Measurement and Implication of Commercial Banks' Interest Rate Spread in Selected SEACEN Countries

Dagva Boldbaatar

The South East Asian Central Banks (SEACEN)
Research and Training Centre
Kuala Lumpur, Malaysia

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Tel. No.: (603) 7958-5600
Fax No.: (603) 7957-4616
Telex: MA 30201
Cable: SEACEN KUALA LUMPUR

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Foreword

The last decade has been a period of dramatic changes for the banking sector in the SEACEN region which underwent liberalisation, consolidation, IT innovations, globalisation and a major financial crisis. As a result, while central banks are interested in allowing banks to compete freely in a market environment, they also committed to ensure that financial structures support efficient financial intermediation. Therefore, the main aim of this project is to examine commercial banks' pricing behaviour and cost of financial intermediation by banks. In short, it investigates the main factors that influence changes in the commercial banks' intermediation spread and the difference between interest rates of lending and deposit taking. Since most financial systems in the SEACEN countries have been deregulated, the setting of interest rates is now very much a commercial bank decision which is influenced by market forces, owners' decisions and regulations. The study thus, looks into the relative importance of these factors in the various SEACEN countries.

The project utilised information and data of major commercial banks provided by six member central banks for which the analysis was done at a micro level. While the analyses of commercial banks' intermediation spread have been conducted in other parts of the world, this analysis of selected SEACEN countries differs in that the respective countries are at various stages of financial development. It is, therefore, extremely useful to analyse the implications of interest rate spread among these SEACEN countries and is a useful reference not only for countries that are included in this Paper but also for other SEACEN member economies as well. The SEACEN Centre would like to take this opportunity to thank the SEACEN member banks and monetary authorities for their kind assistance in providing the data and information, specifically Mr. Anton Hari Prasetyo of Bank Indonesia; Ms. Minjung Kim of The Bank of Korea; Ms. Adeebah Abd Jalil of Bank Negara Malaysia; Mr. Doojav Gan-Ochir of The Bank of Mongolia; Ms. Lucia Laquindanum of Bangko Sentral ng Pilipinas; Mr. Sunil Ratnasiri of Central Bank of Sri Lanka; and, last but not least, Ms. Huey-Ming Chen of The Central Bank of China, Taipei.

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of Research; Mrs Jami'ah Jaafar, Economist, and Mr. Vincent Lim, Senior Economist, for their assistance and encouragement throughout the Project. The views and conclusions stated in the Paper, however, are those of author's and do not necessarily reflect those of the member banks/monetary authorities or the SEACEN Centre.

Dr. Subarjo Joyosumarto
Executive Director
The SEACEN Centre
Kuala Lumpur

June 2006

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EXECUTIVE SUMMARY

This study examines commercial banks' interest rate spreads between lending and deposit rates. The measurement of the spread is important as many central banks are now publishing the overall average interest rates of the banking systems while authorities are increasingly requiring banks to disclose more detailed financial information for determining the spread without additional costs. The intermediation spread is an outcome of banks' decision on rates, affected by both micro and macro level factors. As a social cost of financial intermediation, the spread is subject to many macro level issues that shape efficiencies in financial sector performance. A certain level of financial sector structural development is required before banks can gear up to perform at a level of efficiency that can be observed in the spread.

The spread is a reward for liquidity risk generated by transforming money into loans and also a reward for the selection and monitoring of the right kind of borrowers. It is thus an information premium. The spread also provides sufficient margins for banks to continue operating in the market. To be competitive in the market, banks have to manage and monitor other risks such as market risk, legal risk and so on. Banks must also be able to cover the costs of operation and give good returns for equity holders. In that sense, central banks and Governments can do a lot in terms of improving the environment in which banks operate, by making the economic environment more conducive for efficient risk management. On the other hand, banks tend to grow big and become leveraged. Thus, ensuring the right level of competition in the market place is crucial for achieving a lower social cost of bank intermediation and at the same time providing long run stability of the system as whole.

This analysis of the study is based on a pool of data provided by the selected SEACEN member banks. From the analysis, it was observed that where the risk level is high and the financial infrastructure is not efficient, this methodology seems to be a good way of determining the main factors affecting the spread. The study revealed that banks' spreads are influenced by bank specifics, market forces and the regulatory environment. The findings of the study indicate that the factors that increase the spread in the selected SEACEN countries include market concentration and credit risks. However, bigger banks tend to operate with lower spreads due to better managerial efficiency. Reserve requirements are also costly for customers but statutory reserve remuneration appears to mitigate this burden effectively, at least in some countries. Consolidation through mergers and acquisitions can give banks the market power to operate with higher spreads, contributing to long term stability and profitability of banks.

1. Introduction

1.1 Objective

This project aims to analyse the interest rate spread in the SEACEN countries and to investigate the major factors that determine the spread. In general, interest rate spread, also known as the intermediation spread is defined as the difference between lending rates and deposit rates of commercial banks.

In recent decades, interest rate spread in the SEACEN countries has been influenced by two important factors. Firstly, the liberalization of the global financial sector has a direct impact through the removal of interest rate restriction and directed lending schemes. As interest rate restriction limits interest rate movement, by definition, it directly influence the interest rate spread. Interest rate restrictions or rules can also alter market signals both for banks and depositors by preventing them from making sound decisions regarding market demand and bank conditions. At the same time, directed lending can reduce profitability of banks and if the profit margins of banks are indeed squeezed because of direct lending policies, banks may charge higher interest rates on other market-based commercial loans thus raising the overall spread. Direct lending may lead banks which are unable to rely on market situations in managing their resources, price the time value of money accordingly. Resource management may also be complicated by non-market oriented rules to set interest rates.[1]

Secondly, in the SEACEN countries, the recent financial consolidation through mergers and acquisitions which occurred in a relatively short span of time as compared to the liberalisation of interest rates, has drastically reduced the number of commercial banks. In Malaysia for instance, the number of commercial banks was reduced from 37 in 1993 to 12 in 2004, a decline of more than 60 percent. Similarly, the number of domestic banks in Korea for the same period fell from 24 to 14[2]. Consolidation of the financial sector implies fewer but bigger banks operating in the market. This structural change affects pricing behaviour of commercial banks through two opposing channels. The spread will be narrowed since the banks gain operational efficiency due to the economy of scale. The logic is that if the banks can achieve greater operational efficiency, this could

1. Although the priority sector lending schemes still remain in some of the SEACEN countries, they are now made to be more market-oriented.

2. Statistics related to number of banks are from Weerasekera (1996) and websites of respective central banks. However, in Taiwan there number of domestic commercial banks increase from 41 in 1993 to 45 in 2004. This could be due to the fact that the banking system in Taiwan has yet to be consolidated.

reduce cost pressure and hence increase profitability. Therefore, with increased profit, banks may want to gain more market share by pursuing a narrower spread policy. On the other hand, as banks become financially stronger and are better capitalised, the customers' perception of the bank failure risks is reduced. Therefore depositors are more likely to accept lower deposit rates. Hence, from the banks' point of views, they could exercise market power to increase their interest rate spread since by virtual of being larger in size, they become the dominant financial intermediaries in the market. Fewer banks mean fewer choices for depositors. The above opposing forces need to be analysed concurrently.

There are also a number of other factors that may influence the interest rate spread in the SEACEN countries.[3] The high interest rate spread could signify a number of structural and other problems, such as lack of competition in banking industry, a perception of a widespread unsoundness of banks, scale diseconomies, and/or inherently high operating costs. It is also interesting to note that during the period under study, two other factors that needed to be considered are prices and a boom in information technology (IT) of the banking sector. The soundness of the financial system is important for the proper functioning of the real and banking sectors. Thus lower and stable inflation implies greater financial stability and hence can lead to lower banks' risk.[4] The greater degree of penetration of IT in the banking sector also implies greater efficiency. Generally, in most emerging economies, commercial banks are the largest providers of funds, for working capital as well as for expansion of new business undertakings. As main intermediaries of funds, banks play a significant role in economic growth through their ability, at least partially, to set the price of funds. In some aspects, inefficiency could be reflected in high spreads between deposit and lending rates.

Because we are primarily interested in commercial banks spread, it is acknowledged that pricing of time value of money channelled through banks is very much based on banks' decisions but is subject to the macro environment, market forces and regulations. However, this study will focus on the more general factors but taking into consideration market and country specific factors.

3. Weerasekera (1996) analyses the interest rate structure in relation to commercial banks interest rate spread. The 1997 Asian financial crisis involved major adjustment process in the banking sector and this would have affected the spread.

4. There are many references in this regard, but a particular useful reference is Huybens and Smith (1999).

The research report is organised as follows. Section 1 briefly describes the scope of the study while Section 2 will discuss the intermediation spread in conjunction with it measurement issues. The literature review is in Section 3 and Section 4 discusses the overall interest rate spread of banking system in selected SEACEN countries. Section 4 analyses the overall interest rate spread in the context of various factors including financial sector market structure, its level of development and the overall performance of the banking sector. The empirical analysis is in Section 5. Section 6 concludes the report and offers some policy recommendation.

1.2 Scope of Study: Data and Methodology

This study on interest rate spread covers six SEACEN member countries, namely Korea, Malaysia, Mongolia, Philippines, Sri Lanka and Taiwan[5]. There are major differences in the stage of development of the banking sector. For instance, in Mongolia, a transition economy, the banking system has only recently evolved from mono-banking into a market based system while in other SEACEN countries, the market–oriented banking system has been in force since the 1980's. In light of this, banks' pricing behaviour and competition in the banking sector can vary from one country to another.

The analysis in this study uses individual banks' data from the above countries. The sample period includes forty banks from six different countries covering the period from 4th quarter of 1998 until 4th quarter of 2004. Data are obtained from financial statements of banks and some are confidential in nature. Survey questionnaires were distributed to member central banks. Other data sources and electronic publications such as the SEACEN Financial Statistics, IFS of IMF, EIU country reports, the CIEC, and various World Bank researches including Beck et al (1999) were used extensively to supplement the questionnaire replies. The full list of data sources is given in Appendix 1.

Panel data on pooled series of individual commercial banks of the six SEACEN countries are used in the analysis. The model is based on the Dealership Model introduced by Ho and Saunders (1981) and later extended by Maudos & et. Al. (2004). The panel data methodology also allows us to study the array of factors important for the spread despite the considerable differences in level of financial sector developments in selected countries. By including appropriate

5. Although the preliminary analysis includes Indonesia and Thailand, these two countries are excluded from the empirical study.

variables, we can also derive some policy recommendation from the empirical analysis.

2. Overview

2.1 Measurement of the Spread: Technical Issues

The spread between lending and deposit rates of commercial banks is calculated as the difference between average rates charged on loans and paid for deposits. It can be measured at two different levels. At the macro level, the *overall spread of banking system* is the difference between the average lending rates and deposit taking rates in the banking system. On the micro level, the *bank spread* is similarly calculated but for each individual bank. Although, they are measured at the different levels, both are conceptually similar as both measures are prices for intermediation of financial assets through intermediaries; i.e., remuneration for taking and managing risks involved in lending and bearing the cost of business operation and other relevant factors.

There are a few approaches to calculate this spread. For instance, the "ex-ante" spread is spread when contracted rates of loan and deposit are 'properly' averaged. But, if the interest rates are approximated by using items in the balance sheet and income statement of banks or banking system, then it is the "ex-post" spread. Recently, within the Financial Soundness Indicator (FSI) framework, the IMF suggests the formulae to calculate the weighted average rates on loans and deposits of the banking system of both the ex-post and ex-ant spread.[6] The recommended method is equally useful for calculating both the overall spread of banking system and bank spread. According to the IMF, the ex-ante interest rate formula for averaging of loan rates is by using the share of a particular loan in the total value of bank's loan book as weights[7].

6. IMF (2004)

7. Average of contractual loan rate is:

$$\bar{r} = \sum_{i=1}^{n} w_i r_i; \quad \sum w_i = 1; \quad w_i = L_i / S \quad for\ all\ i = 1,2,...,n$$

This requires certain additional effort to be performed by banks and average of most frequent measurement will give better information for assessing banks of banking system.

Similarly, the same procedure applies to the average of deposit rates. The type of deposits may take many different forms and maturities, which carries clear differences in interest rate in contracts. Unless data are readily available and the banking sector possesses an efficient automated system and the relevant information is ready upon request, it may be burdensome for banks to get access to all the weights and contracted interest rates of loans and deposits. In addition, due to product differentiation across banks, the calculation based the weighted average of contractual interest rates is difficult to obtain.

Another way to analyse the spread is by examining the net interest margin[8]. Beck & et. al. (1999) use net interest margin and overhead cost as general indicator of efficiency of commercial banks. The variations in spread can be proxied by the variations in net interest margin. Regarding the overhead cost, it is more related to the operational efficiency. However, as mention earlier, a narrow spread does not always indicate efficiency. For instance, in situations of banking distress, banks may face narrow, even negative and unstable spread.[9]

The ex-ante spread reflects better concern of risk, while the ex-post rates are realisation of risks involved in past contracts. In addition, efficiency is better stated in the spread that uses ex-ante rates. However, the method to calculate ex-post rates though lacking in accuracy is more efficient. Average rates can be calculated by dividing interest income to loan or interest bearing activities depending on data availability, reported in the income statement[10]. A caveat is that the deviation from true average rate can be as a result of loans and deposits transacted in the middle of the period and also due to unpaid interests of non-performing loans. However, the IMF (2004) has suggested various ways to treat these shortcomings.

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8. Net interest margin (NIM) is total interest income less interest expenses divided by the asset of bank. NIM is closely related to the spread. NIM has become popular since the 70s, when David Cole introduced the Return on Equity Model, based on ratios of bank financial statements. See Ho and Saunders (1981), Saunders and Schumacher (2000), Sarr (2000), Demirgüç-Kunt, Huizinga (1998), and Maudos, Fernandez de Guevara (2004) among many others.

9. For instance, overall spread is negative in Indonesia at the last quarter of 98 and first quarter of 99.

10. Weighted average loan rate in example: $\bar{r} = \sum_{i=1}^{N} r_i \times L_i \Big/ \left(\sum_{t=1}^{T} S_t \Big/ T \right) = II/\bar{S}$

where r_i being interest rate used for calculation on loan i; L_i is the i-th loan that for all loans in sum as interest income, II; S_t is the value of bank's monthly loan portfolio and need to be averaged over period (3 or 4 including last month of preceding quarter, then $T=3$ *or* $T=4$) to smoothen end the period effect. Thus, $\bar{S}$ is the average loan value. Inclusion of previous quarters reduces the most recent loans effect on the average rate calculation. To obtain average interest rate if $\bar{r}$ is quarterly, we need to compound it as $\bar{r}_{an} = (1+\bar{r})^4 - 1$ to get the annualized weighted average interest rate.

Because of data limitation, this study uses the ex-post rates to measure spread. In addition since we are investigating causes of changes in the spread and looking for factors that influences spread, analysis using ex post interest rates would be sufficient.[11]

3. Concepts and Literature Review

The interest rate spread, or the financial intermediation spread is an important indicator for the banking system and the intermediation process. Firstly, the financial intermediation spread is associated with cost of financial intermediation.[12] Interest rate spread between lending and deposit rates may be used for making judgement on banks' efficiency in case of individual bank spread, or banking system's efficiency in case of overall spread of banking system. The IMF (2004) suggests that the *overall spread of banking system* can be used for assessing profitability and pricing behaviour of banks, while the spread between high and low of inter-bank rates can be used for an early indication of change in risk perception. However, there is a caveat when making cross-country comparison. Level differences in the spread among different countries can come from differences in financial development, efficiency of financial infrastructure and the judiciary system in the financial sector.[13] Moreover, macro economic stability and market structure can determine the level of the overall spread[14].

