The Bank Capital Channel of Monetary Policy: Evidence from Countries with mixed Banking Systems

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Abstract

Banks are a major instrument of monetary policy transmission. There is limited evidence on how growth in Islamic finance and banking has impacted monetary policy transmission with mixed banking systems. Moreover, the presence of the bank capital channel in Islamic banks has yet to be tested in literature. This paper is an empirical study carried out to test for the existence of bank capital monetary policy channel in mixed banking systems with Islamic and conventional commercial banks. It fills the gap by studying lending functions of both types of banks and their response to capital changes to uncover the existence of a capital channel of monetary policy transmission. Generalized method of moments (GMM) estimation is used on an unbalanced panel 12 years data of 25 countries from Asia, Middle East and Africa that have both Islamic and conventional banking to estimate a quadratic model. Empirical evidence shows that bank capital causes the nonlinearity in the lending function. The analysis validates that the forward-looking behavior of banks results in the cutting down of the amount of lending that the bank is doing when the capital falls to a certain level close to the regulatory requirements. The paper finds evidence that Islamic bank lending follows the same functional form as conventional banks; however, they differ from traditional commercial banking counterparts considerably in the degree of nonlinearity. The study contributes to banking literature by empirically testing the shape of the lending function of Islamic and conventional banks to test transmission of monetary policy in the two systems.

Keywords: Bank lending determinants, Basel regulation; CAR; Nonlinearity; forward-looking bank behavior; Murabaha

1. Introduction

The conventional versus Islamic banking debate continues to be a major factor effecting consumer behavior in a large part of the Muslim world. Ahmad and Rashid (2019) found that the tag "Islamic" adds to the consumer satisfaction and is a significant factor when people choose a bank. However, are these two banks intrinsically different? How does that difference impact the transmission of monetary policy in these countries? Heuvel (2007) hypothesizes the existence of a bank capital channel of monetary policy. Bank lending is impacted by capital adequacy requirements and is decreased if bank capital falls close to this limit. He proposes that this nonlinearity should also be witnessed in the case of nonbinding capital constraints. Other hypothesized factors that might impact bank lending behavior are interest rates and bank size. Similarly, Gambacorta & Shin (2018) found that higher capitalization, bank size aids the monetary policy through lending. Islamic banks maintain higher access to capital compared to conventional banks and bank capital impacts the monetary policy transmission channels (Gambacorta & Mistrulli, 2004; Zaheer, Ongena & Wiinbergen, 2013)

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explained that the credit channel weakens when Islamic banking grows in mixed banking systems. Zulkhibri & Sukmana (2017) found that the transmission of monetary policy in Islamic banking sector of Indonesia is weak. Kassim et al., (2009) found that Islamic banks to be more sensitive to monetary policy shocks than conventional banks in Malaysia.

There are mixed findings on whether Islamic finance aids in improving or worsening the financial stability of banking system. The difference in their effectiveness as a tool of monetary policy transmission has not been extensively studied in literature and has been limited to country level studies. This study should provide insight to policy makers from the prospective of monetary policy transmission effectiveness. It is also an attempt to distinguish the intrinsic difference in the lending function of Islamic and conventional banks.

"Murabaha" or Cost-Plus products are the closest products of the Islamic banks to a conventional bank loan and comprise the major part of Islamic bank balance sheet. Do the cost-plus products follow the same functional form as the conventional bank loan? Is their response to capital similar to conventional banks? Similar functional forms would suggest a similar lending channel. The response to capital should provide insight into the existence of a capital channel of monetary policy transmission and if it is different across Islamic and conventional banks. This paper tests the Heuvel (2007) hypothesis, to find the determinants of nonlinearity in conventional commercial banks and Islamic banks. Generalized Method of Moments (GMM) is used to test a quadratic model to capture the impact of bank capital on bank lending.

