0.04711 | 1.638 | 0.1022 | -6.103 | 0.0000 |
| 0 | -4.321** | 0.91205 | 0.04721 | | | -6.102 | 0.0000 |

EG_AUDres_3: ADF tests (T=411, Constant; 5%=-2.87 1%=-3.45)

| D-lag | t-adf | beta Y_1 | sigma | t-DY_lag | t-prob | AIC | F-prob |
|---|---|---|---|---|---|---|---|
| 5 | -4.030** | 0.91155 | 0.05676 | -0.8282 | 0.4081 | -5.721 | |
| 4 | -4.294** | 0.90781 | 0.05674 | 0.9114 | 0.3627 | -5.724 | 0.4081 |
| 3 | -4.198** | 0.91147 | 0.05673 | -1.346 | 0.1792 | -5.727 | 0.4693 |
| 2 | -4.554** | 0.90580 | 0.05679 | 2.399 | 0.0169 | -5.727 | 0.3456 |
| 1 | -4.163** | 0.91485 | 0.05712 | -0.5713 | 0.5681 | -5.718 | 0.0610 |
| 0 | -4.364** | 0.91255 | 0.05707 | | | -5.722 | 0.0962 |

EG_USres_3: ADF tests (T=406, Constant; 5%=-2.87 1%=-3.45)

| D-lag | t-adf | beta Y_1 | sigma | t-DY_lag | t-prob | AIC | F-prob |
|---|---|---|---|---|---|---|---|
| 10 | -4.748** | 0.85961 | 0.04239 | -1.293 | 0.1968 | -6.292 | |
| 9 | -5.101** | 0.85203 | 0.04243 | 3.998 | 0.0001 | -6.293 | 0.1968 |
| 8 | -4.352** | 0.87364 | 0.04322 | 2.507 | 0.0126 | -6.258 | 0.0002 |
| 7 | -3.974** | 0.88538 | 0.04351 | -1.143 | 0.2536 | -6.248 | 0.0000 |
| 6 | -4.226** | 0.87981 | 0.04353 | -0.2501 | 0.8026 | -6.249 | 0.0001 |
| 5 | -4.360** | 0.87845 | 0.04348 | 2.421 | 0.0159 | -6.254 | 0.0001 |
| 4 | -3.951** | 0.89116 | 0.04374 | -2.713 | 0.0070 | -6.244 | 0.0000 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 3 | -4.639** | 0.87446 | 0.04409 | 0.7476 | 0.4551 | -6.231 | 0.0000 |
| 2 | -4.584** | 0.87847 | 0.04406 | -1.977 | 0.0487 | -6.235 | 0.0000 |
| 1 | -5.232** | 0.86527 | 0.04422 | 0.1420 | 0.8871 | -6.230 | 0.0000 |
| 0 | -5.384** | 0.86622 | 0.04417 | | | -6.235 | 0.0000 |

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"EXOGENEITY TEST FOR USD RISK PREMIUM"

ECM WITH US PREMIUM AS THE ENDOGENOUS VARIABLE:

THE COEFFICIENT IN FRONT OF EG_Xres_3_1 IS TESTED. EG=engle-granger. X=REPRESENTING RISK PREMIUM UNDER
CURRENCY J. res=residuals from the cointegration regression.

IN THE FOLLOWING ONLY THE ECM AND THE ROBUST T-VALUE OF THE LONG-RUN SOLUTION IS REPORTED.

NOK PREMIUM:

EQ(12) Modelling DPs_USD3m by OLS

The estimation sample is: 2008-09-19 - 2010-04-23

| | Coefficient | Std.Error | t-value | t-prob | Part.R^2 |
|---|---|---|---|---|---|
| DPs_USD3m_1 | 0.186943 | 0.04301 | 4.35 | 0.0000 | 0.0454 |
| DPs_USD3m_5 | 0.166945 | 0.03562 | 4.69 | 0.0000 | 0.0524 |
| DGRI_1 | -0.572728 | 0.2194 | -2.61 | 0.0094 | 0.0169 |
| DGRI_2 | 0.831476 | 0.2145 | 3.88 | 0.0001 | 0.0365 |
| DGRI_3 | 0.640490 | 0.2199 | 2.91 | 0.0038 | 0.0209 |
| DGRI_4 | -1.14709 | 0.2077 | -5.52 | 0.0000 | 0.0713 |
| DTEDspread | 0.323957 | 0.01595 | 20.3 | 0.0000 | 0.5096 |
| DTEDspread_1 | 0.0740203 | 0.02166 | 3.42 | 0.0007 | 0.0286 |
| DTEDspread_3 | 0.0438783 | 0.01554 | 2.82 | 0.0050 | 0.0197 |
| DTEDspread_5 | -0.0266180 | 0.01983 | -1.34 | 0.1803 | 0.0045 |
| DVIX_1 | 0.00270970 | 0.0005667 | 4.78 | 0.0000 | 0.0544 |
| DVIX_2 | 0.00176980 | 0.0006015 | 2.94 | 0.0034 | 0.0213 |
| DVIX_3 | -0.00194025 | 0.0005831 | -3.33 | 0.0010 | 0.0271 |
| DVIX_4 | 0.00167923 | 0.0005309 | 3.16 | 0.0017 | 0.0246 |
| DPs_NOK3m | 0.101392 | 0.01613 | 6.28 | 0.0000 | 0.0905 |
| DPs_NOK3m_3 | 0.0273922 | 0.01553 | 1.76 | 0.0784 | 0.0078 |
| DPs_NOK3m_4 | 0.0451401 | 0.01470 | 3.07 | 0.0023 | 0.0232 |
| DPs_NOK3m_5 | 0.0383184 | 0.01464 | 2.62 | 0.0092 | 0.0170 |
| EG_NOKres_3_1 | 0.0144810 | 0.009949 | 1.46 | 0.1463 | 0.0053 |

sigma 0.0279198 RSS 0.309467254
log-likelihood 908.068
no. of observations 416 no. of parameters 19
mean(DPs_USD3m) -0.00352673 se(DPs_USD3m) 0.054568

AR 1-2 test: F(2,395) = 9.0379 [0.0001]**

ARCH 1-1 test: F(1,414) = 6.3299 [0.0122]*
Normality test: Chi^2(2) = 472.72 [0.0000]**
Hetero test: F(38,377) = 8.7001 [0.0000]**
Hetero-X test: F(209,206)= 237.22 [0.0000]**
RESET23 test: F(2,395) = 2.8407 [0.0596]

| | Coefficients | t-SE | t-HACSE | t-HCSE | t-JHCSE |
|---|---|---|---|---|---|
| EG_NOKres_3_1 | 0.014481 | 1.4555 | 1.4388 | 1.1764 | 0.88606 |

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SEK PREMIUM:

EQ(15) Modelling DPs_USD3m by OLS

The estimation sample is: 2008-09-19 - 2010-04-23

| | Coefficient | Std.Error | t-value | t-prob | Part.R^2 |
|---|---|---|---|---|---|
| DPs_USD3m_1 | 0.189047 | 0.04195 | 4.51 | 0.0000 | 0.0480 |
| DPs_USD3m_5 | 0.147151 | 0.02594 | 5.67 | 0.0000 | 0.0739 |
| DGRI_2 | 1.08490 | 0.1928 | 5.63 | 0.0000 | 0.0729 |
| DGRI_4 | -1.13362 | 0.2081 | -5.45 | 0.0000 | 0.0686 |
| DTEDspread | 0.351168 | 0.01589 | 22.1 | 0.0000 | 0.5479 |
| DTEDspread_1 | 0.0947582 | 0.02205 | 4.30 | 0.0000 | 0.0438 |
| DVIX_1 | 0.00162607 | 0.0005034 | 3.23 | 0.0013 | 0.0252 |
| DVIX_3 | -0.00144204 | 0.0005032 | -2.87 | 0.0044 | 0.0200 |
| DVIX_4 | 0.00185714 | 0.0005287 | 3.51 | 0.0005 | 0.0297 |
| DPs_SEK3m | 0.0884614 | 0.03157 | 2.80 | 0.0053 | 0.0191 |
| DPs_SEK3m_1 | 0.0644587 | 0.03131 | 2.06 | 0.0402 | 0.0104 |
| DPs_SEK3m_5 | 0.0778954 | 0.03074 | 2.53 | 0.0117 | 0.0157 |
| EG_SEKres_3_1 | -0.0102574 | 0.01295 | -0.792 | 0.4286 | 0.0016 |

sigma 0.0291454 RSS 0.342329079
log-likelihood 887.077
no. of observations 416 no. of parameters 13
mean(DPs_USD3m) -0.00352673 se(DPs_USD3m) 0.054568

