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# Determinants of Real Interest Rates: The Case of Jordan Long-Fei

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## Abstract

The study is aimed at investigating the main factors that affect the interest rate yields, in the long-term. In addition, the study surveys the theories and literature relating to the determinants of interest rate. The importance of which is essential not only for governments, but also for banks and corporate financial risk management decisions, including risk exposures in banks and capital markets. Interest rate influences corporate profit as well as growth. For this purpose, the study examines the impact of budget deficit, risk-free rate, capital inflows, money supply and business cycles on real interest rate in Jordan. These factors are based upon well-established theories and straightforward practical view as interest rate determinants. Using data for (1990-2015), the study employed Johansen's co-integrating test, which takes into consideration the long-term unsynchronized relationships. The data is tested for normality, symmetric correlations, covariance diagonal and unit root. The results show that the government budget deficit, short-term risk-free interest rate, capital inflows, money supply and business cycle are long-term determinants of the real interest rate in Jordan. The coefficients of government budget deficit, short-term risk-free rate, money supply and business cycle all are inversely affecting the real interest rate, while capital inflows has a positive impact on the real interest rate.

**Keywords:** Interest Rate, Budget Deficit, Risk-Free Rate, Capital Inflows, Money Supply, Business Cycles, Jordan.

**JEL Classification Code:** E4, E43, E62, C32, E31, E32.

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## 1. Introduction

The rate of interest can be viewed as a value, cost or return. It is a value for discounting cash flows, a cost for borrowing money, or a return from lending money and differing consumption. Interest rate can be expressed as a percentage payable rate or as a percentage discount rate, usually per annum. There is a converse relationship between the contemporary interest rate and the discounted value at that time, such that bond prices fall when interest rates increase. The concept of interest rate is of interest since the early time of the economic science. There are two broad theories of the interest rate: economic and monetary. Economic theories perceive interest rate as a return for real yield on real capital, and concerned with long-term interest rate movements. The real interest rate is set by the general

equilibrium's supply of and demand for capital. Fiscal policies determine long-term interest rates. Government with budget deficit is forced to borrow for spending and to re-financing maturing debt (Boskin, 1987). Monetization, i.e. printing money to finance deficits, increases inflation levels, which in turn increase interest rates. Both inflationary expectations and short term interest rate changes affect long term interest rates. However, these effects are not straightforward or clear. Changes in short term interest rate can influence the rise or fall in long-term interest rates, according to future inflation expectations. Likewise, changes in the real investment, employment and growth affect interest rate levels. The higher the level of investment and employment, savings would decrease and the demand for money increase, hence interest rates increase. But such influence depends on the structure of the economy. Finally, economic openness and international capital markets have their share in influencing interest rates.

Schumpeter (1956) and other economist, such as Bohm-Bawerk (1957), built up barter-economy models for determining interest rates. The real interest parity states that

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real inflation-adjusted interest rate on comparable assets should be equal across countries. Exchange rate expectation is linked to inflation as well as to non-inflationary differentials. Purchasing power parity (PPP) ascertains that the real exchange rate equals the nominal exchange rate adjusted for domestic and foreign differential inflation changes (Butler, 2008, p.75). The international Fisher effect postulates that the difference between the interest costs of loan in different currencies reflects market expectations about future changes in exchange rates over the loan's period (McRae, 1996, p.38) Thus, long term interest rates tend to shift simultaneously in different countries (Patterson & Lygnerud, 1999).

On the other hand, monetary theories see interest rate as a cost of money and short-selling securities, and a return on money lending and buying securities. These are concerned with short-term rate movements. The monetary rate is influenced by the money market's supply and demand for money. In fact, overnight and short-term interest rates are influenced and directly set-up by the central banks. The central bank can exercise its rule as the main supplier of cash to set-up not only overnight (the deposit rate) and short rates (the discount lending rate), but also the refinancing (repo) rate.

The main purpose of the central bank in sitting interest rate levels is to sustain price stability and control inflation. However, higher interest rates encourage people to save and businesses to defer capital spending. Neutral rates are just high enough to compensate for inflation, but not as high as to deterring economic growth and slumping employment. Several reasons, however, challenge such theory. Firstly, there is no guarantee for political support for the price stability, as opposite to the goal of lower interest rates to boost investment and sustain employment. Secondly, most economies are increasingly open, and thus, influenced by the international financial markets. International capital can flow swiftly between countries in search of higher returns, hence unsettling domestic monetary policy. Thirdly, financial systems are varied among different countries and regions, due to varied structure of financial institutions, degree of household and corporate debts, and quantum of the financial sector. Such variation creates uncertainty about the mechanism of transmitting central bank interest rates to the money market. Finally, since forecasting inflation is subject to forecasting errors and judgments (Malmendier & Nagel, 2016), neutral rate is not an objective rate. Some central banks drive it from the annualized growth rate in the money supply M3 (reference level) and the review of the price developments based on bond yields, consumer credit and the exchange rate (Patterson & Lygnerud, 1999).

