ABSTRACT

After the global financial crisis, new channels of monetary transmission mechanism (MTM) such as credit channels were introduced. The bank lending and balance-sheet channels are the two subsets of the credit channel. Researches in Iran have been focused especially on the bank lending channel (bank’s role in the MTM). This article for the first time in Iran investigates the balance–sheet channel and the role of the firms in the MTM. Also the interest coverage ratio (ICR) is assumed to be the best measurement of the quick respond of the firms to the monetary policy changes. Therefore, in this article we investigate the role of ICR in the monetary transmission mechanism in Iran in a balance-sheet channel framework. The period of 2007-2014 and financial statements of 50 nonfinancial Iranian firms are studied. At first we use a panel ARDL method to investigate the short-run and long-run indirect effect of the monetary policy through ICR (RICR) on the amount of the loans. The Results indicate that the effect of RICR decreases over time and is non-significant in the long-run. The derived error correction term demonstrates that the system corrects its previous period disequilibrium at a speed of 33% annually to reach a steady state. Second we investigate whether the financial condition of the firms influences the indirect effect of a monetary policy through the ICR (RICR). By using a Threshold method, we conclude that the indirect effect of the monetary policy through ICR is stronger when the bankruptcy risk of the firms is greater and they own larger amount of liabilities.

JEL Classification: E50; E59; G21; G23; G33.

Keywords: Balance-Sheet Channel; Interest Coverage Ratio; Monetary Transmission Mechanism; Threshold; Panel ARDL.

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1. INTRODUCTION

The monetary transmission mechanism investigates channels through which the monetary policy affects the real economy activities. In this respect many channels known as traditional channels including interest rate and exchange rate channel are introduced. After the financial crisis and due to the lack of efficiency of the traditional channels of transmission, the credit channel was announced. The credit channel includes channels such as the bank lending and balance-sheet channel. This research is going to focus on the balance-sheet channel as a monetary transmission channel. The balance-sheet channel investigates the role of the firms in the transmission of the monetary policy. This approach considers a dominant role for the firms and their financial condition in the transmission of the monetary policy. Net worth and cash flow are the two main factors of the firms that are studied in the relevant researches. It is believed that the monetary policy affects indirectly the real economy variables by affecting the net worth and cash flow of the firms. The interest coverage ratio (ICR) is recognized as the best measurement of how firms quickly respond to the monetary policy changes. According to the importance of ICR, our main goal in this research is to investigate the role of ICR in the balance-sheet channel mechanism in Iran. We suppose that an increase in the loans will lead to more investment and an increase in production and economic growth. Therefore in this study we only focus on the effect of the monetary policy on the amount of the loans of the firms. Our research consists of two steps.
In the first step the long-run effects of monetary policy through ICR are investigated in a Panel ARDL framework. In the second step by using the Threshold method we discuss how bankruptcy risk of the firms may affect the monetary policy transmission. The importance of this research is that it investigates the role of interest coverage ratio in the balance-sheet channel approach (of the monetary transmission mechanism) for the first time in Iran. Indeed according to the balance-sheet channel approach, the financial statements of the firms may influence the intensity of the monetary policy and how it affects the real economy. In this research for the first time in Iran, we answer to two main questions: 1. How the monetary policy affects the amount of loans in the short-run and long-run in Iran through ICR? 2. Does different levels of bankruptcy risk of the firms affect the monetary policy transmission through ICR (RICR)? The findings of this research provide helpful insight to the policymakers to consider different consequences of a monetary policy decision especially by taking into account the interest coverage ratio and the balance-sheet effects of a monetary policy. After discussing the review of literature in the next section, the data and model and methodology of this research is defined. Next the empirical results of the threshold and Panel ARDL methods are discussed. Finally the conclusions of the article are presented in the last section.

2. LITERATURE REVIEW

Mishkin (1996) believes that contractionary monetary policy may play a crucial role in case of financial crises. He sheds light on five factors that accelerate financial crises: 1. Increase of interest rates 2. Stock market decline 3. Unanticipated decline in the price level 4. Increase of uncertainty 5. Bank panics. A contractionary monetary policy together with the asymmetric information problem may easily result in the three first factors. First high risk firms that are more interested in borrowing may cause adverse selection. On the other hand the higher interest rates reduce the firms’ cash flow and worsens their balance-sheets. Also a raise in the interest rate decreases the firms’ net worth and stock prices. This may consequently increase the moral hazard and adverse selection problems and leads an economy to financial crises. In addition in recession periods distinguishing the bad and good credit risks will become harder and uncertainty about debt repay may increase. This again leads to more asymmetric and adverse selection problem and thus affects the lending process. As Friedman and Schwartz discuss when an economy endures recession, deposit withdrawals also increase (Christiano et al., 2004).

