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MASTER THESIS

Determinants of Bank

Interest Margins in Mongolia

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Declaration of Authorship

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Abstract

Research on interest margin is an interesting issue since it has been one of the measures of banks efficiency as well as it defines a part of banking system development. This study investigates Net interest margin and its determinants of the Mongolian Commercial banks over the period of 2004-2010. Net Interest margin is determined by Bank Specific variables using Panel data estimation techniques. According to the estimation carried out for the Mongolian banking system, the evidence reveals that, net interest margin positively affects by the level of market concentration (Mongolian banks tend to increase interest margin when market concentration increases), by the level of Capitalization (higher the risk aversion tend to have a higher net interest margin), and operating cost as well as credit risk are negatively associated with interest margin.

JEL Classification

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Keywords

Net interest margin, Credit risk, Banking system, concentration, Foreign bank, Market structure

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Contents

List of Tables.....	5
List of Figures.....	6
List of Appendices.....	6
Master Thesis Proposal.....	7
1. Introduction.....	10
2. Literature review.....	13
3. Overview of Mongolian Economy and banking sector.....	25
3.1 Overview of the Economy.....	25
3.2 Overview of the Banking sector.....	31
4. Hypothesis and Technical issues.....	43
4.1 Hypothesis.....	43
4.2 Definition and theoretical background.....	44
4.3 Panel data estimation techniques	45
4.4 Measuring interest rate spread.....	48
5. Methodology and data.....	50
5.1 Theoretical Model.....	50
5.2 Data.....	51
6. Empirical estimation	
6.1 Model specification.....	52
6.2 Empirical estimation of the model.....	55
6.3 Empirical result.....	57
7 Conclusion.....	64
8 Appendix.....	66
9 Bibliography.....	76

List of Tables

		Page
Table 1	Literature of Studies Related to Commercial Banks Interest Rate Margin	24
Table 2	Moody's Rated bank's list in Mongolia	34
Table 3	Net Interest Margin in Mongolia	40
Table 4	Hausman test	47
Table 5	Data Description	52
Table 6	Variable Description and Expected Impact on the Bank Interest Margin	55
Table 7	Summary of Estimation Resulted by Pooled OLS, FEM and REM	58
Table 8	Summary of Test Result	59
Table 9	Other Diagnostics Test Result	61
Table 10	Robust Covariance Matrix Estimation Compared to the REM	62

List of Figures

		Pages
Figure 1	Quarterly GDP Growth trend by sector	26
Figure 2	GDP Contribution	26
Figure 4	Annual GDP Growth by Mineral vs Non Mineral	27
Figure 5	Major mineral Production	28
Figure 6	Construction growth	28
Figure 7	Quarterly inflation rate	29
Figure 8	Total asset of Financial sector	30
Figure 9	Financial sector composition	30
Figure 10	Loan indicators in banking sector	32
Figure 11	Banks loan composition by sectors	32
Figure 12	Non-performing loan	33
Figure 13	Outstanding deposit	33
Figure 14	Loan to deposit ratio	34
Figure 15	Distribution of loan market share	35
Figure 16	Total asset of non-bank financial institution	36
Figure 17	Loan indicators in Non-bank financial institution	36
Figure 18	Lending interest rate in Non-financial sector	37
Figure 19	Number of Saving and Credit cooperatives	37
Figure 21	Total assets in Insurance sector	38
Figure 23	Deposit interest rate (%) in Mongolia	40
Figure 24	Lending interest rate (%) in Mongolia	40

Master Thesis Proposal

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Determinants of Bank Interest Margins in Mongolia

Topic Characteristics: The factors which determine interest rate level in a banking sector are important concerns to both policy makers and banking industry. Mongolia is one of the countries which transformed from centrally planned economy to free market economy in early 1990. Therefore, this transition process brought many changes in the economy as well as financial industry In Mongolia. In some countries such as Mongolia, banks are main players in a financial market. At the same time Mongolia has extremely dependent on mining export, as well as its landlocked country. Those features make Mongolian economy more sensitive to any external shocks. Therefore to support economy by efficiency of the banking system is an important issue now days. Based on this role NIM and its determinants are the useful indicators of bank efficiency. From the theoretical and empirical point of view, a high level of interest spread has an ambiguous interpretation. Considering one view, a high level of spread causes an obstacle for the deepening of financial intermediation. If the deposit rate is a lower in the economy, depositors do not want to save their money in the banking sector and the flow of deposit decline. If the loan rate is a high, the demand of loan will dramatically decrease, and investment opportunity of the banking sector will decline. The high level of interest spread encourages to improve profitability of the banking sector and to strength banking financial position specially capitalization. A High level of margin may raise some problems, such as information asymmetry and banking regulatory environment. Therefore, it is important to analyze interest spread of the banking sector to explore whether the financial intermediation works efficiently. Hence, it is important to study the possibilities of having low-interest margin for increasing the efficiency of the banking sector, developing financial sector, and growing the economy because so far there has been no related literature in case of Mongolia. Thus, the purpose of our thesis is to analyze interest margin of a banking sector and to identify its main determinants.

Hypotheses:

1. The ownership structure of the bank explain the difference of the interest margin across Mongolian banks.
2. The market concentration affect negatively the interest margin.
3. The risk aversion is correlated positively with the interest margin.

Methodology:

In order to analyze interest spread, we will work on the Dealership model firstly introduced by Ho and Saunders (1981) and next generation models extended by other authors and use panel data estimation technique. We are going to use “ex-post” spread approximated by using items in the balance sheet and income statement of individual banks.

Basically, an empirical evidence suggests that the bank ownership, market concentration, risk aversion such as market risk, liquidity risk, and credit risk, and efficiency have the most significant effect on the interest margin in developing countries and transition economies.

The thesis is structured as follows: chapter 1, represents literature review on examining the determinants of interest margin in the banking sector. Chapter 2, provides current economic and financial markets review. Chapter 3 contains a main hypothesis and some technical issues. Chapter 4 provides the main theoretical model and data. Chapter 5, explains empirical model and its estimation. In Chapter 6, we will cover an outline of the methodology and describe data used in the analysis. Chapter 6 interprets an empirical estimations results, finally we will provide a conclusion.

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1. Introduction

The banking sector is a crucial role in the financial intermediation process for developing countries. Berglof and Bolton (2002) show that the financial system is strongly dominated by commercial banks in the transition economies. Mongolia transformed from a centrally planned economy system to a free market economy system during the early of 1990. The transition process has brought many changes into the economy of Mongolia, especially in the banking sector. The banking system moved from a one-tiered to a two-tiered in 1991.

In 2013 Mongolian total asset of the financial sector reached at MNT 25.3 trillion (USD 15.25), 82.5%¹ of which is the asset of the banking sector. That implies the financial system in Mongolia primarily based on the banking sector.²

Above statistics clearly show that banking sectors are the main resource of funds in Mongolia.

Mongolia is small open economy country and landlocked between China and Russia therefore economy is strongly dependent on imports as well as mining exports. It makes Mongolian economy extremely sensitive. At the same time banking sector plays an important role in a financial market as well as economy. When intermediary works efficiently, it could support even growth of the economy. Therefore, it is an important issue to examine interest margin which is useful and important indicator to measure efficiency of the banking sector. Furthermore, (Hadad et al, 2003) an efficient intermediation means a lower cost, it indicates by a low net interest margin also it reflects monetary policy as well as country's financial stability to be effective.

Therefore it is necessarily to take attention into Net interest margin and its determinants. Those attractions are driving us to study a financial market and more specifically to explore NIM and its determinants.

Interest margin in Mongolian banking sector dramatically decreased from 24% to 6% during the period between 2002 and 2013³. However, the level of NIM is still higher than developed

¹Mongolian national bank

² Mongolian National bank: www.mongolbank.mn

countries. From a policy maker point of view, lower lending rate is desirable because it tend to influence positively on investments. On the theoretical and empirical view, a high level of interest spread has an ambiguous interpretation. Considering one view, a high level of spread causes an obstacle for the deepening of financial intermediation.

If the deposit rate is a lower in the economy, depositors do not want to save their money in the banking sector and the flow of deposit decline. If the loan rate is a high, the demand of loan will Dramatically decreases, and investment opportunity of the banking sector will decline.

Furthermore, a high level of margin may raise such problems of information asymmetry and banking regulatory environment. On the other side, a high interest spread level encourages to improve profitability of the banking sector and to strength banking financial position specially capitalization, which helps to protect the banking sectors against possible negative shocks.

In general, the empirical evidence of previous studies suggests that the bank ownership, market concentration, risk aversion such as market risk, liquidity risk, and credit risk, and efficiency have the most significant effect on the interest margin in developing countries and transition economies. Micco, Panizza, and M.Yanez (2007), John P. Bonin, IftekharHasan, and Paul Watchel (2005), and ZuzanaFungáčová and TigranPoghosyan (2011) showed as their studies that foreign-owned banks are more cost-efficient than domestic private and public banks and domestic banks tend to have higher profitability and lower cost than the state owned. These results imply that having more foreign-invested banks leads to less interest margin in the banking sector. As a result of the work of Saunders and Schumacher (2000), ZuzanaFungáčová and TigranPoghosyan (2011), Chortareas, Garza-Garcia, &Girardone (2012), the competition of bank industry are negatively related to the interest rate spread. Market risk due to the changes in macroeconomic and macro-policy indicators such as interest rate, inflation, GDP growth, government expenditure, and exchange rate have a positive effect on the interest margin in the banking sector (Saunders & Schumacher 2000; and Maudos&Fernandez de Guevara, 2004;

³Federal reserve bank of ST.Lousresearch.stlouisfed.org

Tennant and Folawewo, 2009; Kasman et al., 2010). Kasman et al. (2010) and Chortareas, Garza-Garcia, & Girardone (2012) examined the impact of managerial efficiency on the interest margin. The result shows that increasing efficiency tends to decrease significantly the interest rate spread. All those previous studies show that bank specific variables and its determinants are an important concern to measure efficiency of intermediary. Also efficient intermediary supports growth of the economy.

Therefore, The purpose of the thesis is to analyze Net interest margin of Mongolian banking sector and to identify the main determinants. As well as to explain the behavior of Net interest margin also to find out which variable is leading to the most changes in NIM behavior. In order to do that, we will work on the Dealership model firstly introduced by Ho and Saunders (1981) and next generation models extended by other authors and use panel data estimation technique. We are going to use “ex-post” spread approximated by using items in the balance sheet and income statement of individual banks. The thesis will focus on microeconomic determinants of interest margin not macroeconomic determinants included. Because any changes in macroeconomic variables should be captured to microeconomic variables already.

Our study result shows that bank specific variables such as market concentration, capitalization, credit risk, operating cost have a significant effect on Net interest margin except foreign investment share. More details about significant level of the variables covered in the estimation result.

The thesis is structured as follows: In the first chapter, we will review the literature on examining the determinants of interest margin in the banking sector and discuss the main theoretical and empirical results. Chapter 2, we are going through Mongolian financial sector and economies current situation. Next Chapter, provides a theoretical background as well as main hypothesis that is necessarily to approach to the next point. Chapter 4, explains an outline of the methodology and describe data used in the analysis. Chapter 5 provides empirical model and its estimation. Chapter 6 interprets a regression result. Finally, we provide conclusion and appendixes which include additional regression results.

2. Literature review

Recently, a large literature has developed examining the determinants of interest rate margin theoretically and empirically. Majority of the literature found on this issue has developed based on the model proposed by Ho and Saunders (1981) who built up a two-step estimation procedure to test their model. This model has been one strand of the literature. In the model, bank assumed to be risk-averse and act solely as an intermediation between lenders and borrowers of funds in the banking sector with monopolistic competition. As a result of the model, main factors determining the margin is the level of risk aversion, the size of transactions, market structure of the banking system, and the variance of interest rates.

Based on this empirical approach, Saunders and Schumacher (2000) analyzed the determinants of interest margins in six European country and US over the period 1988-95 and estimated the model using panel data technique. They found that the degree of bank capitalization, bank market structure, and the volatility of interest rates affect the interest rate margins. Similarly, as a result of another study of the case of seven Latin American countries during the period of 1900s also based on the model of Ho et al. (1981), the factors such as liquidity and capital risk at the bank level, and by interest rate volatility, inflation and GDP growth at the macroeconomic level determine bank margins (Brock, P.L. & Suarez, L.R. 2000).

Lerner (1981) criticized the model of Ho et al. (1981) because the bank is not firm which has a particular production function related with provision of the intermediation services. Maudos and Fernandez de Guevara (2004) extended the dealership model of Ho et al. (1981) introducing operating cost and distinguishing market risk and credit risk affecting margin in response to the criticism of Ho et al. model (1981). They found that the introduced variables have a significant effect on bank interest margin.

The other extended dealer model by Allen (1988) tells that pure interest margin has tended to be reduced when cross-elasticity of demand among bank products is considered. The benefit of

bank depends on the diversified portfolio effect which associated with the demands due to interdependent bank services and product type. In such a way, the dealers try to maintain its inventory risk exposure at the low level.

Demirgüç-Kunt and Huizinga (1999, 2004) attempted to analyze the interest margin using an alternative approach which means a single-stage regression technique based on a behavioral model. The model feature is to include a variety of potential factors of the interest margin. They analyzed the determinants of bank interest margins and bank profitability using bank-level data for 80 developed and developing countries. As a result, the interest rate margin affected by a large number of indicators such as macroeconomic condition, bank market concentration, bank taxation, deposit insurance regulation, overall financial structure, and several legal and institutional indicators. They suggested that banks that have high operating cost, capitalization, leverage tend to have a high net interest margin, for those who have high non interest earning asset tend to have a lower margin.

According to the above study, Claeys&Vennet (2008) analyzed whether low degree of efficiency or non-competitive market conditions in the banking sector causes relatively high interest margins of banks operating in Central and Eastern Europe countries (CEEC) and whether the foreign and state owned bank influence it using panel data technique. As a result, more efficiency leads to significantly less margin while bank market structure does not much explain the margin. Also, the existence of foreign bank reduced the bank interest margins.

Micco, Panizza, and M.Yanez (2007) analyzed the impact of the bank ownership on interest margin using the dealership model. In the model, the banks are assumed to use similar business strategies and a similar set of determinants of interest margin influencing the banks' profitability disregarding their ownership. They estimated empirical model for developing and industrial countries separately. One of the results is that if the ownership structure of the bank is private and in developing countries, it is more likely to have higher profitability and lower costs than state-owned banks. This result also holds for foreign banks, but in case of developed countries this relationship is not observed in their data set. Moreover, more interesting finding

is that the election years cause the differential of performance between public and private banks to widen furthermore.

Similar result can be found from the work of Drakos (2003) and John P. Bonin, Iftekhhar Hasan, and Paul Watchel (2005) who examined this issue in transition economies. Their result emphasized that foreign-owned banks are more cost-efficient than other banks while government-owned banks are less efficient in providing services (Bonin, Hasan & Wachtel 2005). Also, the most recent work of Zuzana Fungáčová and Tigran Poghosyan (2011) analyzed the determinants of interest margin using a unique bank-level data for the period of 1999-2007 in case of Russia. They found a similar result as previous literature that common determinants such as market structure, credit risk, liquidity risk and size of operations have a different effect on the profitability for state-owned, domestic-private and foreign-owned banks.

Recently, the work of Kit Pong Wong (2011) has brought new theoretical approach in the literature. He investigated the optimal interest margin of the bank with the assumption in which the bank is either risk-averse or regret-averse. The model based on previous main literature contributed by Wong (1997), Zarruk (1989), and Zarruk and Madura (1992) who used a firm-theoretical approach. His main finding is that the impact of introducing regret-averse on the optimal bank interest margin depends on the level of probability of default.

The more recent work considering the fiscal and monetary policy effect on the interest rate margin in detail is of Tennant and Folawewo (2009). They examined this issue using dynamic panel estimation techniques for 33 in low- and middle-income countries. As a result of empirical research, only one variable, the banking sector requirement, among the market specific factors has a positive effect on interest rate spread. For macroeconomic policy determinants, inflation, government excess expenditure (government crowding-out) and the discount rate influence significantly the interest rate margin (Tennant & Folawewo, 2009).

Kasman et al. (2010) attempted to explain the bank interest margin by using new explanatory variable which is the financial reform. They examined the impact of this variable in the banking

system of new European and candidate countries. The results suggest that size of the bank and managerial efficiency are negatively and significantly correlated with net interest margins.

