Does Bank Lending Affect Output?
Evidence from an Emerging Market

Samer A.M. Al Rjoub
Department of Banking and Finance, Hashemite University, Zarqa, 13133, Jordan
E-mail: salrjoub@hu.edu.jo
Tel: +962-3903333; Fax: +962-53826613

Arqam AL-Rabbaie
Department of Economics, Hashemite University, Zarqa, 13133, Jordan
E-mail: rabbai@hu.edu.jo
Tel: +962-3903333; Fax: +962-53903344

Abstract

Bank-level data is aggregated to test whether changes in bank loan supply affect output. Money demand shocks, money supply shocks and loan supply shocks are used as instruments. Using these shocks as an instrumental variable, we find that shocks to loan supply have large and statistically significant effects on the supply of bank loans, but money demand and supply shocks have statistically insignificant effects on output.

Keywords: Bank Lending, Money demand and Supply Shocks, loan supply shocks.

1. Introduction

This paper examines whether changes in bank lending in thirteen banks in Jordan cause subsequent changes in income. A large literature in recent years has focused on credit markets as playing a critical role in the transmission of monetary policy actions to the real economy. In the bank lending channel view, banks play a particularly critical role in the transmission of monetary policy actions to the real economy and play a special role in the propagation of economic fluctuations (Brunner and Meltzer (1963), Bernanke (1983) and revived more recently by Driscoll (2004)). The structure of loan supply in Jordan is suitable for providing empirical evidence on the role of banks in the monetary transmission process.

There are many small firms (borrowers) which are bank-dependent, in the sense that they are unable to readily substitute other forms of finance for bank loans and in the sense that there is a lack of close substitute for deposit liabilities on the liability side of the banking sector’s balance sheet. Till this point a very low fraction of corporations and banks are allowed to issue debts through bond issuing in Jordan. This fact may due to the dominance of small size firms and low capital financial institutions in Jordan with the safety and soundness as the ultimate goal of the Central Bank of Jordan (CBJ). We may describe the Jordanian loan market as heavily bank dependent with low elasticity of substitution between different forms of loans. These characteristics give this study a peculiarity in that we can construct a modified macro-model and compare the results with those of industrialized countries to see whether bank lending channel of monetary policy do exists in emerging markets.

The independence of bank as suggested in Kashyap and Stein (1994), Bernanke (1983), Driscoll (2004), and Peek and Rosengren (1995a) have three important consequences. First, banks
serves as a lending channel for monetary policy through which the monetary transmission mechanism may work (the “lending channel” of monetary policy) as well as through the conventional interest-rate channel (the “money channel”). Second, bank failures may help cause recessions (see for example Bernanke (1983) for a discussion of the role of bank failures in the Great Depression and Bernanke and Lown (1991) and Peek and Rosengren (1995a,b) for a discussion of the “credit/capital crunch” in the 1990-1991 recession in the United States). Third, bank regulatory actions may be a source of monetary policy innovations (shocks) potentially as important as other Federal Funds instruments (see Peek and Rosengren (1995a)). Peek and Rosengren (1995a) show that bank lending declines after imposing formal regulatory actions on banks.

Driscoll (2004) extend the work of the Bernanke and Blinder (1988) aggregate demand model of the lending channel to the case of a group of small open economies (the U.S. states) under fixed exchange rates. Driscoll introduce state-specific shocks to money demand in order to test for lending channels. He finds that shocks to money demand have large and statistically significant effects on the supply of bank loans, but small, often negative and statistically insignificant effects of loans on output.

Others like Kashyap and Stien (2000) examined the issue that the size and the liquidity of banks is a determinate of the bank lending reaction; where small and less liquid banks react in their lending by more than do large more liquid banks while large banks are better able to neutralize monetary shocks than small banks (i.e. they react differently).

In this paper we extend both the aggregate demand model of Beranke and Blinder (1988) and Driscoll (1999) model of state specific shocks to money supply and demand. We apply their model and extend to assume that loan supply shocks (which might be caused by Basel accords I of loan rating and capital requirements) are also a candidate instrument in the model. We try to show whether bank lending channel can also be valid for an emerging market economy.