By definition, the spread is affected by factors that influence the interest rate level. A possible scenario is that when interest rates are high, the spread may increase. As higher interest rate may imply higher risk level of the banking

11. Some researches still want to use some form of ex ante rates. Perhaps, calculation inconvenience and limited usage of such expensive information of explicitly averaged rates led some researchers to use reference rates instead. For instance, Barajas et al (1999) use loan rates contracted and deposit rates paid on three-month time deposits within last week of the month. This is less burdensome but will be less representative if some big contracts were concluded earlier in the month. Similarly, selection of deposit type may cause problem when banks' products and customers' preferences are changing over time.

12. Although, intermediation spread is measurable cost of financial intermediation it does not represent social costs. As it pointed out by the reviewer, social cost itself is not directly measurable and low spread not always reflection of low social cost. Adequate spread is needed for banks in a high risk and low market development environment. Under such circumstances, low spread may result in higher social cost.

13. Narrower spread can be a sign of deteriorating profitability of banks. Therefore, spread alone is not enough to judge about efficiency, but by examining it together with interest rate level, we may be able to judge whether banks are operating efficiently. But lower intermediation spread cannot be accepted as a sign of efficiency.

14. See D-KH (1998), D-KLL (2003) for sources of cross country differences.

sector, banks and other intermediaries may have to hedge against the increased risk. On the other hand, a stable macroeconomic environment with lower and steady inflation may lead to lower intermediation spread signalling efficient intermediation.

There are a few important factors that may affect the spread. Market competition in banking sector is one of them. As banks get bigger, it allows them to exercise bargaining power over customers thus giving them opportunities to widen the spread, perhaps to increase its profit margin. This is especially true in countries where banks are the sole dominant financier for external funding.[15] However, the determinant of the spread can be complicated by the fact that the spread has components of two distinct markets, lending and deposit taking. In terms of loan supply in a well established financial market, non-bank financial institutions are competitors to banks and hence they can erode the bargaining power of commercial banks. Another argument is that even if banks are the main financiers, no single bank could really extensively dominate the loan market due to little product differentiation between banks.

However, the situation is very different in the deposit market where banks are in a better position to exercise market power. The reasons are obvious. Banks usually are better in controlling risks as they have implicit cover from central banks. In addition, major and large banks have a distinct advantage because the depositors are concerned about the possibility of bank failure. Larger banks by virtual of their reputation may be perceived as 'too large to fail'. Bigger banks may also mean greater efficiency through efficiency gain such as better cost management, good stream of non-interest income and better risk management. Bigger banks may also be perceived as being more liquid. These attributes imply that depositors may be willing to accept a lower interest for their deposits. Intuitively, competition can eliminate this monopoly profit but in general, bigger banks can call for higher interest spread. In addition, leading and dominant banks' pricing policy can exert significant influence over the general sentiment of the market.

Ho and Saunders (1981), Saunders and Schumacher (2000), and, Maudos and Fernandez de Guevara (2004) developed models to study the behaviour of

15. There are two controversial explanations of bank size (see Demirguc-Kunt and Huizinga (1998)). Some argue that bigger banks are protected from open competition while others argue that more efficient banks will have a larger market share thus consequently competition is the factor contributing to increasing size of banks.

individual banks and its spread in the presence of shocks in the market. [16] These models assume banks' spread covers the burden imposed by regulation and structural inefficiencies, and risk premium on top of cost of running banking business and comfortable profit margins. Demirgüç-Kunt and Huizinga (1998) investigates the determinants of bank spread on worldwide data. The main emphasis is on taxation, influence of financial structure and deposit insurance although the paper also covers wider issues such as financial structure, infrastructure and legal origin. The authors find that higher capitalisation, leverage, operating cost and foreign ownership are associated with higher net interest margin, while higher non-interest earning asset and depositors' funding are associated with lower margin. The operating cost was the most influential factor determining net interest margin. The effect of operating cost and level of non-interest earning assets is larger in high income countries, perhaps with better financial development. Inflation and real interest rate are important macro factors determining higher spread with the effect of real interest rate noticeably larger in developing countries.

Reserve requirement, a form of indirect taxation, reduces margin, while corporate tax burdens are passed on to customers. Both effects are larger in developing countries. Thus, reserve requirement is "superior" to corporate taxation if there is a need to tax banks. Deposit insurance reduces margin, perhaps, due to lower risk of bankruptcy. Regarding the financial structure, the bigger the banking sector relative to GDP and stock market relative to banking, the lower the spread and the bigger the absolute size of stock market and higher concentration of banking, the larger the spread. In other words, this implies that financially intense economies with well capitalised capital market will have lower cost of financial intermediation.[17]

Other authors focus on contemporary issues such as foreign bank penetration, increasing concentration of banking system, competition in banking industry, financial liberalisation, role of external shock or contagion effects and subsidisation of cost of deposit taking and so on. Table 1 offers a summary of some of other studies with diverse emphasises on different aspects of analyses regarding intermediation spread.

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16. Other models include Agénor et al (1999) of supply side disturbances that allows internal versus external shocks as they are transmitted through credit channel, Single Output (loan) model of profit maximising bank Barajas et al (1999) and Multiple Output Model (loan and safe keeping) of Sarr (2000).

17. Well developed financial infrastructure, i. e. efficient legal and institutional settings, better contract enforcement, higher law and order index and less corruption can result in lower spread.

Table 1
Literature of Studies Related to Commercial Banks Interest Rate Spread

Authors and year	Scope of study
Agénor et al (1999)	Empirical analyses of role of external shock in specific Argentinean case.
Barajas et al (1999)	Impact of financial liberalisation on spread in Columbia. Analyses empirically the spread for periods of pre and post liberalisation using quarterly and monthly observations with two distinct models.
Beck et al (1999)	Overview of databases that covers most of the countries. IFS and BanksScope data are used for almost every research that is related with spread and margin. Moreover, paper discusses indicators of financial development technically.
Demirgüç-Kunt, Leaven and Levine (2003)	Impact of concentration, regulation and institutional development on bank efficiency. Widest coverage of banks in different regulatory environment.
Jacob A. Bikker and Katharina Haaf (2002)	Analysis of impacts of concentration for banks in different segments that are capable of competing at the international level or in domestic market segments.
Fernandez de Guevara et al (2002)	Measurement of market power of banks in Europe. Empirical approximation to Lerner index useful for analysis if one possesses detailed commercial bank data.
Maria Soledad Martinez Peria and Ashoka Mody (2004)	Impact of foreign bank penetration on interest rate spread
Montes-Negret F. and Luca Papi (1996)	Questions whether spread is too high in very high inflationary environment using simple model based on bank performance ratios. It is short proof of adequate reflection of risk needed for spread to sustain stable financial market functioning.
Sandrine Corvoiser and Reint Gropp (2002)	On competition and pricing changes in concentrated banking sector following recent consolidation of European banks
Sarr (2000)	Multi–product model. Covers strategy of competition through subsidised cost of deposit taking.
Anthony Saunders and Liliana Schumacher (2000)	Direct extension of dealership model. Focuses on influences of market power and interest rate volatility on the spread.

Banks need to consider the risk profile of the loans and deposits. For instance, there is no ready matching fund for every loan demanded and no instantaneous opportunity for placing into loans when new deposits are supplied. Therefore banks have to interact with the money market or drain/accrue other forms of liquid reserves if the money market is not that liquid. This interaction with the money market contains elements of the market risk of higher interest rate or lower than the new contracted rates before new loans are made or deposits obtained. Hence, to avoid the market risk, banks will pay to depositors less than market rate and charge on loan higher than market rate. The risk is just one element that banks needed to consider. The another is the cost associated with processing transactions covering other generic bank risks. The three constitute the factors that determine the intermediation spread.

On a more micro level, the mechanism that affects the *bank spread* is much more complicated. Internally, interest rate spread should be wide enough to generate profit to cover generic bank risk and operating costs and to compensate the " burden" of negative of net non-interest income; and give a good profit to owners. For instance, if the operating cost and cost of risks increases, a bank can offset these by bearing temporary losses. However, as profit margins can be negative only for a limited time and non-interest earnings are fairly exhaustible, the bank may respond to this cost pressure by adapting a wider interest rate spread.

4. Overall Interest Rate Spread of Banking System in Selected SEACEN Countries

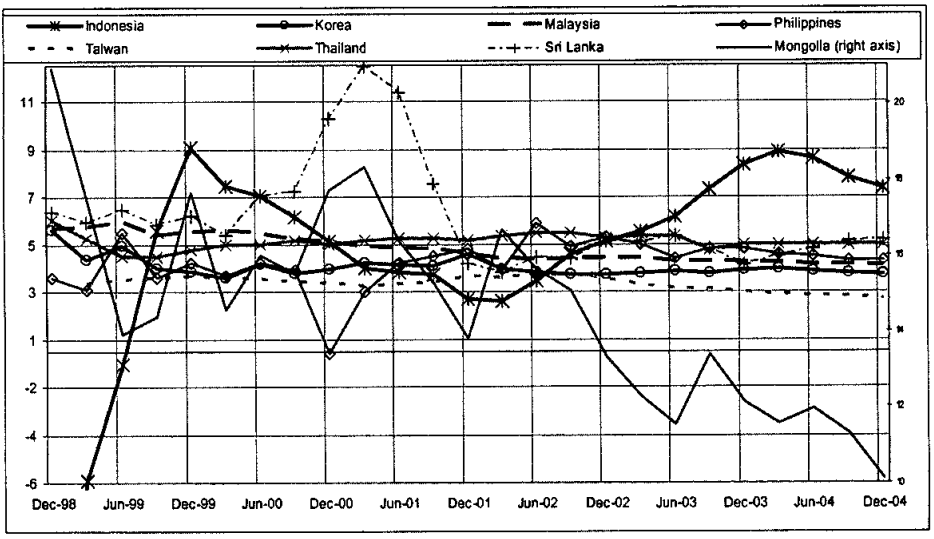
4.1 Spread and Financial Liberalisation

A brief analysis of the overall interest rate spread of banking system in selected SEACEN countries is presented in this section. Overall spread between loan and deposit rates of banking system in eight SEACEN countries is shown in the Figure 1[18]. The sample period is from 4th quarter of 1998 till 4th quarter of 2004. A caveat to this cross-comparison analysis is that the way to averaging the data is not fully disclosed in some countries.

18 . Data are sourced from electronic publication of International Financial Statistics (IFS) of IMF, Economist Intelligence Unit's country reports and statistical publications of the central banks.

The 1997 financial crisis[19] was reflected by the relatively high and volatile spread. During the sample period, apart from Indonesia, all countries experienced a decline in the spread. The most dramatic reduction was observed in Mongolia. It fell to half of what it was at the beginning of sampling period. In the case of other countries, it declined from between 1/5 and 1/3. Mongolia experienced the highest spread, averaging almost 15% per annum against 5.4% of the whole sample and the most volatile spread was in Indonesia with a standard deviation of which is 5.36 against 4.26 for whole sample. The second most volatile spread was observed in Mongolia, with a standard deviation of 2.26. On the other hand, in Taiwan, the spread was most stable and lowest in level (standard deviation 0.31 and average level of 2.8% per annum).

Figure 1
Commercial Banks' Interest Rate Spread Between Average Lending and Deposit Rates in Eight SEACEN Countries: Quarterly Data from 4th Quarter of 1998 till 4th Quarter of 2004



Note: Mongolia in Right Axis
Source: IFS, EIU, and member banks statistic publications, see Appendix I.

19. Although Mongolia did not suffer from Asian crisis of 1997, it experienced prolong domestic banking crisis from 1994 until 1999.

The interest rate spread was more stable in countries where restrictive rules on interest rates on loans, deposits and/or both were imposed. The standard deviation of the sub-sample of group of countries including Thailand, Malaysia, and Korea (all the three countries have some sort of rules on interest rates) is 0.65, while for the rest of the sub-sample, the standard deviation is 5.23. It is interesting to note that the nature of restrictive rules differed. In Thailand, there were rules on both the lending and deposit rates. However, the ceilings for interest rate to be paid on all forms of deposits were removed since 1st quarter of 2004 while lending rate rules are still imposed. In Malaysia, the lending rate used to be the Base Lending Rate, which is the BNM intervention rate plus maximum margin of 2.25 percentage points. In the 2nd quarter of 2004, a major revision was introduced by the central bank[20]. Since then, there is no maximum cap and the base lending rate includes among others, the intervention rate and administrative charges (see reference in footnote for exact formula). The floor on fixed deposits of 1 and 12 month maturity was also introduced. In the case of Korea, the BOK has abolished the few remaining restrictions on interest rates to be paid on deposits. Three types of deposits, namely, household deposits with longer than 3-month maturity and average of 1-million-Won amount (1% annual), ordinary deposits (1% annual), and temporary deposits (no interest) were subject to restrictions during the period covered in this research. The very last restriction was removed in the 1st quarter of 2004.

This evidence may support the argument that restrictive rules are useful in times of severe volatility of financial markets. However, academic opinions differ regarding the effect of imposing ceiling on deposit rates. This kind of restriction in extreme cases are seen as repressive and tends to keep the spread higher resulting in higher cost of intermediation and social cost of disintermediation. On the other hand, a less restrictive rule on interest rate ceiling can prevent banks from entering into 'destructive' competition among themselves leading to a higher overall equilibrium interest rate level[21]. In general, ceilings help to keep deposit rate down and when there is no cap on the lending rate, banks should be able to adopt a higher spread and hence enhance their profit margin. However, restrictive rules can distort market signals by not revealing the true pricing and risk perceptions of banks. Interestingly, Sarr (2000) advocate interest rate ceilings

20. Another big revision, to make restriction more market based, was introduced in October 1998. For further information see the BNM (1999) and the BNM press release "BNM Introduces New Interest Rate Framework" on 23 April, 2004. www.bnm.gov.my

21. See Sarr (2000), McKinnon (1993) and Shaw (1973) for financial repression, and on deposit interest ceiling see Matutes and Vives (2000), and Chiappori et al (1995).

on deposit rates as they could induce financial deepening by preventing banks from entering into competition. Furthermore he argues that to attract depositors, banks may resort to lowering lower fee on non-intermediation service such as safekeeping.

It is interesting to note that financial liberalisation that eventually lifted restrictions and rules has resulted in widening of the interest rate spread. This is caused by the re-pricing of loans according to the market value, and exercising of market power gained by dominant banks during restrictive periods (World Bank 2001). The Columbian case (Barajas & et. al 1999) is one example of liberalisation that did not lower spread.

4.2 Financial Development and Macro Stability

The overall spreads of the banking system averaged from quarterly data for eight selected SEACEN countries are displayed in Table 2. The entries were averaged from quarterly data with increasing weight in time, giving more weight to recent observations[22]. It is noted that a narrower spread is not always associated with a lower level of interest rate. For instance, the spread in Philippines (3.9% per annum) is lower than those of Thailand or Malaysia, but the interest rate level is higher by almost about 4-percentage point per annum. Nevertheless, countries where interest rates are lower and stable tend to have narrower spread. As noted earlier, interest rates are more volatile when their levels are high which consequently generate higher market risk and hence higher spread. This is in line with Saunders and Schumacher (2000) whose findings indicate that the impact of interest rate volatility on intermediation cost causing higher spread is similar to the effect of market structure that allows banks to exercise market power.

22. Increasing in time weight used to i) give relative importance to most recent developments, ii) to display average spread correctly when Indonesia experienced negative spread late 1998 and early 1999.