AR 1-2 test: F(2,401) = 5.4937 [0.0044]**
ARCH 1-1 test: F(1,414) = 25.309 [0.0000]**
Normality test: Chi^2(2) = 335.68 [0.0000]**
Hetero test: F(26,389) = 12.550 [0.0000]**
Hetero-X test: F(104,311)= 147.67 [0.0000]**
RESET23 test: F(2,401) = 6.7051 [0.0014]**

| | Coefficients | t-SE | t-HACSE | t-HCSE | t-JHCSE |
|---|---|---|---|---|---|
| EG_SEKres_3_1 | -0.010257 | -0.79236 | -0.81700 | -0.63423 | -0.55451 |

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THE EUR PREMIUM:

EQ(18) Modelling DPs_USD3m by OLS

The estimation sample is: 2008-09-19 - 2010-04-23

| | Coefficient | Std.Error | t-value | t-prob | Part.R^2 |
|---|---|---|---|---|---|
| DPs_USD3m_1 | 0.214396 | 0.04047 | 5.30 | 0.0000 | 0.0650 |
| DPs_USD3m_5 | 0.150372 | 0.02542 | 5.91 | 0.0000 | 0.0797 |
| DGRI_2 | 0.995235 | 0.1930 | 5.16 | 0.0000 | 0.0618 |
| DGRI_4 | -1.17636 | 0.2060 | -5.71 | 0.0000 | 0.0747 |
| DTEDspread | 0.324562 | 0.01659 | 19.6 | 0.0000 | 0.4865 |
| DTEDspread_1 | 0.0868517 | 0.02167 | 4.01 | 0.0001 | 0.0383 |
| DVIX_1 | 0.00135663 | 0.0005014 | 2.71 | 0.0071 | 0.0178 |
| DVIX_3 | -0.00146283 | 0.0004942 | -2.96 | 0.0033 | 0.0212 |
| DVIX_4 | 0.00196998 | 0.0005178 | 3.80 | 0.0002 | 0.0346 |
| Ps_EUR3m | 0.235333 | 0.04268 | 5.51 | 0.0000 | 0.0700 |
| Ps_EUR3m_1 | -0.235133 | 0.04272 | -5.50 | 0.0000 | 0.0698 |
| EG_EURres_4_1 | 0.00725187 | 0.01819 | 0.399 | 0.6904 | 0.0004 |

sigma 0.0287718 RSS 0.334437166
log-likelihood 891.928
no. of observations 416 no. of parameters 12
mean(DPs_USD3m) -0.00352673 se(DPs_USD3m) 0.054568

AR 1-2 test: F(2,402) = 6.7668 [0.0013]**
ARCH 1-1 test: F(1,414) = 35.313 [0.0000]**
Normality test: Chi^2(2) = 360.56 [0.0000]**
Hetero test: F(24,391) = 16.020 [0.0000]**
Hetero-X test: F(90,325) = 59.271 [0.0000]**
RESET23 test: F(2,402) = 8.7572 [0.0002]**

| | Coefficients | t-SE | t-HACSE | t-HCSE | t-JHCSE |
|---|---|---|---|---|---|
| EG_EURres_4_1 | 0.0072519 | 0.39860 | 0.35294 | 0.32201 | 0.28417 |

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the gbp PREMIUM:

EQ(26) Modelling DPs_USD3m by OLS

The estimation sample is: 2008-09-19 - 2010-04-23

| | Coefficient | Std.Error | t-value | t-prob | Part.R^2 |
|---|---|---|---|---|---|
| DPs_USD3m_1 | 0.182719 | 0.05103 | 3.58 | 0.0004 | 0.0344 |
| DPs_USD3m_2 | -0.144995 | 0.04745 | -3.06 | 0.0024 | 0.0253 |
| DPs_USD3m_3 | -0.0757554 | 0.04385 | -1.73 | 0.0849 | 0.0082 |
| DPs_USD3m_4 | -0.0144758 | 0.04208 | -0.344 | 0.7310 | 0.0003 |
| DPs_USD3m_5 | 0.00798939 | 0.03914 | 0.204 | 0.8384 | 0.0001 |
| DPs_USD3m_6 | 0.247197 | 0.03823 | 6.47 | 0.0000 | 0.1041 |
| DPs_USD3m_7 | -0.182426 | 0.04037 | -4.52 | 0.0000 | 0.0537 |

| | | | | | |
|---|---|---|---|---|---|
| DPs_USD3m_8 | -0.198658 | 0.04110 | -4.83 | 0.0000 | 0.0610 |
| DPs_USD3m_9 | 0.105608 | 0.04182 | 2.53 | 0.0120 | 0.0174 |
| DPs_USD3m_10 | -0.0650695 | 0.03681 | -1.77 | 0.0779 | 0.0086 |
| Constant | 0.00152457 | 0.001100 | 1.39 | 0.1665 | 0.0053 |
| DGRI | 0.428051 | 0.2142 | 2.00 | 0.0465 | 0.0110 |
| DGRI_1 | -0.569570 | 0.2083 | -2.73 | 0.0066 | 0.0203 |
| DGRI_2 | 1.22389 | 0.2008 | 6.09 | 0.0000 | 0.0935 |
| DGRI_3 | 0.494756 | 0.2101 | 2.35 | 0.0191 | 0.0152 |
| DGRI_4 | -0.374711 | 0.2123 | -1.77 | 0.0784 | 0.0086 |
| DGRI_5 | 0.388188 | 0.2146 | 1.81 | 0.0714 | 0.0090 |
| DGRI_6 | -0.269446 | 0.2102 | -1.28 | 0.2006 | 0.0045 |
| DGRI_7 | -0.187000 | 0.2112 | -0.885 | 0.3765 | 0.0022 |
| DGRI_8 | -0.718293 | 0.2160 | -3.33 | 0.0010 | 0.0298 |
| DGRI_9 | 0.459410 | 0.2287 | 2.01 | 0.0453 | 0.0111 |
| DGRI_10 | -0.681662 | 0.2109 | -3.23 | 0.0013 | 0.0282 |
| DTEDspread | 0.349302 | 0.01791 | 19.5 | 0.0000 | 0.5139 |
| DTEDspread_1 | 0.0922474 | 0.02452 | 3.76 | 0.0002 | 0.0378 |
| DTEDspread_2 | 0.0444743 | 0.02447 | 1.82 | 0.0700 | 0.0091 |
| DTEDspread_3 | 0.0663083 | 0.02398 | 2.76 | 0.0060 | 0.0208 |
| DTEDspread_4 | 0.0633861 | 0.02049 | 3.09 | 0.0021 | 0.0259 |
| DTEDspread_5 | 0.0298008 | 0.01884 | 1.58 | 0.1147 | 0.0069 |
| DTEDspread_6 | -0.0252173 | 0.01947 | -1.29 | 0.1962 | 0.0046 |
| DTEDspread_7 | 0.0400095 | 0.02087 | 1.92 | 0.0560 | 0.0101 |
| DTEDspread_8 | 0.109575 | 0.02060 | 5.32 | 0.0000 | 0.0728 |
| DTEDspread_9 | 0.0543246 | 0.02286 | 2.38 | 0.0180 | 0.0154 |
| DTEDspread_10 | 0.108192 | 0.02184 | 4.95 | 0.0000 | 0.0638 |
| DVIX | -0.00139547 | 0.0005310 | -2.63 | 0.0090 | 0.0188 |
| DVIX_1 | 0.000879957 | 0.0005340 | 1.65 | 0.1002 | 0.0075 |
| DVIX_2 | -0.000449060 | 0.0005280 | -0.851 | 0.3956 | 0.0020 |
| DVIX_3 | -0.000604174 | 0.0005290 | -1.14 | 0.2542 | 0.0036 |
| DVIX_4 | 0.000899554 | 0.0005435 | 1.65 | 0.0988 | 0.0076 |
| DVIX_5 | -0.00145121 | 0.0005474 | -2.65 | 0.0084 | 0.0191 |
| DVIX_6 | -0.000175596 | 0.0005501 | -0.319 | 0.7498 | 0.0003 |
| DVIX_7 | 0.00125823 | 0.0005553 | 2.27 | 0.0240 | 0.0141 |
| DVIX_8 | -0.000709945 | 0.0005638 | -1.26 | 0.2088 | 0.0044 |
| DVIX_9 | 0.000248105 | 0.0005573 | 0.445 | 0.6565 | 0.0006 |
| DVIX_10 | -0.00164488 | 0.0005171 | -3.18 | 0.0016 | 0.0273 |
| DPs_GBR3m | 0.0502425 | 0.02091 | 2.40 | 0.0168 | 0.0158 |
| DPs_GBR3m_1 | 0.0265607 | 0.02247 | 1.18 | 0.2381 | 0.0039 |
| DPs_GBR3m_2 | 0.0891953 | 0.02142 | 4.16 | 0.0000 | 0.0459 |
| DPs_GBR3m_3 | 0.00549791 | 0.01987 | 0.277 | 0.7822 | 0.0002 |
| DPs_GBR3m_4 | 0.00425081 | 0.01989 | 0.214 | 0.8309 | 0.0001 |
| DPs_GBR3m_5 | 0.0687458 | 0.01957 | 3.51 | 0.0005 | 0.0331 |
| DPs_GBR3m_6 | 0.0361598 | 0.01977 | 1.83 | 0.0682 | 0.0092 |
| DPs_GBR3m_7 | 0.00573875 | 0.01927 | 0.298 | 0.7660 | 0.0002 |
| DPs_GBR3m_8 | 0.0755375 | 0.01867 | 4.05 | 0.0001 | 0.0435 |
| DPs_GBR3m_9 | -0.00791611 | 0.01877 | -0.422 | 0.6734 | 0.0005 |
| DPs_GBR3m_10 | 0.0545314 | 0.01867 | 2.92 | 0.0037 | 0.0231 |
| EG_GBPres_per3_1 | 0.0104713 | 0.01028 | 1.02 | 0.3092 | 0.0029 |

