

JOINT MOVEMENT BETWEEN JORDANIAN AND FOREIGN INTEREST RATES UNDER FIXED EXCHANGE RATE

Mohammad Alawin
Yasmin Al-As'ad
The University of Jordan

Abstract

Interest rate by and large is one of the important economic variables which may have a significant impact on the economy. This study examines, in particular, the nature of the relationship between the local and foreign interest rates due to the fixed exchange rate between the Jordanian dinar and the U.S. dollar. In addition, it investigates the role of the relationship between interest rates with respect to the independence of monetary policy. Stationarity tests for two scenarios of the U.S. interest rates are used to verify the applicability of the theory of interest rate parity to the Jordanian economy. This theory includes an assumption of a joint movement between local and foreign interest rates. Cointegration test was also used to indicate the extent to which the two rates are cointegrated over the time. The results of stationarity of time-series test and their differences were contrary to the theory of interest rate parity that assumes a domestic interest rate is affected by the foreign interest rate. Thus, the results do not indicate a joint movement between the domestic and foreign interest rates in the long term. Despite this result, the study recommends maintaining an adequate margin between the rates of domestic and foreign interest, which allows the policy makers monetary independence.

Keywords: Domestic Interest Rate, Foreign Interest Rate, Interest Rate Parity, Interest Rates Cointegration, Jordan

1- Introduction

The monetary policy plays a key role in meeting the goals of economic policy. The importance of this role comes from its impact on many economic variables that have the ability to bring about significant changes at all political, economic and social levels. Often, the monetary policy aimed at maintaining the stability of the value of the national currency in order to ensure the stability of the price level and allow for acceptable rise of prices.

Thereby, the country would avoid aggressive short-term fluctuations in the value of money.

The essential role of the central bank concentrates about controlling of the banking system and managing of monetary policy. Yet, due to linking the Jordanian dinar with the U.S. dollar since 1995 with the prediction of a relationship of a joint movement between the rate of domestic interest and the rate of foreign interest in order to make the deposits in Jordanian Dinars more attractive than deposits in U.S. dollars, this linking raises the issue of the independence of the monetary policy in Jordan. In other words, is there a freedom for economic policy makers to recourse to these policies and use them effectively to ensure the transfer of the effects of these policies to all components of the sectors of the national economy. In addition, is there a short-term impact of this joint movement - if any –on the interest rate of Jordan due to sudden shocks which may occur to the U.S. interest rate?

The rest of this paper continues as follows: Section 2 presents the literature reviews and what will distinguish this study from others. Section 3 summarizes the developments for domestic interest rates compared to foreign ones. Section 4 gives theoretical introduction for the concept of interest rate parity. Section 5 describes the methodology. Section 6 presents the conclusion of the empirical model. Finally, Section 7 concludes the study.

2- Literature Review

The correlation and the nature of the relationship between Jordanian and foreign interest rates have not been widely addressed – due to the best of the researchers’ knowledge. However, there are some previous studies, which deal with the overall monetary policy and its impact on the economy. Of these studies is Jaradat (1997) which examines the Jordanian economic openness and its impact on the effectiveness of fiscal and monetary policies. This study aims at determining the economic openness and its role in influencing the monetary and fiscal policies. Some econometric and statistical methods were used with the regression analysis to measure the relationship of openness with the fiscal and monetary policies. The study indicated the economic trends of Jordanian economy with those of foreign countries through the trading and financial links. In addition, this study finds out that Jordan is heavily dependent on the commercial sector and the size of the external financial flows, whether foreign loans or workers’ remittances and transfers which are free of charge in its economic activity.

The study shows also that the impact of fiscal and monetary policies on stimulating the economy in recession becomes lesser when the economy is open. More the economy is open, less are the multiplier of fiscal policy and monetary policy. Besides, the effect of economic policies to mitigate the impact of the economic recession ends.

Frankel *et al.* (2002) uses a large sample of developing countries and the industrialized countries during the period (1970-1999) in an attempt to explore whether selecting the exchange rate system will affect the domestic interest rates sensitivity to global interest rates. The study shows in most cases that we cannot reject this sensitivity in the long term, even for countries that follow a floating exchange rate system. The results of this study focused on the importance of the exchange rate system followed and its relation to the independence of monetary policy. The study confirmed that domestic interest rates for countries which follow the system of a flexible exchange rate will adapt slowly to changes in global interest rates. This implies that these countries have a monetary policy which is more independent.

Farhan (2002) aims at determining the most important limitations of interest rates for both creditor and debtor in the Jordanian economy. The study uses the theoretical framework which is consistent with the ideas of Keynesian school. The study used descriptive statistical analysis in presenting the data and econometric analysis represented in the ordinary least squares method in order to investigate the time-series variables used in the test. The study finds out that the interest rate is negatively affected by changes in the money supply. Yet, at the same time, it is inelastic for changes in the interest rate on the certificates of deposit for three months. Concerning the financial side, the study indicates that the increase in governmental spending does not affect the bank interest rates on deposits, while it has a limited impact on the interest rates for lending purposes. As regards the external economic variables, it maintains that the domestic interest rate is affected by external economic variables represented in the international interest rate and the foreign exchange rates in line with the principle of interest rate parity, which reflects the fact that the Jordanian economy is open.

