

Skidmore College

Creative Matter

Economics Student Theses and Capstone
Projects

Economics

2017

Changes in Profitability for Primary Dealers since the Financial Crisis

Benjamin Allen
Skidmore College

Follow this and additional works at: https://creativematter.skidmore.edu/econ_studt_schol



Part of the [Finance Commons](#)

Recommended Citation

Allen, Benjamin, "Changes in Profitability for Primary Dealers since the Financial Crisis" (2017).
Economics Student Theses and Capstone Projects. 43.
https://creativematter.skidmore.edu/econ_studt_schol/43

This Thesis is brought to you for free and open access by the Economics at Creative Matter. It has been accepted for inclusion in Economics Student Theses and Capstone Projects by an authorized administrator of Creative Matter. For more information, please contact dseiler@skidmore.edu.

Changes in Profitability for Primary Dealers Since the Financial Crisis

SKIDMORE COLLEGE
DEPARTMENT OF ECONOMICS

Economics 375: Senior Seminar in Economics
Classroom: Lib 213
Term: Spring 2017

*This thesis is submitted in partial fulfillment of the requirements for the course Senior Seminar
(EC 375), during the Spring semester of 2017*

Name: _____

Signature: _____

Ben Allen

Economics 375 001

Final Draft

May 02, 2017

Changes in Profitability for Primary Dealers since the Financial Crisis

Abstract

This paper will use bank-specific, industry specific, and macroeconomic variables to examine the determinants of bank profitability since the financial crisis in 2008 for primary dealers with the Federal Reserve. The paper will also examine the determinants of bank profitability before the crisis, from 2000 - 2007, and compare the results to determine how the banking industry has changed strategy due to changing environments. Empirical evidence shows a strong international bias within the primary dealers but finds differences in how market concentration, interest rate adaptability, and several other bank-specific variables effect profitability for United States primary dealers.

Introduction

The financial system is vital to an economy because it is put in place to enhance economic operations. Specifically, the banking industry places a key role in turning savings within the economy into investments in the economy. If financial systems are able to be efficient and continue to increase profitability it could help stimulate economies. Levine et al. (2000) puts it

very eloquently by stating that the financial intermediation provided by the banking sector helps economic growth by taking savings and converting them into investments which are more productive. Therefore, an overall economy should be concerned with the stability of the banking sector. This concern should be especially prevalent after the most recent financial crisis because the banking industry was quickly becoming unstable. Since the financial crisis regulations and changing macro-economic environments have changed the way banks are being profitable. Understanding how the industry has changed is the first step to determining what type of profitability is the most sustainable.

The banking industry has been a concern for academic literature for some time. Modigliani & Miller (1958) try to determine specific variables like capital that help the industry remain stable. Berger (1995) and Bourke (1989) build off of this concern by looking at several countries and relaxing some assumptions made by Modigliani & Miller (1958). Since then there have been numerous case studies and theoretical papers examining bank profitability and it various across time periods, countries, and types of banks. This paper builds off of Hoffman (2011) which specifically looked at the U.S. banking industry before the financial crisis. This paper also splits up time periods which was introduced by Dietrich and Wanzenried (2011) which looked at the effect of the financial crisis on banks in Switzerland. Macro-economic variables are also important to include into a model on bank profitability because it can increase the supply and demand of financial services (Pervan et al., 2015).

The contributions that this paper makes to the literature is examining the U.S. banking industry in two different time periods and then explaining exactly why the industry has changed as a

whole. This paper also specifically looks at primary lenders because they are more transparent, more regulated, and embody the overall trends of the industry. Using a subset of banks is unusual but should provide interesting results that could have implications for the overall industry. Lastly, this paper includes variables like interest rate margins that are not used in literature and the point for the inclusion of this is to determine the adaptability of banks during fluctuating economic periods. The paper finds empirical evidence that there are differences in the U.S. primary dealers bank profitability since the financial crisis. Changes in managerial strategies like amount of loans lent out, amount of capital held, and diversification of portfolios have affected the ways that banks profit. Furthermore, the banking industry seems to have reached a point of market concentration that has caused collusion and helped banks profit more. These findings support my hypothesis that banks have changed the way that they profit since the crisis.

