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Empirical investigation of Risk Tacking Channel of Monetary Policy in Iran

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ABSTRACT

This study deals with investigation of existence of monetary policy risk channel in the economy of Iran. For the same purpose, the seasonal data of macroeconomic variables are used in such a manner that changes in interest rate as an indicator of monetary policy and bank leverage ratio as an indicator of risk are considered. Using VAR approach and Impulse response functions, the experimental test of channel of monetary policy risk in the economy of Iran was examined. The results showed that an expansionary monetary policy which occurs by decrease in interest rates causes that risk of bank system to be increased. In addition, it should be stated that inflation had positive impacts and economic growth had negative impacts on the risk of bank system.

***Keywords*:** Monetary Policy; Risk Tacking Channel; VAR

Classification of JEL: E31, E52

1. INTRODUCTION

In financial market, the financial mediators (including banks, retirement funds, life insurers and other institutes and finance institutes(which are allocated to collecting data, evaluation of projects and monitoringthe debtors, play an important potential role. Banks and similar institutes play an essential role in the financial market since they are specialized to transfer the saving of deposit holders to the usage such as different loans of business whose evaluation is so specialized and costly. The significant part of literature is dedicated to this issue since institutes and banks are able to use the credits in the intended applications more efficient than individual savers and other competing institutions. (The most studies in this regard includes: Diamond and Dybving (1983), Diamond (1984), Boyd and Prescott (1986), Calomiris and Khan (1991).

From experimental respect, there are many evidence that shows banks and other similar institutions play a special role in 'the process of creating credit', for example, Fama (1985) and James (1987) showed that bank loan borrower in comparison with deposit holders typically bear an implicit tax related to legal reserves.

There are several studies which emphasize on importance of relationship between lending of banks, small and newly-established institutions.[1]

[1]Elliehausend and Wolken (1990), Peterson and Rajan (1994)

One of the most important influencing factors on banks credits for granting loan is monetary policy. This policy is made by the central bank and by using several means such as legal reserve rate, rediscount and open market operations. The monetary policy is effective on production through different channels such as interest rate, foreign exchange rate, price of other assets and credit channel. The economists had reached a consensus on this approach that the monetary policy influencesthe economy real part in the shortest time but they are in disagreement about the influencing channels and their importance in relation to each other. However, the new channel of monetary policy effectiveness is through risk channel which is examined experimentally in the economy of Iran in this paper.

2. RISK TACKING CHANNEL OF MONETARY POLICY

In the recent studies in the area of monetary transfer mechanism and the role of monetary policies in economy, the role of and credits and special importance of their risk are dealt with and a new approach to the impacts of monetary policy on the real variables of economy was emphasized through Risk-Taking Channel.Boroi and Zhu, (2008), Angeloni, EstarFaia and Duca, (2011) and Bruno and Song Shin, (2012) tried to introduce a new channel for monetary mechanism and a new relation between real section and financial section of economy. In fact, the monetary policy is able to influence the real variables by influencing the banks' risk. The main hypothesis which is examined in the risk channel of monetary transfer mechanism is that decrease of interest rate in a long term causes bank lending to be more risky and this risk increase bank's portfolio and affects the real variables and price levels with increase in the bank credit default.

2. 1. Mechanism of Risk Tacking Channel of Monetary Policy

Bank theoretical literature has only recently begun to explicitly analyze the role of the monetary policiesin decision-making and risk-taking of banks (Agur and Demertzis 2010, Dell'Ariccia et al. 2010). In the models of Dell'Aricciaet. al. (2010), the only channel through with the bank's risk can be decreased in monitoring the credit granting but the other way is taking pledge from the facility recipients (Bester and Hellwig 1987).

In Dell'Aricciaet. al. (2010) the banks do not receive any pledge for covering the credit risk. Now without changing the model essentially, we assume that the value of facilities paid by the bank is equal to the value of pledge.

The bank's interest can be stated as follows:

$$\prod = \left[q(r_L - r_D(1-k)) + (1-q)w - r_E k - \frac{1}{2} cq^2 \right] L(r_L)$$

where the profit of assets only includes the loans. $L(r_L)$ indicates the request for loan which is a negative function of loan interest rate. $\frac{\partial(L(r_L))}{\partial(r_L)} \langle 0$

The banks are affected by the probability of success in projects for which the loan is granted in such a manner that if the probability of project success is indicated with q, then the monitoring cost of the borrowers will be a quadratic function of q: $\frac{1}{2}cq^2$

Now, if the project fails (with the probability of 1-q), then the amount earned by bank is equal to the rate of w which is less than risk-free interest rate (r)($w < r$) where w is the ratio of the volume of loans granted.