Table 2
The Spread of Banking System and Indicators of Financial Development[43]

	ID	KR	MY	MN	PH	LK	TW	TH
Spread	5.6%	3.4%	4.0%	13.4%	3.9%	5.1%	2.7%	4.6%
Interest	17.1%	7.6%	6.5%	27.9%	10.2%	12.5%	5.0%	6.4%
M2/GDP	47.7%	124.5%	107.9%	39.0%	40.2%	30.5%	211.1%	97.4%
Relative size of banks	66.9%	60.0%	63.7%	82.5%	77.5%	81.7%	82.5%	68.3%
Market capitalisation	20.7%	50.6%	148.8%	3.1%	70.3%	11.4%	112.7%	46.8%
Turnover velocity	40.7%	213.0%	30.0%	NA	17.1%	16.6%	213.2%	100.0%
Market to Banks ratio	36.1%	48.2%	93.8%	9.4%	86.0%	25.5%	51.5%	37.6%
Foreign penetration	7.8%	9.9%	24.7%	26.2%	15.8%	10.4%	7.6%	11.5%
Inflation	7.7%	3.2%	1.5%	5.9%	4.7%	7.0%	0.5%	1.8%
Average growth rate	3.2%	5.4%	3.6%	3.0%	4.4%	4.9%	4.6%	4.6%

NA: not available
Definition of variables and their sources are in Appendix I

Lower Financial Deepening Ratio represented by M2 over GDP is clearly associated with a higher level of interest rate and spread. Meanwhile, *the relative size of deposit money banks* (IFS classification) represented by the ratio of domestic asset of deposit money bank to sum of assets of deposit money banks, central bank and other financial institutions indicates that in Mongolia and Taiwan, banks are dominant. Interestingly, Mongolia and Taiwan also display the highest and lowest spread respectively. Thus, bank dominance in intermediation is not necessarily associated with spread.

It is clear that non-intermediated financing can influence the intermediation costs. If direct and indirect channelling of funds are substitutes, then direct financing through the stock market will be an alternative to financial intermediation via banks and other financial intermediating institutions, except for small borrowers and newly established businesses. Stock market and intermediary institutions are complimentary in terms of their successful expansion. There is the well known wealth effect of stock market for companies to borrow from banks. Banks are important for nurturing companies at their seed stage which are listed later, adding to the capitalisation of stock market. On the supply side of the fund to

23. Country names here and in future coded as: Indonesia – ID; Korea – KR; Malaysia – MY; Mongolia – MN; Philippines – PH; Sri Lanka – LK; Taiwan – TW; Thailand – TH.

the financial system, one can apply the textbook argument of portfolio demand of money. As result, when stock market is well developed and liquid, it may attract more funds from investors, thus, leaving banks under pressure. In that sense, a well developed equity market can discourage banks from charging higher for their services. *Stock market capitalisations* together with *their turnover velocity* are strong indicators of level of sophistication of financial development and when these figures are high, the interest rate level and the spreads are low.

Looking at market liquidity in Taiwan and Korea, the turnover velocity is more than 200 percent, implying that on average, the number of shares traded to total numbers of share in the market are twice in a given period of time, making the market very liquid. In Malaysia, the market size is also relatively large, almost 149 percent of GDP, but only 30 percent of all shares being traded. The market size is smaller in Mongolia (smallest, with market capitalisation only about 3% of GDP), Sri Lanka and Indonesia. But in these countries, the spread is higher, highest being in Mongolia at 13.4%. It appears that bigger, more efficient and active capital market puts pressure on all banks to lower the cost on intermediation even if they are dominant intermediaries in the market. However, the capital market needs to be at a certain volume before this can happen.

Banks size relative to capital market is one of the structural variables tested in Demirgüç-Kunt and Huizinga (1998). It is measured by the percentage ratio of market capitalisation to banks assets. They found that this ratio is negatively correlated to the net interest margin and concluded that it may signal that bigger capital market can substitute for bank financing. Although, market capitalisation in Taiwan is as high as 113% of GDP, it is only over ½ of total bank assets. Taiwan, nonetheless, has a very active market. In Malaysia and Philippines, the market is much less active than that of Taiwan even though the capitalisation is relatively large, at over 93 and 86 percent of banks assets respectively. It is also noted that the relative lack of capital market development in Indonesia, Mongolia and Sri Lanka may allow banks to be only choice of external financing for many businesses.

Foreign penetration is seen as a influential factor in terms of reducing social cost of intermediation and hence the spread.[24] Foreign banks are assumed to be superior in controlling and managing risks providing competition to local

24. See specifically Maria Soledad Martinez Peria and Ashoka Mody (2004).

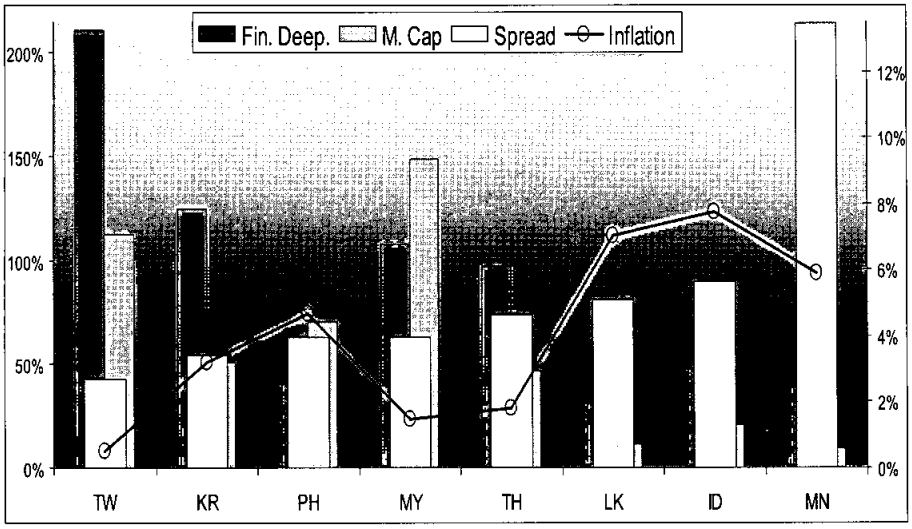
domestic banks. In this sense, foreign banks are carriers of the new technology in the banking sector (Soledad Martinez Peria and Mody 2004). However, foreign penetration is also country specific. For instance, Malaysia have been allowing foreign banks throughout the entire sample period while the first foreign bank entered Mongolia only in March 2002. Its share, however, grew rapidly from 1.5% of total banking system asset to almost third of it within same year.

High and volatile inflation is the most destructive factor for financial intermediation[25]. High inflation implies higher level of interest rates and higher volatility which creates uncertainty. Figure 2 confirms our findings between inflation and the interest rate spread where countries were placed from lowest to highest in terms the spread. The only "outlier" is the Philippines. The difference between the interest rate spread in Malaysia and Philippines is marginal, but deposit rate in Philippines was much higher than lending rates. In addition, banks in both Malaysia and Thailand were subject to interest rate regulations sat one time or another.

Economic growth can influence spread ((Demirgüç-Kunt and Huizinga (1998), and Demirgüç-Kunt, Laeven, Levine (2003)). One explanation is the business cycle argument. When the economy booms, banks face increased demand in the loan market, thus opening the opportunity for gaining extra margin. However, in Table 2 there is no clear distinction whether banks in countries with higher growth experienced higher spread.

25. See Huybens and Smith (1999)

Figure 2
The Spread, Financial Deepening, Capital Market Capitalisation and Inflation



Note: Spread and Inflation –right axis; Financial Deepening and Market Capitalisation (M. Cap) - left axis.
Source: For Spread: Member Central Banks' data from survey combined with EIU quarterly data; CPI from CEIC databases.

4.3 Financial Infrastructure

Components of financial infrastructure such as contract enforcement, property rights protection and levels of Government's regulations can influence bank profitability and their pricing behaviour[26]. Efficient functioning of legal and institutional infrastructure may allow banks to operate with considerably low risk of resolving bad debt and delinquency period in a manner of what was contracted. Therefore, in countries where these infrastructures are functioning well intermediation spread would be narrower.

26. See Demirgüç-Kunt, Laeven and Levine (2003) and Demirgüç-Kunt and Huizinga (1998).

The Heritage foundation developed a series of indicators to measure the level of development of financial infrastructure in the Index of Economic Freedom framework[27]. Three such indicators of banking and finance, property right and regulations are analysed. The banking and finance index is the composite of factors including government ownership of financial institutions, restrictive regulations on foreign banks, government involvement in credit allocations and restrictions on intermediaries' activities. The score is from 1 to 5, and 5 being the most restrictive setting. The property right index is a composite of factors such as the degree of independence, efficiency and presence of corruption in the judiciary system, definite settings for private property protection and contract enforcement law etc. A score of 5 indicates the least protected property right and non-functioning judiciary system. The regulation index mostly consists of factors that impede private business development including bureaucracy, licensing, corruption and etc. A score of 5 means that government impedes business development by imposing regulations resulting in reducing long-term viability of business due to higher costs in business establishments.

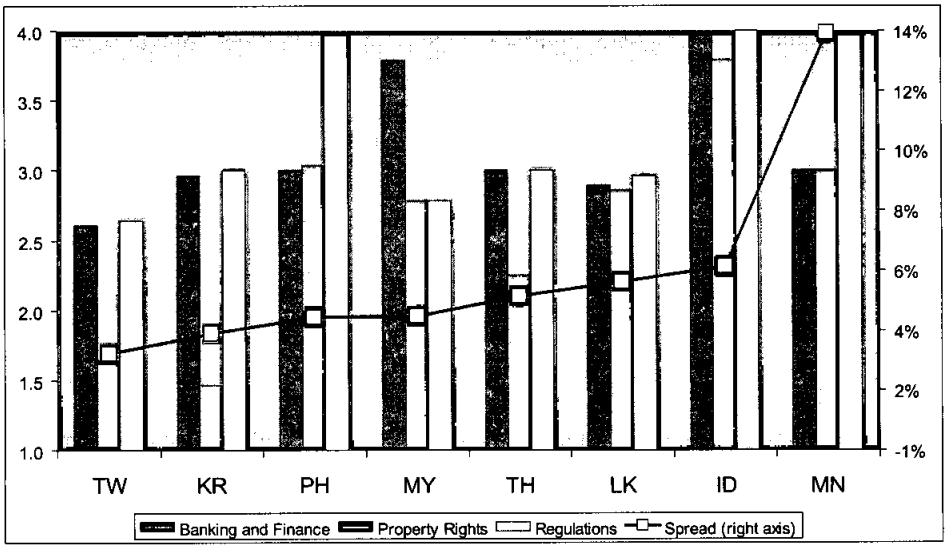
Restrictions in banking institution development would limit financial intermediation services, while existence of legal risk will force banks to operate with unnecessarily higher risk-margin. The regulatory burden for business development may limit the scale of banks by limiting loan demand as too many regulations may lead to rapid growth of informal business financing (IBF). IBF tends to be riskier in nature and hence capital financing under the IBF would tend to be more expensive, allowing existing commercial banks to take the opportunity to extract higher profit margins by following suit.

In Figure 3, these indices are displayed together with the spread. From 1998 up to the end of 2004, these indices have changed little with the exception of the property right protection index which has increased, indicating a worsening of private property protection. Looking at the overall picture, the Philippines and Mongolia have almost the same scores for the three indices but the spreads are considerably different. For Malaysia, it appears that a relatively high level of government involvement in the banking sector did not cause serious social cost in terms of high spreads. In Mongolia and Indonesia, there is significant legal risks and these may be the cause of the high spreads. In short, the influence of financial freedom score on the spread is mixed. [28]

27. Indices are explained in Beach and Miles (2006)

28. See D-KLL (2003) for reference on impacts of these factors on spread/NIM on wider coverage countries.

Figure 3
Indices of Financial Infrastructure Development and Spread



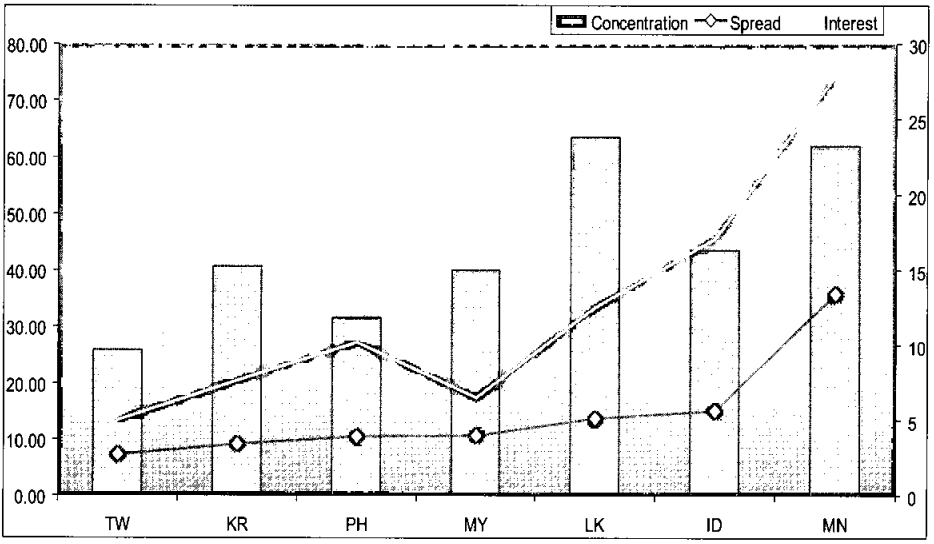
Note: Spread: Right axis
Source: Heritage Foundation online data of score from 1998 up to 2005. Indices are averaged with increasing-in-time weight.

4.4 Competition

Competition among banks is another aspect that influences the spread. The degree of competition depends on the level of banking sector regulation and the size of banks relative to each other. Deregulation and consolidation can impact competition in opposite directions. Deregulation reduces while consolidation enhances competition. However, consolidation may not necessarily increase competition as its effect depends very much on the relative size of dominant banks. Competition itself allows the most efficiently operating banks to enjoy better opportunities and gain bigger market share, thus leading to concentration. In that sense, concentration is a result of competition. Corvoisier and Gropp (2002) and D-KLL (2003)[29] found that concentration indeed allows banks to pursue higher profit margins both in the loan and deposit market. However, analysis of the same market conducted by Biker and Haaf (2002) found that there is a high level of competition even among the biggest banks. Demirgüç-Kunt and Huizinga (1998), using a wider coverage note that the relationship is inconclusive.

29. Demirgüç-Kunt, Leaven and Levine (2003)

Figure 4
Concentration, Lending Rate (Interest) and Spread of Commercial Banks



Note: Concentration was calculated as weighted average with increasing in time weight, on sum of market shares of biggest 3 banks in total assets of banking system. (Spread and Interest right axis)

Source: Data used are from survey questionnaire.

Figure 4 displays concentration in banking as average of quarterly indices from December 1998 until December 2004. The index is calculated as weighted average of assets of the three biggest banks as a percentage share of total assets of the banking system, weighted with increasing time weights. From Figure 4, it appears that that higher concentration is associated with higher level of interest rate and spread perhaps, an indication of market power. Korea has the highest concentration in banks among low spread countries while Indonesia has the lowest concentration in banks among high spread countries. In Korea, five banks make up over 60 percent of assets of the banking system, with the biggest having more than 20 percent share. In case of Indonesia, eight banks hold over 60 percent of banking system's assets with the biggest having about 20 percent (almost same in Korea). However, Indonesia has also the biggest number of banks. By just examining these averaged figures, it is difficult to see whether concentration has some reliable relationship with the overall spread of the banking system. To display the interrelationship between concentration and spread, a simple scatter graph for each country is plotted (Figure A1, Appendix

I). There appears to be a positive relationship between spread and market concentrations

Another area to look at is the merger and acquisitions (M&A) that took place in Korea, Malaysia and Philippines. In case of Korea, two of three biggest banks, had been involved in mergers with two other banks during the sampling period. All three of Malaysia's biggest banks were involved in mergers of which one was merged twice. The effects of these shifts are presented in Figure A1. Although, it is not easy to say that the spread was narrower after M&A, the graphs do suggest there is a likelihood of association of higher spreads and higher concentrations except during the period before and after M&A

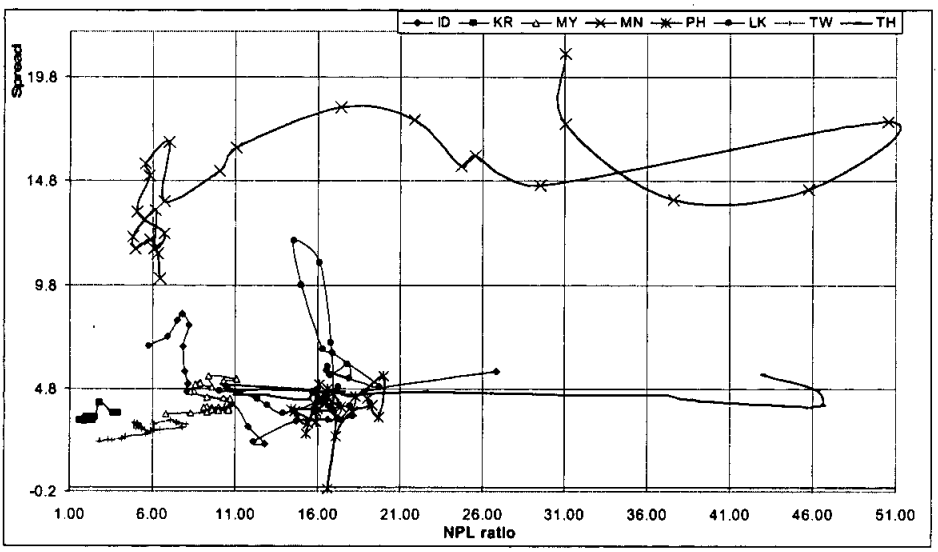
4.5 Credit Risk of Banking System

One of the important indicators of bank performance for analysing interest rate spread is credit risk. Credit risk can be represented by Non-Performing Loan (NPL) ratio or the percentage ratio of NPL to loan portfolio. NPL has financial cost implications for commercial banks as they have to make additional provisions for loan losses, increasing banks' burden and creating cost pressure. One possible response to this pressure is a higher spread, perhaps through higher interest on loans overall. Barajas & et. al. (1999) found a positive relationship between loan quality and the spread. Furthermore, they noted that causality test indicates that NPL causes spread. They conclude that banks may be transferring additional costs generated by credit risk to customers in form of higher spread.