The rest of the paper is organized as follows. Section 2 will discuss the general analytical framework of bank profitability, Section 3 discusses important literature, Section 4 discusses the methodology used in the paper, Section 5 is a discussion of the results, and Section 6 provides some concluding remarks.

Analytical Framework

The underlying theory that drives this paper is a basic micro-economic model of what determines profitability or how efficient a company is at making money. In the most basic sense making money can be seen as profits which are the revenue a company generates minus the cost of running the company. There are certain steps that lead to more profits for any company in any

industry. Any company that increases revenue while cost remains constant will be more profitable. Similarly, any company that decreases cost while revenues remain constant will be more profitable. The issue when examining a specific industry is defining profits and figuring out what determines revenues or costs. Once the determinants of revenue and costs are defined it is then more clear how a company in a certain industry should manage itself to be more profitable. Therefore, it is vital for management to act in the most efficient way possible. The company that meets the demand of consumers in the way that finds the greatest distance between revenue and cost will be the most profitable. All in all, before determining the changes in bank strategies to make money it is important to determine what drives profitability, or more specifically, what drives the difference between revenue and costs.

The banking industry is a service based industry because when doing business with a bank you don't get any goods in return, instead the bank offers to handle your money for you. Therefore, banks are only able to make money from the assets that they hold. However, it is important to note that this paper is not strictly looking at bank profits, instead it is looking at bank profitability. The difference is that profitability is not simply revenues minus costs but it is a measurement of a business's efficiency to make profits. Profitability is a metric that determines the opportunity a company has to make profits in relation to the size of the company. Therefore, the profitability for a bank is how much money they are able to make off of the money that they hold. In other words, a banks' profitability can be defined as the returns on their assets (Modigliani, Miller., 1958). The return on assets show how much banks are making based on how much service they provide, which is one definition of profitability. Therefore, this paper will define profitability for banks as return on assets.

For any company there is a cost of doing business and for banks the cost of doing business is the cost of handling assets. One of the most basic costs is the cost of labor, which is the total wages for employees. Other costs include the interest on their deposits, debts from loans, and regulatory fees. These costs are fees that banks must pay in order to hold assets. Banks are able to cover these costs by generating revenue from the services that they provide. Revenue sources include interest payments on deposits at their bank and any fees that the bank charges customers for doing business. Therefore, when determining what makes banks profitable it is important to incorporate all of the potential costs and revenues. These types of variables are all bank specific and show the differences in bank management from bank to bank (Rudegeair, 2017). Some examples of variables that incorporate the difference between costs and revenues are labor productivity and interest rate margins. Labor productivity shows the return on the investment for a company's cost of labor. Interest rate margins show the difference between interest rate costs and interest rate revenues which is the profits that a bank makes from interest rates. It is also important to show how equip a bank is to exogenous shocks. Variables like credit risk, liquidity, and capital adequacy are all variables that show how well a bank is prepared to deal with unexpected changes. These are vital to profitability because banks that are better prepared for exogenous shocks are more likely to maintain profits in the long-run. Therefore, an equation that would show bank profitability is:

$$(1) ROA = LP + PM + ESP$$

In this equation LP is the labor productivity, PM is the profit margins, ESP is the exogenous shock preparedness. There are many variables that could define each aspect of this equation

which will be explained in the next section of this paper. However, when looking at bank profitability it is important to include some control variables that show what type of industry the bank is operating in. Competitiveness and regulations are both examples of industry characteristics that could influence bank profitability (Nacuer, Omran., 2011). Therefore, when finding a banks' profitability, it is important to include variables that capture the banking industry characteristics which is shown as IC in equation (2).

$$(2) ROA = LP + PM + ESP + IC$$

Equation (2) is a better model for finding bank profitability because it includes bank specific features that drive profitability but controls for ability to make profits in the banking industry as a whole. The final step when determining bank profitability is to control for the macro-economic environment. Pervan et al., 2015 finds evidence that a healthier growing economy increases the supply and demand for bank services. Basically, when an economy is doing well more people require loans and deposits that the banks provide. Therefore, it is important to include variables like gross domestic product or unemployment because they show the demand that an economy has for banking services. Equation (3) adds economic factors (EF) to the bank profitability model.

$$(3) ROA = LP + PM + ESP + IC + EF$$

Equation (3) is the best model for determining bank profitability because it incorporates bank specific characteristics that drive profits, industry characteristics that show bank ability to profit,

and economic factors that determine the demand for banking services. These three types of variables are necessary for determining bank profitability but the issue is that they can be defined in many ways which is seen in the literature.

