

INTEREST RATES UNCERTAINTY, IMMEDIACY COST AND THE ROLE OF BANKS

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ABSTRACT

This study developed the Role of Banks Index (RBX) to characterize the role of banks in delivering its services in an uncertain interest rate and immediate fund requirement environment. We extend the model developed by Ramlee (2001) and Deshmukh, Greenbaum, and Kanatas (1983) by incorporating an element of immediacy costs. The basis of the immediacy cost is in the manner a bank stock up funds as inventory to cater for a loan commitment made to its customer. The strategy adopted in the pooling of funds acts as a penalty cost for borrowing in the last minute. RBX characterizes a banking firm with two possible roles: being a broker when the RBX moved towards 1 and an asset transformer when the RBX moved towards 0. The study successfully operationalized the developed RBX by using a monthly three months KLIBOR rate as a proxy of the uncertain interest rates environment and λ , as the proxy for immediacy costs for the period of 1982 to 2005. We showed that banks act as an asset transformer in an uncertain interest rate and high immediacy costs environment but more as a broker in a stable environment.

Keywords: asset transformer, broker, immediacy costs, Role of Bank Index (RBX), loan commitment, uncertain interest rate

INTRODUCTION

The existence of bank and the role it plays in modern economy has become a major debate among financial researchers. Arguments that support the important role of bank are critical in explaining its survival and also in the formation of regulations that govern the industry. Earlier explanations such as Pyle (1971), Pringle (1974) and Benston and Clifford (1976) justify the existence of bank

based on its ability to reduced intermediation cost. Economies of scale and specialized services allow banks to perform an effective intermediary function between deficit and surplus spending units that are separated by different needs (quantity, maturity, risk, liquidity, terms of contracts, and etc.) as well as physical locations. High transaction costs of matching the needs of economic agents lead to sub-optimal allocation and utilization of funds. Bank fills in this gap, intermediating between these parties that are unknown to each other. These earlier justifications however could not explain the continued existence of banks in a modern society that witness development of financial market and rapid technological progress. In an efficient financial market, lower transaction costs to match surplus and spending units diminished the role of bank as provider of low cost services. With the assumption of perfect market, Fama (1980) shows that banks are not special, performing functions that could easily be replicated by individual agents themselves. Thus, banks are not unique and its existence is replaceable in line with capital irrelevance proposition of Modigliani and Miller (1958).¹

In salvation to the existence of banks, modern explanations offer new sets of theoretical justifications based on the ground of market imperfection in solving problems of asymmetry information. Asymmetry information increases sorting task faced by lenders to distinguish between good and bad borrowers. Without effective monitoring and screening mechanisms, markets will be filled with "lemons", thus, leading to sub-optimal allocation of resources.² Fama (1985) argues that bank plays a special role in the economy that could not be performed by direct financial market.³ Diamond and Dybvig (1983) and Ramakrisnan and Thakor (1984) show that bank performs the monitoring role at a lower cost compared to direct monitoring. With delegated monitoring, pareto optimality is achieved, thus justifying the importance of banks.⁴

¹ Modigliani and Miller (1958) propose that the value of a firm is not influenced by its financing structure. By implication, this indicates bank financing is not unique, thus rendering no special function of bank in the economy.

² Akerlof (1969) introduces the idea of "lemons", i.e. sellers who does not reveal the true information. The concept highlights the problem of asymmetry information between buyer and seller that is being applied in the context of intermediation theory by current researchers.

³ Contrary to Fama (1980), Fama in this 1985 article regards a bank as being special since the act of granting a credit line signals a firm financial strength.