From these two theories emerges the question of the relationship between short and long-term rates. Such

relationship is known as the term structure of interest rates. The figure plotting the yield to maturity (YTM) on the vertical axis and the term to maturity (measured in years) on the horizontal axis showing this relationship is called the yield curve. Fisher (1930) was the first to set up the relationship between interest rates and inflation, by arguing that the nominal interest rate equals the real interest rate plus the expected rate of inflation, which what become well-known as the Fisher Effect. That:

$$r_n = r^* + IP + e_t \quad (1)$$

where  $r_n$  is the market interest rate,  $r^*$  is the real interest rate, and  $IP$  is the expected inflation rate, and  $e_t$  represents other explanatory factors. When Fisher Effect works well,  $e_t = 0$ ; otherwise  $e_t > 0$ .

The Expectations Theory underlines that the yield curve shape depends on expectation of future inflation. Early studies examined the Fisher effect using backward-looking models, i.e. past inflation rates, to represent inflationary expectations, such as Gibson (1970). Shiller and Siegel (1977) show that nominal interest rates vary directly with movements in the general price level. However, in certain times, it is also possible that Fisher Effect does not work at all, as shown by Mishkin (1992). Also, it works in certain countries but not in others, as reported by Mishkin (1984) and Peng (1995). With the emergence of the Rational Expectations Theory of Muth (1961), and the Efficient Market Hypothesis of Fama (1970), literature, in testing Fisher Effect, incorporates these theories in modeling inflationary expectations, such as Peng (1995), Mishkin (1992), and Fama (1975).

Another interest rate theory devoted to explain the term structure of interest rates, i.e. the yield curve, is the Liquidity Preference Theory. It is a monetary theory postulates that since lenders prefer to lend short than long-term loans, they will charge lower rates on short-term than on long-term loans. It states that interest rate changes if demand for money exceeds the supply in the money market, and vice-versa. However, this theory can be seen as a demand for money theory, because the theory is formulated such that the demand for money is the desired reserve of money, and the supply of money is the existing reserve of money. According to Keynes, the demand for and supply of money determine the interest rate (Reynolds, 1979, p.101).

Finally, Market Segmentation Theory postulates that each of the borrower and lender has a preferred maturity. Such preference determines the supply and demand for money in the long-term market in relation to the short-term one (Besley & Brigham, 2005, p.54). This mechanism of the supply and demand shapes the slope of the yield curve.

Here, the interest rate changes if there is excess demand or supply in the bond market. This theory is known as a supply of money theory, because the theory is concerned with the supply of loanable funds.

Nevertheless, it has been argued (Graddy & Spencer, 1990, p.329) that long-term bond prices are more varied than short-term ones, albeit short-term interest rates alter more than long-term ones. That is because the capital gain (loss) of the long-term bonds, resulted from the difference between the market value and the par value, is divided by more years than for shorter-term issues. Determining the factors that influence interest rate yields is essential not only for governments, but also for banks and corporate financial risk management decisions, including risk exposures in banks and capital markets. Interest rate influences corporate profit as well as growth. It forms many corporate decisions, including types and timing of capital financing, sales forecasting, working capital requirements, and the present value of future cash-flows (Lamont, 1997). Besides, identifying such factors is a vital element of bank management for its balance sheet, since interest rate movements affect bank revenues and expenses (Schrand, 1997).

The objective of the study is to investigate the main factors that affect the interest rate yields, in the long-term. For this purpose, the study examines the effect of different factors on the ex post interest rate in Jordan during the period 1990-2015.

## 2. Literature Review

Relevant literature will be reviewed in this section. Firstly, empirical evidences on Fisher Effect, in USA and other developed countries, will be exhibited, as well as in developing countries. Then, literature on other explanatory factors will be reviewed. Such factors include budget deficit, foreign trade balance, national monetary policy, and business cycle.

### 2.1. Literature on Fisher Effect

Fisher hypothesis states that previous changes in the price reflected in the present interest rate. The majority of literature on the USA data shows a direct relationship between interest rates and inflation. Fisher Effect is seen by Fama (1975) as an evidence of an efficient market. However, he used sample autocorrelations between future price changes, instead of lag prices, and the real return on Treasury bill interest rates to form the expectations. Fama concluded that short-term interest rate is an efficient predictor of successive inflation rate. This conclusion is

confronted by Carlson (1977), who used business cycle variable (represented by six month lag of the ratio of employment to population) to Fama's equation. He concluded that rate of inflation that was not fully reflected in interest rates was incorporated in the business cycle.