This fact leads to contraction in loans. The traditional monetary transmission channels such as interest rate and exchange rate channels were incapable to explain the monetary policy side-effects due to asymmetric information. Therefore a need for introduction of new channels emerges. These channels were named “credit channels”. Credit channels include channels such as “bank lending” and “balance-sheet”. In the bank lending channel the emphasis is on the bank characteristics and the banks’ respond to a monetary policy. While the “Balance-sheet” channel focuses on the role that the firms play when a monetary policy is imposed. In recent years a decline in the importance of the bank lending channel has propelled the importance of the introduction of the Balance-sheet channel. The balance sheet channel similar to the bank lending channel is based on the assumption of asymmetric information. In this channel it is considered that a decline in the net worth of a firm worsens the adverse selection and moral hazard problems. This may result in a decrease of collateral of the lenders and consequently the lending and investments will decrease. The hazard problem is believed to arise when the firm’s net worth drops. When the firm owns lower equity and net worth, it becomes more interested in risky investment projects. Therefore the possibility that they would repay their debts will reduce. This indeed will lead to a decrease in the lending according to the moral hazard problem. The balance-sheet literature suggests that there are several ways that a monetary policy may affect a firm’s balance-sheet (Katircioglu et al., 2018; Mishkin, 1996).

Hence it is obvious that along with the role of banks in the recession and monetary contractionary policy periods, firms play a vital role in how the economy may react. Following some factors of the firms that are more affected by monetary policy due to previous literature named net worth (NW), cash flow (CF) and Interest coverage ratio (ICR) are explained in more details. Net worth (NW) of the company according to Bernanke & Gertler (1995) is assumed as the difference of the total assets and total liabilities of a firm. It is believed that a contractionary policy such as an increase in the interest rate, reduces the net worth of the firm and relatively affect the credibility of the firm. Though if the financial health of the firms does not improve, they will be unable to presume their activities due to the lack of finance. Because their external financing will decrease due to the lack of NW and collateral. Banks observe constantly the firms credibility condition in order to hand in loans. Therefore in contractionary policy periods banks pay more attention to their bank lending decisions and they try to lend money to bigger firms which is less risky (Oliner & Rudebusch 1996, Guariglia & Mateut, 2006, Gilchrist et al. 1994). The other important factor affecting the monetary transmission mechanism is the Cash Flow of the firm (CF). Zulkefly (2010) has defined this factor as the net profit to the debt ratio.
They suggest that an increase in the interest rate as a contractionary policy will rise the financial costs of the firm and therefore cause liquidity problems for the firm (Wesche 2000, Zulkefly 2010, Ozlu & Yalcin 2010). Alternatively the “Interest Coverage Ratio” defined by Zhi-Xin & Xin (2012) and Pervez Zamurrad et al. (2014) is the ratio of financial costs to the sum of financial costs and profit. We consider the ICR as this definition in this research. Therefore the monetary policy may affect the “Interest Coverage Ratio” in two ways: 1. By affecting the financial costs 2. By affecting the profit of the firm. There are two facts that make the ICR important. First according to the financial literature the interest coverage ratio is assumed to be the factor that presents the rapid effects of the monetary policy on the financial condition of a firm. Second the “Interest Coverage Ratio” is one of the main financial health ratios that denote the ability of a firm to pay back the financial costs (interest costs). Therefore this ratio is a high-priority for the lenders to assess the financial condition of the firms and their credibility. The higher ratio denotes better financial health of the firm and considerably the firm is more capable of managing the debt potential and is more able to pay the financial cost that leads to the profit. This can be achieved by comparing the financial costs with the profit as the ratio is defined as a proportion of financial costs to the summation of the profit and the financial costs. Another variable that is studied in this research is the leverage ratio. The leverage ratio is also one of the important financial health ratios of a firm.

Additionally this ratio represents the bankruptcy risk of the firm. When the debts ratio of the firms increase, it is believed that their ability to repay the debts will reduced. The leverage ratio in this article is defined as the ratio of the total debts to total assets of the firm. A brief review of the empirical studies according to the credit channel is represented in the following. Taghavi and Mohammadi (2006) in their study named “Effects of monetary policy on the amount of deposits, lending and liquidity of banking system” for years 1995 to 2003, state that the monetary policy (assumed as the required reserve ratio) has negative impact on the growth rate of the reserve deposits and lending of the banks. Thus, a decrease in the required reserve rate (as expansionary monetary policy) will lead to an increase in the reserve deposits and lending. Therefore the results of their study prove the existence of the credit channel in Iran but also it shows that this effect is not considerable.

