Understanding the Cyclical Nature of Financial Intermediation Costs

By Matthew Jaremski and Ayse Sapci [1]

The Great Recession has led macroeconomists to reconsider the dynamic interaction between the financial sector and the real economy in their models. Pre-recession models generally contain passive banking institutions that transfer funds between individuals at a fixed monitoring cost (Townsend 1979, Bernanke et al. 1999). Newer models by Christiano et al. (2008) and Jermann and Quadrini (2012) introduce an active financial sector that creates significant macroeconomic fluctuations. They, however, must construct the financial shocks from model-based estimations due to the lack of data. Sapci (2013) takes these approaches a step forward showing intermediation costs (i.e., all non-interest bank expenses) are highly counter-cyclical which create similar effects as financial shocks. Increases in costs directly impact the available credit in an economy, yet the literature is silent on what factors drive their counter-cyclicality.[2] We fill this gap by examining U.S. intermediation costs using a quarterly, bank-level dataset from 1993 through 2012. Our approach sheds light on what makes costs counter-cyclical and how financial shocks might be better modeled.

Despite spanning the fields of industrial organization, finance, and macroeconomics, most authors examine intermediation costs across countries rather than across time. Demirguc-Kunt et al. (2004) study the average cost of banks in 72 countries between 1995 and 1999, and Barth et al. (2004) study the costs of banks in 107 countries in 1999. They highlight that national-level factors such as regulations on bank entry, economic freedom, private ownership,

[1] Jaremski: Colgate University, 13 Oak Dr., Hamilton, NY 133 46 (email: mjaremski@colgate.edu); Sapci (corresponding author): Colgate University, 13 Oak Dr., Hamilton, NY 13346 (email: asapci@colgate.edu). The authors would like to thank Inessa Love and Ryan Decker for sharing their panel VAR code.

[2] For instance, cost increases are passed on to borrowers which reduce the amount of borrowing (Demirguc-Kunt and Huizunga 1999), and push banks to pursue safer and less costly projects (Imrohoroglu and Kumar 2004).

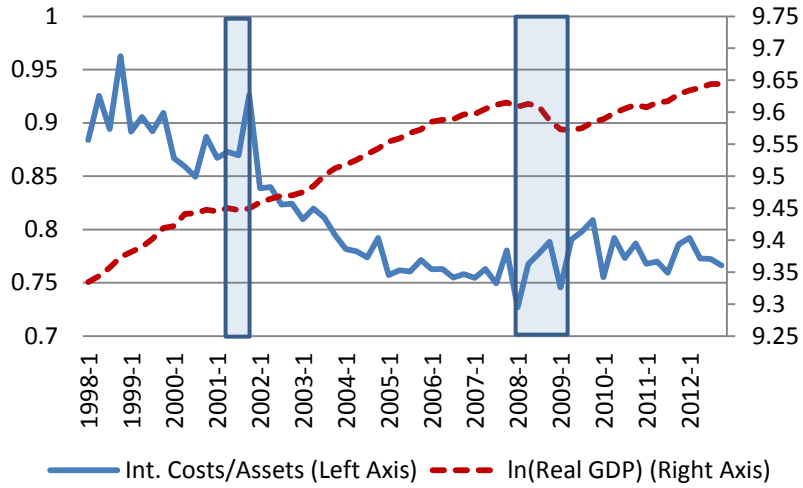
and property rights protection explain most of the cross-country variation. They also find that costs are negatively related to a bank's assets and liquidity and positively related to market share.

The cross-sectional studies shed light on intermediation costs but cannot examine dynamic factors across business cycles. We, therefore, create a panel database from *Mergent Online*'s collection of SEC filings. The database contains the quarterly balance sheet and income statement of the largest 170 U.S. bank holding companies that had at least five years of consistent data between 1993 and 2012.[3] The high frequency data are the first to allow for a separation of microeconomic factors (e.g., bank size, proportion of loans, and liquidity) and macroeconomic factors (e.g., GDP, house prices, and inflation). The approach also offers advantages. The U.S. political and regulatory framework provides a stable environment for testing dynamics across time, and the single country approach avoids the problem of banks operating differently across countries due to omitted policy variables.

Intermediation costs are counter-cyclical at the bank-level even after controlling for balance sheet characteristics and the potential feedback of costs to GDP. The cyclicality is only reduced when house prices are accounted for. Prices rise during expansions allowing for refinancing rather than default. However as house prices decline, there are more defaults and the value of losses per default increases due to the decline in collateral value. Indeed, house prices explain more of the fluctuations in intermediation costs than GDP or any other macroeconomic variable. This empirically confirms the vital relationship between the housing and financial sectors (e.g., Iacoviello 2005).

