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A Monetary Condition Index for Jordan

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ABSTRACT

The MCI is considered as a useful tool for aggregating information related to the combined effect of real interest and exchange rate. The usefulness of the MCI for Jordan can be viewed as a concept that incorporates the effects of the interest and exchange rate channels on aggregate output. Thus, it summarizes the financial conditions in an economy. This paper has constructed an MCI index for Jordan through estimating the effects of real interest and real exchange rates effects on output by using an ARDL model. The results indicate that authorities in Jordan should take the movements of real exchange rate indices into consideration while adjusting monetary and fiscal stances. Also, the results of the model indicated a significant negative impact of real interest rate and real exchange rate on real GDP growth. These results contradict previous studies on transmission mechanism channels in Jordan (Poddar, et al., 2006; Neaime, 2008) and illustrate that the monetary policy in Jordan has some room to maneuver and affect real variables in the long run.

Keywords: Monetary Condition Index, ARDL, Jordan, Real Exchange Rate.

INTRODUCTION

The monetary policy has taken a crucial role in stabilizing the fluctuations in macroeconomic variables. Many central banks have been using the Monetary Condition Index (MCI) for macroeconomic policy analysis in recent years (Costa, 2000). The MCI is considered a useful tool for the aggregation of information related to the combined effect of real interest and exchange rate on the overall economy, which gives policy makers a clearer signal about the proper policy measures to stabilize the economy. Further, it highlights the importance of looking at the integrated effect of these variables on the real economy.

The MCI has been used by some inflation targeting countries as a measure for the monetary policy stance, and sometimes as an operational target for the monetary policy (Bundesbank, 1999). In Jordan, monetary authorities have pegged its currency with the US dollar since late 1995. The Central Bank of Jordan (CBJ) took this measure to enhance the stability of the Jordanian Dinar (JD) and increase the attractiveness of Jordanian Dinar denominated assets (Karam, 2001). Pegging the exchange rate against the US dollar helped in abolishing exchange rate risk through aligning the exchange rate with its major trading partners and donors, and fostering investments and trade.

Investigating the effect of interest rates and the exchange rate on aggregate demand and price adjustment is important for the conduct of monetary policy, as central bank actions triggers a ripple effect through short-term interest rates and to the exchange rate to monetary

* The views presented in this paper are those of the authors and do not represent the views of the Central Bank of Jordan.

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aggregates. However, empirical evidence suggests little effect of the monetary policy in Jordan (Poddar et al., 2006; Neaime, 2008), due to weak transmission channels, which limits the uses of MCI index as a measure of monetary policy stance, rather it should be viewed as an indicator for financial conditions in the Kingdom. This paper aims at investigating the combined effects of real interest rate and real exchange rate channels on GDP. Further, we will construct an MCI for Jordan as a policy indicator which keep track of interest rate and exchange rate movements and their effects on aggregate demand.

1. Monetary Policy and Exchange rate Developments

In 1995, the Jordanian authorities adopted a fixed exchange rate regime with the US dollar[1]. Thereafter, the main monetary policy objective was to defend the peg through maintaining the attractiveness of dinar denominated certificates of deposits against U.S. treasury bills. The authorities widened the interest rate spread with the US dollar on a number of occasions in order to stabilize dollarization ratio during periods of uncertainty (IMF, IEO, 2005). Since then the movements of the RER with the US dollar was governed by the inflation differentials between the US and Jordan.

Domestic inflation levels for the period (1995-1998) have increased steadily on (3.7 percent on average) a higher pace than the inflation rate in the US (2.4 percent on average). These developments have led to an appreciation in the RER by 1.7 percent on average. A large part of fiscal deficits were offset by grants from donor countries and remained below 5 percent of GDP. However, the RER for the period (1999-2003) has witnessed a depreciation led by the decline in basic commodities' prices in international markets as well as the strengthening exchange rate of the US dollar against the main currencies. Fiscal deficit (after grants) ranged from 0.4 percent to 4.7 percent of GDP for the period under consideration (IMF, 2009).

After Jordan graduated from IMF programs in 2004, the domestic prices level increased at accelerating pace due to the repercussions of the Iraqi war and the influx of refugees to Jordan, the accelerated growth pace of the GDP (an average growth of 8.0 percent for the period (2004-2008)), large Foreign Direct Investment (FDI) inflows, and the increase of international oil prices, which increased by around 36.4 percent in 2008. These developments have resulted in an appreciation in the RER, which peaked in 2008; registering an appreciation of 10.7 percent in 2008. However, the repercussions of the global financial crisis on the Jordanian economy have manifested itself through a contraction in the general price level by 0.7 percent in 2009, which was reflected on the RER with the US dollar through registering a depreciation of 0.3 percent. Fiscal deficit ranged from 1.4 percent to 8.3 percent of GDP for the period under consideration as a result of the rise in public spending.

Since 2009, the Jordanian economy has been affected negatively by multiple exogenous shocks; the continuance of the global financial crisis spillovers, the political and military conflicts in the region, which resulted in a massive influx of Syrian refugees. These developments have resulted in a deceleration in the growth pace; averaging 2.6 percent for the period (2010-2015). Furthermore, US price levels have increased in a slower pace than the domestic inflation rate, which resulted in a mild appreciation of 1.7 percent, on average, for the period (2010-2015). Fiscal and external positions have witnessed a deterioration due to the interruptions of Egyptian gas flows, the rise in oil prices in international markets, and the decline in grants from international donors.

