# ON EGYPT'S DE FACTO INTEGRATION IN THE INTERNATIONAL FINANCIAL MARKET

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## INTRODUCTION

Egypt has been gradually dismantling legal restrictions on the entry and exit of capital flows since the early 1990s. Since then the economy has been experiencing intermittent episodes of capital inflows and outflows. Most remarkably, in the wake of the international financial crisis of late 2008, the capital and financial account of Egypt's balance of payments was hit hard as inflows dropped drastically. Net portfolio investment in Egypt decreased by a staggering 570 percent to reach an outflow of more than $9.2 billion in 2008/09. This was reversed to achieve a net inflow in the following year, but once again returned to a net outflow of $2.6 billion in 2010/11 due to the uncertainty brought about by the January 25$^{th}$ revolution. On the one hand, the volatility that portfolio investments have been exhibiting may point to a high degree of financial integration/capital mobility. But on the other hand, preliminary assessment of the rates of return on financial assets in Egypt shows that their behavior is secular from that of its foreign counterparts. That is, a large and varying differential exists between the rates of return on domestic and foreign financial assets, which is inconsistent with a high level of financial integration/capital mobility.

Given such contradicting observations, so how well is the Egyptian economy *de facto* integrated in the world financial market? And does capital mobility complicate the actions of the Central Bank of Egypt in a way that would inhibit monetary autonomy (especially that the exchange rate has been quite stable in Egypt even after the announced floatation in January 2003)? Moreover, while Egypt has become *de jure* financially open, what explains the persistence of this rate of return differential between domestic and foreign financial assets?

Answering these questions is important to understanding how the macroeconomy works. The domestic policies' effectiveness in changing aggregate demand is determined—among other factors—by the degree of the economy's international financial integration. This notion could be better explained in light of the *impossible trinity.* A country that has a pegged exchange rate and a high degree of capital mobility will have no autonomous monetary policy. On the other hand, a country that has a floating exchange rate and a high degree of capital mobility will be able to conduct an autonomous monetary policy, but high capital mobility would imply bigger fluctuations in the exchange rate in response to monetary shocks (Mundell 1963; Dornbusch 1976).

In light of the above, the objective of the paper is two-fold: *first*, to formally test whether Egypt has become *de facto* financially open after the steps taken towards the *de jure* liberalization of the capital and financial account of the balance of payments; *second*, to explain the presence of the large and varying rate of return differential between domestic and foreign financial assets.

For the first objective of this study, we ran two empirical tests: the uncovered interest parity (UIP) test and a monetary autonomy test. Using monthly data, UIP failed to hold, as the exchange rate-adjusted differential between Egyptian 3-month Treasury bill rates and the US counterpart has been found to be nonstationary for the whole period under study (January 2000-December 2011) and for the shorter period that witnessed a large episode of capital inflows (July 2004–June 2008). Also, the monetary autonomy test has shown that the growth rate in the monetary aggregate (M2) Granger-causes movements in the exchange rate-adjusted differential for the whole period under study, as well as the shorter period of high capital inflows. This means that despite the stable exchange rate, and the *de jure* capital and financial openness, the Central Bank of Egypt has been capable of effecting changes in the domestic interest rate. This means that monetary autonomy has been preserved. UIP and monetary autonomy tests both point to a low degree of international financial integration for Egypt.

For the second objective of this study, initially we test for the presence of a long-run equilibrium relationship between the interest rate differential and its potential macro determinants. For the period 2001/02–2010/11, using quarterly data, cointegration was detected between the following five variables: (1) nominal interest rate spread between Egyptian and US 3-month Treasury bill rates, (2) log of the bilateral exchange rate (LE/$), (3) differential between logs of monetary aggregates (M2) in Egypt and the US, (4) differential between the logs of real output in Egypt and the US, and (5) expected differential between the inflation rates in Egypt and the US. Having detected a long-run equilibrium relationship, a vector error-correction model (VECM) was estimated. The generated forecast error variance decomposition shows that the *expected inflation differential* is the most important contributor to the variation in the differential between domestic and foreign 3-month Treasury bill rates.

The rest of the paper is organized as follows. Section I provides an overview of three main areas of the Egyptian economy that are relevant to the study of international financial

integration: (1) the gradual *de jure* liberalization of the capital and financial account of Egypt's balance of payments, (2) developments in the exchange rate, and (3) the evolution of the domestic interest rate in Egypt, as well as that of the US. This also sheds light on domestic financial reforms that have affected the behavior of domestic interest rates as well as the conduct of monetary policy. Thus the purpose of this section is to give a picture of the macroeconomic context —the three legs of the *impossible trinity*—that guides our empirical investigation. Section II is dedicated to the literature review on the approaches to measuring *de facto* international financial integration that are later applied in the empirical section. Section III presents empirical findings of this study based on the UIP test, the test of monetary autonomy, and the cointegration/VECM analysis. Section IV concludes.

## I. Developments in Egypt's Capital and Financial Account, Exchange Rate, and Domestic Financial Market since the Early 1990s

In this section, we trace the developments of the main variables that pertain to the analysis of Egypt's integration in the world financial market. This helps in getting a preliminary assessment of the issue before embarking on the more formal testing, and also serves as a basis upon which necessary assumptions will be built in the empirical section, and for identifying the time period that will be most suitable for the empirical tests.

We start by tracking *de jure* capital and financial liberalization since Egypt adopted the Economic Reform and Structural Adjustment Program (ERSAP). As we make use of the *impossible trinity* as an analytical framework for the analysis, we also cover developments in the prevailing exchange rate regimes as well as the reforms undertaken in the domestic financial market in Egypt, in an attempt to explain the behavior of domestic interest rates vis-à-vis that of foreign counterparts.

***Egypt has started taking steps towards "de jure" financial openness*** since the early 1990s under ERSAP. Capital controls/arrangements could be summarized according to the country's regulations pertaining to the following categories: (1) personal capital transactions, (2) surrender requirements that capital transactions may entail (the stipulation that a certain percentage of foreign currency receipts had to be deposited with the Central Bank or with authorized dealers), (3) capital market and money market instruments, and collective investment securities, (4) derivatives (if any), (5) commercial and financial credit operations, (6) direct investment, and on its liquidation, (7) real estate transactions, and (8) provisions

specific to commercial banks and institutional investors.[1] The details of the developments in these capital control categories and significant milestones are outlined in Appendix (1), but here we briefly present the most important characteristics of Egypt's *de jure* capital and financial openness:[2]

Egypt maintains no restrictions on nonresidents' purchase, sale and issue of capital and money market instruments and collective investment securities in the local market. Residents' investment abroad is subject to minor restrictions: specifically, private pension funds are not allowed to purchase foreign securities or assets abroad.

Further, Egypt does not stipulate surrender requirements pertaining to any capital transactions. Also, there are no restrictions on personal capital transactions nor on credit operations and real estate transactions. And while there are no controls on outward foreign direct investment, inward foreign direct investment is subject to the administrative control that requires that all foreign direct investment inflows must be registered by the General Authority for Investment (pursuant to Laws 8/1997 and 159/1981). Also, there are no restrictions on the liquidation of direct investment. Finally, Egypt still maintains a number of restrictions on institutional investors (insurance companies, pension funds and investment firms and funds). There are maximum limits on securities issued by nonresident institutional investors, and on investment portfolios held abroad by institutional investors. Moreover, there are minimum limits on insurance companies' and pension funds' investment portfolios held locally.

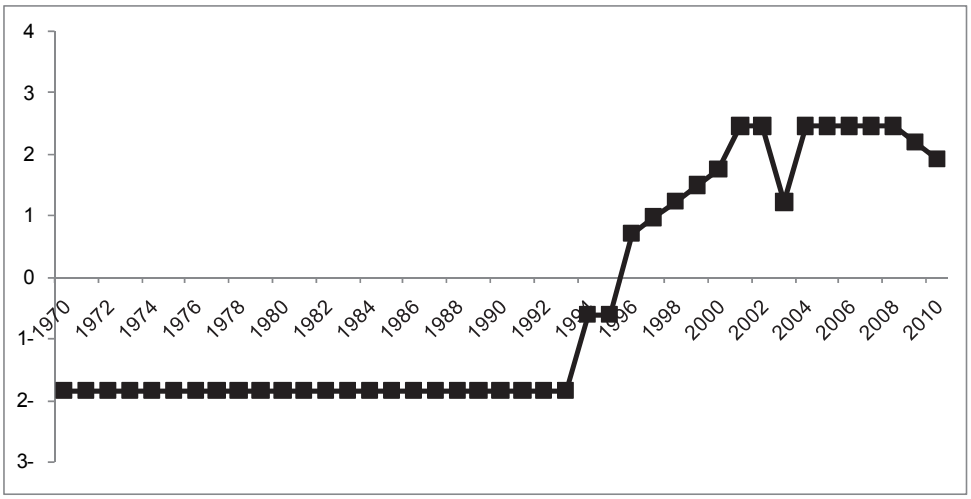
Finally, there are administrative regulations pertaining to investment funds' local and international investments. Investment funds must issue a prospectus approved by the Egyptian Financial Supervisory Authority (EFSA) whose approval is required for issuance of a public or private offering of investment funds.

[1] These eight categories draw on the International Monetary Fund (IMF) classifications of capital restrictions as they appear in its *Annual Report on Exchange Arrangements and Exchange Restrictions* (AREAER). AREAER includes developments in the exchange rate regimes as well as in the arrangements that pertain to cross-border trade and capital transactions.

[2] The description of the status of Egypt's capital openness in this section depends on the latest AREAER that covered 2011.

Chinn and Ito (2008) constructed a "capital openness index" that takes higher values the more open the country is to cross-border capital transactions (Figure 1). [3]

**Figure 1. Chinn and Ito's Capital Account Openness Index (1970–2010)**




*Source*: Chinn and Ito index online http://web.pdx.edu/~ito/Chinn-Ito_website.htm.

Figure 1 shows that Egypt started to liberalize its capital and financial account during the early 1990s. *De jure* capital liberalization measures included the following. In 1994, the requirement that capital transactions be restricted through authorized banks only was cancelled, and so transactions in Egyptian and foreign assets registered at the stock market in Egypt were allowed to be mediated through the foreign exchange market instead of authorized banks. Also, surrender requirements were abolished and restrictions on outward personal capital transactions were removed. In 1996, restrictions affecting the timing of the transfer abroad by nonresidents of the proceeds of sales of Egyptian real estate were eliminated. In 1997, controls on the liquidation of direct investment were removed (as per Law 8/1997). Prior to that, invested capital had to be repatriated within limits, or was subject to the General Authority for Investment's approval.