Bernanke and Blinder (1988) provide a modified version of a traditional IS-LM framework into which they incorporate a bank-lending channel. Bonds and money are the only two financial assets and money is assumed to pay a zero nominal interest rate. Bernanke and Blinder modify this framework by distinguishing between money, bonds, and bank loans to determine the interest rates on bonds and loans and the level of output for a given price level, with equilibrium in the money market, bank loans market and aggregate demand-output equality.

In our model framework extension, we assume regulatory-specific shocks in the money demand and supply of loans, lead to regulation-specific change to money supply and therefore change in output through lending channel. And since by structure of the loan market in Jordan banks are not able to readily substitute for deposits and firms do not regard bank loans and bonds as perfect substitute, the two requirement of the lending channel exists.

The recent structural changes applied on the banking minimum capital requirements and the loan and customers rating may have a negative effect on the amount of loan extended to investors and prohibits investors with good investment ideas from being granted the loans, this may have a negative effect on banks profitability since they have to reduce default risk exposure by granting loans to those with high quality credit standards. These regulatory requirements or what are known now as the Basel accord II and I. This agreement will create shocks for both supply and demand and hence output. The rest of the paper is organized as follows. Section 2 describes data and set assumption and discusses the empirical strategy. Section 3 gives a brief review about banks in Jordan. Section 4 reports results and conclusions while section 5 concludes.

2. Data, Assumptions and Empirical Strategy

Annual data on total deposits and total loans in commercial and mutual savings banks are available for the Jordan Banks for 1980 to 2006 from the special banks annual bulletins and the Central Bank of Jordan monthly and annual statistical reports. The data on loans represent the book value of all commercial and industrial loans. The relevant measure of money for this model is those components of
money, which affect the ability of banks to make loans. This consists of all bank deposits or M2 less
currency and travelers’ checks and M1 less currency. Following this line of literature Interest rates on
these deposits were obtained by dividing the interest paid out on deposits by the quantity of deposits. I
use the GDP deflator to deflate nominal values for all variables. Since all data are demeaned from
cross-sectional averages, in practice the deflator drops out. In what follows we will list the assumptions
for the construction of our model:

(i) Jordan is a small open economy with many banks and firms that are in the phase of
changing their structure and are exposed to external money demand and supply shocks.
(ii) Banks are changing their minimum capital requirements.
(iii) It is a modified version of a traditional IS-LM framework into which they incorporate a
bank-lending channel.
(iv) Bonds and money are the only two financial assets.
(v) Money is assumed to pay a zero nominal interest rate.
(vi) Money supply equal money demand.
(vii) Income is equal to expenditures on consumption, investment, government, and net exports.
(viii) Firms do not regard bank loans and bonds as perfect substitutes.
(ix) Banks do not regard loans and bonds as perfect substitutes.

The following is an extension of both Bern anke and Blinder (1988) and Driscoll (2004)
aggregate demand model of the lending channel to the case of a group of small open economies under
fixed exchange rate. We will assume that Jordan is a small open economy with many banks and firms
that are in the phase of changing their structure and are exposed to external money demand and supply
shocks. The followings are a detailed description of the model assumptions that are identical to those
by previous studies:

We will assume the condition that money supply equal money demand is still exists and may be
written as in the following:

\[ m_t - p_t = \gamma_t - (r_t - r^d_t) + \varepsilon_t \]  

(1)

Where \( y_t \) is income (GDP) and \( r^d_t \) is the deposits interest rate, which may vary slightly across
banks\(^1\), \( \varepsilon_t \) represents shocks to money demand.

Income is equal to aggregate expenditures, which is divided into consumption, investment, and
government spending and net exports. Assume that government spending is exogenous, and net exports
a function of the constant real exchange rate and possibly output.\(^2\) Investment will be a function of the
interest rate on bonds, \( r_B \) and the interest rate on loans \( r_S \). Firms do not regard loans and bonds as
perfect substitutes.

\[ y_t - p_t = -\theta r_B + \mu r_S + \kappa_t \]  

(2)

Where \( \kappa_t \) represents other unmodelled disturbances to aggregate demand (e.g. from fiscal
policy or changes in tastes).

