

## Test of the Bank Lending Channel: The Case of Poland

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### **Abstract**

*This paper tests the bank lending channel for Poland based on a simultaneous-equation model consisting of demand for and supply of bank loans. The three-stage least squares method is employed in empirical work. This paper finds support for a bank lending channel for Poland. Expansionary monetary policy through a lower money market rate or open market purchase of government bonds to increase bank reserves/deposits would increase bank loan supply.*

**Keywords:** Bank lending channel, Policy rate, Bank deposits, Exchange rate, World interest rate, 3SLS

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## 1. Introduction

In assessing monetary policy transmission mechanism, the bank lending channel suggests that monetary policy changes 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 purchases of government bonds increase bank reserves/deposits and loan supply. On the other hand, open market sales of government bonds reduce bank reserves/deposits and loan supply.

The validity of the bank lending channel in advanced countries remains 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. On the other hand, Romer and Romer (1989), Ramsey (1993), Oliner and Rudebusch (1995), and Morris and Sellon (1995) raised doubts about the concept.

Several recent studies have examined the related subject for Poland and other countries. De Bondt (1999) tested the bank lending channel for the European countries. Banks with different sizes and liquidity were included in the sample. He found evidence of the bank lending channel for the continental Europe but not for the U.K.

Altunbs, Fazylov and Molyneux (2002) studied the bank lending channel for the countries under the EMU system. Banks with different asset sizes and capital were considered in the sample. They showed that undercapitalized banks were more responsive to monetary policy changes and found support for the bank lending channel.

Kierzenkowski (2005) investigated the interactions among several channels of the monetary policy transmission mechanism for Poland. His model showed that the bank lending channel may either intensify or weaken the effect of monetary policy changes. Empirical results showed that the bank lending channel had an attenuation impact during 1996-1998 and a neutral impact after 1998.

Havrylchuk and Jurzyk (2005) showed that the sign of the coefficient of bank size was opposite to what the bank lending channel would predict. They did not find evidence that the central bank could influence bank loanable funds. They concluded that there was lack of the bank lending channel in Poland. In addition, foreign and domestic banks responded to short-term interest rates in different manners.

Jimborean (2006) examined monetary policy transmission mechanism for ten CEECs during 1999-2005. He found support for the bank lending channel for Poland and Bulgaria as the coefficient of the monetary policy variable is negative and significant. Bank size did not affect bank loan growth. Monetary tightening had a stronger impact on less liquid banks in Poland. The coefficient of capitalization was negative and significant for Poland.

A study of the bank lending channel for Poland 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 losses due to non-performing loans. To the author's knowledge, few studies have examined the subject for Poland based on a simultaneous-equation model incorporating major global variables. The paper has several major features. First, demand for and supply of bank loans are specified separately in order to identify bank loan supply. Second, major global variables are incorporated into the model to account for potential international capital flows. Third, the three-stage least squares method is employed in estimating the simultaneous-equation model to correct for any correlation between the error terms in loan demand and loan supply. VAR models are not employed in this study mainly because of limited number of sample observations.

## 2. The Model

Extending Bernanke and Blinder (1988, 1992), Suzuki (2004), Havrylchuk and Jurzyk (2005), Jimborean (2006), Zanforlin (2011), Vera (2012) and other studies, we can specify the demand for and supply of bank loans for Poland as:

$$LD = f(LR, Y, BR) \quad (1)$$

$$LS = g(LR, DE, MR, ER, WR) \quad (2)$$

where

LD = demand for bank loans in Poland,

LS = supply of bank loans in Poland,

LR = the lending rate,

Y = output,

BR = the interest rate on bonds,

DE = bank deposits,

MR = the money market rate,

ER = the exchange rate (PLN/USD), and

WR = the world interest rate.

The money market rate is selected to represent a monetary policy indicator (Kishan and Opiela, 2000; Kashyap and Stein, 2000; Altunbas, Fazylov and Molyneux, 2002; Havrylchuk and Jurzyk, 2005). 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 money market rate and the world interest rate.

The sign of the exchange rate is unclear. As the zloty depreciates, there may be three separate impacts on bank loan supply. When the zloty becomes weaker, foreign

investors may be more likely to increase loanable funds to Poland as it can exchange for more units of the zloty per unit of a foreign currency. A weaker zloty is expected to help exports, increase business revenues, result in more favorable financial positions, and increase banks' incentive to supply loans. As the zloty depreciates, collateralized values of firms decrease, and it is likely for investors to reduce the supply of loanable funds (Zanfolin, 2011). Hence, the net impact is unclear and will be determined by empirical work. These effects can be expressed as:

$$\partial LS / \partial ER = \left( \frac{\partial LS}{\partial D} \times \frac{\partial D}{\partial ER} \right) + \left( \frac{\partial LS}{\partial EP} \times \frac{\partial EP}{\partial ER} \right) + \left( \frac{\partial LS}{\partial CV} \times \frac{\partial CV}{\partial ER} \right) > \text{or} < 0, \quad (3)$$

where D, EP and CV stand for the desire to exchange for the U.S. dollar, exports, and collateral values.