As per the Chinn-Ito index, Egypt's *de jure* capital and financial openness continued rather steadily until the observed drop in the index in 2003. This drop is explained by several restrictive measures temporarily introduced to accompany the announcement of floating the Egyptian pound in January 2003; a special exchange rate (of LE 5.35 per $1) applicable to key imported foods was introduced. Also, private and state-owned exporting companies were

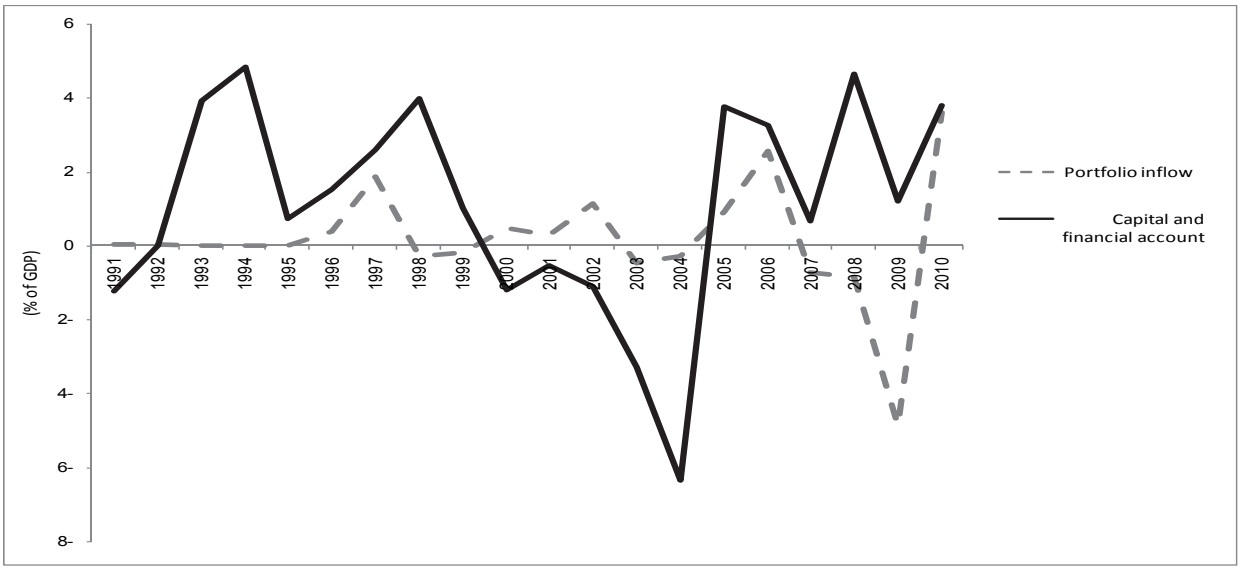
[3] The capital openness index is based on the binary dummy variables that codify the tabulation of restrictions on cross-border financial transactions reported in the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER) (Chinn and Ito 2008).

required to sell at least 75 percent of their foreign currency earnings to state-owned banks. Foreign investors' remittances of profits and dividends were made subject to delays. Those temporary measures were later removed in 2004.

With the exception of the year 2003, Egypt was classified as having a *de jure* open capital and financial account of the balance of payments, according to the Chinn-Ito index during the period 2001–2008. In fact, Egypt's score on this index during this period was "2.45573," which is the highest possible score, and is comparable to that of industrial countries such as the US, the UK and several European countries. The years 2009 and 2010 have seen declines in the level of *de jure* openness as the economy took measures to hedge the adverse effects of the global financial crisis.

Now it is important to see how the legal liberalization of the capital and financial account of the balance of payments has affected the volume of capital inflows in Egypt. We are particularly interested in *portfolio flows* as they are most relevant to the analysis of Egypt's international *financial integration*. Those are presented in Figures 2 and 3 below.

**Figure 2. Capital and Financial Account of the Balance of Payments and Net Portfolio Inflows (% of GDP) (1990/91–2010/11)**



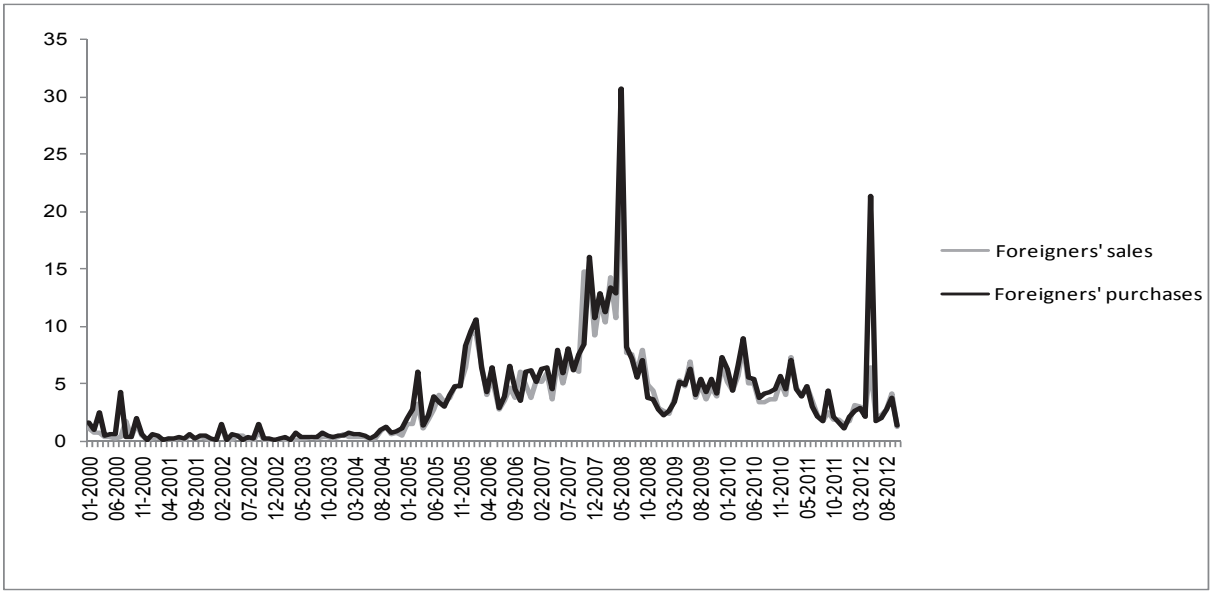

*Source*: Central Bank of Egypt website, online time series: http://www.cbe.org.eg/timeSeries.htm.

Portfolio inflows were quite modest during the early 1990s, but started to pick up during the early 2000s, especially after 2003/04 coinciding with the *de jure* liberalization of the capital and financial account of the balance of payments. In 2005/06, portfolio inflows reached 3 percent of GDP. But that was reversed into a portfolio outflow (reaching a volume

of $9.2 billion, amounting to 5 percent of GDP in 2008/09) on account of the international financial crisis. This was reversed once again in 2009/10 to achieve an inflow of 4 percent of GDP in 2009/10 when the Egyptian economy started recovering from the crisis.

Also, examining the activity in the Egyptian stock exchange, it appears that the volume of sales and purchases by foreigners has also increased towards the end of calendar year 2004 (Figure 3).

**Figure 3. Foreigners' Activity in the Egyptian Exchange (January 2001–July 2012), LE Billions**




*Source*: Unpublished data provided upon request from the Egyptian Exchange (EGX).

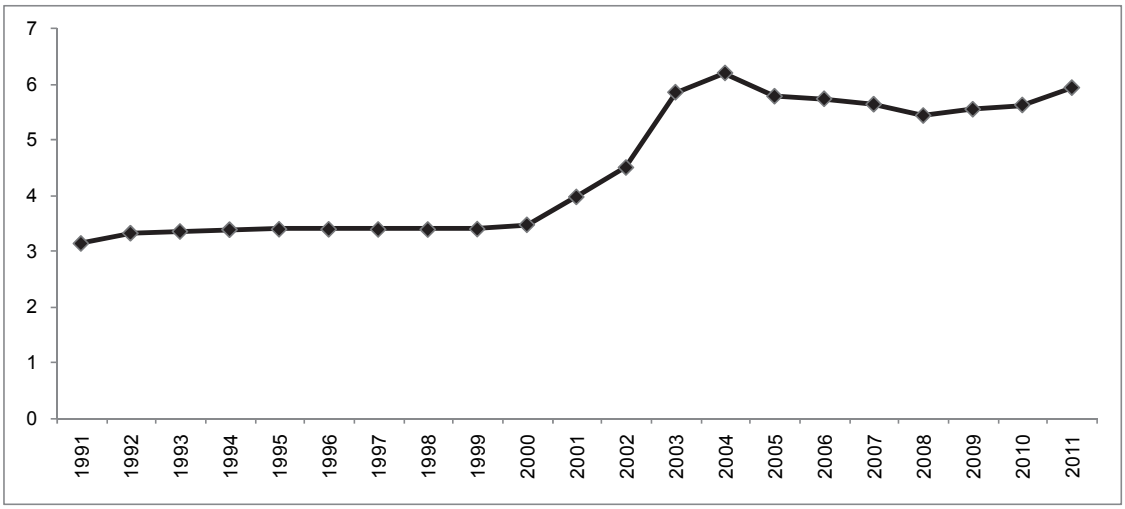
Thus, it appears that portfolio inflows increased in terms of volume—and also became more volatile—after dismantling legal restrictions on capital flows. From Figures 2 and 3, we are particularly interested in the period 2003/04–2007/08 as there seems to be increased activity in portfolio investments. This period also coincides with the period of *de jure* capital and financial openness according to the Chinn-Ito index. Thus the empirical part of this study will attempt to investigate Egypt's *de facto* financial openness during this period in particular.

We now move to the other two areas that warrant consideration before embarking on the empirical part. We trace the evolution of the exchange rate, as well as measures that have been taken to reform the financial market in Egypt. Those are taken up next.

*Regarding developments in the exchange rate,* Egypt's exchange rate has been pegged to the US dollar and acted as the monetary policy nominal anchor since the inception of the

Economic Reform and Structural Adjustment Program (ERSAP) in 1991.[4] The stability of the exchange rate up until 1998/99 is exhibited in Figure 4 below.

**Figure 4. Bilateral Exchange Rate (LE/$) (1990/91–2010/11)**




*Source*: IMF International Financial Statistics online database.

But the pressure on the Egyptian pound was building towards the end of 1998/99, and so the central bank allowed for a depreciation of the official rate and introduced a band around the central rate that was devalued on a number of occasions throughout 2000/01 and 2001/02 (Panizza 2002). Thus the exchange rate regime was classified by the IMF as "pegged within a horizontal band." In January 2003, Egypt announced the floatation of the Egyptian pound. However, the exchange rate seems to have been closely managed as the central bank intervened in the foreign exchange market to mop up excess liquidity spurred by large capital inflows. This was also shown by the buildup of net international reserves. Indeed, the exchange rate exhibited only limited movements despite several external shocks; strong capital inflows during the 2004/05–2007/08 period and large outflows following the 2008 financial crisis (Selim 2012a).