Literature Review

In this section I will review the existing research on determinants of bank profitability. The literature on this topic varies in many ways including time period, country, hypotheses studied, variables affecting profitability, and most importantly the results. However, it is important to analyze all of the literature even though I am only looking at the primary dealers for a couple reasons. One reason is that primary dealers consist of banks from all around the world (Table 1). Another reason is that the literature differs on what variable is the primarily examined in each study. What is constant throughout the literature is the fact that there are three types of determinants: bank-specific, industry specific, and macroeconomic variables which all effect the profitability of a bank. Bank specific variables show the differences in management strategy between banks. Industry specific variables describe the status of the banking industry by looking at regulatory changes and market-concentration. Lastly, macroeconomic variables indicate overall economic growth and give the full picture of the type of environment the banking industry is in.

Bank Specific Determinants

Capital adequacy is a prevalent bank-specific variable throughout literature because it shows how efficient and stable banks are. It does so by expressing a bank's capital risk exposures. There are two schools of thought on how capital affects bank profitability which are the efficiency-risk and the franchise-value hypotheses. The efficiency-risk hypothesis claims that banks with higher rates of return which leads to higher profits will choose low levels of capital ratios but the franchise-value hypothesis suggests that the most efficient banks will look for high capital ratios. Modigliani and Miller (1958) derive the cost of capital and argue that capital will have a negative relationship with profitability due to the cost of acquiring it. However, Modigliani and Miller (1958) make a lot of assumptions including perfect capital markets which is value-maximization behavior, perfect information, no entry barriers, no bankruptcy costs, and no corporate taxes. These assumptions are obviously not all true and even Modigliani and Miller (1958) admit that their simplifications are drastic and must be relaxed in order to be realistic. Even though the assumptions are not realistic many academics agree with the relationship because a high capital ratio implies that a bank is operating too conservatively and missing out on potential trading opportunities that could bring in profits (Goddard et al., 2004). This is described as the opportunity cost of holding capital and the theory implies that holding too much capital is too costly (Goddard et al., 2004). However, after empirical research throughout the European Union the results show a positive relationship which disagrees with the opportunity cost theory (Goddard et al., 2004). Bourke (1989) finds a similar positive relationship in European, Australian, and North American banks and uses the signaling hypothesis which relaxes the perfect information assumption. The theory is that banks with more capital have more

access to cheaper and less risky sources of funds and better asset markets meaning more profits. The hypothesis argues that managers who have information about future cash flows will signal this in capital decisions. Therefore, banks that expected better performance in the future will increase capital causing the positive relationship. Berger (1995) also finds a positive relationship once relaxing the no bankruptcy costs assumption. This supports the bankruptcy cost hypothesis which implies that the greater an exogenous factor is in increasing expected bankruptcy costs, the more capital banks will hold, which will then lower the probability of failure and help profits. Therefore, even though the theory of the capital adequacy ratio suggests a negative relationship, empirical evidence shows the opposite and is explained by the signaling and bankruptcy cost hypotheses. However, as mentioned before, much of the literature on determinants of bank profitability disagrees on the results. Hoffmann (2011) is one of the only studies ever done specifically on determinants of bank profitability in the United States which makes it extremely relevant to my paper considering this paper will examine banks operating in the United States. Even the international primary dealers are being affected by changes in the U.S. economy because of the increased regulations for these specific banks while operating in the U.S. economy. For the U.S. banking industry, the capital profit relationship is slightly more complicated and the efficiency-risk hypothesis is seen when the capital ratio is lower than 41% but any more than that the franchise-value hypothesis is more dominant (Hoffmann, 2011). This implies a non-linear relationship in the U.S. banking industry but Hoffmann (2011) says that if we pay more attention to the single causality between the two there is clearly a negative relationship. Therefore, the relationship between capital adequacy and profits are ambiguous and potentially different for international and U.S. based banks.