The research called “Identifying the balance sheet and lending channels of monetary transmission: A loan-level analysis” by Uluc & Ralf (2011) has investigated the difference between bank lending and the balance-sheet mechanism of monetary transmission for the period of 1995Q1 to 2009Q4 in the United States. The real and nominal interest rates are considered as the monetary policy. The bank lending and balance-sheet effects are studied at the same time in this study, and this is what distinguishes it from other studies. The results present the importance of the balance-sheet channel while no significant effect is recognized for the bank lending channel. Xiang-Feng & Chenxi (2011) in their article “Trade Credit, Traditional Credit and Monetary Policy Transmissions: Evidence from Chinese Firms” have studied 674 firms of the manufacturing sector in china for the period of 2001-2007 with panel data method. Specific characteristics of the firms such as return on sales (ROS), gross profit rate, growth rate on sales, solvency, total assets and total sales are studied. The results indicate that the demand for credit increases when a contractionary monetary policy is imposed and ROS is the main factor affecting the credit. Therefore it has been concluded that when a contractionary monetary policy is imposed the credit demand becomes more important than the credit supply.

Comijani and Alinejad (2012) in a research called “Evaluating the efficiency of monetary transmission channels on production, inflation and their relative importance on Iran economy” explore different channels that monetary policies affect the economy. They studied channels such as interest rate, exchange rate, asset price (stock) and banking loans. The power and relative importance of each channel is investigated in different periods. The results explain that the monetary policy affects the real production in short-run through all four channels. Thus the lending and interest rate channels are the main channels through which the monetary policy affects the growth rate of production. Shabbir (2012a) in his article “Balance-Sheet Channel of Monetary Policy and Economic Growth under Fiscal Dominance: Evidence from Pakistan” have studied the retail data of firms of Pakistan for the period from 2000-2010. The panel data for fixed and random effects is used in order to investigate the monetary policy effect on the economic growth in the balance sheet channel approach. The results show that a contractionary monetary policy such as an increase in the interest rate will reduce the net worth and the cash flow of the firms. In addition if the firms’ financial health does not improve then the firms should terminate their business due to the reduced net worth and collateral credit. The reason is that when the collateral credit of the firms decrease, banks may prefer to lend to bigger firms with less risk.

Using the random and fixed effect panel data for the period of 1999-2010 for Pakistan, Shabbir (2012b) concludes that the net worth of the firm is the main factor affecting the monetary transmission mechanism. In this study called “Balance Sheet Channel of Monetary Transmission in Pakistan: An Empirical Investigation” the firms are
classified in two groups of SMEs and large firms. The data of 160 non-financial companies listed in Karachi are studied. The firms are classified in the textile, cement, fertilizer, chemical, sugar, oil, and automobile sector. The results reveal that a contractionary monetary policy reduces the net worth of a firm in both groups but the effect on the cash flow is greater in the small and medium firms.

The article “The Balance Sheet Channel of Monetary Policy Transmission: Evidence from Chinese Listed Companies” studies data of 636 firms of china for the second quarter of 2005 to the third quarter of 2010. Zhi-Xin & Xin (2012) have used panel data in their study. The ratio of the assets to liabilities (DA) of the firms as a proxy for the firm’s balance-sheet quality is studied as the independent variable. The results show an asymmetric effect of the contractionary and expansionary monetary policy on the firm’s financial health. Thus the contractionary monetary policy affects the DA more than the expansionary monetary policy. Also the results show that the effect of the monetary policy on the interest coverage ratio is positive and significant when a contractionary monetary policy is imposed. But this effect is non-significant when an expansionary monetary policy is imposed. Another conclusion of this study is that small firms are more affected by the monetary policy than larger ones. Ismail & Mawar (2015) in the article “Cash Flow-Investment Relationship in Malaysia: A Panel Threshold Regression Analysis” aims to understand the relationship between cash flow-investment in high and low debt firms. In this regard they consider the debt ratio as the threshold variable. They used The Hansen threshold method (2000) for data of 234 firms from 2004 to 2010. The results indicate that the debt ratio explains well the cash flow-investment relationship of the firms. Therefore it can be concluded that the constrained firms are less able to achieve external financing and they must rely mostly on the internal financings.

In summary some researchers in Iran have studied the monetary transmission channels simultaneously and some have focused on credit channels. For example Comijani and Alinejad (2012) have examined the effect of the monetary policy on production and inflation in Iran through different transmission channels. His results indicate that the bank lending and interest rate channels are the most effective channels in Iran. Taghavi and Mohammadi (2006) also accept the existence of the bank lending channel in Iran. Unfortunately the balance-sheet channel and the role of the firms in monetary transmission mechanism has not been studied in Iran. Therefore the review of the results of a few foreign researches according to the balance-sheet channel can be helpful. Shabbir (2012a) in order to investigate the balance-sheet effect of the firms for Pakistan, has conducted two researches by using panel data. The conclusions show that a contractionary monetary policy affects the net worth (NW) and cash flow (CF) of the firms negatively. Consequently the amount of loans of the firms decrease. He also points out that the effect of the monetary policy on the CF of the SMEs in comparison to the larger firms (that are less constrained) is greater. Other researchers use alternative financial variables in their studies. For example Zhi-Xin & Xin (2011) have also considered return on sales (ROS), gross profit rate, growth rate on sales, solvency, total assets and total sales. He finds out that a contractionary monetary policy increases the demand for credit. Some researches shed light on the importance of the balance-sheet channel.