In the selected SEACEN countries (see Figure 5), there do not appear to be a relationship between aggregate NPL ratio of banking system and the overall spread of banking system[30]. However, country-wise, the relationship clearly varies. For instance, Mongolia initially experienced high NPL but in recent times, it is around 6% and fell considerably until mid-2001. The spread has also gone down. Thailand experienced NPL problem but it did not seem to impact the spread. Perhaps this is due to the interest rate setting rules that is in place to stabilise the spread. Indonesia experienced almost a negative relationship between the two variables in this short time frame. The NPL ratio has gone down but the spread was higher in later periods. Sri Lanka, experienced high spread in late 2000 until end of following year but the NPL ratio changed very little averaging around 14%. For the remaining four countries, both spread and NPL ratio clustered around their means.

30. Similar relationship were also found for changes in NPL stock

Figure 5
NPL Ratio of Banking System against Overall Spread



(Time period: ID: 2000.3-2004.4; KR: 2001.2-2004.4; MY, MN, LK, and TH: 1998.4-2004.4; PH and TW: 1999.1-2004.4)
Source: see Appendix I

5. Empirical Analysis

5.1 Individual Bank Level Analysis

In this section, empirical analysis was conducted on individual banks' data to determine the main factors influencing the spread, and to analyse the impact of policy actions on the spread. The analysis is based on various studies (Maudos & et. al. (2004), Barajas et al (1999), Saunders and Schumacher (2000)). This research on commercial bank data is unique in the sense that it covers banks from countries that are distinctively different in the development of the financial structure, some of which went through intensive consolidation due to financial distresses. One such extreme example is Mongolia, a transitional economy which has been developing its financial system only in the last two decades.

The Dealership Model in its extension (Maudos & et. ala 2004) is used to determine the main bank specific factors that influence the spread. We include in the model, several additional variables to capture changes in market structure due to financial consolidation, financial stability and financial reporting

conventions.[31] In addition, the model includes other subjective factors to be proxied such as degree of risk aversion, possible tradeoffs between the economy of scale and additional cost pressure when a bank grows.[32] Other policy variables that are considered include the imposition of reserve requirement particularly, its effective ratio and remuneration; impacts of merger & acquisitions; and commercial bank transparency indicated by whether there is compulsory income statement and ownership disclosure settings. Among individual banks' specifics, the variables are the roles of operating cost, risk notion of banks, scale of operation, and efficiency of management

The analysis was conducted using panel data of 40 banks from 6 SEACEN member countries. The panel data methodology enables the model to control individual bank and country specifics. In fact, the panel data analysis also allows us to benefit by treating these unobserved time invariant local factors explicitly as not important. The estimation results are understood as average impact over the entire cross sectional data. The sample is from 4th quarter of 1998 to the 4th quarter of 2004. The data was supplied by the member central banks and include 5 banks from Korea, 6 from Mongolia, 11 from Taiwan, 7 from Philippines, 5 from Malaysia and 6 from Sri Lanka. The bank assets in combination make up at least 60% of total assets of the banking systems at the end 2004 in the respective countries. The lowest total share is for Korea (37% in December 1998: banking system in Korea was consolidating rapidly), and highest in Mongolia (97% in June 2001) after which the share increased. Generally in Mongolia and Sri Lanka, banks selected cover more than two-thirds of the banking systems' assets for the entire time span. 38 cross-section units with 760 observations were used for the Model. 29% of observations are for Taiwanese data; 18% for the Philippines and 13% respectively for Korea, Mongolia, Malaysia and Sri Lanka.

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31. Other specifications are qualitative judgements such as measures taken or not taken, especially when the enforcement policy measure has changed, introduced or ceased within sample period. But these subjective variables are beyond the capacity of this research Also, legal risk and proxies of financial structure, macro economic performance, influences of global economy and efficiency of institutional settings were limited Nevertheless, these are assumed to be not essential in revealing the main determinants of the intermediation spread and residuals were used to capture the remainder of specification limitations mentioned.

32. See Saunders and Schumacher (2000), Maudos et al (2004), D-KLL (2003) and Barajas et al (1999).

The dependent variable, *the spread*,[33] is calculated as the difference between ex-post lending and deposit rates. Ex-post lending rates are interest income on loans as share of loan portfolio in percentage and ex-post deposit rates are interest expenses on deposits as percentage share of deposits.

5.1.1 The Model

The Dealership Model (Ho and Saunders (1981) and Maudos & et. al. (2004) described in Appendix II is adopted for controlling bank specifics. Three additional aspects of bank specifics were also used as explanatory variables (Maudos & et. al. (2004). These include managerial efficiency, implicit interest payment and opportunity cost of reserve holding. Reserve requirement was included as a variable representing policy measurements. Thus model is represented as follows:

$$S_i=f(B,C,P)=\alpha_i + \beta_{ji}B_{ji} + \zeta_{ci}C_{ci} + \rho_{ki}P_{ki} + u_i \quad (1)$$

i referring to cross-sectional individual bank and for convenience, the time indication was not included. S, B, C, and P are the spread (dependent variable), bank specifics, country specifics and policy action respectively. *j, c,* and *k* are the number of explanatory variables included to represent bank specifics, country specifics and policy action respectively. *u* is the residual that contains all the remainder of specification shortcomings.

In the Model, there is no synchronisation between receipt of deposits and demand for loans of banks. Banks operating as dealers in both markets use money market assets as buffer stock against this randomness. There will be risks associated with placing excess funds in the money market when deposits are supplied, or financing loans from money market sources when loan demanded prior to the arrival of deposits. The risks are generated by the movement of the market interest rate. When the market rate goes down, funds invested in the market are subject to reinvestment risk and when it goes up loans financed from the market is subject to refinancing risk. This is the first justification of marking up over the market rate when setting the rate on loans and discounting the market rate when paying deposits and hence the derivation of the intermediation spread.

33. The dependent variable, the interest rate spread, is a combination of outcomes in two different markets where banks may have separate strategy though it has to be inter-related. These markets are the market for loan where lending rates are set and market for deposits where deposit rates are set. Furthermore, deposit rates are a combination of two elements; the fees collected by banks for their services of safekeeping and payment settlements; and interest paid to deposit owners as payment for their investment earnings

Besides market risks, the operating costs of processing and monitoring loans and costs associated with deposit taking have to be covered in the spread because banks are assumed to mainly intermediate funds between savers and borrowers. Thus the Model is very much centred on lending activities of banks. Apart from operating costs, banks have to carry credit risks, the amount of default of loan repayments. Finally, all the operations are subject to individual bank's degree of risk aversion. Data on ex ante intermediation spread representing risk perception of bankers would be ideal but in our case, data is ex-post and the degree of risk aversion is represented by the level of capitalisation. These are additional justifications for spreads being positive for a continued period of time. In short, bank will face greater risks, depending on market rate volatility, its own volume of operations and perception about risk, i.e., the degree of risk aversion. Saunders and Schumacher (2000) showed that banks will have positive spread, even if competition among them is tight, because of risk aversion, volume of operation and market volatility.

The formal solution of the Model leads to following[34]:

$$s = \frac{1}{2}\left(\frac{\alpha_D}{\beta_D} + \frac{\alpha_L}{\beta_L}\right) + \frac{1}{2}\left(\frac{C(D)}{D} + \frac{C(L)}{L}\right) - \frac{1}{4}\frac{U''(\overline{W})}{U'(\overline{W})}\left[\begin{array}{l}(L+2L_0)\sigma_L^2 + (D+L)\sigma_M^2 + \\ +2(M_0 - L)\,\sigma_{LM}\end{array}\right] \qquad (2)$$

The first part represents bank's ability to exercise market power to get a higher spread that is conditional on both markets' elasticity of demands. Referring to Appendix II, βs are banks' ability or power to increase the mark up (in loan rate) and discount (deposit rate) without seriously hurting probability of getting supply of deposit and demand for loans, while αs are individual banks' ability to attract deposits and provide loans which are assumed to be constant over time.

The second part are the operating costs. $C(D)$ is the cost of processing deposits and $C(L)$ is cost of processing loan applications and monitoring. These expenditures are proportional to the respective volumes representing the operational cost of a bank together making up the operational costs. The third is a combination of the degree of risk aversion, market and credit risks, interaction of the market with credit risks and size of a bank. This starts with the degree of absolute risk aversion formulation that has a positive sign due to convex utility. It is followed by complicated interactions between credit risk, market risk and

34. For complete solution , see Maudos et al (2004) while a brief explanation is in Appendix II.

inter-action between these risks. All risks are magnified by banks' scale of operations in respective deals. We should say here that apart from operating costs, all the others are difficult to approximate.

In addition to the above, there are two more bank specifics that are considered which are managerial efficiency and implicit interest payments (IIP)[35]. These variables make up the bank specifics. The spread of banks would differ depending on market forces, countries' financial developments as well as policy measures as mentioned afore.

Thus, the empirical Model includes the following:

Bank specifics: Market share of banks, as share of assets in domestic commercial banks' total asset. A negative impact for market share is expected on the spread as we assume that the bigger in terms of market share, the more efficient and smaller the spread. Reputation in terms of market share is more meaningful while concentration represents opportunities to exercise market power. Including both variables is not contradictory as they are essentially different. Concentration allows bank to exercise market power, while market share implicitly indicates market power. Operating costs is also included as share of non-interest expenses in bank assets. This is an important variable and is expected to have a positive impact on the spread. When operating costs increase, banks can respond by either reducing the profit margin or increase the spread. Since the former has exhaustible limits, banks in the long run have to widen the spread. Bigger banks should have no problems raising the spread in face of rising costs due to their lead role and market power which for our purpose is relevant since data are for the bigger banks in the respective countries.

The degree of risk aversion can be approximated by different variables. Deviation of capitalisation as share of risk weighted asset from capital adequacy requirement imposed by the supervisory authority would be best for representing risk taking behaviour of banks. However, as this information is confidential, capitalisation as a percentage ratio of equity to asset is used instead. The main disadvantage of this variable is that there are country-based differences due to varying capital adequacy requirements such as Tier 1 or Tier 2 capital etc. A positive sign for this variable is expected in that those banks which are more risk averse would go with a higher spread as in (2).

35. References of justifying studies for these two additional specifications is found in Maudos et al (2004).

Money market volatility and credit risk are expected to have positive signs as higher risks would mean higher financial costs caused by the realisation of risk. In addition, when risk indices are high, the perceived risk is high and thus, a higher spread is provisioned against it. We use GARCH variances of money market rate for market risk. Non-Performing Loans (NPL) as a percentage of loan portfolio is used for credit risk. Maudos et al (2004) uses loan to asset ratio for this purpose. Both are realisation of past risk i.e., the risk that was more relevant to the earlier decision based on risk perceptions. In addition, the loan to asset ratio may vary accordingly to the log of the loan, size or scale variable. A better representation would be provisioning for doubtful loans for which data was not forthcoming. For size, the log of loan portfolio was used as the Model is more centred on or around lending activity.

Two other variables included are the efficiency ratio in percentage and the ratio of non-interest expenses to total income of banks. The first one is the amount that a bank spends from each earned dollar to run a bank and thus, a higher value corresponds to inefficiency and therefore a negative sign is expected. The main argument employed with reference to the above is that more skilled management achieves better payoff in loans and charges can therefore be reduced. It would also be able to attract deposits more cost efficiently as well. The second variable is related to the remuneration pattern of deposits. As was explained in Saunders and Schumacher (2000), banks pay implicit interest because of various reasons including competition strategy and tax convention since these subsidies for service will not be taxed in general. The Implicit Interest Payment (IIP) is proxied by other expenses net of other income as a percentage of assets. A positive sign is expected meaning that by not collecting fees, such as fee for safekeeping service, the bank will allow itself to pay less on deposit.

Country specifics: Market concentration in banking measured as the sum of the market shares of the three biggest banks are included to measure the degree of tightness of market competition. In a decade of banking consolidation, it has been found in various studies that consolidation was harmful for market competition. The lack of competition will allow banks to attain higher profits through higher spreads via higher interest rates. Some have argued as to whether concentration can be used to measure the level of competition or otherwise. These different approaches assumes that concentration is (i) harmful because it is sign of lax competition or increased opportunity for collusive pricing among a few big banks, ii) not a measurement of loss in competition because efficient banks only get bigger provided that regulations are fair and thus competition will exist among few big banks, and iii) if institutions are protectionist, it will result

in monopolies of banks.. If concentration allows banks to increase their spread, the market power of banks would increase. It is noted that concentration in Mongolia, Sri Lanka and Taiwan has been falling while in other countries, the growth has been decelerating. In interpreting the results, the impact of tighter competition (concentration decreasing) would be a narrower spread.

As was mentioned earlier, inflation is harmful for financial intermediation creating problems such as increases in interest rate levels and risks which ultimately result in hikes in the spread. More financially developed countries tend to have lower intermediation spread due to efficiency and better risk allocation. Absolute and relative size of the capital market may also be indices that measure structural financial development. Hence, countries which are bank dominated can use this as a level of development of direct financing. A negative sign is expected for capital market development or relative size of market to banks.

Policy actions: Reserve requirement is a common form of taxation on banking as it reduces banks' profitability, causing increased intermediation cost and higher spreads. Another policy measure regarding reserve requirement is its remuneration. Central banks remunerate statutory required reserve to mitigate the social cost of this taxation. Whether this is true in all cases is included in our analysis. Half of the six countries covered in this study do not remunerate statutory required reserves with Mongolia halting remunerating since the 2nd quarter of 2002.

Merger and acquisitions are normally initiated or encouraged by the central banks/supervisory authorities in the SEACEN region while it has to be approved by the authorities in some countries. Banks gain some economies of scale with M&A since the aim is to reduce the social cost of intermediation and augment stability. There are two implications of M&A. With M&A, banks would enjoy a bigger market share and have more opportunities to exercise market power for a wider spread. Secondly, efficiency gain would reduce cost pressure and depending on market structure, banks may have a choice of higher profits and lowering operating costs. Therefore, if competitiveness curbs market power, this would have the effect of narrowing the spread or vice versa. 12 out of 40 banks in the analysis have undergone mergers within timeframe of this study.