Abu Al-Rub (2003) examines the extent to which the central bank is independent in addition to the crises the bank faced during the period of (1964-2000). They stud also examines the extent to which the bank is efficient in facing such crises. The analysis of the study shows that the central bank succeeds in meeting monetary stability and finding strong foundations for considerable economic growth. Of the most important results of this study is that the Central Bank of Jordan worked efficiently during the period of the study except for the period 1985 – 1989. This failure is, the study claims, due to excessive government interference in the central bank policy (lack of independence).

Matalqa (2004) assesses the role of monetary policy during the period of economic reform (1993 - 2002) through investigating the impact of interest rates on the certificates of deposit for three months on monetary

stability. This was done through estimating two equations of supply and demand (IS curve and Phillips curve) of the Jordanian economy depending on the Taylor rule. On analyzing the data, the results show no statistical significance of the interest rates on the certificates of deposit (*CDs*) for three months to affect the *GDP* gap. In addition, on applying Taylor rule on the Jordanian economy in order to assess the effectiveness of monetary policy, the results show that the monetary policy can be described during that period as prudent and stable.

Grenade and Moore (2007) tests the hypothesis of interest rate parity for the countries of Eastern Caribbean countries and the United States due to linking the single currency of these countries with U.S. dollars. Time series representing the difference between the interest rate of each of these countries and the U.S. interest rate are determined and tested using stationarity tests to determine if there was a joint movement between the local interest rate for each of these countries and the U.S. interest rate. The results of this study demonstrate verification of the theory of interest rate parity because there is a joint movement between the interest rates for most of these countries and U.S. interest rates, especially the interest rates in the short term. The study attributes lack of joint movement to some countries under study to the claim that their own interest rates may be affected by certain factors or external shocks of their own.

The work of Matros and Weber (2011) deals with a frequently detected failure of the uncovered interest rate parity (*UIP*) - the absence of bivariate cointegration between domestic and foreign interest rates. The paper explains non-stationarity of the interest differential via central bank reactions to exchange rate variations. Thereby, the exchange rate in levels introduces an additional stochastic trend into the system. Trivariate cointegration between the interest rates and the exchange rate accounts for the missing stationarity property of the interest differential. The paper applies the concept to the case of Turkey and Europe.

Finally, Vega (2012) presents a partial equilibrium characterization of the credit market in an economy with partial financial dollarization. Financial frictions, in the form of costly state verification and banking regulation restrictions, are introduced and their impact on lending and deposit interest rates denominated in domestic and foreign currency studied. The analysis shows that reserve requirements act as a tax that leads banks to decrease deposit rates, while the wedge between foreign and domestic currency lending rates is decreasing in exchange rate volatility and increasing in the degree of correlation between entrepreneur's returns and the exchange rate.

What will distinguish this study

This study, according to the best knowledge of the researchers, is considered the first of its kind in the Jordanian economy. Many of the previous studies dealt with the interest rates in Jordan and its determinants, but they did not test the possibility of having a joint movement between the Jordanian and foreign interest rates, especially when the Jordanian dinar is linked with the U.S. dollar since 1995. In addition, other studies have focused on the monetary policy in Jordan, and on its impact of a number of economic variables. Yet, they did not consider monetary policy from a point of view which links it with a fixed exchange rate. Those studies never take into account the effect of fixing the exchange rate against the U.S. dollar on the independence of monetary policy in Jordan.

3- The Development of Jordanian Interest Rates

In a response to the developments in the international financial markets and to the local economic developments, the Central Bank conducts numerous changes on tools of interest rates of the monetary policy. The interest rate plays a key role in the monetary policy, and the open market operations are used as a tool to adjust the domestic liquidity as an alternative to the direct control tools. Central Bank has offered since 1993 certificates of deposit in Jordanian Dinars to sell to licensed banks and use them as a means to influence the market interest rate. Indeed, this approach stands for the beginning of a more controlling monetary policy over the level of liquidity in the economy.

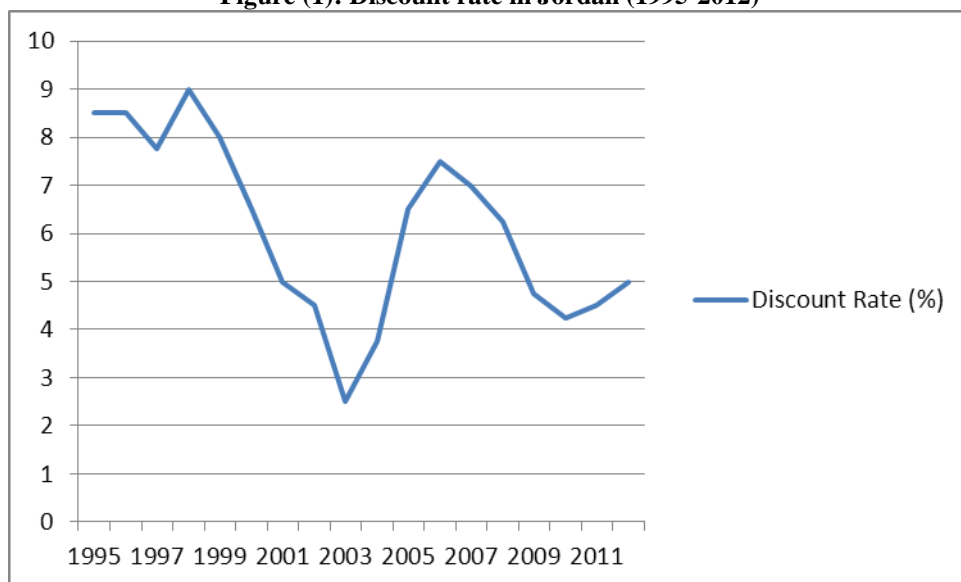
In addition, the interest rates on the certificates of deposit issued by the Central Bank were regarded as a general indication of trends of the interest rates in the domestic market since then. Hence, it holds necessary to review the historical development of the Central Bank tools, namely:

1) Discount Rate

The discount rate has reached 8.5% in 1995 and 1996, while it has decreased in 1997 to reach 7.75%. In 1998, to preserve the stability of the exchange rate resulted by the sharp demand for foreign currency, the central bank raised the discount rate to reach 9%. The period of 1999-2003 is all in all a critical period which included many significant events such as the 11th of September, the Iraq war and the Palestinian Intifada. Thus, the central bank reduced interest rates of most of the tools, including the discount rate to 2.5% in 2003, in order to avoid a recession in Jordan as a result of the tense political situation in the Middle East. The change from decline to rise at a discount rate has been observed up to 7% after the Iraq war, which caused the entry of large foreign capital to the Jordanian market. This has forced the central bank to cut the discount rate during the period from 2008 to 2009 in a response to the global financial crisis that hit most countries in the world, so as to provide the necessary liquidity to the market and preserve the Jordanian

economy from entering a recession. Figure (1) refers to the discount rate in the period (1995-2012) on an annual basis.

Figure (1): Discount rate in Jordan (1995-2012)



Source: Central Bank of Jordan.

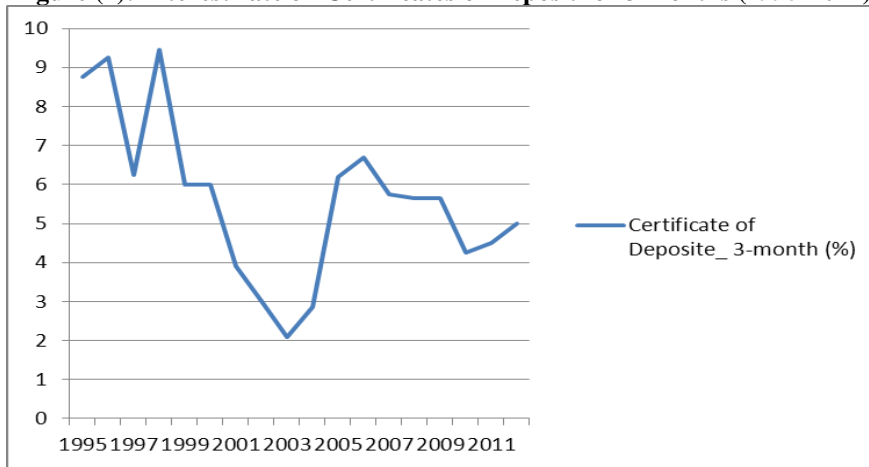
2) *Certificates of deposit and open market operations*

The interest rate in 1995 on the certificates of deposit for three months was 9%, and this percentage rose to reach 9.25% at the end of 1996. This rise suggests a frequent use of this tool in the deflationary policy of the Central Bank, at the time when it did not use the discount rate. Moreover, the entry of the central bank as a seller of the bank notes leads to the increase of supply upon these notes, which, in turn, leads to reduce the price of its balance and increase its profitability (Quaider, 2008).

In the period of expansion (1998-2003), which was a reaction to the political events that were already mentioned, the central bank bought financial securities, which increased the demand for and lowered the price of their profitability. The interest rate got reduced down to 9.45% in 1998 to reach 2.1% in 2003.

In pursuit of monetary stability, which is the ultimate goal of monetary authorities, the central bank raised the interest rates in 2004 until 2006 to get it reach 6.7%, and, then, it reduced the rate a little to revive the Jordanian economy during the global financial crisis. Figure (2) indicates the interest rates on certificates of deposit for three months during the study period (1995-2012) on an annual basis.

Figure (2): Interest rate on Certificates of Deposit for 3-months (1995-2012)

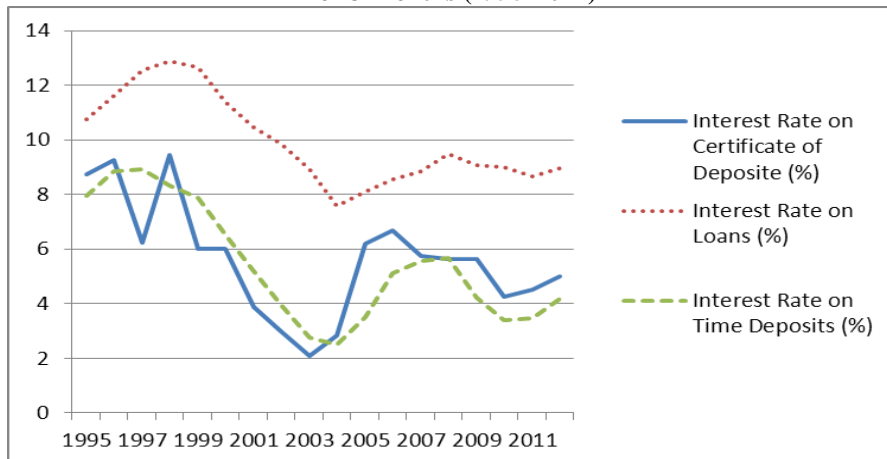


Source: Central Bank of Jordan.