| | | | |
|---|---|---|---|
| sigma | 0.0219322 | RSS | 0.173167187 |
| R^2 | 0.859867 | F(55,360) = | 40.16 [0.000]** |
| Adj.R^2 | 0.838458 | log-likelihood | 1028.83 |
| no. of observations | 416 | no. of parameters | 56 |

mean(DPs_USD3m) -0.00352673 se(DPs_USD3m) 0.054568

AR 1-2 test: F(2,358) = 3.5601 [0.0294]*
ARCH 1-1 test: F(1,414) = 4.6463 [0.0317]*
Normality test: Chi^2(2) = 87.196 [0.0000]**
Hetero test: F(110,305)= 10.611 [0.0000]**
RESET23 test: F(2,358) = 26.083 [0.0000]**

| | Coefficients | t-SE | t-HACSE | t-HCSE |
|---|---|---|---|---|
| EG_GBPres_per3_1 | 0.010471 | 1.0183 | 0.98017 | 1.0429 |

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THE CAD PREMIUM:

EQ(27) Modelling DPs_USD3m by OLS

The estimation sample is: 2008-09-19 - 2010-04-23

| | Coefficient | Std.Error | t-value | t-prob | Part.R^2 |
|---|---|---|---|---|---|
| DPs_USD3m_1 | 0.113913 | 0.05484 | 2.08 | 0.0385 | 0.0118 |
| DPs_USD3m_2 | 0.0121740 | 0.05000 | 0.243 | 0.8078 | 0.0002 |
| DPs_USD3m_3 | 0.0225152 | 0.04645 | 0.485 | 0.6282 | 0.0007 |
| DPs_USD3m_4 | 0.0555138 | 0.04365 | 1.27 | 0.2042 | 0.0045 |
| DPs_USD3m_5 | 0.0464070 | 0.03917 | 1.18 | 0.2368 | 0.0039 |
| DPs_USD3m_6 | 0.212318 | 0.03881 | 5.47 | 0.0000 | 0.0767 |
| DPs_USD3m_7 | -0.182436 | 0.04010 | -4.55 | 0.0000 | 0.0544 |
| DPs_USD3m_8 | -0.234060 | 0.04108 | -5.70 | 0.0000 | 0.0827 |
| DPs_USD3m_9 | 0.0371939 | 0.04246 | 0.876 | 0.3816 | 0.0021 |
| DPs_USD3m_10 | -0.00935468 | 0.03858 | -0.242 | 0.8086 | 0.0002 |
| Constant | 0.000871468 | 0.001092 | 0.798 | 0.4255 | 0.0018 |
| DGRI | 0.587239 | 0.2145 | 2.74 | 0.0065 | 0.0204 |
| DGRI_1 | -0.458394 | 0.2142 | -2.14 | 0.0330 | 0.0126 |
| DGRI_2 | 1.51819 | 0.2151 | 7.06 | 0.0000 | 0.1216 |
| DGRI_3 | 0.622651 | 0.2229 | 2.79 | 0.0055 | 0.0212 |
| DGRI_4 | -0.629727 | 0.2160 | -2.92 | 0.0038 | 0.0231 |
| DGRI_5 | 0.303401 | 0.2186 | 1.39 | 0.1661 | 0.0053 |
| DGRI_6 | -0.0109363 | 0.2079 | -0.0526 | 0.9581 | 0.0000 |
| DGRI_7 | -0.423012 | 0.2061 | -2.05 | 0.0408 | 0.0116 |
| DGRI_8 | -0.290647 | 0.2089 | -1.39 | 0.1650 | 0.0053 |
| DGRI_9 | 0.867777 | 0.2136 | 4.06 | 0.0001 | 0.0438 |
| DGRI_10 | -0.368847 | 0.1980 | -1.86 | 0.0633 | 0.0095 |
| DTEDspread | 0.353466 | 0.01764 | 20.0 | 0.0000 | 0.5272 |
| DTEDspread_1 | 0.106622 | 0.02672 | 3.99 | 0.0001 | 0.0424 |
| DTEDspread_2 | -0.00533647 | 0.02885 | -0.185 | 0.8533 | 0.0001 |
| DTEDspread_3 | -0.0274401 | 0.02739 | -1.00 | 0.3170 | 0.0028 |
| DTEDspread_4 | 0.0140561 | 0.02315 | 0.607 | 0.5442 | 0.0010 |
| DTEDspread_5 | 0.00794821 | 0.02024 | 0.393 | 0.6948 | 0.0004 |
| DTEDspread_6 | 0.0219187 | 0.02035 | 1.08 | 0.2823 | 0.0032 |
| DTEDspread_7 | 0.0557055 | 0.02181 | 2.55 | 0.0111 | 0.0178 |

| | | | | | |
|---|---|---|---|---|---|
| DTEDspread_8 | 0.142328 | 0.02176 | 6.54 | 0.0000 | 0.1062 |
| DTEDspread_9 | 0.00613149 | 0.02396 | 0.256 | 0.7981 | 0.0002 |
| DTEDspread_10 | 0.0839297 | 0.02414 | 3.48 | 0.0006 | 0.0325 |
| DVIX | -0.000934995 | 0.0005351 | -1.75 | 0.0815 | 0.0084 |
| DVIX_1 | 0.000478481 | 0.0005410 | 0.885 | 0.3770 | 0.0022 |
| DVIX_2 | -0.000329463 | 0.0005392 | -0.611 | 0.5416 | 0.0010 |
| DVIX_3 | -0.00167767 | 0.0005417 | -3.10 | 0.0021 | 0.0260 |
| DVIX_4 | 0.000943050 | 0.0005370 | 1.76 | 0.0799 | 0.0085 |
| DVIX_5 | -0.00135171 | 0.0005489 | -2.46 | 0.0143 | 0.0166 |
| DVIX_6 | 0.000366102 | 0.0005412 | 0.677 | 0.4991 | 0.0013 |
| DVIX_7 | 0.00138346 | 0.0005482 | 2.52 | 0.0121 | 0.0174 |
| DVIX_8 | -1.47873e-005 | 0.0005491 | -0.0269 | 0.9785 | 0.0000 |
| DVIX_9 | -0.000248579 | 0.0005481 | -0.454 | 0.6505 | 0.0006 |
| DVIX_10 | -0.00145865 | 0.0005077 | -2.87 | 0.0043 | 0.0224 |
| DPsCAD_3m | -0.0224620 | 0.03742 | -0.600 | 0.5487 | 0.0010 |
| DPsCAD_3m_1 | 0.0120462 | 0.03587 | 0.336 | 0.7372 | 0.0003 |
| DPsCAD_3m_2 | 0.201884 | 0.03405 | 5.93 | 0.0000 | 0.0890 |
| DPsCAD_3m_3 | 0.0410539 | 0.03632 | 1.13 | 0.2591 | 0.0035 |
| DPsCAD_3m_4 | -0.0932145 | 0.03532 | -2.64 | 0.0087 | 0.0190 |
| DPsCAD_3m_5 | -0.0636949 | 0.03484 | -1.83 | 0.0683 | 0.0092 |
| DPsCAD_3m_6 | -0.0981846 | 0.03479 | -2.82 | 0.0050 | 0.0216 |
| DPsCAD_3m_7 | 0.000537820 | 0.03561 | 0.0151 | 0.9880 | 0.0000 |
| DPsCAD_3m_8 | 0.0764549 | 0.03511 | 2.18 | 0.0301 | 0.0130 |
| DPsCAD_3m_9 | 0.107088 | 0.03248 | 3.30 | 0.0011 | 0.0293 |
| DPsCAD_3m_10 | 0.0396816 | 0.03230 | 1.23 | 0.2201 | 0.0042 |
| EG_CADres_per3_1 | 0.0191945 | 0.01306 | 1.47 | 0.1426 | 0.0060 |

