

The Relationship between Exchange Rate Policy and Monetary policy

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Abstract:

The equilibrium between the supply and demand of the domestic currency that is reflected in the foreign exchange market, could be explained by three factors; domestic interest rate, foreign interest rate, change in the expected future exchange rate. The present study aims at evaluating the interest rate parity (UIP) in Egypt over the period 11/2014 - 9/2019 using Johansen cointegration test. The results reflect existence of deviation from the uncovered UIP condition as well as the long-term equilibrium relationship between Egyptian treasury bill rate and American treasury bill rate. Moreover, the devaluation of the Egyptian currency on November 7, 2016 has reduced the exchange rate volatility and provides the monetary policy with the exchange rate stability but increases the Egyptian treasury bill rate and its volatility.

Keywords: *exchange rate, managed floating, interest rate parity, monetary policy, cointegration, emerging market.*

JEL classification: *E4; E5; F31*

1. Introduction

A Central Bank is responsible for achieving stability in three different areas; The financial system stability, monetary stability (local prices), and external stability (exchange rate management). However, the concept of stability is a recent trend, the Federal Reserve Bank announced in 1913 that its role was to establish and secure an elastic currency. Its role was totally different concept than new perception of pursuing the price stability which was known as an absolute objective of the monetary policy in 1970s (Davies,2010,23).

Monetarists believed that the control of money supply in a country is the perfect way to achieve an economic and financial stability. Inflation is a financial phenomenon, occurring when the monetary growth is more than output growth. Thus, in order to reduce the inflation rate, money supply must be decreased. There are many methods and tools that governments used over years, in order to achieve the stability of monetary supply growth. For instance, in 1980, The Central Bank of England controlled money supply by buying and selling governmental debt tools in-order to control the potential deviation that emerges from money supply (Davies,2010,38). In 1995, Ukraine used treasury bills as a primary tool to finance 4.5% of budget deficit with avoiding inflation through 82 auctions (Yushchenko,2000).

Determining the exchange rate system is one of the core factors for an economic system while fixing or floating the exchange rate is the most significant decision to be made in monetary policy (Shambaugh,2004,301). There are variety exchange rate regimes from fixing to floating and some central banks in many countries, approaching the strategy of "managed floating". In this regard, Egypt announced in 1991 that its exchange rate program relies on the managed floating. This paper lays down the core principles of such a strategy that lack previous studies and intends to fill the gap between central bank practice and academic thinking by providing a theoretical framework for a strategy of managed floating. While the existence of deviation from the UIP condition has remained a highly debated topic in international finance, this deviation persists in some liquid markets in the world and in the absence of financial distress (Du, 2018, 953). Moreover, the literature review on the empirical analysis of the UIP condition emphasizes and focuses on the emerging markets (EMs) in the post crisis period compared to developed economies. Many EMs had started liberalizing their financial accounts from 1980s to 1990s and are characterized by UIP, as a result of incomplete liberalization programs or their features that are worse GDP per capita income, higher inflation rates, and uncertainty running to higher nominal interest rates, and pegged financial markets. Such differences may definitely

have a direct consequence on the relationship between the nominal interest rate differential and the exchange rate depreciation (Alper, 2019, 122), (Kumar,2019,2).

The exchange rate of local currencies against foreign currencies is a key element affecting all economic and financial aspects of different countries, especially developing countries. Governments sometimes should interfere in the economic situation in order to maintain the exchange rate stability, especially after several fluctuations and recurring devaluations resulting from critical decisions in-order to achieve economic stability. In Egypt, on November 7, 2016, Egyptian central bank announced the devaluation of the Egyptian currency by 100 %. Consequently, such decision which has been followed by a number of implications, such as increasing the inflation rate and interest rate, requires a review on the relationship between the Exchange rate policy and Egyptian monetary policy.

The purpose of the paper is analysis of short-term interest rate determination under managed floating exchange rate policy, testing UIP condition and analyze convergence between Egyptian treasury bill rate and United States treasury bill rate from 11/2014 to 10/2019 as U.S. may have a more dominant role in world financial markets than other countries.

Following, we first review the relevant literature in section 2. Section 3 provides theoretical background of exchange rate policies. Section 4 carries out methodology. Further, section 5 conveys empirical data and analysis. The paper concludes with section 6, where we summarize the main results and conclusions.

2. Literature Review

The two prices over which administrative control has traditionally being exercised in the capitalist countries are the interest rates and the exchange rate (Fry,1992,37). The simultaneous management of the exchange rate implies that the central bank is equipped to target the exchange rate by means of pure intervention. This is possible since the central bank has two independent instruments at its disposal. With open-market operations, a central bank exchanges treasury bills against domestic central bank reserves in order to aim a level of the short-term interest rate. With foreign exchange market interventions, a central bank exchanges foreign deposits against domestic central bank reserves in order target the exchange rate. While it is almost consensus nowadays is that central banks are capable to completely control short-term interest rates, many countries are in doubt that a direct control of the exchange rate is even possible because of the sheer size of foreign exchange markets (Bofinger,2003,87).