Disclosure requirements involving consolidated financial information are ways to reveal the financial situation of banks and it is thus assumed to intensify competition. Therefore, the more transparent a system is, the more efficient and lower the intermediation cost will be.

The impact of interest rate restrictions is also analysed since Malaysia had imposed lending rate regulations for years and which was eventually eased out in 2004. At the same time, Malaysia introduced deposit rate regulations on certain types of deposits for a short period of time. The Bank of Korea still has some restrictions on deposit rate setting, one of the few remaining restrictions.

Others: Other specifications that might have impact on the spread are also considered. They include accounting losses of banks, financial year ending, and time trend. Losses may change the risk profile of banks or short-term decision to meet earning requirements set by stakeholders. There may also be some regular accounting adjustments at the end of the financial year, especially when considering ex post interest rates and not the contracted rates. Time trend is also included as the time span of the study falls in the post-Asian financial crises period and it is likely that banks made gradual adjustment in the pricing of loans.

5.2 Data Description

5.2.1 The Dependent Variables

Looking at the variability of the loans, deposits and spreads (Table 3),[36] loan rates vary more through cross sections in the overall sample, but within the country they vary more through time. Mongolia was an exception having more variation in the cross sectional data. Deposit rates display a similar pattern. However, the magnitude of coefficient of variations is closer for all samples. Deposit rates were more varied both for the cross sections and through time on a country by country basis.

Table 3
Variability of Spread and Interest Rates within Country Represented by the Coefficient of Variation

	All banks		Korea		Mongolia		Taiwan		Philippines		Malaysia		Sri Lanka	
	CS	T	CS	T	CS	T	CS	T	CS	T	CS	T	CS	T
Loan rate	76	28	6	20	48	38	11	34	25	35	12	23	14	13
Deposit rate	69	41	10	32	71	40	19	54	26	38	13	35	17	35
Spread	98	29	21	13	57	55	25	18	48	49	18	28	22	16

* 100: CS for Cross-sectional Variations and T for Variation Across Time
Source: Calculated by author on data provided by member central banks. Order of countries is by the date of data provided

36. Banks reportsome what higher income/lower expenses in the last quarter of financial year, which is reflected in calculation of implicit interest rates.

The spread did not have these varying patterns of loan and deposit rates as it varies in a much bigger scale for the cross sections. The country-by-country basis shows that cross section data varied in 4 out of 6 countries with variation more pronounced in Malaysia; while both time and cross section coefficient of variation were about the same in Philippines. Variations were higher in Mongolia and Philippines in both dimensions relative to the others. Variations in time were closer than in cross sections when they were compared for all sample coefficients to the average of country coefficients. Cross section variation coefficient of all banks is 98 against the average within countries' variation of 32. In contrast, time variation of all banks is only 29 against 30 as average of within country variations. This is a strong indicator of differences in mean, variations, and patterns on country to country basis.

In general, cross section variation of spread is more than cross section variations for both interest rates of the full sample and most of sub-samples. It is not only the case for Mongolia, where we observe most differences in terms of setting the deposit rate. In contrast, lending rates varied less for both dimensions. Korean banks seem little different from each other in setting their lending rates while Mongolian banks differ greatly in the setting of interest rates they pay depositors.

As was seen earlier, the spread level followed the level of interest rates but the variability is a direct relationship. Cross section variation is more determined by deposit rate variations. It is possible that interest rates vary in the opposite direction as cross sections, resulting in wider spreads. Perhaps, banks tend to keep the level of the spread in changing the interest rate environment. Since the intermediation spread is the composite of two distinct markets for lending and deposit taking, some of the major factors influencing the spread may have a greater impact on one set of interest rates or on both but in the opposite directions. The consensus seems to be that borrowers are less sensitive than depositors in terms of bank performance and therefore banks are less able to charge noticeably different levels of interest rates on loans when they have similar risk profiles.

5.2.2 The Explanatory Variables

The statistics of the explanatory variables are presented in Table 4 in terms of the whole sample mean with its variations. Implicit interest payment (IIP) varies much more than any other variables. Even money market volatility (MMV)

represented by the variances does not seem to fluctuate as much. The coefficient of variation (cv) or standard deviations per unit of mean can be used for this comparative judgement. Although, there is no significant differences for the cross sectional data, capitalisation will be treated to be country specific by the assumption that they will be subject to regulatory differences of capital adequacy. The risk weighted capital adequacies requirements are mostly at 8% of risk weighted asset, but in Mongolia and Sri Lanka they are at 10%. There are also differences in the treatment of Tier1 and Tier 2 capital bases in equity. Capitalisation here is not directly comparable with capital adequacy but indirectly will result in differences in the equity to asset ratio.

Table 4
Explanatory Variables: Full Sample With 40 Cross Section Units Altogether[37]

	mshr	oc	eq2a	mmv	npl	ln(loan)	eff	iip	concen	inf	mcap	sr
mean	9.8	1.0	7.7	8.1	11.1	13.07	36.8	-0.03	41.68	3.50	69.27	6.1
st/dev	7.1	1.1	6.6	36.4	11.5	2.83	23.8	0.85	17.03	3.6	51.77	3.5
obs	997	962	997	1000	973	992	962	963	1000	1000	1000	992
KV	72.7	114	86.3	450	103	21.63	64.5	2546	40.87	102	74.74	57

Source: Calculated using data provided by member central banks

To get a better understanding of the variations of variables in Table 4, the country to country differences are presented. As one would note, the differences are reflected in the individual country's financial development. In Table A1, the statistics of the variables used in the regression are displayed on country-by-country manner. Countries are divided in two groups: Group A includes Taiwan, Korea and Malaysia, where the spreads are lower and less volatile while Group B includes Philippines, Sri Lanka and Mongolia where the spreads are higher and more volatile. Apart from money market volatility and natural log of loans, these variables are in percentage form. Two banks with negative capitalisation were included but for empirical analysis they are excluded.

Banks' asset share in total banking assets were used such as market share. The market share in Mongolia indicates a high level of dominance of a few banks while the lowest market share were recorded for Taiwan at 11%. The operating cost is represented by non-interest expenses excluding loan loss provisions divided by asset in percentage. Data on operating costs were not uniform and as such, only the broader measure was used as a proxy. This was

37. St/dev: standard deviation; obs: number of observations; and,cv: coefficient of variations. Variables name see Table A1 of Appendix I.

low in Taiwan as the sum of total values of this variable across Taiwanese banks were much lower (sum of total value was 78) despite the fact that the number of cross section there is about twice as others. Capitalisation was calculated as a percentage ratio of equity to assets. Again there is considerable cross sectional differences in Mongolia, with the standard deviation of 15 against 4 in Sri Lanka or Philippines, which are next highest. Here we notice differences in the mean across countries. However, cross sectional differences are low in Korea.

GARCH variances of money market rates represent money market volatility (MMV), which is averaged from monthly variances within quarter. Data are taken from IFS and the CBC web data in case of Taiwan. The most volatility is recorded for Sri Lanka while the least for Malaysia. Maudos et al (2004) uses loan to asset for credit risk, but the NPL ratio is used in this study. The lowest is observed in Korea at 9% while on average, it is higher in the Philippines and Mongolia[38]. The natural log of the loan portfolio is specific for individual cases where domestic currencies are converted into natural log before regression. This variable represents the size of bank in the Dealership Model.

The efficiency ratio used to proxy for managerial efficiency is one of the two additional bank specifics. This is in percentage ratio of non-interest expenses to total income of bank, again operating expenses being approximated by non-interest expenses here to keep consistency in data across countries. Therefore, the ratio was prone to odds of high expenses. Irregular entries were in Mongolia and Taiwan. Three Taiwanese banks had irregular entries in 2nd quarter of 2002 and two more in 4th quarter, 2003. One irregular entry was bserved in 2nd quarter of 2000 in Mongolia[39]. The next additional bank specific, implicit interest payment (IIP), is non-interest expenses less other income as percentage of asset[40]. The value is smaller than those reported in quoted references. IIP has less variation within one country but has level differences among countries, which explains the huge variation in the whole sample. However, we do not have any reasonable argument to differentiate by country in the estimation of the whole sample. In fact, the within country variation may capture some of the not captured country specifics.

38. 0% of NPL in Mongolia is due to newly established bank.

39. Second Mongolian bank that had series of irregular entries will be excluded from analysis due to negative capitalization for extended period of time.

40. Approximation follows Saunders and Schumacher (2000).

Three variables representing country specifics are concentration, inflation and market capitalisation of stock exchanges as share of GDP. Concentration is the sum of market shares of the biggest three banks which data was received. In Taiwan and Philippines, they hold less than a third of market assets, but in Mongolia and Sri Lanka, the biggest three banks hold over 60 percent of banking system assets, albeit falling. Thus, we consider the former two least concentrated and latter two most concentrated. Hence, excessive market power is possibly possessed by big banks. Inflation is the 12-month percentage change of the CPI. "Group B" countries in Table A1 all has at least twice as high the average inflation of "Group A" countries. The most stable is in Malaysia while the most volatile is in Sri Lanka. Capital market capitalisation as percentage share of GDP is used to represent financial sector development. Apart from Sri Lanka and Mongolia, the market capitalisation of the other countries is about or more than 50% of GDP. Highly capitalised markets in Malaysia and Taiwan are larger than the GDP. We also consider the alternative variable of capital market development as the relative size to bank assets. The market-to-bank ratio is calculated as the percentage of banking system assets representing the relative importance of direct financing for business expansion.

Most of the policy action variables are dummies and was not displayed in Table A1. The only variable is the effective reserve requirement ratio in percentage. This is the statutory required reserve amount as a percentage share of total deposits of banks. Banks in "Group A" countries in Table A1 were enjoying lower levels of effective reserve requirement ratio. Level differences were encountered in variability in the whole sample. Other policy actions were represented by dummy variables. Statutory reserve requirement remuneration (SRR) dummy takes the value of 1 if statutory reserve is remunerated and 0 if not. Mongolia stopped remunerating since 2nd quarter of 2002 while Taiwan and Philippines continue to remunerate. The dummy for merger and acquisitions (D$MA) takes the value of 0 before merger and 1 afterwards. 12 banks were involved in one or two mergers. Disclosure requirement for better transparency (TRANSP) is represented by the income statement disclosure requirement or ownership disclosure requirements. The CBC, Taipei imposed disclosure requirement for income statement from 2nd quarter of 2002 while other countries apart from Philippines, are also required to disclose. Disclosure of ownership structure, however, is less common. The requirement is only seen in Korea and Malaysia as direct and indirect regulation respectively. In Taiwan, the requirement was introduced together with the income statement disclosure requirement. It takes the value of 1 if the requirement is imposed and 0 if not. Interest rate ceilings are represented by two separate dummies. Deposit rate ceiling

(DRRULE) takes 1 if any form of restriction is imposed and 0 otherwise. Lending rate rule (LRRULE) takes 1 in periods with maximum cap lending rate and 0 otherwise.

A few other dummies were used, including making for losses, financial year ending, and time trend. The dummy for making for losses (LOSS) takes 1 if there is loss and 0 otherwise. The year-end dummy (D$END), takes 1 at the last quarter of financial year, and 0 otherwise. Time trend is the discrete time trend. The assumption is that there may be time trend especially because time span follows closely after crises that require certain adjustment in time although it is acknowledged that countries may experience different patterns in time change. Time trend for each country comes first and it is left where relevant in combination with the common trend.

5.3 Estimation Results

The econometric programme, Eviews 5.1 was used to estimate the Model (1). The estimation method is the pooled GLS with period fixed effect only. Cross-sectional weights and additional specification of covariance matrix were included to be iterated up to convergence with simultaneous update of coefficients. The sample is balance of 760 observations covering 38 cross sectional units in 20 quarterly time periods from 6 different countries.

The formal test of random versus fixed effect and test of two ways fixed effects were conducted. The test results are reported in Table 5[41] and test outputs are in Table A3 and A4 of Appendix II respectively. Intuitively, the cross–sectional fixed effect would be detected because banks will have individual specific intercepts and also because the samples come from different countries. Two ways fixed effects were tested, because the sample analysed envelopes the period of active financial consolidation and after the 1997 financial crises adjustments. However, period fixed effects were not detected.

41. Chi-squire test statistics are reported, see details in the test output.

Table 5

Estimation Result Of Components of Intermediation Spread: Dependent Variable is SPREAD, 38 Banks, at Least 20 Period (Quarterly)

Description of Independent Variables		Variables	Coefficients	p-value
Market share in terms of asset		MSHR	-0.0620	0.013
Operating cost (OC) over asset in percentage		OC	0.1644	0.008
Degree of risk aversion by Equity/Asset (%)	Taiwan (TW: reference country)	EQ2A	-0.0875	0.000
	Korea (KR)	EQ2A*KR	0.1202	0.020
	Mongolia (MN)	EQ2A*MN	0.4362	0.021
	Philippines (PH)	EQ2A*PH	0.0710	0.417
	Malaysia (MY)	EQ2A*MY	-0.0570	0.238
	Sri Lanka (LK)	EQ2A*LK	0.2582	0.068
Money market volatility as market risk		MMV	0.0062	0.073
NPL ratio[42] in %, as credit risk		NPL	0.0159	0.025
Interaction of market and credit risk		MMV*NPL	-0.0005	0.041
Log of loan book as size		LOG(LOAN)	-0.8844	0.000
Operating cost/total income for efficiency (%)		EFF	-0.0106	0.000
Other expenses net of other income as IIP		IIP	0.4812	0.000
Market concentration by share of biggest 3 banks		CONCENTR	0.0656	0.000
Inflation		INF	0.0502	0.000
Capital market capitalization to GDP (%)		MCAP	-0.0001	0.871
Effective reserve requirement ratio		SR	0.0822	0.103
Statutory required reserve remuneration (Dummy) in interaction with effective reserve requirement ratio		SRR*SR	-0.1461	0.016
Dummy for 1st merger & acquisition		D$MA1	0.2513	0.018
Dummy for 2nd merger & acquisition		D$MA2	-0.2197	0.642
Transparency by income statement disclosure requirements (Dummy)		TRANSP	0.0129	0.778
Deposit rate ceiling dummy		DRRULE	0.2084	0.094
Lending rate restrictions		LRRULE	0.0973	0.670
Dummy for making losses		LOSS	0.0505	0.150
Financial year end dummy		D$END	0.0763	0.000
Common time trend		T	0.0618	0.000
Time trend for Taiwan (TW)		T*TW	-0.1148	0.000
Time trend for Philippines (PH)		T*PH	-0.0684	0.006
Time trend for Malaysia (MY)		T*MY	-0.0618	0.000
Adjusted R^2			0.9343	
Number of observations			760	
Hausman test			86	0.000
Cross section fixed effect test			140	0.000
Period fixed effect test			18	0.545

42. NPL ratio calculated as value of Non-Performing Loans to Total Value of Loan Portfolio.

The individual characteristics of each bank in different countries would contain many other aspects that are regarded as time invariant and effectively excluded from our fixed effect estimation. The fixed effect method by removing the period mean or GLS on period demean transformation allows consistent estimation of coefficients to be obtained without the time invariant factors (see Wooldridge 2002). The estimated results are understood to be the averages of the impact over the cross-section.

However, this gain in estimation by demean mentioned above is achieved at the cost of analysis in terms of some qualitative differences. Since the influence of time invariant variables is effectively eliminated, qualitative differences of policies of different central banks cannot be analysed using the fixed effect estimation unless there is a change or regime shift for country covered. For instance, the analysis of, in our case, a qualitative variable, would not be possible unless there is a regime shift as in the case of Mongolia in 2002. This also implies that in Mongolia, any interaction variable with the remuneration of statutory required reserve can be interpreted as such as in the case of the interaction variable between required reserve remuneration and effective reserve requirement ratio.