For example Uluc & Ralf (2010) consider the bank lending and balance-sheet channels at the same time. They announce that no significant effect for the bank lending channel in the United States is obtained. Alternatively they remark the important effect of the balance-sheet channel. An important variable that is studied in our research as a firm financial condition and a threshold variable is the DA ratio. The debt to asset ratio (DA) of the firms is known as a good measurement of the financial health of the firm. In this regard we can point out foreign researches such as Zhi-Xin & Xin (2012) and Ismail & Mawar (2015). The DA ratio of the firms have been considered as a dependent or threshold variable in these articles.

3. METHODELOGY

This article aims to investigate the role of the interest coverage ratio in the monetary transmission mechanism. In this regard we consider the balance-sheet channel approach. The estimations consist of two steps. First we examine the short-run and long-run effects of monetary policy through ICR (RICR) on the amount of loans by using a panel autoregressive distributed lag (ARDL) method. In the next step we aim to investigate whether different financial condition of the firms may affect the indirect effect of monetary policy through ICR (RICR). In this regard we explore whether different levels of bankruptcy risk of the firms may influence the effect of the RICR on the amount of loans. Therefore we estimate two models in this article:

1. The panel ARDL model (Equations 1 and 2):
\[
\Delta \text{TL}_{it} = \sum_{j=1}^{\eta} \gamma_j^1 \Delta \text{TL}_{i,t-j} + \sum_{j=0}^{\alpha} \delta_j^1 \Delta \text{X}_{i,t-j} + \phi \left[ (\text{TL})_{it-1} - \left( \beta_0^1 + \beta_1^1 \text{X}_{i,t-1} \right) \right] \epsilon_{it} \quad (1)
\]

Where \( y \) is the dependent variable which is the total amount of loans (TL), \( X_i \) is a set of independent variables. The RICR is specified as independent variable in our model. \( \gamma \) and \( \delta \) represent the short-run coefficients of lagged dependent and independent variables and \( \beta \) are the long-run coefficients. Also the \( \phi \) represents the ECT (error correction term). The ECT shows the speed of adjustment to the long-run equilibrium. The subscripts \( i \) and \( t \) represent subsequently the firm and time.

2. The panel threshold model (Equation 2):

\[
\text{TL}_{it} = \mu_{it} + \gamma_1^2 \text{RICR}_{it} I(\text{DA}_{it} \leq q) + \gamma_2^2 \text{RICR}_{it} I(\text{DA}_{it} > q) + \alpha x_{it} + u_{it} \quad (2)
\]

In our threshold model the total amount of loans (TL) is the dependent variable. “\( q \)” identifies the threshold variable. The DA ratio as an indicator of the bankruptcy risk of the firm and is considered as the threshold variable in this model. “\( u_{it} \)” is the independent and identically distributed error. “\( i \)” is the indicator function. The RICR is the independent variable that is supposed to own different coefficients due to the level of bankruptcy risk (DA) of the firms. Finally “\( x_{it} \)” includes a set of independent variables. The R, NW, RNW, CF, RCF and ICR variables are considered as the independent variables.

The defined variables in both models are:

R: The monetary policy variable which is considered as the maximum interest rate of the “one year investment deposits”.

NW: Net worth of the firms. This variable is defined as the total amount of assets of the firm minus total liabilities divided by the total amount of assets. According to the literature a positive relation between the NW and the amount of the loans is expected.

RNW: Also we consider the interaction variable of NW and monetary policy(R) as another variable. It is believed that an increase in the interest rates as a contractionary monetary policy may decrease the NW of the firms. Therefore a negative coefficient is expected for this interaction variable.

CF: The Cash flows. In this article the CF variable is defined as the ratio of the special profit/loss of the firm divided by the total amount of assets. A positive relation between CF and the amount of loans is considerable.

RCF: RCF is also the interaction variable of CF and monetary policy. It is expected that the monetary policy affects negatively the CF ratio. This means that the coefficient of the interaction variable of the monetary policy and CF is expected to be negative.

ICR: Interest coverage ratio is another important variable that we study in this article and is defined as the financial costs divided by the summation of the financial costs and profit/loss of the firm. This variable represents the quick responses of the firms to the monetary policy changes.