Interest rate parity is a no-arbitrage state representing an equilibrium state under which investors will be indifferent to interest rates available on bank deposits in two countries. The fact that this state does not always hold, allows for prospective opportunities to earn riskless profits from interest arbitrage (Ubi, 2020, 111). The impact of domestic monetary policy on local real interest rates depends on how much they affect global real interest rates. Although the theoretical significance of real interest rate parity is obvious and an important issue to be considered by policy makers, empirical supports for this parity are surprisingly weak, many researchers found little support for the real interest rate parity (Wu, 1998,838). This research which tests its presence in the Egyptian market as an emerging market, covers the shortage of researchers' interest in UIP in developing countries that have restrictions on the movement of capitals. Thus, we can conclude that the equivalent interest rate parity might be a covered Interest rate parity or uncovered interest rate parity (CFA, reading 11,2019,557):

- Covered interest rate parity (CIP) holds when a forward premium or discount exactly offsets the difference between interest rates of two countries, and the investor will achieve the same return if he invested in either currency. This happens through the arbitrage that forces the forward contract exchange rate to go towards a level that is consistent with the difference between the nominal interest rate of the two countries, for example, the exchange rate of the euro against the dollar is trading at a certain value. If the interest rate in the euro exceeds the interest rate in the US dollar, the value of the euro will decrease against the US dollar, which is equivalent to the high interest rate of the euro.
- The uncovered interest rate parity (UIP) describes the situation in which there is no arbitrage as there are no future markets for the exchange markets or with control of capitals movements to prevent arbitrage meaning that the difference between the local interest rate and the global interest rate equivalents the expected change in the exchange rate; A currency with a high interest rate must decrease its value according to a currency with a lower interest rate and this ensures that the investor achieves the same return in any currency. For example, if the short-term interest rate is 3% in England and 1% in the United States, UIP means that the value of the currency in England decreases by 2% in relation to the US dollar during the next year. Since the UIP is not achieved by arbitrage, the value of the currency in England falls by less than 2% which leads the investor to profit from this situation by borrowing in dollars, converting it to the currency in England and investing in this currency in order to achieve a higher return (CFA, 2019,289).

While the existence of deviation from the UIP condition has remained a highly debated topic in international finance, this deviation persists in some liquid markets in the world and in the absence of financial distress (Du, 2018, 953). For example, Lothian and others examined UIP condition using short-term interest rate for France, United Kingdom and United States. They discovered UIP failures and attributed it to the unique features of the late 1970s and 1980s (Lothian, 2011, 469).

The literature review on the empirical analysis of the UIP condition emphasizes and focuses on the emerging markets (EMs) in the post crisis period compared to developed economies. Many EMs had started liberalizing their financial accounts from 1980s to 1990s and are characterized by UIP as a result of incomplete liberalization programs or their features that are worse GDP per capita income, higher inflation rates, and uncertainty running to higher nominal interest rates, and pegged financial markets. Such differences may definitely, have a direct consequence on the relationship between the nominal interest rate differential and the exchange rate depreciation (Alper, 2019, 122), (Kumar,2019,2). Moreover, others investigated the validity of the UIP condition between a developing country like Nigeria and industrialized countries like China and USA. They discovered that UIP does not hold between Nigeria and USA but it holds between Nigeria and China for high and low disparity in exchange rate respectively between these countries' currencies, market inefficiency (Ubi, 2020, 125).

3. theoretical background

Determining the Exchange rate policy is the most important factor of economic policy. There are many policies of exchange rate system to be implemented. However, the academic discussion has focused on the two corner solutions of the exchange rate spectrum: hard pegs and purely floating regimes, exchange rate regimes could be concluded and divided into three groups, fixed pegs, intermediate and floating.

Intermediate policies which had been the widespread exchange rate strategies in the early 1990s while the international monetary system has witnessed a dramatic transformation. Floating pegs has become the prevailing exchange rate policies at 1999s because the international monetary fund needs to more forcefully boost its members to move toward the policies of greater exchange rate flexibility. Hard pegs could also be more considered than intermediate especially in developing countries, but their market share remains much lower than the share of floating (Bofinger,2003,82).

3/1 Fixed Peg Policy

monetary policy strategy that is used basically to achieve price stability by fixing the value of the domestic currency against another currency with a low-inflation rate (the anchor country) (Azad,2019,2). A fixed exchange rate is an exchange rate which does not change or fluctuates too much, even if some changes occurred within predetermined limits and criteria. Some countries tend to use peg fixed exchange rate policies because it is more stable and it is a powerful tool to enable, exercising and implementing various different economic policies (Kim,2001,79).

There were three international crises recorded throughout history. The first crisis took place in August 1982 when Mexico announced that couldn't be able to keep up with foreign debt and were not able to meet its regularly scheduled debt payment to international creditors. Shortly thereafter, Brazil and Argentina witnessed the same situation, and by Spring 1983, about 25 other developing countries also could not persist keeping up paying regularly scheduled payment which accounted to be about two-thirds of the world's total debt. The second crisis began on December 20,1994, when the government of Mexico proclaimed that it intends to devalue the peso against the dollar by 14%. This decision touched off a panic to sell pesos, thereby convincing the government to float the peso. Consequently, a rash of speculative attacks against other Latin America currencies appeared. The third crisis was an Asian crisis of 1997. In fact, the Asian crisis pushed almost one third of the globe into recession period during 1998th as a result of both, banking and currency crises took-place during the same period, and by the end of 1996, foreign investors started to withdraw their investments out of Thailand fearing Thais' ability to repay or reschedule its debt. Not only, the capital outflow took-place gradually, but also quickly. Shortly thereafter, the foreign investors rushed to convert their baht to dollars, which consequently led to a baht devaluation by 16%. The crisis infected the rest of East Asian countries because they geographically and logistically interconnected throughout trade lines and investment connections (Kim,2001,80).

