MONETARY TRANSMISSION MECHANISMS THROUGH VAR MODEL: EVIDENCE FROM JORDAN (1988 – 2013)

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Abstract

This paper aims to investigate the effects of the monetary transmission mechanism in Jordan, it also examined interest rates passed through the C.B.J C.D rates to the retail rates, it considered the channels of monetary transmission and balance sheets for banks, it also investigated the interest rate, credit, equity prices, financial intermediation tools, exchange rate channel, and the effect of monetary policy on the A.S.E. Our finding reflects the current operating target of the monetary policy, the interest rates of bank loans, and how the C.D of 3months and 6 months influenced both the bank retail rates and foreign reserves. The study shows that the aggregate activities in Jordanian economy responds very slowly to changes in the lending channel of bank lending rates, therefore, it does not influence domestic credit, because the interest elasticity credit demand is low. Also the equity prices and the exchange rate are remarkably the significant channels of transmission monetary policy, generally, the evidence of monetary policy is low significant of affecting economic activities.

Keywords: Monetary transmission mechanism, Jordan, C.B.J, Impulse response function, VAR model

INTRODUCTION

Monetary transmission mechanism describes how policy-induced changes in the nominal money stock or the short-term nominal interest rate impact real variables such as aggregate output and employment. Therefore, the purpose of this paper aims to describe the impact of dominant variables which affect the monetary transmission in Jordan to view whether the key links in that mechanism is in agreement with the monetary transmission in Jordan's financial

policy. The other purpose is to ascertain if interest rate decision affects market rates such as mortgage rates and bank deposit at varying degrees, also the link of the level of demand relative to domestic supply capacity in the labor market and elsewhere. Lastly to check the effect of changes in spending, saving, and investment behavior of individuals and firms, higher interest rates tends to encourage saving rather than spending, and higher value of sterling in foreign exchange markets, so the changes in the official interest rates affect the demand of goods and services produced in a country such as Jordan.

Jordanian central bank pursuing monetary targeting strategy challenged the rationale of its application, which minimized GDP fluctuations, monetary aggregates should be used in the stable monetary demand environment (when IS curve shocks and not LM curve shocks) prevail in the economy. Money demand is strongly affected by interest rates, streams of empirical studies emphasized the importance of money transaction mechanism; such as(Beg, et al, 2010) which expands the standard new Keynesian model with the money demand equation and monetary adjustment in central bank reaction function.

This paper essentially elaborates the points of impacts on the Jordanian economy, it provides an over view of the ex-ante reason for believing that monetary transmission mechanism which may be fundamentally different from what is typically described in economics with more sophisticated financial system, focusing specifically on the implications of various conventional channels of monetary transmission of the financial environment. According to I.M.F financial integration measuring which appears as an indicator economics, in Jordan violence is (- 0.32) and government effectiveness is (0.27) in 2009, and control of corruption is 0.34, these indicators show that government policies do not affect the monetary policy, and it may result to budget deficit and government debts which rises year after year, also the implications of regularity quality which constitutes 0.34, deposit bank assets / GDP is 0.96, net interest margin (0.03), stock market turnover (0.63),and defect financial integration (1.04). (Peddar,et al 2007) studied Jordan monetary transmission using quarterly data from 1996 to Q1 2005, with macro variables as GDP, interest rate, labor, stock market index, savings. They found no effects of monetary policy on interest rate, stock market and GDP. This paper compiled the three main effects: first effect, the liquidity condition affecting money transmission in Jordan's case, second effect, the ex-ante balance sheet composition (such as : deposit funding, capitalization, liquid asset shares) as it influence cross sectional response to liquidity of lending banks and liquidity risk, thirdly, the effect of other macro and microeconomic variables on the money transmission in Jordan, and how the official sector liquidity provision influence the cross sectional difference across banks in foreign lending of Jordan.

Many authors argued that on financial contagion takes the degree of integration of international banking markets, issues relevant for the transmission of shocks such as the decision of banks to lend across border, this choice of banks are strongly driven by bank size and productivity as (Okawa and Vans Wincoop, 2012), and Nie p, mann, 2013). And (Hale et al, 2013) analyzed the transmission of financial shocks through international banking networks, by using data on international syndicated banks, the study shows that these networks tend to support international trade between countries .

The paper contributes directly to the literature on the lending channels of Jordanian monetary policy effectiveness, though I am yet to find any research paper written on this field, it empirically showed that one should take into account this modification to the lending channel mechanism. The overall conclusion drawn from the previous researches presented in the monetary policies to have the loss impact on real activity but the causes of the changes remains open for discussion.

Several studies subjected international transmission of financial shocks in the banking literature; such as Popov, and Udell , 2010) investigated the effect of financial distress of parent banks on loan rejection rates in regions where the subsidiary is located, the paper documents the existence of loan supply shocks to central and western European countries. Therefore, several possible monetary channels can be defined to be as :1- The exchange rate channel;2- The bank lending channel (credit)channel.3-The expectation channel which is shown in figure (1);and 4-The interest rate channel.

Transfer are also sometimes used to finance the emigration of additional family members' needs, and to make human capital investment (C. Edward, et. al, 2003), also accumulate precautionary saving (Amuedo, et. al, 2002), despite the existence of various money transmission modes, most researchers agreed that remitters would be better served , some observations stipulates that remittances could be an important factor in equalizing opportunities across the country, regions (Belo, 2001), the poorer regions with less saving, investment, and high levels of unemployment tends to be the areas experiencing the most emigration, to where the money market transmission appears to be growing very rapidly while at the same time evolving in various directions according to the distention areas (Orozaco, 2002), individuals involved in money transfer may also consider additional attributes of different media including transaction costs, its ease of use of the media's performance as a store of value, acceptability as payment, and geographic accessibility.