It finds evidence of nonlinearity in lending for both Islamic and conventional banks with respect to capital. This is evidence of the existence of capital channel of monetary policy transmission through both Islamic and conventional banks. However, the size of nonlinearity in Islamic banks is found to be lower in Islamic banks indicating that the monetary policy transmission effectiveness through the capital channel might dampen with the introduction of Islamic banks in the banking structure.

1. Literature Review

Over time, Islamic banking has managed to reach global assets to 1.76 trillion dollars as of 2019 and is providing direct competition to conventional commercial banking in the Islamic world. Most Islamic banking critics have proposed that the Islamic banks' lending is not in fact very different from the conventional banks. Chong & Liu (2009), argued that Islamic banks' deposits in Malaysia are in fact closely pegged to conventional banks rates and those Islamic banks practically do not operate on according to the Profit and Loss paradigm (PLS). Aggarwal & Yousef (2000) enumerated that most of the products are not profit and loss sharing and are debt-like in nature. Vast amount of other literature also talks about how Murabaha (Cost Plus/markup financing) and closely related products like Ijarah (leasing normally for things like car financing) which are offered by Islamic banks are not different from conventional loans and since they form the largest share of the products Islamic banks offer this evidence that Islamic banks are the same as conventional banks. The Islamic banks are regulated by the Islamic financial services board which was formed in 2002 and is a body similar to the Basel committee focused on creating international standards for Islamic banks that promote financial stability for Islamic banks. They have been using the Basel II

framework for as the backbone for their prudential regulations. However, Islamic banks do not offer fixed interest rates returns modeling risk in their business model and this makes them different from conventional banking products.

Monetary policy transmission channels have extensively been studied in literature. From the traditional interest rate, exchange rate channels, equity price channels to more recent credit channels. The credit channel focuses on information asymmetry in the credit market leading to a balance sheet and a lending channel of monetary policy transmission. Although some studies suggest that as the traditional role of lending channel weakening as traditional lending by banks decrease, Edward & Mishkin (1995), there is ample cross-sectional empirical evidence highlighting its importance.

The credit theory of monetary policy transmission is focused on the lending and balance sheet channels (Bernanke & Gertler, 1995; Thakor 1996) linked capital requirements solely to credit risk are shown to increase equilibrium credit rationing and lower aggregate lending.

This effect has been studied in the previous literature. Nishiyama, Okada and Watanabe (2006) carried out a study on the decline in the loans of the Japanese banks in the late 1990s. Their findings were that public capital affects the lending of banks with different capitals differently and that the lending supply function was indeed concave and increasing with respect to bank capital in the Japanese case.

Watanabe (2010) empirically examined the ever-greening effect that took place in Japan in the late 1990s. The paper uses real estate lending share of the bank's lending portfolio as the instrument for bank capital. The paper goes on to find that the Ever-greening effect that was observed in Japan was a consequence of excessive regulatory stance by the regulatory authority and this gives the bank an incentive to rebalance the lending portfolio by continuing to lend to risky firms.

Miles (1995) hypothesis states that bank opacity allows banks to keep capital below the optimal level. Carletti and Marquez (2011) find empirical evidence that banks maintain higher capital than the regulatory minimums. Similar findings are reported by (Shin, 2014; Petacchi, 2015).

Heuvel (2007), in examining the effect of the bank lending on the transmission of the monetary policy came up with a dynamic model for a forward-looking bank that features the bank reserve requirements. He finds that capital impacts the lending of banks and monetary policy impact decreasing in the presence of capital regulation. He formulates a dynamic model of banks asset and liability management that incorporates capital to asset requirements. The paper shows that there exists a bank capital channel of the monetary policy that effects the lending of a bank by manipulating the bank's capital. It concludes that financial structure, lending opportunities and market interest rates determine the lending of the bank refuting the Modigliani-Miller theorem that states that the value of the firm is independent of the financial structure. It goes on to show that the bank's lending is dependent on the capital and is concave with respect to it. For that purpose, he uses the following specifications.