Chortareas, Garza-Garcia, & Girardone (2012) used another measurement approach such as structural and non-structural measures, and non-parametric estimate for measuring the competition and efficiency respectively to examine the determinants of bank interest rate margins in case of Latin American countries. They estimated the panel regression using General Method of Moments (GMM) for data covering the period 1999-2006 in over 1700 banks. More interesting result shows that increasing the efficiency and the competition of the market leads to lower interest rate margin.

Dairo Estrada, Esteban Comez and Ines Orozco's paper analyzes determinants of interest margin in Colombian bank. It is also one of the interesting paper. They used two-step approaches to estimating interest margin, as well as the pure spread. In the First step, they covered almost 85 financial institution over 11 years starting 1994-2005. Using these dates they attempt to determine interest margin and a series of pure spread. In the second step using that series to get a coefficient of market power. And regression result shows that the most significant determinants of interest margin are Operational and other financial costs, credit risk as well as efficiency. Another important finding was that there is a positive relation between interest rate margin and pure spread. The Last thing should be highlighted in the paper is the relationship between mergers and net interest margin. According to their finding, mergers increases market power and improving efficiency as the result it could have negative result on net interest margin.

Samy Ben Naceur (2003) investigates his paper in Tunisian banking sector's net interest margin and its profitability, more specifically paper investigates the impact of bank structure and macroeconomics indicators on net interest margin and bank's profitability.

Empirical model contains internal and external variables. For internal indicators, they use capital ratio, loan and liquidity ratio, and external indicators include GDP growth and inflation. Fixed effect, as well as random effect models are used. Empirical result says that banks with

high net interest margin and profitability associated to the banks that hold a high amount of capital as well as banks loan has positive and significant impact on net interest margin. Another finding shows that the size of the bank has negative and significant impact on net interest margin. One of the important findings was that macroeconomic indicators such as inflation and growth rate have no impact on Tunisian banks interest margin as well as profitability. Last thing should be noted from paper was the concentration of banking sector is less efficient in Tunisian banking industry. Also, Stock market development has a positive relation to the bank's profitability.

Dagva Boldbaatar (2000) investigates his paper to analyze interest rate spread in south east Asian countries such as Korea, Malaysia, Mongolia, Philippines, Sri Lanka, Taiwan. Analysis covering those six countries total 40 banks over 6 years of data from 1998-2004. The model used in the study is Ho and Saunders Dealership model. Empirical model includes Bank specifics (market share of banks), country specific (market concentration), Policy action (reserve requirement and mergers, acquisitions) and Other variables (accounting losses).

The estimation method is GLS with fixed effect. Result shows that when market concentration increases it leads most of dominance bank to increase their spread. Banks with high market share tend to lower spread same as Tunisian case. Also operating cost and spread has a positive relationship. According to a degree of risk aversion, Mongolian banks are higher risk takers. Another important finding is that relationship between management efficiency and interest spread. When there is 10 % rise in efficiency ratio it lowers interest spread by ½%.

Banks required reserve ratio and spread has a negative relation. When ratio increases by 10%, spread decreases by 1%. Inflation has a positive impact on interest spread as all of the previous study. In South East Asian banks case when inflation increases spread increases by 0.3%. Mergers and acquisition lead bank to be a dominance in the market, therefore banks tend to increase its spread. Last important finding is that a banking sector in South East Asian countries are the main provider of all financial services and funds. Also, authors find out that the credit risk is more important factor on spread than market risk. Same as most literature when banks

are efficient that they do not face high pressure to cover huge operating cost it helps them to keep interest spread as low as possible.

Banks with high non-interest earning assets have higher spread comparing to those which have smaller non-interest earning assets therefore whose loan portfolio is big might have lower spread as well.

Caliste Ahokpossi (2013) in his work, he attempts to determine interest margin In Sub Saharan Africa. Since Sub Saharan countries banking sector development is very low, compared to the other countries. Therefore, bank lending and deposit services are low and it results that interest rate margin is higher than other countries around the world. Author focused on some certain variables which have more distinct influence with interest margin. Such as market structure, concentration, size of the banks, liquidity risk as well as credit risk. Empirical research covers over 456 Sub Saharan African countries banks during the period of 1995-2008. Same as most of the study, Author considers three common factors which affect interest margin(Bank specific factors, Macroeconomic condition, market structure and regulatory environment).

Empirical result shows that, one of the important factor market concentration and interest spread has positive relation, but the first result showed market structure even insignificant and negative, however, authors found out (interaction of market concentration and bank inefficiency) two variables relation depend on bank efficiency, as well.

Ownership of banks has no difference on interest margin. Foreign owned bank and domestic banks both have same, similar result. Also, they found out that the public banks are less profitable than private banks in Sub Saharan countries. One of the different findings of previous literature was they found no evidence between market share and interest spread. Their result shows that the variable of market share is insignificant. Same as previous study bank specific and macroeconomic factors are all significant and have a huge impact on interest margin.

Oliver, Christoph, Benedikt, Macro Wilkens (2012) discussion paper of German universal bank over a period between 2000-2009. Augmented dealership model by Ho and Saunders is

applied in empiric study. More interesting thing is the Authors tested margin separately, such as interest income margin, and interest expense margin. Interest income margin is defined by interest income divided interest earning asset, interest expense margin is defined as interest expense divided by interest paying liabilities. Empirical result shows three different terms. First net interest margin, interest income margin, finally interest expense margin.

Net interest margin: market power is highly significant impact on NIM, when market power increases by 10% it leads Net interest margin nearly 11%. Operating cost also has a positive impact on net interest margin. Separating of interest income and interest expense margin helps to see clear which one of loan and deposit drive to the result that is shown in net interest margin. Market power is significant and has a positive impact on both of interest income as well as interest expense. But magnitude of the coefficient of both interests, its more powerful effect shown on the asset side. Expected excess holding period return has a negative sign same as Net interest margin. But in separation it becomes more stronger effect than the net interest margin. Interest rate volatility is significant both loan and deposit as well its significant. Bank risk aversion has a significant impact on interest income. Also, they found out that loan fee determinants lead to the result that has shown in net interest income.

Roman Horvath (2009) examined determinants of net interest margin In Czech republic' over 25 banks quarterly date from 2001-2006. Net interest margin regressed against stock market capitalization, corporate income tax, government ownership and operating cost, capital adequacy, credit risk and so on. Their main finding is that more efficient bank tends to a have lower margin. And also they found out that there is no evidence that the bank with a lower margin tends to compensate themselves with a higher fee. Also, there is a positive relation between price stability and interest margin as well as bank who have higher capital adequacy is associated with lower margin.

Mirna Dumičić and Tomislav Ridzak (2012), authors analysis main determinants of net interest margin in Central and Eastern European banks from the period 1999-2010. They used GMM estimator proposed by Arellano Bover. GMM estimator is robust in endogeneity problems therefore it allows to for inclusion of lagged dependent variable together with fixed effects to

control for unobserved heterogeneity.⁴Also, their data set used to for analyzing is relatively small time dimension and has large cross section. So the problem mentioned here can be solved by using GMM.

They included three groups of explanatory variables in the model. First one is bank specific, then country specific macroeconomic variables as well banking market specific variables.

Macro specific variables include, GDP, Current account, Government debt, inflation, a country spread, regulatory cost. Banking market specific variables include concentration. They used share of country total asset held by three largest banks.

Their main findings suggested that there are several variables that drive to decline net interest margin such as strong capital flows and stable macroeconomic environment, for example, stable inflation growth, interest rate both for short and long term, as well as decrease of non-performing loan level. And several variables drive net interest margin high. For example, high level of government debt, caused by high demand of credit. Same as the previous studies, increasing efficiency leads decreasing margin.

Since there are many studies carried out for the determination of net interest margin for specific economies, first of all, I am going to summarize some of the econometric results here. The dealer model of Ho and Saunders (1981) later extended by Saunders and Schumacher (2000), is applied for plenty of different authors studies of examining the impact of explanatory variables (bank specific, macroeconomic factors) on net interest margin.

Demirgüç-Kunt and Huizinga (1999) analyzed 80 countries banks in their study, and they concluded that the net interest margin is pretty higher in transition economy countries than from those developed countries. Also, they suggested that one of the bank specific factors, foreign investment banks tend to have higher net interest margin in developing countries than those developed ones. And finally they suggested that the reason of why foreign invested bank tend to have a higher margin in explained because of technological advantage and development compared to domestic banks. As well as some asymmetric information might be the other reason.

⁴MirnaDumičić and TomislavRidzak(2012)

Since we are interested in, to compare some of the bank specific factors which were included in our model with other authors results. It is much more useful, if we include a different authors conclusion for the each and every one of the variables in our model. Therefore we summarized all literatures that I have been go through to the six most useful bank specific variables.

Operating cost: in the study of Maria-Eleni K. Agoraki (2008), Maudos and Guevara (2004) they conclude that operating cost and interest margin have a positive relation, higher cost means higher net interest margin. This result is consistent in Louvti Rodney Sidabalok (2012) banks with high operating cost tend to set higher interest rate on credit and low interest on deposits that lead higher margin. Ho and Saunders study did not include this variable but later many authors are criticized this fact. Liebeg and Schwaiger (2006), Estradaet.al (2006), Naceur(2003), Affanasief et al.(2002), also found a positive correlation between interest margin and operating cost.

Capital adequacy: Demirgüç-Kunt and Huizinga (1999), Saunders and Schumacher (2000), Louvti Rodney Sidabalok (2012), Maria-Eleni K. Agoraki (2008), found a positive relation between interest margin and capitalization. They conclude that higher risk aversion means higher net interest margin. But some other studies have opposite results. For example, Brock and Franken (2002) found a negative impact. They said more capitalized banks tend to be conservative to issue a loan because of the risk of shareholder's equity, therefore, interest margin might be lower.

Credit risk: Most of the studies found a positive relation between credit risks (nonperforming loan) net interest margin. Demirgüç-Kunt and Huizinga (1999), Louvti Rodney Sidabalok (2012), Maria-Eleni K. Agoraki (2008), Brock and Franken (2002) found a positive relationship between interest margin and credit risk. Higher the level of nonperforming loan means the higher will be a credit risk. Because all the losses from nonperforming loans, banks have to cover by increasing loan rate.

Size of Operation: Louvti Rodney Sidabalok (2012), Maudos and Guevara (2004) concluded a negative correlation between the size of the bank and net interest margin. They said that growing size of the bank tends to set lower interest margin. Maria-Eleni K. Agoraki (2008),found

a positive effect of bank size on NIM it means larger the bank, higher the risk of failure. Therefore, banks tend to set higher net interest margin.

Ownership: Calixte Ahokpossi (2013) found out there is no difference between foreign and domestic owned banks. Maria-Eleni K. Agoraki (2008), Maria Soledad Martinez Peria (2003) Foreign ownership, resulting to increased availability of market based finance and thus to increased competitive pressures that will reduce bank margins⁵.

Market structure: Maria-Eleni K. Agoraki (2008), A notable result is the insignificant effect of all measures of concentration. This result follows the discussion which suggests that the relationship between concentration and interest margins should vanish in transition economies or when regulation restrictions are taken into account same also in Demirgüç-Kunt et al., 2004.⁶

We attempted to trace the literature on the bank interest margin up to date. Most of the literatures reviewed focused on determining a variety of possible factors of interest margin in banking sectors in developing and developed countries. According to the literature, there have developed two theoretical models such as developed by Ho and Saunders (1981) and Zarruk (1989) examining the determinants of interest rate spread. The assumption in which bank is risk-averse or regret-averse distinguishes these two models respectively. The empirical works based on these two models, mainly model of Ho and Saunders (1981), used panel data estimation technique with some extension for samples of cross-countries, over times, and cross-banks within same sectors.

In conclusion, the empirical evidence suggests that three groups of variables determine mainly the bank interest margin.

First, the differences of interest rate margins in banking sectors across countries are explained by macroeconomic and macro-policy variables such as inflation, GDP growth, the discount rate, government expenditure, volatility of interest rate, and the degree of bank capitalization

⁵Maria Soledad Martinez Peria “ how foreign participation and market concentration impact bank spread” (2003)

⁶Maria-Eleni K. Agoraki “ the determinants of net interest margin during transition

(Saunders & Schumacher 2000; and Maudos & Fernandez de Guevara, 2004; Tennant and Folawewo, 2009; Kasman et al., 2010).

Second, in addition to macroeconomic indicators, the legal and institutional indicators such as bank taxation, deposit insurance regulation, and overall financial structure affect the interest rate margins in banking sectors (Demirgüç-Kunt & Huizinga, 1999 and 2004).

Third, variables at bank level such as operating cost, liquidity and capital risk, market and credit risk, efficiency, the ownership structure, bank industry competition, and size of a bank determine the interest margin (Brock, P.L. & Suarez, L.R. 2000; Claeys & Vennet, 2008; Kit Pong Wong, 2011; John P. Bonin, Iftekhar Hasan, and Paul Watchel, 2005; and Micco, Panizza, and M. Yanez, 2007). Among the above determinants, the variables that most of the papers studied, has a significant effect on the interest margin in developing countries and transition economies, are bank ownership, market concentration, risk aversion such as market risk, liquidity risk, and credit risk, and managerial efficiency.

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

Authors and year	Scope of Study
Demirgüç-Kunt and Huizinga (1999, 2004)	Impact of regulation, concentration and institutional development on bank efficiency.
Saunders and Schumacher (2000)	Extended dealership model. Considered mostly the market power and interest rate volatility on net interest margin.
Lovti R. Sidabalok, Viverta (2012)	Analyzes the Net interest margin and its determinants of Indonesian banks. Focused on Pure spread & bank specific factors
Samy Ben Naceur (2003)	The impact bank's characteristics, financial structure and macroeconomic indicators on bank's NIM and Profitability in the Tunisian banking industry
CalixteAhokpessi (2013)	Compared study of total 41 countries with Sub-Saharan Africa's banking system. Investigation to the role of market structure, bank specific characteristic and macroeconomic condition to determine NIM
Maria Doledad Martinez Peria and AshokaMody (2004)	Impact of foreign bank penetration on interest rate spread
Fernandez de Guevara et al (2002)	Measuring the market power in case of European countries. Using lerner index and its calculation.
Macro Wilkens (2012)	discussion paper of German universal bank. Augmented dealership model by Ho and Saunders is applied in empiric study.
DagvaBoldbaatar (2000)	investigates his paper to analyze interest rate spread in south east Asian countries such as Korea, Malaysia, Mongolia, Philippines, Sri Lanka, Taiwan. Analysis covering those six countries total 40 banks.

3. Overview of Mongolian banking sector

3.1 Overview of the Economy

Mongolia is one of the most sparsely populated countries in the world with 1.5641 million square km area living of 2.9 million populations⁷. Average population density is 1.8 persons per 1 km². In terms of land area, it is 18th largest country⁸ in the world. After communist regime, collapsed Mongolia transformed from a centrally planned economy to free market economy system in later 1900.

In terms of economy structure, the agricultural sector accounts for about 15 percent of real GDP (2013) and herding and livestock are dominating in this sector by creating 89 percent of total agricultural production. Besides of an agricultural sector, mining is important to the economy. In 2001, the mining sector constituted 9.5% of GDP, whereas, in 2013, the sector was earning 17% of GDP and accounting for 50% of industrial sector output (National Statistical Office of Mongolia 2014). In addition, mining sector income makes up 80 percent of export income. The growth of Mongolian mining has only just begun. The largest is the gold and copper mine at OyuTolgoi that is known as one of the largest and richest potential mining deposit with the reserves that will last 60 years. The other is the at TavanTolgoi deposit of coking coal already explored that they have 6.4 billion tons of coal, which while smaller in financial potential is still⁹ which attracts the biggest mining players into the deposit. Mongolian GDP were growing constantly in last decades. Most of the country experience, Mongolia, was suffered financial crises in 2009 at that time GDP growth reached the negative point -1.6%. But with a strong demand of China and right response of Authorities with a help of foreign investment and donor countries somehow we passed that period.