Some researchers used different econometric methods as VAR approach to examine the monetary transmission such as (Boughara, 2008), he examined the monetary transmission of low income African countries (MENA), as Tunisia and Morocco , he used choleski identification

scheme in which macro outcomes variables were ordered first, followed by transmission variables such as the supply of loans, on the assumption, that policy reacts contemporaneously at all macro variables. .(R aneny, 1993), used same approach as identifying the role of the bank lending channels, the contrast that the impulse response function of prices and output to a monetary chocks in the case when bank loans were treated as endogenous variables in the VAR model. He found significant differences between macro variables and effective variables which affect monetary transmission, other researchers reached similar results such as (Zeaei, 2009), he used different methodology, also finding a negative association between policy rate and bank lending in co-integration factors, which was estimated by the dynamic least square, his results concluded that changes in policy rates moved bank lending in opposite direction to the changes of policy rates. Other papers were also presented using the same method (VAR) as (Ahmad,2008), he examined monetary transmission in Fijii and Papua new Guiana using six – variables with innovations identified via a choleski decomposition with bank reserves order before other transmission variables, and macro variables, he found that innovations in bank reserves and deposits played an important role in explaining output variations in these countries. (Cetorelli, et al, 2011), showed transmission of the financial crises through the lending channel by a cross section of industrialized countries to a broad panel of emerging markets, micro economic data exercises documenting shock transmission on emerging markets. The purpose of the study also is to empirically test the presence of an active bank lending channel in Jordan and monetary autonomy, proxies by low interest rate co-movements, is most obtainable under flexible exchange rate regimes, and some forms of capital flow restrictions (Klien and Shambaugh, 2013). Also Taylor and Shambaugh, 2005,2013), and (kalien and Shambaugh, 2013) studied the trilemma, and adding variables that introduced the extent of global bank penetration in local economies. In particular global bank's presence is associated with stronger interest rate co-movements in the pegged rate countries that have the most open capital accounts. Obstfeld and Shambaugh, 2010; and Kalien and Shambaugh,2013 have conducted tests of trilemma, their results indicated that the share of global banks in domestic credit creation is correlated with interest rate co–movements with countries which have floating exchange rate regimes, Rey, 2013; who also considered the large gross capital flow in international banking and elsewhere as destabilizing economies and making more difficult conduct of monetary policy.

In some recent studies such as (Cetrolli and Goldberg, 2013) suggests that the complexity of the overall global bank parent organization may influence transmission. Also (Roy, 2013) arguments considered the large gross capital flows in international banking and elsewhere as destabilitizing economies and making more difficult the enforcement of monetary

policy. It is worthy of note that this effect is a supply effect rather than a demand effect garneted by changes in interest rate, in other hand the supply effect, which is transmitted by the credit channel, and the demand effect which is transmitted by interest rate channel can be observed together.

LITERATURE REVIEW

Monetary policy

Monetary policy changes to have an effect on real activities in the short run, and through monetary policy is the dominate of the price level in the long run, also there are many other potential influences in the long run, in addition to other potential influences in price level movement in short horizon, there are several chain variables running from monetary policy changes to their effect on Jordan economy. An alternative path is wealth channel built on the life cycle model of consumption in which the effect of household wealth is key to consumption spending, the connection to monetary policy comes via the link between interest rates and asset prices, a policy induced interest rate increased reduced value of long –lived assets stock, bonds, and real estate. Thus, we can summarize the above in Figure 1 as:

Figure 1. Monetary policy in open market operating
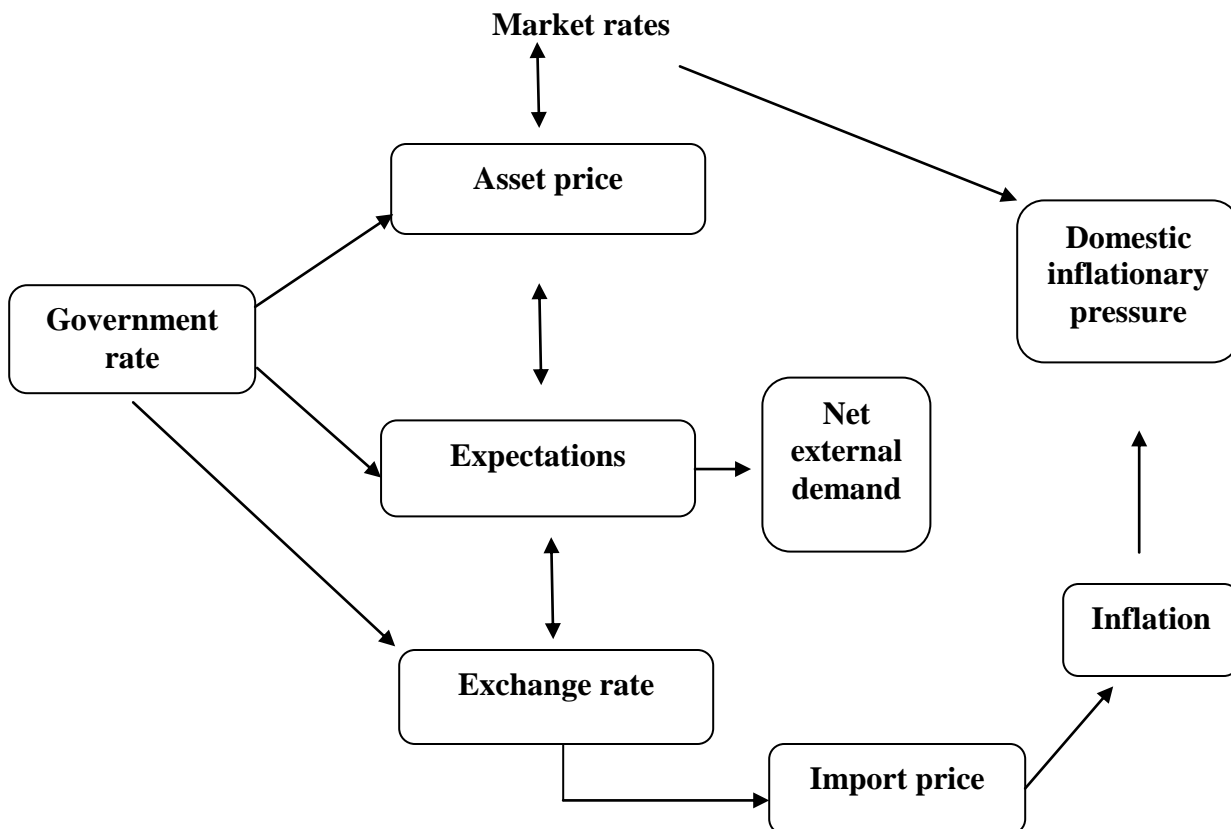
Therefore the conventional description of monetary transmission relies on effective arbitrage along several margins, as such, it implicitly assume the following institutional set up :

- An independent central bank.
- All well functioning and highly liquid interbank market for reserves
- A highly liquid secondary market for government securities.
- A floating exchange rate.
- A highly liquid market for equities and real estate.