⁴ Allen and Santomero (1998) discuss the role for intermediation in the context of risk trading and participation costs. They argued that banks are facilitators of risk transfer who allows its client to participate in sector they are unable to deal alone. Raghuram (1998) proposes an "Incomplete Contracts" perspective in justifying a role for bank. Existing justifications view a bank from the perspective of bank's functions and minimal attention is given on the justifications for why these functions are provided. Banks are different in that they are more than just a "nexus of contracts" where its existence is to take advantage of the incomplete nature of contracts by bringing a

In a wider macroeconomic perspective, bank assumes special role in the transmission mechanism of monetary policy. Proponents of the credit channel propose that bank is special not because of its money liabilities but more so due to its lending activities. Kashyap and Jeremy (1995) shows that the effect of monetary policy on real economic activities is enhanced by its effect on bank lending capacity. Existence of bank-dependent agents (small firms that heavily rely on bank funding) produces asymmetry effect of monetary policy. Oliner and Rudebusch (1995) highlights that smaller bank-dependent firms are adversely affected by contractionary policy compared to large size firms that can borrow from the open financial market. These banking and macroeconomics studies that assign special role for banks suggest the importance of a more detailed characterization of bank role.

We extent these discussions on the role of bank based on a profit maximization behavior according to Santomero's (1984) proposition. Santomero (1984) differentiates the role of bank into two roles, broker and asset transformer. A broker-bank plays a more passive role of intermediation by bridging the gap between lenders and borrowers without taking additional risk. On the other hand, as an asset transformer, bank takes greater risk as re-packager of funds. Bank not only mediates between the two parties but also transforms lenders' assets in advance prior to business realization, thus assuming greater risk of changing environment. Deshmukh et al. (1983) proposes that the role of bank can be characterized according to interest rate environment. Deshmukh et al. (1983) shows that a high level of interest rate leads bank to be an asset transformer while a higher degree of interest rate uncertainty lead bank to be a broker. The role of bank however is ambiguous when high interest rate level and stochasticity occur concurrently. Despite characterizing the interest rate environment that influence the role of bank, Deshmukh et al.'s (1983) proposal is not testable without an explicit measure for the role of bank other than resorting to selected measures of bank balance sheets that could be used to infer bank roles.

The model that we develop enhances our understanding of bank role in several ways. First, we extent this view of Deshmukh et al. (1983) by proposing an explicit measure of the role of bank, i.e. the RBX, that could be employed for empirical tests. The index is derived based on a profit optimizing equation featuring similar set up as those of Deshmukh et al.'s (1983), i.e. an optimizing behavior of bank in facing uncertain loan take down and also uncertain interest rate environment. The RBX adopted specifically look at how a bank decide to build up its sources of fund so as to fulfill the borrowing needs of its customers. Banks decision to seek funding in the last minute presents an added cost since it

variety of non-contractual mechanisms into play derived from the relationship between banker, depositor and borrower.

involves the transaction costs and opportunity costs in liquidating existing liquid assets and costs of new funds acquired. We assume these costs as a penalty on the bank for delaying stocking up of funds till the last minute and thus term it as the immediacy cost and is proxy as, λ . The role of bank is described based on the timing of funding (stocking up funds now or later), the uncertain interest rate environment and more importantly the immediacy cost expected by the bank due to its decision to delay funding of prior loan commitment. The immediacy cost is also influenced by the ability of potential lenders to effectively identify the urgent borrowers. We assume urgent borrowers are identifiable because of their long-term relationship with the bank and that banks have given a prior commitment to finance their future financing needs (Boot, Greenbaum, & Thakor, 1993).

Incomplete information on the part of potential lenders that preclude effective identification of urgent borrowers allows banks to maneuver its role based on the interest rate environment. Thus, this extends incomplete information arguments on the role of bank that largely defines their risk taking activities. Characterization of the role of bank (broker or asset transformer) is subject to the level of index that is bounded between 0 and 1. RBX equal to 1 indicates an extreme role of bank as broker (funding prior to realization of loan take down) and RBX equal to 0 suggests an extreme position of bank as asset transformer. The following discussion is as follows: Section 2 provides a brief review on the role of bank. Section 3 describes the model that we used to derive the index including bank profit function and important elements and assumptions of our model. We provide the empirical characterization and the dynamic of the role of bank in Section 4. Section 5 ends the paper with brief conclusions and potential future studies that could employ the index.