In 2014 Mongolian economy is expected to grow double digit, thanks to the start of copper production of OyuTolgoi mine expansionary policies¹⁰

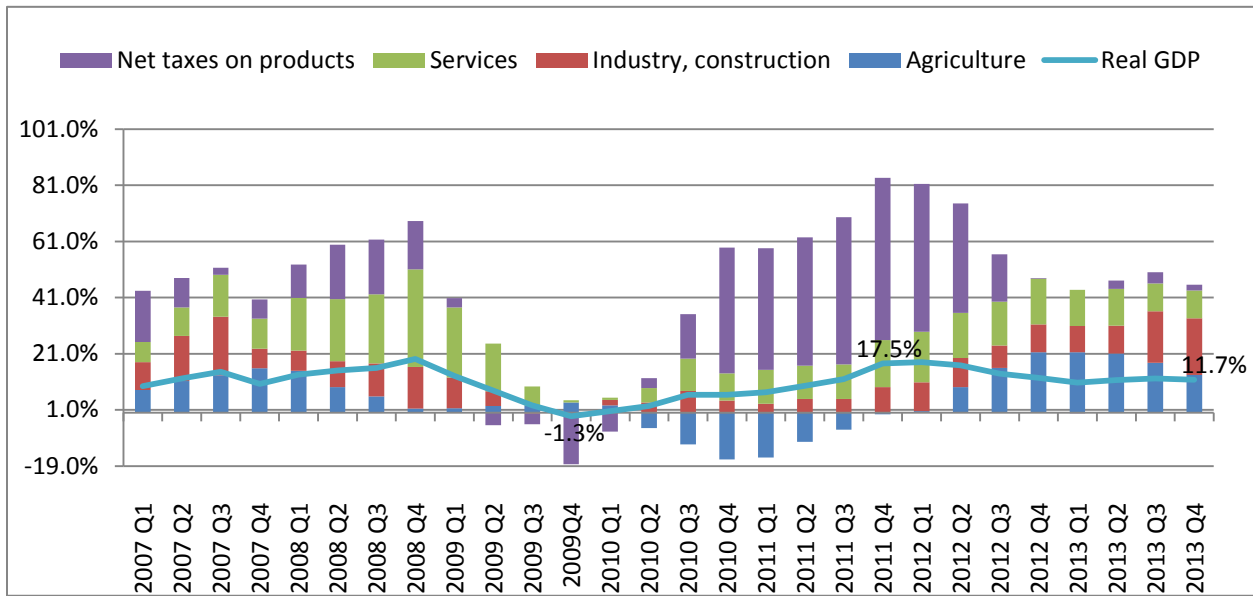
⁷[http: National Statistical Office of Mongolia](http://www.nso.gov.mn/)

⁸www.wikipedia.com

⁹<http://english.news.mn/content/33891.shtml>

¹⁰The world bank group in Mongolia, Mongolian economic update 2013

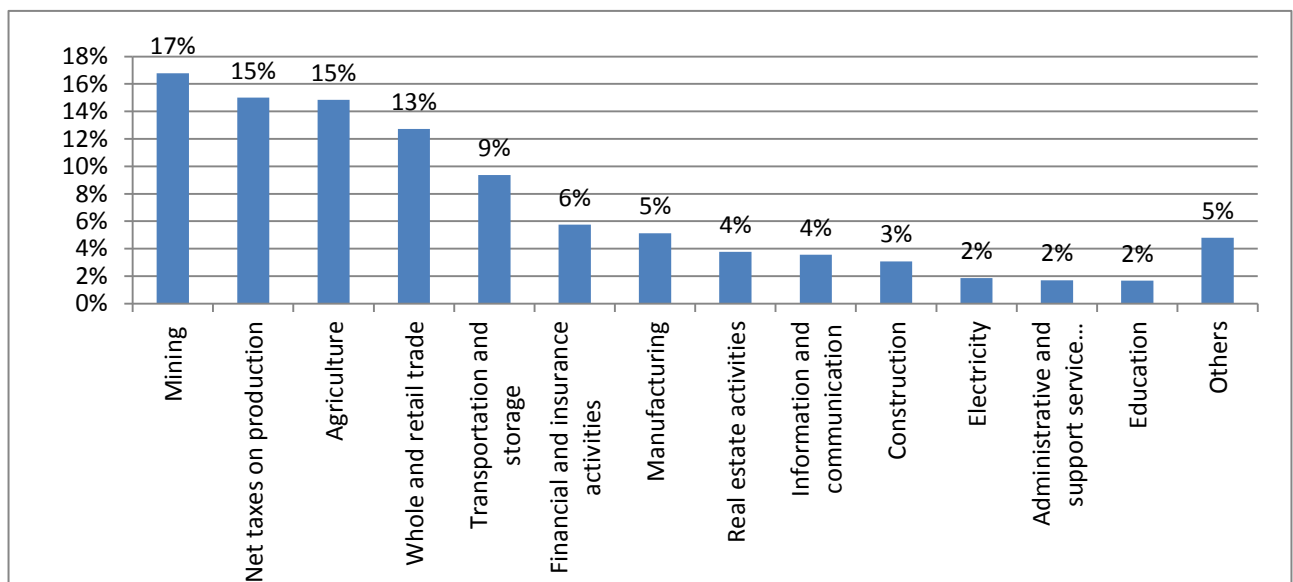
Figure1. Quarterly GDP growth trend by key sectors (yoy,percent)



Source: Monthly bulletin of statistics, National Statistical Office of Mongolia

According to National Statistical Offices the real Mongolian GDP increased by an average of 6.07 percent from 1992 to 2013. All the time of history GDP growth reached its peak point of 17.5 percent in 2011 because of the boom of the mining sector. But over last two years it continued to soften from its peak point to 11.7 percent in 2013

Figure2. GDP contribution by sectors (2013, percent)



Source: Monthly bulletin of statistics, National Statistical Office of Mongolia

GDP consists of 74 percent in six production groups such as the mining sector was 17 percent, agriculture production was 15 percent, Whole and retail trade sectors were 13 percent, transportation was 9 percent, and financial activities were 6 percent, respectively.

However, the agriculture sector has been expanding very heavily in the recent years, contributing the most to economic growth, the mining sector share in the GDP growth began to increase.

Figure3. Annual GDP growth trend by sectors

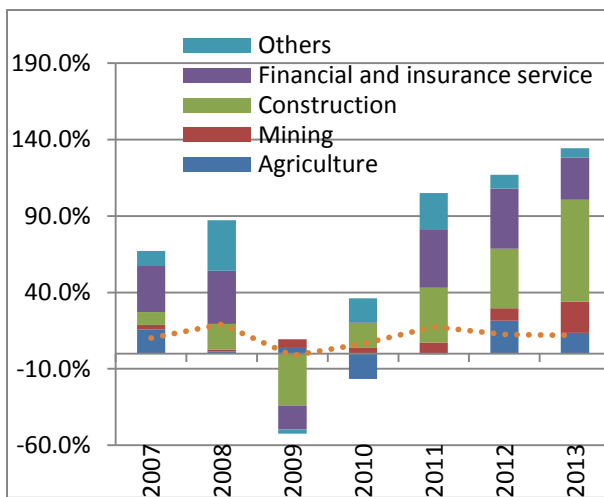
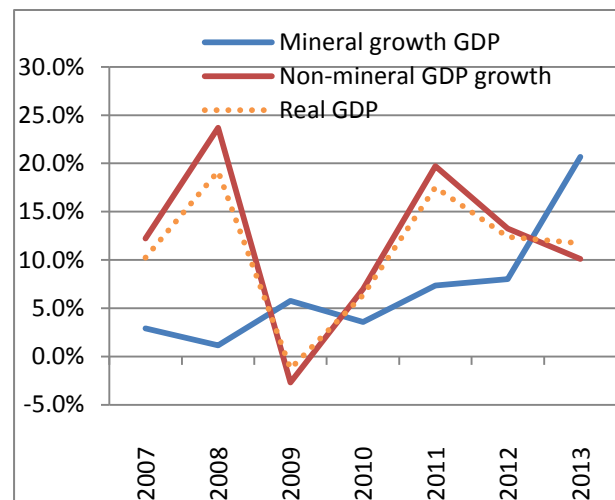


Figure4. Annual GDP growth: Mineral vs Non-mineral



Source: Monthly bulletin of statistics, National Statistical office Mongolia

Last decades the mining sector developed quite fast and dozens of investment were made in this sector. 2011's GDP growth was driven by performance of mineral sector, particularly sharp coal production growth but it rose due to a non-mineral sector by the recovery of the agricultural sector as well as stable growth both in construction, transportation industries in 2012. Mineral GDP registered 20.7 percent growth in 2013 and 27.3 percent in a first quarter of 2014 as the OT mine which has a capable to produce 3 percent of the world's copper production per year, began production in the second half of the last year.

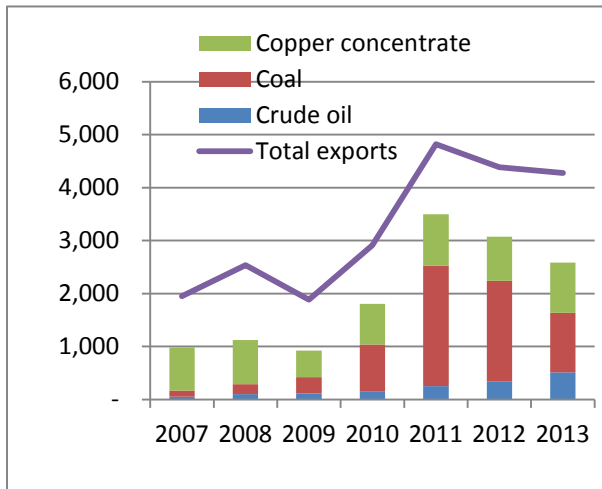


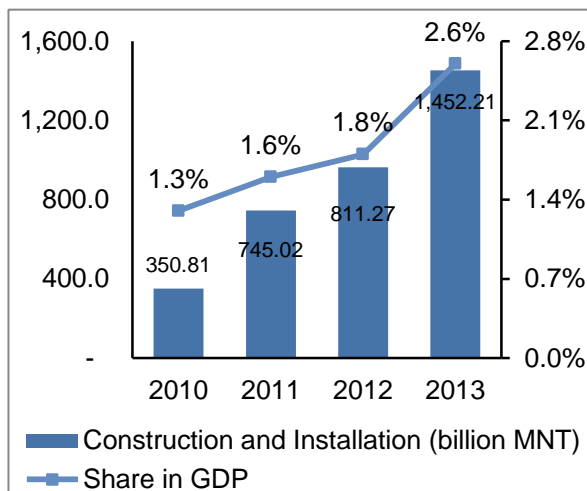
Figure5. Major mineral production (Billion MNT)

In 2013 OT produced approximately 290 thousand tonsof copper concentrate and it affected thatMongolian copper concentrate export increased by 13 percent compared to a previous year. And its amount is expected to raise more. Coal production remained weak during the same period, decreasing by 41.0 percent from a year ago amidst the weak global coal market condition

Another important factor which keeps the mineral growth positive is crude oil. Crude oil production increased almost 53.4 percent from one year ago in 2013.

Contrary to the strong growth of mineral production, non-mineral sector output has been slowing since the third quarter of 2013 amidst the rising inflation and continued currency depreciation. Non-mineral GDP growth fell from 13.2 percent in 2012 down to 10.1 percent in the 2013.

Figure6. Construction (Billion MNT)



However Construction sector accounted slight percent of the total GDP, its boom contributed to double-digit growth of the economy in 2013 and also raises concern on overheating housing market. Construction sector was doubled because of active support from fiscal and monetary policies.¹¹The government and the central bank together provided MNT 3-4 trillion – equivalent to around 20 percent of GDP – to a

¹¹World bank group In Mongolia, Monthly economic update report 2013 November

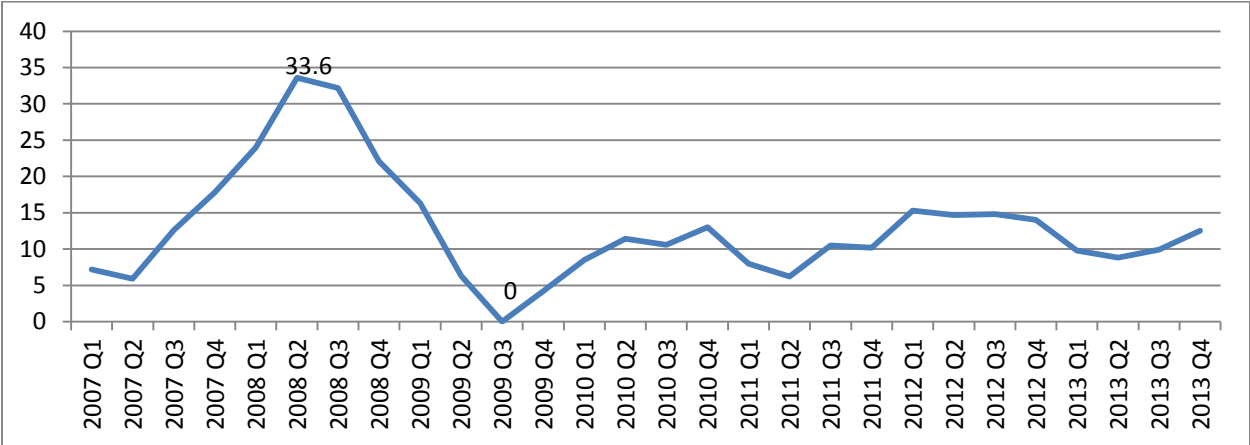
construction of infrastructure (mostly roads) and apartments over the last year, which led to 79.0 percent growth of construction sector in 2013. Construction of apartments jumped by over 50 percent during the same period which was intended to be largely absorbed by the expanded demand created by the lower-rate housing mortgage program of the central bank.

The agricultural sector expanded 13.5 percent in 2013 due to favorable weather.

Agriculture has maintained strong growth – over 20 percent – for six consecutive quarters, after Contraction in 2010 and 2011 in the aftermath of the harsh winter (Dzud). Accounting for almost 16percent of GDP, agricultural production contributed 2 percent of total GDP growth. At the end of 2013, 45.1 million livestock were counted at the nation, of which 20.1 million of sheep, 19.2 million of goat, 2.9 million of cattle, 2.6 million horses and 0.3 million of camel. It was 10.3 percent higher than last year.

In the last quarter manufacturing industry and wholesale/retail sectors growth slowed and reached 6.8 and 17 Percent respectively, but manufacturing is 2.6% Percent lower than a previous year and wholesale and retail is 7 percent higher than previous year. This weak performance was accompanied by a large drop of imports, which indicates weak domestic demand in the face of high inflation and currency depreciation.

Figure7. Inflation (quarterly, percent, yoy)

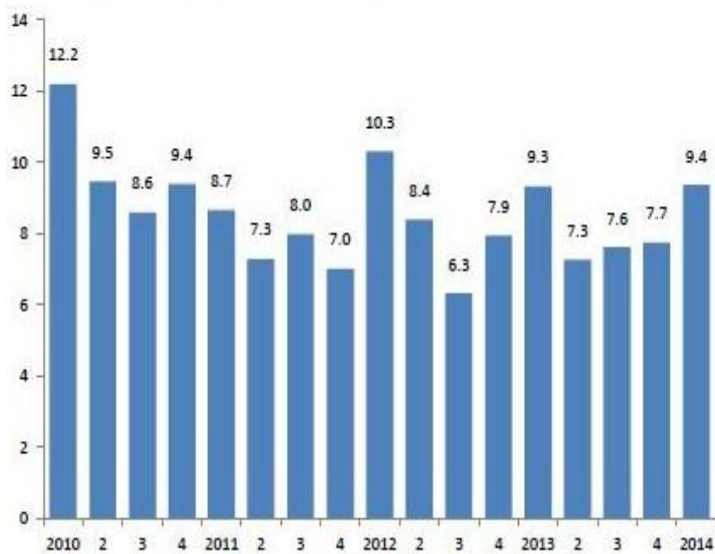


Source: Mongolian National Statistical office

Average inflation rate on a year-on-year basis according to National Statistic office is 12.80 percent between 2007 and 2013. Quarterly inflation rate reached its peak point of 33.6 percent

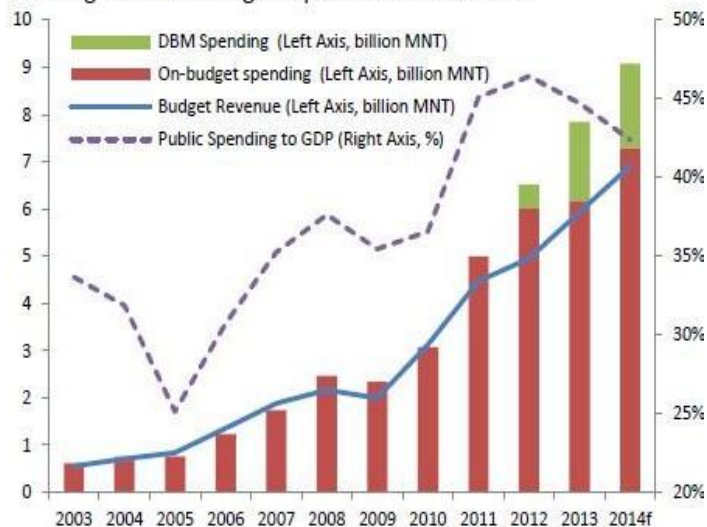
in the second quarter of 2008. Then it was constantly declining to the single digit. Inflation was on an upward trend after it slowed down to 0 percent, the lowest point in the history in 2009. The inflation had been subsided for the first 2 quarters last year from over 14 percent at the end of 2012 to 8.8 percent, reflecting stabilizing meat price and some effect of the Price Stabilization Program, organized by the bank of Mongolia. However, it began again to pick up from the third quarter of last year, led by accelerating core inflation amidst growing money supply and escalating currency depreciation.