$$V_t = \max_{\{N_{t+s}, D_{t+s}\}_{s=0}^{\infty}} E_t \left[\sum_{s=0}^{\infty} \left(\prod_{u=0}^{s-1} (1 + r_{t+u})^{-1} \right) D_{t+s} \right] \quad (1)$$

His model contains this bellman value function equation (1) in which the bank maximizes its shareholders sum of discounted dividends subject to laws of motion for capital and loans, a regulatory constraint, a financial constraint and the initial position of the balance sheet. The laws of motion represent the growth of loans and equity capital for the bank. In the model the loans evolve according to the following equation.

$$L_{t+1} = (1 - \delta_{t+1} - \omega_{t+1})L_t + (1 - \delta_{t+1} - b_{t+1})N_t \quad (2)$$

The new loans are equal to the old loans L_t plus the new loans N_t with default and repayment modeled in it. δ is the repayment rate; the ω is the default rate for old loans and b the random fraction of the new loans that will go bad, which is an increasing function of new loans N_t and ω_{t+1}. The average contractual interest rate, a decreasing function of new loans N_t, on all outstanding loans is represented by

$$\bar{\rho}_{t+1} = \frac{\{(1 - \delta_{t+1} - \omega_{t+1})L_t\}\bar{\rho}_t + \{(1 - \delta_{t+1} - b_{t+1})N_t\}\rho(N_t)}{L_{t+1}} \quad (3)$$

The capital evolves according to the following equation.

$$E_{t+1} = E_t - D_t + (1 - \tau)\pi_{t+1} \quad (4)$$

The new capital is the last year's equity E_t minus the dividends D_t plus the after tax profit represented by $(1-\tau)\pi_{t+1}$. The regulatory constraint incorporates how the bank cannot have capital less the percentage of the total loans outstanding. Capital must be greater than γ times the loans, which is the capital requirements

$$E_t \geq \gamma L_t \Rightarrow E_t - D_t \geq \gamma(L_t + N_t)$$

$$E_t \geq \gamma L_t \Rightarrow N_t = 0 \text{ and } D_t = 0$$

The financial constraint in the model restricts negative dividends for the bank, which incorporates the inability of the bank to issue new equity. The dividends therefore cannot be negative as that is equivalent to issuing new equity.

$$D_t \geq 0 \quad (5)$$

The result is simulated using two different interest rates and shows three variables: the new loans, the dividends and Z is the result with the regulatory constraint having a slack. The model reveals that the lending function of the bank is an increasing concave function with respect to the bank capital to asset. The highly capitalized bank lending looks the same as the unconstrained lending. The lending seems to be unaffected when the capital changes for those are highly capitalized. The highly capitalized banks would be therefore less responsive to capital shocks. Interest rate is negatively related with new lending.

His results show that banks reduce lending as a function of both excess capital and outstanding loans when the loans are low or when the interest rate is high. The new lending in fact ceases with banks that have low loans and are not highly capitalized.

In this paper I test whether this simulation result holds in the real world. I also test his hypothesis for the case of Islamic banks. To test any difference in the lending of the two competing banks the best countries would be those that have a mixed system of both conventional and Islamic banking in place.

2. Estimation Method

The model is susceptible to biased estimates because of the lag term, which is why the Arellano-Bond Dynamic Panel GMM Estimation technique is used. For the GMM estimation method the model is estimated using the following quadratic dynamic panel model specification.

$$Y_{j,c,t} = \alpha Y_{j,c,t-1} + \beta X' + \lambda_j + \mu_{jt} \quad (7)$$

The dependent variable $Y_{j,c,t} = \left(\frac{\Delta L_{j,c,t}}{A_{j,c,t}}\right)$ represents new lending for bank j of country c at time t normalized for asset size. It represents the increase in the outstanding net loans of the bank as has been used by Heuvel (2007). X is [1 x cj] vector consisting of all the independent variables $X= \left\{\left(\frac{K_{jct}}{A_{jct}}\right), \left(\frac{K_{jct}}{A_{jct}}\right)^2, \mathrm{Log}(A_{jct}), i_{jct}, \mathrm{HHI}_{jct}, \mathrm{Interactionterms}_{jct}, \mathrm{Inflation}, \mathrm{GDP}..\right\}$

