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Deposit Rate and Lending Rate in Jordan, Which leads Which? A Cointegration Analysis

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Abstract: This study intends to investigate empirically the long-run relationship between deposit and lending rates in Jordan by utilizing quarterly data over the period (1994-2010). Empirically, we search to identify the dominant interest rate; either deposit rate or lending rate. To achieve the current study goals, we employ the error correction model technique and the asymmetric short-run dynamic model. The empirical evidence of the Jordanian economy illustrates deposit and lending rates have a long-run relationship. Deposit rate leads lending rate. As a result, the short-run lending rate adjustment for the deviation from the long-run equilibrium by about 22 percent in the current period. In the long-run, lending rate adjusts by 90 percent for a change in deposit rate.

Keywords: Monetary policy, Retail interest rate, Symmetric adjustment, Interest rate pass-through, Error correction model.

JEL Classification: E43

Introduction

Understanding monetary policy effectiveness is a fundamental topic of monetary economics. For this reason, large number of economists focused on exploring channels of monetary transmission on both empirical and theoretical levels (e.g., Bernanke & Gertler, 1995; Mishkin, 1995; Clarida, Gali & Gertler, 1999; Ireland, 2005; Poddar, Sab, & Khachatryan; 2006). Through the investigation process the relationship between policy short-term interest rate and banks' retail interest rates i.e. deposit and lending rates has received modest consideration in monetary theory and empiri-

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cal studies. Meanwhile, firms' and households' behaviors are more related to retail interest rates rather than the policy short-term interest rate. Accordingly, monetary economists conduct a large number of studies based on data from single and group of countries to investigate the interest rate pass-through (e.g., Hofmann & Mizen, 2004; Liu, Margaritis & Tourani-Rad, 2008; Payne & Waters; 2008; Ozdemir, 2009; Sweidan, 2010). Technically, these studies examine the degree and speed of adjustment of retail interest rates for a change in policy interest rate.

Within this framework of analysis, monetary and macro economists confirm that many important economics variables display asymmetric adjustment and asymmetric effect. For example[1], Cover (1992) confirmed that positive monetary policy shocks in the U.S. economy do not affect output. On the contrary, negative monetary policy shocks affect output. Other economists claim that retail bank interest rate is sticky, for example, de Bondt (2005) explored the interest rate pass-through process in the euro area. He concluded the immediate pass-through of market interest rates to retail bank interest rates is incomplete.

In this paper, we work on a new link. We believe commercial banks have a crucial role in the monetary transmission mechanism. Setting deposit and lending rates are vital for lenders and borrowers. We accept as true that exploring the long-run relationship between deposit and lending rates help to understand interest rate pass-through in depth. Additionally, we highlight on the nature of the decisions made by the commercial banks' whether it is affected by either their costs or their revenues.

Within the current literature review progress, we produce series of papers to understand monetary policy in Jordan[2]. Sweidan (2008) investigated whether Jordan's policy interest rate adjusts differently to expansionary versus contractionary monetary policies or not. He utilized threshold autoregressive (TAR) and momentum TAR (MTAR) models. His conclusion confirms that Jordan's policy interest rate exhibits symmetric adjustment. It means that the CBJ is not biased of either easy or tight monetary policy. Sweidan (2009) studies the CBJ preferences. He finds the CBJ prefers high levels of inflation rate and output. Recently, Sweidan (2011b) inspected empirically the relationship between short-term policy interest rate and both deposit and lending rates in Jordan. He explored the speed of adjustment and pass-through from policy rate to deposit and lending rates. He ended-up that Jordan's deposit and lending interest rates follow a symmetric movement for their deviations from the long-run equilibrium. Besides, he found Jordan's deposit rate adjusts larger and faster than lending rate for a deviation from the long-run equilibrium. Further, Sweidan (2011a) examined monetary policy inertia in the Jordanian economy. His results prove that monetary policy inertia is highly significant in Jordan. Also, the evidence illustrates that both inflation rate and output gap have insignificant effect on setting policy rate. Moreover, policy interest rate seems to be set gradually in reaction to monetary policy inertia, foreign interest rate and unobserved variable.