Quarterly Unemployment Rate (%)



Source : labor Force survey

On-budget and Off-budget Expenditures: 2003-2014



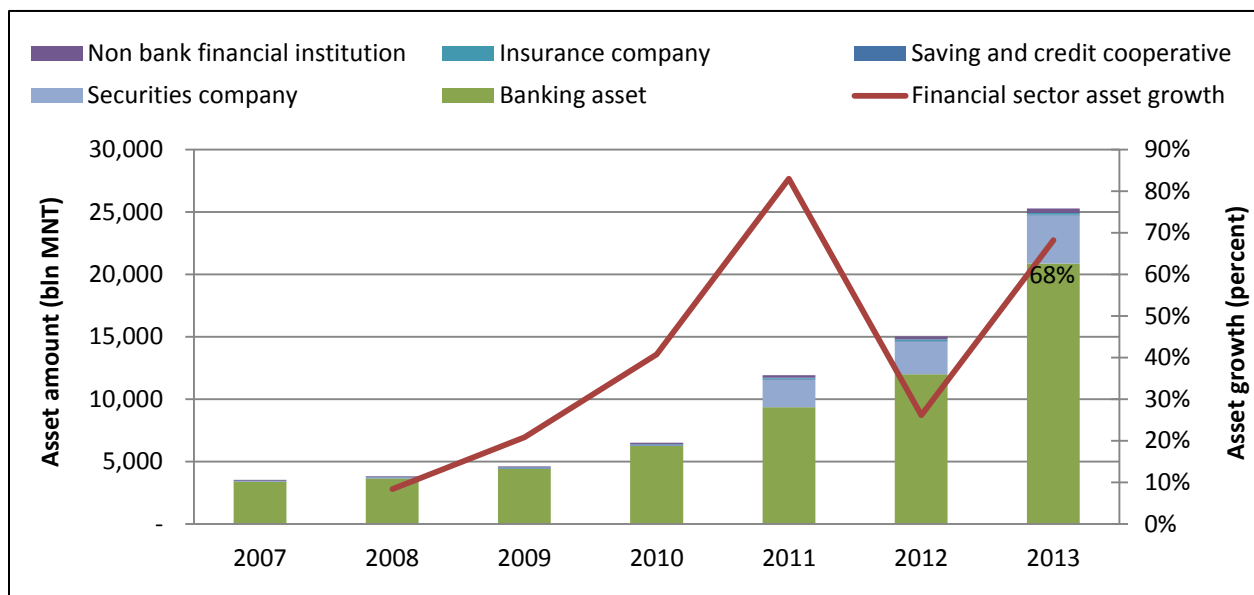
Most recent update of statistic shows that unemployment rate in the first quarter of 2014, stood at 9.4% which is quite similar to the level in the same period of the previous year. Second and third quarter's every year approximately as similar as previous year just 0.1 or 0.2 percent difference is noticed. Which clearly means that Mongolian unemployment rate has strongly seasonally pattern due to harsh weather and seasonal dependent business.

Budget revenue increased by 7.7 percent compared with a previous year due to increased consumption tax. Government spending(including DBM spending) has been risen since 2011 till 2014 first quarter by 25%-46%. From the graph.we can see that fiscal policy remained expansionary due to large off- budget spending.

3.2 Overview of the Financial sector

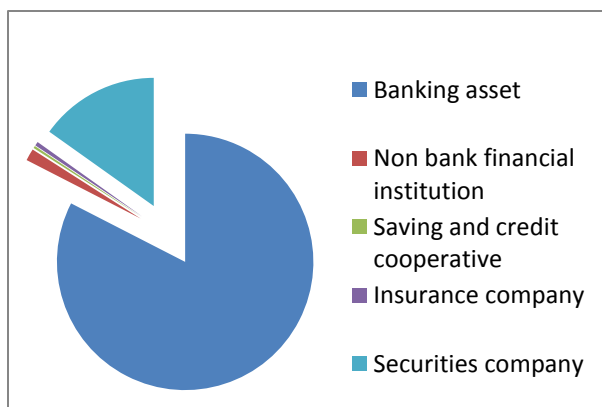
Mongolian financial sector has been on a rising trend since 2007, and its asset increased 6 times higher than 2007 amount. During this time, assets growth for the financial sector was an average of 41 percent, and its peak point was 83 percent in 2011. It grew at a slower pace in 2012 but still maintained double-digit growth. In 2013 assets for tis sector reached MNT 25. trillion, an increase of 68 percent from the previous year that accounted for 144 percent of GDP. It was mainly driven by short term investment and high growth on loans.

Figure8. Financial sector assets (Billion MNT)



Source: Bank of Mongolia and Financial Regulatory Commission

Figure9. Financial sector composition (2013 percent of total)



In terms of this sector's assets composition, banks asset accounted for 82.5%, Non-bank financial institution assets for 1.5%, Saving and credit cooperative for 0.3%, and insurance companies for 0.5%, remaining 15.2% were security companies asset. That

implies the financial system in Mongolia primarily based on the banking sector.¹²

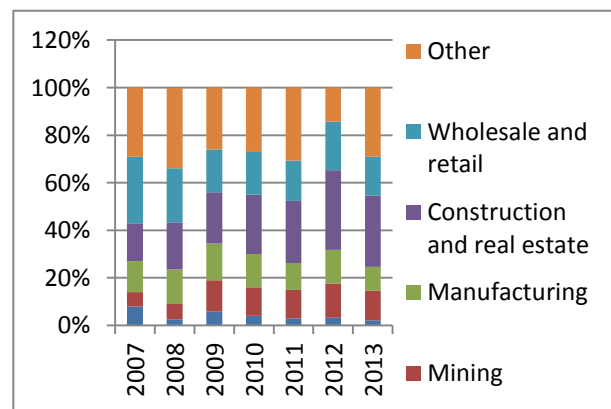
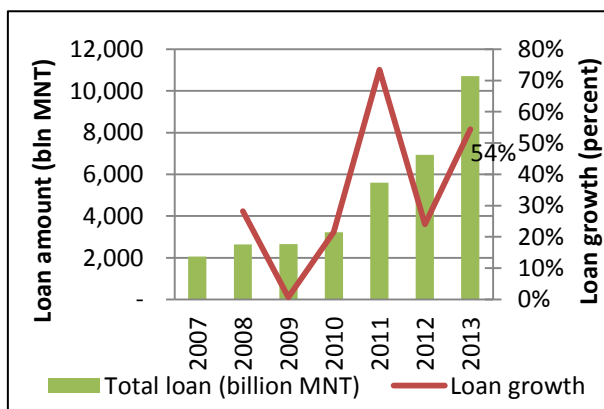
Currently, there are 14 commercial banks, 263 Non-bank financial institutions, 141 saving and credit cooperatives, 17- insurance companies, 88 securities companies successfully running in Mongolian financial market.

As of the end of 2013, Total assets of the banking sector amounted to MNT 19.3 trillion which was 68.2 percent higher than the previous year. Short term investment reached 2.4 trillion and 68 percent of which was placed by Bank of Mongolia bills.

In comparison with the last year, the loans outstanding grew by 54.4 percent and reached MNT 10.7 trillion.

Figure 10: Loan indicators in the banking sector

Figure11: Bank loan composition by sectors



Source: Mongol bank annual report 2013

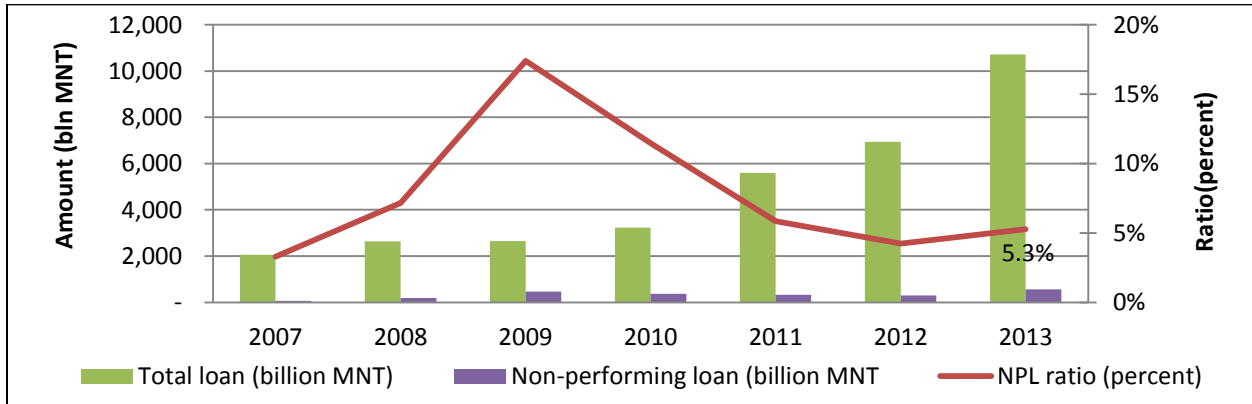
In terms of loan financing to economic sectors, construction, whole sale and retail, mining and manufacturing sectors amounted to 30.1 percent, 16.3 percent, 12.4 percent as well as 10.1 percent respectively .Compared to a previous year, share of real estate sector loans over the total loans rose by 3.1 percentage points, whereas a manufacture share of a total loan decreased by 1.4 percent points.

¹² Mongolian National bank: www.mongolbank.mn

As well as it looks clear that Loans to the mining industry reached 12.4 percent, a stable trend over¹³ the last three years.

Situation of Non-performing loan:

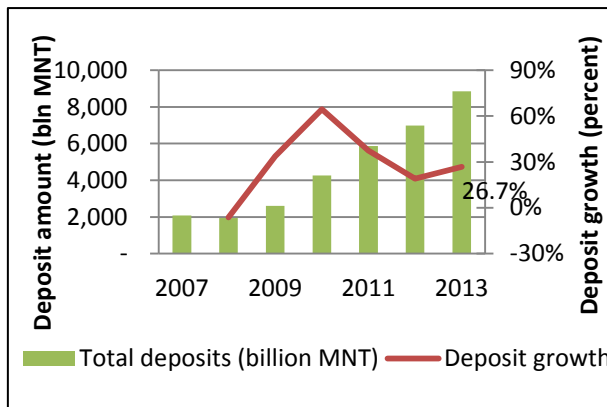
Figure 12: Non performing loan indicators



Source www.mongolbank.mn

From 2009, the quality of total loans outstanding has improved, and the balance of non-performing loans amounted to MNT 293.4 billion which accounted for 4.2 percent of the total loans in 2012. But in 2013 it picked up and reached MNT 564.3 billion which accounted for 5.3 percent of the total loan.

Figure 13: Banks deposit

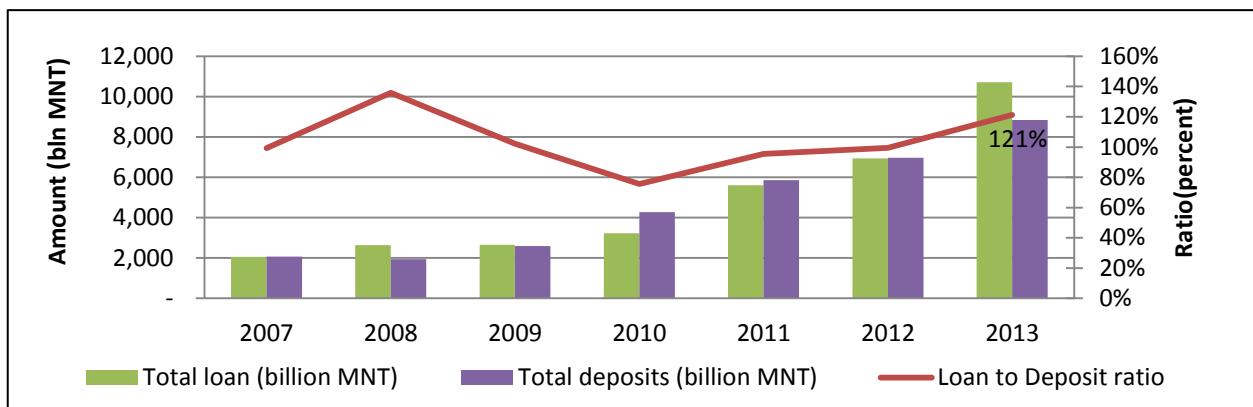


Total liabilities in the banking sector reached MNT 17.5 trillion, 68.3 higher than a previous year. The increase was mainly due to bank and financial institutions loan especially Central bank loan which loan of MNT 2.8 trillion was given to the

¹³ http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2013/11/07/000442464_20131107125022/Rendered/INDEX/826050WPOMongo00Box379865B00PUBLIC0.txt

Commercial banks. As for the total liabilities structure, deposits amounted to 43.4 percent, 16.9

Figure 14: Loan and deposit ratio



Source: www.mongolbank.mn

percent was to current accounts, 28.8 percent to loan funding from other financial institutions respectively. Deposits, as a major source of liabilities for banks, have been growing steadily and reached MNT 8.8 trillion, an increased which accounted for 50 percent of the GDP.

Loan to deposit reached 121 percent in 2013, rapid increase from the previous year. The reason for this increase was commercial bank operation on the credit extended by the central bank's policy lending program.