The estimation technique is used because the capital to asset ratio is assumed to be endogenous and its relationship with new loans might be bidirectional. The other second issue is that the model involves bank specific unobservable effects that are present that need to be considered as the maybe correlated with the explanatory variables. The presence of a lagged dependent variable complicates the situation for it can be creating an autocorrelation problem with the model and causing a bias in the results. To address these problems the Arellano-Bond Dynamic Panel GMM Estimation is used. The model will be differenced first to remove the fixed effects and the final to be estimated model takes the form of

$$\Delta(Y_{j,t}) = \beta(\Delta Y_{j,t-1}) + \Delta\beta X'_t + \Delta(\mu_{jt}) \quad (8)$$

To address the endogeneity problem of the capital to asset ratio a 2-year lag of the same variable are used as instruments. The Arellano-Bond test for AR (2) is not rejected for the appropriateness of the use of lag 2 variables values as instruments.

a) Data and Preliminary Testing

The data sample used to test the Heuvel (2007) forms an unbalanced panel consisting of 25 countries from 1998-2012. The dependent variable is a difference and a lagged term is also included which reduces the data time period to 2000-2012. The 25 countries included represent all the countries that have Islamic banks in the Middle East, Asia and Africa.

All these countries have a parallel banking system running conventional banks along with the Islamic banks which makes the sample ideal to verify whether the lending nonlinearity of the

lending products is the present and does this nonlinearity hold for Islamic banks as well or not. All of these countries only Iran is the country where all banks are classified as Islamic.[1] The Bankscope database was used to get bank specific variables. The macroeconomic variables like GDP growth rate and inflation rate are taken from IFS database. The data drops any insolvent banks from the sample. Turkey is not included in the sample because it has been classified as part of Europe in the Bankscope database. Of the sample, only Iran is the country with all banks classified as Islamic banks. The financing assets from the Islamic bank balance sheet are defined as the loans for Islamic banks in this estimation.

Table 1: Observation for all the countries

#	Country Name	Commercial Banks		Islamic Banks		Total
		Observations	Average KA	Observations	Average KA	
1	Bahrain	225	17.993355	345	52.656054	570
2	Bangladesh	480	9.085149	78	7.25372	558
3	Brunei Darussalam	15	5.8826	45	18.880174	60
4	Egypt	479	9.638101	45	5.402032	524
5	Gambia	120	15.891163	15	8.4028	135
6	Indonesia	1883	13.420067	60	15.274652	1943
7	Iraq	165	23.2595	90	37.531782	255
8	Islamic Republic Of Iran	0	n.a	240	13.559198	240
9	Jordan	161	12.673767	45	20.276233	206
10	Kuwait	120	13.758395	135	36.053519	255
11	Lebanon	968	10.09396	45	39.307461	1013
12	Malaysia	734	11.972029	270	8.35758	1004
13	Mauritania	134	22.668384	30	30.223266	164
14	Oman	165	15.943472	15	99.267	180
15	Pakistan	448	9.757556	134	27.704433	582
16	Palestine	43	11.367053	30	14.410286	73
17	Philippines	673	14.972438	13	59.209999	686
18	Qatar	105	15.394432	60	18.692324	165
19	Saudi Arabia	165	12.069463	60	48.893889	225
20	Singapore	465	19.052197	15	48.893889	480
21	Syrian Arab Republic	195	18.338564	30	20.336	225
22	Sudan	0	n.a	180	19.360134	180
23	Tunisia	252	13.958605	15	24.691786	267
24	United Arab Emirates	300	16.93222	150	21.154738	450
25	Yemen	90	10.742122	60	13.946543	150
	Total	8385		2205		10590

Observations for each country in the sample. Average KA is the average capital to asset ratio in percentage maintained by banks calculated across the number of years of data.Turkey is not included in the sample as it is classified in Europe by the Bankscope.