Mishkin (1992) tested the unit roots of inflation and interest rates, using Dickey Fuller and Phillips, and found that both contained a unit root ( $I(1)$ ). He examined the common trend in inflation and interest rates, employing cointegration tests, and observed that there is a long-term, but not short-term Fisher effect. Wallace and Warner (1993) agreed with Mishkin's findings of ( $I(1)$ ). They used the term structure expectations model and apply cointegration test of Johansen and Juselius (1990), and found short and long term Fisher relationships as well as proved the expectations theory of the term structure. Moreover, Pelaez (1995) used Engle-Granger two-step method and Johansen's vector autoregressive error correction model (VER), and found similar ( $I(1)$ ) results to previous studies, but no support of a Fisher effect, due to the random-walk effect demonstrated by the ex-ante real interest rate. Jaques (1995) detected that the statistical properties of interest and inflation rates time series are varied. He showed that inflation (interest) rate is a  $I(1)$  ( $I(0)$ ) series, respectively. It can be concluded that the majority of literature on the USA data do not found a one-to-one relationship as assumed by Fisher hypothesis.

Other studies examine Fisher effect in other developed countries. Mishkin (1984) used seven OECD countries' real interest rates and found positive Fisher relationship in the UK, the US and Canada, but weak effect in Germany, the Netherlands and Switzerland. These results confirmed later on by Peng (1995), who found long-term relationship in France, U.K and U.S, and a weaker relationship in Germany and Japan. As for empirical literature in the developing countries, it has been found limited. Most of the work was undertaken in the south-east Asia and Latin America. To the best of author knowledge, none has been applied in the Arab countries.

Thornton (1996) studied Fisher effect in Mexico between Treasury bill and inflation rates, using the Johansen and Juselius (1990) cointegration tests. He concluded that there is a long-term relationship between nominal interest and inflation rates. Payne and Ewing (1997) examined Fisher effect in nine developing countries, using similar tests and Johansen (1988) unit root test. They found  $I(1)$  in the interest rates and inflation in these countries. The cointegration tests revealed a long-term relationship between market interest and inflation rates in Malaysia, Pakistan, Singapore and Sri Lanka, but not in Thailand, Niger, India, Fiji and Argentina. Teker, Alp, and Kent (2012) investigates the relationship between the consumer price index and deposit interest rates in Turkey, using the

threshold autoregressive (TAR) unit root and threshold vector error correction (T-VEC). They find that when the change in the difference between interest and inflation rates is more than the value of the threshold, a shock occurred in interest rates and rapidly returns to balance. However, in the case that the gap between interest and inflation rates in the extreme system is further enlarged, the ECM coefficient remains significant and is higher than ECM coefficient in the standard system. T-VEC equations revealed that the interest rate is positively influenced by its two lag periods, and the inflation is directly influenced by its one lag period. It can be seen that the above empirical literature in certain countries provides significant evidence on the Fisher hypothesis. However, this conclusion should be taken with caution as there were some deviations in other countries.

## 2.2. Literature on Other Explanatory Factors

Recent literature has shown that there are other explanatory factors that might affect interest rates including government budget deficit, foreign trade balance, national monetary policy, and most importantly the business cycle. Boskin (1987) found that budget deficits affect interest rates directly and indirectly. Budget deficits increase interest rates directly by increasing the demand in credit markets, and not directly via the ambiguity of the state of the economy. MacAvoy (2003) argues that deficits might cause "crowding out" of investment, and Krueger (2003) predicts that budget deficits crowd out investment in new plants and equipments for many coming years. Cebula (2003) provides evidence on causal relation between real interest rates and budget deficits. Dai and Philippon (2005) shed light on the impacts of fiscal policy on interest rates and thus yield curve determinant factors. They used a macro-finance model that considers a no-arbitrage term structure model and a set of structural restrictions that allow for identifying shocks in fiscal policy and tracing the impacts on different maturities bond prices. The end result shows that budget deficit increases long-run interest rate, because of higher expected spot rates, and higher risk premia. Kiani and Uchida (2013) empirically quantify the effect of Japan's large government deficits on long-term interest rates and the yield curve. They used a simple loanable funds model. The results reveal the direct effect of budget deficits and long-term interest rates.

Ajlouni (2017) scrutinizes the effect of government budget deficit and other factors on the long-run interest rate bonds in Jordan. The multivariate analysis indicates that budget deficit and real personal tax rate variables are statistically significant. Thus, concluding that after controlling for other variables, there is a significant impact of budget deficit on long-term interest rate in Jordan. Akpansung (2013) provides empirical evidence that disturbances in monetary

variables resulted in balance of payments disparity. Thus, any disequilibrium in the balance of payment can, *ceteris paribus*, be competently adjusted through domestic credit demand, and then foreign trade balance. The central banks can do this by restricting the growth of domestic credit, such that consumers cut their extra expenditure in order to restore their cash balances.

Giannoni and Woodford (2002) suggest a general model to obtain an optimal monetary policy imperative for a dynamic linear rational expectations model and a quadratic objective function for policy. They show that the association between the interest-rate and other intended variables is not contemporary, and propose common forms per which optimal policy can be characterized by a "super-inertial" interest-rate rule. However, Koenig and Dolmas (2003) argue that as short-term interest rates approach zero, the Federal Reserve standard means for motivating the economy become useless. The Fed will need to open-market purchases of longer-term government bonds, as it was in the 1940s and early 1950s. Moreover, in such an environment of close to zero interest rates, Eggertsson (2009) states that in a typical New Keynesian business cycle model, tax reduction on wages and capital, can deepen a recession because it increases deflationary pressures and it deters people to spend and encourages them to save when spending is needed.