There are many identical events are in common between the Asian crisis and the Latin-American crises, are so remarkable. First of all, all three episodes took-place under a fixed-exchange rate strategy (Kim,2001,79). Therefore, economists disagree over the implementation of strategies with a fixing exchange rate (Shambaugh, 2004,301).

Some countries, such as Chile and Colombia, preemptively switched to floating exchange rates trying to gain some control over prices while some smaller countries responded by moving to institutionally locked-in agreements, such as currency boards or full dollarization (Azad,2019,3).

currency board arrangement and full dollarization are rough measures that tend to be approached in extreme conditions. They have been sponsored to monetary policy strategies for emerging countries, especially in parts of Latin America that have a long history of monetary instability. Which discussed in following lines.

3/1/1 Currency Board Arrangement

The domestic currency is fully backed up to 100% by a foreign (reserve) currency (such as the U.S. dollar) and, the exchange rate between the two currencies is fixed.

Thus, a currency board is a variant of a fixed exchange rate or even stronger commitment mechanism because domestic money can only be printed if it is fully backed by the foreign currency reserve. In fact, a currency board arrangement is a contemporary strategy which is the same as a fully backed gold foreign reserves, and taking the place of gold reserves. Currency boards have been approved by Hong Kong (in 1983), Argentina (in 1991), the Lithuania (in 1994) with the U.S. dollar, Estonia (in 1992), Bulgaria (in 1997), and Bosnia and Herzegovina (in 1999) with the euro (Azad, 2019, 3).

3/1/2 Dollarization

One country's use of another country's money for example U.S. dollar with a strong commitment mechanism than a currency board. Although, dollarization sidesteps the possibility of a speculative attack on the domestic currency and also eliminates the inflation-bias problem of flexible policy, it is subjected to the usual difficulties of a fixed exchange rate regime; it implies the loss of an independent monetary policy and the inability of the central bank to act as a lender for international institutions or countries in crises, and the loss of seigniorage¹.

Recently, twelve countries in Europe chose to give up their national currencies while Ecuador (in 2000) was the first among several countries in Latin America to accept the United States dollar as its official national currency, thereafter, El Salvador. (in 2001) (Calvo, 2002, 380).

3/2 Intermediate Policies

Recent experiences show the importance of considering an intermediate policy for exchange rate system between long standing hard pegs and floats. Intermediate policies take place when exchange rate is not pegged precisely but floats within low level bands (soft pegs), allowing the exchange rate to deviate by small amounts without ending the fixed exchange rate system. One aspect of intermediate policies is the continued presence of soft pegs whereby exchange rates swing within a wider band than with harder pegs (Klein, 2015, 34). Note

⁽¹⁾ It is the revenue that the government receives by issuing money.

that, soft pegs are not the only source of an intermediate level in exchange rate regimes. There is also a bias of countries to consider change between pegged, and floating exchange rate (Klein,2015,53).

There is still an important and critically relevant intermediate system strategy in-between hard pegs policies and floats. Intermediate policies reduce the degree to which the local interest rate must precisely follow the base rate (Shambaugh,2004,306). There is evidence that soft pegs allow for greater scope over monetary policy than hard pegs, particularly in emerging and developing countries. The simplest and most certain means for achieving some measure of monetary autonomy is to allow the exchange rate to float or institute broad longstanding capital controls (Klein,2015,64). Monetary policy autonomy can be achieved with temporary or partial capital control rather than extensive barriers, or with an exchange rate policy that allows limited and low currency variations levels as considered in free floating (Klein,2015,34).

Intermediate policies require an easing of monetary policy when there is a tendency for domestic currency appreciation, and tightening of monetary policy when there is a tendency for domestic currency depreciation. Those policies should be met successfully to reduce transaction costs and exchange rate risk and prevent speculative bubbles. Then, increasing international trade and international investment (Azad,2019,2). While monetary expansion is expected to result in depreciation of the national currency, the size of this depreciation may increase or decrease with the level of openness of the economic system² that is reflected in production and distribution strategies that become more international, and technological improvements which makes the exchange of goods and services easier and removes the obstacles against the capital transactions. Isik examined whether the effects of monetary policy on the exchange rates depend on the degree of openness of a country using panel data of 41 developing and developed countries for 1988-20000 period. The results indicate that interaction between openness and money supply are found to be adverse and statistically significant. So, the higher the level of openness, the lower the effects of monetary expansion on the exchange rate regardless of whether countries are developed or developing, or even, whether they are adopting fixed or flexible exchange rate systems (Isik, 2015, 62).