Bank size, also known as total assets, is another determinant of bank profitability that can be affected by managerial decisions. Bank size and profitability are closely related because an increase in size could allow banks to realize economies of scale. Increased size allows banks to lower average costs, reduce risk, and increase efficiency (Regehr and Sengupta, 2016). Many empirical studies have used bank size as a variable and found a positive relationship between size and profits which supports the economies of scale theory (Hoffmann 2016; Pasiouras and Kosmidou, 2007; Pervan et al., 2015). Even though this has been the prevailing theory and there is empirical evidence in support of the theory, it is unclear how realistic it is in all cases because it assumes that banks are able to take advantage of economies of scale. In some countries there are regulations that might inhibit the ability of banks to take advantage of economies of scale. This could explain why some empirical studies for specific countries have found insignificant results between bank size and profitability (Athanasoglou et al., 2008; Islam and Nishiyama, 2016). Goddard et al. (2004) studied all countries in the European Union and is the best evidence for proving banks in some countries are unable to take advantage of scale efficiencies. The article found that the relationship between size and profitability was positive for the U.K. but insignificant or negative for other countries. This shows that the relationship depends on whether or not banks in a country are able to take advantage of economies of scale.

In the U.S. before the financial crisis there seemed to be a negative relationship between bank size and profitability since profitability depends on efficient use of increased technology not increased size (Hoffmann, 2011). A study done by the Federal Reserve Bank of Kansas City tried to look at how the crisis affected the size-profitability relationship in the U.S. and argue that the relationship is actually positive. Regehr and Sengupta (2016) conducted the study and argue

that technological advances are not separate from the size-profitability relationship because an increase in technology allows for banks to better take advantage of economies of scale. The study finds that from 2000-2014 there is a clear positive relationship but with diminishing returns and technological advances decrease the diminishing returns allowing for larger banks to take advantage of economies of scale. The results of Hoffmann (2011) can be explained by the fact that technological change decreases the diminishing returns because if technological change is kept separate it would seem as if that was the reason for increased profitability. Therefore, if technological change is included into the size-profitability relationship, the primary dealers in the U.S. can expect to see a positive correlation but at a diminishing rate and eventually turning negative.

Apart from capital adequacy and bank size, there are always several other variables that are included in studies about determinants of bank profitability. However, the only two that are constant are typically capital adequacy and bank size, while the rest vary from study to study. Other variables in literature that are worth examining include productivity, operating costs, liquidity ratio, credit risk, loan to asset ratio, deposit to total asset ratio, and several others. These variables do not have a great deal of theoretical literature that attempts to explain the relationship between them and profitability. The variables are included because they are taken from income statements and balance sheets, which represent management strategies in financial institutions. Typically, these variables have a clearer relationship with profitability, which is why there is not a great deal of literature about them. All in all, capital adequacy, bank size, and other bank-specific variables are the most important in determining bank profitability, which makes them vital in any model.

Industry Specific Determinants

Industry specific characteristics have also been proven to affect the profitability of banks. The banking industry is unique and has changed drastically since the financial crisis. One of the reasons that the industry has changed is due to an increase in regulation. Regulations affecting capital requirements, lending practices, and short-selling have changed the way that banks can operate which, in turn, changes the way that banks can profit. Regulations in the banking industry are put in place for good reason and are thought to mitigate the chances of future economic crises. However, too much regulation could increase the costs for banks which will decrease profitability throughout the industry. Therefore, studies have been done to determine how regulations have affected profitability throughout the industry. The issue with including regulation in a dynamic economic model is that it is difficult to quantify a specific regulation. Many researchers have realized this issue and attempted to provide a solution. Naceur and Kandil (2009) looked at credit requirement regulations in Egypt and used short and long term dummy variables to account for regulation. The idea for using dummies is that it captures how the introduction of regulations effect bank profitability. Naceur and Kandil (2009) used a long term dummy that showed how the overall introduction of the regulation has effected bank profitability. The short term dummies were used to test the progressive effects of the regulations over time to see how long it took for regulations to start effecting profitability. It did this by splitting up the entire time period since the introduction of the regulation into four periods and looking at the difference in results for each time period. There are a couple issues with dummy variables and it is because it can only account for one single regulation but since the financial crisis in 2008 there have been numerous regulations. However, Naceur and Kandil (2009)