Hellwig, Mukherji, and Tsyvinski (2005) develop a stylized currency crises model with heterogeneous information among investors and endogenous determination of interest rates in noisy rational expectations equilibrium. They conclude that multiplicity appears strongly, either when the high cost of local interest rates causes devaluation, or when central bank lacks of foreign reserves causes devaluation. As an immediate implication of the random walks exchange rates, Alvarez, Atkeson, and Kehoe (2006) indicate that the key cause of nominal interest rate differentials on currency-denominated bonds is time-varying risk. Using Japanese experience with deflation over last two decades, Kurihara (2016) provides strong evidence that interest rates and consumer prices have not affected demand for money, due to the using quantitative easing policy changed the demand function for money.

Kwark (2002) studies the relation between the default risk and interest rate spread and it causes business cycle in a general equilibrium model. He finds that the interest rate differential between risky and risk-free has high predictive influence for successive variations in real output. Neumeyer and Perri (2005) show that real interest rates lead the cycle and counter-cyclical, the net exports is strongly counter-cyclical, and output is less volatile than consumption. Also, business cycles in developed countries (Sweden, New Zealand, Netherlands, Canada, and Australia) are less

volatile than emerging countries (Philippines, Korea, Mexico, Brazil, and Argentina).

It has been found out that most of the empirical literature was carried out in developed countries. This research seeks to fill the gap in the literature by using data from an emerging economy, *i.e.* Jordan. As the monetary authority, Central Bank of Jordan (CBJ) performs monetary policy so as to confront the local inflation and output gap. CBJ maneuvers a fixed to the US Dollar exchange rate (peg regime), since 1995. However, CBJ is somehow freely maneuvering monetary policy in the short-term, and is independent in deciding the spread between local and US interest rates. Since the Jordanian Dinar crisis in 1988, when it lost more than half of its value, Jordanian monetary policy evolved considerably and undertaken a course of monetary reforms, which re-established trust in the Jordanian Dinar and supported the safeguarding of a fixed exchange rate system ever since. In addition, the CBJ has adopted more sophisticated indirect control policy instruments, which enhanced its ability to achieve monetary stability and a higher degree of independence. Finally, the CBJ has built a large value of foreign reserves and gold, while maintaining low and stable inflation without restricting economic growth (Maziad, 2009).

### 3. Research Methodology

This study aims at investigating interest rate determinants in the Jordanian context. Using annual data, the study sample covers the period from 1990 to 2015, the latest data available year. The data is collected from the Central bank of Jordan's annual reports and monthly statistical bulletins.

#### 3.1. Model

The general *ex-ante* Fisher Effect model of interest rate indicates that:

$$rn = f(r^*, IP) \tag{2}$$

where (rn) is the nominal interest rate, ( $r^*$ ) is the real interest rate and (IP) is the inflation premium. In fact, the risk-free security's interest rate (treasury bills, for example) equals:

$$rf = r^* + IP \tag{3}$$

However, this study argues that equation (2) above is misspecified. Because it excluded government budget

deficit (Bd), foreign trade balance (FTB), national monetary policy (MP), and most importantly the business cycle (BC). The literature reviewed above shows that these factors can influence interest rate. Thus, the correct model indicates that:

$$r_n = f(r^*, IP, Bd, FTB, MP, BC) \tag{4}$$

In case of Jordan, the workers' remittances (WR) is a better measure of the amount of cash inflows to the country than foreign trade, monetary policy is measured by the real growth rate of money supply (MS2), business cycle is indicated by the real growth rate of GDP (GDPg) and equation (3) is replaced by treasury bills interest rate (rf). Therefore, equation (4) is re-written as:

$$rn = f(Bd, rf, WR, MS2, GDPg) \tag{5}$$

Since this study is about forecasting what determines interest rates, and since the determination is not expected to be spontaneous, then, the model estimates (rn) in year (t1) based on determinant factors in year (t). Thus, the estimation model of equation (5) would be:

$$m_{t+1} = f(Bd_t, rf_t, WR_t, MS2_t, GDPg_t) \tag{6}$$

#### 3.2. Data

This section exhibits the computations of the data used for empirical tests, as follows:

The nominal interest rate (rn) is the real rediscount rate, calculated by:

$$rn_t = Re\ discountRate_t - Inflation_t \tag{7}$$

The government budget deficit is estimated, following Cebula (2008), as follows: The government budget at year (t) constraint includes previous year (t-1) outstanding debt (D),

interest charges on outstanding debt ( $r^* \cdot D$ ), worker's remittances (WR), government revenues (Rev) and government expenditures (Exp), as follows:

$$D_t = D_{t-1} + r_{t-1} \cdot D_{t-1} + WR_{t-1} + Exp_{t-1} - Rev_{t-1} \tag{8}$$