These developments have triggered a national reform agenda in collaboration with the IMF in order to bring back the fiscal and external positions into a sustainable path. Monetary policy tried to mitigate the effects of these shocks on the Jordanian economy through maintaining the attractiveness of the Jordanian dinar by having adequate reserve buffers. Monetary authorities have updated its monetary policy toolkits in order to alleviate the liquidity disturbances and enable banks to better their liquidity managing in times of uncertainty (IMF, 2012).

2. Literature review

The construction of the MCI indices in different countries has been centered in the central banking circles. Bank of Canada was the first central bank to construct an MCI index in order to view the integrated effect of interest and exchange rate on the monetary policy stance due to the close linkages between the Canadian and the US markets (Bundesbank, 1999). Other central banks, financial institutions, and international organizations have followed the steps of the Canadian Central Bank in constructing the index as means for assessing monetary policy stance and discussing monetary policy issues, others have used the index as an operational target (Ericsson, et al., 1998), as exogenous shocks that affects the real exchange rate could be offset through changes in short-term interest rate as a response for monetary policy actions (Freedman, 1995).

The Monetary Conditions Index can be defined as the weighted sum of changes in an exchange rate q and an interest rate r from their levels in a chosen base year, its basic formula could be written as follows (Ericsson, et al., 1998):

$$MCI_t = \theta_r(r_t - r_b) + \theta_q(q_t - q_b) \qquad (1)$$

The most important factor of formulating the index is to determine the weights, which signals the impact of the exchange rate and interest rates on aggregate demand. The relative weight between the coefficients (θ_q/θ_r) could be derived through the estimation of an aggregate demand function for the economy (Osborne-Kinch & Holton, 2010):

$$\Delta y_t = \alpha r_t + \beta q_t + x + \mu \qquad (2)$$

Where Δ is the first difference operator, y is Gross Domestic Product (GDP), r is the interest rate and q is the exchange rate. The t subscript refers to the latest period under consideration (Osborne-Kinch & Holton, 2010). This function seeks to discover the effect of changes in interest rates, exchange rates and other economic variables, represented by x on aggregate demand (equation (2)).

The most crucial factor in the formulation of the MCI index is the derivation of weights through the estimation of the interest rates and the exchange rate on the aggregate demand and price adjustment mechanism (Duguay, 1994). Most of the indices constructed for various countries depended mainly on the effects of interest rates and exchange rates on aggregate demand for the purpose of not alarming the markets for the fluctuations in the index (Kannan, et al., 2007). Other researchers have estimated the weights based on the effects of the interest rate and exchange rate channels on influencing future inflation rates (Hataiseree, 1998).

The estimation of the weights, which corresponds to the implicit elasticities in the estimated relationship (Costa, 2000), has been based mainly on using Vector Autoregressive Models (VARs) and structural models[2], weights estimated through VARs depend on the average Impulse Response Function (IRF) of the responsiveness of the aggregate demand to individual shocks in the interest and exchange rates for a number of quarters, while model based estimations on macroeconomic models (Osborne-Kinch & Holton, 2010).

For example, (Duguay, 1994) has suggested the use of small aggregated models rather than large scale macroeconomic models to quantify the relations between interest and exchange rate with real activity. Also, the paper suggests that central bank actions have direct effect on interest and exchange rate than money aggregates. However, co-integration, erogeneity, and parameter constancy were ignored and remain untested (Eika, et al., 1996). Other researchers have built econometric models in order to specify the transmission mechanism channels and the effects of interest and exchange rates on output and price adjustments. US, (2004) has used a simple structural model for Turkey to estimate the MCI as an alternative rule of monetary policy. The results showed that the macroeconomic stabalization would be much faster if the MCI is used for the conduct of monetary policy as taylor rule ignores the effects of monetary policy on exchange rates.

However, the shortcomings of the MCI index have been discussed by Eika, *et al.,* (1996), they found that the use of an MCI for monetary policy casts doubts on the usefulness of this indicator for monetary policy analysis unless some assumptions are satisfied by the empirical model, such as the consistency of the model, co-integration, erogeneity, potential omitted variables, and the dynamics of the model. They have analyzed the MCI indices for Canada, Sweden, and Norway; they found similar empirical problems in the models used for the construction of MCI. Further, Bundesbank, (1999) has concluded that taylor rule and MCI have some shortcommings with regards to the freedom in construction, thus, niether of them is suitable for deducting monetary policy recommendations. However, they provide “rough reference points” for the assesment of the monetary policy.

3. Why an MCI can be Useful for Jordan

The MCI was constructed as a mean to view the integrated effect of real exchange rates and interest rates in a flexible exchange rate regime. However, the usefulness of the MCI index for Jordan can be viewed in two main perspectives; first, the MCI is considered an appropriate way for integrating the information in a way that gives clearer signals for the combined effects of interest and exchange rates on aggregate demand. Secondly, the MCI provides us with a concept that incorporates the effects of the interest rate and exchange rate channels on aggregate output. Thus, the MCI could be viewed as a composite index that summarizes the financial conditions in an economy with a fixed exchange rate regime and a high degree of openness.

