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Test of the bank lending channel: The case of Hungary

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Abstract. *This study examines the bank lending channel for Hungary based on a simultaneous-equation model consisting of the demand for and supply of bank loans. The three-stage least squares method is applied. This paper finds evidence of a bank lending channel for Hungary. Expansionary monetary policy via a lower interbank rate or open market purchase of government bonds to increase bank reserves/deposits would increase bank loan supply.*

Keywords: bank lending channel, federal funds rate, bank deposits, 3SLS.

JEL Classification: E52, E51.
REL Classification: 11B.

1. Introduction

The bank lending channel suggests that monetary policy affects bank loan supply. A lower policy rate reduces the cost of borrowing by banks and increases bank incentives to make loans. Conversely, a higher policy rate increases the cost of borrowing by banks and reduces bank incentives to make loans. Open market operations affect bank reserves/deposits and the amount of loans banks can make.

Whether the bank lending channel is valid has remained inconclusive. Bernanke and Blinder (1988), Bernanke and Blinder (1992), Gertler and Gilchrist (1994), Bernanke and Gertler (1995), Peek and Rosengren (1995), Kashyap, Stein and Wilcox (1993), Kashyap and Stein (1995, 2000), and Suzuki (2004) argue or find support for the bank lending channel. One the other hand, Romer and Romer (1989), Ramsey (1993), Oliner and Rudebusch (1995), and Morris and Sellon (1995) raised doubts about the concept. To the author's knowledge, few studies have examined the subject for Hungary based on a simultaneous-equation model incorporating global factors.

A study of the bank lending channel for Hungary is important. During the recent financial crisis, bank loans decreased significantly partly because many loan applicants were not eligible for loans due to poor credit standing and partly because banks would like to avoid potential large increase in non-performing loans. The paper has several major features. First, bank loan demand and supply are specified separately in order to identify bank loan supply. Second, global factors are incorporated into the model to account for potential international capital flows. Third, the three-stage least squares method is applied in empirical work to correct for any correlation between the error terms in loan demand and loan supply.

2. The model

Extending Bernanke and Blinder (1988, 1992), Suzuki (2004), Zanforlin (2011), Vera (2011) and other studies, we can specify the demand for and supply of bank loans as:

$$L^d = f(LR, Y, BR) \qquad (1)$$

$$\qquad\quad - \quad + \quad +$$

$$L^s = g(LR, DE, PR, EX, FR), \qquad (2)$$

$$\qquad\quad + \quad + \quad - \quad ? \quad -$$

where:

L^d = demand for bank loans in Hungary;
L^s = supply of bank loans in Hungary;
LR = the lending rate;
Y = output;
BR = the interest rate on bonds;
DE = bank deposits;
PR = the policy rate of the central bank;
EX = the exchange rate, and
FR = the foreign interest rate.

We expect that bank loan demand has a negative relationship with the lending rate and a positive relationship with output and the interest rate on bonds and that bank loan supply has a positive relationship with the lending rate and bank deposits and a negative relationship with the policy rate of the central bank and the foreign interest rate.

The sign of the exchange rate is unclear. As the forint depreciates, there may be three separate effects on bank loan supply. A weaker forint is expected to help exports, increases business revenues, results in more favorable financial positions, and increases banks' incentive to supply loans. As the forint becomes weaker, foreign investors may be more likely to increase loanable funds to the country as it can exchange for more units of the forint per unit of a foreign currency. As the forint depreciates, collateralized values of firms decrease, and it is less likely for banks to increase loan supply. Hence, the net impact is unclear and will be determined by empirical work.

3. Empirical results

The data were collected from the *International Financial Statistics* published by the International Monetary Fund. Bank loans are measured in billions of forints. Industrial production is selected to represent output and is an index with 2005 as the base year. The government bond yield is chosen to represent the interest rate on bonds. Bank deposits are measured in billions of forints. The interbank rate is used to represent the policy rate. The exchange rate is measured as units of the forint per U.S. dollar. The euro area government bond yield is used to represent the foreign interest rate. All the variables are expressed on a log scale. Hence, the estimated coefficient is the estimated elasticity. The sample ranges from 2001.Q1 to 2013.Q1 and has a total of 49 observations. The data for the interbank rate earlier than 2001.Q1 are not available.