Literature is commonly measures the government budget deficit in year (Bdt) as the difference between Dt and Dt-1, such that:

$$Bd_t = D_t - D_{t-1} = \bar{r}_{t-1} * D_{t-1} + WR_{t-1} + Exp_{t-1} - Re v_{t-1} \quad (9)$$

Cebula (2008) argues that interest payments paid by the treasury should be excluded from equation (8). The product is primary budget deficit (PBdt). However, in the Jordanian case, there are two sorts of debt: domestic and foreign. Thus, the primary budget deficit is expressed as:

$$PBd_t = Bd_t - \bar{r}ld_{t-1} * LD_{t-1} = \bar{r}fd_{t-1} * FD_{t-1} + WR_{t-1} + Exp_{t-1} - \bar{r}ld_{t-1} * LD_{t-1} \quad (10)$$

where (LD) is the government domestic debt, (rld) is the average interest rates on (LD), (FD) is the government foreign debt and (rfd) is the average interest rates on (FD).

The real risk-free interest rate (rf) is the 6-month Treasury Bills interest rate, computed by:

$$rf = TreasuryBillRate_t - Inflation_t \quad (11)$$

Capital inflows factor is represented by workers' remittances from abroad, for two reasons: First: data is not available about international capital investment inflows, but for the last five years or so. Second: workers' remittances

cash inflow is a major and vital source of foreign currency in Jordan, and it is highly significantly correlated with economic growth, i.e. more than 90%. For the purpose of this study, capital inflow is calculated as:

$$K_t = WR_t / GDPm_t \quad (12)$$

The domestic fund available in the economy is represented by the broader money supply definition (MS2), and computed by:

$$MS2g_t = MoneySupply_t * 2 * Growth_t - Inflation_t \quad (13)$$

The business cycle is measured by the growth of the economy, and corresponded by the annual growth rate of the GDP. Based on above calculations, equation (6) is rewritten to reflect the data framework and to represents the empirical model of the study, as follows:

$$m_{t+1} = a + Bd_t + rf_t + K_t, MS2g_t, GDPg_t + e_t \quad (14)$$

The following Table 1 and Figure 1 show the data used in the study.

**Table1.** Summary Statistics and Correlation of the Data of the Study for the Period (1990-2015)

Statistics	Nominal Interest Rate (rn <sub>t+1</sub> )	Budget Deficit (Bd <sub>t</sub> )	Risk-Free Rate (rf <sub>t</sub> )	Capital Inflows (K <sub>t</sub> )	Money Supply (MS2 <sub>t</sub> )	GDP Growth Rate (GDPg <sub>t</sub> )
Average	0.02564	0.19417	0.00849	0.15251	0.05434	0.09980
Maximum	0.07418	0.26984	0.07568	0.20850	0.13433	0.28358
Minimum	-0.07695	0.11815	-0.12170	0.08949	-0.11070	0.02998
Variance	0.00102	0.00152	0.00191	0.00163	0.00281	0.00374
Correlation	Nominal Interest Rate (rn <sub>t+1</sub> )	Budget Deficit (Bd <sub>t</sub> )	Risk-Free Rate (rf <sub>t</sub> )	Capital Inflows (K <sub>t</sub> )	Money Supply (MS2 <sub>t</sub> )	GDP Growth rate (GDPg <sub>t</sub> )
Nominal Interest Rate (rn <sub>t+1</sub> )	100%					
Budget Deficit (Bd <sub>t</sub> )	6.7%	100%				
Risk-Free Rate (rf <sub>t</sub> )	22.0%	28.7%	100%			
Capital Inflows (K <sub>t</sub> )	6.2%	67.9%	50.1%	100%		
Money Supply (MS2 <sub>t</sub> )	5.4%	6.1%	46.2%	12.1%	100%	
GDP Growth rate (GDPg <sub>t</sub> )	-7.1%	-25.9%	-60.2%	-17.4%	-7.1%	100%

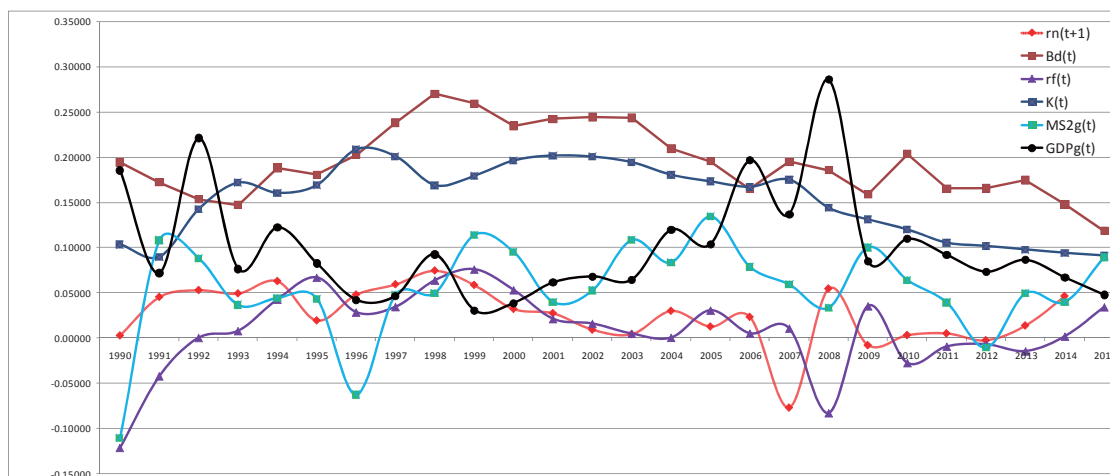


Figure 1. Data of the Study during the Period (1990-2015)