THE ROLE OF BANK

A great deal of theoretical and empirical analysis has been devoted towards understanding the role of banks and the circumstances under which they are operating. A survey on the role of banks that have evolved from the literature of banking theory shows that a bank performs the role of a broker and an asset transformer. The role of bank as a broker is largely centered on the idea of bank's ability to minimize transactions costs when trying to attract deposits. The monetary mechanism, along with bank pricing decisions, allows banks the opportunity to attract deposits, which may be reinvested at a positive spread. Earlier literature on the role of bank as an asset transformer, however, centered on the idea of transforming large-denomination financial assets into smaller units. A more recent approach in understanding the asset transformation role is to look

at bank as an evaluator of risk in an imperfect market environment.⁵ Alternatively banks can be viewed as an asset transformer in its role as a trader of risk, a facilitator for improved transaction in an incomplete environment for contracts among parties involved in the financing of a project (Raghuram, 1998).

Majority of the studies conducted to better understand the role of bank have dealt with how a bank behaves in an environment of uncertain amount and rate of deposits, capital reserve, amount of loans and the lending rates to be extended. In all of these studies both theoretical and empirical, it was taken for granted that a bank behaves as a broker, asset transformers or both.⁶ Banks are said to perform both roles in an environment of uncertain interest rates by adjusting its composition of balance sheet.

Deshmukh et al. (1983) is among the first theoretical paper that provides analytical analysis on the role of bank. Role of bank either as a broker or asset transformer is analyzed by examining how a bank decides to borrow in advance for the purpose of accumulating funds after considering the realized rate of lending. Deshmukh et al. (1983) states that increase in the level of loan rate would prompt a bank to operate as an asset transformer. However, an increased in uncertainty regarding interest rates results in bank performing as a broker. Thus, if bank operates as a broker in a high level and volatility of interest rate, the effect of interest rate volatility dominates the opposing effect of higher interest rate level.

How a broker and asset transformer execute its role can be shown by evaluating the main activities of banks in attracting deposits as well as the sale of loans. Economic synergies between deposit taking and lending (as proxied by loan commitment) are two different manifestations of the same functions, i.e. the provision of liquidity that explains both the role of a broker and the asset transformer. Kashyap, Raghuram, and Stein (1999), provides the theoretical and empirical case where executing both roles could result in synergy, i.e. by sharing the burden of holding liquid assets on the balance sheet.

The broker and asset transformer both understand that to offer liquidity, it has to invest in a certain type of costly "overhead". These overheads on deposits and loan commitments require the overhead to be in the form of cash and securities that banks hold as buffer stock in view of the capital market imperfections. The buffer according to Kashyap et al. (1999) serves as cushion against liquidity shock that could not be raised in short notice from external

⁵ See Raghuram (1998) for a detail description.

⁶ See Baltensperger (1980), Sprenkel (1987), Sealey (1980), Deshmunk et al. (1982, 1983), Lieber and Orgler (1986), and Zarruk (1989).

sources. As long as deposits withdrawals and loan commitment takedowns are not too highly correlated, banks are able to get by with a smaller total volume of cash and securities on their balance sheets than would two separate institutions that specializes in one of the two products. While all the previous studies cited enhance on understanding how a broker and the asset transformer execute their functions, the model that we develop significantly follows the works of Deshmukh et al. (1983) and Kashyap et al. (1999). The former significantly related to our understanding of the role of bank in uncertain interest rates environment, while the latter provides us an insight into the activities (namely loan commitment) that could best explain the behavior and role of the bank.

THE MODEL

The Framework

The model considers a bank operating in two periods. The bank is a price taker, i.e. all interest rates are assumed to be determined exogenously in a highly competitive market. In the beginning of the period ($t = 0$) the bank decides on the amount of loan commitment to be issued. The loan take down will occur at the end of period 1 ($t = 1$) and the bank expects the amount to be $E(L^*)$, where $E(\cdot)$ is the expectation operator. For this loan commitment facility, such as in a revolving credit or a bank guarantee, the borrower has to pay a commitment fee denoted as θ as percentage to total commitment granted. It is customary for borrowers in such facilities to be charged a nominal sum prior to any actual realization of the facilities. The decision on the amount of loan to be realized or takedown is made by the borrower. As loan is withdrawn, the borrower is charged r_L , and repayments will be collected at the end of the period 2. The characterization of the role of bank rests on the decision on the amount of initial fund to be sourced by the bank in the beginning of the first period, $t = 0$ as initial inventory, denoted as L_0 . Given the expectation of loan take down, the bank has two extreme choices in sourcing the initial inventory, that in turn reflect its role in the intermediation process, i.e. be as:

1. Broker – The initial inventory sourced exactly matched the amount of loan take down expected, i.e. $L_0 = E(L^*)$. With this strategy the bank minimizes its risk of funding as it enters the second period by adopting a low-risk strategy. The initial inventory sourced will cost the bank r_1 , i.e. period 1 market interest rates that are known to the bank. In the interim period prior to the loan take down this fund will be invested in highly liquid securities that yield r_s . This is in the spirit of Tobin (1982) where

banks hold secondary reserves to ensure liquidity.⁷ Thus, in the first period the bank earns r_s from the securities and θ as commitment fee. The sum of these two rates however is less than r_1 . Under this strategy, bank acts passively. If the actual amount of loan taken turns as expected, then, the bank basically locked in a known rate of return. There is no need for additional funding in period 2. However, the bank will suffer some losses if no loan is taken. In addition, in case market interest rate decline in the second period, the bank will also suffers an opportunity loss by borrowing in advance at r_s even if loans are taken out.

2. Asset Transformer – The initial inventory is zero, i.e. $L_0 = 0$. This is a high-risk strategy since the bank is subject to withdrawal of loan in the second period. If the loan take down turns as expected, the bank faces immediate need to source for fund in period 2. The rate is not known in advance, thus, posing a risk to the bank that it might be higher than r_1 . In addition, the urgency in attracting fund imposed additional cost to the bank. This assumption we termed as immediacy cost and is reflected by the increasing marginal cost of borrowing in the second period. Although the inter-bank borrowing rate may be lower in the second period, the cost of liquidating and opportunity cost foregone in liquidating the liquid assets will result in the increase of marginal cost of borrowing for the bank hence making the costs in the second period higher. The total cost of second period borrowing is an increasing function of the deficiency in initial inventory represented by $(E(L^*) - L_0)^\lambda E(r_2)$, where λ represents the "immediacy cost", a penalty to the bank for delaying its funding for loan committed. Despite the higher risk, in case of no loan withdrawal the bank enjoys θ as commitment fee without bearing any cost to it.

The essential difference between the broker and asset transformer in our model relates to the bank's choice of risk exposures in storing its initial fund as inventory. If the bank borrows equal to the amount of expected loan demand ($E(L^*)$) in the first period, we treat this as an act of the broker; hedging itself prior to the realization of loan demand. By borrowing now, the bank is taking advantage of the lower cost of fund in the current period. Although this involves an opportunity costs for not investing in short term securities now, the banks are able to save on the transaction costs involve when liquidating assets and avoid the marginal costs of borrowing in the second period. On the other hand, when the bank decides to postpone borrowing to the second period, it is said to be performing as an asset transformer; attracting fund only when the loan demand is

⁷ Ho and Saunders (1981) terms the strategy as defensive where more liquid assets are kept so as to avoid having to borrow unexpectedly at higher costs. This act of a bank showed how a bank operates as a broker.

realized. As will be shown later, this decision of initial funding greatly relies on the market interest rates environment and the immediacy costs in sourcing fund at the last minute. The optimality of initial funding is subject to the relative difference between current market interest rate and the expected in interest rate in the next period, i.e. r_1 vs. $E(r_2)$ and the immediacy cost λ . We propose that the role of bank varies according to the environment of market interest rates that the bank perceived and the ability of market participants to identify the degree of immediacy when a bank sourced its fund.

Solution of the Model and the Role of Bank Index

With all the assumptions in place, we are now ready to solve for optimal initial fund inventory, L_0 . This is performed backward. As the bank enters period 2, the amount of loan demanded is realized. The response of the bank depends on its funding strategy opted in period 1. If bank already sourced the funding needed then it merely requires the bank to liquidate the securities to be converted into loans. This implies that the bank has to forego return on securities in exchange for return on loans. On the other hand, if the initial fund is not sufficient (or in extreme is zero), the bank must aggressively search for new fund and this will cost the bank $\{(E(L^*) - L_0)^\lambda E(r_2)\}$.