In its *Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER)*, the IMF had been modifying the classification of the exchange rate regime in Egypt over the years since the early 1990s till 2011: ranging from a conventional peg, to a managed float, and then to a managed float with no preannounced path. However, attempts to determine the *de facto* exchange rate regime in Egypt did not find any dramatic changes in the regime classification: Ilzetzki, Reinhart and Rogoff (2008) classified the Egyptian exchange rate

[4] Selim (2012b) points out that the Egyptian pound peg to the US dollar dates back to the 1960s.

regime as a *de facto* moving peg to the US dollar throughout the period 1991–2007. Selim (2012b) showed that after the *announced* floatation of the Egyptian pound in January 2003, the exchange rate remained stable, despite very intense reserve volatility between FY05 and FY07. According to Selim's classification, only 2008/09 could be classified as a float.

The above review of the *de facto* exchange rate regime is important to the use of the *impossible trinity* framework. As the exchange rate regime has ranged between a *fixed* and a *strongly managed* regime since the early 1990s, exploring the extent of monetary autonomy will have implications for the degree of Egypt's financial integration. In other words, the stable exchange rate will allow us to interpret the preservation of monetary autonomy as a low degree of financial integration.

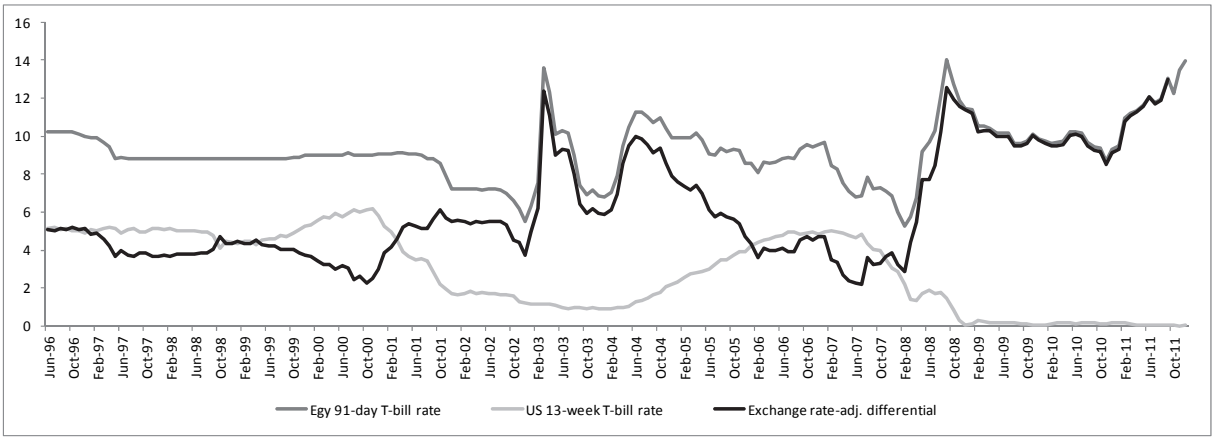
*Now we turn to analyzing the behavior of the domestic short-term interest rate* in Egypt. We first trace the developments in domestic financial reforms, and then plot the movements in domestic interest rates against those of foreign counterparts in order to assess to what extent the international financial market influences the behavior of domestic interest rates in Egypt.

Domestic financial reforms started when Egypt adopted ERSAP in 1991. The stabilization phase (1991–1996) involved measures of financial liberalization, such as the abolishment of private and public interest rate ceilings in 1992 and 1993, respectively. In previous studies, there was no single short-term interest rate that stood out as the most obvious indicator of monetary policy stance. In fact, the Central Bank of Egypt seems to have used several interest rates and did not rely on a single short-term interest rate (Al-Mashat and Billmeier 2007; Moursi, El-Mossallamy and Zakareya 2007). But the 3-month Treasury bill rate could be considered as the short-term policy rate as it was issued in coordination with the Central Bank of Egypt. Treasury bills were first introduced in 1991 on a weekly auction basis. The objective was to initiate a market mechanism to determine interest rates, introduce an instrument to regulate banks' reserves, and absorb excess liquidity as well as dampen the impact of capital inflows (i.e., effect sterilization[5]), besides financing the budget deficit (El-Refaie 2002; Al-Mashat and Billmeier 2007).

[5] Selim (2012b) defines "sterilization" as the intervention of the central bank to offset changes in net foreign assets (reserve accumulation), which is done by either changing net domestic assets (selling bonds) or adjusting its reserve deposits. This is done to avoid nominal appreciation of the exchange rate in the face of capital inflows. According to Selim, "if sterilization is completed, it would only alter the relative supplies of available LE and dollar assets but would have a neutral impact on the domestic interest rate, money supply and inflation."

In Figure 5, we trace the developments in the 3-month Treasury bill rate against that of the US counterpart, along with the exchange rate-adjusted differential between the two rates.

**Figure 5. Three-Month Treasury Bill Rates in Egypt and the US, and Exchange Rate-Adjusted Differential (July 1996–December 2011) (in percent, annually)**




*Source*: Prior to 2003, monthly data on the Egyptian 3-month Treasury bill rate were obtained from Central Bank of Egypt upon request. Starting 2003, data were obtained from the Central Bank of Egypt, *Monthly Statistical Bulletin*, various issues. The US 13-week Treasury bill rate was obtained from the International Financial Statistics online database.

*Note*: Exchange rate-adjusted differential is calculated by author according to the following formula: $(1 + i_t) - (1 + i_t^*) S_{t+k}/S_t$. where i and i* are the domestic and foreign interest rates, respectively. S is the nominal exchange rate (LE/USD), and is obtained from the International Financial Statistics online database. k is the maturity period, equal to 3, in this case.

Figure 5 shows that fluctuations in the Egyptian 3-month Treasury bill rate are independent from those in the US counterpart, with the exception of the short period January 2006–March 2008, during which there is a noticeable correspondence between the two series, as well as a decline in the exchange rate-adjusted differential between them. But apart from that period, the exchange rate-adjusted differential seems to move in parallel to the Egyptian 3-month Treasury bill rate. This may be held as preliminary evidence that the Egyptian interest rates are not strongly influenced by the external financial market.

The three-month Treasury bill rate (along with the other short-term domestic interest rates) remained elevated[6] and almost constant from 1996/97[7] up until 2000/01, after that it started to move more freely. This behavior could be explained by the fact that up until the year 2000/01, Treasury bills represented the main placement for banks' excess liquidity (i.e., funds which were not given out as bank loans nor invested in projects were used to purchase Treasury bills); noting that "excess reserves" were the main operational target for monetary policy. El-Refaie (2002) explained that the Central Bank of Egypt chose to keep the interest rate on Treasury bills constant in an attempt to maintain a balance between conflicting policies. On one hand, there was a need to issue more Treasury bills to finance the budget deficit and to absorb excess liquidity caused by capital inflows (which meant accepting higher interest rates on Treasury bills), while on the other hand, there were growth targets (which necessitated keeping interest rates low). Another factor that contributed to the stable interest rate on Treasury bills prior to 2001 was the dominance of the state in the banking sector, which tended to create rigidities in the interest rate structure (Al-Mashat and Billmeier 2007).

The larger flexibility of the 3-month Treasury bill rate starting from 2000/01 could be attributed to several factors. The overnight domestic currency interbank market was introduced in 2001. Interbank lending therefore became an alternative placement for banks' excess liquidity. The Central Bank of Egypt gradually introduced other supportive monetary policy tools. These included repos, reverse repos and short-term deposits at the Central Bank of Egypt. The introduction of the interbank market and the new tools for conducting monetary policy enhanced the degree of *market determination* of the Treasury bill rate. Finally, in 2005 the Central Bank of Egypt's monetary policy framework was restructured. The overnight interest rate on interbank transactions was formally adopted as the main operational target instead of the excess bank reserves (Al-Mashat and Billmeier 2007; Moursi, El-Mossallamy and Zakareya 2007).

Moreover, the fluctuations that are observed in the Treasury bill rate since 2000/01 coincided with developments in the exchange rate; that is, the step devaluations (later on

[6] It is worth noting that domestic interest rates shot upwards following the financial liberalization reforms that were undertaken in the early 1990s (Abdel-Khalek 2001). Also, the Central Bank of Egypt maintained a tight monetary policy under ERSAP, and thus there was a positive and noticeable differential between Egyptian and developed countries' interest rates (El-Refaie 2002).

[7] Monthly data for the 3-month Egyptian Treasury bill rate are available from the Central Bank of Egypt (upon request) starting from fiscal year 1996/97.

depreciation) of the Egyptian pound. Based on an empirical study that covered the period 2000/01–2007/08, Selim (2012a) provides evidence that the monetary authority had been strongly reacting to changes in the exchange rate.

In light of the above analysis, we decide to start the empirical analysis from 1999/2000 as it marks the beginning of *de jure* capital and financial openness, according to the Chinn-Ito index. This year also marks the beginning of the enhanced variability in the exchange rate-adjusted differential between the Egyptian and US 3-month Treasury bill rates. Moreover, the Egyptian interest rates prior to 2000 could not be described as "market-determined" (as it was held constant) and so would not be relevant to the analysis of Egypt's international financial integration.

## II. LITERATURE REVIEW: HOW DO WE MEASURE *DE FACTO* INTERNATIONAL FINANCIAL INTEGRATION?

Literature on financial integration has presented a multitude of methodologies for its measurement, but has failed to judge one single approach as the most reliable one. In what follows, we focus on the two methodologies that are applied later in the empirical section of this paper.[8]

### *Uncovered Interest Parity (UIP)*

This approach assesses the responsiveness of domestic interest rates to changes in foreign interest rates, and to what extent changes in the relative rates of return on domestic and foreign financial assets give rise to cross-border arbitrage flows (Montiel 1994). Interest rate differentials are thus used to assess the degree of cross-border capital mobility arising from the equalization of return rates on financial assets in two different countries. The argument is

[8] See Montiel (1994) and Frankel (1996) for a review of other popular methodologies for measuring international financial integration. The two empirical tests applied in this paper are chosen as they are the most straight-forward and have not been applied to the Egyptian case before, to the best of our knowledge.

that, if capital is perfectly mobile, then its rate of return should be equal across countries; and hence, no interest rate differential should exist (Hussein and de Mello 1999).[9]

In the context of measuring financial integration, the UIP condition is formally stated as:

$$1 + i_t = E_t [(1 + i_t^*) S_{t+k}/S_t ] \quad (1)$$

where $i_t$ is the domestic interest rate, $i_t^*$ is the foreign interest rate, and $S_t$ and $S_{t+k}$ are the domestic-currency price of foreign exchange in the current period and the next, respectively. The next period (t+k) is determined by the maturity of the financial asset whose return rate we are interested in.[10] $E_t$ is the expectation operator. The expected exchange rate however is subjective, since it is unobservable. Thus, when applying the uncovered interest parity test, "rational expectations" is imposed in order to allow the use of ex-post values of $[(1 + i_t^*) S_{t+k}/S_t]$ as equivalent to their expected values plus a prediction error 'e'. As such,

$$E_t [(1 + i_t^*) S_{t+k}/S_t ] = [(1 + i_t^*) S_{t+k}/S_t ] + e \quad (2)$$

where the prediction error 'e' should be a mean-zero, serially uncorrelated random variable. In other words, the ex-post interest rate differential (which is equal to the prediction error, e) would be stated as follows:

$$\text{Exchange rate-Adjusted differential} = d_t = (1 + i_t) - (1 + i_t^*) S_{t+k}/S_t \quad (3)$$

Provided that all variables that appear in equation 3 are stationary, the UIP condition consists of testing the null hypothesis that $d_t$ has a zero mean (i.e., no differential exists) and is serially uncorrelated (that is, successive lags of the differential /prediction error should not be correlated).