[3] The database covers 80 percent of U.S. commercial bank assets on average. Results are similar when dropping banks that closed during the crisis.

Figure 1. Intermediation Costs and GDP (1998-2012)



Note: Shaded regions denote business cycle contractions. Data only include banks present for the entire period.

I. Determinants of Financial Intermediation Costs

Financial intermediation costs consist of all non-interest expenses that a bank undertakes. They include day-to-day expenses such as personnel and office expenses as well as specialized costs such as litigation and data processing. An increase in cost, therefore, does not always indicate a decrease in a bank's efficiency. For instance, an increase might simply be the result of a bank opening a new branch or taking a more active investment strategy. It is thus helpful to examine the ratio of costs to assets instead of their level, but results are similar for both measures. In Figure 1, the ratio rises during two shaded recessions and declines after them. Even though most components of intermediation costs increased during the recessions, loan processing expenses, professional service fees, and litigation expenses drove the major spikes. As the economy declines, banks find it difficult to gauge the credit-worthiness of investments and borrowers are more likely to default.

Is the counter-cyclicality of intermediation costs driven by any particular economic factor? Following the empirical literatures, we estimate two types of models. The first is a fixed-effects linear panel similar to the industrial organization literature, and the second is a panel

vector auto-regression (VAR) similar to the macroeconomic literature. Both models control for heterogeneity amongst banks through bank-fixed effects, yet each have their own advantage. The linear model allows us to quickly assess the effects of a large number of variables, whereas the panel VAR model allows us to account for the dynamic relationships between variables.

A. Linear Fixed Effects Model of Financial Intermediation Costs

Building on the cross-sectional models of Demirguc-Kunt et al. (2004) and Barth et al. (2004), we start with a linear fixed-effects model containing a variety of national and bank-level control variables.[4] Assets and market share (defined as the ratio of assets to the total value of commercial U.S. bank assets) measure the bank's size while the ratios of loans to assets, cash to assets and capital to liabilities measure the relative size of its loan portfolio, liquidity and leverage, respectively. Real GDP and the industrial production index assess the overall health of the economy. Inflation, monetary policy and money stock are accounted by the change in the CPI, the effective federal funds rate, and M2, respectively. Finally, the Dow Jones industrial average measures the effect of the stock market and the Case-Shiller U.S. national home price index captures the effect of the housing sector. The specification is:

$$(1)\ Costs_{i,t} = a + \beta_1 \Delta GDP_t + \boldsymbol{\beta_2 X_{i,t}} + \boldsymbol{\beta_3 Z_t} + \boldsymbol{Q_t} + \boldsymbol{u_i} + e_{i,t}$$

where $Costs_{i,t}$, is either the logarithm of intermediation costs or the ratio of costs to total assets, ΔGDP_t is the log change in GDP, $\boldsymbol{X_{i,t}}$ is the vector of balance sheet variables and $\boldsymbol{Z_t}$ is the vector of macroeconomic variables, $\boldsymbol{Q_t}$ is a vector of quarter dummies, $\boldsymbol{u_i}$ is bank-fixed effects, and $e_{i,t}$ is the error term. The inclusion of bank-fixed effects is necessary to control for the variety of banks in the sample and account for constant characteristics such as location, ownership, and

[4] The seasonally adjusted macroeconomic data are taken from the St Louis Federal Reserve Fred Database. We deflate to 2000 dollar values using the GDP deflator. All indices are normalized to 2000.

stock exchange listing.[5] The change in GDP provides the best view of the cyclicality, but the results are similar when using the change in industrial production. The results in Table 1 are split into four specifications. The first contains only the GDP variables to measure the extent of counter-cyclicality and the remaining specifications add variables in an attempt to explain it.

The counter-cyclicality of intermediation costs is clearly evident. The negative effect of the change in GDP remains even when the bank-specific variables are added. It only becomes statistically insignificant when the macroeconomic variables are included. Given that the house price index is the only consistently significant macroeconomic variable, the variable seems responsible for the counter-cyclical relationship. Indeed, the coefficient on the change of GDP remains statistically significant if house prices are dropped from the model. The insignificance of the other macroeconomic coefficients is in line with the findings of other studies.

The bank-specific variables generally take their expected signs. An increase in bank size measured by assets and market share decreases the cost ratio due to economies of scale. Total costs also increase with assets because expansion involves substantial costs. Banks with high liquidity or leverage tend to be more cost efficient. The surprising relationship between leverage and costs can be due to risk-adjusted leverage requirements and the costliness of raising additional capital.

B. Panel VAR Model of Financial Intermediation Costs

The linear model suggests that house prices are responsible for the counter-cyclicality of costs, but cannot account for the dynamics between the variables or the potential bidirectional

[5] Since we are primarily concerned with identifying whether the bank-level factors account for the cyclicality of intermediation costs, we leave the examination of constant characteristics to other papers.