Thus, with this ex-ante view, the bank's profit function can be described as:

$$\pi = L_0(r_s + \theta) + L_0(r_L) - L_0(r_1) - L_0(r_s) + \{E(L^*) - L_0\} r_L - \{(E(L^*) - L_0)^\lambda E(r_2)\} \quad (1)$$

The bank decides on its initial funding L_0 that will maximize the above profit function. Taking the first derivative of the profit function with respect to initial inventory yields sufficient condition to maximize profitability:

$$L_0 = E(L^*) - [r_1 (1 - \theta)/\lambda E(r_2)]^{1/(\lambda-1)} \quad (2)$$

The above optimal condition provides the characterization of the role of bank. Dividing both sides with L^* and normalizing them to be equal to 1 yield the role of bank index (RBX), i.e.:

$$L_0/E(L^*) = 1 - \{[r_1 (1 - \theta)/\lambda E(r_2)]^{1/(\lambda-1)}/E(L^*)\} \quad (3)$$

Equation (3) describes the two extreme modes of role of bank that can be adopted by the bank, i.e. broker and asset transformer. The RBX range between 0 to 1, i.e. $0 < L_0/E(L^*) < 1$. With no immediacy cost ($\lambda = 1$), the role bank opted is significantly driven by the relative difference between current and future

interest rates, i.e. $(r_1/E(r_2))$. In one extreme case, where the RBX is equal to 1, a complete broker-bank exists. This implies exact matching of initial funding with expected loan demand. According to Equation (3), this condition is achieved when the interest rate charged in the first period is less than the second period. Intuitively, when current interest rate is low, there is no cost of carrying initial fund inventory whatever the amount is, i.e. $\{[r_1 (1 - \theta)/\lambda E(r_2)]^{1/(\lambda-1)} < 1$. Therefore, with this situation bank chooses to be a complete broker. On the other extreme, a complete asset transformer-bank exist when the $RBX = 0$. Bank carries zero initial fund inventory. This takes place when the numerator of term in bracket on the right hand side of Equation (3) is equal to 1, i.e. the ratio between current and future interest rates is greater than or equal to 1, i.e. $(r_1/E(r_2)) > 1$. This condition indicates that the bank expects interest rate in the future to be equal or lower than the current interest rate. Lower or equal expected interest rate attracts the bank to delay their funding activities.

In addition to uncertain loan take down, lower interest rate expectation also reduces the cost of funding in the second period compared to funding in advance. Thus, the RBX ties the role of bank to the uncertainty of interest rate movement. These are two extreme cases achieved when immediacy cost is zero. With the presence of immediacy costs, the role of bank is expected to be in between the two extreme. Movement of RBX towards 1 implies a greater broker role while movement of RBX towards 0 implies a greater asset transformer role. The RBX also proposes that as interest rate is in an upward trend bank would prefer to act like a broker, while in a declining interest rate trend, bank adopt an asset transformer role. The choice of exposure is also subject to the presence of the immediacy cost as reflected by λ that penalizes bank to delay its funding. Assuming no changes in the relative cost of fund between period 1 and 2, with the presence of immediacy cost, i.e. $\lambda > 1$, the bank would be motivated to assume a broker-role. The degree of immediacy cost is parallel to the ability of the market participant to identify urgent borrowers. As urgent borrowers could be identified effectively, banks decision to delay funding will be costly, thus, a broker role is preferred. We proceed in the next section by an empirical characterization of the RBX and some preliminary examinations that portray the dynamic of the role of bank.

CHARACTERIZATION OF THE RBX

We characterize the role of bank as described in the preceding section using the case of the Malaysian banking industry. The generation of RBX is based on the three-month Kuala Lumpur Inter Bank Offer Rate (KLIBOR) for a period of 20 years starting from 1982:01 to 2005:12. The KLIBOR are sourced from the

Monthly Statistical Bulletin of the Bank Negara Malaysia (Central Bank of Malaysia). The current period cost of funds (r_1) is reflected by the contemporaneous value of the KLIBOR. The expected cost of fund for the next period ($E(r_2)$) is based on the three-months ahead value of KLIBOR. We are aware of the usage of the intervention rate as a basis of lending rate calculation as of 1998. However, such rates determination basis will only result in a less volatile interest rate environment thus making the depiction of role of banks in our uncertain interest rates environment less reliable. We determined the RBX for several assumptions on the cost of immediacy, λ . Since the value of λ is not observable, we proxy the cost of immediacy based on an integer value, i.e. $\lambda = 2, 3, \text{ and } 4$.⁸