Sweidan (2011b) did not study in-depth the direct relationship between deposit and lending rates in Jordan, we believe this is a missing significant link because it focuses on the commercial banks' behavior and even it confirms the consistency of Sweidan (2011b) findings. Their behavior in setting their deposit and lending rates significantly affects monetary policy effectiveness. The rest of the paper is organized as follows: Section 2 presents the literature review of the relationship between deposit and lending rates. Section 3 introduces deposit and lending rates in Jordan. Section 4 introduces the method of the current study. Section 5 presents the empirical results. Conclusions are presented in the section 6.

Literature Review

Literature shows few studies have explored the relationship between deposit and lending rates. The attention on this imperative relationship is essential to understand monetary policy effectiveness, particularly interest rate pass-through. This concept means how a change in a policy interest rate affects the commercial banks' retail interest rates; deposit and lending rates. Dueker (2000) checked whether an asymmetric relationship exists between lending rate and market interest rate or not. He found an asymmetric behavior; lending rate responds faster to positive shocks of market rate than negative shocks. Accordingly, he stated banks are unlikely to decrease their lending rates during a recession due to the higher risk of default. This risk-averse behavior of bankers may result in lending rate displaying asymmetric movements to a change in market rate. Thompson (2006) demonstrated that banks may set their prime lending rates as some mark-up or margin over their deposit rates. If the markup is perceived to be too high or too low, the market force will command banks to alter back to some normal equilibrium spread. This conclusion is supported by the findings of Ewing, Payne, and Forbes (1998) and Ewing and Kruse (2007). Both studies confirmed that the spread returns back to its long-run equilibrium situation following a shock. With more details, the former confirmed the existence a long-run cointegration between lending rate and certificate of deposit rate. As a result, lending rate modifies to eliminate any disequilibrium position. The latter concludes that the relationship between prime-deposit rate spread is affected by economic growth, inflation rate and monetary policy. Technically, shocks to inflation enlarge the spread. In contrast, unpredicted changes in the federal funds rate and economic growth narrow the spread. Additionally, Thompson (2006) suggested a considerable idea which is banks may use this technique of asymmetric retail interest rate setting behavior even though it may not be optimal in the long-run. If banks have market power, they can expand of the spread by slowly adjusting their lending rates to the falling deposit rates. Nevertheless, other competing banks would simply alter their lending rates first

to capture more customers and gain larger market share. On the international assessment level, Chatrath et al. (1997) investigated the long-run relationship between bank lending and borrowing markets across six industrialized countries[3]. Their finding illustrated an increase of integration among banks lending and borrowing markets. It is a vital conclusion and consistent with the movement towards the globalization. Recently, Su and Chang (2010) employed the threshold error-correction model to examine the presence of a non-linear cointegration between lending and deposit rates of eight[4] Eastern European countries. Their results proved the existence of asymmetric behavior.

Deposit and Lending Rates in Jordan

The economy of Jordan is categorized as lower middle-income with about 6.11 million inhabitants and annual per capita income at constant market prices equal to $2290 in 2010. The Jordanian economy is part of the Middle East region which is identified as unstable region. Hence, the economy is very sensitive to external shocks either political events or economic affairs i.e. higher international oil prices and lower external grants. Since late 1995, the dinar has been officially pegged to the Jordan the US$ at a fixed exchange rate 1JD= $1.4104. That's why, the Central Bank of Jordan (CBJ) seeks to accumulate foreign reserves to help cushion against external shocks and preserve the fixed exchange rate. The CBJ main goals are to enhance economic growth, retain price stability and protect the fixed exchange rate with the U.S. dollar.