[9] Three interest parity conditions were commonly examined in the literature: covered interest parity, uncovered interest parity and real interest parity. *Covered interest parity* refers to the extent to which arbitrage leads to the equalization of expected returns on domestic and foreign assets of the same type, provided that *exchange rate risk is hedged* by forward cover. *Uncovered interest parity* is similar to the covered interest parity condition, but *without forward cover*. *Real interest parity* refers to the extent to which arbitrage leads to the equalization of expected *real* returns across similar domestic and foreign assets. And according to Montiel (1994), the uncovered interest parity is the only condition that is relevant for the purpose of measuring the degree of financial integration for a developing country. That is because the real interest parity condition incorporates both financial and real integration, and the covered interest parity condition requires the existence of forward markets, which is not the case for most developing countries. Thus, this section will concentrate on the uncovered interest parity condition only.

[10] For example, if we are considering the 3-month Treasury bill rate, then k is equal to 3.

However, if the terms $(1+i_t)$ and $[(1 + i_t^*) S_{t+k}/S_t]$ are non-stationary, then for the uncovered interest parity condition to hold, the exchange rate-adjusted differential $d_t$ should be "stationary." In other words, a long-run relationship should exist between the return rates on the domestic and exchange rate-adjusted foreign financial assets. Empirically, this means that they must be co-integrated, such that the exchange rate-adjusted differential between the two rates is stationary.

To the best of our knowledge, UIP has not been tested in the fashion described above to try to gauge Egypt's integration in the world financial market. Thus we present here an example of how the UIP condition was employed for the People's Republic of China (PRC). Cheung, Chinn and Fujii (2006) employ the UIP condition to test for the PRC's financial integration with each of the following economies: Hong Kong, Taiwan, Japan and the US.[11] Specifically, for the period February 1996–June 2002, unit root tests were applied on the uncovered interest differential between domestic and exchange rate-adjusted foreign one-month interbank interest rates for the following economy-pairs: PRC/Hong Kong, PRC/Taiwan, PRC/US and PRC/Japan. For all pairs—except the PRC/US—the null hypothesis of presence of a unit root was strongly rejected. When a dummy variable for the 1997 financial crisis was included, they were also able to reject the null hypothesis of the presence of a unit root for the PRC/US series. Thus, after accounting for the 1997 financial crisis, all the uncovered interest differential series were proven to be stationary and shocks to the UIP were deemed as transitory. Based on this test, Cheung, Chinn and Fujii concluded that PRC is strongly integrated with the other economies of Greater China (Taiwan and Hong Kong) as well as its major trading partners (Japan and the US). This work has been held as evidence of the fading effectiveness of *de jure* capital controls in China.

The UIP test has been applied widely in the context of investigating financial integration. But the failure thereof has been interpreted with caution. While departure from UIP may be an indicator of a low degree of financial integration, it should be noted that this is a common empirical finding, and may not be enough to prove that a country is not well integrated in the world financial market. That is because for UIP to hold, two stringent conditions need to be in check: (1) investors need to be "rational" with regards to *expectations*

[11] Cheung, Chinn and Fujii (2006) also test for other criteria of integration, namely, real interest parity and real purchasing power parity. But we focus solely on their findings in the UIP test as they are the most relevant to this study.

of the future spot exchange rate, and (2) investors need to be risk-neutral, such that no premium exists between domestic and foreign interest rates. In reality, those two conditions are very difficult to hold, and literature has dubbed them as the textbook/traditional reasons for departure from UIP: expectations are not necessarily rational, and investors usually demand a *premium* as they are risk-averse. This risk premium may be time-variant due to exchange rate risks, political risks, etc., which thus leads to failure of UIP.

But in addition to these traditional reasons, Alper, Ardic and Fendoglu (2009) also state other reasons for the unfavorable empirical evidence for the UIP condition, including: existence of transaction costs, possible effects of central bank interventions (notably to stem exchange rate fluctuations in the "fear-to-float" context), and the possibility that investors may care for real rather than nominal returns.

***Test of Monetary Autonomy***

Under fixed exchange rates, tests of monetary autonomy can be based on whether the central bank's monetary policy tools are successful in changing the stock of money and domestic interest rates. As discussed earlier in the context of the *impossible trinity*, if a country maintains a pegged exchange rate regime, then a high degree of capital mobility will render the monetary policy ineffective in stimulating aggregate demand. That is because monetary authorities become incapable of affecting the money supply or domestic interest rates. For the central bank to change the stock of money, it engages in open market operations in order to effect a change in its domestic assets. The change in the domestic assets of the central bank will in turn lead to a change in domestic interest rates. In a financially closed economy, this would result in a change in the stock of money. However, if a country is characterized by a high degree of capital mobility, then the change in domestic interest rates will soon be eliminated through arbitrage flows. The change in the central bank's domestic assets (that took place because of open market operations) will be offset by a change in its foreign assets, while the stock of money remains unchanged (Montiel 1994). More specifically, under perfect capital mobility, a credit expansion will create an equivalent capital outflow, and vice versa (Rennhack and Mondino 1988).

This property of capital mobility has been formally tested by constructing a structural model of the financial sector of an economy, and estimating an *offset coefficient*. This

coefficient gives the amount of capital outflow per unit of expansion of domestic credit.[12] The offset coefficient ranges from zero to -1. A value of -1 would indicate a high degree of capital mobility (Montiel 1994; Rennhack and Mondino 1988).

Obstfeld, Shambaugh and Taylor (2005) have assessed the validity of the *impossible trinity* using data series over 130-years long. In an attempt to capture the *monetary independence* element of the trinity, they relied on the extent to which local interest rates diverge from the world interest rate (that is, the interest rate in some well-defined base-country market). They argued that "[e]ven if the interest rate is not the primary instrument of monetary policy, it should be directly affected by monetary policy changes and thus would still serve as a measure of the stance of policy. If the interest rate is insulated from global market conditions by capital controls this is important as well in that it demonstrates how capital controls can allow monetary autonomy and a fixed exchange rate to exist simultaneously." Based on this reasoning, there is another approach for testing monetary autonomy based on causality tests, rather than the estimation of the offset coefficient.[13] So with perfect capital mobility and a pegged exchange rate, a country will be unable to pursue an autonomous monetary policy. Hence, the domestic financial aggregates, such as money (M1, M2) or domestic credit, should not Granger-cause movements in domestic interest rates, nominal or real output (Montiel 1994).

Montiel (1989) presented empirical evidence for 12 developing countries for the period 1962-1986, showing that past changes in domestic financial aggregates (money supply or domestic credit) helped predict nominal GDP. Given that the countries were characterized by a fixed exchange rate, the Granger-causality tests were used as evidence to conclude that capital mobility/financial integration was imperfect for those countries.

We turn next to the application of these two tests to assess Egypt's *de facto* financial integration. We first test whether Egypt has become *de facto* open financially, upon the *de jure* capital and financial liberalization. As the tests show that Egypt's *de facto* financial integration is limited, we try to explain why that is the case. So, we try to assess the reasons behind the persistence of the large and time-varying interest rate differential between domestic and financial assets. This is done by employing the Dornbusch model in the context

[12] Unit of expansion here means: expansion of domestic credit by one unit of domestic currency.

[13] Obstfeld, Shambaugh and Taylor refrained from the use of the approach that relied on the extent to which capital account openness *offsets* domestic credit expansion as it is difficult to identify exogenous credit shocks.

of a cointegration/vector error-correction analysis in order to identify the relatively more important contributors to the variability that the interest rate differential exhibits.

## III. THE EMPIRICS: ON EGYPT'S *DE FACTO* INTEGRATION IN THE WORLD FINANCIAL MARKET

The objective of this empirical section is twofold. First, we would like to formally test how responsive domestic interest rates are to foreign counterparts. This is tested using the uncovered interest parity condition as well as the monetary autonomy test. Second, we would like to model the behavior of that interest rate spread that exists between domestic and foreign financial assets against the macro variables proposed by the fundamentals-based Dornbusch approach. This is done through cointegration/vector error-correction analysis.[14]

### *The Uncovered Interest Parity (UIP) Test*

As explained in the literature review section, in the context of international financial integration, the UIP condition is tested to check whether the return rates on financial assets issued in two different countries are equalized. That is, to see whether the financial assets in the two countries are substitutes. So UIP is said to hold when investors are indifferent towards the interest rates in the two countries, because the exchange rate between those countries is expected to adjust such that the returns on the two financial assets are ultimately equalized, thereby eliminating the potential for uncovered interest arbitrage profits.

Alternatively, in cases where a wedge may be persistent between the return rates on domestic and foreign financial assets, the UIP condition only requires that such a wedge be time invariant.[15] More formally put, for UIP to hold with the presence of a persistent interest rate differential, the exchange rate-adjusted interest rate differential should be stationary. We have presented the formula of the exchange rate-adjusted interest rate differential in the literature review section, but we reiterate it here for convenience:

$$\text{Ex/Rate-Adj. Differential}_t = d_t = (1 + i_t) - (1 + i_t^*)\, S_{t+k}/S_t \qquad \text{(3 revisited)}$$

[14] Discussion of data sources and issues is deferred to Appendix 2.

[15] Even though there is literature (see Frankel 1991) that views the ability to sustain a wedge between domestic and foreign interest rates as a straightforward indicator of a low degree of financial integration, there are counter-arguments to that view: It might be the case that domestic interest rates in the informal market, rather than that of the formal financial system, are closely tied with foreign interest rates. Moreover, in a financially repressed economy, where interest rates on Treasury bills are to some extent "administered," then the rate of return on such assets differs from foreign interest rates primarily due to the fact that domestic interest rates are not market-determined, and not due to absence of arbitrage flows (Montiel 1994). Thus, in our analysis, we account for the interest rate wedge (that could be considered as a risk premium) in the UIP condition.

where i and i* are the interest rates on domestic and foreign financial assets (Egyptian and US 3-month Treasury bill rates), respectively, and $S_t$ and $S_{t+k}$ are the nominal exchange rate in the current period and at the end of the maturity period, respectively. The nominal exchange rate here is measured as the domestic-currency price of foreign exchange. So for the bilateral exchange rate between Egyptian and US currencies, "S" is expressed in Egyptian pounds per 1 US dollar.