We can argue that these conditions are rarely satisfied in low countries such as Jordan, as doubts are raised on the relevance of the monetary transmission policy. The transmission mechanism can be decomposed as from C.J.B actions to macro variables, and from financial variables to aggregate demand. In addition to other policies which depends on the elasticity of the investment saving curve (IS curve)with respect to formal sector. Financial variables tend to be wealth when the formal financial sector is small as in Jordan's case, the effects of C.J.B policy independence influence the perceived implications of any current policy action, many regulatory order has been made by C.J.B such as entry barriers pro institutional investor base, and limits on branches, and entry barriers in the banking sector, including licensing requirements or limits on foreign banks, also the C.J.B policy covers interest rates control, such floors or ceilings.

The firms and companies which are listed in ASE and minimal turnover in ASE, the ratio is significantly too small as in low income countries(LICs),and the both ratios of the value traded and turnover are dramatically small, the banks demand for C.J.B credit can be dependent on : the government securities, reserves, the commercial banks that manages a portfolio consisting of loans minced the deposit.

Theories of money transaction

A. **The money view :** It based on the notion that reductions in the quality of outside money raise real rates of returns, thus there are credit market imperfections that makes the calculation of the marginal efficiency of investment, the theory focuses on M2, but the logic of portfolio view suggest that monetary base significantly appreciates, also extremely difficult to measure economically the significant response of inventory investment to change in interest rate .

B. **Balance sheet effects (lending view):** It is referred to as the board lending channel, or financial accelerator, to emphasize the impact of policy changes on the balance sheet of borrowers, it is the similarity to mechanism of theory of money view, because it involves the impact of changes in real investment. The balance sheet reflects that the shape of the

marginal efficiency of investment curve. It's in this theory a function of debt equity ratio in the economy, can be effected by monetary policy (Broinord, w et all, 1993). They also consider that under the understanding of the transmission mechanism, a characterization of how the assets holding credit market imperfections.

Table 1. Balance sheets of Jordanian banks 2013

Fraction of total assets	0.091
Fraction of total loans	0.062
Cash	0.035
Securities	0.36
Total loans	0.58
Transaction deposits	0.17
Large deposits	0.03
Subordinated debt	0.001
Other liabilities	0.08
Equity	0.06

Source: CBJ (Central bank of Jordan) yearly book issued, Amman, 2014

The above table (1) examines the balance sheets of banks' of different sizes which answers this question "is larger share of transaction deposits relative to more time, deposits across all bank size categories?". We have found from the table results and other analyses that the relative share of large time deposits increased substantially. As the share of transmission deposits declined year after year. Despite the observed decline in large deposits and securities, the author has observed that a contractionary monetary policy action is accompanied by an increase in bank loans and the efficient management of the liabilities to fund these loans. The dominant groups that have easier access to external finance, and whether the bank size, bank liquidity and combination characterize money transaction, therefore we move the banks data level and maintain the methods, thus we can compare the micro level evidence with macro evidence and pinpoint the underlying differences.

C. **Preliminaries (empirical evidence):** First two questions will be addressed in this context, one of them do nominal shocks in fact have real effects ?,it seems pointless to study the way in which policy changes work, the second question is how can we measure monetary policy, to calculate the impact of monetary policy, a quantitative measure that can be reliably be associated with policy changes is needed. Friedmand and Schwartz,

(1963) investigated the impact of money on real economic activities as modern investigation, this study is the most powerful evidence to support the claim that the monetary policy plays an important role in aggregate fluctuations. Many researches evidence seemed reasonably persuasive in making the case that money matters, which emphasized that in the short run, nominal interest rates changes can't be associated with changes in inflationary expectations, in other sight they must represent real interest rate movements such as real interest rate changes have impact on real reserves allocations .

Other evidence came from Cecchetti, (1987), who established that output growth is significantly correlated with money growth at lags up to 10 y's, there were many possible interpretations to the findings, but one interpretation suggested that monetary shocks have something to do with aggregate fluctuations.

Lastly they suggest that looking at aggregates for evidence of the right degree of imperfect substitute ability or timing of changes may be very difficult, what seems promising is to focus on the other distinction between the two views. According to previous literature reviews, the intermediate target of monetary policy has often been identified on prior grounds, in the VAR and impose restrictions on the reduce form VAR innovations designed to extract the structural monetary policy innovations (Gordon, et all,1994).

CHANNELS OF MONEY TRANSMISSION

GDP and interest rate in Jordan

The relationship between the government target funds in Jordan and the behavior of macro economy is the subject of economic government policy, as we see in diagram (1), the volatility of real GDP has declined market since 1997, this means that there is a great response to monetary policy, but after 2008 the response to monetary policy , this allows for a question, are changes in the transmission mechanism responsible? Or are other structural changes in the economy, such as innovation in the firm's management with positive response responsible for this situation?

Some researchers said that the distinction between shocks and propagation, may be according to the size and how it deeply affects the volatility size or weaker propagation, but also monetary transmission encompassing the various in which monetary policy shocks propagate through economy, a more counters decal policy will attenuate the impact shock in output (GDP). Other factors affecting monetary policy volatility such as the economic environment, also expectation and attitudes of investor which can be a major contributor to macroeconomic volatility, a fall in real interest rates lower than the cost of capital causes a rise in investment

spending as keynesian channel of monetary transmission, through lending to an increase in aggregate demand which lead to a rise in output, also low real interest rates then lead to rise in business fixed investment, consumer durable expenditures all affect the economic activity in Jordan, which produced a rise in aggregate output.