Table 1 lists down all the countries that are included in the study with the average capital position in percentage listed. The capital position of Islamic banks is found to be a lot higher compared to the conventional commercial banks. This could be reflective of the fact that Islamic banks need to be better capitalized as their business model is focused more on risk sharing paradigm and since risk is not taken into account while calculating this ratio the banks seem to be keeping ratios that are higher than what is required under Basel/IFIS framework. Since the model includes quadratic terms and interaction of these quadratic the variance inflation factor is calculated which turn out to be around 8 for the quadratic terms when they are included in the regressions and therefore fall below the limit that can cause multicollinearity. Scatter graphs of all the banks in the system, the Islamic banks and the conventional banks don't seem to be providing a clear indication of the nonlinearity and I find

[1]Iran has through religious law making classified all its banking as Islamic. The banks may in fact be operating as conventional banks and be classified as Islamic. The coefficient of this variable might be revealing when it is interacted with the squared term.

that the banks' capital ratio for especially for Islamic banks is really scattered. See Figure 3, 4 and 5 in the appendix.

3. Findings

The estimated results are shown in in Table 2.

Table 2: Estimation Results

Dependent Variable: New Loans	GMM 1 Coeff/(Std. Err)	GMM 2 Coeff/(Std. Err)	GMM 3 Coeff/(Std. Err)
Bank Specific Variables			
L.New Loans	-0.201	-0.197	-0.128
	(0.123)	(0.123)	(0.133)
K/A	1.174**	1.125**	1.049*
	(0.531)	(0.535)	(0.566)
(K/A)^2	-3.349**	-3.169**	-3.515**
	(1.270)	(1.290)	(1.368)
Interest	0.000	-0.008	-0.011
	(0.004)	(0.013)	(0.014)
(Interest)^2		0.000	0.000
		(0.000)	(0.004)
Log(A)	0.131***	0.132***	-0.795**
	(0.020)	(0.020)	(0.392)
Log(A)^2			0.031**
			(0.013)
Interaction Terms			
(K/A)^2*Islamic Banks	2.209**	2.070**	2.349**
	(1.016)	(1.030)	(1.093)
Macroeconomic Variables			
Concentration (HHI)	2.0212***	2.039***	2.270***
	(0.474)	(0.474)	(0.510)
GDP Growth Rate	0.001	0.001	0.001
	(0.001)	(0.001)	(0.001)
Inflation Rate	0.001	0.001	0.001
	(0.001)	(0.001)	(0.001)
Time Dummies	Yes	Yes	Yes
No. of Observations	1474	1474	1474

The result shows strong evidence of nonlinearity in the bank's loan supply function. The capital asset requirement ratio has a positive but insignificant sign. This is evidence that shows that there is a direct relationship between the banks decision for issuing new loans and the capital position. The significant negative sign shows that the lending function is indeed nonlinear and concave with respect to the capital to asset ratio. This result is in concurrence with the nonlinear lending function that Heuvel (2007) predicts using his simulations. Interest rate has a negative effect on lending however the coefficient is insignificant and does not seem

to be affecting the choice of new lending of the bank significantly as was predicted by (Heuvel, 2007).

Since the impact of interest rates on lending is positive the second model estimation includes a squared term for interest rates to test if it may be affecting the nonlinearity in the bank's lending. The results show that that the quadratic term is positive and insignificant showing that it is not the reason for the concavity in the lending function.

Model 3 uses the squared term of the log of assets and this reveals that bank size causes increasing returns to lending rather than the decreasing returns that were predicted by theory and this effect is amplified for Islamic banks. Change in loans is higher as bank size increases and this effect amplified in Islamic banks.