According to Moody's latest rating through Mongolian banking sectors, covered four largest commercial banks of total 14. Those four banks which are rated held almost 77.7% of a total system loans and 77.6% of total system deposit as of September 2012 (table 2).¹⁴

Table 2 Rated banks in Mongolia by Moody's

¹⁴<http://www.iflr.com>

Name	Total Assets (in MNT million)	Domestic Market Share (Loans, in %)	Domestic Market Share (Deposits, in %)	Long-Term Bank Deposit Rating (Local Currency) and Outlook	Long-term Bank Issuer Rating (Foreign Currency) and Outlook	Standalone Credit Strength(1) and Outlook
Trade and Development Bank of Mongolia	2,698,878	22.9%	20.3%	B1 / Stable	B1 / Stable	E+ / b1 / Stable
Khan Bank	2,456,862	24.9%	25.2%	B1 / Stable	B1 / Stable	E+ / b1 / Stable
Golomt Bank	2,312,273	21.0%	25.4%	B1 / Stable	B1 / Stable	E+ / b1 / Stable
XacBank	939,140	9.0%	6.7%	B1 / Stable	B1 / Stable	E+ / b1 / Stable
Total	8,407,154	77.7%	77.6%			

Source: Moody's investors service, Banking system outlook 2012

The banking system is highly concentrated, with top of four banks that held over 70% of total market share, and the top five banks are accounting for over 86 percent. A very small portion of financial sector assets is held by nonbank financial institutions that are supervised by the Financial Regulatory Commission (FRC)¹⁵

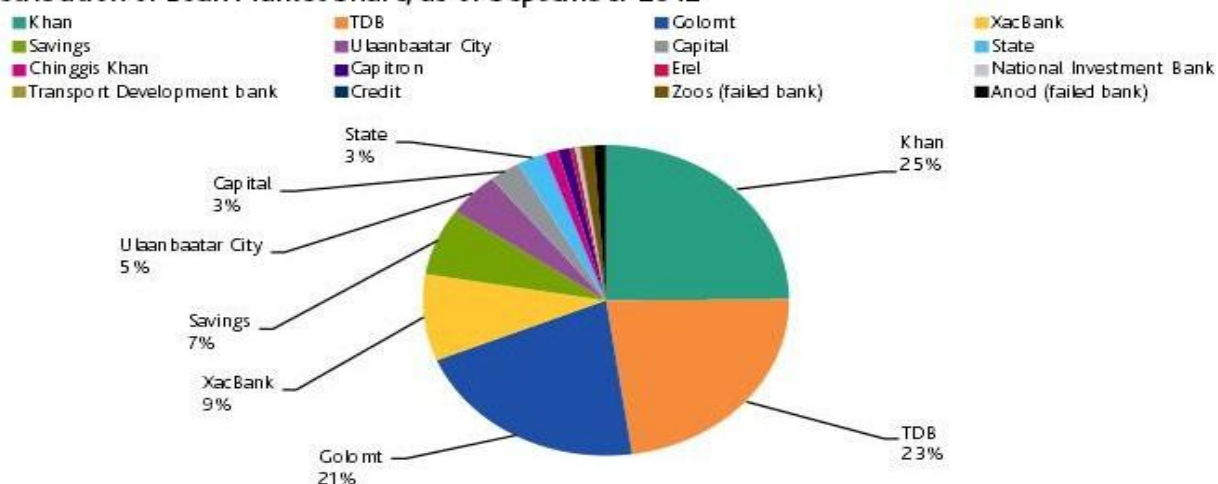
Top five banks tend to remain dominant for the next 1-2 years. (Figure 7) shows all 14 commercial banks which are currently providing all bank and financial services into the market. The largest five banks such as Khan, TDB, Golomt, XacBank, Savings were commanded over 84% of loans in September 2012. Due to moody's report they expect those banks will keep their dominance next to 12-18 months, as well. Foreign investors from the United States, Japan and Switzerland hold controlling shares in two of the five largest domestic banks, and those from Belgium, China, Japan, Russia and UK established joint-venture. Bank's private investment arm IFC(international financial institution) is minority owners of the Trade and Development Bank (TDB, the largest bank), and IFC also holds minority interests in the Agriculture Bank (KHAN Bank, the largest microfinance bank). The rest of the domestic financial institutions are owned by individual businessmen and privately held companies.¹⁶

Figure 15:

¹⁵MONGOLIAN MACROECONOMIC ENVIRONMENT AND FINANCIAL SECTOR ... (n.d.). Retrieved from <http://unentogs.blogspot.com/2013/06/mongolian-macroeconomic-environment-and.html>

¹⁶Government Financial sector reform Program 2000-2010

Distribution of Loan Market Share, as of September 2012



Source: www.iflr.com IFLR financial law publication

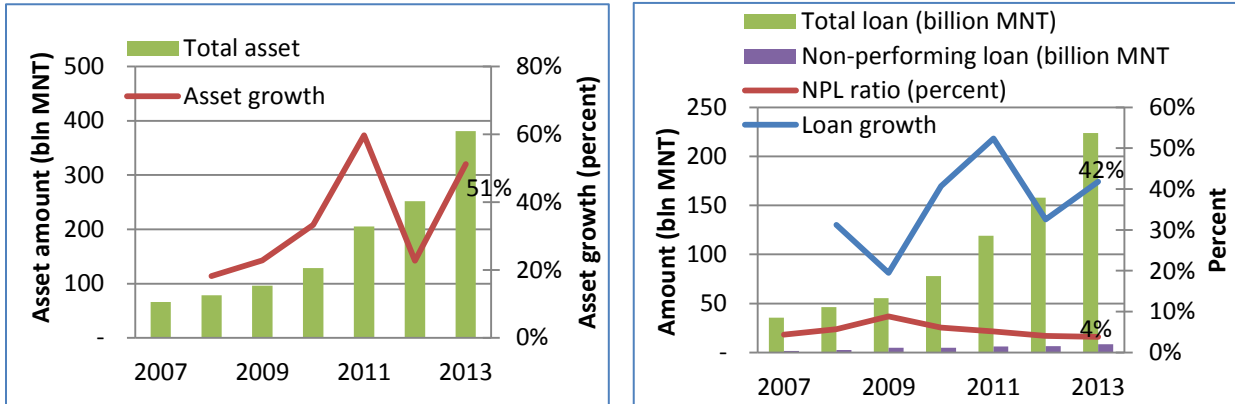
Net interest income in Trade Development bank has risen 34% and 16% respectively in 2013 3 Q compared with last year 3Q.¹⁷ XAC Bank's interest income and profit before tax were up to 34% and 29% respectively in 2013 3 Q compared with the same period of previous year 2012.¹⁸ Net interest income of the next biggest bank Khan banks' profit before tax have risen 29% and 36% respectively 2013 3 Q compared with the same quarter of 2012.¹⁹ Golomt bank, NII before tax, have risen 19% and 33% respectively in 2013 3 Q compared with the same quarter in 2012.

Figure 16: Asset in non-bank financial institution Figure 17: loan indicators in Non-financial

¹⁷ TDB company presentation

¹⁸ Mongolian Economy - Updates on Mongolian Banking Industry 3Q 2013, <http://www.mongolianeconomy.mn/en/b/5021> (accessed 15 may, 2014)

¹⁹ Khan bank company presentation

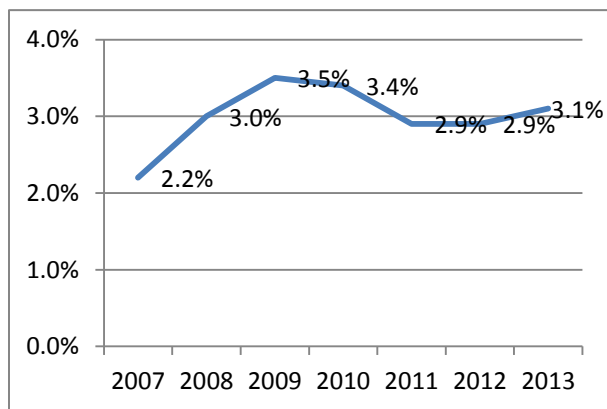


Source: Non-bank financial institution’s annual report- 2007, 2008, 2009, 2010, 2011, 2012, 2013 by Financial Regulatory Commission

In 2013 total of 263 registered Non-bank financial institutions were operating, and its number has been growing steadily and highly over last 4 years. Total assets of the non-bank financial sector grew at 51.2 percent or MNT 129.1 billion from last year to MNT 381.1 billion which constituted 2.2 percent of GDP. Reasons for this rapid increase were institutions equity increased by 36.8 percent and reached MNT 234.3 billion, loan increased by 42 percent related to mainly new founded institutions.

This sector loans outstanding totaled MNT 223.71 billion, an increase of MNT 65.9 billion or 42 percent compared to the previous year. In regards to the quality of total loans outstanding, 96.2 percent or MNT 215.2 billion was classified as performing, 3.8 percent or MNT 3.5 billion

Figure 18: Lending interest rate in non-bank financial institution (monthly)



Source: Non-bank financial institution’s annual report-2013 by Financial Regulatory Commission

was classified as non-performing loan.

Since 2007, lending interest rate of non-bank financial institutions has been on upward trend and reached its peak point of 3.5 percent monthly in 2009. In 2013 it began to increase, and monthly average loan interest rate was between 2.23 and 4.02 percent. These increases on loan interest rate were driven by Mongolian economic recessions in 2009 and 2013.

Saving and credit cooperatives

Figure 19: Number of saving and credit cooperatives

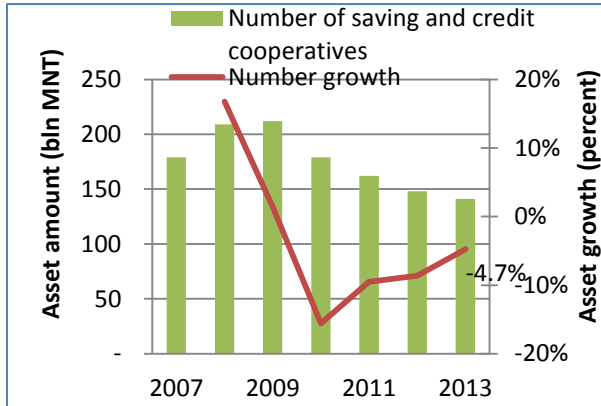
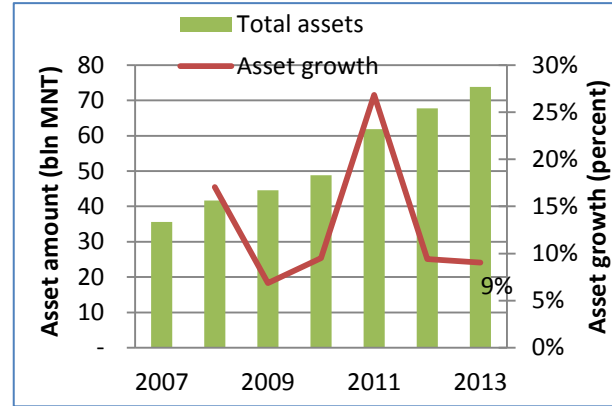


Figure 20: Assets in saving and credit cooperatives



Source: Saving and credit cooperative annual report-2007, 2008, 2009, 2010, 2011, 2012, 2013 by Financial Regulatory Commission

However, saving and credit cooperatives affection on economy is less compared to other financial sectors, it is very efficient to disturb financial services on the wide area of Mongolia. In 2013, Mongolian financial sector comprised of 141 saving and credit cooperatives operating through their 27.2 thousand members. This cooperatives number decreased by 6 times or 835 compared to 2006's because the Government of Mongolia executed the mistaken policies on this sectors through law, regulations and its monitoring. The government of Mongolia approved new Saving and Credit Cooperative law in 2008 and improved its legal environment, monitoring and people's knowledge. Despite decline of saving and credit cooperatives, its asset was on steady upward trend. As of the end of the reporting year, its assets grew at 9 percent and reached a total of MNT 73.8 billion.

In 2013, loans outstanding totaled MNT 49.4 billion, an increase of MNT 1.1 billion or 2 percent compared to the previous year. In regards to the quality of total loans outstanding, 96.9 percent or MNT 47.8 billion was classified as performing, 3.1 percent or MNT 1.6 billion was classified as non-performing loan. Total deposits amounted 50.7 which was 7.6 percent higher

than 2012 amount. Loan to deposit reached 97.4 percent in 2013, slightly moderated from the previous year.

Insurance

Figure 21: Assets in Insurance sector

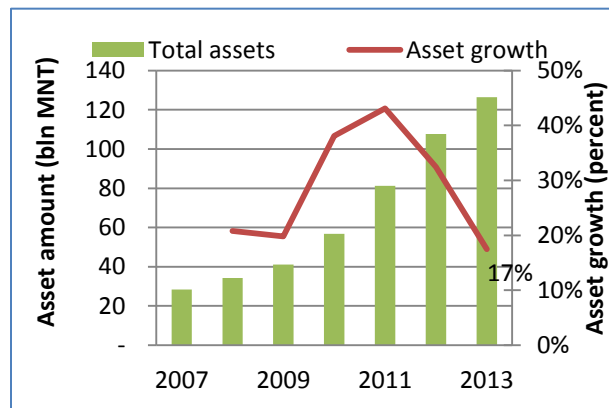
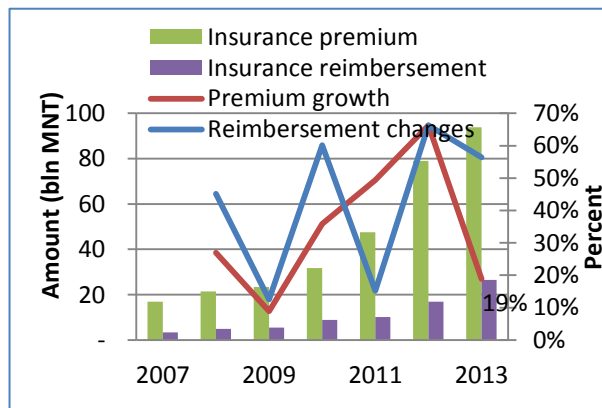


Figure 22: Operation indicators in Insurance sector



A total of 17-insurance companies operated steady in this sector over last 4 years and their assets reached MNT 126 billion in 2013. This indicator was 17 percent higher than the previous year. The insurance premium increased by five times to MNT 93.9 billion between 2007 and 2013. Drivers insurance, a new type of insurance in Mongolia, supported by the Government of Mongolia has contributed to 33.9 percent of the total premium.

Net interest margin in Mongolia: Mongolia has been persistently high deposit and lending rates from the beginning of the transition period until 2008 than those countries in Central and Eastern Europe, as well as some Asian countries.

Some of emerging Asian countries interest rates were declined significantly when inflation declined, but since transition process has been delayed in Mongolia it can be the reason that interest rate has been higher many years and it started become lower from the end of 1999.

Deposit rate stabilized in 2002 around 14%. Since 2008 deposit rate began to decline because of inflation rate came down. Then it rose again (Figure 8).

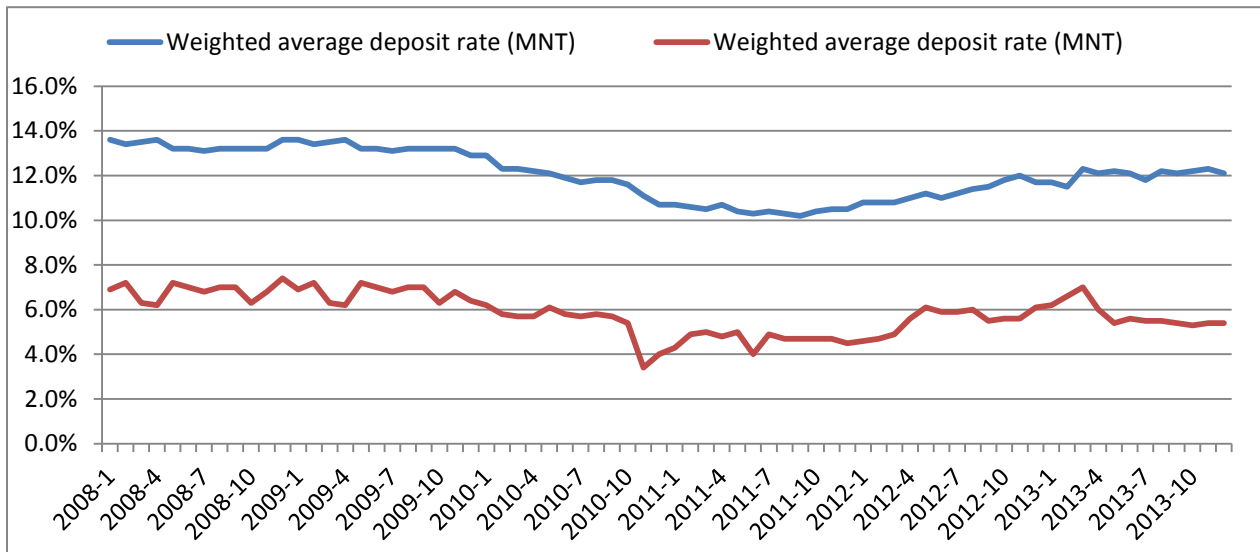
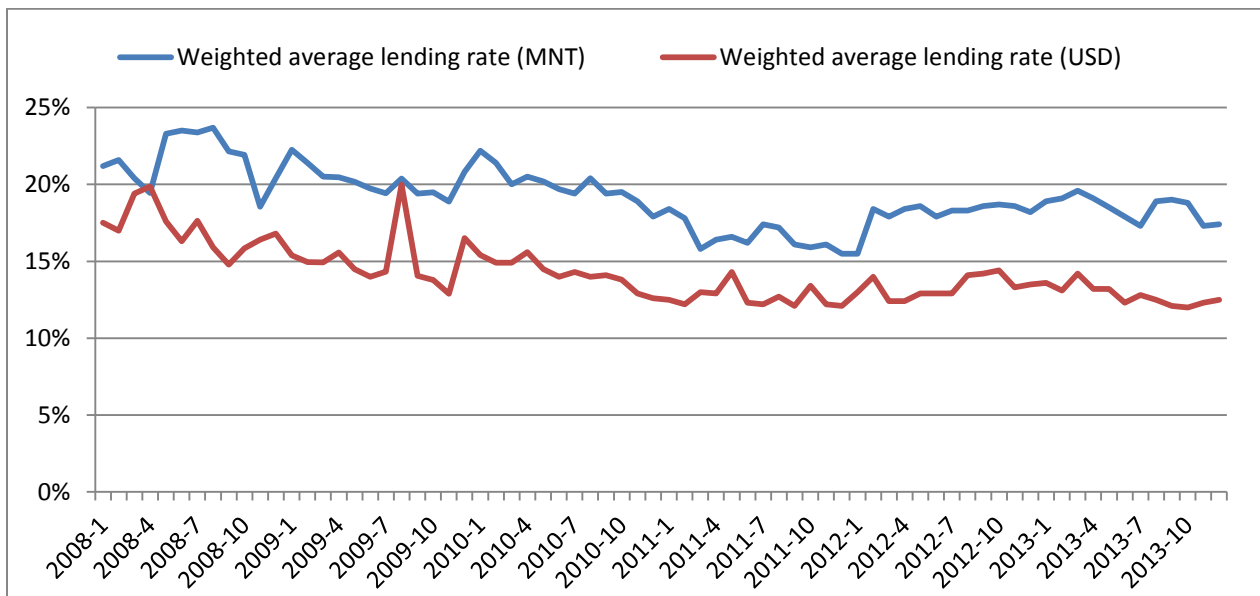


Figure 23. Deposit interest rate (%) in Mongolia

Source: www.tradingeconomics.com

Between 2002 and 2007 Mongolian banks have continued enjoying high lending and deposit rate as well as it was the highest rate compared with some other Asian countries. Mongolian banking sector is characterized high loan rate.