Table 1— Linear Fixed Effects Model of Determinants of Intermediation Costs

	Intermediation Costs/Assets				Ln(Intermediation Costs)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
GDP Growth	-1.167*	-1.785***	-0.533	-0.604	-3.750***	-0.965**	-0.507	-0.180
	[0.699]	[0.657]	[0.579]	[0.587]	[0.669]	[0.488]	[0.591]	[0.453]
Ln(GDP)	-0.501***	0.273*	0.105	0.974***	3.117***	0.127	3.414***	0.473*
	[0.102]	[0.157]	[0.314]	[0.318]	[0.151]	[0.101]	[0.404]	[0.247]
Ln(Assets)		-0.192***		-0.200***		0.847***		0.837***
		[0.057]		[0.058]		[0.032]		[0.033]
Market Share of Assets		-5.706*		-5.628*		-3.102		-2.996
		[3.375]		[3.317]		[2.022]		[1.964]
Cash/Assets		-0.005**		-0.005***		-0.003		-0.004***
		[0.002]		[0.002]		[0.002]		[0.001]
Loans/Assets		-0.007		-0.002		0.045		0.055
		[0.065]		[0.065]		[0.047]		[0.047]
Capital/Liabilities		0.043*		0.039*		0.040**		0.036**
		[0.023]		[0.021]		[0.016]		[0.014]
Inflation			-0.008	-0.008			-0.005	-0.002
			[0.007]	[0.007]			[0.005]	[0.004]
Industrial Prod. Index			-0.003	-0.005**			-0.007***	-0.001
			[0.002]	[0.002]			[0.002]	[0.001]
Ln(M2)			-0.186	-0.138			0.391	0.038
			[0.185]	[0.167]			[0.258]	[0.141]
Effective Federal Funds Rate			-0.001	-0.001			-0.001	-0.001
			[0.001]	[0.001]			[0.001]	[0.001]
Dow Jones Industrial Avg.			0.106*	0.083			-0.080	0.003
			[0.055]	[0.050]			[0.061]	[0.040]
House Price Index			-0.001***	-0.001***			-0.001***	-0.001***
			[0.001]	[0.001]			[0.001]	[0.001]
Observations	11,227	11,227	11,227	11,227	11,227	11,227	11,227	11,227
R-squared	0.047	0.148	0.054	0.157	0.574	0.846	0.592	0.849

Note: All specifications contain bank fixed effects as well as quarter fixed effects. Standard errors are provided in brackets.
*** Significant at the 1 percent level.
** Significant at the 5 percent level.
* Significant at the 10 percent level.

relationship. For instance, a rise in costs might choke off investment and cause a decline in GDP and house prices. The effect of reverse causality is less pronounced when looking at individual bank data, but it becomes a concern when there is a systemic increase. We, therefore, examine their relationship using a panel VAR. This technique combines the VAR approach that treats all the variables as endogenous with the panel-data approach that accounts for heterogeneity across banks. We specify a VAR model as follows:

$$(2) \quad \boldsymbol{Y_{i,t}} = \; a + \mathrm{A(L)}\boldsymbol{Y_{i,t-1}} + \boldsymbol{u_i} + \boldsymbol{e_{i,t}}$$

where $\boldsymbol{Y_{i,t}}$ is the vector of variables described below, L is a lag operator of length L, A(L) a matrix of lagged coefficients, $\boldsymbol{u_i}$ is bank-fixed effects, and $e_{i,t}$ is the error term.[6] In the interest of space, we focus on the results of three models similar to Table 1. The first contains GDP and the ratio of intermediation costs to assets, the second adds house prices, and the final adds the bank-specific variables used in the previous section.[7]

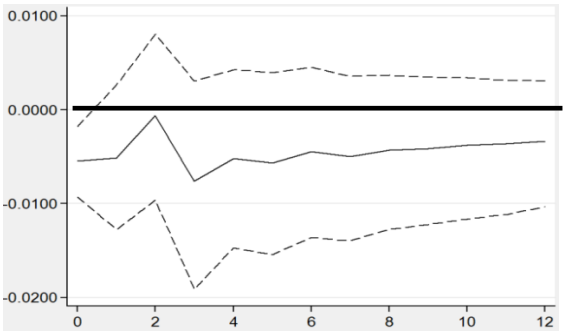
We display the model's results through impulse response functions using a Cholesky ordering to obtain orthogonalized shocks. GDP enters first so that it represents a cyclical shock of general economic conditions. We order housing prices next in the system so that changes in the variable do not reflect the changes in general conditions captured by GDP. The identification strategy thus controls for the occurrence of a general decline that leads to an endogenous decline in housing prices.[8] Finally, we order the balance sheet variables in the same order as they appear in Table 1 with intermediation costs listed last.