Equity price channel

Equity price involves two channels, they involve Tobin's – Q theory of investment, and wealth effect on consumption, Tobin's –q theory provides a mechanism through the effect of monetary policy which affects the evaluation of equities, the theory considered that q is the market value of firms divided by the replacement cost of capital, if q is high relative to the replacement cost of capital .

Considering a different angle of analyses is the wealth channel, many papers analyzed the impact of wealth and estimated impact on consumption with impact assuming no response of asset prices. In our analyses it was evidently suggested that wealth channel has slightly weaker effect in money transmission policy, despite growing importance of equities in households. This is attributed to the transitory nature of asset values response to C .D rates and nominal interest rate also weak relation with exchange rate in Jordan.

Reserves and interest rates

As a nation the epicenter of monetary policy in Jordan is the reserves, it is here that the overnight interest rate targeted by C.J.B is determined and open market operations have the impact, in particular, the rise in volume of reserve balance and diminishing reliance to open market operations to effect rate changes, these changes in government fund, C.D 3 months, 6 months target were accompanied by systematic patterns in open market operations, yet the effective nominal rates, C.D interest rates, and overnight interest rate seems to track its target more closely than in the past Jordanian economy, and this may eventually create some technical differences between past and present monetary policies.

These policies allows for separate control over both overnight interest rate and the quality of bank reserves, according to these channels we can consider that monetary policy is not the only factor in the propagation of shocks, therefore C.J.B used (M_2), the money supply as target to support its monetary policy objectives, where Jordan is vulnerable to external development, in particular the environment around is unstable, also immigrations from surrounded countries are so high also high level of international oil prices, under these conditions C.J.B of Jordan has accumulated foreign reserves to help cushion external shock, and to avoid low internal growth.

Asset price and money channels

The relationship between asset prices and money channels is illustrated in figure (2), it emphasized the effect of changes in fiscal policy and global economy, commodity prices, bank capital, and the changes of risk premia which are shocks outside control of the central bank, in other hand the diagram specifies the channels of money transmission.

Figure 2. Asset prices and money channels
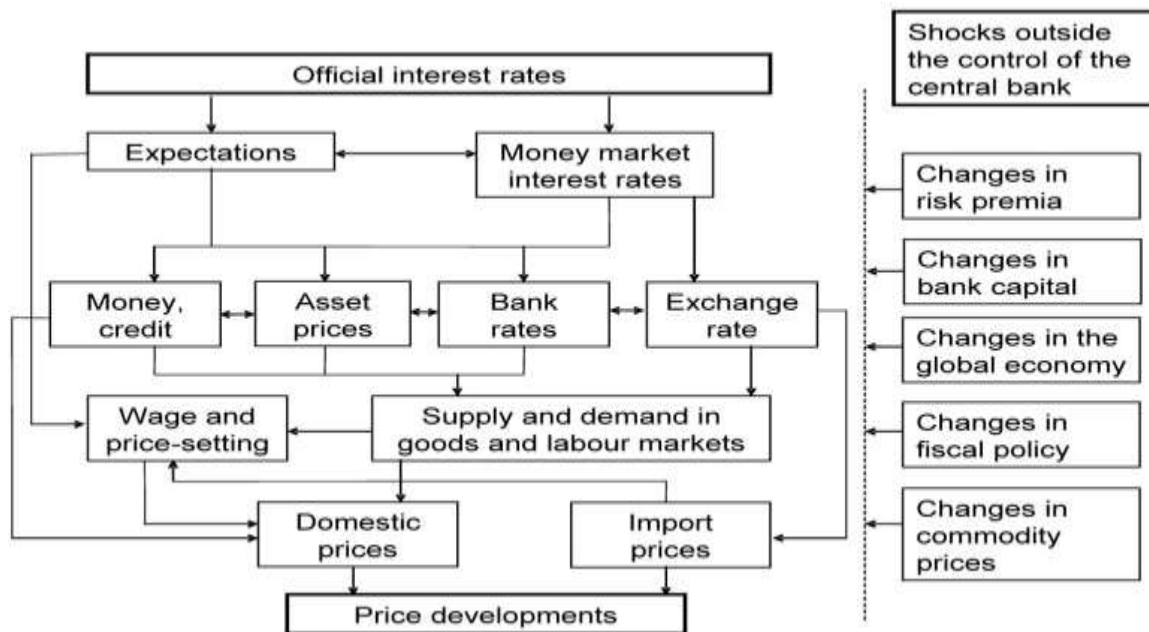
Source: European central bank, money transmission, monetary policy

The expectations and the impacted factors are built around the IS curve, Phillips curve and monetary policy rule is appropriate in the period of relative stability, monetary aggregates may be a better measure of monetary policy than interest rates when expectations are no longer anchored and interest rates reach a level close to zero especially in deflationary disturbances (Good hart, 2007). The channels in diagram, are two main channels of the impact of increased money supply on the aggregated demand and inflation ; the first channel is concerned with the impact through the expectation on asset prices and through wealth effects and a decrease of cost borrowing, where the second channel regards the impact of increased liquidity on the supply of credit. (Mishkin,2001) ; considered the traditional channels of monetary policy transmission and he considered the control of interest rate in short term are often used in aggregate analyses.

METHODOLOGY

The Data

We obtained financial data for commercial banks and their money transmission from the banks and from C.J.B bank scope data base from C.J.B annual reports and monthly reports. A yearly data of real output, along term of interest rate, reserves, Jordanian funds rates, the level of prices, the industrial index are used in the study as macro variables as simulations of other previous studies. We studied a 15y's data from 1997 to 2014, we collected data from several keys sources :

1. Financial reports of J.D.O.S (Jordanian department of statistics).
2. A compustat–type data base compiled by C.J.B from annual reports, in addition some I.M.F annual reports and year book for this period of study, we measured average Tobin's q as the market value of assets divided by their replacement value which was also calculated, assuming that fixed assets and investors appreciate at a rate to consumer price index (CPI), these data are available.

The Research Design

Data in stock price in C.J.B annual reports. To get best results of fitting data and make all variables in the same order of magnitude, we made appropriate transformation to get the average changes in each variable in the model, we set all variables as:

Average of GDP_t = GDP_t – GDP_{t-1} / GDP_{t-1} ....(1)

This transformation can improve the result and give precise results of the model. The second step in building the model and impulse response is the VAR lag order, we have commonly used lag order selection criterion AIC, SC, HQ, and FPE. we use the VAR select and results are reported in table (2).