| | | | |
|---|---|---|---|
| sigma | 0.0218164 | RSS | 0.171343477 |
| R^2 | 0.861343 | F(55,360) = | 40.66 [0.000]** |
| Adj.R^2 | 0.840159 | log-likelihood | 1031.03 |
| no. of observations | 416 | no. of parameters | 56 |
| mean(DPs_USD3m) | -0.00352673 | se(DPs_USD3m) | 0.054568 |

AR 1-2 test: F(2,358) = 7.0767 [0.0010]**
ARCH 1-1 test: F(1,414) = 10.115 [0.0016]**
Normality test: Chi^2(2) = 60.966 [0.0000]**
Hetero test: F(110,305)= 11.246 [0.0000]**
RESET23 test: F(2,358) = 31.668 [0.0000]**

| | Coefficients | t-SE | t-HACSE | t-HCSE |
|---|---|---|---|---|
| EG_CADres_per3_1 | 0.019195 | 1.4694 | 1.3158 | 1.2314 |

AUD PREMIUM:

EQ(28) Modelling DPs_USD3m by OLS

The estimation sample is: 2008-09-19 - 2010-04-23

| | Coefficient | Std.Error | t-value | t-prob | Part.R^2 |
|---|---|---|---|---|---|
| DPs_USD3m_1 | 0.0890816 | 0.05456 | 1.63 | 0.1034 | 0.0074 |
| DPs_USD3m_2 | -0.0916010 | 0.05184 | -1.77 | 0.0781 | 0.0086 |
| DPs_USD3m_3 | 0.0109122 | 0.04798 | 0.227 | 0.8202 | 0.0001 |
| DPs_USD3m_4 | 0.0322478 | 0.04427 | 0.728 | 0.4669 | 0.0015 |
| DPs_USD3m_5 | 0.0858939 | 0.04151 | 2.07 | 0.0393 | 0.0118 |

| | | | | | |
|---|---|---|---|---|---|
| DPs_USD3m_6 | 0.177323 | 0.04035 | 4.39 | 0.0000 | 0.0509 |
| DPs_USD3m_7 | -0.194074 | 0.04136 | -4.69 | 0.0000 | 0.0576 |
| DPs_USD3m_8 | -0.221374 | 0.04257 | -5.20 | 0.0000 | 0.0699 |
| DPs_USD3m_9 | 0.0809454 | 0.04264 | 1.90 | 0.0585 | 0.0099 |
| DPs_USD3m_10 | 0.00365214 | 0.03945 | 0.0926 | 0.9263 | 0.0000 |
| Constant | 0.00129475 | 0.001100 | 1.18 | 0.2398 | 0.0038 |
| DGRI | 0.478715 | 0.2060 | 2.32 | 0.0207 | 0.0148 |
| DGRI_1 | -0.609222 | 0.1984 | -3.07 | 0.0023 | 0.0255 |
| DGRI_2 | 1.22672 | 0.1980 | 6.19 | 0.0000 | 0.0963 |
| DGRI_3 | 0.577730 | 0.2005 | 2.88 | 0.0042 | 0.0225 |
| DGRI_4 | -0.182122 | 0.2021 | -0.901 | 0.3682 | 0.0023 |
| DGRI_5 | 0.615241 | 0.2020 | 3.05 | 0.0025 | 0.0251 |
| DGRI_6 | -0.276319 | 0.1970 | -1.40 | 0.1616 | 0.0054 |
| DGRI_7 | -0.306457 | 0.1940 | -1.58 | 0.1151 | 0.0069 |
| DGRI_8 | -0.353680 | 0.2027 | -1.75 | 0.0818 | 0.0084 |
| DGRI_9 | 0.677518 | 0.2065 | 3.28 | 0.0011 | 0.0290 |
| DGRI_10 | -0.258142 | 0.1933 | -1.34 | 0.1825 | 0.0049 |
| DTEDspread | 0.369161 | 0.01969 | 18.8 | 0.0000 | 0.4941 |
| DTEDspread_1 | 0.146478 | 0.02766 | 5.30 | 0.0000 | 0.0723 |
| DTEDspread_2 | 0.0711219 | 0.02922 | 2.43 | 0.0154 | 0.0162 |
| DTEDspread_3 | 0.0488019 | 0.02741 | 1.78 | 0.0759 | 0.0087 |
| DTEDspread_4 | 0.0321574 | 0.02289 | 1.40 | 0.1610 | 0.0055 |
| DTEDspread_5 | -0.0121060 | 0.02085 | -0.581 | 0.5619 | 0.0009 |
| DTEDspread_6 | -0.0171598 | 0.02028 | -0.846 | 0.3981 | 0.0020 |
| DTEDspread_7 | 0.0572225 | 0.02195 | 2.61 | 0.0095 | 0.0185 |
| DTEDspread_8 | 0.132107 | 0.02221 | 5.95 | 0.0000 | 0.0895 |
| DTEDspread_9 | 0.0418360 | 0.02436 | 1.72 | 0.0867 | 0.0081 |
| DTEDspread_10 | 0.0651563 | 0.02355 | 2.77 | 0.0060 | 0.0208 |
| DVIX | -0.00133396 | 0.0005273 | -2.53 | 0.0118 | 0.0175 |
| DVIX_1 | 0.000615909 | 0.0005389 | 1.14 | 0.2538 | 0.0036 |
| DVIX_2 | -2.32027e-005 | 0.0005238 | -0.0443 | 0.9647 | 0.0000 |
| DVIX_3 | -0.000588612 | 0.0005258 | -1.12 | 0.2637 | 0.0035 |
| DVIX_4 | 0.00105193 | 0.0005274 | 1.99 | 0.0468 | 0.0109 |
| DVIX_5 | -0.00193527 | 0.0005393 | -3.59 | 0.0004 | 0.0345 |
| DVIX_6 | 1.11171e-005 | 0.0005423 | 0.0205 | 0.9837 | 0.0000 |
| DVIX_7 | 0.00107418 | 0.0005372 | 2.00 | 0.0463 | 0.0110 |
| DVIX_8 | -0.000181947 | 0.0005343 | -0.341 | 0.7337 | 0.0003 |
| DVIX_9 | -0.000332336 | 0.0005296 | -0.628 | 0.5307 | 0.0011 |
| DVIX_10 | -0.00115773 | 0.0005071 | -2.28 | 0.0230 | 0.0143 |
| DPs_AUD3m | 0.0276341 | 0.02616 | 1.06 | 0.2916 | 0.0031 |
| DPs_AUD3m_1 | 0.0349198 | 0.02597 | 1.34 | 0.1795 | 0.0050 |
| DPs_AUD3m_2 | -0.0927548 | 0.02582 | -3.59 | 0.0004 | 0.0346 |
| DPs_AUD3m_3 | -0.0584681 | 0.02623 | -2.23 | 0.0264 | 0.0136 |
| DPs_AUD3m_4 | -0.0485459 | 0.02682 | -1.81 | 0.0711 | 0.0090 |
| DPs_AUD3m_5 | 0.0779902 | 0.02658 | 2.93 | 0.0036 | 0.0234 |
| DPs_AUD3m_6 | 0.0453843 | 0.02639 | 1.72 | 0.0864 | 0.0081 |
| DPs_AUD3m_7 | 0.0681918 | 0.02660 | 2.56 | 0.0108 | 0.0179 |
| DPs_AUD3m_8 | 0.0285262 | 0.02722 | 1.05 | 0.2954 | 0.0030 |
| DPs_AUD3m_9 | 0.0550906 | 0.02662 | 2.07 | 0.0392 | 0.0118 |
| DPs_AUD3m_10 | -0.0642772 | 0.02550 | -2.52 | 0.0121 | 0.0173 |
| EG_AUDres_3_1 | 0.0163763 | 0.009536 | 1.72 | 0.0868 | 0.0081 |

sigma 0.021817 RSS 0.171353994
R^2 0.861334 F(55,360) = 40.66 [0.000]**

Adj.R^2 0.840149 log-likelihood 1031.02
no. of observations 416 no. of parameters 56
mean(DPs_USD3m) -0.00352673 se(DPs_USD3m) 0.054568

AR 1-2 test: F(2,358) = 1.9070 [0.1500]
ARCH 1-1 test: F(1,414) = 4.1565 [0.0421]*
Normality test: Chi^2(2) = 47.329 [0.0000]**
Hetero test: F(110,305)= 8.4050 [0.0000]**
RESET23 test: F(2,358) = 25.643 [0.0000]**

T-test using robust std.error:

EG_AUDres_3_1 0.016376 1.7174 1.3427 1.3189 0.99280

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"EXOGENEIRY TEST FOR GRI"

THE COEFFICIENT IN FRONT OF EG_XRES_3_1 IS TESTED, X=REPRESENTING RISK PREMIUM UNDER CURRENCY J.