By structure of the loan market in Jordan banks are not able to readily substitute for deposits
and firms do not regard bank loans and bonds as perfect substitute, and hence loans and bonds cannot
be considered as perfect substitutes in the banks portfolio, where the supply of loans can be written as
follows:

\[ l_t^i = -\lambda r_B + \mu r_S + \beta (m_t - p_t) + \vartheta_t \]  

(3)

Where \( \vartheta_t \) represents shocks to loan supply (e.g. the new Basel accords I and II and any new
structural changes in the banking sector.

\(^1\) This aspect is ignored in this research.
\(^2\) This assumption will not make difference in our study and hence whether exchange rate float or begged, shocks still
exists.
Also, by structure of the loan market in Jordan, firms do not regard bank loans and bonds as
perfect substitute, i.e., Loans and bonds are not perfect substitutes in the firm's portfolio, where the
demand of loans can be written as follows:
\[ l^t = r^t + \theta \sigma^t + \omega \beta + \nu_t \] (4)
Where \( \nu_t \) represents shocks to loan demand.

To solve the problem of separating the effects occurring through interest rates on loans and
bonds and hence to determine the effects of monetary shocks on output through loans, the variables in
equations (1) through (4) must be demeaned to eliminate liquidity preference channel. The demeaned
equations are as follows:

\[ \tilde{m}_t - \tilde{p}_t = \tilde{\gamma}^t + \tilde{\sigma}^t + \epsilon_t \] (5)
\[ \tilde{y}_t - \tilde{p}_t = -\alpha \tilde{r}^t + \kappa_t \] (6)
\[ \tilde{l}^s_t = \mu \tilde{S}_t + \beta (\tilde{m}_t - \tilde{p}_t) + \vartheta_t \] (7)
\[ \tilde{l}^d_t = -\chi \tilde{S}_t + \omega \tilde{y}_t + \nu_t \] (8)

As was indicated by Driscoll (2004) in order to test for the monetary effect on output one must
use an instrument variable since OLS is biased. Driscoll used the money demand shocks as one of the
instruments, we add here by adding money supply and loan supply shocks as another instruments when
estimating.

To obtain money demand and supply shocks, we estimate equation 5 for the aggregate banking
data. Both M1 and M2 adjusted are used. The reason for the adjustment rely on the fact that some of
the components of M2 (i.e. M1 less currency) may not offer any monetary services, which may lead
equation 1 to be miss specified, we also use a measure of money consisting of demand deposits and
savings deposits (i.e. M2 less currency)³.

To estimate money demand shocks:
M2 less currency:
\[ \tilde{m}_t - \tilde{p}_t = \tilde{\gamma}^t + \tilde{\sigma}^t + \epsilon_t \] (9)
M2 less currency:
\[ \tilde{m}_t - \tilde{p}_t = \tilde{\gamma}^t + \tilde{\sigma}^t + \epsilon_t \] (10)

To estimate money supply shocks:
M1 less currency:
\[ \tilde{m}_t - \tilde{p}_t = \tilde{\gamma}^t + \tilde{\sigma}^t + \epsilon_t \] (11)
M2 less currency:
\[ \tilde{m}_t - \tilde{p}_t = \tilde{\gamma}^t + \tilde{\sigma}^t + \epsilon_t \] (12)

Where \( \tilde{r}^s_t \) is the demeaned interest rate on loan calculated by dividing the interest rates
received on loans by the quantity of loans.