The estimation results are displayed in Table 5 and output included in Appendix II as Table A2. In general, the statistical results are significant for most variables, including the dummy variables. Implicit elasticity using partial effects and sample means are used, derived from the estimation to interpret the results (Table 6). From the results, the most influential factor is market concentration. A 10% increase may allow banks to widen spread by about 4½%. When market concentration increases the dominance of a few banks, this allows banks, or at least major banks, to increase their spread. Banks with higher market share tend to run with lower spread as a 10% rise would lower spread about 1%.

Operating cost (OC) has positive impact on spread. A 10% increase will see a ¼% increase in spread. This is expected as the higher the cost of running bank, the higher will be the spread to cover that cost. Degrees of risk aversions are significant in Korea, Mongolia and Sri Lanka and in terms of magnitude of the implicit elasticity terms, they differ from each other. Mongolian banks appear to be risk takers which may signal towards a relatively high risk level in that market. For instance, in the case of Mongolia, a 10% increase in degree of risk aversion would increase spread by 0.8% (calculation need to be done using sum of -0.09 and 0.44 from Table 5 above). This may imply that the relative high

spread is caused by banks' mark-ups due to the already high level of widespread lending risk.

Credit risk by NPL seems at least 3 times more important than market risk (MMV). Credit risk is likely to boost spread by almost 3% following a 10% rise. However, the interaction between market risk and credit risk has a negative impact on the spread but its effect is relatively small

Table 6
Impact on the Spread in Terms of Elasticity Calculated Using Sample Means and as Response to 10% Increase in Arguments of Main Continuous Time Variant Factors

Explanatory variables		Mean of explanatory variables	Estimated coefficients	Impact on the Spread of 10% increase of independent variables
Market share		9.462	-0.0620	-1.00
Operating cost		0.902	0.1644	0.25
Degree of risk aversion	Taiwan	8.398	-0.0875	-1.25
	Korea	0.796	0.0327	0.04
	Mongolia	1.333	0.3487	0.79
	Philippines	2.290	-0.0875	-0.34
	Malaysia	1.234	-0.0875	-0.18
	Sri Lanka	0.865	0.1707	0.25
Market risk		7.196	0.0062	0.08
Credit risk		10.329	0.0159	0.28
Interaction between market and credit risk		112.196	-0.0005	-0.10
Size		13.208	-0.8844	-1.51[1]
Managerial efficiency		35.255	-0.0106	-0.64
Implicit Interest Payment		-0.102	0.4812	0.08
Concentration in banking sector		40.417	0.0656	4.53
Inflation		3.343	0.0502	0.29
Effective required reserve ratio		5.965	0.0823	0.84

Note: The Mean of SPREAD is 5.858.

43. Loan is estimated in natural logarithm, thus coefficient estimated is semi-elasticity.

On *Priori*, the coefficient of the log of loans as the scale variable is positive because a bigger scale means higher operation costs. In our study, it is negative sign and highly significant[44]. This could mean that perhaps, the scale of economies matters here - when banks gain economies of scale, they become more efficient, resulting in narrower spreads. As loan exposure increases by 10%, the spread will decline by 1½%.

The results also show that management efficiency has significant impact on lowering spread. It lowers spread by more than ½% following a 10% rise in efficiency ratio. The impact of implicit interest payment(IIP) on the other hand is much smaller than anticipated. Its impact is less than 0.1% following a 10% increase. As for inflation, the impact is about 0.3% and positive as expected, which means keeping inflation down will contribute to lower spread by reducing the market risk and by ensuring financial stability, risk perception will also be lowered. The absolute size of the capital market is not significant.[45] In theory, if direct and indirect financing are complementary to each other, a bullish capital market will boost net-worth of borrowers, resulting in a higher demand for bank loans. Given a constant deposit rate, the spread will increase. However, if both channels of financing were substitutes, a boost in the capital market should have the opposite impact. Looking at Table 2, it appears that a capital market of significant size and high turnover velocity appear to lower the spread. However, in the panel data analysis, they are not significant in the individual bank's analysis, perhaps due to the limitation of the methodology since level differences were eliminated by the estimation.

Turning to policy measures, effective required reserve ratio positively influences spread. A 10% rate will increase spread by almost 1% as banks have to compensate for the opportunity cost. Certainly, taxation via reserve requirement will increase the cost of financial intermediation. As for the qualitative variables, we have to rely on the level impact interpretation using basis points. Remunerating for reserve requirement, which is the way to mitigate social cost, appears to be efficient at least in Mongolia because it lowers spread and social cost of intermediation.

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44. Coefficient of log of loan was negative and significant in case of European banks (Maudos et al 2004)

45. The variable, percentage ratio of market capitalisation to banking system assets is similarly not significant.

The results also show that mergers & acquisitions allow banks to gain considerable market power and after merger, the spread is higher by 25 basis points. However, there were no major differences when there is a 2nd M&A. As for the deposit rate ceiling variable, by imposing some selective regulation on deposit ceiling, banks managed to raise their spread by 21 basis points.

6. Conclusion and Policy Recommendations

6.1 Conclusion

Banks are the main provider of funds in the SEACEN countries. Efficiency in financial intermediation is seen through banks' spread between lending and deposit taking rates. Although the intermediation spread is very much a banker's decision in today's liberalised environment, it may also be affected by changes in market forces, regulation settings and other bank decisions. The analysis of spreads is very much dependent on data availability. A standardised format of measurement of spread is very much desirable for making comparison. For this purpose, the method suggested by the IMF for ex post interest rates seems to be a good alternative for the disclosure of interest rates[46]. For a more detailed analysis that involves individual commercial banks, one still have to rely on member central banks' support for supplying the available data.

The development of the SEACEN member countries' financial systems differs vastly as do the interest rate spreads. Intermediation spread, the cost of channelling funds via intermediaries, is lower in places where financial services are readily available. In other words, where there is a higher degree of financial deepening, the intermediation cost will be lower. However, financial deepening should not be encouraged solely so that the spread can be narrower as there is trade off between low spreads and profitability of banks and hence long run stability. One major finding is that the overall spread of the banking system will be lower when there is significant capital market development. Financial consolidation is vital to sustain the economy with a greater variety of available financial services. Through mergers and acquisitions, banks are able to improve their profitability and operational efficiency. In so doing, banks gain better abilities and opportunities for managing risks, thus gaining market power. This could result in higher intermediation spreads, as the social cost of financial intermediation

46. For the initiative in Mongolia, see Enhhuyag (2005)

has increased. It has been found that increased concentrations in banking allow banks to enjoy higher spreads which is not dependent on a country's level of financial development. This seems to be true for all banks regardless of their size.

On the other hand, narrow or negative spreads do not mean that it is a better solution for reducing the social cost of intermediation when there is a banking distress. However, in general, a narrower spread means greater efficiency of the banking system. The spread normally consists of the operating cost, risks that are generic to banking, and profits to owners. Interest rates are set according to the future risk evaluation. Therefore, it is common to have a higher spread where there is a greater risk perception. Likewise, the spread will be lower when there is less likelihood of risk and banks have operational efficiency. In short, narrower spreads signal efficiency in a stable economic environment but a wider spread does not necessarily mean that there is inefficiency either.

When comparing individual bank's spread, efficient banks that do not face operating cost pressure will go with a narrower spread and are usually bigger in size. Thus, bigger banks tend to have lower spreads. However, greater market power of banks can mean that the spreads can be increased. It has been found that spreads are narrowing as market power and share of banks shift as a result of M&A. The explanation may be that as competition tightens, concentration falls and bigger banks lead in their lower spread strategy, backed by the lead role and stable bases of operation. Thus if we have a positive relationship between spread and concentration, bigger banks would have a lower spread. In other words, in an efficient setting, competition in a liberalised market would force banks to be efficient and achieve a bigger market share. This consolidation allows them to widen the spread since competitive pressure is eased along with improved soundness.

In general, individual commercial bank's interest rate spread is peculiar to the bank and factors taken into consideration include the size, risks and choice in segments. Research has shown that the choice in segments matters as banks with higher non-interest earning assets tend to have higher spreads and this indicates that banks with bigger loan portfolios may have a lower spread. Risks, especially, credit risks, are an important factor for higher bank spreads. Risk perceptions vary among countries but generally they become more important where there is lower capitalisation. Credit risks are more important for the spread than market risks. The operating cost is also very important in deciding the spread as with the efficiency of bank management that can reduce the social

cost of financial intermediation. Although banks in the selected SEACEN countries are operating differently from each other, the study has managed to garner common factors that influence the spread.

6.2 Policy Recommendations

One major finding is that banking market concentration may have allowed banks to increase the spread. Thus, an equal balance of market power among competitors is an important consideration when bank consolidation takes place. It is also worth noting that even in a consolidated and competitive market environment, banks tend to increase their spreads when they are making losses. To ensure profitability, banks need to operate in a more efficient regulatory environment that reduces risks, especially credit risks, and perhaps, legal risks which would help in providing long run stability of the banking system.

As part of direct regulatory burden, the cost of statutory reserve requirement is also included in the cost of financial intermediation. By remunerating statutory reserves, authorities can mitigate this cost effectively. In line with the above discussion on concentration, mergers and acquisitions may allow banks to gain enough market power to boost their spread. However, these consolidations are in some sense, necessary for banks to increase in scale for better efficiency and profitability. In light of this, while consolidations may be expensive in terms of the cost of financial intermediation, it allows for the long run stability of the banking system through improved profitability of banks. On the other hand, concentration will be harmful if competition is stifled and banks are not allowed to compete fairly. However, consolidation that contributes to equalising market power among players would not be detrimental to competition.

Setting deposit rate ceilings is one way of preventing banks from getting into unproductive competition amongst themselves. However, as was discussed, the restrictions can make spreads and interest rates unresponsive to changes in banking performance. Once the banks are not sensitive to market signals, it would be difficult for depositors to make appropriate choices in their selection of banks. This may lead to the collapse of banks which will have a high cost on the financial system as a whole. The use of deposit rate restrictions or ceilings is therefore only reasonable for the short term as was the case in Malaysia.

Risks are another important factor in the consideration for spreads. Risk perceptions are reflections of the risk level in the market and therefore lowering the risk level will be a key consideration in the lowering of the spread. As far

as the spread is concerned, credit risk is important because lending is the core business of banks. Credit risks can be expensive for banks to bear through provisioning. Thus, measures to lower credit risks will certainly help to narrow the spread. In addition, it would be beneficial to further investigate the reasons for heightened risks perceptions in some countries as it was revealed that risk perceptions are country specific, at least for half of the selected SEACEN countries under study. It was, however, not possible to elaborate on legal risks and the impact of financial infrastructure in the analysis due to insufficient data sets.

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APPENDIX I

Variables and their Sources

- **Average lending rates of banking system:**

Average lending rates are annualized quarterly rates, or quarterly data that published by sources below. In Table 2, it has averaged with increasing time trend weight to take into account recent developments.

	Source	Name	Comments
Indonesia	EIU	Lending rate	End period
Korea	MSB	Principal Interest Rate on Loans and Discounts, on average balance of DMBs	End period
Malaysia	MSB	Average Lending Rate	Published by the BNM (end period)
Mongolia	IFS, EIU	Lending Rate	end period
Philippines	The BSP	Lending rates of commercial banks (weighted average in percent per annum)	Rates are same as it published in the EIU's country report
Sri Lanka	IFS	Minimum Unsecured Rate	
Taiwan	FSM	Weighted Average Rates on Loans (Domestic Banks)	Accessible as the Central Bank of China web site publication (pp147)
Thailand	IFS, EIU	Lending Rate	

IFS-International Financial Statistics by IMF;
EIU-Economist Intelligence Unit country report: web link is http://store.eiu.com;
MSB-stands for Monthly Statistical Bulletin of central banks;
FSM-Financial Statistics Monthly by the CBC

- **Average deposit rate of banking system:**

Average deposit rates are annualized quarterly rates, or quarterly data that published by sources below. In Table 2 it has been averaged with increasing time trend weight to take into account recent developments.

Indonesia	EIU	Deposit rate	End period
Korea	MSB	Average rate on DMBs' deposits	End period
Malaysia	MSB data used		Calculated as weighted average of interest by types of deposit
Mongolia	IFS, EIU	Deposit Rate	End period
Philippines	EIU	Deposit Rate	
Sri Lanka	IFS	Fixed Deposits	3 month (max)
Taiwan	FSM	Weighted average interest rate on Deposits (Domestic Banks)	Accessible as the Central Bank of China web site publication (pp147)
Thailand	IFS, EIU	Deposit Rate	

- **Interest rate**

In Table 2, the Interest Rate is represented by Average Lending Rate defined above.

- **M2, broad money:**

Standard definition of respective countries. Source: Seacen Financial Statistics (SFS)

- **GDP:**

Source: CEIC Economic Database by CEIC Data (SG) Pte Ltd: web link is www.ceicdata.com;

- **Relative size of banks:**

It is Assets of Deposit Money Banks over sum of asset of Deposit Money Banks, Monetary Authority and Other Financial Institutions.
Assets of DMB: Sum of from 22a up to 22d by IFS classification of IMF
Monetary Authority: 12a to 12c
Other Financial Institutions: 42a to 42d and 42h
Source: Electronic publication of IFS of IMF

- **Market capitalization as percentage of GDP:**

Source: CEIC

- **Turnover velocity:**[47]

Definition: The turnover velocity is the ratio between the turnover of domestic shares and their market capitalization. The value is annualized by multiplying the monthly moving average by 12:
Source: Statistics of World Federation of Exchanges, from web pages http://www.fibv.com/WFE/home.asp?menu=27&nav=ie

- **Market to Bank Ratio:**

Calculated as capital market capitalization over banking system asset in percentage
Source: CEIC for market capitalization and SEACEN SFS for banking system asset

- **Foreign Penetration:**

Provided by member central banks in response to survey questionnaire

- **Inflation and Growth Rate:**

Inflation as 12 months proportional change in CPI, growth rate is real GDP growth rate
Source: CEIC

- **Concentration:**

Concentration was calculated as sum of market share of biggest 3 banks in terms asset.
Source: survey questionnaire

47. Data in the Table 2 is weighted average of annual data 1998-2004 with increasing weight in time

- **Credit Risk:**

Represented by of Non-Performing Loan value as percentage share in total value of loan.
Source: CEIC in case of Indonesia, Korea, Malaysia, Taiwan and Thailand. The BOM web page for Mongolia; and, the CBSL provided for Sri Lanka

- **Data for individual commercial banks:**

Data described in following Table A1 was provided by the member central banks in response to the survey questionnaire. Calculation of specific variables is discussed in the report.