### 3. Empirical results

The data were collected from the International Financial Statistics published by the International Monetary Fund and the National Bank of Poland. Bank loans are measured in millions of zlotys. Gross domestic product is selected to represent output and is measured in millions of zlotys. The government bond yield is chosen to represent the interest rate on bonds. Bank deposits are measured in billions of zlotys. The money market rate is used to represent the policy rate of the central bank. The exchange rate is measured as units of the zloty per U.S. dollar (PLN/USD). The 10-year U.S. government bond yield and the euro area government bond yield are selected to represent the world interest rate. All the variables are expressed on a log scale. Hence, the estimated coefficient is the elasticity. The sample runs from 2004.Q1 to 2013.Q1 and has a total of 37 observations. The data for the lending rate earlier than 2004.Q1 are not available. Table 1 compiles descriptive statistics for the variables used in regression analysis.

**Table 1: Descriptive statistics of variables without log transformations during 2004.Q1-2013.Q1**

	Mean	Median	Maximum	Minimum	Std. Dev.
Bank loans	531142.3	539875.0	843278.3	238228.2	221138.3
Lending rate	6.561081	6.326700	8.136700	5.740000	0.696952
Gross domestic product	311847.0	313058.0	442231.0	213036.0	62086.00
government bond yield	5.702251	5.750000	7.253330	3.943330	0.690973
Bank deposits	532019.3	524341.4	807942.0	305579.4	161915.3
Money market rate	4.457931	4.435970	6.477630	2.766670	1.020323
Zloty/USD exchange rate	3.061078	3.105400	3.893800	2.181670	0.371438
10-year U.S. government bond yield	3.589009	3.716670	5.070000	1.643330	1.004115
Euro area government bond yield	3.891824	4.049000	4.604900	2.219700	0.520199

**Notes:** The zloty/USD exchange rate is measured as the units of the zloty per U.S. dollar. The sample size is 37. D, EP and CV in equation (3) are used for theoretical analysis and not for empirical estimation mainly due to lack of data for D and CV.

Table 2 presents estimated coefficients, z values, and other related statistics. In the estimated regression for bank loan demand, 91.26% 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% or 10% level. If the lending rate rises 1%, bank loan demand will decline 0.5786%. A 1% increase in gross domestic product will cause bank loan demand to rise by 2.1961%. An increase in the interest rate on bonds will cause bank loan demand to rise by 0.6128%.

In the estimated regression for bank loan supply, the regression can explain approximately 99.56% of the variation in loan supply, and all the estimated coefficients are significant at 1% level. Bank loan supply is positively affected by the lending rate, bank deposits and the euro area government bond yield and negatively associated with the money market rate, the exchange rate and the 10-year U.S. government bond yield. The estimated coefficient of 0.3701 for the lending rate suggests that bank loan supply is less sensitive to the lending rate than bank loan demand. As the money market rate declines 1%, bank loan supply will rise by 0.2415%. When the zloty depreciates, bank loan supply is expected to decrease. Hence, the negative effects of zloty depreciation dominate the positive impact. The different signs of the euro government bond yield and the 10-year U.S. government bond yield may be due to multicollinearity.

**Table 2: Estimated regressions for bank loan demand and supply for Poland**

Log(demand for bank loans):		
	Coefficient	z statistic
Log(lending rate)	-0.5786	-1.88
Log(gross domestic product)	2.1961	18.18
Log(government bond yield)	0.6128	2.90
Intercept	-14.6299	-8.14
R-squared	0.9126	
Sample period	2004.Q1-2013.Q1	
Sample size	37	
Log(supply of bank loans):		
	Coefficient	z statistic
Log(lending rate)	0.3701	3.63
Log(bank deposits)	1.2398	14.35
Log(money market rate)	-0.2415	-4.97
Log(exchange rate)	-0.2099	-2.62
Log(10-year U.S. government bond yield)	-0.2117	-2.74
Log(euro area government bond yield)	0.3185	6.57
Intercept	-3.4766	-2.49
R-squared	0.9956	
Sample period	2004.Q1-2013.Q1	
Sample size	37	

**Notes:** All the coefficients are significant at the 1% level, except that the coefficient of the lending rate in loan demand is significant at the 10% level.

When the log of the nominal effective exchange rate is chosen to replace the log of the PLN/USD exchange rate, its coefficient of 0.3035 is significant at the 2.5% level. If the log of the PLN/EUR exchange rate is used to replace the log of the PLN/USD exchange rate, its coefficient of -0.2510 is significant at the 10% level. Other results are similar. To save space, these results are not printed here and will be made available upon request. Due to limited number of observations, the VAR model is not employed in empirical work as including several lags for each of the variables would reduce the degrees of freedom significantly.

#### **4. Summary and conclusions**

This study has examined demand for and supply of bank loans for Poland based on a simultaneous-equation model. The exchange rate and the world interest rate are incorporated into the model to capture potential international capital flows. The three-stage least squares method is employed in empirical work. 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 money market rate, appreciation of the zloty or a lower 10-year U.S. government bond yield would increase bank loan supply. The coefficient of the euro area government bond yield should be negative, and the positive sign is probably due to multicollinearity.

There are several policy implications. First, a simultaneous-equation model is more appropriate than a single-equation method because the supply of bank loans can be clearly identified. Second, expansionary monetary policy through a lower money market rate or open market purchases of government bonds is expected to increase bank loan supply. Although the coefficients of bank deposits and the money market rate have the expected sign and are both significant at the 1% level, the impact of a change in the money market rate is more directly measurable than the effect of a change in bank deposits because banks may have other avenues to raise funds and deposits in case of monetary tightening. Third, the recent upward trend of the PLN/USD exchange rate suggests that it would have a negative impact on bank loan supply.

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