Real exchange rate movements affects the economy through influencing the competitiveness of the domestic production, thus, exports of goods and services would be the most affected sector from an appreciation in the real exchange rate (RER). In small open economies, such as Jordan, the exchange rate channel is considered one of the most important channels on the macroeconomic aggregates. The theoretical relationship of the uncovered interest rate parity (UIP) and the purchasing power parity concept could summarize the influence of monetary policy movements on real exchange rate. However, under a fixed exchange rate regime, a rise in interest rates above the interest rates of the anchor country would cause an increase in capital inflows, which would put upward pressures on the exchange rate and cause appreciation in the real exchange rate. Thus, the central bank will respond by increasing its foreign exchange reserves to bring interest rates down to its original level (Dubravko & Klau, 1998).

Further, in a fixed exchange rate regime, changes in monetary policy stance by the authorities takes into consideration price stability as a priority as adjustments to external shocks relies on the fiscal policy. The interest rate channel could be viewed in an *IS-LM* context, where expansionary policies lead to a fall in interest rates, thus decreasing the cost of capital and stimulating investment, which then results in an increase in aggregate demand and output. It is worthy of mentioning that the effect on real spending decisions depends on the effectiveness of the transmission of changes in short-term interest rates to real interest rates and the existence of price stickiness, which causes changes in monetary policy rates to have significant effects on short-term real interest rates. Thus, the monetary authorities could influence short-term interest rate to affect real variables in the economy such as output and prices (Taylor, 1995; Dubravko & Klau, 1998).

However, some studies have provided a set of stylized facts about the Monetary Transmission Mechanism (MTM) in Jordan. For example, Poddar, *et al.* (2006) investigated the MTM in Jordan using a vector autoregressive approach for a quarterly data that covers the period (Q1:1995 – Q1:2005), they found that changes in monetary policy stance and their effects on short-term interest rates (real rate of *CDs* with a maturity of three months) are transmitted to retail lending rates[3]. Further, they found that the spread between domestic and foreign interest rates (spread between three months *CD* rate and the Federal Funds Rate (*FFR*)) influence foreign reserves. Also, they found little evidence that support the effectiviness of monetary policy in influencing output as the interest rate, credit, asset prices and exchange rate channels have little power in explaning output variations.

Further, Neaime (2008) has examined the role of MTM using a monetary VAR model for the period (Q1:1990 – Q4:2006). The study found that the effect of exchange rate channel on prices and output is insignificant. As for the interest rate channel, the study found that the GDP is responsive for changes in monetary policy stance while the prices and exchange rates are insignificant, which is consistent with the trilemma in light of the adoption of a fixed exchange rate regime with the US dollar, and that the CBJ does not enjoy the status of an autonomous entity. The study promoted the privilages of adopting a flexible exchange rate but indicated that the fixed exchange rate policy supported the accumulation of international reserves and attracting capital inflows. However, the answer to floating vis-à-vis fixed exchange rates depends on the characteristics of the country (Frankel, 2003).

However, there are some problems that manifests while constructing and interpreting changes in the MCI. The most important part in constructing the MCI is the relative weights between the coefficients of interest rate and exchange rates, which is unobservable. Thus, the MCI would be dependent on model specification. Further, the MCI assumes implicitly that the effect of the interest rate and exchange rate is the same (Costa, 2000; Eika, et al., 1996). Moreover, there are difficulties in interpreting the changes in the MCI in terms of their significance for monetary policy analysis. For example, if a change in real exchange rates was due to domestic factors, it would not be appropriate for the monetary policy to try to bringing back the MCI index to its original level as demand shocks are often accompanied by inflationary pressures (Bundesbank, 1999). Thus, viewing the MCI as a monetary policy rule should be avoided.

4. Methodology for constructing MCI

Many studies resorted to VARs as a standard approach for estimating the weights, through using the response of the aggregate variables to shocks in interest and exchange rates. However, we will use the bound testing approach in order to estimate the long run relationship between the interest and exchange rate and growth rates. The model will include the variables related to the interest rate and exchange rate channels such as the real interest rates and bilateral exchange rate between Jordan and the US[4]. The relationship that will be tested could be expressed in the following form:

$$\begin{aligned} CRGDP_t = \alpha_0 + \alpha_1 RIR_t + \alpha_2 RER_t \\ + \alpha_3 CRRGDP_t \\ + \alpha_4 FBGDP_t \\ + \alpha_5 LOIL_t + \varepsilon_t \end{aligned} \tag{3}$$

The dependent (*CRGDP)*, represents the real growth of GDP, the variable of real interest rate variable (*RIR*) was calculated as the difference between short-term interest rate (operational target of the monetary policy) and the inflation rate for a six months period to previous period. As for the real exchange rate variable (*RER*), we used its logarithmic form for six months moving average of six months due to the slow process of the transmission mechanism from policy variables to real macroeconomic variables. Further, we used credit extended to all economic sectors as a ratio of the GDP (*CRRGDP*) in order to capture the effects of credit channel. The remaining variables represent the overall fiscal balance to GDP (*FBGDP*) and the logarithmic form of international oil prices (*LOIL*) finally ε_t is white noise.

The data was obtained from the Central Bank of Jordan statistical database and from the US Bureau of Economic Analysis for the period (1995:Q1 to 2015:Q4). The start date of the data sample was dictated by the availability of the data and the intention of constructing the index by estimating the weights since the adoption of a pegged exchange rate regime by the Kingdom in 1995.