3/3 Floating Policies

This world is becoming more complex from both perspectives either politically and operationally and this led to a widespread development and consideration for

² Openness is shaped by liberalization on trade and finance.

past decades toward floating exchange rates in a range of ways. It been proved that fixing the rate is almost impossible while there is no generally accepted model for determining exchange rates in the short or medium term suggesting to model the exchange rate as a random walk remains the standard and challenges to go through (Davies,2010,48). Some criteria of managed floating require classifying and dividing the floating policies to three sub-categories: Pure floating, independent floating and Managed floating.

3/3/1 Pure Floating:

The exchange rate is only being determined by the market with no exchange market intervention by central banks at all. Further, the changes in foreign exchange reserves are due to technical factors only (Bofinger,2003,83). According to the textbook model of floating exchange rates, the central banks do not ever try to intervene in the foreign exchange market. Accordingly, the level of the foreign exchange reserves only remains almost constant or at least, it is characterized by very little volatility particularly when compared to intermediate or fixed polices (Bofinger,2003,83).

Direct exchange market intervention is not yet widely supported. For example, while the international economic suffered some deficits and fluctuations, especially the European export sector due to appreciation of the value of the European Euro during 2008, Europe Central Bank (ECB) did not interfere, stressing that exchange markets are efficient, and exchange rate fluctuations reflect the fundamentals of the economy. Although central banks and finance ministers in many European countries were concerned about exchange rate fluctuations, failing to recognize the reasons for their volatility, they refused to intervene to mitigate volatility because they believe that intervention is always harmful.

Others claims that free floating is made from economic books only, and just three countries declared that floating their currencies and they have already done. The currencies are United States dollar, German deutsche mark (and now the euro) and the Japanese Yen, and called G-3 which represent the reserve of The World (Calvo, 2002,382).

Some authors and researchers, based in their papers, suggested a relationship between the pure floating and an autonomous monetary policy, setting in which, the central bank targets a short-term interest rate, assuming that the exchange rate could be determined by the market according to the uncovered interest rate parity (UIP). Floating regime may not insulate domestic interest rates from all foreign interest rate shocks, but it would allow to direct interest rates for domestic purposes (Bofinger,2003,85), (Klein,2015,34), (Shambaugh,2004,323).

3/3/2 Independent Floating:

Where the exchange rate is being determined by the market, with a minimal foreign exchange market intervention, aimed at moderating the rate of change and preventing excessive fluctuation in the exchange rate, rather than forming a certain direction for it (Bofinger,2003,84).

Pure and independent floating imply that the exchange rate direction is mainly being determined by the market. Furthermore, Economists always prefer pure and independent floating stressing that it is not possible to fix both the exchange rate and domestic monetary conditions at the same time (Davies,2010,47); Monetary policy can care either domestic or external objectives. Hence, it is better to focus on the domestic prices stability, leaving the exchange rate floats, concluding that policy cannot serve both (Bofinger,2003,87).

Inflation targeting (IT) has been very successful in industrialized countries. Therefore, some emerging and developing economies, follow these strategies. However, inflation targeting can be exposed to temporary supply price shocks which tend to be larger and may cause a greater effect in underdeveloped countries than in developed countries. (Azad,2019,3), early adopters of inflation target (IT) in developed economies certainly seemed to support the view that a high degree of exchange rate flexibility is integral to successful inflation-targeting (Ghosh, 2016,173). Increased credibility and increasing stable and accurate inflation expectation will reduce a major source of shocks for both interest rates and exchange rates. Thus, successful and credible inflation targeting is likely to contribute to less variability of interest rates and exchange rates (Bofinger,2003,86).

Inflation targeting essentially copied from a political initiative; In the longer term, monetary policy could only affect nominal variables and not real variables, which would instead be affected by non-monetary real economic factors. Initial declarations of inflation targeting generally allow for a gradual transition from the current level of inflation to a more desired steady-state level which is consistent with price stability (Davies,2010,31,33).

In fact, even if inflation targeting is accepted as the policy framework, there are still many choices to be made and strategies to be followed, about which inflation rate should be the targeted, what the time horizon should be, how much deviation should be allowed over time. When an inflation target is announced, central bank will be held responsible for meeting the inflation target. Moreover, there is reference to subordinate goals, usually relating to the level of growth or unemployment. Basically, the inflation target is supposed to take priority in the event of conflict. Targeting inflation involves the central bank to estimate the most likely path or direction of prices, close attention is typically paid to all

variety of indicators that have shown predictive power for inflation in the past (Davies,2010,34)

3/3/3 Managed Floating:

The monetary authority impacts the movement of the foreign exchange rate through active intervention in the foreign exchange market without specification, commitment or announcement of the exchange rate path with the control of the short-term interest rate. The central bank intervenes in the foreign exchange market when the exchange rate drifts away from the UIP (Bofinger, 2003,94). Whereas the advantage of the managed floating strategy is that the central bank intervenes with policies to align the exchange rate in the uncovered interest parity (UIP) path. As it becomes clear from above, the exchange rate is determined mainly by the market for pure and independent floating, while for managed floating the exchange rate is determined by the central bank. In other words, what differentiates the managed floating from the intermediate floating systems is that there is no predetermined announcement path for exchange rate.