Table 2. Lags of selection criterion model of VAR

Lags	Log likelihood	Prob (L.R)	AIC	SC	HQC
1	275.806		-19.6	-16.62557	-18.48663
2	370.823	0.000	-15.9883	-20.1326	-23.86684

The strikes above indicate that the best model is the minimum value of the respective information criterion lag, base on table 2, AIC is the minimum value and lag 2 is chosen, because yearly data was utilized in analyses, and the results in table are reasonable.

In VAR model four types of models are present, with trend, having constant, having non – constant, having trend and constant, therefore the general impulse response function is expressed below:

$$GI(J, \delta i, Ft_{-1}) = E (y_t +J) e_{it} \quad \ldots\ldots\ldots\ldots\ldots\ldots(2)$$

That is different of conditional expectations given at one time shock occurs in series, j coincides with orthogonal zed residual co variance matrix, the corresponding response coefficient can be drawn as :

$$\Psi ij (s) = \Sigma \Psi ij, k \quad\quad\quad \ldots\ldots\ldots\ldots..(3)$$

And the total effects can be obtained by

$$\Psi ij (\ddot{\omega}) = \Sigma \Psi ij, k \quad\quad\quad \ldots\ldots\ldots\ldots\ldots(4)$$

The impulse response function shows the effect of shocks on the adjustment path of the variables, forecast error variance decompositions measures the contributions of each type of shock to the forecast error variance which can be produced after using the basic VAR command. The result of VAR appear as the response in lag (RCPE)to a shock in itself, where the series is stationary and therefore shocks are not persistent, their effects eventually die out very quickly in demand impulse response function. Shocks to the lag (2) create smaller, but significant response though it falls to zero very quickly, thus first equation of demand is estimated through VAR procedure, and also second equation.

This analysis was conducted using Johansen's procedure (1992), starts with the following reformation of VAR(k) model :

$$\Delta x_t = \Pi x_{t-1} + \delta d_t + \Sigma Y_i \Delta x_{t-1} + e_{it} \quad \ldots\ldots\ldots\ldots\ldots\ldots(5)$$

Where,

X_t is a P *1 vector endogenous variables, $Y_i,$ i-1,2,3,….are (p *p) matrix of short run parameters, Π is a (p *d) matrix of long run parameters, D_t is a vector of deterministic (constant, linear trend, seasonal dummies, intervention dummies, …….ect), and e_{it} is a vector of error which assumed to independent identically Gaussian distribution also it considered to be a positive definite matrix.

Supply equation of reserves or money as :

$$Rs = b_0 + b_4 M + b_5 r + b_6 cp + e^s \quad \ldots\ldots\ldots\ldots\ldots(6)$$

Where : Y denotes to the innovation in reduced VAR equation for real output, P:the level of prices, R: long run of interest rates, CP commodity prices, M: denotes the stock of reserves, and government fund rates, and e^d, e^s are structural shocks to demand and supply reserves.

Money demand function

The long run money demand is an important approach for the monetary policy maker, and the quality of information delivered by monetary aggregates stability of the long term money demand function .Juselius,2006) modeled a small economy, such as Jordan and advised to take into account the rate of exchange rates. The model as:

$$M_t - P_t = b_0 + b_1 GDP + b_2 Y_t^{TB} + b_3 d_t^m + b_4 W_t + e_{rt} \quad …(7)$$

Where,

Mt is M2;money supply in nominal terms ; Pt is the price level. GDP: is gross domestic product in j. dinar Y_t^{TB} : is yield to one year treasury bills approximating the cost of holding assets. And d_t^m: deposits interest approximating from holding assets in the form of cash, wealth is the equity price index (CPI) deflator is used e_{rt} real effective exchange rates.

The variables in the estimations are brought to the logarithms from expect interest rate the suggested results are: the increased quality of price index can cause an increase in money demand. It may result to an increase in transactions, due to the wealth effect and may have a positive sign, in other hand the effect of substitution of assets, money and securities may be negative, and b5 will be positive due to negative effects of domestic currency appreciation economics, ADF test for unit root, variables in second order integration was rejected.

Real money test of Johnsen test, hypotheses were rejected due to lack of co-integration, the existent analyses are two co-integration vectors, first co integration vector of money demand function, and the other approximates the equation of deposits interest rate of the banking sector in Jordan.

$$M_t - P_t = GDP - 4.3\,(Y_t^{TB} - d_t^m) + 0.04 \text{Wealth}_t + 0.38 er_t \quad ……..…(8)$$
$$(-) \qquad (16.39) \qquad (9.84) \qquad (2.56)$$

We can interpret that 1%increase of GDP causes 1%increase of money demand, the demand 1% increases of equity price causes 0.01%increases of money demand, this indicates that the wealth effect is too small.

Money demand function determined unambiguously the interest rate and money growth decision – making dilemma equation can be written as :

$$\tilde{\omega}(Rt\ N - Rt\ cir) - (1 - \tilde{\omega})(\Delta Mt / \Delta\ Mt\text{-}1) \qquad ……………………(9)$$

Where, Rt N is the nominal interest rate, Rt /Rt-1 is the desire (target)nominal interest rate, ΔMt is the change in the quantity of money, and ΔMt / ΔMt-1 is monetary target, ῶ is the weight assigned by the bank to the information.

This equation depends on inflation target and expected inflation, output gap, and real money. The GDP in constant prices and the random variables determining changes in the velocity of money. The equation determines the level of variables of described target short –run, using the classic Taylor – reaction function, the expected results of analyses of this equation depends negatively on the liquidity gap in the previous period with current price, positively on the difference between expected inflation and negatively on the output.