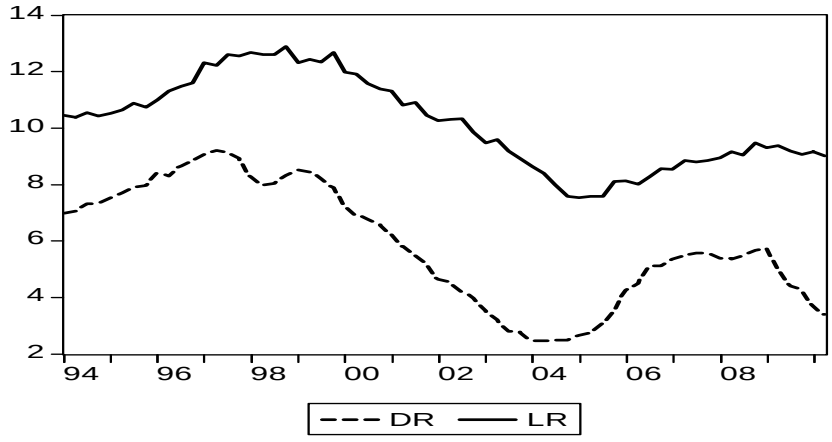
In September 1993, the CBJ utilized the indirect method i.e. certificate of deposit which is issued by itself to control the money supply. The new operating procedure has a vital impact on deposit and lending rates. The CBJ targets banks' deposit and lending rates to guarantee a high demand on the Jordanian dinar relative to the U.S. dollar. Hence, the success of monetary policy to achieve its goals depends on how the certificate of deposit rate affects the bank's retail interest rates. In March 1998, the CBJ used the overnight deposit facility (ODF) as a new tool to control the liquidity in the money market on a daily basis. The ODF interest rate is the floor of the inter-bank rate. Technically, the CBJ is operating between two boundaries; maintaining the attractiveness of the Jordanian dinar versus maintaining a pegged exchange rate to the U.S dollar. Consequently, it is fundamental for the CBJ to be effective and have a symmetric control and effect on deposit and lending rates to keep their spread within a certain margin. For this reason, we expect to find a long-run relationship between deposit and lending rates in Jordan.

Figure (1) shows the movement of deposit and lending rates in the Jordanian economy during the period (1994:1-2010:2). The average spread between the two interest rates is 4.31 basis points. The range of the spread is between 2.61 basis points in the

first quarter of 1996 and 6.37 basis points in the second quarter of 2003. The range of deposit rate is 6.74. However, the range of lending rate is 5.36 basis points. Moreover, deposit rate reaches its maximum and minimum faster than lending rate over the data sample of the current study. This behavior proves that deposit rate is more flexible than lending rate to economic events and policy actions. Sweidan (2011b) proved that deposit rate adjusts larger and faster than lending rate for a deviation from the long-run equilibrium. For this reason, Jordan's monetary policy action needs roughly 11 quarters to be effective. He explained this behavior by two reasons: first, the highly competitive banking sector environment in Jordan. Second, large share of the Jordanian banks are a family-business, as a result, they are watchful in conducting their family business. Thus, he believes this is a basic restriction on Jordan monetary policy effectiveness.

Jordan has a stable, privately owned and growing banking sector. Besides, it is well capitalized, liquid and profitable and opened to external investors. The number of operating banks in this sector is 23 divided among the following categories; 13 local commercial banks, 8 foreign banks and 2 Islamic banks. The banking business environment in Jordan is vastly competitive. The latest data illustrates a remarkable deterioration in the market concentration. Nevertheless, the market share of the largest three banks is around 40%.

Figure 1: Jordan's Deposit and Lending Rates



The Methodology

In order to explore the long-run relationship between lending and deposit rates in the Jordanian economy, we utilize an error-correction model (ECM) as a first step in the estimation process. The specification of the ECM[5] is as follows:

$$\Delta lr_t = \psi_0 + \sum_{j=1}^{J} \alpha_j \Delta dr_{t-j} + \sum_{k=1}^{K} \beta_k \Delta lr_{t-k} + \lambda ect_{t-1} + e_t \quad (1)$$

Where lr_t denotes the lending rate, dr_t is the deposit rate, *ect* stands for the error correction term[6], e_t is the stochastic error and assumed to be normally distributed, $(0, \sigma^2)$ but not serially correlated. α_j and β_k reflect the immediate or short-run adjustment parameters, λ is the speed of adjustment of lending rate for a departure from the prior equilibrium. Empirically, we aim at estimating the parameters of the model. Moreover, we will utilize the variance decomposition which shows the relative power of each variable in the model to explain the remaining variables.