Johansen Co-integrating test is employed to examine the study model (equation 14) because, as mentioned in Giannono and Woodford (2002), the relationship between the interest rate and the determined variables is not purely contemporaneous. Johansen Co-integrating tests the long-term relationship between the variables.

#### 4. Analysis and Results

Before investigating the impact of the determinants factors on interest rate in Jordan, the study performs various tests of the data, in terms of normality (Doornik-Hansen), symmetric correlation (Lawley) and covariance diagonal (Adjusted LR). Table 2 shows that: the data is normal, the correlation matrix is not symmetric, i.e. not all correlations are equal, and the covariance matrix is not diagonal.

Table 2. Testing the Study Data for Normality, Symmetric Correlations and Covariance Diagonal

Test for multivariate normality	
Doornik-Hansen	chi2(16) = <b>39.261***</b> Prob > chi2 = <b>0.0010</b>
Test that correlation matrix is compound symmetric (all correlations equal)	
Lawley	chi2(27) = <b>102.43***</b> Prob > chi2 = <b>0.0000</b>
Test that covariance matrix is diagonal	
Adjusted LR	chi2(28) = <b>248.11***</b> Prob > chi2 = <b>0.0000</b>

Note: (\*\*\*) indicates rejection of null hypothesis of non-normality, equal correlations and diagonal covariance matrix at 1% or less.

In addition, Phillips-Perron test for unit root is conducted. Table 3 exhibits the results that the null hypotheses of unit roots are rejected at (99%) and (95%). Hence, all variables are stationary in levels, and thus, causality test can be performed in levels.

Table 3. Phillips-Perron Test for Unit Root in the Study Data

Variable	Test Value	Interpolated Dickey-Fuller 5% Critical Value	MacKinnon approximate p-value for Z(t)
Rn(t+1)	-22.540***	-12.500	0.0012
Bd(t)	-3.680**	-12.500	0.7384
rf(t)	-15.954***	-12.500	0.0004
K(t)	-2.959*	-12.500	0.7112
MS2g(t)	-26.569***	-12.500	0.0000
GDPg(t)	-23.421**	-12.500	0.0005

Note: (\*\*\*) , (\*\*) and (\*) indicate rejection of null hypothesis of unit root at 1%, 5% and 10% or less respectively. Number of obs. = 25 Newey-West lags = 2

This study uses time-series data, summarized in the tables above, to investigate the impact of certain factors on the interest rate in Jordan during the period (1990-2015). It examines the long-term effect of the government budget deficit, short term risk-free interest rate, capital inflows, money supply and business cycle on the re-discount rate. The empirical model of the study (equation 14 above) is tested using Johansen Co-integrating test. The results are reported in Table 4.

**Table 4.** Johansen Co-integrating test of the Study Data

Co-integrating equations			
Equation	Parms	chi2	P > chi2
-----	-----	-----	-----
_ce1	5	<b>1242.038***</b>	<b>0.0000</b>
-----	-----	-----	-----
Identification: beta is exactly identified			
Johansen normalization restriction imposed			

beta	Coef.	z	P> z
_ce1			
rnt1	1		
bd <sub>t</sub>	-.2939653	-7.86***	0.000
rf <sub>t</sub>	-.6998978	-20.44***	0.000
k <sub>t</sub>	.279525	9.51***	0.000
ms2g <sub>t</sub>	-.1428701	-5.53***	0.000
gdp <sub>t</sub>	-.0560984	-2.59***	0.010
cons	.0119637		

Note: (\*\*\*) indicates significant at 1% or less.

The results show that government budget deficit, short-term risk-free interest rate, capital inflows, money supply and business cycle are long-term significant determinants of the real interest rate in Jordan. The results show that the coefficients of these factors are statistically significant, indicating that government budget deficit, short-term risk-free rate, money supply and business cycle all are inversely affecting the real interest rate, while capital inflows has a positive impact on the real interest rate.

These results are in line with some of the literature (see, for example, Kwark, 2002; Neumeyer & Perri, 2005). However, the direction of the influence might be different. For example, the result of this study shows that the long-term government budget deficit has a negative impact on real interest rate increases. This is in conflict with Ajlouni (2017). However, such contradicting results can be attributed to the time-varying effect, since Ajlouni (2017) employed concurrent relationships.