S: is spread
MSHR: market share
OC: operating cost
EQ2A: equity to asset ratio in percentage
MMV: money market volatility
NPL: NPL ratio
LOAN: value of loan portfolio (millions of local currency)
EFF: efficiency ratio
IIP: implicit interest payment
CONCENTR: concentration
INF: inflation
MCAP: market capitalization
SR: statutory required reserve as percentage share of total deposit represents effective reserve requirement ratio

Table A1. DESCRIPTIVE STATISTICS COUNTRY BY COUNTRY

GROUP A: Taiwan, Korea, and Malaysia has lower and less volatile spread

	S	MSHR	OC	EQ2A	MMV	NPL	Ln(LOAN)	EFF	IIP	CONCENTR	INF	MCAP	SR
TAIWAN													
Mean	2.503	5.654	0.295	6.476	0.352	4.548	13.480	24.095	-0.119	26.060	0.455	109.960	4.923
Maximum	4.000	11.060	0.778	10.658	1.701	12.833	14.148	61.724	0.509	26.740	2.747	152.209	10.383
Minimum	0.061	2.650	0.123	3.021	0.010	0.461	12.651	1.286	-1.020	24.950	-1.702	68.648	2.408
Std. Dev.	0.672	2.235	0.130	1.951	0.437	2.470	0.418	8.746	0.181	0.415	1.054	20.289	1.105
Sum	661	1555	78	1781	97	1251	3707	6361	-31	7167	125	30239	1354
Sum Sq. Dev.	119	1369	4	1043	52	1672	48	20118	9	47	304	112785	335
Observations	264	275	264	275	275	275	275	264	264	275	275	275	275
Cross sections	11	11	11	11	11	11	11	11	11	11	11	11	11
KOREA													
Mean	3.971	10.489	1.104	6.028	0.302	2.522	17.186	37.992	0.163	37.390	2.865	50.401	2.574
Maximum	6.647	24.330	8.096	9.638	4.069	8.636	18.649	87.454	1.240	44.580	4.913	73.334	4.915
Minimum	2.216	3.320	0.438	3.338	0.006	0.584	15.371	15.354	-0.497	24.890	0.507	29.679	0.732
Std. Dev.	0.919	4.729	0.939	1.378	0.797	1.723	0.669	13.771	0.226	6.020	1.113	10.682	0.989
Sum	476	1311	132	754	38	252	2148	4559	20	4674	358	6300	322
Sum Sq. Dev.	100	2773	105	235	79	294	55	22567	6	4494	154	14149	121
Observations	120	125	120	125	125	100	125	120	120	125	125	125	125
Cross sections	5	5	5	5	5	5	5	5	5	5	5	5	5
MALAYSIA													
Mean	3.956	10.318	0.353	9.347	0.038	9.870	17.160	20.541	-0.507	38.845	1.746	149.755	2.591
Maximum	6.059	21.092	0.687	13.151	0.318	18.352	18.409	36.977	0.225	42.150	5.064	224.769	3.679
Minimum	1.842	3.030	0.180	5.611	0.000	2.780	16.059	7.802	-2.129	30.640	0.675	113.517	1.336
Std. Dev.	0.637	5.065	0.080	1.829	0.082	3.621	0.616	5.842	0.404	3.383	0.868	25.260	0.528
Sum	475	1290	42	1168	5	1234	2145	2465	-61	4856	218	18719	324
Sum Sq. Dev.	48	3181	1	415	1	1626	47	4062	19	1419	93	79119	35
Observations	120	125	120	125	125	125	125	120	120	125	125	125	125
Cross sections	5	5	5	5	5	5	5	5	5	5	5	5	5

Source: Data provided by the member central banks of corresponding countries

Table A1. DESCRIPTIVE STATISTICS COUNTRY BY COUNTRY
Continued

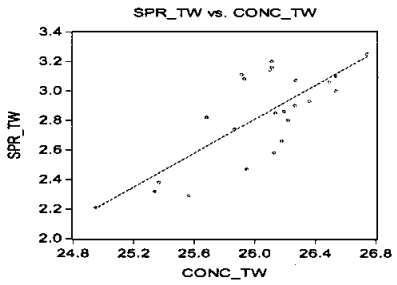
GROUP B: Philippines, Sri Lanka and Mongolia has higher and more volatile spread

	S	MSHR	OC	EQ2A	MMV	NPL	Ln(LOAN)	EFF	IIP	CONCENTR	INF	MCAP	SR
PHILIPPINES													
Mean	4.742	7.426	1.009	12.392	2.417	18.062	11.496	51.464	0.047	30.290	4.978	66.225	11.211
Maximum	22.258	13.756	2.479	21.263	15.682	57.266	12.350	80.003	0.925	33.960	9.842	98.406	16.532
Minimum	-1.082	1.488	0.551	6.661	0.004	5.801	10.078	24.611	-1.135	20.930	2.375	51.545	4.184
Std. Dev.	2.743	3.105	0.282	3.468	3.856	12.614	0.509	13.423	0.312	3.536	1.941	12.534	2.586
Sum	797	1300	170	2169	423	3161	2012	8646	8	5301	871	11589	1962
Sum Sq. Dev.	1256	1677	13	2092	2587	27685	45	30089	16	2176	655	27335	1164
Observations	168	175	168	175	175	175	175	168	168	175	175	175	175
Cross sections	7	7	7	7	7	7	7	7	7	7	7	7	7
SRI LANKA													
Mean	8.439	14.428	1.019	5.470	39.004	15.804	10.787	37.993	0.567	65.000	6.455	12.723	7.354
Maximum	13.786	32.440	1.598	12.335	384.477	27.146	11.749	71.865	1.205	69.000	15.556	21.089	13.025
Minimum	3.337	4.108	0.601	-3.338	0.431	5.455	9.500	22.451	-0.137	58.860	-1.945	6.618	3.397
Std. Dev.	1.836	8.746	0.149	3.534	87.024	4.698	0.579	6.680	0.192	2.962	4.739	4.535	1.682
Sum	1266	2164	153	820	5851	2371	1618	5699	85	9750	968	1908	1103
Sum Sq. Dev.	502	11397	3	1861	1128399	3289	50	6648	5	1307	3346	3064	422
Observations	150	150	150	150	150	150	150	150	150	150	150	150	150
Cross sections	6	6	6	6	6	6	6	6	6	6	6	6	6
MONGOLIA													
Mean	17.112	14.589	2.612	6.591	11.187	17.318	9.418	55.042	-0.371	66.192	6.372	3.413	6.759
Maximum	59.709	47.856	11.470	33.649	28.927	100.000	11.562	362.716	6.197	84.980	14.317	4.702	13.577
Minimum	-3.567	1.102	0.074	-67.879	0.819	0.000	5.718	1.785	-7.966	52.850	-1.573	1.820	0.279
Std. Dev.	10.900	10.994	1.919	14.864	9.354	19.529	1.488	46.614	1.951	10.214	3.799	0.803	3.367
Sum	2430	2145	366	969	1678	2563	1337	7706	-52	9929	956	512	960
Sum Sq. Dev.	16752	17647	512	32256	13036	56064	312	302023	533	15545	2151	96	1598
Observations	142	147	140	147	150	148	142	140	141	150	150	150	142
Cross sections	6	6	6	6	6	6	6	6	6	6	6	6	6

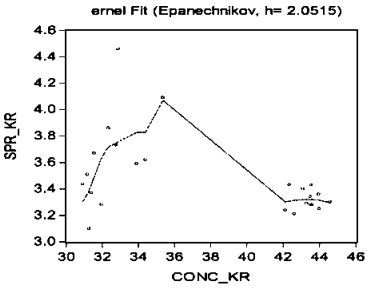
Source: Data provided by the member central banks of corresponding countries

Figure A1. Overall spread of banking system against market concentration as total share of biggest three banks: country by country

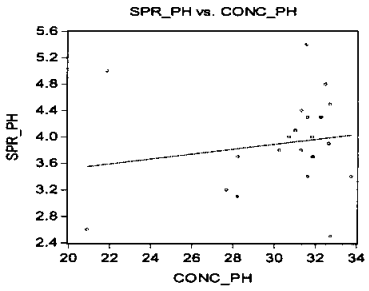
a) Taiwan



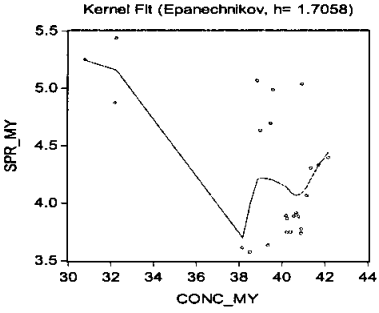
b) Korea



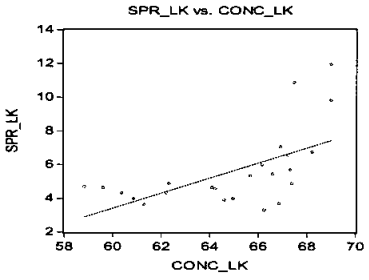
c) Philippines



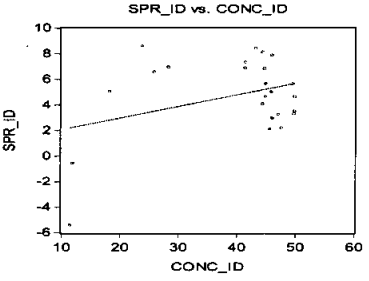
d) Malaysia



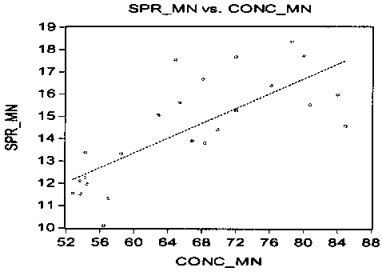
e) Sri Lanka



f) Indonesia



g) Mongolia



APPENDIX II

Dealership Model

The dealership model developed initially by Ho and Saunders (1981) was extended by Saunders and Schumacher (2000) and Maudos et al (2004). Empirical model (Maudos & et. ala (2004)) is as follows:

1. Bank maximizes expected utility of,

$$EU(W) = U(\overline{W}) + U'(\overline{W})E\left[W - \overline{W}\right] + \frac{1}{2}U''(\overline{W})E\left[W - \overline{W}\right]^2 \quad (1)$$

W being wealth with initial value of $W_0 = L_0 - D_0 + M_0$, where L_0, D_0, and M_0 are initial value of loans, deposits and money market assets respectively.

2. Bank sets deposit rate, when it receives deposit, as money market rate less some amount of a, to place new deposit in market until new loans are approved comfortably. Loan rate set as market rate plus b, if it being financed from the market until new deposit arrives or some loans repaid. These differences of deposit and market, loan and market rates are reflection of market risk of downward/upward interest movements. Thus deposit, loan rates and spread are:

$$\begin{aligned} r_D &= r - a \\ r_L &= r + b \\ s &= r_L - r_D = a + b \end{aligned} \quad (2)$$

Where, r_D, r_L, and s are deposit, loan rates and spread respectively.

3. The arrival of deposits and loan applications are random and independent from each other. Their probabilities are, however, decreasing functions of a and b separately. It is assumed that relatively bigger a and b discourages potential customers to approach bank on the ground of poor payoff and expensive loan. The probabilities are:

$$\Pr_D = \alpha_D - \beta_D a; \quad and \quad \Pr_L = \alpha_L - \beta_L b \quad (3)$$

Where, α, and β are bank's ability to attract customers and market elasticities of deposit supply and loan demand to respective interest rates. Thus, the ratio, α/β, will represent market power. If deposit supply is inelastic, small β_D, bank will be able to lower interest rate without seriously reducing a chance arrival of

new deposit and same way, in case of loan demand, bank may charge higher rate on loans.

Then, when new deposit arrives at the bank, it will be placed it in the money market, changing initial wealth by getting *a*, subject to market risk and bearing costs of processing deposits, C(D). If loan was demanded before deposit supplied, bank will borrow (or redeem asset) from money market charging *b*, again subject to market risk and bearing loan processing cost of C(L). With these, the final wealth after above will be:

$$\begin{aligned} W &= (1+r_w)W_0 + z_L L_0 + z_M M_0 - (C(L)+C(D)) \\ \overline{W} &= E[W] = (1+r_w)W_0 - (C(L)+C(D)) \end{aligned} \tag{4}$$

this is formulation of expected wealth without changes in D or L, and $r_w = \frac{r_I I_0 + rM_0}{W_0}$ is rate of return for initial wealth, where, $I_0 = L_0 - D_0$ net investment in loan or net credit inventories as defined in Maudos et al (2004) and it returns $r_I = \frac{r_L L_0 - r_D D_0}{I_0}$

The z 's are respective risks due to uncertainties in the markets. Risk in net credit inventories represented by credit risk z_L, since payment to deposit assumed riskless and market related changes in money market. Then we combine (4) in objective function (1) to get expected utility before new arrival of deposit supply or loan demand. It will be:

$$EU(W) = U(\overline{W}) + \frac{1}{2}U''(\overline{W})\left(L_0^2\sigma_L^2 + M_0^2\sigma_M^2 + 2L_0M_0\sigma_{LM}\right) \tag{5}$$

Here we have expected utility depends, among other things, credit risk represented by the variance of uncertainty in the profitability of loan, σ_L^2; market risk by variances of uncertainty in money market payoffs, σ_M^2, and inter-actions of credit and market risk represented by co-variances of uncertainties, σ_{LM}. Now it is possible to calculate change in *EU(W)* after new deposit supplied. Gain in expected utility $\Delta EU(\overline{W}) = EU(\overline{W}_T) - EU(W)$ will be:

$$\begin{aligned} \Delta EU(\overline{W}) &= U'(\overline{W})[aD - C(D)] + \\ &+ \frac{1}{2}U''(\overline{W})\left[(aD - C(D)^2) + (D + 2M_0)D\sigma_M^2 + 2L_0L\right. \end{aligned} \tag{6}$$

Here D is the new deposit supplied to bank and others as defined before.

Similarly, gain in utility after new loan has been made:

$$\Delta EU(\overline{W}) = U'(\overline{W})[bL - C(L)] + \frac{1}{2}U''(\overline{W})\begin{bmatrix}(bL - C(L))^2 + (L + 2L_0)L\sigma_L^2 + \\ + (L - 2M_0)L\sigma_M^2 + 2(M_0 - L - L_0)L\sigma_{LM}\end{bmatrix} \quad (7)$$

As before, L is the new loan made and a and b in (6) and (7) comes from pricing behaviour of bank mentioned earlier in (2). Further we combine (6) and (7) taking in account probabilities stated in (3), then it forms maximisation problem as follows.

$$\begin{aligned} &EU(\Delta W) = (\alpha_D - \beta_D a)\Delta EU(W_D) + (\alpha_L - \beta_L b)\Delta EU(W_L) \\ &\max_{<a,b>}(\alpha_D - \beta_D a)\Delta EU(W_D) + (\alpha_L - \beta_L b)\Delta EU(W_L) \end{aligned} \quad (8)$$

by substituting (6) and (7) into (8) we get FOC solution for a and b, then adding them as in (2) we get equation for interest rate spread between lending and deposit rates:

$$\mathbf{s} = \frac{1}{2}\left(\frac{\alpha_D}{\beta_D} + \frac{\alpha_L}{\beta_L}\right) + \frac{1}{2}\left(\frac{C(D)}{D} + \frac{C(L)}{L}\right) - \frac{1}{4}\frac{U''(\overline{W})}{U'(\overline{W})}\begin{bmatrix}(L + 2L_0)\sigma_L^2 + (D + L)\sigma_M^2 + \\ + 2(M_0 - L)\sigma_{LM}\end{bmatrix} \quad (9)$$

The ~~1~~st part ~~of~~ the equation represents banks' market power to enjoy with additional spread, or negatively speaking monopoly add-ups. The 2nd part bank are operation costs. The 3rd part is multiplied by the bank absolute degree of risk aversion. Banks are assumed to be risk averse, therefore, $U'(\overline{W}) < 0, U'(\overline{W}) > 0$ and thus their ratio is negative. The remaining can be considered as four different variables. Variances and co-variance represent credit risk, market risk and interaction of afore risk, which is quite natural for banking business. What was left is mostly bank size. The credit risk plausibly depends upon bank leverage, while interactions between the mentioned two risks related with banks frequent interaction with money market. Thus their action does not alter market in a significant manner. We should not expect big influences of this variable. In addition it is difficult to put prejudgement about the sign, as it is clear from (9) that it is related to the relative amount of new loan and money market asset.

Maudos et al (2004) introduced three other variables combined with other research findings. The first variable is the implicit interest payment (IIP), the expenses associated with subsidies for account holding expenses if bank serves customers as safe keeping institutions and other occasional promotion expenses. The second variable is the opportunity cost of holding liquid reserve or regulatory taxes due to statutory requirement of reserve and liquidity ratio imposed within prudential ratio assessment of banking. Both of them require holding of some reserve, sometimes exceeding banks' needs. The bank may run with excess reserve, more than required statutory requirement to meet liquidity to capital ratio requirements. It is therefore valid to take total liquid reserve in the empirical analysis.