Using monthly data, the time series properties of the exchange rate-adjusted differential are investigated. The results of the Augmented Dickey Fuller (ADF) test are reported in Table 1. As shown, the exchange rate-adjusted interest rate differential is non-stationary, either tested for the whole dataset (January 2000–September 2011), or for the short period that witnessed an episode of large portfolio inflows in Egypt (July 2004–June 2007). *This implies a failure of UIP.*

**Table 1. Augmented Dickey-Fuller Test Results for Terms Included in the UIP Condition**

| | Stationarity test details for variable in LEVEL | | | Stationarity test details for variable in FIRST DIFFERENCES | | | |
|---|---|---|---|---|---|---|---|
| Series tested for stationarity | Time period; # of included observations | ADF test details | MacKinnon one-sided p-values associated with t-statistic of the ADF test | Time period; # of included observations | ADF test details | MacKinnon one-sided p-values associated with t-statistic of the ADF test | Order of integration of variable in level |
| **Exchange rate-adjusted Egy-US 3-month T-bill rate differential** | 2000:03 – 2011:09; 139obs | Constant, 1 lag | 0.4451 | 2000:03 – 2011:09; 139 | Constant, 0 lags | 0.0000 | **I(1)** |
| | 2004:07 – 2008:06; 48 obs | Constant, 1 lag | 0.2499 | 2004:07 – 2008:06; 48 | Constant, 0 lags | 0.0001 | |
| **Interest rate spread between Egy and US 3-month T-bill rates** | 2000:03 – 2011:12; 142 | Constant, 1 lag | 0.5483 | 2000:03 – 2011:12; 142 | Constant, 0 lags | 0.0000 | **I(1)** |
| | 2004:07 – 2008:06; 48 obs | Constant, 1 lag | 0.2418 | 2004:07 – 2008:06; 48 | Constant, 0 lags | 0.0002 | |
| **Exchange rate depreciation** | 2000:05 – 2011:12; 140 obs | Constant, 2 lags | 0.0000 | | | | **I(0)** |
| | 2004:07 – 2008:06; 48 obs | Constant, 0 lags | 0.0008 | | | | |

It is useful to disentangle the components of the exchange rate-adjusted interest rate differential in order to investigate the time series properties of each component, and identify which term contributes to its non-stationarity. It appears that the spread between the Egyptian

and US 3-month T-bill rates is responsible for the non-stationarity of the exchange rate-adjusted interest rate differential.[16] Unsurprisingly, exchange rate depreciation is stationary, and this is because the nominal exchange rate in Egypt is closely managed, even after the announcement of the *de jure* floatation in January 2003. Selim (2012b) provides empirical evidence that Egypt's exchange rate has been *de facto* fixed years after the announced floatation.

As pointed out in the literature review section, failure of UIP may only be a preliminary (not decisive) indicator of the degree of international financial integration. Therefore, before we move to the explanation of the non-stationarity of the interest rate differential between domestic and US financial assets, we turn to the test of *monetary autonomy* as another empirical test for Egypt's *de facto* international financial integration.

***Monetary Autonomy Test***

In this empirical test, we make use of the *impossible trinity* framework once again. As mentioned earlier in the context of this framework, a country with a pegged exchange rate and perfect capital mobility will not be able to conduct autonomous monetary policy. So in this test, we ask the following question: are the actions of the Central Bank of Egypt actually succeeding to effect changes in monetary variables (such as the domestic interest rate)? Or are the actions of the Central Bank of Egypt frustrated by capital mobility? In other words, examining the extent of monetary autonomy in Egypt will help us draw conclusions on the degree of Egypt's financial integration, given that the exchange rate is quite stable (i.e., the exchange rate is not flexible; and so does not fluctuate to absorb nominal shocks). Monetary autonomy would not be preserved in such a setting, unless financial integration/capital mobility is imperfect.

We approach this question of monetary autonomy through running a Granger-causality test that investigates whether changes in money supply bear predictive content for the exchange rate-adjusted differential between domestic and US 3-month Treasury bill rates. If changes in the domestic monetary aggregate Granger-cause movements in that differential, monetary policy is said to be autonomous as it creates deviations from uncovered interest

[16] This piece of information is useful for the cointegration/VECM analysis that is conducted in this study (the third empirical test), as the spread between the Egyptian and US 3-month Treasury bill rate ($i - i^*$) enter the cointegration /VECM as the *variable of interest*, in the investigation of the reason behind the low level of Egypt's international financial integration.

parity. Given this finding—coupled with Egypt's stable exchange rate—we could conclude that Egypt's financial integration is imperfect. The Granger-causality test was run twice: the first time, for the sample as a whole: (January 2000–September 2011), and the second time, for the period that had registered the highest score in terms of *de jure* capital and financial openness (July 2004–June 2008). The lag structure of the Granger-causality tests was chosen by running unrestricted 2-variable vector-autoregressions (VAR) consisting of the endogenous variables in their levels (logM2 and the exchange rate-adjusted differential between Egy-US Treasury bill rates). According to the Akaike information criterion for the estimated VAR in levels, two lags were selected for Granger-causality test that was run for the sample as a whole, but four lags were selected for the shorter period that witnessed a surge in Egypt's *de jure* capital and financial openness. Results are presented in the following table.

**Table 2. Granger-Causality Test Results**
***Null Hypothesis: Δ(LM2) does not Granger Cause Δ(Ex/Rate-Adj. Differential)***

| | No. of lags chosen by Akaike info. criterion | No. of Obs. | F-Statistic | Prob. | Conclusion |
|---|---|---|---|---|---|
| Full sample (2000M1-2011M9) | 2 | 138 | 2.87979 | 0.0597 | Reject $H_o$ at 10 percent signif. |
| Shorter sample (2004M7-2008M6) | 4 | 48 | 2.36289 | 0.0698 | Reject $H_o$ at 5 percent signif. |

As displayed in Table 2 above, we are able to reject the null hypothesis of *no Granger-causality* for the entire sample period (January 2000–September 2009) as well as for the shorter period (July 2004–June 2008) that witnessed an increase in financial flows on the back of Egypt's *de jure* financial openness. That is, the growth of M2 helped predict changes in the exchange rate-adjusted interest rate differential for the entire period under study. This refutes the argument that monetary autonomy is challenged by increased financial openness in Egypt.[17] The upshot is that during the periods under investigation, Egypt has enjoyed mere *de jure* openness, but a *de facto* limited degree of financial integration.

Now our next task is to try to identify the reasons behind this limited degree of *de facto* financial integration. We look into this query through identifying the contributors to the variation in the non-stationary interest rate spread between Egyptian and US financial assets.

[17] That the "conduct of monetary policy is complicated by capital mobility" is a recently oft-cited argument (for example in: IMF, 2009 and 2010 Article IV consultation, p. 17 and p. 5, respectively)

Thus the objective of the following test is to explain the behavior of the interest rate spread against its potential macro-determinants.

***Cointegration/VECM Analysis***

In the two preceding empirical tests, we have seen that the interest rate spread[18] is not entirely explained by the expected depreciation in the exchange rate (i.e., UIP fails to hold). We have also seen that monetary autonomy is preserved despite the stable exchange rate.

Now the objective of our VECM analysis is to explain the variation in the interest rate spread in an attempt to find the reasons behind Egypt's low *de facto* financial integration. This is done in the context of the "sticky price monetary approach" introduced by Dornbusch (1976). The interest rate spread ($i - i^*$) is central to the mechanism that the Dornbusch model[19] presents. According to Dornbusch, a contractionary monetary policy raises the interest rate spread, attracts capital inflows and leads to nominal exchange rate appreciation such that it may overshoot its long-run equilibrium value. While the nominal exchange rate constituted the focus of the Dornbusch model, we may also make use of this model to explain the behavior of the interest rate spread. Our goal from using the Dornbusch model is to provide an analytical framework for the choice of the variables; and for us to build expectations regarding the direction of the relationships amongst them in the multivariate time series analyses. This is done by running a VECM where all the variables that appear in the Dornbusch model are allowed to be endogenous, and hence we would be able to distill the *variance decompositions* of the interest rate spread as generated from the VECM analysis. Thus the Dornbusch approach provides a reference point for the model specification. So our VECM consists of the following 5 endogenous variables: 1. $S_t$: log of the bilateral exchange rate (LE/USD), 2. ($i_t$–$i_t^*$): nominal interest rate spread between Egyptian and US 3-month Treasury bill rates, 3. ($M_t - M_t^*$): differential between logs of monetary aggregates (M2) in Egypt and the US, 4. ($Y_t$–$Y_t$*): differential between the logs of real output in Egypt and the US, and 5. ($\pi_t^e - \pi_t^{e*}$): expected differential between the inflation rates in Egypt and the US.

[18] In this part of the empirical analysis, the interest rate differential is calculated as the *spread* between the domestic and foreign interest rates ($i - i^*$). As mentioned earlier in the empirical section, it is the interest rate spread that is responsible for the non-stationarity of the exchange rate-adjusted interest differential (see footnote 15).

[19] The seminal Meese and Rogoff (1983) article indicated that fundamentals-based exchange rate determination models (including the Dornbusch model) are not superior to a random walk model for exchange rate determination. Nevertheless, such models are very useful as frameworks of analysis.

At first, the time series properties of all the pertinent variables are investigated using the appropriate unit root test (Augmented Dickey Fuller). The results of the test show that all variables are I(1).[20] Initially, a vector autoregression (VAR) is run with all the endogenous variables in their levels for the purpose of deciding upon the lag structure. Based on the Akaike information criterion, two lags are selected for all the multivariate time series analyses that appear next.

The long-run relationship between the five endogenous variables included in our model is detected using the Johansen test of cointegration. Indeed, the variables appear to be cointegrated. The Johansen test for cointegration detects at most 2 cointegration vectors. We present below the cointegration equation (displaying the interest rate differential on the left-hand side) with the standard errors shown in parenthesis below, but the details of the Johansen test are deferred to Appendix (3).

$$i_t - i_t^* = \underset{(11.11)}{-24.45}\ S_t + \underset{(8.02)}{2.70}\ (M_t - M_t^*) - \underset{(7.61)}{12.88}\ (Y_t - Y_t^*) + \underset{(0.23)}{0.63}\ (\pi_t^e - \pi_t^{e*}) \qquad (4)$$

The objective of displaying the above cointegration equation is to look at the signs and statistical significance of the coefficients of the long-run relationship between the interest rate differential and each of the rest of the endogenous variables.[21]

From the cointegration equation above, we could observe that all variables are statistically significant and appear with the expected signs, with the exception of the monetary aggregate differential.[22] We could illustrate what the above expression means from the perspective of the domestic variables that appear in the above cointegartion equation. Ceteris paribus, there is a negative association between the domestic interest rate (i) and the bilateral nominal exchange rate (S = LE/US dollar); a negative association between domestic real GDP

[20] ADF tests are not presented here, but can be furnished by the author upon request.