The second empirical step of the current study is to examine if the lending rate adjusts asymmetrically to the movement of the error correction term (*ect*). To achieve this goal, we adopt the methodology of Scholnick (1996), Sander and Kleimeier (2000), Ozdemir (2009) and Sweidan (2011b) which is known as the asymmetric short-run dynamic model. This technique divides the error correction term into two components, as follows:

$$ect_t^{+} = ect \text{ , if } ect > mean(0)$$
$$ect_t^{+} = ect = 0, \text{ otherwise}$$

$$ect_t^{-} = ect \text{ , if } ect < mean(0)$$
$$ect_t^{-} = ect = 0, \text{ otherwise}$$

Then, we estimate the asymmetric short-run dynamic model, which has the following form:

$$\Delta lr_t = \mu_0 + \sum_{j=1}^{J} \alpha_j \Delta dr_{t-j} + \sum_{k=1}^{K} \beta_k \Delta lr_{t-k} + \lambda_1 ect_{t-1}^{+} + \lambda_2 ect_{t-1}^{-} + \varepsilon_t \quad (2)$$

In equation (2), the parameter λ_1 of the ect_{t-1}^{+} measures the speed of adjustment of lending rate in response to the previous disequilibrium relation with deposit rate when the two rates are above their equilibrium level. Whereas, the estimated parameter λ_2 of the ect_{t-1}^{-} computes the speed of adjustment of lending rates in response to the prior disequilibrium relation with deposit rate when the two rates are below their equilibrium level. The test of whether lending interest rate adjusts asymmetrically relies on the values of λ_1 and λ_2 in equation (2). If λ_1 and λ_2 are statistically significant and $\lambda_1 > \lambda_2$, then banks adjust retail interest rate downward faster than upward. However, if $\lambda_1 < \lambda_2$, then banks adjust retail interest rate upward faster than downward.

Empirical Results

We use quarterly data from Jordan during the period (1994:1-2010:2). The data source is the CBJ monthly statistical bulletin. The model has two variables, which they are deposit rate and lending rate. The first step in the empirical results is to explore whether the data on the level has a unit root or not. This is a fundamental step to avoid producing a spurious regression. Consequently, we perform Augmented Dickey-Fuller (ADF) unit root test without trend and intercept[7]. Results are reported in Table (1). The lag length of ADF test is selected based on Schwartz Criterion. The two series have a unit root on the level. However, all of them are stationary at the first difference.

Table (1): Augmented Dickey -Fuller Unit Root Test

Variable	Levels		First Difference	
	Lag Length	ADF test	Lag Length	ADF test
dr	1	-1.07	0	-3.61
lr	2	-0.61	1	-3.55

Note: The critical values are -2.60, -1.94 and -1.61 at 1%, 5% and 10%, respectively.

The next step in the empirical results is to test if there is a bivariate cointegration relationship between lending rate and deposit rate. We use Johansen test and the results are reported in Table (2). The trace test statistics and maximum eigenvalue illustrate that there is one cointegration relation between lending and deposit rates at 5 percent and 1 percent significant levels. The result confirms the existence of a long-run relationship.

Table (2): Lending rate and deposit rate cointegration test

Trace Test Statistics				
Null	Alternative	Statistic	5% Critical Value	1% Critical Value
$r = 0$	$r > 0$	25.80	15.41	20.04
$r \leq 1$	$r > 1$	2.35	3.76	6.65
Maximum Eigenvalue				
Null	Alternative	Statistic	5% Critical Value	1% Critical Value
$r = 0$	$r = 1$	23.45	14.07	18.63
$r = 1$	$r = 2$	2.35	3.76	6.65