We will implement the Auto-Regressive Distributed Lags (ARDL)[5] bound testing approach of cointegration developed by Pesaran & Shin, (1998), and Pesaran, et al., (2001). The ARDL cointegration approach has some advantages over other cointegration methods. The applicability of the model without the need of unit root testing and classifying the variables according into I(1) or I(0). Further, the ARDL procedure do not require a large sample to validate the existence of a cointegrated relationship, and allows different optimal lags for the independent variables, which is impossible in other conventional cointegration methods. Finally, the ARDL approach estimate the long-run relationships using a single reduced form equation whereas conventional methods estimate long-run relationships using a system equations.

Prior to testing cointegration, we have conducted a for the order of integration for each variable using augmented Dickey Fuller (ADF) and Phillip Perron (PP) statistical tests. Though this procedure could not be considered as a requirement for applying ARDL, it could point the usefulness of using this method. The results (Annex III) indicate the existence of a mixture in the order of cointegration of I(0) and I(1); therefore, it is more convenient to proceed with ARDL approach.

The results (Annex III) illustrates different stationarity for the dependent variable (*LRER*), and two independent variables (*CRRGDP*, *FBGDP*) depending on the unit root test used. The ADF test accommodate general ARMA(*p*, *q*) models with unknown orders through augmenting the basic autoregressive unit root test (Said & Dickey, 1984), while the PP test corrects for any serial correlation and heteroscedasticity in the errors of the test regression by directly modifying the test statistics. The ADF unit root test cannot distinguish highly persistent stationary processes from nonstationary processes very well. Also, the power of unit root tests diminish as deterministic terms are added to the test regressions. That is, tests that include a constant and trend in the test regression have less power than tests that only include a constant in the test regression (Hamilton, 1994).

The next step is to proceed with estimating the log run relationships among variables as suggested by Pesaran & Shin, (1998). Thus, equation (3) could be expressed in ARDL form, in order to estimate the conditional error correction (EC) version of the ARDL, as follows:

$$
\begin{aligned}
\Delta CRGDP_t &= \alpha + \sum_{i=1}^{k} \phi_1 \Delta CRGDP_{t-i} \\
&+ \sum_{i=1}^{k} \phi_2 \Delta RIR_{t-i} \\
&+ \sum_{i=1}^{k} \phi_3 \Delta LRER_{t-i} \\
&+ \sum_{i=1}^{k} \phi_4 \Delta CRRGDP_{t-i} \\
&+ \sum_{i=1}^{k} \phi_5 \Delta FBGDP_{t-i} \\
&+ \sum_{i=1}^{k} \phi_6 \Delta LOIL_{t-i} + \delta_1 \Delta RIR_{t-i} \\
&+ \delta_2 \Delta LRER_{t-i} + \delta_3 \Delta CRRGDP_{t-i} \\
&+ \delta_4 \Delta FBGDP_{t-i} + \delta_5 \Delta LOIL_{t-i} + \varepsilon_t
\end{aligned} \tag{4}
$$

Where Δ is the first difference operator and k is the optimal lag length. Further, lag selection was based on Akakie Information Criterion (AIC). The bound testing approach is based on the joint F-statistic (Wald statistic test), that is testing the null of no cointegration against the alternative hypothesis. From this test, two sets of critical values are generated, the upper (I(1)) and lower (I(0)) bounds. The calculated *F*-statistic should be above the upper bound to reject the null hypothesis, thus, indicating the existence of a cointegration. On the other hand, if the calculated F-statistic is below the lower bound, we cannot reject the null hypothesis. The critical bounds values can be obtained from Pesaran, et al., (2001). The existence of a long run relationship between the variables (eq. 5) and the short run dynamics (eq. 6) could be expressed as follows:

$$\Delta CRGDP_t = \alpha + \sum_{i=1}^{k} \phi_1 \Delta CRGDP_{t-i} + \sum_{i=1}^{k} \phi_2 \Delta RIR_{t-i} + \sum_{i=1}^{k} \phi_3 \Delta LRER_{t-i} + \sum_{i=1}^{k} \phi_4 \Delta CRRGDP_{t-i} + \sum_{i=1}^{k} \phi_5 \Delta FBGDP_{t-i} + \sum_{i=1}^{k} \phi_6 \Delta LOIL_{t-i} + \mu_t \quad (5)$$

$$\Delta CRGDP_t = \alpha + \sum_{i=1}^{k} \phi_1 \Delta CRGDP_{t-i} + \sum_{i=1}^{k} \phi_2 \Delta RIR_{t-i} + \sum_{i=1}^{k} \phi_3 \Delta LRER_{t-i} + \sum_{i=1}^{k} \phi_4 \Delta CRRGDP_{t-i} + \sum_{i=1}^{k} \phi_5 \Delta FBGDP_{t-i} + \sum_{i=1}^{k} \phi_6 \Delta LOIL_{t-i} + \psi ECT_{t-i} + \xi_t \quad \mathbf{(6)}$$

Where ψ is the coefficient for the error correction term (*ECT*), which shows the speed of convergence of the variables to its equilibrium values. The coefficient value should be significant with a negative sign. Further, ξ_t and μ_t, are normally distributed with zero mean and constant variance. Finally we will perform stability tests in order to validate the model outputs to confirm the validity of the model. We will implement various residual tests for normality (JB-test), serial correlation (LM test) and heteroscedasticity (Breusch-Pagan test), along with the cumulative sum (CUSUM) and cumulative sum of squares (CUSUMSQ) tests to check the stability of the short run coefficients due to the structural changes which makes the variables' series susceptible to multiple structural breaks (Brown, et al., 1975).