3) A reflection of the development of the monetary policy tools on the market interest rates

The Central Bank used all tools of the monetary policy during the study period. It is claimed that using the market operations (buying and selling the certificates of deposit) was the most commonly used and influential tool in the market. The response of the market interest rate for these tools was as a result of floating the interest rate on various types of credit and deposits in 1990. The interest rate was determined due to the market forces, making the interest rate an influential tool in the management of monetary policy. Figure (3) indicates the development of the market interest rate on deposits and loans with the interest rate on certificates of deposit for three months.

Figure (3): Interest rates (on deposits and loans) with those on certificates of deposit for 3-months (1995-2012)



Source: Central Bank of Jordan.

4) The interest rate of Jordan and its relationship with the American one

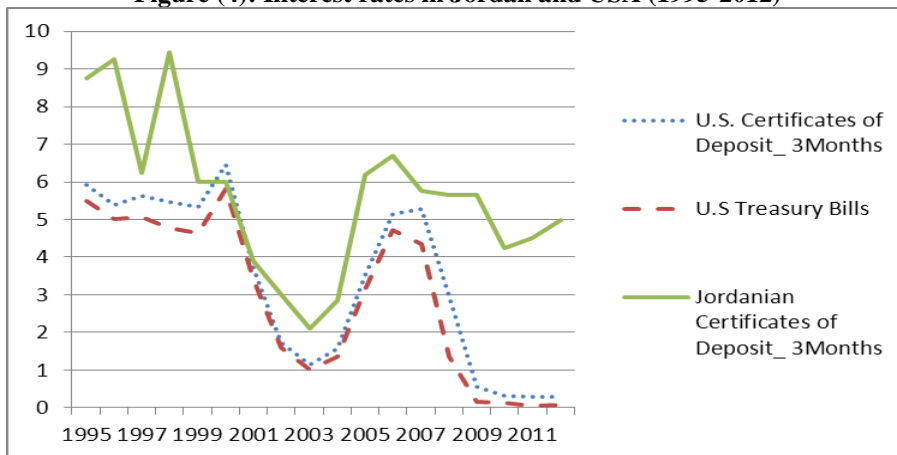
Based on the main objective of the study to determine the extent of joint movement between the domestic interest rate (Jordan) and the foreign interest rate (American), we will review the historical development of the interest rate of the U.S. Figure (4) indicates this development during the period (1995 - 2012) in a yearly manner.

Generally speaking, one of the most important events that rocked the U.S. economy during the study period is the event of the 11th of September in 2001, when the U.S. Federal agency, during the year, reduced the interest rate nine times. This caused the reduction of the interest rates on the tools denominated by Jordanian Dinars five times during the same year in order to encourage the domestic demand and stimulate the economy to keep up with the global monetary developments. The reduction has continued until the end of the year 2003 after the end of the war in Iraq. In 2004, for the purposes of monetary stability, the American federal agency raised the interest rate. Similarly, the Jordanian Central bank resorted to the same tool. This trend has continued to rise until 2007. In 2008, when appeared the global financial crisis, which threatened to get the U.S. economy in particular and the world economy in general to enter in global recession, the U.S. authorities reduced the interest rate by 0.5 in an attempt to stimulate the market and increase liquidity. In Jordan, the Central Bank used the same way, leading to a significant reduction on the prices of the various benefits. This reduction of U.S. interest rate continued until it reached historic levels in decline to 0.09% in 2012.

The decrease of U.S. interest rates, since 2008, to unprecedented and unexpected levels make the difference between domestic interest rates and foreign ones get larger in a way that gives the Jordanian government more space and freedom to move up or down without the fear of approaching the local rate from the foreign one.

It should be noted that this joint movement was not observed until the events the USA have experienced such the 11th of Sept., Iraqi war, and the financial crisis. During the beginning of the study period (1995) when the JD was linked to the U.S. dollars until the year 2000, we would notice the absence of any joint movement between the domestic and foreign interest rates. Figure (4) illustrates the nature of these moves.

Figure (4): Interest rates in Jordan and USA (1995-2012)



Source: Central Bank of Jordan and the Federal Reserves.

4- The Theoretical Framework

The theory of interest rate parity

The theory of interest rate parity can be applied to the macro or micro-economic level. It is applied to the micro level when the financial market is effective, and there is no restriction on the movement of capital. It can be applied to the macro-level when the domestic interest rate equals the foreign interest one in the long-term (Lorena *et. al*, 2012).