IN THE FOLLOWING ONLY THE ECM AND THE ROBUST T-VALUE OF THE LONG-RUN SOLUTION IS REPORTED.

FOR THE SEK, EUR AND GBP RISK PREMIUM AUTOMETRICS CONCLUDES WITH INSIGNIFICANCE OF THE LONGTERM SOLUTION IN ECM.

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NOK premium

EQ( 1) Modelling DGRI by OLS

The estimation sample is: 2008-09-19 - 2010-04-23

| | Coefficient | Std.Error | t-value | t-prob | Part.R^2 |
|---|---|---|---|---|---|
| DGRI_1 | 0.0401501 | 0.04982 | 0.806 | 0.4208 | 0.0017 |
| DGRI_2 | -0.0147762 | 0.04868 | -0.304 | 0.7616 | 0.0002 |
| DGRI_3 | -0.0485893 | 0.04887 | -0.994 | 0.3207 | 0.0026 |
| DGRI_4 | 0.0962694 | 0.04985 | 1.93 | 0.0542 | 0.0096 |
| DGRI_5 | -0.131341 | 0.04722 | -2.78 | 0.0057 | 0.0197 |
| Constant | -0.000135471 | 0.0002957 | -0.458 | 0.6471 | 0.0005 |
| DTEDspread | -0.0147360 | 0.005116 | -2.88 | 0.0042 | 0.0211 |
| DTEDspread_1 | 0.00301114 | 0.005185 | 0.581 | 0.5618 | 0.0009 |
| DTEDspread_2 | -0.00964707 | 0.005220 | -1.85 | 0.0653 | 0.0088 |
| DTEDspread_3 | -0.0115907 | 0.005172 | -2.24 | 0.0256 | 0.0129 |
| DTEDspread_4 | -0.0217390 | 0.004573 | -4.75 | 0.0000 | 0.0554 |
| DTEDspread_5 | 0.00383460 | 0.004488 | 0.854 | 0.3934 | 0.0019 |
| DVIX | 0.00128091 | 0.0001119 | 11.4 | 0.0000 | 0.2539 |
| DVIX_1 | 0.000683803 | 0.0001318 | 5.19 | 0.0000 | 0.0654 |
| DVIX_2 | 8.80762e-005 | 0.0001344 | 0.655 | 0.5126 | 0.0011 |
| DVIX_3 | 0.000267713 | 0.0001338 | 2.00 | 0.0461 | 0.0103 |
| DVIX_4 | 0.000166448 | 0.0001351 | 1.23 | 0.2188 | 0.0039 |

| | | | | | |
|---|---|---|---|---|---|
| DVIX_5 | 0.000535757 | 0.0001256 | 4.27 | 0.0000 | 0.0451 |
| DPs_USD3m | 0.0191091 | 0.01084 | 1.76 | 0.0786 | 0.0080 |
| DPs_USD3m_1 | -0.0139710 | 0.01092 | -1.28 | 0.2016 | 0.0042 |
| DPs_USD3m_2 | 0.0123384 | 0.01029 | 1.20 | 0.2313 | 0.0037 |
| DPs_USD3m_3 | 0.0113519 | 0.009478 | 1.20 | 0.2318 | 0.0037 |
| DPs_USD3m_4 | -0.00291688 | 0.009026 | -0.323 | 0.7467 | 0.0003 |
| DPs_USD3m_5 | -0.00435897 | 0.008436 | -0.517 | 0.6057 | 0.0007 |
| DPs_NOK3m | 0.00582213 | 0.003803 | 1.53 | 0.1266 | 0.0060 |
| DPs_NOK3m_1 | -0.00708824 | 0.003908 | -1.81 | 0.0705 | 0.0085 |
| DPs_NOK3m_2 | 0.00325304 | 0.003730 | 0.872 | 0.3837 | 0.0020 |
| DPs_NOK3m_3 | 0.00611704 | 0.003589 | 1.70 | 0.0891 | 0.0075 |
| DPs_NOK3m_4 | 0.00477171 | 0.003555 | 1.34 | 0.1803 | 0.0047 |
| DPs_NOK3m_5 | -0.00744337 | 0.003494 | -2.13 | 0.0338 | 0.0117 |
| EG_NOKres_3_1 | 0.00317884 | 0.002711 | 1.17 | 0.2417 | 0.0036 |

sigma 0.00596869 RSS 0.0137157043
R^2 0.461973 F(30,385) = 11.02 [0.000]**
Adj.R^2 0.420049 log-likelihood 1556.26
no. of observations 416 no. of parameters 31
mean(DGRI) -7.69927e-005 se(DGRI) 0.0078376

AR 1-2 test: F(2,383) = 3.6458 [0.0270]*
ARCH 1-1 test: F(1,414) = 50.922 [0.0000]**
Normality test: Chi^2(2) = 228.35 [0.0000]**
Hetero test: F(60,355) = 12.264 [0.0000]**
RESET23 test: F(2,383) = 11.701 [0.0000]**

| | Coefficients | t-SE | t-HACSE | t-HCSE | t-JHCSE |
|---|---|---|---|---|---|
| EG_NOKres_3_1 | 0.0031788 | 1.1725 | 0.99012 | 0.97249 | 0.64861 |

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SEK PREMIUM:

EQ( 5) Modelling DGRI by OLS

The estimation sample is: 2008-09-19 - 2010-04-23

| | Coefficient | Std.Error | t-value | t-prob | Part.R^2 |
|---|---|---|---|---|---|
| DGRI_1 | 0.0881918 | 0.04291 | 2.06 | 0.0405 | 0.0107 |
| DGRI_2 | -0.104465 | 0.04314 | -2.42 | 0.0159 | 0.0148 |
| DGRI_4 | 0.0944266 | 0.04169 | 2.27 | 0.0241 | 0.0130 |
| DGRI_5 | -0.130348 | 0.04400 | -2.96 | 0.0032 | 0.0221 |
| DGRI_7 | 0.0734303 | 0.03786 | 1.94 | 0.0531 | 0.0096 |
| DGRI_9 | -0.0603366 | 0.04561 | -1.32 | 0.1866 | 0.0045 |
| DGRI_10 | 0.0807466 | 0.04184 | 1.93 | 0.0544 | 0.0095 |
| DTEDspread | -0.0203400 | 0.005175 | -3.93 | 0.0001 | 0.0382 |
| DTEDspread_2 | -0.0343540 | 0.005353 | -6.42 | 0.0000 | 0.0957 |
| DTEDspread_3 | -0.0259018 | 0.005121 | -5.06 | 0.0000 | 0.0617 |
| DTEDspread_4 | -0.0252537 | 0.003096 | -8.16 | 0.0000 | 0.1460 |
| DTEDspread_6 | -0.0196313 | 0.004187 | -4.69 | 0.0000 | 0.0535 |