The results (Annex IV) indicate the existence of a cointegrated relationship at the (1) percent level. Further, we have applied the bound test approach for each variable in order to validate the existence of a long run relationship and the bound test validates the existence of a long run relationship. Also, diagnostic tests indicate that the estimated model is stable and that the tests for the CUSUM and CUSUMQ fall inside the critical bounds of (5) percent significance.

5. Empirical results

In this study, we will investigate the effects of real interest rates and real exchange rate channels in Jordan in order to estimate the weights for the period (1995-2015) that will be used to construct the MCI index. ARDL were used to estimate the long run relationship between the variables. Results of the Error Correction Model (*ECM*) (Annex 1) shows that most of the short run relationship is insignificant (except for the lagged terms). Also, the significance of the error correction term (at 1 percent level) indicates the evidence of causality and a high rate of convergence to equilibrium values (-0.44). Further, we have selected the max lags to be at 8 periods, thus, optimal lags selection for the independent variables was (1, 7, 5, 2, 8, 5) for growth in GDP (*CRGDP*), real exchange rate (*LRER*), real interest rate (*RIR*), oil Prices (*LOIL*), extended credit to GDP (*CRRGDP*), and the fiscal balance to GDP (*FBGDP*).

Table (1): Long run coefficients

Variable	Coefficient	Std. Error	t-Statistic
LRER	-42.05	9.91	-4.24*
RIR	-4.25	1.23	-3.45*
LOIL	-3.26	1.88	-1.74***
CRRGDP	0.86	0.26	3.31*
FBGDP	-0.18	0.12	-1.52
Constant	166.37	42.64	3.90*

* Significant at 1 percent.
** Significant at 5 percent.
*** Significant at 10 percent.

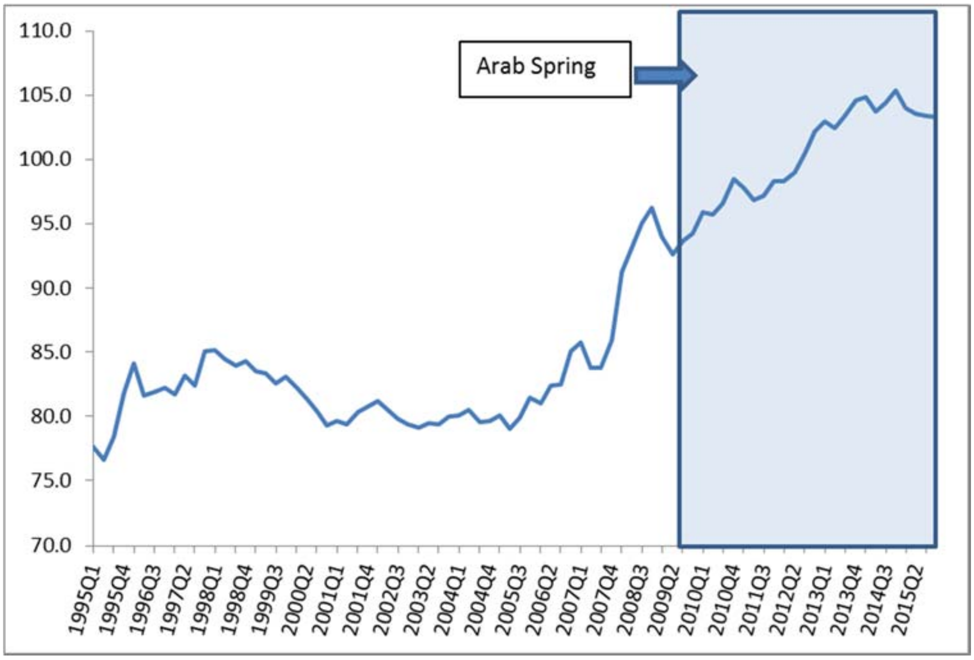

Figure (1): Monetary Conditions Index

The long run coefficients indicate the existence of a long run relationship between real exchange rate, real interest rates, and extended credit as a percentage of GDP at a 1 percent significance level with the output growth. Also, oil prices have a statistically significant relationship with GDP growth rate. These results indicates that changes in short term interest and real exchange rates have a negative impact on GDP growth rates, which shows that the transmission mechanism in Jordan is working, at least for the interest and exchange rate channels. These results contradict the findings of Poddar et al., (2006) and Neaime (2008).

6. MCI Index

According to the model results, the weights of the coefficients (θ_q/θ_r) which reflect their estimated relative effects on output was around one to ten. That is; a one percentage point increase in the real exchange rate (appreciation) induces ten times the change in the Jordan's MCI as would a one percent increase in real interest rates. Consequently, the MCI will be constructed on the level data for the real interest rates and real exchange rates. Thus, we could conclude that the effect of changes in interest rates on output is smaller than the effects of real exchange rate changes on output, which is consistent with the characteristics of a small open economy with a fixed exchange rate regime. A fall in the MCI is interpreted as a loosening of monetary conditions, as a decline in real interest rates and/ or a depreciation in the real exchange rate increases aggregate demand. Further, an appreciation in the real exchange rate affects the aggregate demand negatively and increases the MCI. As a policy indicator, the MCI aims to keep track of interest rate and exchange rate movements and their effects on aggregate demand.