The resulted estimated equations are as follows:
(i) money demand shocks:
M1 less currency:
\[ \tilde{m}_t - \tilde{p}_t = -0.014 \tilde{y}_t - 11.21 \tilde{r}^d + \epsilon_t \] (9)
T-statistic (-0.24) (-2.61) **
M2 less currency:
\[ \tilde{m}_t - \tilde{p}_t = 0.647 \tilde{y}_t - 0.196 \tilde{r}^d + \epsilon_t \] (10)
T-statistic (9.8) # (-0.04)

³ I deduct only the amount of currency in the hand of the public and ignored the amount of time deposits since the later is
reported in the CBJ statistical bulletins as one amount combined with saving deposits. This will not affect the result
severely.
(ii) money supply shocks:
M1 less currency:
\[ \bar{m}_t - \bar{p}_t = 0.119\bar{y}_t - 2.25\bar{r}_t + \epsilon_t \]  
(11’)
T-statistic (1.71) *** (-1.59)
M2 less currency:
\[ \bar{m}_t - \bar{p}_t = 0.68\bar{y}_t - 0.62\bar{r}_t + \epsilon_t \]  
(12’)
T-statistic (6.91) * (-0.45)

In all the equations the interest rate coefficients are not statistically significant except for money demand equation using M1. This implies that loan rates in Jordan do not signal changes in money supply.

The coefficients of income are all positive and less than one in all the equations, this implies an inelastic income to any change in money. All the coefficients of income are significant except for equation (9’). In what follows shocks from money demand and supply will be used in the two-stage least square/IV procedure. But before testing the model we will give a brief overview about the banking sector in Jordan.

3. The Banking Sector in Jordan
The banking sector is very active in Jordan. It is one of the main pillars of the national wealth and it is pushing the whole economy forward. The size of the Jordanian banking sector is large with total asset of 12913 million Jordan Dinar in the year 2000. The Central Bank of Jordan (CBJ) represents the monetary authority in the Kingdom who monitor and organize banking activities and who is concerned with output and inflation variability trying to target optimal policies. At present twenty-four commercial banks and financial institutions are operating in Jordan, of which nineteen are domestic and five are foreign. There are five private investment banks and one Industrial Development Bank, in addition to other specialized credit institutions.

Most of these banks are actively engaged in providing services to trade and industry and can advise potential investors. They play a particularly critical role in the transmission of monetary-policy actions to the real economy. Policy actions that affect the reserve positions of banks will generate adjustments in interest rates and in the components of the banking sector’s balance sheet. Traditional models of the monetary transmission mechanism focus on the impact of these interest-rate changes on money demand and on consumption and investment decisions by households and firms. The ultimate effects on bank deposits and the supply of money are reflected in adjustments to the liability side of the banking sector’s balance sheet (for more details see Walsh, 2000). In this paper we will quantify this ultimate effect to see whether policy actions by the Central Bank will have any monetary transmission mechanism on the banking sector lending channels.

4. Results
Table 1 shows a positive and statistically significant correlation between output and lending. Lagged out put at first and second lag have a positive effect of 0.345 and 0.438 respectively. Contemporaneous Loan also has positive effect of 0.109. Lagged loan exert no effect. As we said before we cannot conclude from this reduced form regression whether this relationship is due to loan supply and what the magnitude of this effect are in order to determine if the effect is small or large. In order to do so shocks to money supply and demand and loan supply are used as instrument for loan supply in the second stage regression. Table 2 presents the first stage regression of loans on output and the money demand; supply and loan supply shocks using all specification of money supply (M1 and M2 less currency).

Results from Table 2 shows that in the first-stage of the two-stage least squares/IV procedure, where loan is regresses on money demand, money supply, loan supply shocks, the coefficients on the
money demand and supply shocks are statistically insignificant which imply that these shock are invalid instruments and will imply that loans will not respond to shocks to money demand or money supply. This absence of response indicates a disabled lending channelled of the monetary transmission mechanism. But as we learn from Table 2, when we used loan supply shock as a regressor, the coefficient on the loan supply shock is statistically significant which nominate it as a valid candidate instrument in the second stage square regression. Loan will respond to shocks to loan supply but not to money and demand shocks.