Table 1 presents estimated coefficients, z values, and other related statistics. In the estimated regression for bank loan demand, 86.23% of the variation in bank

loan demand can be explained by the three right-hand side variables. All the coefficients are significant at the 1% level. If the lending rate rises 1%, bank loan demand will decline 0.7793%. A 1% increase in industrial production will cause bank loan demand to rise by 1.3205%. An increase in the interest rate on bonds will cause bank loan demand to rise by 1.3663%.

Table 1. *Estimated regressions for bank loan demand and supply for Hungary*

Log(demand for bank loans)		
	Coefficient	z statistic
Log(lending rate)	-0.7793	-5.11
Log(industrial production)	1.3205	9.33
Log(government bond yield)	1.3663	7.10
Intercept	1.5820	2.10
R-squared	0.8623	
Sample period	2001.Q1-2013.Q1	
Sample size	49	
Log(supply of bank loans)		
	Coefficient	z statistic
Log(lending rate)	2.2425	5.11
Log(bank deposits)	0.2030	2.16
Log(interbank rate)	-1.6545	-5.55
Log(exchange rate)	-1.2996	-9.20
Log(euro area government bond yield)	-0.0363	-0.25
Intercept	12.4409	13.71
R-squared	0.8036	
Sample period	2001.Q1-2013.Q1	
Sample size	49	

Notes: All the coefficients are significant at the 1% level, except that the coefficient of bank deposits is significant at the 5% level.

In the estimated regression for bank loan supply, all the estimated coefficients are significant at 1% or 5% level. Bank loan supply is positively affected by the lending rate and bank deposits and negatively associated with the interbank rate and the exchange rate. The coefficient of the euro area government bond yield is insignificant at the 10% level. The estimated coefficient of 2.2425 for the lending rate suggests that bank loan supply is much more responsive to the lending rate than bank loan demand. As the interbank rate declines 1%, bank loan supply will rise by 1.6545%. When the forint depreciates, bank loan supply is expected to decrease. Hence, the negative effect of currency depreciation dominates the positive impacts.

When the nominal effective exchange rate is chosen to replace the exchange rate, its coefficient is positive and significant at the 1% level. However, the value of R-squared declines a great deal. When the euro area government bond yield is replaced by the 10-year U.S. Treasury bond yield, its coefficient has a positive sign but is insignificant at the 10% level. To save space, these results are not printed here and will be made available upon request.

4. Summary and conclusions

This paper has examined bank loan demand and supply for Hungary based on a simultaneous-equation model. The exchange rate and the foreign interest rate are incorporated into the model to capture potential international capital flows. The three-stage least squares method is employed in empirical work. Major findings are summarized below. A lower lending rate, more output, or a higher interest rate on bonds would increase bank loan demand. A higher lending rate, more bank deposits, a lower interbank rate, or appreciation of the forint would increase bank loan supply.

There are several policy implications. First, a simultaneous-equation model is more appropriate than a single-equation model because bank loan supply can be clearly identified. Second, bank loan supply is much more sensitive to the lending rate than bank loan demand. It suggests that if the loan demand curve shifts upward, the percent increase in bank loans will be greater than the percent increase in the lending rate. Third, monetary easing via a lower interbank rate or open market operations to buy government bonds is expected to increase bank loan supply. Although the coefficients of bank deposits and the interbank rate have the expected sign and are both significant at the 1% or 5% level, the impact of a change in the interbank rate is more measurable than the effect of a change in bank deposits because banks may have other avenues to change deposits. Fourth, recent appreciation of the forint since the 2008-2009 financial crisis suggests that it would have a positive impact on bank loan supply as foreign investors are likely to provide more loanable funds to Hungary.

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