In the aftermath of the currency crisis in 1989, authorities in Jordan struggled to combat inflationary pressures and stabilize the exchange rate through adopting macroeconomic reforms in collaboration with international institutions (Schlumberger, 2002). The CBJ started to move away from direct intervention in the market to influencing liquidity levels in the domestic markets through interest rates (IMF, IEO, 2005; Maziad, 2009). In 1995, authorities pegged the exchange rate of the Jordanian Dinar with the US dollar in order to have a clear nominal anchor and stabilize the macroeconomic conditions. Monetary authorities continued its tightening monetary policy coupled with market-oriented reforms in the financial sector and on its monetary policy tools, during that period the real exchange rate appreciated mildly (0.5 percent on average from 1995 till 1998), which explains the increase in the MCI by 0.6 percent on average during the same period.

Moreover, speculative attacks on the Jordanian Dinar during 1999 and the depreciation in the real exchange rate for the period (2002-2004)[6] coupled with loosening monetary policy (decrease in key policy interest rates) have contributed in the decline in the MCI. But in the fourth quarter of 2006, monetary authorities changed the monetary policy stance through increasing short term interest rates coupled with an appreciation of the real exchange rate, which induced an increase in the index by 2.9 percent. The MCI continued to increase despite the loosening monetary policy which tried to combat the effects of the rise in oil prices in international markets and capital inflows on price stability.

However, the repercussions of the global financial crisis on the economy have moved the CBJ to decreasing interest rates on key monetary policy instruments by 225 percentage points during (2008-2009) to stimulate the economy and maintaining adequate liquidity levels in the market through ceasing the issuance of CDs since 2007. The pace of increase in the MCI decelerated as a result of the sharp decline in short-term interest rates[7] and the mild depreciation due to the contraction in inflation rates during 2009.

Exogenous shocks coupled with the breakout of the Arab spring and the accelerated influx of Syrian refugees to the Kingdom resulted in deterioration in the fiscal and external balances coupled with a decline in the foreign reserves in the Kingdom to reach USD 6.6 billion in 2012. These developments have casted some doubts in the credibility of the peg. The CBJ raised its interest rates on its key monetary policy instruments in order to preserve the attractiveness of the Jordanian Dinar and build its reserve buffers (IMF, 2012). These developments have decelerated the pace of increase in the MCI as a result of the mild depreciation in the real exchange rate and the increase in short term interest rates.

Authorities in Jordan adopted a comprehensive macroeconomic adjustment program in order to stabilize the economy through bringing back the external and fiscal accounts to sustainable levels (IMF, 2012). The program in collaboration with international agencies has helped in stabilizing the economy. Liberalization of fuel prices was a major component of the program, which contributed in increasing inflation rates in the Kingdom (IMF, 2012). The abatement of these conditions, the buildup in international reserves has helped the CBJ to decrease its interest rates on monetary policy instruments in order to stimulate the economy. However, the influx of the refugees has accelerated which caused a demand shock and induced an appreciation the real exchange rate. These developments resulted in an increase in the MCI level by around 5.0 percent at the end of 2015 compared with the level of the index at the end of 2011.

7. Conclusions and policy implications

This paper has investigated the effects of real interest rates and real exchange rate channels on aggregate demand. The MCI should not be viewed as a monetary policy rule (Bundesbank, 1999). However, the results of this paper indicate that authorities in Jordan should pay more attention to real exchange rate indices and takes them into consideration while implementing adjustments to the monetary and the fiscal stances. Thus, the construction of this index highlights the importance of viewing the integrated effects of the real interest rates and real exchange rate on real variables, which leads to a more proper conduct of monetary policy in the Kingdom.

Further, the results of the model indicated a significant negative impact between real interest rate and real exchange rate on real GDP growth. These results contradicts previous studies on the transmission mechanism channels in Jordan and illustrate that the monetary policy in Jordan is able to maneuver and affect real variables in the long run. Further, the estimated coefficients of real interest rates and real exchange rate indicates that the real exchange rate have a much higher impact on the output compared to interest rates, which could be consistent with the characteristics of small open economies.

NOTES

(1) The Jordanian Dinar was pegged with the US dollar at (1 JD =0.709 USD).

(2) Please see Duguay, (1994), Hataiseree, (1998), Bundesbank, (1999), Kannan, et al., (2007), and US, (2004) for methodologies used in estimating the weights.

(3) A recent study of Al-Jarrah, *et al.* (2016) examined the transmission of changes in monetary policy stance on market interest rates using disaggregated bank level data; they found that short-term interest rate changes are transmitted to lending rates. Further, they found that credit supply is also affected by short-term interest rate changes.

(4) The real exchange rate was calculated according to the following equation $RER_t = s_t \frac{p_t}{p_t^*}$, were an increase (decrease) in the RER means an appreciation (depreciation) in the bilateral real exchange rate, were s_t represents the nominal exchange rate between Jordan and the US, p_t is the domestic price level (CPI), and p_t^* is the price level at the US (all items).

(5) The ARDL procedure does not indicate the direction of causality between the variables.