RICR: RICR is also defined as the interaction variable of the monetary policy and the interest coverage ratio. RICR is the most important variable studied in this research and reveals the indirect effect of a monetary policy through ICR on the amount of the loans of the firms.

DA: Finally DA is the variable suggested as the proxy of firm’s bankruptcy risk. This variable is defined as the ratio of total liabilities to the total assets of a firm. On that account a firm with a greater ratio of DA is expected to own a greater risk of bankruptcy. It is believed that high share of liability in a firms’ financing condition will make them unable to repay their debts.

The data of the firms for the period of 2007-2014 is studied. The average DA ratio for the studied firms were approximately 67 percent. Besides the quantile plot of the DA variable for the firms in figure (1) demonstrates that less than 25 percent of the DA data were below 0.5. This means that over 75 percent of the DA ratios of the...
firms are more than 0.5. By reviewing the data of this article for the period of 2007-2014, it can be derived that only ten out of fifty firms in our study have a liability to asset share below 0.5.

Figure 1.
Quantile Plot of Debt to Asset Ratio

The ratios of the firms are calculated by the data of the firms by the author. The data of the financial statement of the 50 nonfinancial firms and interest rate for the period of 2007-2014 is used in this research. The financial statement of the firms are obtained by the “codal” website of the “Tehran Stock Exchange” and the interest rate data is obtained from the central bank of Iran. Firms that have received both short-run and long-run loans in the whole period of 2007-2014 are considered in this research. As far as this article consists of two steps of estimation. We describe the two methods of estimation in this section. First we provide a short explanation of the panel ARDL method and then the Threshold method will be described. According to Roodman (2006) in some cases the efficiency of the GMM-Difference and the GMM-SYS estimators suggested by Arellano and Bond (1991), Arellano and Bover (1995) and Blundell and Bond (1998) decrease. The GMM only estimates the short-run dynamics and these estimates are mostly restricted to short time. Therefore the stationarity of the variables are ignored. Hence there are doubts about the reliability and consistency of the results derived by using the GMM method. Besides in GMM estimation the imposition of homogeneity assumptions on the slope coefficients of lagged dependent variables could lead to biases (Kiviet, 1995). Thus unless the slope of coefficients are identical, these estimations are likely to produce inconsistent and misleading long-run coefficients (Pesaran & Shin, 1999; Pesaran et al., 1997; Pesaran et al., 1995). Consequently Pesaran et al. (1999) suggests the incorporation of the dynamic heterogeneous panel regression into the error correction model by using the autoregressive distributed lag ARDL. A panel ARDL model can be defined as equation (3):

\[ \Delta(y)_{it} = \sum_{j=1}^{p-1} y_{i,t-j} + \sum_{j=0}^{q} \delta_{i,j} \Delta(X)_{i,t-j} + \varphi \{ y_{i,t-1} - \{ \beta_0 + \beta_1(X)_{i,t-1} \} \} + \epsilon_{it} \]  

\( (3) \)

Where \( y \) is the dependent variable, \( X \) is a set of independent variables, \( \gamma \) and \( \delta \) represent the short-run coefficients of lagged dependent and independent variables and \( \beta \)s are the long-run coefficients. Also the \( \varphi \) represents the ECT (error correction term). The ECT shows the speed of adjustment to the long run-equilibrium. The subscripts \( i \) and \( t \) represent subsequently the firm and time. The term in the brackets shows the long-run regression. The estimator considers the maximum likelihood and the long-run equilibrium and the heterogeneity of the dynamic adjustment process (Demetriades et al., 2006). The ARDL panel has advantages in comparison to other long-run estimators. For example, according to Johansen (1995) and Philipps et al. (1990) the long-run relationships exist only in the context of co-integration among variables with the same order of integration. But Pesaran et al. (1999) argue that panel ARDL can be used for variables with different order of integration and it is not important whether the studied variables are I(0) or I(1). Also in panel ARDL method we can have both the short-run and long-run effects at the same time (Samargandi et al., 2015). Another advantage of panel ARDL estimation is that by including the lags of dependent and independent variables, it provides consistent coefficients even when endogeneity exists (Pesaran et al., 1999). In the panel threshold regression (PTR) it is possible to investigate the

\[ \Delta(y)_{it} = \sum_{j=1}^{p-1} y_{i,t-j} + \sum_{j=0}^{q} \delta_{i,j} \Delta(X)_{i,t-j} + \varphi \{ y_{i,t-1} - \{ \beta_0 + \beta_1(X)_{i,t-1} \} \} + \epsilon_{it} \]  

\( (3) \)

1 For more information about the difference between PMG and MG models read M. Hashem Pesaran et al., (1998) “Pooled Mean Group Estimation of Dynamic Heterogeneous Panels”