Figure 1 depicts the RBX and the KLIBOR for the period analyzed. We plot three different RBX reflecting the different level of cost of immediacy. As discussed earlier the RBX is constrained between 0 (complete asset transformer-bank) and 1 (complete broker-bank). In reality due to the uncertainty of interest rate movement and the presence of immediacy cost, these two extreme roles will not be achieved. Thus, a more meaningful analysis is generated by examining the movement in the RBX. Movement towards 1 indicates bank's tendency to take the role of a broker. Conversely, an asset transformer role will be associated with the index movement towards 0.

We first examine the basic case of immediacy cost, i.e. $\lambda = 2$. Over the two decades, the average RBX stood at around 0.49 where the highest value was 0.65 in 1989 while the lowest was 0.05 in 1987. This indicates that on average Malaysian banks do not significantly incline to any of the role. Nevertheless, inclination towards specific role is obvious in several instances. Four episodes of steep decline in the RBX are identified. These occur in 1985, 1986, 1998 and 1999, respectively. The declining RBX implies that during these periods, Malaysian banks assume the role of an asset transformer. The largest decline occurred in January 1987 where the RBX reaches the lowest value of 0.06, an extreme asset transformer role.

⁸ Theoretically as explained in the earlier section the immediacy cost can be zero, achieved when $\lambda = 1$. Under this situation, the role of bank purely rely on the relative cost between current and future interest rate and the situation will always be at extreme broker or extreme asset transformer.

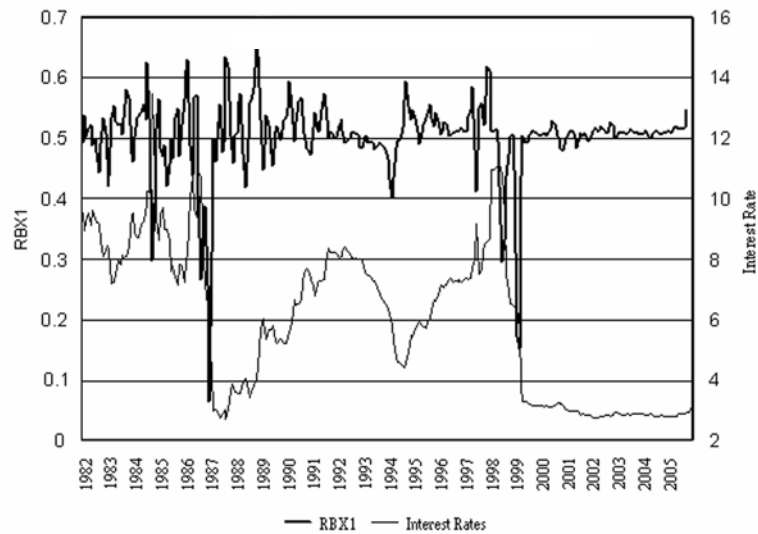


Figure 1. Role of bank with no immediacy cost under uncertain interest rate environment

In line with the pattern of the KLIBOR depicted below the index, these reversion to the role of an asset transformer associates with the relatively steep decline in the level of interest rate in the economy. Taking the case of 1987, the RBX decline from 0.49 in April 1986 to 0.06 in early 1987. This is parallel to the steep decline in KLIBOR from about 10% to a very low level of about 3.9%. It is also important to note that these reversions generally take place slightly earlier than the actual decline in the level of interest rates. The linear association (i.e. correlation coefficient) between the index and contemporaneous cost of fund is -0.33 . This indicates that any increase in the first period costs of funds causes banks to postpone their funding in anticipation of lower cost in the near future. On average, the movement of the index precedes changes in the cost of fund with a six months lag. These characterizations highlight our earlier intuition. As a bank anticipates a decline in interest rate, delaying initial funding is a best strategy. In case of loan take out, the bank can simply source the funding needed at a lower cost of fund. Not only that it can reduce its actual cost of fund, it also avoids the opportunity cost of no loan take out.