Figure 24 lending interest rate (%) in Mongolia



Source: www.tradingeconomics.com

Lending rate in Mongolia (Figure 9) stabilized in 2007. Since 1999 lending rate has been declining significantly. Indeed In 2007, average lending rate reached 21.5%, after that it continues has been declining. In 2011 in the history it reached the lowest point 16.4%.

Late of 2011 lending rate started to rise by 1% because of inflation rose up.

Table 4 Net interest margin in Mongolia

2000	8.42662
2001	8.697495
2002	7.388924
2003	6.723718
2004	7.485916
2005	6.193867
2006	5.270883
2007	4.344161
2008	3.662189
2009	3.26529
2010	3.122041
2011	3.147208

Source : Data market.com

However late of 2000, Net interest margin level has been declining a year of 1999 until now. It reached in early 2007 to the same level as some emerging Asian countries. Compared to the high lending and deposit rate declining process, interest margin started to decline quite earlier. It means Mongolian commercial banks may have started to take more risk in their lending and mostly they have been financing their costs by taking deposits.

But in 2000 net interest margin was 8.4% and it decreased every year almost 1 %. Basically, these rapid decrease reached 3.14% in 2011 and it did not decrease more in a previous year.

But comparing to 2000 (8.4%) with 2011 (3.4%) it could be a sign that Mongolian banking sector developing and more bank are entering to the market as well as several banks were bailed out.

4 Hypothesis and Technical issue

4.1 Hypothesis

According to the goal of the thesis, I am attempting to examine the potential factors of the interest margin in Mongolian banking sectors based on the literature review. Among the potential factors, we are interested in more assessing the impact of bank ownership, market concentration, and risk aversion due to the market risk.

Because first, Mongolian banking sector consisting of totally fourteen commercial banks has six foreign invested banks and one state-owned banks by the end of 2013.

Second, there are four big banks in terms of asset having high shares of the market in the banking sector.

Third, the economy heavily depend on the international market due to export and import sectors which are very sensitive to the price of commodities such as gold, copper, and mineral products. Furthermore, Mongolian economy is in a risky environment. Particularly, the inflation is persistently high and not stable, the exchange rate is very volatile, macroeconomic fiscal and monetary policy are not reliable and can not be consistent with each other and economic phases, and there are many things bearing market risks. Therefore, I state the following three hypotheses.

Hypothesis 1: The ownership structure of the bank explains the difference of the interest margin across Mongolian banks.

We expect that having more foreign banks contributes to decreasing the interest margin. Therefore, the expected value of the estimated coefficient is a negative sign.

Hypothesis 2: The market concentration affects positively the interest margin.

Mongolian banking sector's Herfindahl index was 0.18 in 2012. It implies that the banking sector is relatively higher concentration. According to the literature, increasing market competition leads to increasing the interest rate spread. So the expected coefficient in the model is a positive sign.

Hypothesis 3: The risk aversion is correlated positively with the interest margin.

We follow the explanatory variable standing for risk aversion defined by Maudos and Guevara (2004). CAP (ratio of equity to total asset) is proxy for the degree of the risk aversion of the bank. A higher *CAR* represents a higher risk aversion. A higher risk aversion is reflected in a higher interest margin. Hence, a sign of the coefficient is expected to have a positive.

4.2 NIM Definition and Theoretical background

In most of the literature, net interest margin is defined as a function of internal²⁰ and external factors. Internal factors including bank specific factors such as leverage, portfolio performance, default risk, liquidity risk, bank size, market structure, ownership. In the external factors include macroeconomic and industry specific factors such as inflation, GDP growth and so on.

Net interest margin (*NIM*) is most commonly defined as the difference between interest revenue of asset and interest expense on bank liabilities, is expressed as a function of internal (bank specific) and external (macroeconomic) factors. (Gongera Enock George, 2013)

There are several models to analyze net interest margin. First one will be mentioned here is the **Accounting decomposition** developed by Hanson and Rocha (1986). In this approach banks' profit and loss statements are carried out. Following formula can be derived :

²⁰ Bank Specific and Macroeconomic Determinants of Commercial bank profitability
[http://www.berjournal.com/wp-content/plugins/downloads-manager/upload/BERJ%20\(2\)2011 article8 pp139-152.pdf](http://www.berjournal.com/wp-content/plugins/downloads-manager/upload/BERJ%20(2)2011%20article8%20pp139-152.pdf) (accessed April 15, 2014).

$$\text{NIM} = \frac{(OE - \text{NNI} - \text{NEI})}{TA} + \frac{LLP}{TA} + \frac{T}{TA} + \frac{NI}{TA} \quad (1)$$

Where NIM (net interest margin) depends on NI (Net income), NNI (Net interest income) NEI (Net noninterest income), TA (Total asset), LLP (Loan loss provision), T stands for Taxes. According to the accounting decomposition analysis, NIM influenced by Operating expenses, income, non-performing loan, taxis.

And next model that is quite useful for developing and transition countries is so called Dealer model proposed by Ho and Saunders (1981). The model also extended by Allen (1988) and Angbazo (1997). Also model used several papers proposed by Saunders and Schumacer (1971) and Drakos (2003).

4.3 Panel data estimation technique

here we will briefly discuss the panel data estimation technique. Panel data analysis is one of the most active and useful in econometrics now days. Panel data is repeated a measure of one or more variables on the same set of cross section units, such as one or more person and countries. Therefore structure of panel data mostly, the number of cross section units are larger than the number of a time period. Hence panel data analysis is used to our estimation, and there are several benefits of using it.

First of all, we can recall the benefits of panel data:

- They are more informative (they can be more variability than others as well as less collinearity, more degree of freedom) and estimates are more efficient.²¹
- They allow to study individual dynamics
- They give information on the time ordering of events
- It also allows to control unobserved heterogeneity for individuals²²

²¹ Josef Brunderl (2005) "Panel data Analysis"

²² Josef Brunderl (2005) "Panel data Analysis"

Panel data models mostly different to each other with their assumptions of z .

There are two types of Panel data, balanced and unbalanced panel. To see the difference between them is an important issue.

- Balanced panel consists of observations $n=N*T$, on individuals $i=1\dots,N$ at all time $t=1..T$ in other words the number of time period T is the same to all I individuals
- Unbalanced consists if the number of the time period is different than from individuals then its called unbalanced panel.

The most common estimator of Panel data is as follows : Pooled OLS estimator, and two most frequently used estimator for continuous dependent variables, are Random effects estimator and fixed effect estimator. Pooled OLS is the simplest case of using panel data estimation. The simplicity of this model comes with the assumption of error term. Error term is assumed to be, $\varepsilon_{jj} \sim iid(0, \delta^2)$, that is, for a given X , there is no serial correlation between observations and error term.²³ We pool the data and estimate it an OLS regression.

The following model is considered :

$y_{jj} = x'_{jj}\beta + z'_j\alpha + e_{jj}$ we can rewrite it in the following format: $y_{jj} = x'_{jj}\beta + c_i + e_{jj}$ The disturbance term is decomposed in two parts. First part is related to the common stochastic error term, second part is assumed to be uncorrelated with X .

Pooled regression model: if z contains constant term Just OLS can provide efficient estimator. As I mentioned before there are two common estimations of a panel data Fixed and random model. So the important assumption to distinguish these two model is whether z may or may not be correlated with explanatory variables. If z is uncorrelated and observed with X then it is random effect, if z is unobserved correlated with X then, it is fixed effect model.²⁴

²³ Panel estimation methods - uni-bamberg.de. (n.d.). Retrieved from <http://www.ub.uni-bamberg.de/elib/volltexte/2004/3/GH-Chap-2.pdf>

²⁴<http://www.ub.uni-bamberg.de/elib/volltexte/2004/3/GH-Chap-2.pdf>

Random effect model can be consistently but inefficiently estimated by OLS and for that efficient method needed. However, Random effect model is useful for large sample. It also reduces the number of parameters to be estimated. There is also a probability the random effect estimation to give an inconsistency estimator if assumptions are not meet properly.²⁵.

If we formulate simple version of random effect model, it could be shown:

$$y_{jt} = x'_{jt}\beta + (\alpha + u_i) + e_{jt} \quad (2)$$

- α is constant mean of heterogeneity which is unobserved
- u_i is random heterogeneity specific to i th observation

There are 3 types of Random estimation method.

1. Generalized Regression: OLS is consistent but inefficient

$$y_{jt} = x'_{jt}\beta + (\alpha + u_i) + e_{jt}$$

2. Within Regression: By taking deviation from group means, LSDV is consistent but inefficient. $y_{jt} - \bar{y} = (x_{jt} - \bar{x})'\beta + e_{jt} - \bar{e}$

3. Between estimators: By taking group means. It gives consistent estimator but inefficient one as well. $\bar{y} = \alpha + \bar{x}'\beta + u - \bar{e}$

Fixed effect model can be estimated using least squares dummy variable estimation. It is also can be estimated using OLS, but usually with a large number of observations, as usual in empirical applications, computation becomes infeasible.²⁶ Fixed effect model comes from the assumption of omitted variable. $y_{jt} = x'_{jt}\beta + c_i + e_{jt} \Rightarrow$ if c_i is correlated with explanatory variable. Such model is estimated using Least Square dummy variable (LSDV). Such a model can

²⁵ Josef Barunik "Advanced Econometric" lecture 9

²⁶ Josef Barunik "Advanced Econometric" lecture 9

be estimated by OLS as well but as I mentioned earlier only in case of Large sample empirical application can become infeasible. therefore we can reduce dimensions by LS estimator.

$$\widehat{\beta} = [X'M_D X]^{-1} [X'M_D y] = \widehat{\beta}_{within} \text{ where } M_D = I - D(D'D)^{-1} D' \quad (3)$$

To sum up Random effect and Fixed effect estimator, both methods manage of panel data also both of them taking into account heterogeneity. The difference between them is whether time-invariant effect are correlated with regressors or not.

The problem here is whether to choose which model is most suitable. There are several tests which could help us to make the right choice. For example Breusch-Pagan test, Lagrange-Multiplier, Hausman tests. Lagrange-Multiplier test is test on whether there are individual specific effects.²⁷ Hausman test is a great method, which helps us to decide whether Fixed or Random effect model is the most reliable one. Since to choose the best model which give us right answer is an important for our estimation. Therefore are going to use Hausman test to make our decision. In Housman test we have two basic assumptions. If Random effect model: $E[c_i/X_i] = 0$ vs Fixed Effects $E[c_i/X_i] \neq 0$.

Table 4: Hausman test

	RE Model	FE Model
$\widehat{\beta}_{FGLS}(\text{Random effects})$	Consistent, Efficient	Inconsistent
$\widehat{\beta}_{LSDV}(\text{Random effects})$	Consistent, inefficient	Consistent, possibly efficient

4.4 Measuring interest rate spread

There are two approaches to measuring net interest margin. Ex-ante and Ex-post. The ex-anti approach uses the rates quoted on loan and deposits and draws inferences from the difference between them.²⁸ On the other hand, it means this is the rate that public can understand or see easily to figure out which financial institutions set which rate. When interest rate is

²⁷ Baltagi (2001) Advance econometrics

²⁸ Commercial bank interest rate spread In Jamaica by John W. Robinson (2000)

approximated by using banks balance sheet and income statements information then it is called ex post spread. So basically this spread is calculated from banks financial information so it is followed with the fact.

Both approaches have strength and weakness. For example, ex ante spread known to be better of risk concern while ex post spread rates are realization of risk involved in past contracts. The one unique difference between these two approaches is that they are different on the amount of loan defaults. Somehow ex-post method is more useful due to giving accurate results. Many research shows that there is a chance for the data used for ex-ante method could lead inconsistency. The reason could be because the data collected from different sources. On the other hand, the ex-post method may have its shortcomings, as the interest income and loan loss provisioning tend to materialize in different time periods (Demirgüç-Kunt and Huizinga 1998).

Therefore to prevent inconsistency as well as from generating considerably different outcome from net interest margin, it is probably better to apply ex post approach based on financial statement of the banks. Also regarding with data limitation as well as to find out the factors which influence spreads and causes to change it, using ex-post interest rate approach would be more sufficient.

Another way to analyze the spread is to examine net interest margin (total interest income less interest expenses divided by total asset). On the other hand, net interest margin is defined by banks specific factors and macroeconomic or regulatory determinants.

Bank specific factors include all internal factors which could influence banks internal system operations. For example, capital adequacy, default risk, credit risk, management quality, banks size, market structure, ownership etc..

Macroeconomic factors such as GDP, inflation rate have a significant impact as well.

Countries with emerging economy, such as Mongolia, a commercial bank plays a significant role in economic growth. Therefore, it is important taking into consideration bank spread between deposit and lending rate.

5 Methodology and data

5.1 Model

Theoretical model

To test the above stated hypothesis, We will use the model developed by Ho and Saunders (1981) and later the model extended by Maudos and Fernandez de Guevara (2004). Martinez and Mody (2004) successfully applied this model to the banking sector of Argentina, Chile, Colombia, Mexico, Peru. As well as John. Robinson (2002) carried out this model in Jamaica banking sector. In some east Asian countries, banking sectors applied this model also successfully. Most researchers agreed that Ho and Saunders Dealer model gives distinct result for this countries that are emerging, and transition economy, as well as developing countries.

The idea of the model is as following :

According to the Authors, the banks are considered as intermediaries which accept deposits and provide loans. Which leads bank to set the price of loan and deposit by itself while the quantity of loan and demand are exogenously defined.

First model of Dealer looks like :

$$S = \frac{\alpha}{\beta} + \frac{1}{2} + R\sigma^2 Q \quad (4)$$

The first term of equation α/β stands for ratio of intercept (α) and slope (β) of the deposit and lending functions. Thus this ratio measures market power of bank. Second term expresses the element of risk premium. R is coefficient of risk aversion, sigma is interest rate variance, Q stands for banks size of transaction.

The last formal solution of dealership model leads following result.

$$s = \underbrace{\frac{1}{2} \left(\frac{\alpha_D}{\beta_D} + \frac{\alpha_L}{\beta_L} \right)}_{\text{marketpower}} + \underbrace{\frac{1}{2} \left(\frac{C(D)}{D} + \frac{C(L)}{L} \right)}_{\text{operatingcost}} - \underbrace{\frac{1}{4} \cdot \frac{U''(\bar{W})}{U'(\bar{W})} [(L + 2L_0)\sigma_L^2 + (D + L)\sigma_M^2 + 2(M_0 - L)\sigma_{LM}]}_{\text{degreeofriskaversion}} \quad (5)$$

The first part of the equation expresses the bank's ability to increase interest margin by using market power. The ability is conditional on two markets' elasticity of demands. Where β 's are power of the bank to increase the markup of loan rate and discount deposit rate without seriously hurting probability of getting supply of deposit and demand for loans, while α is individual bank's ability to attract deposit and provide loans.

The next part of the equation shows the operating cost of the bank. $C(D)$ is operating cost related to deposit and $C(L)$ is operating cost of a loan such as application cost, monitoring cost. These expenditures are proportional to the respective volumes representing the operational cost of the bank together makeup the operational costs.

The last part of the equation is mainly expresses the combination of the degree of risk aversion, market and credit risk, and interactions between market and loan risk.