[21] It is noted, however, that this is not presented as an estimation of the *causal* relationships. We refrain from presenting this as an estimated interest rate differential because monetary models (including Dornbusch's sticky-price monetary model which we rely on) have been generally used in the literature to explain the behavior of the exchange rate and not the interest rate differential. Later when the VECM is estimated, the exchange rate is modeled as the dependent variable in the cointegrating vector.

[22] Having a statistically insignificant monetary differential may be explained by monetary neutrality. That is, monetary shocks "die out" in the long-run, and thus their effect on the real economy is only transitory.

(Y) and the domestic interest rate (i); and finally a positive association between expected inflation ($\pi^e$) and the domestic interest rate (i).[23]

In other words, the above expression means that a depreciation of the foreign value of the Egyptian pound (i.e., an increase in S) is associated with a decrease in the domestic interest rate. That would in turn lead to a decrease in the spread between the domestic and foreign interest rates. Also, monetary tightening (a contractionary policy) which would entail an increase in the domestic interest rate (and a bigger interest rate spread) is associated with a smaller domestic real output; thus the negative association between the real GDP differential and the interest rate spread. Finally, a rise in domestic inflationary expectations is associated with a rise in the domestic interest rate (thus a higher interest rate spread).

Having detected the presence of a long-run relationship among the variables, our multivariate time series analysis should include an error correction term. Therefore, a vector error correction model (VECM) is estimated (details of estimated VECM are presented in Appendix 4).[24]

The short-run dynamics in the VECM are represented in a system of five equations where each endogenous variable is regressed on lagged values of itself and lagged values of all the other endogenous variables, in addition to the error-correction term(s). The error-correction term(s) is basically the lagged error obtained from the cointegration relationship.[25]

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[23] The effect of foreign variables is opposite to that discussed above for the domestic variables.

[24] The VECM is a restricted form of the vector autoregression (VAR). VECM not only models the joint behavior of the endogenous variables, but also allows for the presence of an additional term that corrects for short-run deviations from the long-run equilibrium. Therefore, in the presence of such a long-run equilibrium relationship, estimating an unconstrained VAR may amount to a mis-specified model, as the short-run deviations are thought to be an important factor that characterizes the relationship between the endogenous variables of our model (Enders 1996).

[25] The ordering of the variables in the VECM is important. The variable that comes first is considered to have a contemporaneous effect on itself and all the other variables in the system, whereas the second variable in the ordering is considered to have a contemporaneous effect on itself and the variables that follow it in the ordering, but not on the preceding variable. The VECM was estimated using the following ordering: exchange rate, M2 differential, real GDP differential, inflation differential and interest rate differential. As mentioned above, the results of the VECM estimation are presented in appendix 4. *Exchange rate* comes first as it is the variable of interest in the Dornbusch model (i.e., it is the *explained* variable). For the rest of the endogenous variables, the ordering is ad-hoc, and it follows from the way the Dornbusch model equation is presented in various papers that attempted to estimate it starting with a monetary shock (see, for example, Frankel (1984)). And thus, the M2 differential comes as the second endogenous variable in the ordering, as the monetary shock could be thought of as the policy variable in this model; the central bank's tool to stimulate the economy, and thus would have a contemporaneous effect on the other endogenous variables in the model. It is worth noting that the variance decomposition results (which are our main focus for analysis) do not change drastically for other trials with different orderings.

Among the short-run dynamics, the equation that captures the interest rate spread (i - i*) is our main focus.

Specifically, we would like to investigate how the other four endogenous variables in the model affect the interest rate spread, as well as the relative importance of the various shocks in explaining the variation in the interest rate spread.

In order to do so, we run Granger-causality tests after estimating the VECM. The objective of the Granger-causality test is to see whether the endogenous variables in the model bear predictive content for the interest rate spread. After that, we generate variance decomposition for the interest rate spread in order to identify the major contributor to the variation in it. Granger-causality tests will allow us to interpret the variance decompositions in a "causality" context.

Granger-causality test results for the interest rate differential as the dependent variable are displayed below, while the details are deferred to Appendix 5.

**Table 3. Granger-Causality Test Results**

| *Null Hypothesis:* | Chi-sq statistic | Prob. associated with statistic | Conclusion |
|---|---|---|---|
| *Δ(Log Ex/Rate) does not Granger-cause Δ(Interest Rate Spread)* | 48.34 | 0.000 | Reject $H_o$ at 1 percent signif. |
| *Δ(M2 Diff) does not Granger-cause Δ(Interest Rate Spread)* | 28.12 | 0.000 | Reject $H_o$ at 1 percent signif. |
| *Δ(Y Diff) does not Granger-cause Δ(Interest Rate Spread)* | 7.89 | 0.0193 | Reject $H_o$ at 5 percent signif. |
| *Δ(Expected Inflation Diff) does not Granger-cause Δ(Interest Rate Spread)* | 7.67 | 0.0216 | Reject $H_o$ at 5 percent signif. |
| *ALL* | 74.92 | 0.000 | |

From the table above we could reject the null hypothesis of no Granger-causality for all the variables, and for the model as a whole. So, we infer that the endogenous variables included in the model are important to the analysis of the interest rate spread. Each variable individually Granger-causes the interest rate spread. This means that lagged values of the

exchange rate, M2 differential,[26] real GDP differential and the expected inflation differential all help predict the interest rate spread. This finding will thus enable us to interpret the variance decomposition results from a *causality* perspective. This is what we turn to next.

**Table 4. Variance Decomposition of the Interest Rate Spread**

| Period | S.E. | Log exchange rate | M2 DIFF | Real output DIFF | Expected inflation diff | Interest rate spread |
|---|---|---|---|---|---|---|
| | | | | | | |
| 1 | 1.113269 | 5.012832 | 5.259772 | 0.005169 | 4.408972 | 85.31325 |
| 2 | 1.585606 | 6.370312 | 30.13086 | 10.50546 | 2.316600 | 50.67677 |
| 3 | 2.195189 | 21.51066 | 36.33592 | 14.18180 | 1.213716 | 26.75791 |
| 4 | 2.578927 | 16.16546 | 40.99022 | 18.50373 | 4.183254 | 20.15734 |
| 5 | 3.057474 | 12.35156 | 39.55840 | 17.90784 | 14.56626 | 15.61593 |
| 6 | 3.449404 | 10.36032 | 36.02928 | 18.00702 | 21.92611 | 13.67727 |
| 7 | 3.673506 | 9.175198 | 33.93519 | 17.90533 | 25.76981 | 13.21448 |
| 8 | 3.815660 | 8.534757 | 33.19195 | 17.61646 | 27.53861 | 13.11822 |
| 9 | 3.949128 | 7.968798 | 33.04482 | 17.78140 | 28.10841 | 13.09657 |
| 10 | 4.093741 | 7.469287 | 32.80721 | 18.32886 | 28.37785 | 13.01680 |

From the table above, it seems that the monetary aggregate differential (M2Diff) and the expected inflation differential are the major contributors to the observed variability in the interest rate spread. In the beginning, the variation in the interest rate spread is mainly explained by itself. Shocks to the expected inflation differential start to be relatively important as a source of variation in the interest rate spread after 5 forecast periods, and more so towards the $10^{th}$ forecast period, as more than 28 percent of the variation in the interest rate spread is attributed to shocks to the expected inflation differential. This is a plausible finding as interest rate changes are mainly explained by *expected* inflation as the Fisher hypothesis postulates.

Shocks to the M2-differental contribute around 33 percent of the variation in the interest rate spread towards the end of the forecast horizon. This result is in line with the finding of the monetary autonomy test, which has shown that interest rate spread is responsive to changes in the domestic monetary aggregate (M2) in the short run.

[26] Once again, the empirical finding that the monetary aggregate differential (M2diff) Granger-causes the interest rate differential is an indicator of an autonomous monetary policy in Egypt. As mentioned earlier, there are previous studies that argue that monetary policy in Egypt is being complicated by the presence of an open capital account and a stable exchange rate. However, the Granger-causality results further confirm the conclusion that Egypt is only weakly integrated in the world financial market, and that the Central Bank of Egypt is still capable of effecting changes in monetary variables which in turn affects the interest rate differential, as shown.

## IV. CONCLUSION

The empirical tests conducted in this study proved that Egypt sustains a low degree of *de facto* international financial integration: uncovered interest parity (UIP) does not hold between Egyptian and US financial assets, as evidenced by the non-stationary exchange rate-adjusted differential between the 3-month Treasury bill rates of the two countries. Moreover, it was shown that monetary policy is autonomous: changes in the monetary aggregate (M2) Granger-cause movements in that exchange rate-adjusted differential (i.e., M2 growth succeeds to create deviations from UIP). So, despite the *de facto* managed exchange rate arrangement that Egypt has adopted since the early 2000s (even after the announced floatation of the exchange rate in January 2003), the Central Bank of Egypt was capable of effecting changes in domestic interest rates. That is to say, even though the exchange rate has been stable, monetary policy in Egypt was still independent in the face of a legally liberalized capital and financial account of the balance of payments.

It is thus said that during the periods under investigation, Egypt has been enjoying *de jure* financial openness only, with limited *de facto* integration in the world financial market.

Cross-border capital flows in Egypt could be described as *volatile* but have not been large enough to wipe out (or at least smoothen) the non-stationary differential that exists between interest rates on domestic and foreign financial assets. While that interest rate differential could be attractive to capital inflows, it seems to constitute a risk factor that deters investors. According to the variance decompositions generated from the VECM, the high inflation rate in Egypt (which implies a large Egy-US inflation differential) has been a main contributor to the variability of that spread between interest rates on domestic and foreign financial assets, and thus could be deemed as a culprit behind Egypt's limited *de facto* financial integration, as it led to the persistence of a large and time-varying *risk premium*/interest rate differential.

Since the early 1990s, Egypt has been facing recurrent episodes of capital inflows with aggressive sterilization; resisting the nominal appreciation of the exchange rate. But Selim (2012b) showed that sterilization was not complete, in the sense that part of the increase in liquidity due to capital inflows was not sterilized, and thus translated into monetary growth and inflation. This gave rise to the vicious cycle of monetary tightening to curb inflation,

which meant a further increase in the interest rate differential, attracted capital inflows, and warranted the Central Bank's intervention to sterilize the effect of the accompanying increase in liquidity. Excess liquidity that remained unsterilized fed into the inflation rate and required further monetary policy tightening, and so on.

Thus, this study points to the lack of policy coordination during the episodes of high capital inflows, which led to overheating in the economy, without reaping the potential gains from the *de jure* financial openness as the ensuing inflation problem in Egypt was responsible for the persistent large and varying risk premium between the domestic and foreign financial markets.