VARs and impulse response function

We estimated the data by VAR model, VAR is an econometric model used to capture the evaluation and the interdependence between multiple time series, generating the ARMA models. The problem which arose when we estimated VAR model was that monetary policy may respond contemporaneously to other variables in the systems, to the extent that the innovations in the equation for monetary policy instruments were correlated with innovations in other variables. Choleeski decomposition is used as reduced form, innovations assumed to be recursive, in the first variable is assumed to be structural, second variable is structural innovations and combined with a contemporaneous response to structural, these results leads to refer to the recursive assumption, in our model we have added (ReR) the real exchange rate, also the interest rates which as assumption has an effect on real GDP and consumer prices, the approach identified that monetary policy shocks is orthogonal to the variables in C.J.B data set in this study.

The imposed restrictions have imperial support, and at first in the identification process, the restrictions on 8 parameters formulated in above equations are tested, as mentioned in the introduction and test the main objective of this paper is to investigate the sensitivity of impulse response function analyses to alternative specification of VAR model of monetary policy mechanisms, in order to test the effect of parameters which controlled the monetary policy the following models are utilized in analyses :

1- VAR model,
2- VECM without imposing any restrictions on the co integration vector (UVECM), and
3- VECM tested and estimated by restrictions. In this paper we have considered only the response of variables and the impulse of monetary policy mechanism.

The system of VARs can be estimated consistently and efficiently by O.L.S, because all the variables on the right hand side are dated to t-1, whereas the error terms are dated to t,

sometimes error terms are called " innovation " they are the forecast errors of variables conditional on observing in past values, hence for annual data we use 1 lag by lag criterion like BIC and AIC to come up with statistical tests for the optimal lags. Econometric analysis, one can use a VAR like a reduce form, because we cannot give a structural interpretation to the innovations, where structural VAR analysis presumes that the innovation in the VAR equation are driven by deeper structural shocks. The reduce form p-th order VAR denoted as:

Yt = a + ψYt-1 +……+ ψYt-p + et ……………….(12)

Where,

Yt :is covariance –stationary, t: is period back observation. Yt-1 : denoted to the i-th lag of Y,a denoted to a k *1 vector of constant (intercept), ψ is a k*k matrix for every 1,and et referred to k*1 vector of error terms.

According to impulse response, a merely response of the variable in both estimated equations. VAR is an econometric model used to capture the evaluation and interdependences between multiple time series, a supply disturbance in the supply equations. However the immediate impact effect of one St / deviation supply shock varies from one year to another. The impulse response function describes the effect of shocks on the adjustment path of the variables where as for cat error variance, decompositions measure the contribution of each type of shocks but both of them are useful in assessing how shocks to economic variable reverberate through a system. Impulse response function shows the effects of shocks on the adjusted path of the variables, forecast error variance decompositions measure the contribution of each type of shock to the forecast error variance, both of them are useful in assessing how shocks to economic variables reverberates through system.

Impulse response function (IRF) of a dynamic system is its output when presented with a brief input - signal called impulse and refers to the reaction of any dynamic system in response to some external changes as a function of s called impulse response function :

$$\partial Y_{it} + s / \partial e_r \qquad ………………………..(13)$$

This function describes the response of Y_{it} +s to one time impulse in Yit with other variables dated t.

As choleski decomposition the relationship among the reduce form innovation is assumed to be recursive, and assumed to be structural if the first variables were a structural innovation in the second variable combined with contemporaneous response to structural innovation in the first variable. Then we can refer recursive assumption, the implementation of choleski scheme, have tended to order the monetary policy variable on the implicit that innovation in these variables are exogenous but may affect the other variables in the VAR models. The identifying assumptions are that monetary policy does not react

contemporaneously to the innovation in real output and price level, this could neglect possibilities of innovations in other macroeconomic variables. Vector auto regressions, or VARs, are the multivariate generalization of univariate ARMA processes, they are widely used as tools both for prediction and for model building and evaluation, Formally, a VAR(p) is a vector auto reggression where there are p autoregressive lags of each, variable in each equation. Consider two variables, xt and zt, Assume for now that these are stationary. In scalar form, the VAR can be written as follows :

$$X_t = c_x + \Sigma\, B_{1,j}^{\;x}\, X_{t-j} + \Sigma\, B_{2,j}^{\;x}\, Z_{t-j} + e_{xjt} \quad ....(14)$$

$$Z_t = C_z + \Sigma\, B_{1,j}^{\;z}\, Z_{t-j\,+} \Sigma\, B_{2,j}^{\;z}\, Z_{t-\,+} e_{xjt} \quad ....(15)$$

EMPIRICAL FINDINGS AND DISCUSSION

Unit root tests

The macroeconomic data have trends in our paper, and - trends means that a series grows or declines over time, this present some unique challenges, a related concept is that of stationary if it has a time invariant means variance, and auto variance. Macroeconomics is often interested in business cycle statics, things as standard deviations (volatility) and correlation (co – movement) the procedure that we proceed depends on ADF test and eliminates U_{t-1} by lagging the equation one period as below equation of first difference :

$$\Delta Y_t = \rho 0 + (\,1 - \rho\,)a_t + (\rho - 1)Y_{t-1} + e_t \quad ....(16)$$

The null hypotheses that the series follows a random walk with no drift corresponds to :

$$Y = B = a_0 = 0$$

Table 3. indicates to the results of ADF tests and KPSS test for the data

Variables	ADF tests*		KPSS tests*
Interest rate	Tau-ct(1)	-0.08292	0.231433
		(0.9952)	(0.149)
Price level	Tau-ct(1)	-5.64251	0.152276
		(8.035e-006)	(0.149)
avGDP	Tau-ct(1)	-1.34885	0.11358
		(0.8754)	(0.149)
IPI	Tau-ct(1)	-2.54185	0.0819516
		(0.3097)	(0.149)
Exchange rate	Tau-ct(1)	-4.39021	0.0456295
		(0.002213)	(0.149)

Table 3...

Reserves	Tau-ct(1)	-3.53042		0.0859105
		(0.03616)		(0.149)
Stock rate	Tau-ct(1)	-4.41576		0.0665683
		(0.00201)		(0.149)
M2	Tau-ct(1)	-3.33226		0.0955697
		(0.06109)		(0.149)

: significant at 5 percent level.   Between parentheses ( ) is the prob –level of test.