In addition to the expectation of interest rates, the presence of the immediacy cost also influence the role of bank. The sign of influence is positive, i.e. the higher the immediacy cost the more would a bank be a broker. This relationship is indicated in Figure 2. With greater penalty in last minute borrowing, banks would prefer a more passive strategy of being a broker. In addition, the immediacy cost also reduces the gain from expected lower cost of

fund. This is indicated by the smaller decline in the RBX for the four episodes of steep decline in the index. Based on the 1987 episode, vertical comparison shows that the RBX decline significantly when low penalty cost is imposed ($\lambda = 2$) where the RBX decline by 87%. On the other hand, when the immediacy cost increase ($\lambda = 4$), the decline in RBX is very minimal reaching about 8%.

Thus, in line with modern explanation of intermediation, asymmetry information not only justifies the presence of banks but also influence the role of bank in the intermediation process. High degree of information asymmetry prevent market participant from accurately identifying each other. Identification of an urgent borrower is a difficult task, thus, the motivating banks to be an asset transformer. As asymmetry information is resolves completely, the urgency of banks in sourcing fund is observed causing them to prefer a brokerage role adopting a passive role carrying minimal contribution to the economy.

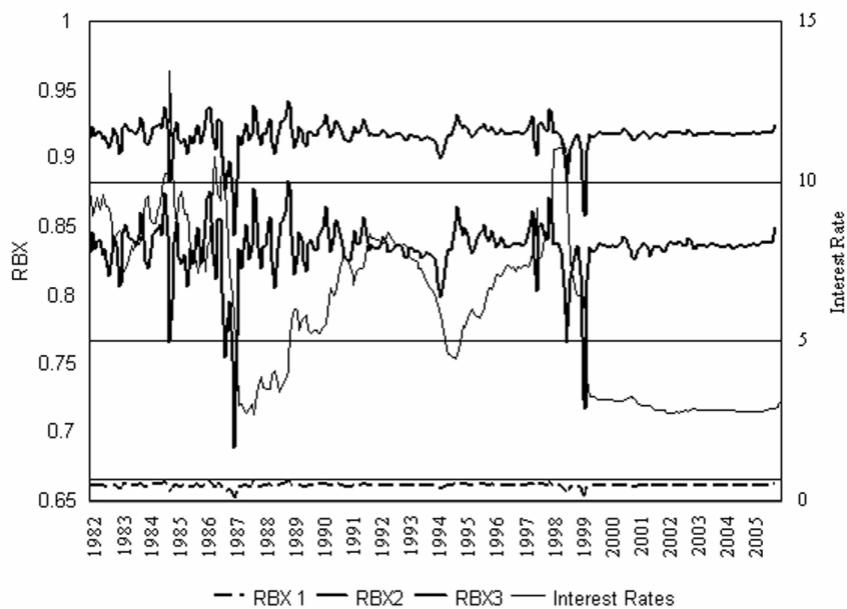


Figure 2. Role of bank with immediacy cost under uncertain interest rate environment

CONCLUSION

In an effort to provide further insight into the role of a bank, this paper develops an index that characterizes the role of bank as either a broker or asset transformer. Characterization of bank role is based on bank's objective to maximize profit under arrangement of loan commitment that faces uncertainty in interest rates. The RBX is tied to the decision of bank to maintain its initial funding prior to loan take down. Banks that stock initial inventory equivalent to the expectation of loan demand prior to the realization of loan is characterized as broker, acting passively in exchange for low risk. In the opposite, banks that maintain zero initial funding prior to realization of loan demand behave as an asset transformer, acting aggressively in carrying higher risk.

The RBX is constrained between 0 and 1. Extreme position as broker is achieved when RBX equals to 1, while RBX equals to 0 indicates extreme asset transformer. We propose two factors that dictate the role of bank: uncertainty in interest rates and the immediacy cost, i.e. penalty for late funding. Holding immediacy cost constant, expectation of lower interest rates in the future relative to current rates attracts bank to be asset transformer and vice versa. With greater immediacy cost, an environment of low asymmetry of information, late funding is penalized, thus, banks prefer to be broker. Understanding of the role of bank is widened with these characterizations of the role of bank.