5.2 Data

The thesis examines the determinants of net interest margin of Mongolian banking system. In the study, out of 17 private banks that run in the Mongolian banking industry, 13 of them which have no missing data between the years 2004 and 2010 were selected. My dataset consists of the quarterly balance sheets and profit and loss accounts of banks. The sources of the data provided from the Central Bank of Mongolia (CBM). The data constitutes a balanced panel with $i = 13$, and $t = 27$. In Table 4, shows the data description used in the empirical estimation is as following :

Notation	Description	Obs	Mean	Standard deviation	Min	Max
NIM	Interest income minus interest expenses divided by total expenses	324	0.016	0.015	-0.158	0.105
HHI	Herfindahl index for banking sector	324	0.132	0.018	0.115	0.180
lwage	Logarithm of wage cost is used for proxy of personal expenses	324	1.43	1.28	0.42	8.41
CAP	Ratio of equity to total asset	324	0.251	0.225	0.046	0.966
NPL	Ratio of nonperforming loans to total loans	324	0.090	0.149	0.000	0.999
ln_asset	Logarithm of total asset	324	11.08	1.50	8.75	14.16
FIS	Share of foreign investment in each bank	324	0.295	0.367	0.000	1.000

6 Empirical part

6.1 Model specification

Empirical model which is employed most of the recent studied include all the determinants of interest margin in a single equation. Very first empirical model involves the estimation of the following linear equation:

$$NIM_{ij} = c + \sum_{j=1}^j \beta_j X_{ij}^j + \varepsilon_{ij} \quad (6)$$

Where NIM denotes net interest margin for bank i at t year, c is a constant term, X are the explanatory variables and ε_{ij} is the disturbance.

Determination of Net interest margin basically depends on internal (bank specific) variables and external (macroeconomic) variables. Bank specific control variables are the most important one. Most of the studies related with Net interest margin, bank specific variables are:

Capital adequacy (leverage): the variable can be expressed by different ways. For example capital adequacy requirement imposed by supervisory authority is one of the risk taking behaviour of banks.²⁹ However majority of the studies using capitalization as a proxy of ratio between total equity and total asset. This variable express as an indicator for the risk insolvency and the market value of the asset. The variable can affect the income of the firm, through risk premium (the bank has to pay in order to borrow funds). Due to some of the features of transition countries such as, they tend to have high non-performing loans, therefore, this issue is pretty important for those countries. Also, equity finance is relatively expensive funding, therefore, increase in equity capital for any reason may increase its cost. Indeed it leads net interest margin higher. However the positive correlation is expected between risk aversion and NIM. Which means banks with high risk aversion tend to have a higher margin.

²⁹ SEACEN research and training center (2006) DagvaBoldbaatar "Measurement and implication of Commercial banks interest spread in selected SEACEN countries"

Market structure: There are three general methods to measure market structure. First one is three firm concentration index (CR), which is calculated from the largest 3 banks market share in each country in terms of total asset. Second one is Herfindahl-Hirschman index (HHI) or Lerner Indexes, HHI is calculated as the sum of squared market share in term of assets. Higher concentration means more power to the bank, it leads higher interest margin. Some literature suggests two different expected signs. One is when bank is more concentrated they are oligopolistic behaviour, so they set higher interest margin. Another hypothesis confirms that more concentration produce more efficient gain from cost reduction. Therefore expected sign will be negative. More concentration results less interest margin.

Lerner Index is a measure of inefficiencies resulting from the difference between a price and marginal cost.³⁰ And the last measurement is Market power (MP), it means that a bank may force higher margin by setting deposit rate lower or by setting loan rate higher or changing both of them. Bank concentration signals market power and a positive correlation. Therefore great concentration results high spread.

Operational cost: when operating cost increases banks tend to increase their interest margin to cover their expenses. It is one of the important variable. Operating cost is included most of the econometrical equation, it testes whether higher operating costs are passed or not to the clients of the banks by increasing their net interest margin.

Credit risk: This is one of the important indicators of bank performance to analyze net interest margin. A variable is used to capture the possibility of default charged on loan interest rate. This variable is measured by ratio of loan loss provision to a total loan. Most of the banks assets are in the form of loan, therefore, if there is a problem with loan quality it could be the reason of bank failure.

Size of Bank: these variable controls cost differences as well as risk diversification due to the size of the bank. Larger banks can gain some economy's scale. First bigger banks can enjoy with

³⁰Louvti Rodney SidabalokViverita (2002) "the Determinants of Bank net interest margin Indonesia"

their substantial amount of market share, and might have opportunities to increase interest spread.

Also when banks are becoming extremely large, the size impacts negatively due to bureaucratic. As well as, too large banks face some difficulties related with the cost association of managing large institution may decrease the benefit of economies scale.

Second, an efficiency gain would reduce cost pressure, therefore, banks may have a higher profits, more loans in order to lower the operating cost. So banks may pass on some of these benefits to their customers by lowering margin.

Ownership: this variable mostly included in the model where countries banking system contains foreign investment banks. Some of the literatures confirm that there is a possibility to lower spreads if foreign banks compete directly with domestic banks. It may force domestic banks to lower spreads. Alternatively, domestic banks that faced with foreign bank competition, they may redirect their lending to segments that are more opaque(Peria, 2002) and where they have informational advantage and greater market power, allowing them to charge higher spreads.³¹

³¹Maira Soledad, Martine Peria, AshokaModay (2003) “ how foreign participation and market concentration impact bank spread in Latin America” https://www.clevelandfed.org/research/conferences/2003/may3/peria_mody.pdf

6.2 Estimation of the model

We will use following empirical model, which is based on the theoretical and empirical model mentioned in the previous section. In order to estimate the empirical model, I will apply the panel data estimation technique.

$$NIM_{it} = \alpha_i + \beta_1 HERF_{it} + \beta_2 PE_{it} + \beta_3 CAP_{it} + \beta_4 CR_{it} + \beta_5 LA_{it} + \beta_6 FOB_{it} + \varepsilon_{it} \quad (7)$$

Where index i referring to cross-sectional individual bank while index t expresses the quarter. NIM_{it} is the net interest rate margin for the bank i in the period of t . α_i is an individual effect or fixed effect of bank.

Table 6 Variable description and expected impact on the bank interest margin			
Variable	Notation	Description	Expected impact
Net interest margin	NIM	Interest income minus interest expenses divided by total expenses	
Market structure	HHI	Herfindahl index for banking sector	(+)
Operational cost	OPE	Logarithm of per worker wage cost	(+)
Capitalization	CAP	Ratio of equity to total asset	(+)
Credit risk	NPL	Ratio of nonperforming loans to total loans	(+)
Size of operation	LA	Logarithm of total asset	(±)
Ownership	FIS	Share of foreign investment in each bank	(-)

Description of each variable is as follows:

Operation cost (OPE): The variable OPE expresses operational cost. We will use logarithm of per worker wage cost to proxy operational cost. This variable help to find the impact of operation cost on the interest margin. If the bank has high operational cost, it tends to transfer such high costs to their customers by increasing interest margin. Hence, expected sign of the variable is a positive sign.

Capital adequacy (CAP): We follow Maudos and Guevara (2004). The ratio of equity to the total asset (CAP) is proxy for the degree of the risk aversion of the bank. If the ratio of CAP is high, it indicates higher risk aversion which means the interest rate margin will be higher. Hence, a sign of the coefficient is expected to have a positive.

Credit risk (CR):The variable CR measures credit risk of individual bank. In order to proxy credit risk, we will use the ratio of nonperforming loans to total loans. If the bank has high credit risk, which is likely to be reflected in the charging of higher margins. Hence, a sign of the coefficient is expected to have a positive.

Size of operation (LA):The variable LA is the logarithm of total asset of the bank which is used to proxy for the size of bank's operation. The sign of the coefficient is ambiguous meaning. On one hand, the theoretical model indicates that the relationship between the size of operations and interest margins are correlated positively. On the other hand, economies of scale suggest that the bank provided more loans should have more interest income and low interest margin.

Ownership (FIS): In order to estimate the effect of foreign banks, I will use the variable FIS which is a share of foreign investment in each bank. The expected value of the coefficient is a negative sign.

Market structure (HHI):In order to capture market structure of Mongolian banking sector, we will use the explanatory variable HHI which computed by Herfindahl–Hirschman index. The index measures the degree of market competition. I use the share of the bank in terms of the total asset in the banking sector to calculate the index. Mongolian banking sector's Herfindahl index was 0.18 in 2012. It implies that the banking sector is relatively higher concentration. According to the literature review higher market concentration is likely to contribute to high margins, so expected coefficient in the model is a positive sign.

7 Empirical Result

In this section, we present the result of the estimations. We estimated the model proposed by Ho and Saunders (1981) and extended by Maudos and Fernandez de Guevara (2004) using panel data estimation method for the quarterly data of Mongolian 13 commercial banks covering from 2004 Q1 to 2010 Q3. I used software of R studio to estimate the empirical model since this software is getting more popular and we covered this model from our classes, therefore, we wanted to use it in my thesis. The code written in R Studio is enclosed at the end of Appendix section.

The estimation results of models are given in the Table 6. We estimated the pooled ordinary least square (POLS), fixed effect model (FEM), and random effect model (REM) in order to compare these models and choose the best fitted model for my data set. Table 6 shows that the estimation summary of these three estimated model in below (see Appendix, Table 7.1, 7.2 and 7.3 for detail estimation result).

Table 7 Summary of estimation results by Pooled OLS, FEM, and REM						
	Pooled OLS		FEM		REM	
Explanatory variables	Estimated coefficient	t-value	Estimated coefficient	t-value	Estimated coefficient	t-value
Intercept	0.016	1.59	-	-	0.033*	2.54
lwage	-0.004***	-6.01	-0.005***	-4.83	-0.005***	-5.27
cap	0.022***	3.99	0.020*	2.27	0.017*	2.31
npl	-0.033***	-5.07	-0.034***	-4.56	-0.030***	-4.29
ln_asset	-0.001	-1.19	-0.006***	-3.40	-0.003*	-2.15
fis	0.005*	2.18	0.0007	0.22	0.003	1.02
hhi	0.104	1.96	0.231***	3.48	0.138*	2.44
R-Squared	0.216		0.169		0.165	
Adj.R-Squared	0.211		0.160		0.161	
F-statistic	14.55		10.38		10.468	
p-value	0.00		0.00		0.00	

Significance level: *** 1%, ** 5%, * 10%

From the above results, shows that across these three models the estimated coefficients of variables *lwage*, *cap*, and *npl* are statistically significant and the value of them do not vary much across different estimation methods. Therefore, the results for these variables are quite robust. However, whether the estimated coefficients of *ln_asset*, *fis*, and *hhi* are significant depends on the estimation model. Therefore, the next thing I want to do is to compare those models by using some appropriate test for each model such as F, LM, and Hausman tests to identify the best model which could say the exact right result among those three models.

7.1 Tests for Fixed and Random effects

In order to choose a better model from above three estimated models, It is an important to know exactly which of those models give me the right result in order to know exact change of which variable impact net interest margin how many percents. Since my three models give me somehow different results for some of the variables, we have to choose the most specific one.

Therefore, we tested for time-fixed effects using F-test, for random effects using LM test, and for fixed or random using Hausman test. In Table 7, we present brief summary of results of test, null hypothesis and decisions (*Detailed hypothesis and test results are shown in Appendix, Table 8.1, 8.2, and 8.3*).

Table 8 Summary of Test results			
Tests:	F	LM	Hausman
Comparison:	POLS vs FEM	POLS vs REM	FEM vs REM
H_0 :	POLS > FEM	POLS > REM	REM >FEM
Test result(p-value)	0.00	0.00	0.06
95% confidence level	Lower than 0.05	Lower than 0.05	Higher than 0.05
Decision	H_0 is rejected POLS < FEM	H_0 is rejected POLS < REM	H_0 is not rejected REM >FEM
The best model:	REM > FEM > POLS		

More detail explanation of test result as follows :

- **POLS vs Fixed Effect Model:**

We used F -test to compare POLS estimates with FEM estimates. The hypothesis is stated as follows:

H_0 : all dummy variables equal to zero \rightarrow POLS is better than FEM if null hypothesis is not rejected

H_a : at least one of them is different from zero \rightarrow FE model is better than OLS if this hypothesis is accepted (*Detailed hypothesis and test results are shown in Appendix, Table 7.1*)

- **POLS vs Random Effect Model:**

We used LM -test to compare POLS estimates with REM estimates. The hypothesis is stated as follows:

$H_0: \sigma_\alpha^2 = 0 \rightarrow$ POLS is better than REM if null hypothesis is not rejected

$H_a: \sigma_\alpha^2 \neq 0 \rightarrow$ RE model is better than OLS if this hypothesis is accepted

We can reject null hypothesis because $p - value = 8.305e - 07$ is lower than 0.05 and $chisq$ is larger than critical value. So this result implies that **REM is better than POLS model**(see Appendix, Table 7.2 for test result in detail).

- **FEM vs REM:**

We used Hausmantest to compare FEM estimates with REM estimates. The hypothesis is stated as follows:

$H_0: Cov(\alpha_i, x_{it}) = 0 \rightarrow$ **REM** is better than FEM if null hypothesis is not rejected

$H_a: Cov(\alpha_i, x_{it}) \neq 0 \rightarrow$ **FEM** is better than RE model if this hypothesis is accepted

From the result, it is clear that null hypothesis is not rejected because $p - value = 0.06053$ is bit higher than 0.05 at 95% confidence level, but null hypothesis can be rejected at 90%

confidence level. Therefore, **REM model** is better than FE model at 95% confidence level (see Appendix, Table 7.3 for test result in detail).

To conclude the tests results From table 7, that **REM** is better than other two models because tests' results suggest $REM > FEM > POLS$. Hence, RE model is better fitted model for my data. In further analysis, i prefer to use the RE model.

7.2 Other diagnostics

Since We are working with panel data that means I could face several problems that are usually generated from cross section and time series data. So in order to prevent those problems or to improve the result of my chosen model, we should run several tests.

For RE model, we checked for cross sectional dependence using Breusch-Pagan LM test of independence and Pasaran CD test, serial correlation using Breusch-Godfrey, for stochastic trend (non-stationary) using Dickey-Fuller test and heteroskedasticity using Breusch-Pagan test. There probably be cross-sectional dependence problem in macro panels with long time series (in my data, $t = 27$ and $i = 13$). Moreover, serial correlation tests apply to macro panels with long time series. A summary of test results is shown in Table 8 (see Appendix, Table 9.1, 9.2 and 9.3 for test result in detail).

Table 9 Summary of Test results				
Tests:	1. Breusch-Pagan LM test	2. Breusch-Godfrey test	3. Dickey-Fuller test	4. Breusch-Pagan test
H_0:	No cross sectional dependence	No serial correlation	Unit root	Homoskedasticity
Test result (p-value)	0.00	0.08	0.01	0.00
95% confidence level	Lower than 0.05	Higher than 0.05	Smaller than 0.05	Lower than 0.05
Decision	H_0 is rejected → there is cross sectional dependence	H_0 is not rejected → there is no serial correlation	H_0 is not rejected → stationary	H_0 is rejected → there is heteroskedasticity

From the above table result, it is more clear that there are problems of cross sectional dependence and heteroskedasticity in my data set. So, it is necessary to improve my RE model by estimating robust covariance matrix estimation.

7.3 Robust covariance matrix estimation

Since there is a problem of heteroskedasticity and cross sectional dependence due to my test result we have to solve the problem. Most common used method to solve such a problem is using Robust covariance matrix estimation. Which means we can control heteroskedasticity by using Robust covariance matrix estimation when it is detected. In my case, we should use "White2" of robust covariance matrix estimation for general heteroskedasticity but no serial correlation in the random effect model. I present final estimation result in Table 8.4.

Table 10 Robust covariance matrix estimation compared to the previous REM		
REM (covariance matrix estimation)		
Explanatory variables	Estimated coefficient	Std.error
Intercept	0.0325*	0.0140
lwage	-0.0045*	0.0022
cap	0.0172*	0.0106
npl	-0.0296**	0.0103
ln_asset	-0.0028*	0.0014
fis	0.0029	0.0033
hhi	0.1383*	0.0607
R-Squared	0.16537	
Adj.R-Squared	0.1618	
F-statistic	10.4683	
p-value	0.0000	

Significance level: *** 1%, ** 5%, * 10%

Table 9 reports robust covariance matrix estimation results for the RE model. All estimated coefficients, with the exception of the share of foreign direct investment, are statistically significant at 90% and 95% confidence level and their signs are line with the expected ones

except the sign of *lwage*. This finding suggests that the dealership model well describes interest margin determinants for the Mongolian banking sector.