In 1991, the Arabic Republic of Egypt announced that it has adopted a managed floating policy (described by the IMF classification). While this policy is shared by a large number of central banks, managed floating policy has so far acknowledged relatively little academic interest because the academic discussion has focused on the two corner solutions of the exchange rate spectrum: hard pegs and purely floating regimes (Bofinger,2003,81). The common terms "floating" and "managed floating" lack to or even have no a clear and constant agreed definition, and therefore there is no consensual theoretical framework which define and represent the exact core principles of such a strategy. As a consequence, the central bank which is supposed to be assuming and being held responsible for managed floating, receives little academic guidance for the management approaches of monetary and exchange rate policies (Bofinger,2003,82). So, this paper aims to enrich the theoretical framework for such strategy.

The objectives of managing the exchange rate were to minimize day to day volatility, and stabilize the real exchange rate and keep aligned to fundamentals (Kohli,2003,372); The central bank is avoiding an excessive fluctuation and aims to moderate exchange rate trends when there is volatility in the foreign exchange rate market by two ways; the exchange rate and the interest rate. The simultaneous management of the exchange rate suggests that the central bank is able to target the exchange rate by means of sterilized intervention. This is possible since the central bank has two independent instruments at its disposal. A central bank may buy/sell foreign currency (spot as well as forward) directly in the forex market either by itself or indirectly through the public banks. Also, a

central bank can exchange short-term domestic notes against domestic central bank reserves, in order to target a level of the short-term interest rate.

By concentrating on the floating rate corner, researchers built an approach that classifies foreign exchange interventions, according to their objective of view which could be divided into two main categories: exchange rate smoothing and exchange rate targeting (Bofinger,2003,84). According to the smoothing objective, interventions are undertaken to counter erratic short-term (day-to-day) exchange rate adjustments, but not to change the market determined trend. The variations in the foreign exchange reserves that are related with this objective should be randomly distributed around zero.

According to the targeting objective, interventions are undertaken to create a level or a path direction for the exchange rate. The changes in the foreign exchange reserves that are related with this objective are expected to exhibit a high degree of continuance since their purpose is to counter an existing market trend; A central bank exchanges the foreign deposits against domestic central bank reserves in order to target the exchange rate (Bofinger,2003,86). Due to targeting objective, central bank is leaning against the wind implies resistance against market forces for a prolonged period and is aimed at supporting the exchange value of the currency in an aggressive manner. Maintaining a particular target level of the exchange rate involves a view by the authorities on what the exchange rate should be or where they would like it to be (Kohli,2003,376).

There is a relationship between managed floating policy and fear of floating since most exchange rate regimes described as "freely floating" under the IMF classification, are actually characterized by heavy exchange rate management by particular authorities which never let the exchange rate freely float. Actually, they decided to react to exchange rate fluctuations through a financial strategy or a monetary policy (Kohli,2003,369). Especially, when economies move from fixed to floating exchange rate regimes, they are more likely to experience rises in the variability of the real exchange rate. Likewise, a regime formally announced as pegged (and described as such by the IMF classification) experience repeated manipulations of the peg, which might allow the authorities considerable room for setting interest rate independently from world rates (Frankel,2004,716).

One of the main reasons for central banks' fear of floating is that the huge share of emerging market's external debt is denominated by a foreign currency. Therefore, currency floating represent cost with currency fluctuations, in addition to the existence of pass-through effect from exchange rate to inflation (Montes, 2020,77).

Literature review regarding the fear of floating is greater in developing countries; Apparently, emerging markets floating has been largely confined of brief periods following currency crisis or chaotic episodes of high inflation. Evidence from Calvo (2002) who examined the behavior of exchange rates, foreign exchange reserves, interest rate across 39 developed and developing countries from 1970 to 1999. The results indicate that there is evidence that variability in interest rates and foreign exchange reserves is high relative to the variation in the exchange rate in developing countries indicating existence of fear of floating. Moreover, the most important outcome of monetary policy credibility that has power to reduce the fear of floating (Montes, 2020,77).

The fear of floating may represent a problem to the expectations building process since the public may not recognize what the main goal of a central bank (inflation target or exchange target) is (Montes, 2020,78). On the other hand, noticing that the adoption of inflation target (IT) with fear of floating may cause less volatility in the inflation rate for developing countries because it is addressing commitment technologies for central bankers; Monetary policy can support either domestic or external objectives. Hence, it is better to focus on the domestic prices stability, leaving the exchange rate floats, concluding that policy cannot serve both (Bofinger,2003,87).

4. Methodology:

The supply and demand analysis of the foreign exchange market can be explained, by asking, how and why exchange rate change. The analysis may be simplified by assuming the amount of dollar assets is a fixed amount: the supply curve is vertical at a given quantity and does not shift. Therefore, under this assumption, we only need to look at variables that shift the demand curve for dollar assets, which are domestic interest rate, foreign interest rate, change in the expected future exchange rate (Mishkin,2012,395). To realize how foreign interest rate has influence on domestic interest rate, interest parity equation is used.

$$R_{it} = R_{bit} + E_t[e_{t+1} - e_t] + p, \quad (1)$$

- R_{it} is the domestic interest rate,
- R_{bit} is the base country interest rate,
- e_t is exchange rate,
- p is the difference in risk on two assets.