REFERENCES

- Allen, F., & Santomero, A. (1998). The theory of financial intermediation. *Journal of Banking and Finance*, 21, 1461–1485.
- Arkerloff, G. A. (1969). The market for lemons: Quality uncertainty and the market mechanism. *Quarterly Journal of Economics*, 84, 488–500.
- Baltensperger, E. (1980). Alternative approaches to the theory of the banking firm. *Journal of Monetary Economics*, 6, 1–37.
- Benston, G. J., & Clifford, W. S. Jr. (1976). A transactions cost approach to the theory of financial intermediation. *Journal of Finance*, 31, 215–31.
- Boot, A., Greenbaum, S., & Thakor, A. V. (1993). Reputation and discretion in financial contracting. *American Economic Review*, 8, 1165–1183.
- Deshmukh, S. D., Greenbaum, S. I., & Kanatas, G. (1982). Bank forward lending in alternative funding environment. *Journal of Banking and Finance*, 925–940.
- _____. (1983). Interest rate uncertainty and the financial intermediary's choice of exposure. *The Journal of Finance*, 38(1), 141–147.
- Diamond, D. W., & Dybvig, P. H. (1983). Bank runs, deposit insurance and liquidity. *Journal of Political Economy*, 91(31), 401–419.
- Fama, E. (1980). Banking in the theory of finance. *Journal of Monetary Economics*, 6(1), 39–57.

- _____. (1985). What's different about banks? *Journal of Monetary Economics*, 15, 29–40.
- Ho, T. S. Y., & Saunders, A. (1981). The determinants of bank interest margins: Theory and empirical evidence. *Journal of Financial and Quantitative Analysis*, 16, 581–600.
- Kashyap, A. K., & Jeremy, C. S. (1995). The impact of monetary policy on bank balance sheets. *Carnegie-Rochester Conference Series on Public Policy*, 42, 151–195.
- Kashyap, A. K., Raghuram, R., & Stein, J. (1999). *Banks as liquidity providers: An explanation for the co-existence of lending and deposit taking* (Working Paper NBER, 6962), 1–45.
- Lieber, Z., & Orgler, Y. E. (1986). Optimal borrowing and banks lending policies: An interactive approach. *Journal of Finance*, 10, 255–265.
- Modigliani, F., & Miller, M. H. (1958). The costs of capital, corporation finance, and the theory of investment. *American Economic Review*, 48(3), 261–297.
- Oliner, D. S., & Rudebusch, G. D. (1995). Is there bank lending channel for monetary policy? *Federal Reserve Bank of San Francisco, Economic Review*, 2, 3–20.
- Pringle, J. J. (1974). The imperfect-markets model of commercial bank financial management. *Journal of Financial and Quantitative Analysis*, 69–86.
- Pyle, H. D. (1971). On the theory of financial intermediation. *Journal of Finance*, 26, 737–747.
- Raghuram, R. G. (1998). The past and future of commercial banking viewed through an incomplete contract lens. *Journal of Money, Credit and Banking*, 30(3), 524–549.
- Ramakrishnan, T. S., & Thakor, A. V. (1984). Information reliability and a theory of financial intermediation. *Review of Economic Studies*, 51(3), 415–432.
- Ramlee, S. (2001). *The role of commercial banks in an uncertain interest environment*. Doctoral dissertation, Universiti Kebangsaan Malaysia.
- Santomero, A. M. (1984). Modelling the banking firm: A survey. *Journal of Money, Credit and Banking*, 576–602.
- Sealey, C. W. Jr. (1980). Deposit rate-setting, risk aversion, and the theory of depository financial intermediaries. *Journal of Finance*, 35(5), 1139–1153.
- Sprenkle, C. M. (1987). Liability and asset uncertainty for banks. *Journal of Banking and Finance*, 147–159.
- Tobin, J. (1982). The commercial banking firm: A simple model. *Scand. Journal of Economics*, 84(4), 495–550.
- Zarruk, E. R. (1989). Bank spread with uncertain deposit level and risk aversion. *Journal of Banking and Finance*, 13, 797–810.