| | | | | | |
|---|---|---|---|---|---|
| DTEDspread_8 | -0.0104763 | 0.004660 | -2.25 | 0.0251 | 0.0128 |
| DTEDspread_9 | 0.0226339 | 0.004909 | 4.61 | 0.0000 | 0.0518 |
| DVIX | 0.00107993 | 0.0001094 | 9.87 | 0.0000 | 0.2002 |
| DVIX_1 | 0.000573201 | 0.0001150 | 4.98 | 0.0000 | 0.0600 |
| DVIX_3 | 0.000322598 | 0.0001075 | 3.00 | 0.0029 | 0.0226 |
| DVIX_5 | 0.000551302 | 0.0001154 | 4.78 | 0.0000 | 0.0554 |
| DVIX_9 | -0.000342246 | 0.0001197 | -2.86 | 0.0045 | 0.0206 |
| DPs_USD3m | 0.0300534 | 0.01041 | 2.89 | 0.0041 | 0.0210 |
| DPs_USD3m_1 | -0.0257359 | 0.008156 | -3.16 | 0.0017 | 0.0250 |
| DPs_USD3m_2 | 0.0399328 | 0.009865 | 4.05 | 0.0001 | 0.0404 |
| DPs_USD3m_3 | 0.0487678 | 0.009768 | 4.99 | 0.0000 | 0.0602 |
| DPs_USD3m_6 | 0.0231800 | 0.007815 | 2.97 | 0.0032 | 0.0221 |
| DPs_USD3m_8 | -0.0186250 | 0.009694 | -1.92 | 0.0554 | 0.0094 |
| DPs_USD3m_9 | -0.0241248 | 0.008415 | -2.87 | 0.0044 | 0.0207 |
| DPs_SEK3m | 0.00789127 | 0.006018 | 1.31 | 0.1905 | 0.0044 |

sigma 0.00558478 RSS 0.0121328133
log-likelihood 1581.77
no. of observations 416 no. of parameters 27
mean(DGRI) -7.69927e-005 se(DGRI) 0.0078376

AR 1-2 test: F(2,387) = 0.59118 [0.5542]
ARCH 1-1 test: F(1,414) = 6.5288 [0.0110]*
Normality test: Chi^2(2) = 93.905 [0.0000]**
Hetero test: F(54,361) = 8.3269 [0.0000]**
RESET23 test: F(2,387) = 28.367 [0.0000]**

Robust standard errors

| | Coefficients | t-SE | t-HACSE | t-HCSE | t-JHCSE |
|---|---|---|---|---|---|
| DGRI_1 | 0.088192 | 2.0554 | 1.3573 | 1.5379 | 0.89810 |
| DGRI_2 | -0.10446 | -2.4214 | -1.4678 | -1.4574 | -0.89719 |
| DGRI_4 | 0.094427 | 2.2652 | 1.6161 | 1.4195 | 0.87446 |
| DGRI_5 | -0.13035 | -2.9627 | -1.7398 | -1.8154 | -1.1450 |
| DGRI_7 | 0.073430 | 1.9398 | 1.1438 | 0.99624 | 0.59518 |
| DGRI_9 | -0.060337 | -1.3229 | -0.79269 | -0.87959 | -0.61709 |
| DGRI_10 | 0.080747 | 1.9297 | 1.6301 | 1.5906 | 1.0425 |
| DTEDspread | -0.020340 | -3.9304 | -2.5737 | -2.7418 | -1.4778 |
| DTEDspread_2 | -0.034354 | -6.4172 | -4.5349 | -4.4055 | -2.3682 |
| DTEDspread_3 | -0.025902 | -5.0583 | -3.5399 | -3.6068 | -1.9840 |
| DTEDspread_4 | -0.025254 | -8.1560 | -3.9203 | -4.0760 | -2.4311 |
| DTEDspread_6 | -0.019631 | -4.6892 | -2.4764 | -3.5121 | -1.9811 |
| DTEDspread_8 | -0.010476 | -2.2480 | -1.3331 | -1.4434 | -0.81886 |
| DTEDspread_9 | 0.022634 | 4.6102 | 3.0675 | 3.1381 | 1.6605 |
| DVIX | 0.0010799 | 9.8672 | 7.1483 | 7.2418 | 5.1247 |
| DVIX_1 | 0.00057320 | 4.9849 | 3.5723 | 3.5787 | 2.3878 |
| DVIX_3 | 0.00032260 | 3.0015 | 2.0459 | 2.0648 | 1.2940 |
| DVIX_5 | 0.00055130 | 4.7772 | 3.4223 | 3.1962 | 2.3943 |
| DVIX_9 | -0.00034225 | -2.8597 | -1.3778 | -1.7769 | -1.2064 |
| DPs_USD3m | 0.030053 | 2.8865 | 2.1360 | 2.3985 | 1.4327 |
| DPs_USD3m_1 | -0.025736 | -3.1556 | -2.4108 | -2.1348 | -1.3372 |
| DPs_USD3m_2 | 0.039933 | 4.0479 | 2.6004 | 2.6144 | 1.4395 |
| DPs_USD3m_3 | 0.048768 | 4.9928 | 3.3050 | 3.4125 | 2.0638 |

| | | | | | |
|---|---|---|---|---|---|
| DPs_USD3m_6 | 0.023180 | 2.9661 | 1.6999 | 2.1504 | 1.2717 |
| DPs_USD3m_8 | -0.018625 | -1.9212 | -1.1989 | -1.2015 | -0.82424 |
| DPs_USD3m_9 | -0.024125 | -2.8669 | -1.8718 | -1.6622 | -0.92600 |
| DPs_SEK3m | 0.0078913 | 1.3113 | 1.2989 | 1.0168 | 0.67415 |

THE EUR PREMIUM:

EQ( 1) Modelling DGRI by OLS

The estimation sample is: 2008-09-19 - 2010-04-23

| | Coefficient | Std.Error | t-value | t-prob | Part.R^2 |
|---|---|---|---|---|---|
| DGRI_1 | 0.0614592 | 0.04954 | 1.24 | 0.2155 | 0.0040 |
| DGRI_2 | -0.0277726 | 0.04903 | -0.566 | 0.5714 | 0.0008 |
| DGRI_3 | -0.0653730 | 0.04921 | -1.33 | 0.1848 | 0.0046 |
| DGRI_4 | 0.122294 | 0.04997 | 2.45 | 0.0148 | 0.0153 |
| DGRI_5 | -0.138038 | 0.04791 | -2.88 | 0.0042 | 0.0211 |
| Constant | -0.000102793 | 0.0002886 | -0.356 | 0.7219 | 0.0003 |
| DTEDspread | -0.0100276 | 0.004910 | -2.04 | 0.0418 | 0.0107 |
| DTEDspread_1 | 0.00733510 | 0.005032 | 1.46 | 0.1458 | 0.0055 |
| DTEDspread_2 | -0.00464750 | 0.005115 | -0.909 | 0.3641 | 0.0021 |
| DTEDspread_3 | -0.0157691 | 0.004960 | -3.18 | 0.0016 | 0.0256 |
| DTEDspread_4 | -0.0231999 | 0.004520 | -5.13 | 0.0000 | 0.0640 |
| DTEDspread_5 | 0.00223798 | 0.004395 | 0.509 | 0.6109 | 0.0007 |
| DVIX | 0.00102279 | 0.0001157 | 8.84 | 0.0000 | 0.1686 |
| DVIX_1 | 0.000554538 | 0.0001283 | 4.32 | 0.0000 | 0.0463 |
| DVIX_2 | 9.44304e-005 | 0.0001294 | 0.730 | 0.4660 | 0.0014 |
| DVIX_3 | 0.000385981 | 0.0001307 | 2.95 | 0.0033 | 0.0221 |
| DVIX_4 | 4.41001e-005 | 0.0001320 | 0.334 | 0.7385 | 0.0003 |
| DVIX_5 | 0.000467190 | 0.0001238 | 3.77 | 0.0002 | 0.0357 |
| DPs_USD3m | 0.00557558 | 0.01041 | 0.536 | 0.5925 | 0.0007 |
| DPs_USD3m_1 | -0.0207061 | 0.01073 | -1.93 | 0.0543 | 0.0096 |
| DPs_USD3m_2 | 0.00321653 | 0.01004 | 0.320 | 0.7488 | 0.0003 |
| DPs_USD3m_3 | 0.0213886 | 0.009432 | 2.27 | 0.0239 | 0.0132 |
| DPs_USD3m_4 | 0.00956928 | 0.009178 | 1.04 | 0.2978 | 0.0028 |
| DPs_USD3m_5 | -0.00621890 | 0.008651 | -0.719 | 0.4727 | 0.0013 |
| DPs_EUR3m | 0.0627667 | 0.01027 | 6.11 | 0.0000 | 0.0885 |
| DPs_EUR3m_1 | -0.00472484 | 0.01067 | -0.443 | 0.6581 | 0.0005 |
| DPs_EUR3m_2 | -0.0143400 | 0.01077 | -1.33 | 0.1837 | 0.0046 |
| DPs_EUR3m_3 | -0.00126025 | 0.01054 | -0.120 | 0.9049 | 0.0000 |
| DPs_EUR3m_4 | 0.00539699 | 0.01017 | 0.531 | 0.5959 | 0.0007 |
| DPs_EUR3m_5 | -0.00729636 | 0.01025 | -0.712 | 0.4768 | 0.0013 |
| EG_EURres_4_1 | 0.00811742 | 0.004153 | 1.95 | 0.0513 | 0.0098 |

| | | | |
|---|---|---|---|
| sigma | 0.00583078 | RSS | 0.0130892075 |
| R^2 | 0.486549 | F(30,385) = | 12.16 [0.000]** |
| Adj.R^2 | 0.44654 | log-likelihood | 1565.99 |
| no. of observations | 416 | no. of parameters | 31 |
| mean(DGRI) | -7.69927e-005 | se(DGRI) | 0.0078376 |