Figure 2 displays the impulse responses of the ratio of intermediation costs to assets to a GDP increase in the three panel VAR models. An increase in GDP decreases costs; however, once house prices are added to the model, the counter-cyclicality of intermediation costs disappears. The cost response to GDP declines towards zero and quickly becomes positive. On the other hand, in Figure 3, an increase in house prices severely decreases intermediation costs and the effect remains negative through 12 quarters. The results are similar when including the bank-specific information. GDP increases evoke a slight negative response in costs, yet house price increases have a larger and longer lasting effect.

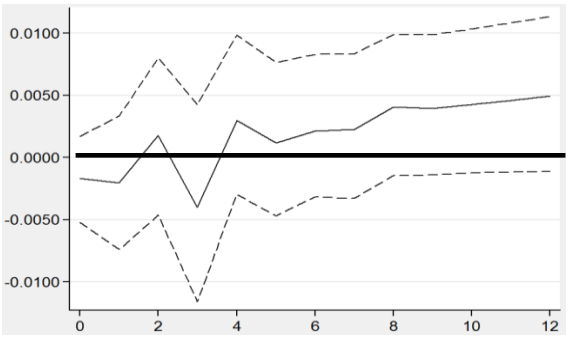
[6] Building off Love and Zicchino (2006), we use the modified version of panel VAR code by Ryan Decker used by Fort et al. (2013). We use the Helmert transformation to control for state fixed effects.
[7] We use the cost ratio instead of the level because it yields similar results and controls for size by construction.
[8] The ordering effectively biases towards finding an effect of GDP. If ordered first, house prices have a larger effect and GDP has a smaller effect. Other changes to the order have no substantial effect on the reported results.

Figure 2. Impulse Responses of the Cost Ratio to GDP Increase in Panel VAR

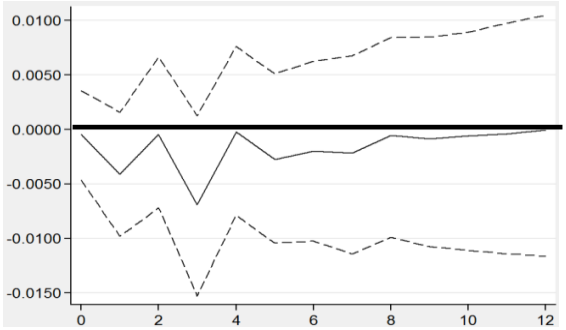
Panel A: Two-Variable Model



Panel B: Three-Variable Model



Panel C: Full Model



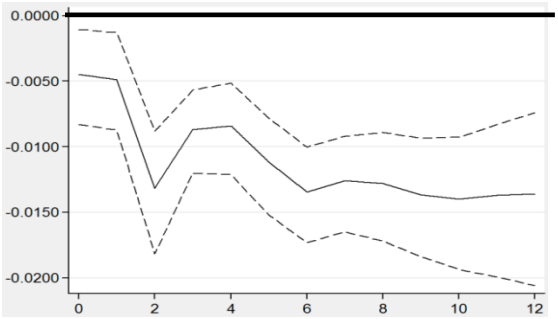
Note: See text for variables contained in each model.

II. Conclusion

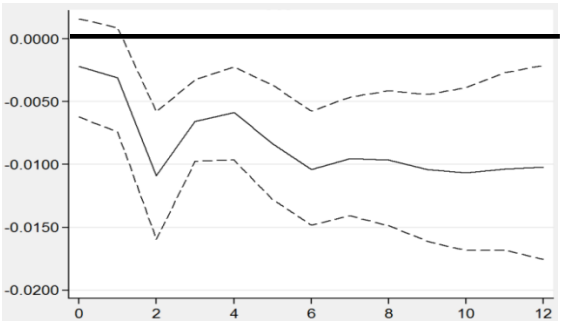
This paper shows that housing prices drive the counter-cyclical nature of financial intermediation costs. Because housing is used as collateral, a price decline causes a higher number of defaults and a greater value of losses. These in turn directly increase intermediation costs. For instance, the normally stable professional service fees at the International Bank of Commerce increased more than three times and the legal costs of First Bank increased more than four times during the recent recession. Increases in intermediation costs cause banks to raise

Figure 3. Impulse Responses of the Cost Ratio to House Price Increase in Panel VAR

Panel A: Three-Variable Model



Panel B: Full Model



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interest rates and focus on safe borrowers, and consequently, the financial system amplifies the effects coming from the housing sector by creating a credit crunch in the economy.

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