## 5. Conclusion

This study surveys the theories and literature relating to the determinants of interest rate. The results of the empirical findings on Fisher effect based upon the rational expectation and efficient market theories are mixed. The evidence from the US (Latin American) is mostly consistent with Fisher effect, while outcomes from other developed (developing) countries are not clear-cut. Each of the interest rate theory focuses on a particular fundamental factor that determines

the equilibrium rate. However, emphasizing on one determinant factor of the interest rate arrives at the expense of other relevant factors. This study argues that the basic analysis of the factors that determine, in the long-term, the real interest rate include, but not limited to, government budget deficit, short-term risk-free interest rate, capital inflows, money supply and business cycle. These factors are based upon well-established theories and straightforward practical view as interest rate determinants. This might help in establishing a new interest rate theory.

Globalization and integration between international financial markets are contributing in the determination of domestic interest rates. As central banks become more in agreement towards their fundamental approaches in conducting their domestic monetary policy, such that pursuit market and price stability, domestic long-term interest rates determined coincidentally similarly, an aspect that is not covered in this study.

## References

- Ajlouni, M.M. (2017). Government Budget Deficit and Long-Term Interest Rate Yields in Jordan. *International Review of Management and Business Research*, 6(2), 878-885.
- Akpanung, A.O. (2013). A Review of Empirical Literature on Balance of Payments as a Monetary Phenomenon. *Journal of Emerging Trends in Economics and Management Sciences*, 4(2), 124-132.
- Alvarez, F., Atkeson, A., & Kehoe, P.J. (2006, March). Time-Varying Risk, Interest Rates, and Exchange Rates in General Equilibrium. Federal Reserve Bank of Minneapolis, *Research Department Staff Report 371*. Retrieved August 4, 2007, from <https://www.minneapolisfed.org/research/SR/SR371.pdf>.
- Besley, S., & Brigham, E.F. (2005). *Essentials of Managerial Finance* (13th ed.). Ohio, USA: Thomson, South-Western.
- Bohm-Bawerk, E.V. (1957). *Capital and Interest: A Critical History of Economic Theory*. New York, USA: Kelly & Millman Inc.
- Boskin, M.J. (1987). Deficits, Public Debt, Interest rates and Private Savings: Perspectives and Reflections on Recent Analyses and on US Experience. In M. J. Boskin, J. S. Fleming, & S. Gorini (Eds), *Private Saving and Public Debt* (pp. 252-286). Oxford, UK: Basil Blackwell.
- Butler, K.C. (2008). *Multinational Finance* (4th Ed.). West Sussex, UK: John Wiley and Sons.
- Carlson, J.A. (1977). Short Term Interest Rates as Predictors of Inflation: Comment. *American Economic Review*, 67(3), 469-475.
- Cebula, R.J. (2008). Determinants of Long-Term Real Interest Rate Yield: The Case of US. *The ICFAI Journal of*