The estimates reveal strong nonlinearity in the lending function for the squared quadratic term for the capital to asset ratio. The coefficient size increase is attributed to using lagged instruments. The capital requirement being represented by K/A is the factor affecting the nonlinearity of the lending function in concurrence with (Heuvel, 2007). The Islamic bank lending function is also negative but the strength of this nonlinearity is significantly lesser. The bank size has a positive effect on the new lending but the results are not significant and don't contribute to the concavity of the lending function. The interest rate coefficient is consistent with the (Heuvel, 2007) in decreasing the lending for the banks but the results are not significant, and the coefficient size is very small.

4. Conclusion and Further Studies

The empirical analysis of the bank lending supply function reveals that the banks new loan's function is an increasing nonlinear concave function with respect to the BASEL capital to asset requirements. Banks operate in a forward-looking manner reducing their lending in case of capital falling close to the minimum required level. This decrease in the new lending can be explained by the bank reducing its lending to avoid falling below the minimum capital adequacy requirement that it is supposed to fulfill. The evidence from this paper shows that the cost-plus Islamic products are in fact just like debt products of the commercial banks as many preceding researches have pointed out how the lending of these products are less responsive to the capital constraint than their competing commercial banks.

The analysis provides empirical evidence that (Heuvel, 2007) theory is consistent for Asian banks. The bank capital affects the amount of lending the bank does and banks that are low on capital have reduced lending. This phenomenon is the cause of the nonlinearity in the bank loan supply function. The bank size has a positive effect on the new lending, but the results are not significant and do not contribute to the concavity of the lending function. The interest rate coefficient is consistent with the (Heuvel, 2007) in decreasing the lending for the banks but the results are not significant, and the coefficient size is very small. Our findings point out the fact that the Islamic banks' lending function is less concave than the commercial bank lending function.

These findings are significant and the (Heuvel, 2007) paper could also be revisited for the development of an optimal banking lending function for Islamic banks specifically where the regulatory constraint is not binding.