It can be expressed about the mechanism by which the domestic interest rates respond to foreign rates under a fixed exchange rate system by addressing the triple impossible problem in the open economy and the theory of the interest rate parity. The economic policy makers in open economies face two options out of three undesirable ones: free movement of capital, a fixed exchange rate and an independent monetary policy.

This triple impossible problem requires that the countries that enjoy freedom of movement of capital and a fixed exchange rate are forced to get rid of the independence of the monetary policy and adopt the monetary policy to which a fixed exchange rate is related. Due to openness of the capital, the theory of parity of the interest rate stipulates that the nominal local interest rate equals the foreign interest rate in addition to risk premium on the financial securities of the two countries (Grenada and Moore, 2007).

The economic literature has hypothetically assumed that the independence of the monetary policy in one country must get the interest rate of this country avoid the response to the changes occurring in the interest rate of other benefits. In detail, any impact of foreign interest rates on the domestic one would be a sign for the loss of domestic monetary policy independence. However, we cannot ignore the importance of international

interest rates in forming the monetary policy especially in the developing countries (Maziad, 2009).

The condition of the interest rate parity states that the forward exchange rate (f) has to have an unbiased prediction for the future exchange rate (S_{t+1}). This can be formulated as follows (Grenada and Moore, 2007):

$$E(S_{t+1}) - S_t = \alpha + \beta (f_t - S_t) + e_t \tag{1}$$

where (E) is the coefficient of prediction, (S_t) is the logarithm of the current exchange rate, and (e_t) is the amount of error, which is assumed to be constant and normally distributed with a mean equal to zero and constant variance σ^2 .

On the other hand, the theory of the interest rate parity implies that the difference between the forward and actual rate is represented by the difference between the domestic and foreign interest rates. Mathematically, this relationship would be represented as follows:

$$f_t - S_t = r_t - r_t^* \tag{2}$$

where (r_t) represents the domestic interest rate and (r_t^*) represents the foreign interest rate.

By substituting Equation (2) in Equation (1), we get:

$$E(S_{t+1}) - S_t = \alpha + \beta (r_t - r_t^*) + e_t \tag{3}$$

When β is not statistically different from (1), this means that the theory of parity of the interest rate is verified, since any change in the right side multiplied with β will have almost the same impact on the left side of the Equation (3).

Practically speaking, due to linking the JD with the US dollar, $E(S_{t+1}) - S_t = 0$. Thus, Equation (3) can be re-written:

$$r_t - r_t^* = \frac{-\alpha - e_t}{\beta} \quad \text{or} \quad r_t - r_t^* = \frac{-\alpha}{\beta} + u_t \tag{4}$$

where
$$u_t = \frac{-e_t}{\beta}$$

We can test whether the theory of interest rate parity between Jordan and the United States through testing stationarity of the difference between the interest rates between the two countries, and we can state the following null hypothesis:

$$H_0: X_t = (r_t - r_t^*) \sim I(1)$$

where $I(1)$ means that the series is integrated of first difference, which means the time series is non-stationary at the level and (X_t) representing the difference in the interest rate.

The formulation of the alternative hypothesis will be as follows:

$$H_1: X_t = (r_t - r_t^*) \sim I(0)$$

where $I(0)$ means that the series is integrated of order 0, which means that the series is stationary at the level.

In case the null hypothesis is rejected, meaning that there is no stationarity of the difference between the domestic interest rate and the foreign one, this would be statistically significant evidence of joint movement between the domestic interest rates and foreign ones. This refers to the lack of independence of the monetary policy in Jordan. In the case of acceptance of the null hypothesis, it, statistically, indicates the absence of joint movement between domestic interest rates and foreign ones, which indicates the independence of the monetary policy.

5- Methodology

The economic theory indicates that if the country follows the policy of a fixed exchange rate, in addition to follow a policy of freedom of movement of capital, the domestic interest rates must be close to the interest rates of the country to which the local currency is attached. Thus, there is a joint movement between the rates of interest between the two countries (Frankel, *et. al.*, 2002). This joint movement would be affected by certain factors including; the degree of openness to the international economy and the nature of economic shocks.

In this chapter, we will test the theory of interest rate parity by verifying the existence of a joint movement between domestic interest rates and the foreign ones. Since the test of the theory of interest rate parity is only a test of the stationarity of time series of both interest rates, the study will specifically test whether there is joint movement between the foreign interest rate (represented by American certificates of deposits for three months and treasury bills) and the interest rate of Jordan (represented by the certificates of deposit for three months).

To achieve the objective of this research, the study uses the method of quantitative analysis, which is based on the test of the theory of interest rate parity, that is, testing whether there is a joint movement between the Jordanian and foreign interest rates by using the test of Augmented Dickey Fuller (*ADF*) that tests the stationarity of the time series of the study variables in addition to using *KPSS* test, which also tests the stationarity of the time series. After that, we will examine cointegration among variables. Augmented Engle-Granger (*AEG*) and Johansen test will be used to examine if there is a long-term relationship between the variables of the study.

To achieve the objective of the study, data from reports and bulletins of the Central Bank of Jordan and the International Monetary Fund bulletins will be collected. A monthly series (January 1995 - December 2012) will be taken. The certificates of deposit for three months will present the domestic interest rate in addition to the treasury bills. In addition, we will have two different scenarios for U.S. interest rates (certificates of deposit for three months and Treasury Bills) so as to ensure the validity of the results of this study.