In table (3)all variables were found to be stationary in the first difference due to results which rejected null hypotheses of unit root in data, among both tests ADF and KPSS, also according to table results and Cusdm tests for stability, we decided that due to Harvey-Collier test results of t(15) =2.78829 with p-value 0.01378 and mean of scaled residuals equal to 0.014337 and its significant level 0.0205674. These results concluded that the data stationary and stable after first difference. Also the graph(1) shows the test of null hypotheses of normal distribution as chi-square (x2) = 1.358 with p – value = .50718.

Granger – causality tests of data

The key of transmission channel is passed through the CD of 3 months and CD 6 months rate to deposable in Jordan Economic are more responsive to monetary policy than responsive of lending rates according the regression results, the money multipliers volatility increased as the forecasting of the reserve money level. The accommodating monetary policy C.J.B started using the CD auction rates since 1995as the operating target to achieve exchange rate stability. Also has some independence in setting the interest rate spread. In other hand C.B.J attempts to influence bank deposit and lending rates to induced changes in the demand for Jordanian Dinar against other currencies such as U.S dollars.

In table (4) and (5) we have regress the real deposit rate and R Cdm_6 as in dependent in second model the real lend rate as independent according the results the real deposits rate changes by 0.73 while the real lending rates rate changes 0.64in Jordan data.

Table 4. OLS results of 6 month CD rates on real lending

Dependent variable: Real lending rate

Variable	Coefficient	St / Error	t-statistic	Problem
CD M6	0.63992	0.07681	10.897	0.003
C.	4.79737	0.2687	18.7634	0.004
R^2	0.4876	S.D depend var		2.8763

Table 5. Granger Causality Test

		Short –run			Long term		
Impact Of output							
Output →	Interest rate	Yes	Yes	Yes	No	No	No
Output →	Lending rate	Yes	Yes	Yes	No	Yes	No
Output →	Credit	Yes	No	Yes	No	Yes	No
Output →	Stock index	Yes	Yes	No	No	No	No
Output →	RER	Yes	No	No	Yes	No	No

The above table illustrate the direction of relationship between the output and other effected variables in short run and long term.

Table (6) explained the causality test of variables in the study, the reserves have no effects in deposits and total balance sheets and vice versa, also the bank loans have low effects on long term deposits, the effects strongly appear in the total balance sheets and bank loans, and reserves with long term deposits (0.197). The granger causality is a technique for determining whether one time series is useful in forecasting the other, therefore it can determine whether there is causality relationship between variables. Jordan is a small open economy; domestic technology is a simple one, and nominal trend shocks have no long run effects on the foreign variables where long run monetary neutrality; nominal trend shocks do not affect GDP in the long run.

Table 6. Granger causality test for the data of Jordanian banks

Variables	Deposits	Bank loans	Total balance sheets	Managed liabilities	Long term deposits
Reserves	0.000	0.4537	0.000	0.3761	0.7652
Deposits	-----	0.4698	0.000	0.2334	0.0138
Bank loans	0.0031	-----	0.1264	0.0001	0.0002
Total balance sheets	0.0123	0.7322	-----	0.5427	0.1937
Managed liabilities	0.0127	0.5645	0.6324	-----	0.0543
Long term lending	0.2961	0.0013	0.7858	0.48836	-----

Table 7. Co integrating tests results of data of Jordan money transmission

Estimation period : 1990 – 2014

Log likelihood : - 354.157

Rank	Eigen value	λ trace test	P –value	λ max test	P –value
0	0.8137	85.500	0.0013	38.659	0.0094
1	0.79051	46.841	0.0606	35.951	0.0021
2	0.28767	10.890	0.9593	7.8010	0.9067
3	0.12093	3.0885	0.9551	2.9644	0.9387
4	0.00538	0.12408	0.7247	0.10956	
				0.7214	

According to the result of co integration vector which appears in table 6, we reject null hypotheses of co integration therefore the suitable method to be followed is VARs method.

The innovation behavior of interest rate are extracted from a VAR reduced form, these innovations do not necessarily represent exogenous monetary policy shocks, where some authors denoted the es; residual of supply equation of reserves relevant monetary policy shock, where VAR reduced form represents some combination of an exogenous monetary policy shock and endogenous contemporaneous response to monetary policy innovations in their variables, due to the mutual effects between variables together this can be observed in innovation in aggregated demand, and this the main challenge is how to remove the effect of such responses from the innovation in the monetary policy variables.

From the results of graphs of (IRF), we can vividly say that the money supply as whole has exponentially grown up, this indicates that the quantity of money amount increased through the period of study in Jordan economy, the growth rate approximately as compound annual average rate within 10% to 11.4%, then almost trend of data is stationary; this appeared in VAR residual diagram (3), the residuals of VARs display that strong volatility (impulse) of reserves and M_2 during the period of 1997-2005, where the average of Gross Domestic Product(output)ratio, this give us an indicator that the quality and quantity of money amount is increased in Jordan economy. The result for normality of residuals of VAR test by Duornik-Hensen test as chi–square (14) = 2.36579 with p – value (0.00504).

Results of impulse response function of var aims to analyze the dynamic effects of the system as our model, we have 6 variables, in order to display the response function, we should have to graph the impulse between variables, Formal finance may involve transactions between related parties, reliance on specialized money lenders.

Under the circumstances in Jordan and surrounding neighboring countries, the formal sector in Jordan is relatively small and conducted a relatively as the financial intermediation needs, table 8 shows that a small ratios of deposit money bank and assets to GDP is 0.39, while the ratio of low countries income is 0.33, also the financial assets to GDP p is 0.47, it is greater than Low income countries which is 0.33 (Poddar et. al., 2007). Jordan Q_i 1996 to 2014 Q3 as:

Table 8. Jordan Q_i 1996 to 2014 Q3 indicators

Violence	- 0.32
Gov. effectiveness	0.27
Regularity quality	0.34
Rule of low	0.49
Control of accountability Money	0.71
Deposit bank assets / GDP	0.96
Net interest margin	0.03
Bank concentration	0.85
Stock market turnover	0.63
Number of listed comp per lok population	0.37
De facto financial integration	1.04
Stock capitalization / GDP	2.23
Stock market traded value / GDP	1.89

Sources: Financial integration measures dnunqena (2008), securities from L.M.F 2008) and other indicators from Kaufman, Kraay and Mastruzzi (2009).