Banks are financed through public deposits or equity, which is a constant proportion of bank assets (k).We assume absorption rate of deposits equal to the risk-free rate ($r_D = r$). Absorption rate of deposits are not affected by loan non-payment risk. In fact, here we assume there is no liquidity risk. In conditions that the project is successfully performed, the deposits are financed through loans and in the circumstances that the project fails, the deposits areensured with a fair rate.

Rate of return on equity is related to the rate financing. Return on equity is dependent on two factors: 1 - the rate of bank financing and 2 - the equity risk premium which is the descending and linear function of banks' probability success. $r_E = r + \xi - aq$

The model can be solved by two-stage Backward Induction. In the first stage, the banks get loans optimal rate. Then in the second stage,the banks assume the loans rate as a determined rate and then we obtain theoptimal probability of success of the project. (It shall be noted thatthe possibility of the project success is as same as monitoring probability on the borrower since a project is successful for banks which was appropriately under supervision.)The banks obtained optimal monitoring intensity as follows:

$$\frac{\partial \Pi}{\partial q} = \left[(r_L - r_D(1-k) - w - ak - cq \right] L(r_L) = 0$$

$$\hat{q} = \frac{1}{c}(r_L - r_D(1-k) - w + ak).$$

Thus the optimal limit of monitoring has an inverse relationship with central bank's policy-making rate ($r_D = r$), cost of monitoring and pledges value and direct relationship with facilities granting rate and degree of capitalization. For certain level of interest rates of banks with higher monitoring costs consider greater response than the pledges value.

$$\frac{\partial \hat{q}}{\partial w} = -\frac{1}{c}$$

$$\frac{\partial^2 \hat{q}}{\partial w \partial c} = \frac{1}{c^2}$$

Increase effects of interest rate of monetary policy on are shown as follows:

$$\frac{\partial \hat{q}}{\partial r} = -\frac{1}{c}(1-k), dr_L = 0$$

Moreover, one can also show that banks with higher monitoring costs display greater response to changes in monetary policy rate:

$$\frac{\partial^2 \hat{q}}{\partial r \partial c} = \frac{1}{c^2}(1-k)$$

Also banks with a change in the monetary policy rate adjust its lending facilities rate. By solving the first stage of the model, we can show that if monetary policy rate declines, thenbanks with good percent of capitalrequire less supervision, while banks with less capital need more supervision.

It can be said that for banks with low capital ratio, risk-shifting effect is greater, because the lower interest rates will increase the profit margins of the bank ($r_L - r_D$), so the banks that more percent of their financing is fulfilled by the deposits are more motivated to increase their level of supervision in order to gain better revenue. So the monitoring of banks increases or risk reduces. But the banks that more percent of their financing is fulfilled by the equity (have greater capital ratio) has no incentive to increase the level of supervision in order to obtain more money. In these banks, pass-through impacts are dominant. So monitoring reduces and the risk increases in these banks.

3. EMPIRICAL STUDIES

Few studies have been conducted on new channels of monetary policy risk, including Wickens (2011) that examined the relationship between credit default risk and macroeconomic shocks (such as monetary policy shocks and fiscal policy) and showed that the credit default risk is affected by macroeconomic shocks and it influence real variables and prices level of the economy. Lown and Morgan (2006) has used the ratio of capital to assets of banks in America as an indicator of bank risk-taking and sought to examine the impacts of risk tacking channel of monetary policy by using VAR and taking into account variables such as GDP,price level, interest rate of central bank, commercial loans of banks. The results of their study showed that a reduction policy in interest rates of banks will increase the ratio of capital to assets. De Graeve et al (2008) examined the role of monetary policy on the default probability of loans granted (as an indicator of the banks risk) by using data from the German banking system. For this purpose, they used VAR and the variables of economic growth and inflation were included in the model as control variables. Their results showed that an expansionary monetary policy (lowering of interest rates of the central bank) can reduce the banks risk. Ioannidou et al (2009) examined the channel of monetary policy transfer by Time-Varying Duration models, using financial statement data of Bolivia banks and calculating default probability of new loans by using hazard model. They announced Indicator of monetary policy as the central bank interest rate and considered the variables of economic growth, inflation and the special characteristics of banksas control variables. The results showed that reduction of interest rate of central bank will increase the probability of default on the new bank loan, so the banks which have more liquidity power and borrows fewer loans from the other banks to finance their liquidity,increase in the default of new bank loans will be higher.

Eickmeir and Hofmann (2010) investigated the risk transfer channels using a new model to analyze Factor Analysis Vector Auto Regressive (FAVAR) for time series data of America's banking system. In this study, credit profit margin was used as a risk index and presented the monetary policy shocks using the same constraints in FAVAR and variables of GDP, inflation, and other financial variables were included in the model as control variables.