(6) Please see (IMF, IEO, 2005) for the developments in the Jordanian economy during (1989-2004).

(7) Monetary authorities tried to stimulate the economy through decreasing interest rate on key monetary policy instruments, which caused a sharp decline in the interbank rates.

Annex I: ARDL cointegration results

Cointegrating Form				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LRER)	30.213862	34.780407	0.868704	0.3899
D(LRER (-1))	-16.659516	73.417722	-0.226914	0.8216
D(LRER (-2))	-93.594707	73.439893	-1.274440	0.2095
D(LRER (-3))	137.714566	70.006517	1.967168	0.0558
D(LRER (-4))	-111.164868	66.493869	-1.671806	0.1020
D(LRER (-5))	111.697553	53.369847	2.092896	0.0424
D(LRER (-6))	-92.033751	27.844553	-3.305269	0.0019
D(RIR)	-0.769761	0.254097	-3.029395	0.0042
D(RIR (-1))	1.350643	0.440578	3.065613	0.0038
D(RIR (-2))	-0.522780	0.412420	-1.267593	0.2119
D(RIR (-3))	0.077898	0.386819	0.201382	0.8414
D(RIR (-4))	1.020679	0.311111	3.280757	0.0021
D(LOIL)	0.373247	1.206311	0.309412	0.7585
D(LOIL(-1))	4.483856	1.503951	2.981384	0.0048
D(CRRGDP)	-0.197122	0.144524	-1.363936	0.1799
D(CRRGDP (-1))	0.451402	0.199514	2.262512	0.0289
D(CRRGDP (-2))	-0.682719	0.217013	-3.145979	0.0030
D(CRRGDP (-3))	-0.209778	0.218813	-0.958711	0.3432
D(CRRGDP (-4))	-0.182204	0.180027	-1.012091	0.3173
D(CRRGDP (-5))	-0.075137	0.186081	-0.403788	0.6884
D(CRRGDP (-6))	0.645689	0.195509	3.302611	0.0020
D(CRRGDP (-7))	-0.389522	0.117203	-3.323481	0.0019
D(FBGDP)	-0.007806	0.016340	-0.477713	0.6353
D(FBGDP(-1))	0.053247	0.017252	3.086434	0.0036
D(FBGDP(-2))	0.014914	0.018300	0.814957	0.4197
D(FBGDP(-3))	-0.006254	0.016358	-0.382304	0.7042
D(FBGDP(-4))	0.033750	0.015960	2.114715	0.0404
CointEq(-1)	-0.439608	0.118384	-3.713425	0.0006
Cointeq = CRGDP - (-42.0523*LRER -4.2548*RIR -3.2595*LOIL + 0.8568* CRRGDP -0.1780*FBGDP + 166.3690)[1]				

1 In order to apply ARDL approach, equation (3) is modeled as a conditional ARDL error correction model (eq. (4)). This equation illustrates the existence of an error correction term which shows the speed of adjustment back to the long run equilibrium as a consequence of a short term shock.