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http://www.econ-society.org
effects of a dependent variable due to different values of a threshold variable. Equation (4) shows a threshold model:

\[ y_{it} = \begin{cases} 
\mu_i + \gamma_1'(K)_{it} + \alpha X_{it} + u_{it} & D_{it} \geq q \\
\mu_i + \gamma_2'(K)_{it} + \alpha X_{it} + u_{it} & D_{it} < q 
\end{cases} \]  

(4)

Equation (4) denotes that the observations are divided into two regimes. \( D_{it} \geq q \) and \( D_{it} < q \). \( \gamma_1 \) and \( \gamma_2 \) represent the coefficients of the variable that differ according to the two regimes. \( y_{it} \) is the dependent variable and \( X_{it} \) are the independent variables. \( K_{it} \) is the dependent variable that have different effects due to different values of the threshold variable. For each of the estimated regressions the sum square of the residuals are defined as:

\[ S_1(\gamma) = \hat{e}^0 - \hat{e}^0(\gamma) \]  

(5)

The sum square residual function \( S_1(\gamma) \) is related to \( \gamma \) by the indicator function \( q_{it} \geq \gamma \). The optimum value for \( \gamma \) is the value that approves the assumption of:

\[ \hat{\gamma} = \text{arg}_{\gamma} \min S_1(\gamma) \]  

(6)

The F value that reveals the difference between the coefficient should be significant. The test is conducted according to the Hansen (2000) and the LR. The F value is as follows:

\[ F = \frac{S_0 - S_1(\gamma)}{\hat{\sigma}^2} \]  

(7)

Where \( S_0 \) is the squared residual value estimated by the ordinal minimum squared method. The critical advantages of the endogenous threshold regression technique over the traditional approach are as follows: 1. It does not require any specified functional form of nonlinearity, and the number and location of thresholds are endogenously determined by the data; 2. Asymptotic theory applies which can be used to construct appropriate confidence intervals. Also in order to test the null hypothesis of a linear formulation against a threshold alternative, a bootstrap method is used to assess the statistical significance of the threshold effect (Chang et al., 2010).

4. RESULTS AND DISCUSSION

The results of the Unit-root tests are presented in Table (1). The null hypothesis of the unit roots is not rejected for almost all of the variables except for the monetary policy variable (R) in the Levin Lin& Chu test.

Table 1. Unit-Root Tests

<table>
<thead>
<tr>
<th></th>
<th>CF</th>
<th>ICR</th>
<th>NW</th>
<th>R</th>
<th>RCF</th>
<th>RICR</th>
<th>RNW</th>
<th>TL</th>
<th>DA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(0/00)</td>
<td>(0/00)</td>
<td>(0/00)</td>
<td>(1/00)</td>
<td>(0/00)</td>
<td>(0/00)</td>
<td>(0/00)</td>
<td>(0/00)</td>
<td>(0/00)</td>
</tr>
</tbody>
</table>

Note: In the Levin, Lin & Chu Unit-root test the Null Hypothesis is Unit root (common unit root process) and in the Hadri Unit-root test the Null Hypothesis is being Stationarity

Resource: Researcher estimations

The Kao Co-integration test is applied. The results of the Kao test with t-Statistic of -6/36 and Probability of 0/00 and subsequently Residual and HAC variances of 0/006 and 0/005 proves that at least one long-run equation exists. Therefore we can use the variables at level in the estimations. Table (2) displays the long-run and short-run coefficients of studied variables. The Results illustrate that the effect of the monetary policy through ICR is negative and significant in the short-run but it decreases in the long-run and become non-significant. In addition the error correction term indicates that the system corrects its previous period disequilibrium at a speed of 33% annually to reach a steady state. Thus we conclude that the indirect effect of the monetary policy through the ICR improves the intensity of the effect of the monetary policy on the amount of the loans of the firms in the short-run. Also table (2) reports the Hausman test results for the homogeneity restriction. Pesaran & Zhao (1998) offer a test for choosing between the PMG and MG long-run estimators. When the p-value of the test takes value over 0/05 it means that the PMG estimator is better than the MG estimator. If the p-value takes the value below 0/05 it indicates
that the model is heterogeneous and the PMG estimations are inconsistent. Since the p-value of the Hausman test in our estimations is 0.76, the PMG model provides better results and is chosen.