Tests of stationarity

The stationarity of time-series is of important issues in the field of econometrics in general and in time series analysis in particular. Indeed, some empirical studies using time series data assume usually that these series are stable or static without being tested. This leads to a lack of trust with the results of those studies which may yield spurious results. Thus, it is said that the time series is non-stationary if this it is integrated with a rank higher than zero. Statistically speaking, non-stationary time series is a series with unfixed mean and variance and integrated with a rank equal 1 or higher.

To test the stationarity, we can use joint tests which can reinforce the result of each other. Specifically, we will use the test of Augmented Dickey Fuller (ADF) and test of (KPSS) developed by Kwiatkowski *et al.*, (1992), which gained great popularity in the economic literature, as it is widely used as a test to examine the unit root of time series. The second test will be used as confirmatory analysis. For example, if we reject (accept) the null hypothesis of non-stationarity in the first test, and we accepted (rejected) the null hypothesis of stationarity in the second test, we would have confidence that the existing series is stable (unstable) (Nusair, 2003). Table (1) shows these possibilities.

Table (1): The potential results of ADF and KPSS tests with respect to the null hypothesis

KPSS ²	ADF ¹	
	Accept	Reject
Accept	No results' confidence	Confidence in the results (Stationarity)
Reject	Confidence in the results (No Stationarity)	No results' confidence

1: refers to ADF's null hypothesis of no stationarity.

2: refers to KPSS's null hypothesis of stationarity.

a) Augmented Dickey Fuller Test

This test will be used to test the theory of interest rate parity between Jordan and the United States. This test is useful in testing stationarity of the difference between the two interest rates to determine if there was a joint movement between the local interest rate and the foreign one in the long run. The following regression equation will be used (Gernade and Moore, 2007)

$$\Delta X_t = \alpha X_{t-1} + \sum_{j=1}^k \beta_j \Delta X_{t-j} + e_t \tag{5}$$

where X_t is the variable of concern and e_t is the amount of random error.

The null hypothesis (non- stationarity of time-series) is rejected if the value of α is statistically significant, indicating to verify the theory of interest

rate parity, and the relationship is stationary between the local interest rate and the foreign one.

b) KPSS test

On the other hand, stationarity of the relationship can be measured between the local interest rate and the foreign one through using *KPSS* test used by Kwiatkowski *et al.* (1992). The null hypothesis in this test is different from *ADF* test, in which the null hypothesis assumes the stationarity of the time series versus non-stationarity in the alternative hypothesis.

KPSS test assumes that we can split the variable of concern as follows:

$$x_t = x(t) + x(s) + \varepsilon_t \quad (6)$$

where $X(t)$ is the deterministic trend, $X(s)$ is random walk, and ε_t Stationary Error. In addition the term $x(t)$ is presented in the following equation:

$$x(s)_t = x(s)_{t-1} + u_t \quad (7)$$

In this test, we calculate the standard deviation of the resulting random error (u_t). If ($\sigma_u = \text{zero}$), the variable will be stationary. We can test this hypothesis by calculating Lagrange Multiplier by calculating the percentage of the sum of random errors squares $S^2 = \sum u_t^2$ (resulting from the regression of the Equation 7) divided by the square of variance of the error term estimated from the Equation (6). This is as follows:

$$LM = \frac{\sum_{t=1}^N S_t^2}{\hat{\sigma}_\varepsilon^2} \quad (8)$$

If the calculated statistical value of LM is less than the critical value, we cannot reject H_0 . This, in turn, is evidence of a joint movement between domestic interest rates and foreign ones. Hence, we might conclude that the monetary policy is not free.

Cointegration Test

This test is undertaken between variables integrated of the same order. For the test of cointegration, if the variables at levels are non-stationary and integrated of the first-order (integrated of order 1). Then, if it is possible to generate a linear combination of these variables, characterized by being stationary (integrated of order 0), the variables are cointegrated. Thus, the level of the variables can be used in the regression. By comparing the calculated values of the critical values at the significant levels 1% and 5%, the number of cointegration vectors can be determined. After confirming that variables of the study are non-stationary at the level and stationary in the difference and checking that all of them are cointegrated, the variables which are cointegrated reflect a long term balancing relationship.

6- Empirical Results

Augmented Dickey Fuller Test Results

Table (2) shows the Augmented Dickey Fuller (*ADF*) test's calculated and tabulated values of the two models of differences between the domestic and foreign interest rates. The first difference ($r_t - r_{1t}^*$) represents the difference between Jordanian interest rate on the certificates of deposits for three-month period and the interest rate of the American certificates of deposits for a three-month period. However, the second difference ($r_t - r_{2t}^*$) represents the difference between the interest rate on the Jordanian certificates of deposits for three-month period and the interest rate of the American treasury bills for a three-month period. It is worth noting that it was not dealt with the interest rate on the Jordanian Treasury bills because of its constancy and irresponsiveness to the monetary developments during the study period, as the case of the interest rate on certificates of deposit.