- Applied Economics*, 7(3), 37-79.
- Cebula, R.J. (2003). Budget Deficits and Real Interest Rates: Updated Evidence on Causality. *Atlantic Economic Journal*, 31(3), 255-265.
- Dai, Q., & Philippon, T. (2005, August). Fiscal Policy and the Term Structure of Interest Rates. *NBER Working Paper*, No. 11574. Retrieved August 5, 2007, from <http://www.nber.org/papers/w11574>.
- Eggertsson, G.B. (2009, November). What Fiscal Policy Is Effective at Zero Interest Rates?. Federal Reserve Bank of New York. *Staff Reports No. 402*. Retrieved February 22, 2011, from <http://www.nber.org/chapters/c12027.pdf>.
- Fama, E.F. (1970). Efficient Capital Markets: A Review of Theory and Empirical Work. *Journal of Finance*, 25(2), 383-417.
- Fama, E.F. (1975). Short Term Interest Rates as Predictors of Inflation. *American Economic Review*, 65(3), 269-282.
- Francis, J.C., & Ibbotson, R. (2002). *Investments: A Global Perspective*. New Jersey, USA: Pearson Education, Prentice Hall,
- Giannoni, M.P., & Woodford, M. (2002, December 16). Optimal Interest-Rate Rules: I. General Theory, Working Paper delivered at the Jacob Marschak Lecture at the 2001 Far Eastern Meeting of the Econometric Society, Kobe, Japan.
- Gibson, W.E. (1970). Price-Expectations Effects on Interest Rates. *Journal of Finance*, 25(1), 19-34.
- Graddy, D.B., & Spencer, A.H. (1990). *Managing Commercial Banks: Community, Regional and Global*. New Jersey, USA: Prentice Hall, Inc.
- Hellwig, C., Mukherji, A., & Tsyvinski, A. (2005, March) Self-Fulfilling Currency Crises: The Role of Interest Rates. *NBER Working Paper No. 11191*. Retrieved January 29, 2006, from <http://www.nber.org/papers/w11191>.
- Jacques, K. (1995). Unit Roots, Interest Rate Spreads and Inflation Forecasts. *Applied Economics*, 27(7), 605-608.
- Kiani, K.M., & Uchida, T. (2013). Budget Deficits and Long-Term Interest Rates in Japan. *British Journal of Economics, Management & Trade*, 3(4), 389-404.
- Koenig, E.F., & Dolmas, J. (2003, May). Monetary Policy in a Zero-Interest-Rate Economy. *Presentation in Federal Reserve Bank of Dallas*. Retrieved August 4, 2007, from <https://www.dallasfed.org/~media/documents/research/swe/2003/swe0304a.pdf>.
- Krueger, A.B. (2003, March 6). Big Federal Deficits, Bigger Risks. *New York Times*.
- Kurihara, Y. (2016). Demand for Money under Low Interest Rates in Japan. *Journal of Economic & Financial Studies*, 4(4), 12-19.
- Kwark, N.S. (2002). Default Risks, Interest Rate Spreads, and Business Cycles: Explaining the Interest rate Spread as a Leading Indicator. *Journal of Economic Dynamics & Control*, 26(2), 271-302.
- Lamont, O. (1997). Cash Flow and Investment: Evidence from Internal Capital Markets. *Journal of Finance*, 52(1), 83-109.
- MacAvoy, P. (2003). Don't Just Stand There... Treasury Secretary William E. Simon and Fiscal Policy during Stagflation 1975-1976. *Atlantic Economic Journal*, 31(3), 213-218.
- Malmendier, U., & Nagel, S. (2016). Learning from Inflation Experiences. *The Quarterly Journal of Economics*, 131(1), 53-87.
- Maziad, S. (2009). Monetary Policy and the Central Bank in Jordan. *IMF Working Paper No. WP/09/191*. Retrieved September 12, 2009, from <https://www.imf.org/external/pubs/ft/wp/2009/wp09191.pdf>.
- McRae, T.W. (1996). *International Business Finance: A Concise Introduction* (1<sup>st</sup> Ed.). West Sussex, UK: John Wiley & Sons.
- Mishkin, F. (1984). Are Real Interest Rates Equal across Countries? An Empirical Investigation of International Parity Condition. *Journal of Finance*, 39(5), 1345-1357.
- Mishkin, F.S. (1992). Is the Fisher Effect for Real? A Reexamination of the Relationship between Inflation and Interest Rates. *Journal of Monetary Economics*, 30(2), 195-215.
- Muth, J.F. (1961). Rational Expectations and the Theory of Price Movements. *Econometrica*, 29(3), 315-335.
- Neumeyer, P.A., & Perri, F. (2005). Business Cycles in Emerging Economies: The Role of Interest Rates. *Journal of Monetary Economics*, 52(2), 345-380.
- Patterson, B. & Lygnerud, K. (1999, December). The Determination of Interest Rates, European Parliament, Directorate General for Research. Economic Affairs Series, *Working Paper No. ECON116*. Retrieved November 24, 2013, from [http://www.europarl.europa.eu/workingpapers/econ/pdf/116\\_en.pdf](http://www.europarl.europa.eu/workingpapers/econ/pdf/116_en.pdf).
- Payne, J.E., and Ewing, B.T. (1997). Evidence from Lesser Developed Countries on the Fisher Hypothesis: A Cointegration Analysis. *Applied Economics Letters*, 4(11), 683-687.
- Peng, W. (1995). The Fisher Hypothesis and Inflation Persistence Evidence from Five Major Industrial Countries. *IMF Working Paper No. 95/118*, Washington D.C. Retrieved December 24, 2013, from <https://www.imf.org/en/Publications/WP/Issues/2016/12/30/The-Fisher-Hypothesis-and-Inflation-Persistence-Evidence-From-Five-Major-Industrial-Countries-1936>
- Reynolds, L.G. (1979). *Macroeconomics: Analysis and Policy*. Illinois, USA: Irwin, Inc.
- Schrand, C.M. (1997). The Association between Stock Price Interest-Rate Sensitivity and Disclosures about Derivative Instruments. *The Accounting Review*, 72(1), 87-109.

- Schumpeter, J.A. (1956). *The Theory of Economic Development: An Inquiry into Profits, Capital, Credit, Interest and the Business Cycle*. Cambridge, USA: Harvard University Press.
- Shiller, R.J., & Siegel, J.J. (1977). The Gibson Paradox and Historical Movements in Real Interest Rates. *Journal of Political Economy*, 85(5), 891-907.
- Teker, D., Alp, E.A., & Kent, O. (2012). Long-Run relationship Between Interest Rates and Inflation: Evidence from Turkey. *Journal of Applied Finance and Banking*, 2(6), 41-54.
- Thornton, J. (1996). The Adjustment of Nominal Interest Rates in Mexico: A Study of the Fisher Effect. *Applied Economics Letters*, 3(4), 255-257.
- Wallace, M.S., & Warner, J.T. (1993). The Fisher Effect and the Term Structure of Interest Rates: Tests of Cointegration. *Review of Economics and Statistics*, 75(2), 320-324.