Table 2. The Long-Run Estimation of RICR (Panel ARDL Method)

<table>
<thead>
<tr>
<th>VARIABLES</th>
<th>PMG Long-Run Coefficients</th>
<th>PMG Short-Run Coefficients</th>
<th>MG Long-Run Coefficients</th>
<th>MG Short-Run Coefficients</th>
</tr>
</thead>
<tbody>
<tr>
<td>EC</td>
<td>-0.333*** (-5.307)</td>
<td>-0.348*** (-4.656)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D.RICR</td>
<td>-0.429* (-1.659)</td>
<td>-2.024 (-1.393)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RICR</td>
<td>-0.00215 (-0.857)</td>
<td>1.117 (0.301)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>0.111*** (3.106)</td>
<td>0.0983*** (2.718)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Observations</td>
<td>350</td>
<td>350</td>
<td>350</td>
<td>350</td>
</tr>
<tr>
<td>Hausman Test</td>
<td>chi2(1) = 0.09</td>
<td>Prob&gt;chi2 = 0.76</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

z-statistics in parentheses *** p<0.01, ** p<0.05, * p<0.1
The null hypothesis of the Hausman test is that difference in coefficients is not systematic. The Prob of the Hausman test with the value of 0.24>0.05 indicates that the selection of the PMG is more appropriate than MG method

Also the threshold results in the second step of estimations are reported in tables (3) and (4). The provided information in table (3) reveals the best number of the thresholds for the estimated model. By comparing the F values, probability and RSS values of the single and double thresholds, the double threshold model proves not to be significant and the single threshold model is chosen. Considering a single threshold effect the whole sample is split into two regimes where firms have DA ratios over and below 0.47.

Table 3. Threshold Estimates

<table>
<thead>
<tr>
<th>Residual Sum of Squares (RSS)</th>
<th>Fstat</th>
<th>Prob</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single Threshold Model</td>
<td>2/44</td>
<td>17/39</td>
</tr>
<tr>
<td>Double Threshold Model</td>
<td>2/38</td>
<td>9/86</td>
</tr>
</tbody>
</table>

Threshold Estimate: 0/47
Confidence Region: 0/43
Trimming Percentage: 0/05
Bootstrap P-value: 0/05
Critical Values: 14/21 (16 percent), 18/17 (5 percent), 22/3 (1 percent)

Number of the firms and years used in the estimation are 50 and 8 respectively with total observations of 400 (with trimming process at 0.05 percent and bootstrap and quantiles of 300 and 200 subsequently. The confidence level is 95%.

The debt asset ratio (DA) as the measurement of the bankruptcy risk of the firms is the threshold variable in this article. It is assumed that the greater DA ratio of a firm indicates the greater bankruptcy risk of the firm and it presents the bigger share of liabilities in the firm’s financing structure. RICR is the interaction variable estimated by multiplying the monetary policy variable (interest rate) to the interest coverage ratio. According to the threshold model the way that the monetary policy affects firms through interest coverage ratio is studied in two different regimes. The first regime represents the situation that the DA ratio of the firm is more than the threshold variable. The second regime represents the situation where the DA ratio is less than the threshold variable. Therefore the effect of the monetary policy through ICR (RICR) on the amount of the loans differs for the firms with a high debt and low debt ratios. Firms that own higher amount of debt are less able to access external financing. The higher amount of debt indicates higher bankruptcy risk for the lenders. Those firms are believed to be less able to repay their liabilities. As far as their ability to gain external finance reduces, they become more vulnerable to the imposed...
monetary policy. Consequently, the monetary policy affects their interest coverage ratios and amount of loans more intensively.

The estimation of the threshold method in Table (4) demonstrates the different effects of the monetary policy through interest coverage ratio (RICR). The effect of the RICR differs according to the different level of the DA ratio. Hence when the debt to asset ratio (the bankruptcy risk of the firm) is more than 47 percent, the RICR effect is greater and about -5/25. This result verifies that when the firms confront financial difficulties and own larger amounts of liabilities in their financing, they are more vulnerable to the imposed monetary policy. While for the DA ratios below 0.47, the RICR effect is weaker and about -0/004.

Table 4. Effect of RICR on Total Loans Considering DA as Threshold Variable

<table>
<thead>
<tr>
<th>VARIABLES</th>
<th>Coefficients</th>
<th>VARIABLES</th>
<th>Coefficients</th>
</tr>
</thead>
<tbody>
<tr>
<td>RNW</td>
<td>0/003</td>
<td>RICR</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0/004)</td>
<td>DA &lt; 0.47</td>
<td>-0/004***</td>
</tr>
<tr>
<td>NW</td>
<td>-0.85***</td>
<td>DA ≥ 0.47</td>
<td>-5/24</td>
</tr>
<tr>
<td></td>
<td>(0/11)</td>
<td></td>
<td>(0/001)</td>
</tr>
<tr>
<td>CF</td>
<td>1/15</td>
<td></td>
<td>5/50</td>
</tr>
<tr>
<td></td>
<td>(1/53)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>R</td>
<td>-0.007***</td>
<td>Constant</td>
<td>0/66***</td>
</tr>
<tr>
<td></td>
<td>(0/002)</td>
<td></td>
<td>(0/04)</td>
</tr>
<tr>
<td>RCF</td>
<td>-1/26</td>
<td>Observations</td>
<td>400</td>
</tr>
<tr>
<td></td>
<td>(1/53)</td>
<td>Number of cross</td>
<td>50</td>
</tr>
<tr>
<td>ICR</td>
<td>0/001</td>
<td>R-squared</td>
<td>0/563</td>
</tr>
<tr>
<td></td>
<td>(0/001)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Standard errors in parentheses  *** p<0.01, ** p<0.05, * p<0.1