The equation (1) of interest rate parity means that the difference between the interest rate of the two countries equals the expected change in the exchange rate (Shambaugh,2004,305). Therefore, with a reliable exchange rate in the fixed

exchange rate policy, if the change in the exchange rate equals zero, and the short-term financial assets risks in the foreign country and the local country are the same, the interest rate on this asset must be the same in both the domestic and foreign countries (Klein, 2015,36). A high interest rate currency would depreciate against those with lower interest rates; The higher returns in high interest rate currencies are rewarded by the equivalent loss associated with the currency depreciation. In other words, the ex-post exchange rate change should equal the interest rate differential between two currencies or a regression of ex-post exchange rate change on interest rate differential should produce a beta coefficient close to one (Kumar,2019,1).

This equation could only be held if money can flow across borders. The presence of obstacles to this financial flow breaks the relationship between the interest rate in the two countries. So, restrictions on the movement of capitals, such as tax on citizens who borrow from abroad, it is possible to generate a wedge between the two interest rates with this tax and a net internal flow. The form of the equation changes by adding the tax to the right part of the equation, and the high or low tax allows the government to move the local interest rate away from the foreign interest rate even if the expected change in the exchange rate equals zero which means giving the government a portion of monetary independence ((Klein, 2015,37).

This research which tests its presence in the Egyptian market as an emerging market, covers the shortage of researchers' interest in UIP in emerging markets in order to fill in an important gap in the literature since there is a lack of comprehensive surveys on this topic for the Ems using Cointegration tests that provide an especially suitable framework for evaluating long-run interest rate parity relationships through 3 stages:

- The first stage of the analysis, we test for stationarity of the interest rate in each currency and exchange rate change. we implement this stage through a unit root test using the Augmented Dickey Fuller methodology. The presence of a unit root is implied by the coefficient on the lagged value of the series being zero.
- The second part of the analysis, we test whether the dependent variable and independent variables have long equilibrium relationship by Johansen cointegration test.
- The third step, estimate parameters when proved there are cointegration.

5. Empirical data and analysis

5.1 Descriptive statistics

Our basic source of interest rate data is the international financial statistical of International Monetary Fund (IMF) and using monthly Egyptian pound / dollar exchange rate from Egyptian Central Bank from September 2014 to October 2019. We choose money market interest rates because they reflect market forces better than deposit rates. The variables are:

- **Independent variable:** Egyptian 3-month treasury bill rate (R_{it})
- **Dependent variables:**
 - United states treasury bill rate (R_{bit}) because U.S. may have a more dominant role in world financial markets than other countries.
 - Change of Egyptian pound / dollar exchange rate [$e_{t+1} - e_t$]

figure (1) Egyptian treasury bill rate, United States treasury bill rate and exchange rate change from September 2014 to October 2019