Table (2): The results of the ADF test for the differences in domestic and foreign interest rates

variables	intercept only			intercept and trend		
	ADF statistic	ADF critical value (5%)	ADF critical value (10%)	ADF statistic	ADF critical value (5%)	ADF critical value (10%)
$r_t - r_{1t}^*$	-2.05	-2.879	-2.576	-1.987	-3.437	-3.143
$r_t - r_{2t}^*$	-1.378	-2.879	-2.576	-1.177	-3.437	-3.143

Through investigating Table (2), it is clear to us that the difference between domestic interest rates and foreign interest ones is unstable whether the equation includes constant only or both constant and trend. The null hypothesis, of a unit root, cannot be rejected even at the 10% level. This result contradicts the theory of interest rate parity and the presence of a relation between the domestic interest rates and the foreign ones.

KPSS Test Results

It was resorted to this test to confirm or reject the results of the first test of stationarity. Table (3) indicates calculated and tabulated values of the difference between the domestic and foreign interest rates ($r_t - r_{1t}^*$) and ($r_t - r_{2t}^*$) as defined when presenting the results of the first test.

Table (3): The results of the KPSS test for the differences in domestic and foreign interest rates

Variables	intercept only			intercept and trend		
	KPSS statistic	KPSS critical value (5%)	KPSS critical value (10%)	KPSS statistic	KPSS critical value (5%)	KPSS critical value (10%)
$r_t - r_{1t}^*$	0.384	0.463	0.347	0.139	0.146	0.119
$r_t - r_{2t}^*$	0.322	0.463	0.347	0.198	0.146	0.119

Through investigating Table (3), it is clear to us that the first variable ($r_t - r_{1t}^*$), which represents the difference between the interest rate on certificates of deposit of Jordan for a period of 3 months and the interest rate on certificates of deposit of America for a period of 3 months is non-stationary at the level of 10% significant level. However, it is stationary only at the level of 5% significant level or less, in the case of constant only into the equation. Yet, in the case of a constant and trend, the null hypothesis stating that there is stationarity is rejected at the 5% level.

As for the second variable ($r_t - r_{2t}^*$), which represents the difference between the interest rate on the certificates on deposits three-month period and the interest rate of the American treasury bills for a three-month period, in the case of entry of a constant and trend into the equation, the hypothesis stating that there is variable stationarity is rejected when the 5% level. But if there is only the fixed, the hypothesis stating that there is stationarity cannot be rejected.

In sum, the tests of stationarity, which used the tests of (*ADF*) and (*KPSS*) strengthened the result that the variables (differences between the domestic and foreign interest rates) are not stationary. This is evidence that the monetary policy in Jordan has great freedom and independence.

Cointegration test Results

We have to verify the stationarity of all variables of concern: the interest rate on certificates of deposit in Jordan for a period of 3 months (r_t), the interest rate on American certificates of deposit for 3 months (r_{1t}^*) and the interest rate on Treasury bills of the U.S. for 3 months (r_{2t}^*). Table (4) shows the results of non-stationarity of the data at the level, but stationarity when adopting the first difference.

Table (4): The results for the ADF test for domestic and foreign interest rates

variables	intercept only				intercept and trend			
	ADF statistic (level)	ADF statistic (first difference)	ADF critical value (5%)	ADF critical value (10%)	ADF statistic (level)	ADF statistic (first difference)	ADF critical value (5%)	ADF critical value (10%)
r_t	-1.297	-12.862	-2.879	-2.576	-1.256	-12.85	3.437	-3.143
r_{1t}^*	-1.527	-4.547	-2.879	-2.576	-1.85	-4.507	3.437	-3.143
r_{2t}^*	-1.217	-4.07	-2.879	-2.576	-1.873	-4.098	3.437	-3.143

The results of *KPSS* test confirm the previous outlined results that state non-stationarity of domestic interest rates at the level and stationarity at the first difference as described in Table (5):

Table (5): The results for the KPSS test for domestic and foreign interest rates

Variable	intercept only				intercept and trend			
	KPSS statistic (level)	KPSS statistic (first difference)	KPSS critical value (5%)	KPSS critical value (10%)	KPSS statistic (level)	KPSS statistic (first difference)	KPSS critical value (5%)	KPSS critical value (10%)
r_t	-1.297	-12.862	-2.879	-2.576	-1.256	-12.85	3.437	-3.143
r_{1t}^*	-1.527	-4.547	-2.879	-2.576	-1.85	-4.507	3.437	-3.143
R_{2t}^*	-1.217	-4.07	-2.879	-2.576	-1.873	-4.098	3.437	-3.143

Because the time series for each of the interest rate on certificates of deposit of Jordan for a period of 3 months (r_t), the interest rate on American certificates of deposit for 3 months (r_{1t}^*) and the interest rate on Treasury bills of the U.S. for 3 months (r_{2t}^*) are integrated of order (1), Two Steps-Test Augmented Engle-Granger (AEG) will be used for Cointegration. The first step undertakes a regression in which certificates of deposit of Jordan for a period of 3 months (r_t) as the dependent variable and the interest rate on American certificates of deposit for 3 months (r_{1t}^*) as the explanatory variable. In addition, the interest rate on Treasury bills of the U.S. for 3 months (r_{2t}^*) is taken as the explanatory variable as well. These relationships can be expressed as follows:

$$r_t = c + \beta_1 r_{1t} + e_{1t}$$

$$r_t = c + \beta_1 r_{2t} + e_{2t}$$

where c is a constant.