As a conclusion, the results suggest that the short-run effect of RICR is negative and significant in the short-run while this effect decreases and become non-significant in the long-run. Also the indirect effect of the monetary policy through ICR (RICR) is greater for firms with DA ratios more than 47 percent. Therefore the firms’ financial condition and accessibility to external funds such as loans will decrease more intensively when the liabilities of the firms exceed half of the amount of their assets. The results of this research are complementary to researches done by Comijani and Alinejad (2012) and Taghavi and Mohammadi (2006) and verifies the existence of the balance-sheet effect in Iran. In consistence with Ismail & Mawar (2015) we have considered the debt to asset ratio (DA) as the threshold variable and we notice that the constrained firms (with DA ratios over 0.47) are less able to achieve external financing and they must rely mostly on the internal financings. Therefore they are more affected by the monetary policy. Also in accordance with Shabbir (2012b) we conclude that the net worth (NW) is an important variable in the balance-sheet channel approach. In addition our results similar to Zhi-Xin & Xin (2012) approve the significance of monetary policy on the interest coverage ratio (ICR).

5. CONCLUSION

The aim of this study is to investigate the role of ICR in the monetary transmission mechanism in Iran in a balance-sheet channel framework. Dissatisfaction with the traditional monetary transmission channels such as interest rate and exchange rate channels and incapability of these channels to explain the monetary policy side-effects due to asymmetric information lead to the introduction of new channels named “credit channels”. Credit channels include channels such as “bank lending” and “balance-sheet” channels. The “Balance-sheet” channel focuses on the role that firms play when a monetary policy is imposed. It is believed that a contractionary policy such as an increase in the interest rate, reduces the net worth and cash flow of the firm and relatively affect the credibility of the firm. The “Interest Coverage Ratio” is also another important variable that we consider in this research and it is defined as the ratio of financial costs to the sum of financial costs and profit. The monetary policy may affect the “Interest Coverage Ratio” in two ways: 1. By affecting the financial costs and 2. By affecting the profit of the firms. There are two facts that shed light on the importance of the ICR. First according to the financial literature, the “Interest Coverage Ratio” is assumed to be the factor that presents the rapid effects of the monetary policy on the financial condition of a firm. Second the “Interest Coverage Ratio” is one of the main financial health ratios that denote the ability of a firm to pay back the financial costs (interest costs). Therefore this ratio is a high-priority for the lenders to assess the financial condition of the firm and their credibility.
In this respect our main focus in this research is the investigation of the effect of the monetary policy through ICR (RICR) on the amount of loans of the firms in Iran. The importance of this research is that it investigates the role of interest coverage ratio in the balance-sheet channel approach (of the monetary transmission mechanism) for the first time in Iran. This article has employed the data of 50 nonfinancial Iranian firms for the period of 2007 up to 2014. Firms that have received both short-run and long-run loans in all of the years from 2007-2014 are considered. This article consists of two steps. In the first step we applied a panel ARDL method to comprehend the indirect short-run and long-run effect of the monetary policy through ICR (RICR) on the amount of the loans in Iran. The Results show that the effect of the monetary policy through ICR (RICR) decreases in the long-run and become non-significant. Also the derived error correction term indicates that the system corrects its previous period disequilibrium at a speed of 33% annually to reach a steady state. In the next step of our study we have investigated whether the bankruptcy risk of the firms (DA) will affect the indirect effect of a monetary policy through the interest coverage ratio (RICR). This means that whether the RICR coefficients differ due to different bankruptcy risk of the firms. Therefore we used a panel threshold model and we conclude that the indirect effect of the monetary policy through interest coverage ratio (RICR) is stronger when the firms own a greater bankruptcy risk. This means that the monetary policy through the ICR (RICR) has a greater effect on the amount of loans when their debt to asset ratio of the firms surpass 47 percent. Consequently if the liabilities of the firms exceed half of their assets, they are facing financial difficulties and this will make them more vulnerable to the monetary policy. Consequently the amount of the loans may decrease more intensively when a monetary policy is imposed. The findings of this article donate helpful insight to the policymakers to consider different consequences of a monetary policy decision especially by taking into account the interest coverage ratio (ICR) and the balance-sheet effects of a monetary policy.

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