Annex II: CUSUM and CUSIMQ tests results

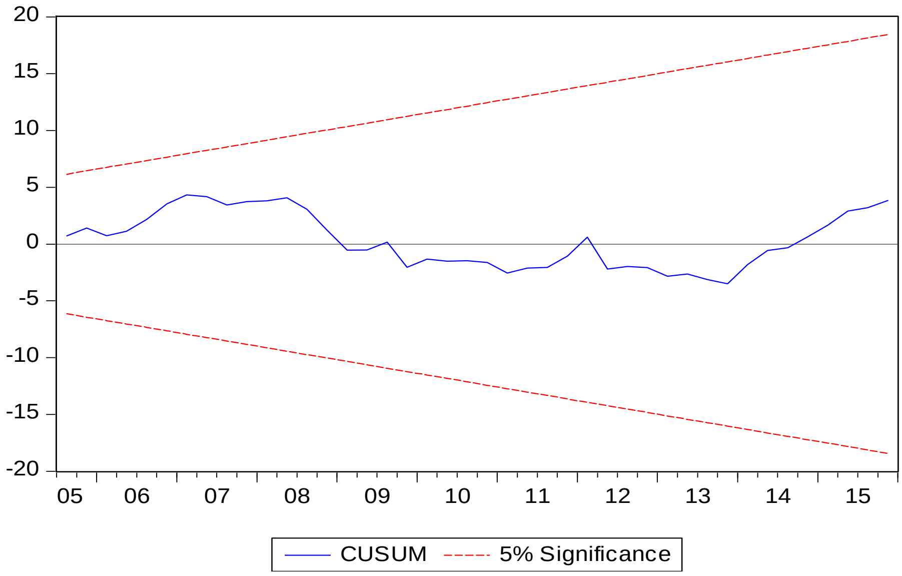

Figure (2): CUSUM test

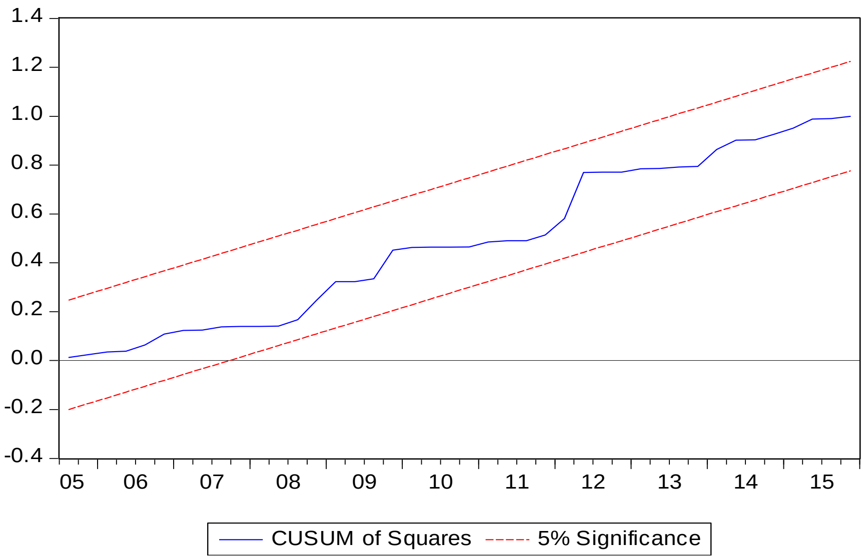

Figure (3): CUSUMQ test

Annex III: Unit root tests results

Variable	Level			First Difference			Conclusion
	None	Intercept	Intercept & trend	None	Intercept	Intercept & trend	
Augmented Dickey-Fuller statistical test (ADF)							
CRGDP	-1.26	-3.67*	-3.65**	-8.40*	-8.34*	-8.29*	I(0)
LRER[(1)]	0.60	-0.94	-2.58	-1.63	-1.69	-1.76	I(2)
RIR	-0.83	-1.13	-2.62	-10.63*	-10.60*	-10.63*	I(1)
LOIL	0.14	-1.59	-1.94	-6.77*	-6.74*	-6.82*	I(1)
CRRGDP	-0.02	-2.92**	-3.08	-6.62*	-6.58*	-6.57*	I(0)
FBGDP	-1.43	-10.46*	-11.32*	-12.1*	-12.03*	-11.97*	I(0)
Phillips-Perron statistical test (PP)							
CRGDP	-1.39	-3.57 *	-3.55**	-12.84*	-12.77*	-12.59*	I(0)
LRER	2.13	0.0174	-1.32	-4.81*	-5.02*	-4.95*	I(1)
RIR	-0.88	-2.26	-3.44	-11.04*	-11.87*	-13.01*	I(1)
LOIL	0.39	-1.41	-1.32	-6.64*	-6.61*	-6.64*	I(1)
CRRGDP	0.079	-2.085	-2.00	-6.57*	-6.54*	-6.52*	I(1)
FBGDP	-8.41*	-10.37*	-11.18*	-58.05*	-59.81*	-59.67*	I(0)

* Significant at 1 percent.
** Significant at 5 percent.
(1) Stationary at the second difference.

Annex IV: Diagnostic tests

ARDL bound test		
F-statistic	4.932117[1]	
Critical Value Bounds		
Significance	**I(0) Bound**	**I(1) Bound**
10%	2.26	3.35
5%	2.62	3.79
1%	3.41	4.68

Diagnostic tests	**Probability**
Breusch-Pagan-Godfrey Heteroskedasticity Test	Prob. F(33,42) 0.2443 Prob. Chi-Square(33) 0.2637
Normality test, JB-test	Prob. 0.742
Serial Correlation LM Test	Prob. F(9,33) 0.205

1 The F-statistics for the ARDL bound test for the dependent variables showed the existence of a log run relationship at 1percent significance level (LRER; 7.55, RIRH; 4.82, LOIL; 6.74, CRRGDP; 8.46, FBGDP; 24.93).

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مؤشر الظروف النقدية للأردن[1]

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ملخص

يعد مؤشر الظروف النقدية (*MCI*) كأداة مفيدة في تحليل الأثر المجمع لقناة سعر الصرف وأسعار الفائدة الحقيقية على الاقتصاد، إذ يلخص هذا المؤشر الظروف المالية ضمن الاقتصاد الأردني، وقد تم في هذه الدراسة إنشاء مؤشر الظروف النقدية من خلال تقدير أثر سعر الفائدة الحقيقي وسعر الصرف الحقيقي على الناتج باستخدام نموذج الانحدار الذاتي متعدد الفجوات. وقد أظهرت نتائج الدراسة بأن السلطات في الأردن لابد أن تأخذ بعين الاعتبار تحركات سعر الصرف الحقيقي عند تعديل موقف السياستين المالية والنقدية. كما بينت نتائج النموذج المستخدم وجود علاقة عكسية ذات دلالة إحصائية بين سعر الفائدة الحقيقي وسعر الصرف الحقيقي من جهة ومعدلات النمو في الناتج المحلي الحقيقي. وتتعارض هذه النتائج مع النتائج التي خلصت لها دراسات سابقة حول ميكانيكية انتقال أثر السياسة النقدية في الأردن *(Poddar, et al., 2006; Neaime, 2008)* إذ تبين وجود حيز كافٍ للسياسة النقدية يمكنها من المناورة والتأثير على المتغيرات الحقيقية في الأمد الطويل في ظل انتهاج نظام سعر الصرف الثابت.

الكلمات الدالة: مؤشر الظروف النقدية، نموذج الانحدار الذاتي متعدد الفجوات، سعر الصرف الحقيقي.

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