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Appendix

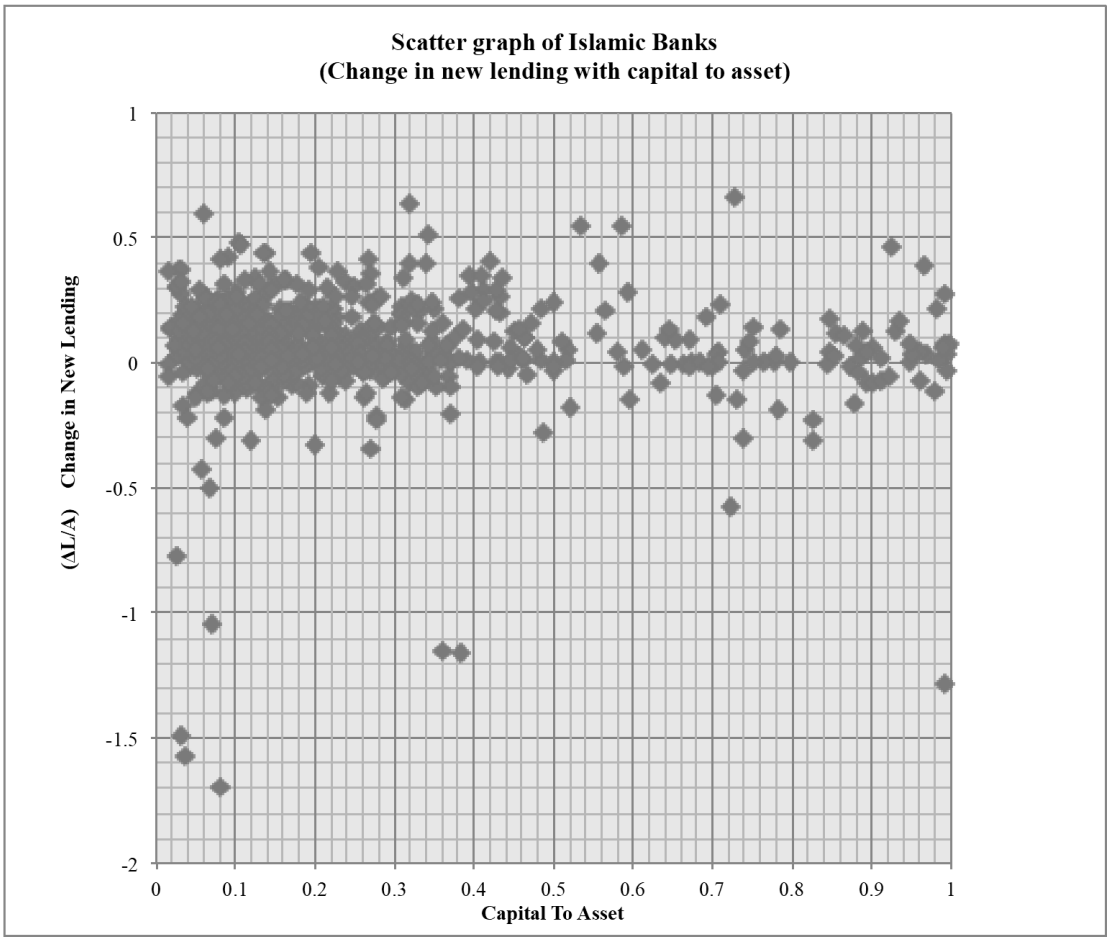

Figure 1: Scatter graph of Islamic Banks

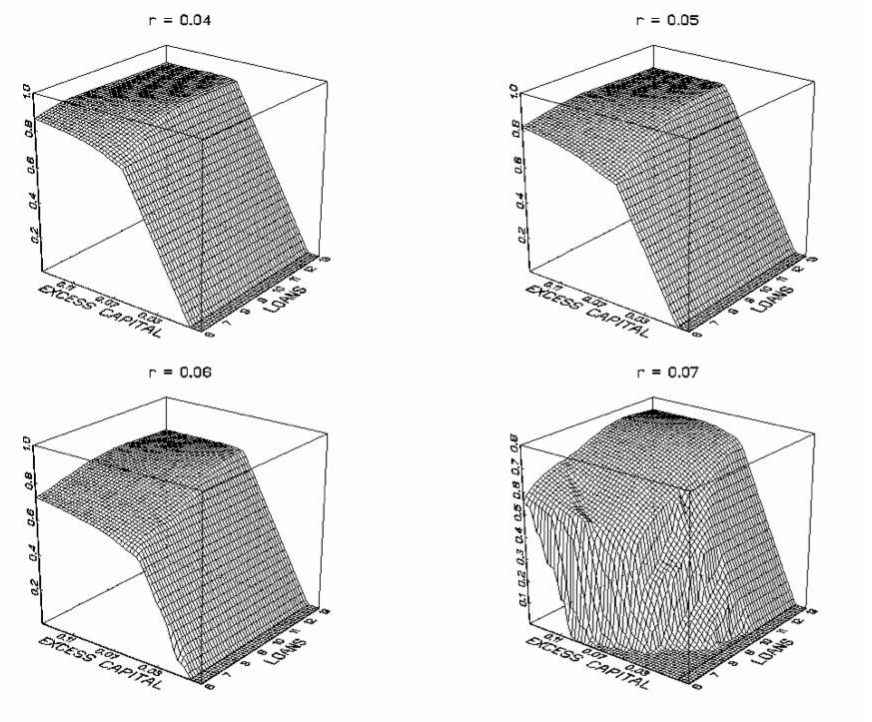

Figure 2: Optimal Bank Policy with Respect to Excess Capital and Loans (Source: Heuvel (2007))