AR 1-2 test: F(2,383) = 2.5977 [0.0758]
ARCH 1-1 test: F(1,414) = 21.395 [0.0000]**
Normality test: Chi^2(2) = 193.42 [0.0000]**
Hetero test: F(60,355) = 7.6115 [0.0000]**

RESET23 test: F(2,383) = 10.312 [0.0000]**

| | Coefficients | t-SE | t-HACSE | t-HCSE | t-JHCSE |
|---|---|---|---|---|---|
| EG_EURres_4_1 | 0.0081174 | 1.9547 | 1.9844 | 1.7901 | 1.6251 |

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GBP PREMIUM:

EQ( 8) Modelling DGRI by OLS

The estimation sample is: 2008-09-19 - 2010-04-23

| | Coefficient | Std.Error | t-value | t-prob | Part.R^2 |
|---|---|---|---|---|---|
| DGRI_2 | -0.0779947 | 0.03930 | -1.98 | 0.0479 | 0.0099 |
| DGRI_5 | -0.121689 | 0.04247 | -2.87 | 0.0044 | 0.0204 |
| DGRI_9 | -0.0940042 | 0.04334 | -2.17 | 0.0307 | 0.0118 |
| DTEDspread | -0.00998577 | 0.003140 | -3.18 | 0.0016 | 0.0250 |
| DTEDspread_2 | -0.0242077 | 0.004758 | -5.09 | 0.0000 | 0.0617 |
| DTEDspread_3 | -0.0160306 | 0.004722 | -3.40 | 0.0008 | 0.0284 |
| DTEDspread_4 | -0.0221280 | 0.002975 | -7.44 | 0.0000 | 0.1232 |
| DTEDspread_6 | -0.0191089 | 0.003944 | -4.84 | 0.0000 | 0.0562 |
| DTEDspread_8 | -0.0171911 | 0.003026 | -5.68 | 0.0000 | 0.0757 |
| DTEDspread_9 | 0.0115623 | 0.003313 | 3.49 | 0.0005 | 0.0300 |
| DVIX | 0.000974353 | 0.0001124 | 8.67 | 0.0000 | 0.1602 |
| DVIX_1 | 0.000553804 | 9.948e-005 | 5.57 | 0.0000 | 0.0729 |
| DVIX_3 | 0.000172130 | 0.0001013 | 1.70 | 0.0899 | 0.0073 |
| DVIX_5 | 0.000532838 | 0.0001047 | 5.09 | 0.0000 | 0.0617 |
| DVIX_9 | -0.000300954 | 0.0001147 | -2.62 | 0.0090 | 0.0172 |
| DPs_USD3m_2 | 0.0188369 | 0.008398 | 2.24 | 0.0255 | 0.0126 |
| DPs_USD3m_3 | 0.0279547 | 0.008610 | 3.25 | 0.0013 | 0.0261 |
| DPs_USD3m_6 | 0.0176848 | 0.007130 | 2.48 | 0.0135 | 0.0154 |
| DPs_GBR3m | 0.0173875 | 0.004204 | 4.14 | 0.0000 | 0.0416 |
| DPs_GBR3m_1 | 0.0195074 | 0.004268 | 4.57 | 0.0000 | 0.0503 |
| DPs_GBR3m_9 | -0.00890890 | 0.004104 | -2.17 | 0.0305 | 0.0118 |
| DPs_GBR3m_10 | 0.0108068 | 0.004170 | 2.59 | 0.0099 | 0.0168 |

sigma 0.00546708 RSS 0.0117762639
log-likelihood 1587.97
no. of observations 416 no. of parameters 22
mean(DGRI) -7.69927e-005 se(DGRI) 0.0078376

AR 1-2 test: F(2,392) = 0.62093 [0.5380]
ARCH 1-1 test: F(1,414) = 10.001 [0.0017]**
Normality test: Chi^2(2) = 95.439 [0.0000]**
Hetero test: F(44,371) = 10.100 [0.0000]**
RESET23 test: F(2,392) = 12.047 [0.0000]**

| | Coefficients | t-SE | t-HACSE | t-HCSE | t-JHCSE |
|---|---|---|---|---|---|
| DGRI_2 | -0.077995 | -1.9844 | -1.1127 | -1.0931 | -0.76709 |
| DGRI_5 | -0.12169 | -2.8654 | -1.5232 | -1.5872 | -1.1056 |
| DGRI_9 | -0.094004 | -2.1690 | -1.1904 | -1.4660 | -1.0776 |
| DTEDspread | -0.0099858 | -3.1805 | -1.9753 | -1.9774 | -1.1926 |
| DTEDspread_2 | -0.024208 | -5.0881 | -2.9683 | -2.7764 | -1.6684 |
| DTEDspread_3 | -0.016031 | -3.3951 | -3.0861 | -2.1958 | -1.3992 |
| DTEDspread_4 | -0.022128 | -7.4392 | -3.8841 | -3.5738 | -2.3789 |
| DTEDspread_6 | -0.019109 | -4.8448 | -2.4269 | -3.5082 | -2.4198 |
| DTEDspread_8 | -0.017191 | -5.6809 | -2.6192 | -2.7999 | -1.7064 |
| DTEDspread_9 | 0.011562 | 3.4898 | 1.6970 | 1.8398 | 1.1423 |
| DVIX | 0.00097435 | 8.6701 | 5.8523 | 5.9493 | 4.4394 |
| DVIX_1 | 0.00055380 | 5.5668 | 3.4681 | 3.3619 | 2.3798 |
| DVIX_3 | 0.00017213 | 1.7000 | 1.2406 | 1.0295 | 0.72760 |
| DVIX_5 | 0.00053284 | 5.0887 | 3.8295 | 3.5164 | 2.7088 |
| DVIX_9 | -0.00030095 | -2.6237 | -1.3492 | -1.5824 | -1.1817 |
| DPs_USD3m_2 | 0.018837 | 2.2429 | 1.1964 | 1.2198 | 0.69486 |
| DPs_USD3m_3 | 0.027955 | 3.2469 | 2.2722 | 1.8930 | 1.2272 |
| DPs_USD3m_6 | 0.017685 | 2.4803 | 1.3560 | 1.8007 | 1.2294 |
| DPs_GBR3m | 0.017387 | 4.1359 | 3.3876 | 3.3363 | 1.6383 |
| DPs_GBR3m_1 | 0.019507 | 4.5705 | 3.3046 | 3.3652 | 1.8982 |
| DPs_GBR3m_9 | -0.0089089 | -2.1708 | -1.8921 | -1.2449 | -0.59462 |
| DPs_GBR3m_10 | 0.010807 | 2.5913 | 2.3259 | 2.5681 | 1.3983 |

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THE CAD PREMIUM;

EQ( 5) Modelling DGRI by OLS

The estimation sample is: 2008-09-19 - 2010-04-23

| | Coefficient | Std.Error | t-value | t-prob | Part.R^2 |
|---|---|---|---|---|---|
| DGRI_4 | 0.0767024 | 0.04176 | 1.84 | 0.0670 | 0.0083 |
| DGRI_5 | -0.0980994 | 0.04383 | -2.24 | 0.0258 | 0.0122 |
| DTEDspread_2 | -0.0106043 | 0.003182 | -3.33 | 0.0009 | 0.0267 |
| DTEDspread_4 | -0.0159100 | 0.002896 | -5.49 | 0.0000 | 0.0694 |
| DVIX | 0.00108648 | 9.740e-005 | 11.2 | 0.0000 | 0.2350 |
| DVIX_1 | 0.000784754 | 9.728e-005 | 8.07 | 0.0000 | 0.1384 |
| DVIX_5 | 0.000510225 | 0.0001106 | 4.62 | 0.0000 | 0.0500 |
| DPsCAD_3m_2 | 0.0149389 | 0.006975 | 2.14 | 0.0328 | 0.0112 |
| DPsCAD_3m_3 | -0.0314265 | 0.006698 | -4.69 | 0.0000 | 0.0516 |
| DPsCAD_3m_5 | 0.0275539 | 0.006140 | 4.49 | 0.0000 | 0.0474 |
| EG_CADres_per3_1 | -0.00179909 | 0.002757 | -0.653 | 0.5144 | 0.0011 |

sigma 0.00586286 RSS 0.0139210948
log-likelihood 1553.17
no. of observations 416 no. of parameters 11
mean(DGRI) -7.69927e-005 se(DGRI) 0.0078376