The final step in the empirical results is to estimate the error correction model (ECM). Let us examine the ECM[8] results which are presented in Table (3). First consider the lending rate regression. Lending rate adjusts significantly for three factors; short-run movement of lagged lending rate, deviation from its long-run equilibrium and adjustments for deposit rate movements in the long-run. The short-run changes in the

lagged lending rate have a negative impact on changes in lending rate with a value equal to 32 percent and it is statistically significant different from zero. A possible explanation is that in the short-run banks are revising their lending rate downward because of the high competition in the market. The short-run adjustment speed of lending rate deviation from its long-run equilibrium is corrected roughly by 22 percent in the current period. Also, this parameter has the right sign and statistically significant different from zero. As a result, the mean adjustment lag[9] of lending rate needs approximately 5 quarters to approach its long-run equilibrium. In the long-run, lending rate adjustment coefficient is 90 percent and is statistically significant different from zero. Accordingly, lending rate adjusts by 90 percent of a 1 percent change in deposit rate in the long run. This type of adjustment is incomplete because it is less than one.

The variance decomposition illustrates the relative importance of each variable in the model to explain the other variables. Table (4) shows the ability of deposit rate to explain the variation of lending rate over the time horizon. This evidence supports the idea that deposit rate is dominant and leads lending rate.

Table (3): The Results of the Error Correction Model

The order of the variables is lending rate then deposit rate

Variables	Δlr_t	Δdr_t
C	- 0.030 (-1.1)	-0.024 (-0.77)
dr_{t-1}	-0.90 (-14.56)***	-
Δdr_{t-1}	0.063 (0.53)	0.49 (3.58)***
Δdr_{t-2}	-0.066 (-0.51)	0.28 (1.85)*
Δlr_{t-1}	-0.32 (-2.80)***	0.03 (0.22)
Δlr_{t-2}	-0.0014 (-0.11)	0.05 (-0.38)
ect_{t-1}	-0.22 (-4.79)***	0.01 (0.23)
$\bar{R}^2$	0.42	0.40
F-stat.	10.05	9.17

Notes:
1) The ECM estimated using 2 lags based on lag length criterion; LR, FPE, AIC, SC and HQ.
2) */**/***: denotes significance at the 10/5/1 percent level, respectively.
3) T-statistics are in parenthesis.

Table (4): The Variance Decomposition of Lending Rate

Quarters	Lending Rate	Deposit Rate
1	100.0	0.0
3	86.98	13.02
6	47.43	52.57
9	27.03	72.97
12	19.14	80.86

Second consider the deposit rate regression. Deposit rate responds significantly only for two factors; its short-run and long-run lagged values. Since the error correction term of deposit rate model is statistically insignificant different from zero, deposit rate does not react to its departure from the long-run equilibrium. These are crucial findings because it means deposit rate does not adjust for any diversion from the long-run equilibrium and any change in lending rate. These findings prove that deposit rate leads lending rate. In the short-run deposit rate is affected positively by its first and second lagged, the value of this influence is 49 percent and 28 percent, respectively, and it is statistically significant different from zero. This finding supports the above-mentioned behavior of the short-run bank lending rate. In the short-run, banks are revising their deposit rates upward because Jordan's banking sector has a high competition level.

The results of the asymmetric model are reported in Table (5). The results of the symmetric and asymmetric models are identical. The new information provided by the asymmetric model is the speed of adjustment when the lending rate is above and below their equilibrium levels are 25 percent and 19 percent, respectively, and statistically different from zero. To investigate if lending rate adjusts symmetrically to the deviation from its long-run equilibrium, we should test whether the two parameters λ_1 and λ_2 are equal or not. The Wald statistic is reported in Table (5), the symmetric adjustment hypothesis of lending rate cannot be rejected. Lending rate displays a symmetric adjustment to the error correction term movement.