realized that dummies were not the best option to account for regulation in the regulation-profitability relationship so the study also tested capital requirements effect on intermediation. As capital requirements increase and the capital adequacy internalizes risk for shareholders' banks raise the cost of intermediation (Naceur, Kandil, 2009). Therefore, when looking at capital requirements it is possible to simply look at the increase in intermediation, but this might create a serious endogeneity problem when looking at determinants of bank profitability. Another way to quantify regulation is to create variables that incorporate the cost of a regulation. Naceur and Omran (2011) examined reserve holding requirements and used a variable COST_RESERVES which was the ratio of non-interest earning assets divided by total assets. The variable is argued to equal the cost of holding a reserve and over time an increase in the cost is mainly caused by an increase in reserve requirement regulation. Therefore, if there are regulations that are designed specifically for a single aspect of a bank it is better to use a variable that embodies the cost of the regulation instead of dummy variables.

When examining any industry, it is important to look at the market concentration of the industry to determine how profitable a company is able to be within that industry. A more concentrated market means that most of the market share is controlled by a couple of companies and, at the most concentrated, the market is controlled by a monopoly. Less market concentration implies an industry that resembles perfect competition. Whether a market is more or less concentrated can determine what companies can charge for goods and services which directly affects profitability. In the banking industry, if a market is more concentrated the banks can act as an oligopoly and collude to charge more for intermediation while keeping costs constant which increases profitability. In theory, market concentration should have a positive relationship with

profitability but whether this is true or if financial industries are even able to become concentrated is up for debate.

The literature on market concentration is split into two groups: structural and non-structural. In the banking industry the structural approach is used because it consists of the structure-conduct performance and efficient structure hypotheses. Structure-conduct performance hypothesis (SCP) argues that the more concentrated a banking industry is the more it will collude and behave like an oligopoly which increases bank profits. Whereas, the efficient-structure hypothesis (ESP) argues that a higher concentration means more efficient banks are buying less efficient ones so it is the efficiency of the bank driving higher profits not market concentration. Whether or not banks are able to collude has been questioned due to the evidence that higher levels of concentration lead to lower loan risk and lower rates charged by banks (Bourke, 1989). There is also evidence of the opposite argument, Delis et al. (2008) found that there is anticompetitive behavior when market concentration increases suggesting banks collude which increases profitability. The issue with this study is that it was done with data from Greece, Spain, and Latvia which are all less regulated financial systems than the U.S. and the time period is from 1993-2004 which is before the financial crisis. Once an industry is more regulated it becomes increasingly difficult to collude. Naceur and Omran (2011) studied Middle East and North African countries and found that when more financial regulation was included market concentration became less of a factor for bank profitability. This agrees with ESP because banks with higher efficiency pass the lower costs onto their customers by lowering loan rates to be more competitive. In this case the more efficient banks acquire the less efficient banks but cannot act like an oligopoly because of regulations and fear of other banks entering the market. Many articles that originally supported the SCP hypothesis ended up finding an insignificant

relationship between market concentration and profitability which further supports the ESP hypothesis (Athanasoglou, 2008; Pervan et al., 2015; Islam, Nishiyama, 2016). The U.S. is an interesting case because when the typical Herfindahl-Hirschman Index is used market concentration is insignificant but when share of deposits in the market is used the relationship becomes significant and positive (Hoffmann, 2011). The share of deposits relationship does raise questions of endogeneity and might be slightly biased which could explain the difference in significance. After a review of the literature it is important to include market concentration but insignificant results seem to be the most probable scenario due to the developed financial industry in the U.S.