AR 1-2 test: F(2,403) = 0.20065 [0.8183]
ARCH 1-1 test: F(1,414) = 8.6257 [0.0035]**
Normality test: Chi^2(2) = 153.42 [0.0000]**
Hetero test: F(22,393) = 12.223 [0.0000]**

Hetero-X test: F(77,338) = 24.218 [0.0000]**
RESET23 test: F(2,403) = 41.503 [0.0000]**

Robust standard errors

| | Coefficients | t-SE | t-HACSE | t-HCSE |
|---|---|---|---|---|
| EG_CADres_per3_1 | -0.0017991 | -0.65257 | -0.43728 | -0.39405 |

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THE AUD premium:

EQ( 6) Modelling DGRI by OLS

The estimation sample is: 2008-09-19 - 2010-04-23

| | Coefficient | Std.Error | t-value | t-prob | Part.R^2 |
|---|---|---|---|---|---|
| DGRI_1 | 0.0370717 | 0.04875 | 0.760 | 0.4474 | 0.0015 |
| DGRI_2 | -0.0428862 | 0.04883 | -0.878 | 0.3803 | 0.0020 |
| DGRI_3 | -0.0605629 | 0.04905 | -1.23 | 0.2177 | 0.0039 |
| DGRI_4 | 0.142760 | 0.04945 | 2.89 | 0.0041 | 0.0212 |
| DGRI_5 | -0.163380 | 0.04689 | -3.48 | 0.0006 | 0.0306 |
| Constant | -0.000144221 | 0.0002962 | -0.487 | 0.6266 | 0.0006 |
| DTEDspread | -0.00896002 | 0.005507 | -1.63 | 0.1045 | 0.0068 |
| DTEDspread_1 | 0.00679632 | 0.005399 | 1.26 | 0.2088 | 0.0041 |
| DTEDspread_2 | -0.00997829 | 0.005208 | -1.92 | 0.0561 | 0.0094 |
| DTEDspread_3 | -0.0175026 | 0.005062 | -3.46 | 0.0006 | 0.0301 |
| DTEDspread_4 | -0.0231084 | 0.004611 | -5.01 | 0.0000 | 0.0612 |
| DTEDspread_5 | 0.00395587 | 0.004654 | 0.850 | 0.3958 | 0.0019 |
| DVIX | 0.00124083 | 0.0001157 | 10.7 | 0.0000 | 0.2300 |
| DVIX_1 | 0.000624168 | 0.0001319 | 4.73 | 0.0000 | 0.0550 |
| DVIX_2 | 9.66530e-005 | 0.0001324 | 0.730 | 0.4658 | 0.0014 |
| DVIX_3 | 0.000365889 | 0.0001322 | 2.77 | 0.0059 | 0.0195 |
| DVIX_4 | 5.12267e-005 | 0.0001334 | 0.384 | 0.7011 | 0.0004 |
| DVIX_5 | 0.000508992 | 0.0001268 | 4.01 | 0.0001 | 0.0402 |
| DPs_USD3m | 0.0141704 | 0.01148 | 1.23 | 0.2178 | 0.0039 |
| DPs_USD3m_1 | -0.0205739 | 0.01124 | -1.83 | 0.0680 | 0.0086 |
| DPs_USD3m_2 | 0.0154481 | 0.01014 | 1.52 | 0.1285 | 0.0060 |
| DPs_USD3m_3 | 0.0267376 | 0.009565 | 2.80 | 0.0054 | 0.0199 |
| DPs_USD3m_4 | 0.00513990 | 0.009132 | 0.563 | 0.5739 | 0.0008 |
| DPs_USD3m_5 | -0.00839775 | 0.008705 | -0.965 | 0.3353 | 0.0024 |
| DPs_AUD3m | 0.00371855 | 0.006311 | 0.589 | 0.5561 | 0.0009 |
| DPs_AUD3m_1 | -0.0156096 | 0.006101 | -2.56 | 0.0109 | 0.0167 |
| DPs_AUD3m_2 | -0.00249748 | 0.006439 | -0.388 | 0.6983 | 0.0004 |
| DPs_AUD3m_3 | -0.00584323 | 0.006415 | -0.911 | 0.3629 | 0.0022 |
| DPs_AUD3m_4 | -0.0136951 | 0.006287 | -2.18 | 0.0300 | 0.0122 |
| DPs_AUD3m_5 | 0.0147667 | 0.006352 | 2.32 | 0.0206 | 0.0138 |
| EG_AUDres_3_1 | 0.000398753 | 0.002463 | 0.162 | 0.8715 | 0.0001 |

| | | | |
|---|---|---|---|
| sigma | 0.00598851 | RSS | 0.0138069727 |
| R^2 | 0.458393 | F(30,385) = | 10.86 [0.000]** |
| Adj.R^2 | 0.41619 | log-likelihood | 1554.88 |

no. of observations 416 no. of parameters 31
mean(DGRI) -7.69927e-005 se(DGRI) 0.0078376

AR 1-2 test: F(2,383) = 3.1103 [0.0457]*
ARCH 1-1 test: F(1,414) = 29.431 [0.0000]**
Normality test: Chi^2(2) = 191.92 [0.0000]**
Hetero test: F(60,355) = 12.939 [0.0000]**
RESET23 test: F(2,383) = 13.782 [0.0000]**

| | Coefficients | t-SE | t-HACSE | t-HCSE | t-JHCSE |
|---|---|---|---|---|---|
| EG_AUDres_3_1 | 0.00039875 | 0.16189 | 0.12203 | 0.12422 | 0.10016 |

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THE USD PRmeium:

EQ(10) Modelling DGRI by OLS

The estimation sample is: 2008-09-19 - 2010-04-23

| | Coefficient | Std.Error | t-value | t-prob | Part.R^2 |
|---|---|---|---|---|---|
| DGRI_4 | 0.124680 | 0.04034 | 3.09 | 0.0021 | 0.0230 |
| DGRI_5 | -0.163147 | 0.04279 | -3.81 | 0.0002 | 0.0346 |
| DTEDspread | -0.0126097 | 0.004812 | -2.62 | 0.0091 | 0.0166 |
| DTEDspread_4 | -0.0182651 | 0.002957 | -6.18 | 0.0000 | 0.0859 |
| DVIX | 0.00121233 | 0.0001055 | 11.5 | 0.0000 | 0.2453 |
| DVIX_1 | 0.000762223 | 0.0001039 | 7.34 | 0.0000 | 0.1170 |
| DVIX_5 | 0.000516653 | 0.0001145 | 4.51 | 0.0000 | 0.0478 |
| DPs_USD3m | 0.0229289 | 0.009660 | 2.37 | 0.0181 | 0.0137 |
| DPs_USD3m_1 | -0.0151280 | 0.006603 | -2.29 | 0.0225 | 0.0128 |
| EG_USres_3_1 | 0.00388255 | 0.003370 | 1.15 | 0.2499 | 0.0033 |

sigma 0.00610747 RSS 0.0151443042
log-likelihood 1535.65
no. of observations 416 no. of parameters 10
mean(DGRI) -7.69927e-005 se(DGRI) 0.0078376

AR 1-2 test: F(2,404) = 1.9123 [0.1491]
ARCH 1-1 test: F(1,414) = 40.300 [0.0000]**
Normality test: Chi^2(2) = 192.06 [0.0000]**
Hetero test: F(20,395) = 12.432 [0.0000]**
Hetero-X test: F(65,350) = 33.210 [0.0000]**
RESET23 test: F(2,404) = 17.924 [0.0000]**

| | Coefficients | t-SE | t-HACSE | t-HCSE | t-JHCSE |
|---|---|---|---|---|---|
| EG_USres_3_1 | 0.0038825 | 1.1522 | 0.90884 | 0.66918 | 0.56052 |