The variable *lwage* - logarithm of wage cost per worker is a proxy variable of operational cost. The coefficient of *LWAGE* is statistically significant at 90% confidence level and has a negative sign. Which is not in line with Maria-Eleni K. Agoraki (2008), Maudos and Guevara (2004) as well as Liebeg and Schwaiger (2006). The sign is different from what we expected. However, our finding suggests that the bank with high operational cost (labor cost) does not tend to give such a high costs to their customers by increasing interest margin. It can be explained by the competition for the small banks because they try to have good professionals by attracting them a higher salary.

The coefficient of *CAP* is statistically significant at 90% confidence level and has a positive sign which is fitted the findings of existence literature such as Demirgüç-Kunt and Huizinga (1999), Saunders and Schumacher (2000), Louvti Rodney Sidabalok (2012), Maria-Eleni K. Agoraki (2008). Therefore, a positive relation between interest margin and capitalization. It means the banks which have a higher the risk aversion tend to have a higher net interest margin. This result indicates that banks with higher risk aversion tend to set higher margins. It can be explained by the fact that more risk aversion banks have higher margins so as to recover their higher cost of equity financing.

From the result, we can see that the credit risk influences negatively bank interest margins. The coefficient of *NPL* is statistically significant at 95% confidence level and its sign is different from expected one. And it is not fitted with some of the studies, Demirgüç-Kunt and Huizinga (1999), Louvti Rodney Sidabalok (2012), Maria-Eleni K. Agoraki (2008), Brock and Franken (2002). They found a positive relationship between interest margin and credit risk. However, some of the Latin American countries have found a negative relation. The market discipline argument can thus explain the negative sign. Following this argument, depositors require a higher premium for depositing their savings in riskier banks that have higher non-performing loan ratios.

Therefore, this result can explain that the increase in deposit rate in risky banks would lead to a decline in interest margin.

The coefficient of *LN_ASSET* is statistically significant at a 10% level and has a negative sign in the RE model. The negative coefficient indicates that relatively larger (smaller) banks tend to decrease (increase) interest margin. In line with Maudos and Fernandez de Guevara (2004), size of operations measured by the logarithm of total assets confirms the presence of economies of scale as larger banks tend to have lower margins. Also, the result maybe suggests that larger bank provided more loans should have more interest income and low interest margin.

The coefficient of *FIS* is statistically significant neither FE model nor RE model. Hence, we can conclude that foreign investment on banking sector and interest margin have no statistical relationship. So our finding is in line with Calixte Ahokposs (2013), which detects that there is no difference between foreign and local banks in the way they determine their net interest margin.

Another explanatory variable used in the model is the concentration level in terms of asset, measured by the Herfindahl- Hirschman index (*HHI*). The coefficient of *HHI* is statistically significant at a 10% level and has a positive sign. It is consistent with the theoretical and empirical results with Calixte Ahokposs (2013), Davga Boldbaatar (2006). Therefore, higher concentration level means more power for the banks, which leads higher margin.

Conclusion

In this study, the determinants of net interest margin in Mongolian banking sector were analyzed using the dealership model introduced by Ho and Saunders (1981), through the period 2004-2010. Firstly we made an analyze of current Mongolian economic and banking sector situation after that, the attention was mainly focused to the econometric estimation which estimates Net interest margin against bank specific variables. Since banks are the main provider of funds in Mongolia, their efficiency can be seen through spread between lending and deposit rates. This thesis will provide a new research to determine net interest margin in Mongolian banking sector as well as it shall also contribute the first written work for this topic in Mongolian case. The analysis of Net interest margin is very much dependent on availability of data.

However based on the availability of data, net interest margin was estimated against some important bank specific variables as well as market concentration variable using panel data technique. From the test result, RE model is the most preferable model than Pooled OLS and FE models. The results of RE model show that all variables are statistically significant determinants for the net interest margin except foreign investment share. Therefore, in our model we only focused on bank specific determinants. From the equation that we estimated, some of the variables were line with our prediction as well as existing literature, but some of them were different from what we were expected.

Mongolian banks tend to increase interest margin when market concentration increases. When banks have more market share, they gain more opportunities to set higher interest margin. Our estimation proved that higher concentration, allowing to the banks to enjoy a high margin.

Interest margin in Mongolia, negatively affects the increase of nonperforming loans. It could be, over the estimation period Mongolian banking sector focused on an increase in loan market

share. Therefore, there has been a variety of loan products offered. It reflects in setting the margin.

However, in Mongolia, more capitalized banks tend to be conservative to issue a loan because of the risk of shareholder's equity. It may be explained by the fact that more risk aversion banks have higher margins so as to recover their higher cost of equity financing.

Since our result underline the importance of binding market concentration, capital adequacy, while promoting size of the bank, operational efficiency to downward pressure on interest margin. From the result obtained above, interest margin explained significantly by bank specific factors such as size of the bank, capital adequacy, credit risk, operational cost, market concentration, as well.

For the further research, we need to develop our research by introducing macroeconomic determinants that influence net interest margin of a banking system may be incorporated for the next study.

Appendix A

Appendix

Table 7.1 Estimation result of POLS regression

Call:

```
plm(formula = nim ~ lwage + cap + npl + ln_asset + fis + hhi,  
     data = data_mater thesis, model = "pooling", index = c("xid",  
     "tid"))
```

Balanced Panel: n=12, T=27, N=324

Residuals :

```
Min. 1st Qu. Median 3rd Qu. Max.  
-0.126000 -0.005620 -0.000599 0.005180 0.088300
```

Coefficients :

```
Estimate Std. Error t-value Pr(>|t|)  
(Intercept) 0.01584774 0.00999401 1.5857 0.11380  
lwage -0.00424239 0.00070618 -6.0075 5.165e-09 ***  
cap 0.02229044 0.00558706 3.9897 8.223e-05 ***  
npl -0.03302722 0.00651630 -5.0684 6.831e-07 ***  
ln_asset -0.00107393 0.00090263 -1.1898 0.23502  
fis 0.00543814 0.00248926 2.1846 0.02965 *  
hhi 0.10371814 0.05283360 1.9631 0.05051 .
```

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Total Sum of Squares: 0.076477

Residual Sum of Squares: 0.059964

R-Squared : 0.21592

Adj. R-Squared : 0.21125

F-statistic: 14.5491 on 6 and 317 DF, p-value: 1.1268e-14

Source: Own R-file

Appendix

Table 7.2 Estimation result of FEM

Call:

```
plm(formula = nim ~ lwage + cap + npl + ln_asset + fis + hhi,  
     data = data_project.set, model = "within", index = c("xid",
```

"tid"))

Balanced Panel: n=12, T=27, N=324

Residuals :

Min.	1st Qu.	Median	3rd Qu.	Max.
-0.129000	-0.003640	-0.000127	0.003460	0.086000

Coefficients :

	Estimate	Std. Error	t-value	Pr(> t)
lwage	-0.00461106	0.00095458	-4.8304	2.157e-06 ***
cap	0.02011508	0.00886602	2.2688	0.0239777 *
npl	-0.03406003	0.00746956	-4.5598	7.413e-06 ***
ln_asset	-0.00637517	0.00187521	-3.3997	0.0007641 ***
fis	0.00067075	0.00308739	0.2173	0.8281551
hhi	0.23132917	0.06647004	3.4802	0.0005739 ***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Total Sum of Squares: 0.061724

Residual Sum of Squares: 0.051282

R-Squared : 0.16918

Adj. R-Squared : 0.15978

F-statistic: 10.3848 on 6 and 306 DF, p-value: 1.7624e-10

Source: Own R-file

Appendix

Table 7.3 Estimation result of REM

Call:

```
plm(formula = nim ~ lwage + cap + npl + ln_asset + fis + hhi,  
data = data_project.set, model = "random")
```

Balanced Panel: n=12, T=27, N=324

Effects:

varstd.dev share

idiosyncratic 1.676e-04 1.295e-02 0.874

individual 2.411e-05 4.911e-03 0.126

theta: 0.5476

Residuals :

Min. 1st Qu. Median 3rd Qu. Max.
-1.29e-01 -4.45e-03 -5.37e-05 3.88e-03 8.76e-02

Coefficients :

	Estimate	Std. Error	t-value	Pr(> t)
(Intercept)	0.03250033	0.01280357	2.5384	0.01161 *
lwage	-0.00454976	0.00086288	-5.2728	2.492e-07 ***
cap	0.01721218	0.00743835	2.3140	0.02131 *
npl	-0.02957664	0.00689813	-4.2876	2.400e-05 ***
ln_asset	-0.00279551	0.00129909	-2.1519	0.03216 *
fis	0.00291785	0.00285984	1.0203	0.30837
hhi	0.13830676	0.05657423	2.4447	0.01504 *

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Total Sum of Squares: 0.064744

Residual Sum of Squares: 0.054037

R-Squared : 0.16537

Adj. R-Squared : 0.1618

F-statistic: 10.4683 on 6 and 317 DF, p-value: 1.3437e-10

Source: Own R-file

Appendix B

8.3 Tests for fixed and random effects

I used F -test to compare POLS estimates with FEM estimates. The hypothesis is stated as follows:

H_0 : all dummy variables equal to zero \rightarrow POLS is better than FEM if null hypothesis is not rejected

H_a : at least one of them is different from zero \rightarrow FE model is better than OLS if this hypothesis is accepted

Appendix
Table 8.1. F-test result for comparing POLS vs FEM
F test for individual effects
data: nim ~ lwage + cap + npl + ln_asset + fis + hhi F = 4.71, df1 = 11, df2 = 306, p-value = 1.136e-06 alternative hypothesis: significant effects
Source: Own R-file

From the test result, H_0 is rejected because $p - value = 1.136e-06$ is lower than 0.05 at the 95% confidence level. Hence it implies that **FEM is better than POLS**

POLS vs Random Effect Model:

I used LM -test to compare POLS estimates with REM estimates. The hypothesis is stated as follows:

$H_0: \sigma_\alpha^2 = 0 \rightarrow$ POLS is better than REM if null hypothesis is not rejected

$H_a: \sigma_\alpha^2 \neq 0 \rightarrow$ RE model is better than OLS if this hypothesis is accepted

Appendix
Table 8.2. LM test result for comparing POLS vs REM
Lagrange Multiplier Test - (Breusch-Pagan)
data: nim ~ lwage + cap + npl + ln_asset + fis + hhi chisq = 24.2858, df = 1, p-value = 8.305e-07 alternative hypothesis: significant effects
Source: Own R-file

I can reject null hypothesis because $p - value = 8.305e - 07$ is lower than 0.05 and $chisq$ is larger than critical value. So this result implies that **REM is better than POLS model**

FEM vs REM:

I used Hausman test to compare FEM estimates with REM estimates. The hypothesis is stated as follows:

$H_0: Cov(\alpha_i, x_{it}) = 0 \rightarrow$ **REM** is better than FEM if null hypothesis is not rejected

$H_a: Cov(\alpha_i, x_{it}) \neq 0 \rightarrow$ **FEM** is better than RE model if this hypothesis is accepted

Appendix
Table 8.3. Hausman test result fro comparing FEM vs REM
Hausman Test
data: nim ~ lwage + cap + npl + ln_asset + fis + hhi
chisq = 12.065, df = 6, p-value = 0.06053
alternative hypothesis: one model is inconsistent
Source: Own R-file

From the result, we can see that null hypothesis is not rejected because $p - value = 0.06053$ is bit higher than 0.05 at 95% confidence level, but null hypothesis can be rejected at 90% confidence level. Therefore, **REM model** is better than FE model at 95% confidence level.

8.4 Other diagnostics

- **Test for Cross sectional dependence**

We use Breusch-Pagan LM test of independence for testing cross sectional dependence.

H_0 : residuals across entities are not correlated \rightarrow there is no cross sectional dependence

H_a : the residuals are correlated across entities \rightarrow there is cross sectional dependence

Appendix

Table 9.1. Breusch-Pagan LM -testresult for cross sectional dependence

Breusch-Pagan LM test for cross-sectional dependence in panels

data: formula

chisq = 158.6584, df = 66, p-value = 1.343e-09

alternative hypothesis: cross-sectional dependence

Source: Own R-file

From test result, we can conclude that **there is cross sectional dependence** because null hypothesis is rejected due to the lower $p - value = 3.175e - 12$ than 0.05.

- **Test for Serial correlation**

We use Breusch-Godfrey/Wooldridge test for serial correlation in panel models

H_0 : there is no serial correlation

H_a : there is serial correlation

Appendix

Table 9.2. Breusch-Godfrey/Wooldridge test result for serial correlation

Breusch-Godfrey/Wooldridge test for serial correlation in panel models

data: $nim \sim lwage + cap + npl + \ln_asset + fis + hhi$

chisq = 37.7281, df = 27, p-value = 0.08226

alternative hypothesis: serial correlation in idiosyncratic errors

Source: Own R-file

From the test result, we can say that **there is no serial correlation** because $p - value = 0.08226$ is higher than 0.05.

- **Test for Heteroskedasticity**

We use Breusch-Pagan test to know whether there is a heteroskedasticity in our estimation.

H_0 : there is no heteroskedasticity \rightarrow homoskedasticity

H_a : there is a heteroskedasticity \rightarrow heteroskedasticity

Appendix

Table 9.3. Breusch-Pagan test result for heteroskedasticity

Breusch-Pagan test

data: $nim \sim lwage + cap + npl + ln_asset + fis + hhi + factor(xid)$

BP = 1949.753, df = 17, p-value < 2.2e-16

Source: Own R-file

Appendix C

- **R-code**

```
# Master thesis "empirical part"
```

```
#install.packages('foreign')  
library(foreign)
```

```
#install.packages('plm')  
library(plm)
```

```
#import data  
data_project<- read.dta("D:/Subjects in CU/3. convert.dates = TRUE, convert.factors = TRUE,  
missing.type = FALSE, convert.underscore = FALSE, warn.missing.labels = TRUE)
```

```
# define panel dataset
```

```
attach(data_project)  
data_thesis<-plm.data(data_project, index = c("xid", "tid"))
```

```
# 1: Estimate the empirical model by pooled OLS
```

```
pooled<-plm(nim ~ lwage+cap+npl+ln_asset+fis+hhi, data=data_project.set, index=c("xid",  
"tid"), model="pooling")  
summary(pooled)
```

```
# 2. Estimate Fixed effects using Least squares dummy variable model
```

```
lsdv<-lm(nim ~ lwage+cap+npl+ln_asset+fis+hhi+factor(xid)-1, data=data_project.set)
```

```
summary(lsdv)
```

```
# 3. Estimate Fixed effect model - "Witin Estimator"
```

```
fem<-plm(nim ~ lwage+cap+npl+ln_asset+fis+hhi, data=data_project.set, index=c("xid", "tid"),  
model="within")  
summary(fem)
```

```
fixef(fem)
```

```
# 4: Estimate the model by random effect model
```

```
rem<-plm(nim ~ lwage+cap+npl+ln_asset+fis+hhi, data=data_project.set, model="random")  
summary(rem)
```

```
# 5: Comparison of pooled OLS, fixed effect and random effect
```

```
# pooled OLS vs FE: F test
```

```
pFtest(fem, pooled)
```

```
# pooled OLS vs RE: Breusch-Pagan Lagrange multiplier
```

```
plmtest(pooled, type=c("bp"))
```

```
# FE vs RE: Hausmen test
```

```
phtest(fem, rem)
```

```
# If the p-value is < 0.05 then the fixed effects model is a better choice
```

```
# 6: test for cross-sectional dependence/contemporaneous correlation
```

```
# a) Breusch-Pagan LM test for cross-sectional dependence in panels
```

```
pcdtest(rem, test = c("lm")) # from the result, there is cross sectional effect
```

```
# b) Pesaran CD test for cross-sectional dependence in panels
```

```
pcdtest(rem, test = c("cd")) # result is the same as BP test
```

```
# 7: test for serial correlation in idiosyncratic errors
```

```
# Breusch-Godfrey/Wooldridge test for serial correlation
```

```
pbgttest(rem)
```

```
# 8: Augment Dickey fuller test for stationary
```

```
library(tseries)
```

```
adf.test(data_project.set$nim, k=2)
```

```
# 9: Breusch-Pagan test for heteroskedasticity
```

```
library(lmtest)
```

```
bptest(nim ~ lwage+cap+npl+ln_asset+fis+hhi+factor(xid), data = data_project, studentize=F) #  
from the result, there is heteroskedasticity
```

```
# 10: Robust covariance matrix estimation for heteroskedasticity consistent coefficients
```

```
coefest(rem, vcovHC(rem, method = "white2"))
```

Endnote

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