A monetary policy of Jordan shock of one standard deviation to the interest rate, Reserves, etc. Variables this on be interpret that government debt (both internal or external) increased year to after year, also the higher ratio of interest rate is higher than it should be which has a 4 year negative impact thus the C.B.J is embedded to reduce the interest rate of loans in this study and has a statistically significant positive effect from credit channel to interest rate to reserves, for instance, positive LPI represented in supply equation shocks cause GDP to rise and exchange rate and money supply to increase, many factors affect GDP in Jordan such M_2, R exchange rate, reserves, ... And granger causality test confirm this opinion.

Under constraint exchange rate and perfect capital mobility, arbitrage between government reserves and between variable causes incipient capital flows which change equity-bruin value of exchange rated to sustain in covered interest partially with sticky prices the nominal exchange rate reflects the depreciation that induces expenditure switching in the Jordanian market goods and services.

The effectiveness of C.B.J willingness to allow the exchange rate to a more degree of capital mobility for a given changes in domestic short term interst rate.

The response in both model demand equation and supply equation variables have positive sign, since positive shock in the exchange rates means the devaluation of national currency, and export increase however, the response in the VAR model, the response in transitory sleazing from the third year of data, when comparing OXECm and VAR in short run a shock in the exchange rates generates similar effects in both supply equation variables.

The price level in demand equation have different response in the short – run response in the model and a positive sign is expected, in the VAR model the level prices response is insignificant, thus the government tried to keep consumer prices constant in 2002 – 2008 in real terms, but did away with this policy after the 2008. A shock money supply M2 also generates different responses depending on the model as long-run money neutrality imposed price responses are changeable with such patterns after achieving 7 periods equilibrium, the inertial effect is not significant, but become positive and significant after 7 periods the impact is smaller, generally the impact is quite small and non-significant, that main source of fluctuation in GDP is inflation rate and M_2 changes.

A demand shock has a positive impact on the level of GDP and the response is merely small of the variables in the equation and as impulse responses figures declines gradually in periods, others sides up as long run restrictions bites. The reserve target model gives us very different results as exhibited in the variance decomposition diagrams and table of analyses which showed that the effect of monetary policy is still negligible even if it is measured by the bank reserves, if we have a look to the table and graphs estimated policy stance has shifted quite differently from previous early years in Jordan data. It has almost shifted in opposite direction in same period, also we can note that a positive shock indicates to a loose stance in the case of exchange rate effects.

M_2, reserves and interest rate where their direction in graphs in the same period is relatively tight, but the monetary policy has a tight effect in the variables of the study as shown in the variance decomposition, we can say that the shock may reflect the reserves demand shock rather than the monetary policy shock, we can state that the reserves is almost solely affected by M2, and not affected GDP(output) and the price level. The graphs and table of variance decomposition seems to support this interpretation. The increase of money demand by raising interest rate to suppress the large fluctuation of money aggregates, but this result may be more sensitive to rate targeting of monetary policy in Jordan, and the GDP(output)and price level responds positively to M2 shock, this explains the opinion which says that M2 shock contains some part of the monetary policy shock .

The estimated significant influence of M2 shock (e $_m$) over GDP and price level more than the tight effect and less of affected shock of exchange rate, where the bank lending effect is not negligible which has a large fluctuation which is paralleled with M2and GDP shock during and after 2003 to 2008 till present, this interpretation seems quite convincing due to the results of variance decompositions.

In fact the base money increased immediately in Jordan and its response to an upward shock in the short run interest rate, this suggests that interest rate shock increase may have occurred as a result of a positive shock to the demand for money in Jordan. Lending slightly against the shocks by expanding the base of money in the country, where the reserves could reduce the base of the money and deliberately raise short term interest rate of inflation (level of prices).

CONCLUSION

Jordan is an average low-income country and not as some classification considered it in medium income countries, it has a relatively closed capital account relatively fixed exchange rate, poorly developed domestic securities market (through ASM)which tends to be larger, and to trade more actively than those considered previously. Therefore, this study provides a framework and a set of stylized facts as other few papers which reformed the base which the monetary policy in Jordan follows, also this paper used a non structural VAR approach model, the paper focused on the short -term effects of the macroeconomic variables, such as stock market rate, exchange rate, interest rates, industrial production index, commodity price index, etc. Although the real effects should be small such the result of analyses and accompanied as few previous research which studied this matter (Tushar poddor, et al, 2006), The VAR model can be used to forecast monetary policy, therefore many policies could be drawn from this paper:

1- Monetary policy's effect appear to be somewhat weaker than they were in past years.

2- Financial policies is one possible cause of this change, but it is not the only determinant effect of the variables, there are other causes of these changes such as the structural deficit in economy, political disorder , immigration from neighboring countries, changes in oil prices, corruption in government system .

3- Financial consideration nor the shrinking reserves volume appears to be one of major factor affecting monetary transmission, the C.J.B has increased its foreign exchange reserves to help maintain the peg to the U.S dollar as the nominal anchor.

In this analyses we have found less evidence for the claim that policy of C, J, B operating target has an impact on GDP, however, a positive nominal exchange rate trend shock raises the level of prices in the long- run, it also raises the domestic price level, were domestic positive trend shock rise to domestic GDP in the long –run, and domestic price level in the long run, and depreciates the domestic currency, in other hand the interest rates are not un-reasonable because all other variables' nominal trend shock rises. The impact variables of monetary policy such as interest rates which affects and drives bank deposits, and lending channel rates, the result shows that monetary system does not seem to have an effect on asset prices, whenever there is a statistical link on analyses between monetary policy and lending channels. The researcher noticed that the impact of monetary policy has a positive sign, but it has a low effect on other channels.

Generally the interpretations of VARS and decompositions are too difficult and still tentative and needs more studies to investigate the M2,interest rate, reserves, and bank lending shocks, and measure the accurate effects of monetary policy and Jordan. Furthermore, the paper recommended that the monetary policy should be more sophisticated and more openness, also further research may fly to add more variables and take the subject more depth.

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APPENDIX

Figure 3: The impulse response of factors affecting money transmission of Jordan