In sum, the findings of the current paper and the previous series of our papers tell a consistent story about Jordan's retail interest rate movements. We think the best explanation of this behavior is the high competitiveness in Jordan's banking sector. There is no doubt that any change in policy rate affects deposit rate faster and larger than lending rate. The first priority of Jordan's bank is to control their deposit rates (costs) for a change in policy rate. Then, the second concern is to adjust their lending rates (revenues) to guarantee certain level of profits. This process of adjustment is slow and needs approximately 5 quarters for lending rate to reach to its long-run equilibrium for a change in deposit rate. Moreover, Sweidan (2011b) finds that it requires lending rate around 11 quarters to accomplish its long-run equilibrium for a change in policy rate. The gap is the mean adjustment lag of deposit rate to attain its long-run equilibrium for a change in policy rate, which is around 6 quarters as proved by Sweidan (2011b). The policy implication of the above-mentioned findings is that the slow speed of adjustment makes the monetary policy effectiveness slow too.

Table (5): The Results of the Asymmetric Model: Lending Rate

Variables	Δlr_t
C	-0.002 (- 0.04)
Δlr_{t-1}	-0.34 (-2.88)***
Δlr_{t-2}	-0.01 (-0.09)
Δdr_{t-1}	0.07 (0.62)
Δdr_{t-2}	-0.06 (-0.49)
ect_{t-1}^{+}	-0.25 (-3.51)***
ect_{t-1}^{-}	-0.19 (-2.43)**
R^2	0.42
F-stat.	8.35
Wald stat. Prob.	0.29 (0.59)

Note:
1) */**/***: denotes significance at the 10/5/1 percent level, respectively.
2) T-statistics are in parenthesis.

Conclusions

Monetary policy effectiveness depends largely on the degree and speed of retail interest rates modification to a change in policy interest rate. This adjustment channel polarized more attention of monetary economists over the last two decades. What is more, we claim that commercial banks have a significant role in this process by setting their retail interest rate. Hence, the current paper provides evidence from a developing country about the role of commercial banks in the interest rate pass-through. Put it in a different way, we study the long-run relationship between deposit rate and lending rate in a developing country.

One of the big economic challenges in developing countries, particularly the Middle Eastern countries, is to explore the relationships among the macroeconomic variables, specifically, those macroeconomic variables related to the policy reaction. Filling this gap helps us to understand our economies and to take better economic decisions. Thus, we work on a continuous series of papers to understand monetary policy in Jordan, which lacks such vital studies. In our previous two published papers, we inspected whether the Jordan policy interest rate adjusts differently to expansionary versus contractionary monetary policies. Besides, we examined the relationship between short-term policy interest rate and both deposit and lending rates in Jordan. The current paper intends to check the long-run relationship between deposit and lending rates in Jordan by using a quarterly data over the period (1994-2010). Therefore, the current paper contributes to the existing empirical body of Jordan's monetary policy.

We can summarize the findings of the current paper as follows: First, Jordan's deposit and lending rates have a long-run relationship. Second, Deposit rate is dominant and leads lending rate. Third, the short-run lending rate adjustment speed for the divergence from the long-run equilibrium is about 22 percent in the current period. Consequently, the mean adjustment lag of lending to reach to its long-run equilibrium is approximately 5 quarters. Fourth, in the long-run, lending rate has an incomplete adjustment for a change in deposit rate. The empirical findings of the current paper and the previous series of our papers has a policy implication, which is the slow speed of adjustment among policy interest rate, deposit interest rate and lending rate makes Jordan's monetary policy effectiveness slow too.

NOTES

[1] For additional reading see Sichel (1993).

[2] Poddar, Sab and Khachatryan (2006) studied monetary policy transmission in Jordan.

[3] These countries are USA, Canada, Japan, France, Germany and the UK.

[4] These countries are Bulgaria, Czech Republic, Hungary, Poland, Romania, Russia, Slovakia and Ukraine.

[5] This is the final order of the variables which relies on several evidences; findings of Sweidan (2011b), the behavior of deposit and lending rate in figure (1) of section 3, the finding of the ECM and the variance decomposition results.

[6] $ect_t = (lr_{t-1} - \gamma dr_{t-1} - c)$, Where γ reveals the long-run adjustment.

[7] We followed Enders (1995) methodology, for more details see Enders (1995) pages 221-224.

[8] We run two residual tests of autocorrelation and both of them reject the hypothesis of autocorrelation.

[9] Mean adjustment lag $=((1-\alpha_j)/b_k)$.

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