## APPENDIX 1. RESTRICTIONS AND ARRANGEMENTS ON CAPITAL: CURRENT STATUS AND DEVELOPMENTS IN THE PAST

| | Status of Controls on Capital Transaction and Provisions Specific to Financial Institutions (as per AREAER for years 2008-2009-2010) | Developments in the past (as per AREAER for years 1991-2007) |
|---|---|---|
| Repatriation requirements for capital transactions | No surrender requirements to the central bank, and no surrender requirements to authorized dealers. | Prior to 1991, surrender requirements existed. All banks were required to deposit 15 percent of their foreign currency deposits with the central bank. Proceeds from sales of property owned in Egypt by foreigners (or their heirs) must be deposited in a special capital account in the name of the foreign seller at an authorized bank. See the section "Controls on Real Estate Transactions" below to trace the gradual removal of all types of controls on real estate transactions. |
| Controls on capital market instruments | No restrictions on nonresidents' local purchase and sale of capital market securities (including: shares, other securities of a participating nature, bonds and other debt securities). Also, there are no restrictions on the issuance of such capital market securities locally by nonresidents. Capital Market Law 95/1992, amended by Law 123/2008, allows international institutions to issue bonds in the local market, subject to approval of the Egyptian Financial Supervisory Authority (EFSA).[27]<br>However, there are restrictions on residents' purchase abroad of capital market securities. Specifically, private pension funds are not allowed to invest in foreign securities or assets abroad. | Prior to 1994, transactions in Egyptian and foreign securities registered at the stock market in Egypt were not transferred through the free market for foreign exchange. Instead, imports and exports of securities and transfers related to their purchases or sales were effected through authorized banks.<br>Since 1994, the foreign exchange market was to be used for transferring proceeds associated with the sale of both Egyptian and foreign securities.<br>With regards to local sale and/or issue of shares or other securities by nonresidents: No controls under the foreign exchange law and regulations on the issuing of securities in the country by nonresidents. Trading in securities denominated in foreign currency must be settled in foreign currency.<br>Approval of Capital Market Authority (CMA)[28] was required for issuing bonds.<br>Prior to June 2008, international institutions were not allowed to issue bonds.<br>June 1st 2008, Law 123/2008 was issued to allow international institutions to issue bonds in the local market, subject to CMA approval. |
| Controls on money market instruments, and controls on collective investment securities | No restrictions on nonresidents' purchase, sale or issue locally. Also, no restrictions on residents' sale or issue abroad.<br>But again, purchases abroad by residents of *money market instruments* and *collective investment securities* are subject to restrictions as private pension funds are not allowed to invest in foreign securities or assets abroad. | |
| Controls on | Derivatives are permitted for purchase, sale and issue by nonresidents in the | Prior to 2007, derivatives did not exist in the Egyptian market. |

[27] The Egyptian Financial Supervisory Authority (EFSA), established by law 10/2009, replaced the Egyptian Insurance Supervisory Authority, the Capital Market Authority, and the Mortgage Finance Authority in application of the provisions of the supervision and regulation of insurance law no. 10 of 1981, the capital market law no. 95 of 1992, the depository and central registry law no. 93 of 2000, the mortgage finance law no. 148 of 2001, as well as other related laws and decrees that are part of the mandates of the above authorities.

[28] CMA was later on replaced by EFSA (See previous footnote).

| | | |
|---|---|---|
| derivatives and other instruments | Egyptian market only for genuine hedging purposes within banks. Also, derivatives are allowed for sale and issue abroad by residents for hedging purposes only. But purchase abroad by residents is restricted. | |
| Controls on credit operations | No controls on commercial or financial credits to residents and nonresidents.<br>But it is worth noting that for commercial credits from nonresidents to residents, ministries, government agencies, public authorities and private sector entities are all required to register their debt obligations with the CBE.<br>And for financial credits from nonresidents to residents, residents are required to register their foreign debt with the CBE for statistical purposes. | Prior to 2006, there were controls on medium- and long-term commercial credits from nonresidents to residents.<br>No controls were applied if the maturity of the commercial credits is one year or less and if these credits are received by the private sector. |
| Controls on direct investment | No controls on outward direct investment. But with regards to inward direct investment, nonbank companies of foreign exchange dealers must be owned entirely by Egyptians. All FDI inflows must be registered by the General Authority for Investment (Laws 8/1997 and 159/1981). | |
| Controls on liquidation of direct investment | No controls on liquidation of direct investment. | Prior to 1997, there were controls on the liquidation of direct investment: Specifically, upon the request by foreign investors and subject to the approval of the board of the General Authority for Investment, repatriation of the invested capital had to be within the limits of its value calculated on the basis of the announced exchange rate at the time of liquidation or disposition. This had to be in 5 equal annual installments, provided that the authority approved the result of the liquidation. Exceptionally, the invested capital was allowed to be transferred in full, if the balance of the foreign currency account held by the investor with one of the authorized bank permits, or if the authority's board approved making the transfer in full under certain conditions. If the invested capital was done in-kind, it was allowed to be repatriated in-kind. |
| Controls on real estate transactions | No controls on purchase or sale of real estate by residents and nonresidents. | There were restrictions that affected the timing of the transfer abroad by nonresidents of the proceeds of sales of Egyptian real estate. Such restrictions were eliminated on July 15, 1996.<br>Prior to 2006, local purchase and sale of real estate by nonresidents were subject to controls.<br>From 2003 till end-2005, non-Egyptians were not allowed to sell property within five years after taking possession thereof.<br>All controls on sale and purchase of real estate by nonresidents were abolished in 2006. |
| Controls on personal capital transactions | No controls on personal capital transactions (i.e., no controls on personal loans, gifts, endowments, inheritances and legacies, settlement of debts abroad, transfer of assets, transfer of prize earnings). | Prior to 1994, outward personal capital transactions were restricted. Egyptian emigrants, foreigners leaving Egypt permanently and accrued alimony beneficiaries living abroad were authorized to transfer abroad funds up to certain limits prescribed by some pertinent legal provisions. |
| Provisions specific to commercial banks | No restrictions on borrowing abroad, nor on maintenance of accounts abroad.<br>No restrictions on lending to nonresidents (financial or commercial credits).<br>No restrictions on lending locally in foreign exchange.<br>No restrictions on the purchase of locally issued securities denominated in foreign exchange.<br>No differential treatment of deposit accounts held by nonresidents (compared to | July 16, 2003: Law 88/2003 – Banking sector and money law came into effect requiring that the face value of shares (excluding trading securities) owned by banks may not exceed the bank's capital base.<br>Prior to 1993, regulations governing open foreign currency positions were different: The difference between a bank's foreign currency denominated assets and foreign currency denominated liabilities should be limited to 15 |

| | | |
|---|---|---|
| | that of deposits held by residents).<br>However, there exists differential treatment of deposit accounts in foreign exchange: Banks' deposits in foreign currencies (held by Egyptians or foreigners) are subject to a 10 percent reserve requirement, which must be deposited with the CBE and is remunerated at London Interbank Bid Rate (LIBID).<br>Also, there is a requirement for liquid assets in foreign currencies of 25 percent.<br>Egypt applies "fit and proper tests" to shares held by residents and nonresidents in any bank in Egypt that exceed 5 percent of the bank's issued capital. These require CBE notification. Shares that exceed 10 percent of a bank's issued capital require CBE approval.<br>There are limits to open foreign exchange positions: the surplus/deficit for each currency may not exceed 10 percent of the capital base. The aggregate surplus/deficit for total long or short positions may not exceed 20 percent of capital base. | percent of the bank's capital. |
| Provisions specific to institutional investors (***1***. insurance companies, ***2***. pension funds, and ***3***. investment firms and collective investment funds) | There are limits (max.) on securities issued by nonresidents for all three types of institutional investors.<br>There are limits (max.) on investment portfolios held abroad for all three types of institutional investors.<br>There are limits (min.) on insurance companies' and pension funds' investment portfolio held locally.<br>There are regulations pertaining to investment funds' local and international investments. All investment funds must issue a prospectus approved by the EFSA. EFSA's approval is required for issuance of a public or private offering of investment funds. | |

## APPENDIX 2. ISSUES PERTAINING TO DATA USED IN THE EMPIRICAL TESTS:

The UIP and the monetary autonomy tests were conducted using monthly data. The following are the data sources of each variable:

- Interest rate on Egyptian 3-month Treasury bills: Prior to January 2003, series obtained upon request from the Central Bank of Egypt. The rest of the series (January 2003–December 2011) is obtained from the Monthly Statistical Bulletin.
- Interest rate on US 13-week Treasury bills: International Financial Statistics online database.
- Bilateral exchange rate (LE/$): International Financial Statistics online database.
- Domestic liquidity in Egypt (M2): International Financial Statistics online database.

The Cointegration/VECM analysis was conducted using quarterly data due to the absence of monthly data for real output in Egypt.

- The real output differential was calculated as the difference between the logs of Egypt's quarterly real output (in LE billions) and that of the US (in USD billions). Egypt's real GDP was obtained from the Ministry of Planning and International Cooperation website: www.mop.gov.eg.
- The interest rate differential is calculated as the spread between the Egyptian 3-month Treasury bill rate and the 13-week US Treasury bill rate.
- The monetary aggregate differential was calculated as the difference between the logs of Egypt's domestic liquidity (M2) (in LE billions) and the US counterpart (in USD billions).
- The inflation differential was calculated as the difference between the Egyptian inflation rate and the US inflation rate. Both series were obtained from the International Financial Statistics online database. *Expected* inflation differential was assumed to be the (t+1) series of the inflation differential series.

All US data series used to calculate the rest of the differentials were obtained from the International Financial Statistics online database.