Table 3 reports the results of running the regression in table 1 but using loan supply shocks as instruments. The coefficients o loans are statistically significant, and have the same sign. They suggest that increases in growth rate of loan supply lead to contemporaneous increase in income growth.

**Table 1:** OLS Regressions of Output on Loans

<table>
<thead>
<tr>
<th>Dependent Variable: $\Delta y_{it}$</th>
<th>1983-2001 Total Loans</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\Delta y_{it-1}$</td>
<td>0.345 (0.03)**</td>
</tr>
<tr>
<td>$\Delta y_{it-2}$</td>
<td>0.438 (0.09)***</td>
</tr>
<tr>
<td>$\Delta \bar{l}_{it}$</td>
<td>0.109 (0.06)***</td>
</tr>
<tr>
<td>$\Delta \bar{l}_{it-1}$</td>
<td>-0.042 (0.50)</td>
</tr>
<tr>
<td>$\Delta \bar{l}_{it-2}$</td>
<td>-0.058 (0.43)</td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.072</td>
</tr>
</tbody>
</table>

All variables are demeaned. P-values are in parentheses.

*, **, *** are 1%, 5%, and 10% level of significance respectively.

**Table 2:** First stage instrument variables regression: loan on money demand shocks, money supply shocks, and loan supply shocks

<table>
<thead>
<tr>
<th>Dependent variable: $\Delta \bar{l}_{it}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Money demand Shocks</td>
</tr>
<tr>
<td>M1</td>
</tr>
<tr>
<td>------------------------------------------</td>
</tr>
<tr>
<td>$\Delta y_{it-1}$</td>
</tr>
<tr>
<td>$\Delta y_{it-2}$</td>
</tr>
<tr>
<td>$\Delta \epsilon_{it}$</td>
</tr>
<tr>
<td>$\Delta \epsilon_{it-1}$</td>
</tr>
<tr>
<td>$\Delta \epsilon_{it-2}$</td>
</tr>
</tbody>
</table>

All variables are demeaned. P-values are in parentheses.

*, **, *** are 1%, 5%, and 10% level of significance respectively.

**Table 3:** Second stage of IV Regression: Output on Loans

<table>
<thead>
<tr>
<th>Dependent Variable: $\Delta y_{it}$</th>
<th>1983-2001 Total Loans</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\Delta y_{it-1}$</td>
<td>0.345 (0.03)**</td>
</tr>
</tbody>
</table>

All variables are demeaned. P-values are in parentheses.

*, **, *** are 1%, 5%, and 10% level of significance respectively.
### Table

| $\Delta \hat{y}_{t-2}$          | 0.438435***
|---------------------------------|----------------
|                                 | (0.0927)       |
| $\Delta \hat{l}_s$             | 0.109177**     
|                                 | (0.0650)       |
| $\Delta \hat{l}_{l-1}$         | -0.042112      
|                                 | (0.5045)       |
| $\Delta \hat{l}_{l-2}$         | -0.058388      
|                                 | (0.4302)       |
| $R^2$                           | 0.0719         |

All variables are demeaned. P-values are in parentheses.

*, **, *** are 1%, 5%, and 10% level of significance respectively.

### 5. Conclusion

This paper examines the link between monetary policy or regulatory actions and the equilibrium quantity of bank loans. In this paper we extend both the aggregate demand model of Beranke and Blinder (1988) and Driscoll (2004) model of state specific shocks to money supply and demand. We assume regulatory-specific shocks in the money demand, supply and supply of loans will lead to regulation-specific change to money supply and therefore change in output through lending channel. And since by the structure of the loan market in Jordan, banks are not able to readily substitute for deposits and firms do not regard bank loans and bonds as perfect substitute, the two requirement of the lending channel exists.

We use a panel of bank-level data to test whether changes in bank loan supply affect output. Money demand, supply and loan supply shocks are used as instruments. Using these shocks as an instrumental variable, we find that shocks to loan supply have large and statistically significant effects on the supply of bank loans. Loans have positive and statistically significant effects on output. They suggest that increases in growth rate of loan supply lead to contemporaneous increase in income growth.
References