Macroeconomic Determinants

The last category of variables is macroeconomic determinants; which literature has shown can affect bank profitability as mentioned in the analytical framework section of this paper.

Macroeconomic determinants include the variables that show how healthy the economy is that banks are operating in. Some literature has stated that these are control variables while others have argued that they are extremely important to bank profitability. Nevertheless, every study on bank profitability must include them in order to be considered thorough because of the documented significance. The macroeconomic variable that is most consistently used throughout literature is Gross-Domestic Product Growth Rate. This variable describes whether or not an economy is growing and shows the relationship between economic growth and profitability. Like most variables that are included in determining bank profitability the relationship between it and profitability varies across literature. Tan and Floros (2012) which is the first study to focus on the relationship between Gross-Domestic Product's Growth Rate and bank profitability in China.

The study argues that government should lower the speed of economic growth because high GDP growth decreases the profitability of Chinese banks. The negative relationship can be explained by increased competition due to lower entry barriers that result from high GDP growth (Tan, Floros, 2012). The opposing argument is that an increase in GDP growth has a positive impact on bank profitability because GDP growth increases supply and demand for loans and deposits which was seen in Croatia (Pervan et al., 2015). There is also more nuance to this relationship as Pasiouras and Kosmidou (2007) determined while studying foreign and domestic banks in the European Union. Domestic banks in the E.U. have a positive and significant relationship with GDP growth rate while foreign banks have a negative relationship (Pasiouras, Kosmidou, 2007). The change in relationship can be attributed to a difference in knowledge and expectations about macroeconomic conditions in a country. Also, the fact that the different types of banks service different segments of customers that may react differently in the same macroeconomic conditions contributes to the different relationship. Therefore, due to the variety of different results, the expected relationship between GDP growth rate and profitability for the primary dealers is unclear and may even be different for international and domestic banks.

Another commonly used macroeconomic variable when determining bank profitability is inflation. The theory in the literature is that high inflation rates are associated with high loan interest rates and therefore higher profits. However, if the inflation is unexpected and banks are slow to increase interest rates, bank costs could grow faster than bank revenues causing the reverse relationship. In Asian banks inflation has a positive impact on bank profitability indicating that bank managers anticipated inflation while their customers did not (Islam, Nishiyama, 2016). However, in the Middle East and North Africa the bank managers were slow to adjust rates with inflation causing inflation shocks to be passed on through deposit rates and

the banks bearing the cost of inflation (Naceur, Omran, 2011). When banks bear the cost of inflation there is a negative relationship between the two. Therefore, the relationship between inflation and bank profitability in the U.S. will depend on if bank managers for primary dealers correctly anticipate inflation.

The macroeconomic variable that has changed the most since the financial crisis is interest rates. The Federal Reserve reduced interest rates to an unprecedented low following the economic crash. In 2007 the effective federal funds rate was 5.26 and after the crash it was drastically lowered to 0.15 (Figure 1). The change in interest rates concerns banks because loans and other investments make more money when interest rates are higher. Therefore, higher interest rates are believed to lead to higher profits for banks. However, banks costs are also higher when interest rates are high because the deposits that they use to finance their business are more expensive. The Federal Reserve of St Louis issued a report in 2016 that showed net interest margins were higher when interest rates were lowered after the financial crisis. This means that bank profits increased once the rates were lowered which implies that there is an inverse relationship between interest rates and bank profitability. Scheiber et al. (2016) studied the effects of ultra-low and negative interest rates in Denmark, Sweden, and Switzerland and found similar results to the U.S. They argue that the declines in interest income are more than compensated for by the declines in interest expenses. If banks are able to get creative by charging higher fees, lowering operating costs, and other revenue creating measures then bank profits can increase after an interest rate cut. It is unclear whether or not U.S. banks would be able to see the same results as Denmark, Sweden, and Switzerland but the report from FRED suggests that U.S banks have been able to compensate for the loss in interest income. Therefore, it would be more beneficial to

look at how adaptable the banks in my sample are to changing interest rates. One way to look at how adaptable banks were to changing interest rates is to use interest rate margins for each bank which would make it a bank specific variable. The adaptability of a bank could better show how interest rates have effected bank profitability. This technique has never been used in literature besides (Hoffman, 2016) which used interest rate margins as an independent variable because it is shows a specific profit margin of banks.