Angeloni et al (2010) examined the impacts of monetary policy on financial markets.For that purpose, they examined the risk of bank's balance sheet, leverage ratios of banks and fluctuations of stock markets in America and in Europe. The results showed that a tighter monetary policy increased the risk of a balance sheetin America and Europe and increased the leverage ratio of banks in America but it had no significant impacts on the leverage ratio of banks in Europe. Meanwhile, a tighter monetary policy had no significant impact on fluctuation of stocks market in America and Europe.

4. EXPERIMENTAL TEST OF RISK TACKING CHANNEL OF MONETARY POLICY

In order to estimate the review of risk transfer channel of monetary policy, the monthly data of economic variables and bank variables for the years 2006 to 2012 are used.

In order to evaluation of the risk tacking channel of monetary policy in the economy of Iran, according to empirical studies, VAR is use. In this equations system, changes of interest rates isused as a monetary policy indicator and the ratio of bank leverage (ratio of debts to asset) is considered as an indicator of risk in banks. Other variables included in the model are as follows: indicator of monetary policy (interest rates of banking system), GDP, inflation and banks investment. The estimated regression function can be demonstrated as follows:

$$Leverage_t = \beta_0 + \beta_1 Policy_t + \beta_2 Inf_t + \beta_3 Gdp_t + \beta_4 Capital_t + \varepsilon_t$$

where Leverage represents the leverage ratio of the Bank, Policy is indicator of Monetary Policy, Inf indicates inflation, Gdp is for Gross domestic production, Inv indicates total investment in the economy and Cap indicates bank’s investment.

Before estimating the intended model, we examine the reliability of variables. Therefore, Dickey Fuller unit root test was used and the results are shown in the table below.

4. 1. Experimental results

The results of Augmented Dickey-Fuller test (ADF) show that all of the variables used in the model would become integrated by one differentiation.

Table 1. Augmented Dickey-Fuller Unit Root t (ADF) Test Result.

ADF Test		
Variables	**levels**	**1st difference**
Leverage	-0.53	-5.67**
Policy	-2.09	-6.62**

Inf	.-3.28	-3.38**
Gdp	-2.39	-3.35**
Capital	-1.57	-3.30

Note: ** Represents significance at 5 % level of significance

4. 1. 1. Long-Term Relationship and Co-integration Analyses Tests

Considering non-sustainability levels of variables, subject of study, in the next stage, Co-integration among the levels of variables must be tested, inspired by the economic theory. Thus, at this stage, co-integration among the said variables is tested using Johansson's Methodology. The results have been given in Table 2.

Table 2. Unrestricted Co-integration Rank Test (Trace and Maximum Eigen value) for estimation of the number of Co-integration vectors.

λ_{trace} Test				λ_{Max} Test			
Critical quantity 95 %	Statistics Test	Con Theory	Hypothesized No. of CE (s)	Critical quantity 95%	Statistic Test	Con Theory	Hypothesized No. of CE (s)
63.87	307.54	$R \geq 1$	$R = 0$	32.11	220.29	$R = 1$	$R = 0$
18.39	42.91	$R \geq 2$	$r \leq 1$	25.82	45.08	$R = 2$	$r \leq 1$
3.84	25.87	$R = 3$	$r \leq 2$	19.38	30.89	$R = 3$	$r \leq 2$

Note: - Trace test indicates 3 cointegratingeqn(s) at the 0.05 level.
- Max-eigenvalue test indicates 3 cointegratingeqn(s) at the 0.05 level.

After confirming the existence of long-term relationship, we dealt with estimation of long-term relationship.

Co-integration Equation:

$$Leverage_t = \beta_0 + \beta_1 Policy_t + \beta_2 Inf_t + \beta_3 Gdp_t + \beta_4 Capital_t + \varepsilon_t$$

Table 3. Co-integration Equation.

	coefficient	**t- static**
Policy	0.11	4.21
Inf	0.0001	2.32
Gdp	-2.92E-08	-4.20
Capital	1.29E-05	0.16

Impulse response function:

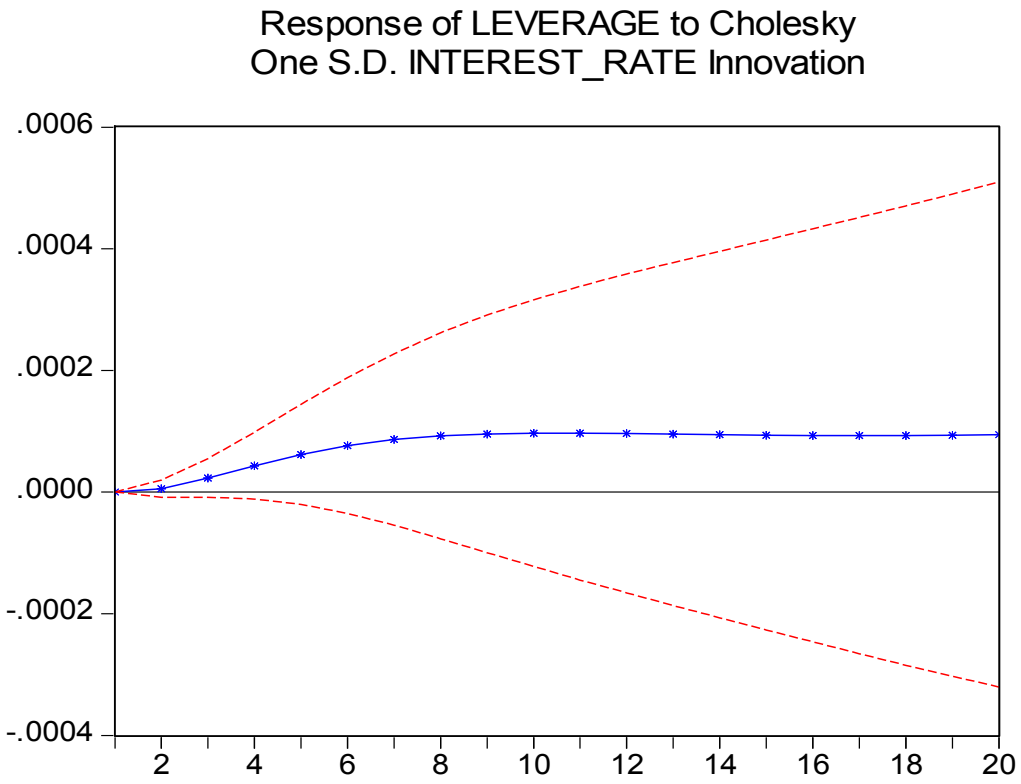

Figure 1. Risk taking Channel.

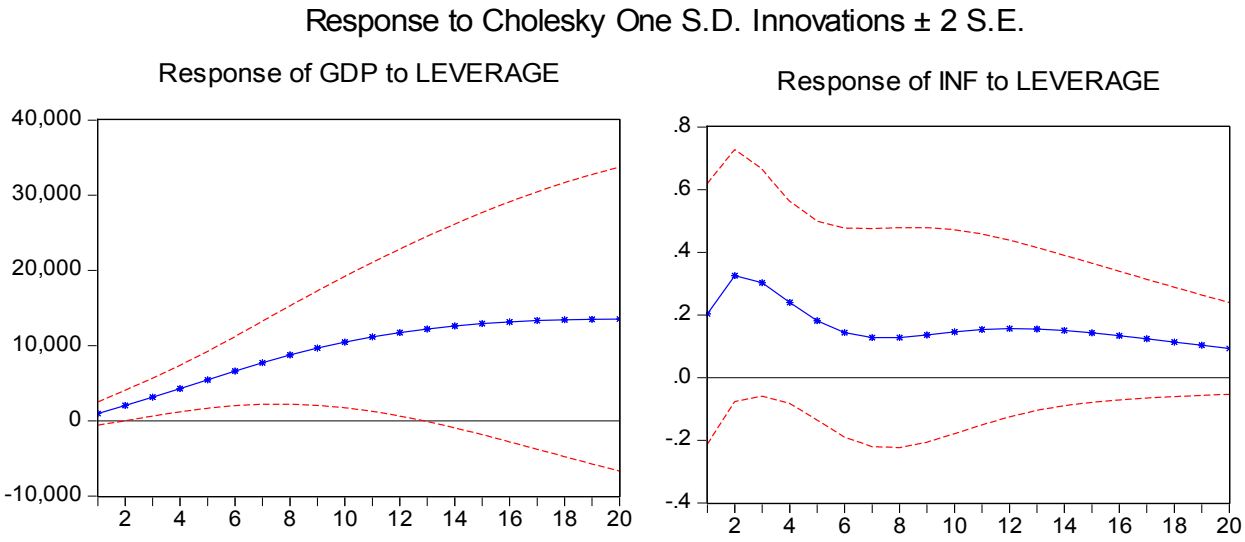

Figure 2. Response of Gdp and Inflation to Risk.

5. CONCLUSION

Regarding the estimation results of long-term relationship, it can be said that an expansionary monetary policy which happens by lowering interest rates, causes increase in risk of the banking system. It should also be said that inflation had the positive impacts and economic growth had a negative impact on the risk of the banking system.

The results of impulse response function showed that any changes in the interest rate cause increase in the risk of the bank system which will continue till 20 courses. On the other hand, as it was shown in the Figure 2, increase in the risk of banking system has led to increase in inflation and economic growth. In fact, it can be said that through increase in the volume of the bank's demands, the bank risk has caused the money flow in the economy to face problem and in this way, it had remarkable impact on inflation in Iran. So, it is clear that there is a risk tacking channel of monetary policy in the economy of Iran.

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