Then, the random error (e_{1t}) (e_{2t}) is estimated. The second step includes checking the stationarity of the series of these two random error terms. After conducting regression between the previous variables and saving the value of random error terms, carrying out the tests of *ADF* and *KPSS* is done on these series. If they are stationary, it is a sign of a long term balancing relationship between the variables. If the tests of *ADF* and *KPSS* state that they are not stationary, this is contrary to a long-term relationship between the variables. The result of these tests appears in Tables (6) and (7):

Table (6): The results for the ADF test for error terms of regression equations (r_t) on both (r_{1t}) and (r_{2t})

variables	intercept only			intercept and trend		
	ADF statistic (level)	ADF critical value (5%)	ADF critical value (10%)	ADF statistic (level)	ADF critical value (5%)	ADF critical value (10%)
e_{1t}	-2.057	-2.879	-2.576	-1.991	3.437	-3.143
e_{2t}	-1.36	-2.879	-2.576	-1.167	3.437	-3.143

It appears that we cannot reject the null hypothesis stating the non-stationarity of the random error. This precludes the long-term relationship between domestic interest rates and foreign interest rates. The results confirm non-stationarity of the estimated random error, which is indicated by the results of a test (*KPSS*) as also described in Table (7) below.

Table (7): The results for the *KPSS* test for error terms of regression equations (r_t) on both (r_{1t}) and (r_{2t})

variables	intercept only			intercept and trend		
	<i>KPSS</i> statistic (level)	<i>KPSS</i> critical value (5%)	<i>KPSS</i> critical value (10%)	<i>KPSS</i> statistic (level)	<i>KPSS</i> critical value (5%)	<i>KPSS</i> critical value (10%)
e_{1t}	0.356	0.463	0.347	0.132	0.146	0.119
e_{2t}	0.305	0.463	0.347	0.193	0.146	0.119

This indicates that the previous results are a bit confusing. The statistical results of the tests of the theory of interest rate parity refer to the rejection of this hypothesis between the rates of domestic interest (represented by the interest rate on certificates of deposit of Jordan for a period of 3 months) and the foreign interest rate (represented by the interest rate on certificates of American deposit for a period of 3 months or interest rate on U.S. Treasury Bills for a period of 3 months). Generally, this is a proof that the monetary policy of Jordan enjoys autonomy required for the implementation of macroeconomic objectives.

What shows this confusion are the results of Figure (4) stating that there is a correlation between the local interest rate and the foreign one. The joint movement seems evident, especially during the period 2001-2008 of the study period. This contradiction can be explained by the presence of a positive difference between the two rates, which tends in the entire period except in 2000, to be in favor of the domestic interest rate. In addition, the United States during the study period had reduced the interest rates to historic levels. All this has helped to create a positive and big difference for the local monetary authority to protect the exchange rate which is pegged to the dollar.

The positive difference between the two rates has contributed to give greater freedom and independence for the domestic monetary policy not to get it follows completely the foreign interest rates. Thus, this study does not negate the role that the monetary authority desires to monitor the foreign interest rates (represented by American interest rates). Notwithstanding, the low level of American rates contributed to create a positive difference for the domestic rates which helped to give different reactions by the local monetary authority (between the rapid response and slow response) for the changes of

the U.S. interest rates. Thus, it weakens the complementary relationship between the two variables.

What supports the above is the results of *AEG* test for cointegration, which proved the absence of long-term complementary relationship between the variables above. To carry out Robustness to verify the validity of the previous results, Johanson Cointegration test has been applied which also denied such a relation. In addition, Granger Causality test did not prove that the foreign interest rates caused domestic interest rates (the results of the two tests are available upon request).

7- Conclusion

This study examined the test of the theory of interest rate parity to verify the existence of a joint movement between the domestic and foreign interest rates, using ADF and KPSS tests in addition to test of cointegration to determine the degree of cointegration between the domestic interest rates and the U.S. interest rates. The most important results of this study can be summarized as follows: The results of the stationarity test of the time series for differences between the domestic and foreign interest rates are contrary to the theory of interest rate parity that assumes a response of the domestic interest rate to the foreign one. Therefore, the results did not indicate the presence of a joint movement between the rates of domestic and foreign interest in the long-run. On conducting the cointegration tests to determine a long-term relationship between domestic and foreign interest rates, Augmented Engle Granger test and Johansen Cointegration test denied any cointegrated relationship between the variables.

In spite of the previous findings, this study does not negate the role that the monetary authority desires to monitor the foreign interest rates (represented by American interest rates) and maintain a positive margin in favor of the domestic interest rate, especially in light of the exchange rate system based on linking the Jordanian dinar to the dollar. Yet, because of the low level of U.S. interest rates, which contributed to create a positive difference for the benefit of domestic interest rates, this helped the local monetary authority to keep a comfortable margin to prevent shocks and rapid reaction to changes of the U.S. interest rates on the local economy. The results of this study prove (during the study period) that there is a room for the economic policy makers who can make use of, especially with regard to the monetary policy which is featured by a challenge for independence in light of both linking the Jordanian exchange rate of dinar with the U.S. dollar and the free movement of capital.

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