## APPENDIX 3. JOHANSEN TEST OF COINTEGRATION

Sample (adjusted): 2002Q4 2012Q1
Included observations: 38 after adjustments
Trend assumption: No deterministic trend
**Series: Interest_Spread Log_EX/RATE M2_DIFF Real_Output_DIFF INFL_DIFF_EXPECTED**
Lags interval (in first differences): 1 to 2

Unrestricted Cointegration Rank Test (Trace)

| Hypothesized No. of CE(s) | Eigenvalue | Trace Statistic | 0.05 Critical Value | Prob.** |
|---|---|---|---|---|
| None * | 0.655593 | 84.08763 | 60.06141 | 0.0001 |
| At most 1 * | 0.462216 | 43.58224 | 40.17493 | 0.0219 |
| At most 2 | 0.280281 | 20.01092 | 24.27596 | 0.1572 |
| At most 3 | 0.164666 | 7.512944 | 12.32090 | 0.2770 |
| At most 4 | 0.017628 | 0.675838 | 4.129906 | 0.4707 |

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

| Hypothesized No. of CE(s) | Eigenvalue | Max-Eigen Statistic | 0.05 Critical Value | Prob.** |
|---|---|---|---|---|
| None * | 0.655593 | 40.50539 | 30.43961 | 0.0020 |
| At most 1 | 0.462216 | 23.57132 | 24.15921 | 0.0599 |
| At most 2 | 0.280281 | 12.49797 | 17.79730 | 0.2619 |
| At most 3 | 0.164666 | 6.837106 | 11.22480 | 0.2640 |
| At most 4 | 0.017628 | 0.675838 | 4.129906 | 0.4707 |

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

**Cointegrating Equation, Normalized on the Interest Rate Spread**

Normalized cointegrating coefficients (standard error in parentheses)

| Interest_Spread | Log_EX/RATE | M2_DIFF | Real_Output_DIFF | INFL_DIFF_E |
|---|---|---|---|---|
| 1.000000 | 24.45213 | -2.702222 | 12.87669 | -0.626041 |
| | (11.1128) | (8.01581) | (7.61008) | (0.22924) |

**Cointegrating Equation, Normalized on Log Exchange Rate**

Normalized cointegrating coefficients (standard error in parentheses)

| Log_EX/RATE | M2_DIFF | Real_Output_DIFF | INFL_DIFF_E | Interest_Spread |
|---|---|---|---|---|
| 1.000000 | -0.110511 | 0.526608 | -0.025603 | 0.040896 |
| | (0.28198) | (0.16552) | (0.00941) | (0.01273) |

## APPENDIX 4. ESTIMATED VECTOR ERROR CORRECTION MODEL ALLOWING FOR TWO COINTEGRATING EQUATIONS

Sample (adjusted): 2002Q4 2012Q1
Included observations: 38 after adjustments
Standard errors in ( ) & t-statistics in [ ]

| Cointegrating Eq: | CointEq1 | CointEq2 |
|---|---|---|
| Log Exchange Rate(-1) | 1.000000 | 0.000000 |
| M2_DIFF(-1) | 0.000000 | 1.000000 |
| Real_output_DIFF(-1) | 0.625595 | 0.895720 |
| | (0.06985) | (0.40969) |
| | [ 8.95574] | [ 2.18632] |
| INFL_DIFF_E(-1) | -0.077400 | -0.468706 |
| | (0.01969) | (0.11548) |
| | [-3.93095] | [-4.05875] |
| Interest_Spread(-1) | 0.137016 | 0.869780 |
| | (0.03394) | (0.19905) |
| | [ 4.03725] | [ 4.36975] |

| Error Correction: | D(LEXRATE) | D(M2DIFFQ2) | D(YDIFF) | D(INFL_DIFF_E) | D(DIFF) |
|---|---|---|---|---|---|
| CointEq1 | -0.433514 | -0.066536 | -0.150216 | -4.883106 | 2.046435 |
| | (0.09013) | (0.05174) | (0.15010) | (5.85086) | (2.88868) |
| | [-4.80979] | [-1.28595] | [-1.00077] | [-0.83460] | [ 0.70843] |
| CointEq2 | 0.073736 | 0.011009 | 0.020955 | 1.013417 | -0.742320 |
| | (0.01594) | (0.00915) | (0.02654) | (1.03454) | (0.51077) |
| | [ 4.62677] | [ 1.20337] | [ 0.78954] | [ 0.97958] | [-1.45333] |
| D(Log Exchange Rate (-1)) | 0.274856 | 0.008588 | 0.125235 | -2.918680 | 0.834735 |
| | (0.15951) | (0.09157) | (0.26564) | (10.3546) | (5.11224) |
| | [ 1.72312] | [ 0.09379] | [ 0.47144] | [-0.28187] | [ 0.16328] |
| D(Log Exchange Rate (-2)) | 0.230557 | 0.059994 | -0.187756 | 6.976736 | 34.58506 |
| | (0.16808) | (0.09649) | (0.27991) | (10.9107) | (5.38681) |
| | [ 1.37173] | [ 0.62179] | [-0.67078] | [ 0.63944] | [ 6.42033] |
| D(M2_DIFF(-1)) | -0.599940 | 0.137571 | -1.223991 | -15.32235 | -33.86326 |
| | (0.33712) | (0.19353) | (0.56142) | (21.8839) | (10.8045) |
| | [-1.77961] | [ 0.71087] | [-2.18017] | [-0.70016] | [-3.13418] |
| D(M2_DIFF(-2)) | -0.575244 | 0.286509 | 0.371222 | 35.62947 | -34.30681 |
| | (0.42736) | (0.24533) | (0.71171) | (27.7421) | (13.6968) |
| | [-1.34603] | [ 1.16784] | [ 0.52159] | [ 1.28431] | [-2.50473] |
| D(Real_output_DIFF (-1)) | 0.042421 | 0.200688 | -0.480456 | 9.461324 | -9.580363 |
| | (0.10813) | (0.06207) | (0.18007) | (7.01910) | (3.46546) |
| | [ 0.39232] | [ 3.23315] | [-2.66814] | [ 1.34794] | [-2.76453] |
| D(Real_output_DIFF (-2)) | 0.055834 | 0.159957 | -0.275055 | 9.692150 | -6.744453 |
| | (0.11962) | (0.06867) | (0.19921) | (7.76497) | (3.83371) |
| | [ 0.46676] | [ 2.32944] | [-1.38076] | [ 1.24819] | [-1.75925] |
| D(INFL_DIFF_E(-1)) | 0.000578 | 0.000625 | 0.002599 | 0.709947 | -0.168649 |
| | (0.00288) | (0.00165) | (0.00479) | (0.18683) | (0.09224) |

| | | | | | |
|---|---|---|---|---|---|
| | [ 0.20079] | [ 0.37806] | [ 0.54233] | [ 3.79987] | [-1.82829] |
| D(INFL_DIFF_E(-2)) | 0.002465 | -0.002997 | -0.001942 | -0.281720 | -0.129859 |
| | (0.00332) | (0.00191) | (0.00553) | (0.21549) | (0.10639) |
| | [ 0.74269] | [-1.57251] | [-0.35126] | [-1.30733] | [-1.22057] |
| D(Interest_Spread(-1)) | -0.004501 | 0.000751 | 0.001156 | 0.084809 | -0.181985 |
| | (0.00316) | (0.00181) | (0.00526) | (0.20518) | (0.10130) |
| | [-1.42415] | [ 0.41362] | [ 0.21964] | [ 0.41333] | [-1.79644] |
| D(Interest_Spread (-2)) | -0.002923 | -0.000488 | 0.008279 | -0.160265 | -0.242315 |
| | (0.00299) | (0.00172) | (0.00498) | (0.19415) | (0.09585) |
| | [-0.97742] | [-0.28419] | [ 1.66224] | [-0.82548] | [-2.52794] |
| R-squared | 0.537080 | 0.331126 | 0.477529 | 0.407569 | 0.785386 |
| Adj. R-squared | 0.341230 | 0.048141 | 0.256484 | 0.156925 | 0.694588 |
| Sum sq. resids | 0.031371 | 0.010338 | 0.087004 | 132.1948 | 32.22357 |
| S.E. equation | 0.034736 | 0.019940 | 0.057847 | 2.254865 | 1.113269 |
| F-statistic | 2.742296 | 1.170119 | 2.160323 | 1.626089 | 8.649801 |
| Log likelihood | 80.96996 | 102.0610 | 61.58865 | -77.60678 | -50.78679 |
| Akaike AIC | -3.629998 | -4.740052 | -2.609929 | 4.716147 | 3.304568 |
| Schwarz SC | -3.112865 | -4.222920 | -2.092796 | 5.233279 | 3.821700 |
| Mean dependent | 0.007686 | 0.015262 | 0.009829 | 0.143954 | 0.200368 |
| S.D. dependent | 0.042797 | 0.020438 | 0.067087 | 2.455769 | 2.014453 |
| Determinant resid covariance (dof adj.) | | 6.49E-09 | | | |
| Determinant resid covariance | | 9.73E-10 | | | |
| Log likelihood | | 124.6710 | | | |
| Akaike information criterion | | -2.877420 | | | |
| Schwarz criterion | | 0.139186 | | | |

## APPENDIX 5. GRANGER-CAUSALITY TEST RESULTS AFTER RUNNING VECM ALLOWING FOR 2 COINTEGRATING VECTORS; AND 2 LAGS

VEC Granger Causality/Block Exogeneity Wald Tests
Sample: 2000Q1 2012Q3
Included observations: 38

Dependent variable: D(LEXRATE)

| Excluded | Chi-sq | df | Prob. |
|---|---|---|---|
| D(M2DIFFQ2) | 8.662786 | 2 | 0.0131 |
| D(YDIFF) | 0.254989 | 2 | 0.8803 |
| D(INFL_DIFF_E) | 0.828224 | 2 | 0.6609 |
| D(DIFF) | 2.747753 | 2 | 0.2531 |
| All | 13.32479 | 8 | 0.1012 |

Dependent variable: D(M2DIFFQ2)

| Excluded | Chi-sq | df | Prob. |
|---|---|---|---|
| D(LEXRATE) | 0.503592 | 2 | 0.7774 |
| D(YDIFF) | 11.25030 | 2 | 0.0036 |
| D(INFL_DIFF_E) | 2.532281 | 2 | 0.2819 |
| D(DIFF) | 0.276183 | 2 | 0.8710 |
| All | 16.33914 | 8 | 0.0378 |

Dependent variable: D(YDIFF)

| Excluded | Chi-sq | df | Prob. |
|---|---|---|---|
| D(LEXRATE) | 0.510114 | 2 | 0.7749 |
| D(M2DIFFQ2) | 4.969782 | 2 | 0.0833 |
| D(INFL_DIFF_E) | 0.318162 | 2 | 0.8529 |
| D(DIFF) | 2.767251 | 2 | 0.2507 |
| All | 8.400897 | 8 | 0.3953 |

Dependent variable: D(INFL_DIFF_E)

| Excluded | Chi-sq | Df | Prob. |
|---|---|---|---|
| D(LEXRATE) | 0.411813 | 2 | 0.8139 |
| D(M2DIFFQ2) | 1.675501 | 2 | 0.4327 |
| D(YDIFF) | 2.289692 | 2 | 0.3183 |
| D(DIFF) | 0.923958 | 2 | 0.6300 |
| All | 5.391570 | 8 | 0.7150 |

Dependent variable: D(DIFF)

| Excluded | Chi-sq | Df | Prob. |
|---|---|---|---|
| D(LEXRATE) | 48.33800 | 2 | 0.0000 |
| D(M2DIFFQ2) | 28.11958 | 2 | 0.0000 |
| D(YDIFF) | 7.891213 | 2 | 0.0193 |
| D(INFL_DIFF_E) | 7.674205 | 2 | 0.0216 |
| All | 74.91509 | 8 | 0.0000 |

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