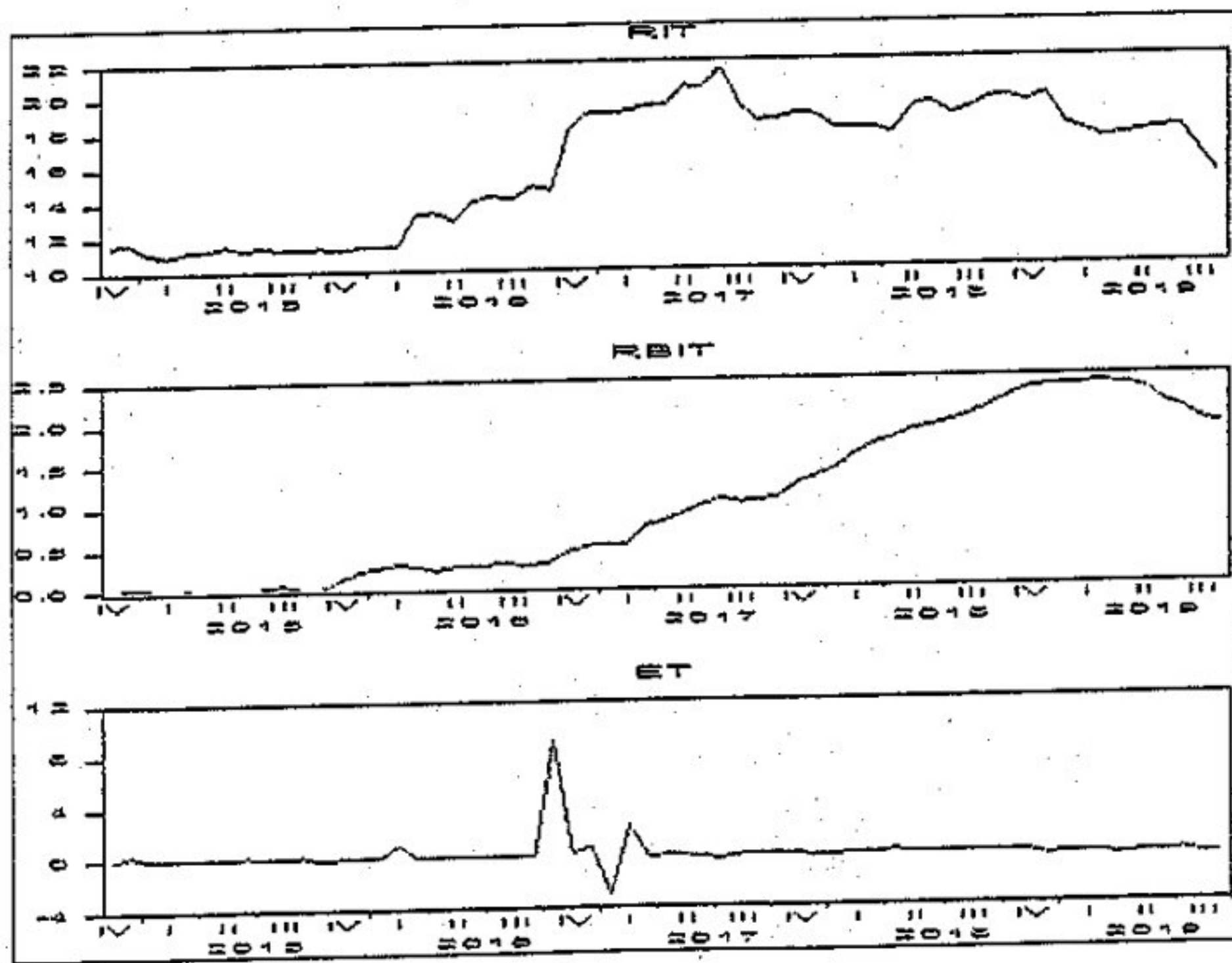


Table (1) summary statistics of variables

Date	Variables	N	Mean	Max	Min	Std. Dev.	Skewness	Kurtosis	Jarque-Bera
11/2014 To 10/2016	Egyptian treasury bill (Rit)	24	12.16	14.78	10.85	1.3	0.90	2.15	3.973958 0.137109
	U.S treasury bill (Rbit)	24	0.147	0.33	0.02	0.12	0.17	1.18	3.417924 0.181054
	Exchange rate change (Et)	24	0.756	8.9	-0.19	1.828	4.77	23.09	296.72 0.0001
11/2016 To 10/2019	Egyptian treasury bill (Rit)	25	15.44	21.56	11.11	3.59	-0.06	1.25	3.961666 0.137954
	U.S treasury bill (Rbit)	25	0.75	2.33	0.02	0.79	0.79	2.09	4.329035 0.114805
	Exchange rate change (Et)	25	-0.050	2.3156	-2.99	0.6736	-1.15688	15.69193	242.7228 0.0001
11/2014 To 10/2019	Egyptian treasury bill (Rit)	29	16	21.56	10.85	3.44	-0.32	1.50	6.559349 0.037641
	U.S treasury bill (Rbit)	29	0.99	2.4	0.02	0.87	0.36	1.55	6.454031 0.039676
	Exchange rate change (Et)	29	0.150	8.9083	-2.99	1.2794	5.40503	39.29687	3526.038 0.00001

Table (1) and figure (1) report that:

- Egyptian treasury bill rate mean increased from 12.16% before devaluation of the Egyptian currency to 15.44% after devaluation of the Egyptian currency. Also, its variability (standard deviation) increased from 1.3 to 3.59. Egyptian interest rates have presented considerable volatility. This movement could occur in response to domestic financial conditions.
- United states treasury bill rate mean increased from 0.147% before devaluation of the Egyptian currency to 0.75% after devaluation of the Egyptian currency. Also, its variability (standard deviation) increased from 0.12 to 0.79.
- Exchange rate change mean decreased from 0.756 before devaluation of the Egyptian currency to -0.05 after devaluation of the Egyptian currency. Also, its variability (standard deviation) decreased from 1.82 to 0.6736. The low variability of the Egyptian exchange rate change can be explained with reference to the severity with which the exchange rate is managed and provides evidence that Egyptian authorities managed the float to achieve specific exchange rate objective.

- According to Jarque-Bera Test, series of Egyptian treasury bill rate and United states treasury bill rate are normally distributed, but series of exchange rate change is not normally distributed.

5.2 Unit Root Tests

Table (2) results of unit root test from 11/2014 to 10/2019

Variables		Code	Augmented Dickey-Fuller test (ADF)
Egyptian treasury bill	Original	RIT	-1.360315 0.5954
	First difference	RIT	-6.90413 0.0001*
U.S treasury bill	Original	RBIT	-0.79174 0.8137
	First difference	RBIT	-3.93497 0.0033*
Exchange rate change	Original	ET	-8.095474 0.0001*

*indicates rejection of the null hypothesis at 1 per cent level.

Table (2) reports

the results that Egyptian treasury bill rate and United States treasury bill rate are stationary after first difference. exchange rate change is stationary as original form. We will adopt methods appropriate for nonstationary data (cointegration testing techniques) to weigh up the significance of long-run market linkages.

5.3 Cointegration Test:

The null hypotheses of the track and Eigen Value tests are the cointegration rank reflecting the number of linearity independent stationary relation between variables. The null hypothesis is rejected if the track test is larger than the corresponding critical value (Goodwin,1994,117).