Table A2. Estimation output: Dependant variable is SPREAD

Dependent Variable: S?
Method: Pooled EGLS (Cross-section weights)
Date: 04/03/06 Time: 10:31
Sample (adjusted): 2000Q1 2004Q4
Included observations: 20 after adjustments
Cross-sections included: 38
Total pool (balanced) observations: 760
Iterate weights to convergence
Cross-section weights (PCSE) standard errors & covariance.
(d.f. corrected)
Convergence achieved after 23 weight iterations

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	15.0751	2.3582	6.3926	0.000
MSHR?	-0.0620	0.0250	-2.4784	0.013
OC?	0.1644	0.0616	2.6682	0.008
EQ2A?	-0.0875	0.0195	-4.4907	0.000
EQ2A?*KR?	0.1202	0.0516	2.3291	0.020
EQ2A?*MN?	0.4362	0.1883	2.3170	0.021
EQ2A?*PH?	0.0710	0.0875	0.8117	0.417
EQ2A?*MY?	-0.0569	0.0482	-1.1810	0.238
EQ2A?*LK?	0.2582	0.1410	1.8308	0.068
MMV?	0.0062	0.0034	1.7976	0.073
NPL?	0.0159	0.0070	2.2524	0.025
MMV?*NPL?	-0.0005	0.0002	-2.0503	0.041
LOG(LOAN?)	-0.8844	0.1855	-4.7665	0.000
EFF?	-0.0106	0.0025	-4.3309	0.000
IIP?	0.4812	0.0872	5.5206	0.000
CONCENTR?	0.0656	0.0110	5.9771	0.000
INF?	0.0502	0.0105	4.7912	0.000
MCAP?	-0.0001	0.0005	-0.1623	0.871
SR?	0.0823	0.0503	1.6349	0.103
SR?*SRR?	-0.1461	0.0604	-2.4196	0.016
D$MA1?	0.2513	0.1057	2.3767	0.018
D$MA2?	-0.2197	0.4726	-0.4648	0.642
TRANSP?	0.0129	0.0459	0.2817	0.778
DRRULE?	0.2084	0.1243	1.6774	0.094
LRRULE?	0.0973	0.1891	0.5147	0.607
LOSS?	0.0505	0.0350	1.4399	0.150
D$END?	0.0763	0.0214	3.5619	0.000
T	0.0618	0.0137	4.5094	0.000
T*TW?	-0.1148	0.0136	-8.4535	0.000
T*PH?	-0.0684	0.0246	-2.7858	0.006
T*MY?	-0.0618	0.0147	-4.1944	0.000
Fixed Effects (Cross)				
_A--C	0.974182			
_B--C	1.137927			
_C--C	2.219925			
_D--C	-0.346766			
_E--C	-0.497635			
_F--C	2.784759			

_G--C	3.52414
_H--C	1.44756
_J--C	-2.11781
_K--C	4.463815
_L--C	0.050824
_M--C	-0.810543
_N--C	-0.783676
_O--C	-0.440424
_P--C	-0.029858
_Q--C	-0.196117
_R--C	-0.410823
_S--C	-0.774102
_T--C	0.591701
_U--C	0.74097
_V--C	-0.850148
_W--C	-0.67926
_X--C	-0.064367
_Y--C	-2.112212
_Z--C	0.601456
_AA--C	-1.711453
_AB--C	0.052446
_AC--C	-5.095729
_AD--C	2.845624
_AE--C	2.698076
_AF--C	4.362611
_AG--C	3.458993
_AH--C	2.801342
_AI--C	-3.727569
_AK--C	-1.53262
_AL--C	-5.145053
_AM--C	-2.444471
_AN--C	-4.985714

Effects Specification

Cross-section fixed (dummy variables)

Weighted Statistics

R-squared	0.940522	Mean dependent var	27.19759
Adjusted R-squared	0.934764	S.D. dependent var	21.98807
S.E. of regression	2.999404	Akaike info criterion	11.20831
Sum squared resid	6225.526	Schwarz criterion	11.62287
Log likelihood	-4191.158	F-statistic	163.3226
Durbin-Watson stat	1.609894	Prob(F-statistic)	0

Unweighted Statistics

R-squared	0.940522	Mean dependent var	5.860893
Sum squared resid	6225.53	Durbin-Watson stat	1.76326

Table A3. Random effect test (Hausman test standard Eviews 5.1 settings)

Correlated Random Effects - Hausman Test
Pool: POOL_FINAL_2_NPL_ORG
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	86.27309	24	0.0000

Cross-section random effects test comparisons:

Variable	Fixed	Random	Var(Diff.)	Prob.
MSHR?	-0.0767	0.0392	0.0032	0.0393
OC?	1.6668	1.7331	0.0150	0.5876
EQ2A?	-0.0297	-0.1163	0.0816	0.7616
EQ2A?*KR?	-0.5177	0.2991	0.1737	0.0500
EQ2A?*MN?	0.3314	0.4793	0.0916	0.6250
EQ2A?*PH?	0.2310	0.1653	0.1185	0.8486
EQ2A?*MY?	-0.2068	0.3046	0.1860	0.2357
EQ2A?*LK?	0.5392	-0.2676	0.2392	0.0990
MMV?	0.0030	0.0102	0.0000	0.0291
NPL?	-0.1508	-0.0846	0.0009	0.0253
MMV?*NPL?	-0.0003	-0.0008	0.0000	0.0440
LOG(LOAN?)	-3.0236	-0.8532	0.2077	0.0000
EFF?	-0.0905	-0.0765	0.0001	0.2376
IIP?	1.4470	1.3707	0.0179	0.5680
CONCENTR?	0.0950	0.1377	0.0011	0.1936
INF?	0.0225	-0.0169	0.0001	0.0005
MCAP?	0.0035	0.0026	0.0000	0.7706
SR?	0.1156	0.0270	0.0110	0.3991
SR?*SRR?	-0.2781	-0.0026	0.0106	0.0074
D$MA1?	1.8454	0.3567	0.1450	0.0001
D$MA2?	0.7132	-0.8709	0.2953	0.0036
TRANSP?	0.3981	0.3329	0.1470	0.8650
LOSS?	-0.5711	-0.8192	0.0125	0.0266
D$END?	0.5176	0.4373	0.0012	0.0185

Cross-section random effects test equation:
Dependent Variable: S?
Method: Panel Least Squares
Date: 04/01/06 Time: 10:21
Sample (adjusted): 2000Q1 2004Q4
Included observations: 20 after adjustments
Cross-sections included: 38
Total pool (balanced) observations: 760

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	45.0849	7.3289	6.1516	0.0000
MSHR?	-0.0767	0.0613	-1.2513	0.2112
OC?	1.6668	0.2949	5.6529	0.0000
EQ2A?	-0.0297	0.3036	-0.0977	0.9222
EQ2A?*KR?	-0.5177	0.4437	-1.1667	0.2437
EQ2A?*MN?	0.3314	0.3238	1.0236	0.3064
EQ2A?*PH?	0.2310	0.3553	0.6501	0.5159
EQ2A?*MY?	-0.2068	0.4459	-0.4637	0.6430

EQ2A?*LK?	0.5392	0.5100	1.0573	0.2908
MMV?	0.0030	0.0118	0.2569	0.7973
NPL?	-0.1508	0.0349	-4.3149	0.0000
MMV?*NPL?	-0.0003	0.0008	-0.4603	0.6454
LOG(LOAN?)	-3.0236	0.4856	-6.2264	0.0000
EFF?	-0.0905	0.0186	-4.8573	0.0000
IIP?	1.4470	0.2586	5.5960	0.0000
CONCENTR?	0.0950	0.0412	2.3059	0.0214
INF?	0.0225	0.0443	0.5068	0.6125
MCAP?	0.0035	0.0067	0.5235	0.6008
SR?	0.1156	0.1384	0.8351	0.4039
SR?*SRR?	-0.2781	0.1269	-2.1909	0.0288
D$MA1?	1.8454	0.5617	3.2851	0.0011
D$MA2?	0.7132	0.9635	0.7402	0.4594
TRANSP?	0.3981	0.5848	0.6808	0.4963
LOSS?	-0.5711	0.3578	-1.5963	0.1109
D$END?	0.5176	0.2411	2.1465	0.0322

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.770424	Mean dependent var	5.860893
Adjusted R-squared	0.750361	S.D. dependent var	5.57945
S.E. of regression	2.787712	Akaike info criterion	4.966378
Sum squared resid	5424.393	Schwarz criterion	5.344359
Log likelihood	-1825.22	F-statistic	38.39979
Durbin-Watson stat	1.979593	Prob(F-statistic)	0

Table A4. Two way fixed effect test

Redundant Fixed Effects Tests
Pool: POOL_FINAL_2_NPL_ORG
Test cross-section and period fixed effects

Effects Test	Statistic	d.f.	Prob.
Cross-section F	3.696361	-37,679	0.0000
Cross-section Chi-square	139.4643	37	0.0000
Period F	0.840619	-19,679	0.6584
Period Chi-square	17.67006	19	0.5446
Cross-Section/Period F	2.592339	-56,679	0.0000
Cross-Section/Period Chi-square	147.2552	56	0.0000

Cross-section fixed effects test equation:
Dependent Variable: S?
Method: Panel Least Squares
Date: 04/01/06 Time: 10:22
Sample (adjusted): 2000Q1 2004Q4
Included observations: 20 after adjustments
Cross-sections included: 38
Total pool (balanced) observations: 760

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	10.1237	3.0018	3.3725	0.0008
MSHR?	0.0436	0.0225	1.9424	0.0525
OC?	1.7370	0.2958	5.8720	0.0000
EQ2A?	-0.0629	0.0963	-0.6527	0.5142
EQ2A?*KR?	0.2199	0.1653	1.3306	0.1838
EQ2A?*MN?	0.4213	0.1101	3.8249	0.0001
EQ2A?*PH?	0.0924	0.0870	1.0620	0.2886
EQ2A?*MY?	0.2541	0.1088	2.3362	0.0198
EQ2A?*LK?	-0.3184	0.1353	-2.3538	0.0189
MMV?	0.0133	0.0120	1.1085	0.2680
NPL?	-0.0842	0.0175	-4.8093	0.0000
MMV?*NPL?	-0.0009	0.0008	-1.2377	0.2162
LOG(LOAN?)	-0.7379	0.1716	-4.2994	0.0000
EFF?	-0.0717	0.0161	-4.4597	0.0000
IIP?	1.2508	0.2353	5.3154	0.0000
CONCENTR?	0.1445	0.0260	5.5499	0.0000
INF?	0.0088	0.0514	0.1705	0.8647
MCAP?	0.0010	0.0085	0.1149	0.9085
SR?	0.0756	0.0917	0.8239	0.4103
SR?*SRR?	0.0172	0.0791	0.2172	0.8282
D$MA1?	0.3972	0.4317	0.9201	0.3578
D$MA2?	-1.1646	0.8109	-1.4363	0.1514
TRANSP?	0.2830	0.5419	0.5222	0.6017
LOSS?	-0.8547	0.3678	-2.3240	0.0204
D$END?	-0.0555	0.6868	-0.0808	0.9357

Effects Specification
Period fixed (dummy variables)

R-squared	0.730521	Mean dependent var	5.860893
Adjusted R-squared	0.714337	S.D. dependent var	5.57945
S.E. of regression	2.982072	Akaike info criterion	5.079265
Sum squared resid	6367.21	Schwarz criterion	5.34751
Log likelihood	-1886.12	F-statistic	45.13908
Durbin-Watson stat	1.656557	Prob(F-statistic)	0.0000

Period fixed effects test equation:
Dependent Variable: S?
Method: Panel Least Squares
Date: 04/01/06 Time: 10:22
Sample (adjusted): 2000Q1 2004Q4
Included observations: 20 after adjustments
Cross-sections included: 38
Total pool (balanced) observations: 760

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	45.0849	7.3289	6.1516	0.0000
MSHR?	-0.0767	0.0613	-1.2513	0.2112
OC?	1.6668	0.2949	5.6529	0.0000
EQ2A?	-0.0297	0.3036	-0.0977	0.9222
EQ2A?*KR?	-0.5177	0.4437	-1.1667	0.2437
EQ2A?*MN?	0.3314	0.3238	1.0236	0.3064
EQ2A?*PH?	0.2310	0.3553	0.6501	0.5159
EQ2A?*MY?	-0.2068	0.4459	-0.4637	0.6430
EQ2A?*LK?	0.5392	0.5100	1.0573	0.2908
MMV?	0.0030	0.0118	0.2569	0.7973
NPL?	-0.1508	0.0349	-4.3149	0.0000
MMV?*NPL?	-0.0003	0.0008	-0.4603	0.6454
LOG(LOAN?)	-3.0236	0.4856	-6.2264	0.0000
EFF?	-0.0905	0.0186	-4.8573	0.0000
IIP?	1.4470	0.2586	5.5960	0.0000
CONCENTR?	0.0950	0.0412	2.3059	0.0214
INF?	0.0225	0.0443	0.5068	0.6125
MCAP?	0.0035	0.0067	0.5235	0.6008
SR?	0.1156	0.1384	0.8351	0.4039
SR?*SRR?	-0.2781	0.1269	-2.1909	0.0288
D$MA1?	1.8454	0.5617	3.2851	0.0011
D$MA2?	0.7132	0.9635	0.7402	0.4594
TRANSP?	0.3981	0.5848	0.6808	0.4963
LOSS?	-0.5711	0.3578	-1.5963	0.1109
D$END?	0.5176	0.2411	2.1465	0.0322

Effects Specification
Cross-section fixed (dummy variables)

R-squared	0.770424	Mean dependent var	5.860893
Adjusted R-squared	0.750361	S.D. dependent var	5.57945
S.E. of regression	2.787712	Akaike info criterion	4.966378
Sum squared resid	5424.393	Schwarz criterion	5.344359
Log likelihood	-1825.22	F-statistic	38.39979
Durbin-Watson stat	1.979593	Prob(F-statistic)	0.0000

Cross-section and period fixed effects test equation:
Dependent Variable: S?
Method: Panel Least Squares
Date: 04/01/06 Time: 10:22
Sample (adjusted): 2000Q1 2004Q4
Included observations: 20 after adjustments
Cross-sections included: 38
Total pool (balanced) observations: 760

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	10.1253	2.9081	3.4818	0.0005
MSHR?	0.0441	0.0219	2.0094	0.0449
OC?	1.7509	0.2768	6.3248	0.0000
EQ2A?	-0.0728	0.0936	-0.7779	0.4369
EQ2A?*KR?	0.2312	0.1480	1.5617	0.1188
EQ2A?*MN?	0.4285	0.1059	4.0471	0.0001
EQ2A?*PH?	0.1187	0.0828	1.4339	0.1520
EQ2A?*MY?	0.2517	0.1054	2.3872	0.0172
EQ2A?*LK?	-0.3066	0.1317	-2.3269	0.0202
MMV?	0.0119	0.0118	1.0036	0.3159
NPL?	-0.0839	0.0172	-4.8851	0.0000
MMV?*NPL?	-0.0009	0.0008	-1.1884	0.2351
LOG(LOAN?)	-0.7538	0.1615	-4.6667	0.0000
EFF?	-0.0729	0.0143	-5.0947	0.0000
IIP?	1.2424	0.2247	5.5282	0.0000
CONCENTR?	0.1470	0.0247	5.9478	0.0000
INF?	-0.0206	0.0453	-0.4555	0.6489
MCAP?	0.0020	0.0063	0.3175	0.7510
SR?	0.0765	0.0876	0.8730	0.3830
SR?*SRR?	0.0062	0.0739	0.0840	0.9330
D$MA1?	0.3458	0.4067	0.8501	0.3956
D$MA2?	-1.0561	0.7902	-1.3364	0.1818
TRANSP?	0.3906	0.4576	0.8536	0.3936
LOSS?	-0.7892	0.3559	-2.2174	0.0269
D$END?	0.4310	0.2530	1.7037	0.0889

R-squared	0.727744	Mean dependent var	5.860893
Adjusted R-squared	0.718854	S.D. dependent var	5.57945
S.E. of regression	2.958401	Akaike info criterion	5.039516
Sum squared resid	6432.818	Schwarz criterion	5.191928
Log likelihood	-1890.02	F-statistic	81.86123
Durbin-Watson stat	1.661968	Prob(F-statistic)	0.0000