Table (3) results of Johansen cointegration test

Hypothesis	Track Test			hypothesis	Eigen Value Test		
	Track statistic	0.05 Critical Value	p-value		Max-Eigen statistic	0.05 Critical Value	p-value
$H_0: r=0$	44.73447	29.79707	0.0005	$H_0: r=0$	34.43754	21.13162	0.0004
$H_0: r \leq 1$	10.29693	15.49471	0.2586	$H_0: r=1$	7.155281	14.2646	0.4709
$H_0: r \leq 2$	3.141648	3.841466	0.0763	$H_0: r=2$	3.141648	3.841466	0.0763

Table (3) reports:

reject the null hypothesis that there is not one linear equilibrium relationship between variables indicating existence of cointegration in nominal interest rates. Cointegration results produced evidence of statistically significant long run relationship between domestic interest rate and foreign interest rate. Results consist with Frankel (2004) who proved that all developing country economics exhibit high sensitivity of local interest rates to international interest rates in the long run.

5.4 Estimation and results:

According to Johansen cointegration test (JML), there is an evidence that there are linear equilibrium relationships between variables. So, the third step to measure and estimate parameters through Fully Modified Least Squares (FMOL).

Table (4) results of model estimation

Variables	FMOLS		
	Coefficient	T-statistic	p-value
RBIT	2.833421*	4.610827	0.00001
ET	0.227618	0.546893	0.5867
Constant	12.60213*	15.2495	0.00001
R ²	0.471693		
Adj-R ²	0.452482		
Long-run variance	16.05334		

Table (4) reports:

- The estimated constant could be viewed as reflecting the level of domestic interest rate characteristics. The constant is 12.6 suggesting that, on average, Egyptian treasury bill rates were above United states treasury bill rates by 1260 basis points for this period. Constant term is significantly different from zero meaning the existence of a significant wedge between interest rates implies that countries could, on average, have pursued interest rate policies which were at conflict with those in their trading partners and we believe that this is coherent with the fact that domestic economic stabilization objectives become important goals of central bank's reaction functions during the period meaning higher constant risk premium.
- The estimated slope is considerably large (2.833421) and statistically larger than one suggesting an over adjustment for local interest rates to international interest rate. United states treasury bill rate effects on Egyptian treasury bill rate positively and significantly. When the value of

coefficient of United states treasury bill rate increase by 1%, Egyptian treasury bill rate increase by 2.8%. results consist with Frankel (2004) who proved that floating and managed floating regimes tend to exhibit the highest interest rate levels and all developing country regimes display high sensitivity of local interest rates to international interest rates in the long run.

- Exchange rate change effects on Egyptian treasury bill rate positively but not significantly. When the value of coefficient of exchange rate change increase by 1%, Egyptian treasury bill rate increase by 0.227%.
- We found strong support for cointegration between domestic interest rate and foreign interest rate but little signal in favor of nominal interest rate equalization since the estimated constant not does not equal zero and the estimated slope does not equal one meaning UIP condition does not exist in Egyptian exchange market.
- The value of R^2 indicate that 47 % of Egyptian treasury bill rate variability is explained by United states treasury bill rate and exchange rate change. There are other variables do not exist in this model explains 53% of it.

6. Conclusion

The announcement which was made by the Egyptian monetary authorities to float the local currency against the US dollar, and it was clear from the review of the finance literature regarding the various exchange rate policies and their features interfered by the central bank was made in the exchange rate policy by reducing the value of the Egyptian pound against the dollar, which did not contribute to the achievement of The UIP condition, which means that the goal of the Egyptian monetary policy intervention strategy during the study period in the exchange market is not to create a path for the exchange rate align with the UIP path, but to reduce exchange rate fluctuation and give the monetary policy external stability (exchange rate stability), which means the central bank's awareness of the objectives of the exchange rate policy and to stabilize the exchange rate through flotation management, even if at the same time raising the Egyptian treasury's rate and increasing its volatility.

Egyptian treasury bill rates were above United states treasury bill rates by 1260 basis points for study period concluding large interest rate differentials have stronger forecasting powers for currency movement than interest rate differentials (Lothian,2011).

The managed float policy, which is the exchange rate policy used in Egypt, affected the creation of a stable balance relationship between the Egyptian treasury bill rate and the US treasury rate, and this result is consensus with the

Shambaugh's study (2004) that supports the idea that the domestic interest rate response to the foreign interest rate is due to the exchange rate system, and is not consistent with the Abraham's study (1999) which confirmed that despite the fixed exchange rate policy in the Kingdom of Saudi Arabia during the period from January 1988 to March 1994, there is no stable balance relationship between the local interest rate and the dollar interest rate. The effect of this stable equilibrium relationship is reflected in the impact of positive or negative shocks occurring in the United States. Uncertainty about monetary policy in the United States of America can lead to an increase in the Egyptian treasury bills rate and a decrease in the value of the local currency. This represents an area for further research in the monetary policy, using a longer period of time, or adding additional variables such as inflation rates and foreign currency reserves.

Researchers recommend the Egyptian monetary policy to pay attention to improving the credibility of monetary policy and to ensure transparency and disclosure of the goals of the central bank and the methods of monetary policy used to achieve these goals and the extent required to achieve them, and to increase the value of the Egyptian currency using the conservative monetary policy based on reducing the money supply and reducing inflation rates by specifying a targeted inflation rate and the central bank not interfering with the exchange rate and letting it move according to the forces of supply and demand as much as possible.

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