Lastly, unemployment is included in several studies but it has the most straightforward relationship with bank profitability. The unemployment rate has a negative effect on bank profitability because lower unemployment means there is a more efficient labor force and higher productivity within banks (Regehr, Sengupta 2016). Similarly, lower unemployment could lead to more demand for financial services. All in all, macroeconomic variables such as GDP growth rate, inflation, interest rates, and unemployment are indicators of bank profitability. All the variables have been proven to have a significant relationship with bank profitability in some way meaning that they are vital to include. Typically, the relationship depends on whether or not banks are expecting some type of exogenous shock and if they are prepared for it. Due to the unexpected financial crisis, the results for the U.S. in recent years could be much different than the literature that observes data from before 2008.

Conclusion

Overall the literature on banking profitability has been extensive and shows empirically different results making it difficult to hypothesize the expected effects of most determinants of banking profitability. Dietrich and Wanzenried (2011) studied the effects that the financial crisis had on

Swiss banking profitability and concluded that the crisis actually helped bank profitability significantly. Even though the Swiss financial sector and overall economy is much different than the United States it sheds light on the fact that the financial crisis did not hurt banks as much as the general public thought. The literature has proven that managerial decisions and various exogenous shocks significantly impact bank profitability but what type of relationship these variables have with bank profitability is unclear due to difference in bank reactions. It is important how banks react to changes in exogenous factors in order to increase profits so depending on how primary dealers reacted to the various industry and macroeconomic shocks will determine how profitability was effected. Also it is possible that international primary dealers moved their money to other economies which has been seen before (Williams, 2003). This would create an international bias within my results and could potentially cause the international primary dealers to be less effected by the financial crisis and changing U.S. economy. All in all, my paper will add to the literature by examining the differences in bank profitability for the primary dealers in the U.S. before and after the most recent financial crisis. The changing economic and industry environments have caused banks to change strategies and profit differently (Rudegeair, 2017). This paper will use the primary dealers as the subject group because of the clear criteria for being one, the increased transparency, and requirement to competitively bet on government securities. These well-known facts about primary dealers could make them more susceptible to changing environments. This paper will attempt to find out exactly how they have had to change strategies.

Methodology

Based on my definition of bank profitability defined in the analytical framework section and my determinants of profitability mentioned in the literature review section, I will use an econometric regression model to test my theory that banks have had to change the way that they profit since the financial crisis. This paper will be using 18 banks that are primary dealers with the Federal Reserve of New York (Table 1). These banks are made up of six United States banks and twelve international banks that are based in different countries all over the world. I will split up my data series that ranges from 2000-2016 on an annual basis into two sections; one before the financial crisis and one after. Therefore, there will be one balanced panel data set from 2000-2007 that will have a total of 121 observations. There will also be one balanced panel data set from 2008-2016 that will have a total of 138 observations. There are many observations being omitted due to difficulty in collecting data for some banks. A panel data model is used because it is the best way to analyze a data set that contains cross-sectional and time-series data. This type of data set will give a more comprehensive view of the banking industry across time. After using this methodology on both time periods I will analyze the empirical results to determine the differences between the two periods. From there I can conclude how different macro-economic environments have affected the way that bank management has changed strategy. The econometric model is defined as follows:

$$ROA_{it} = \alpha_i + \beta_0 + \beta_1 \ln(SIZE)_{it} + \beta_2 \ln(PROD)_{it} + \beta_3 CAP_{it} + \beta_4 IntMar_{it} + \beta_5 CRED_{it} + \beta_6 LD_{it} + \beta_7 \ln(HHI)_{it} + \beta_8 UNEMP + \beta_9 GDPGR_{it} + \beta_{10} INF_{it} + \varepsilon_{it}$$

The dependent variable is ROA, or return on assets, for bank i at time t , with $i = 1, \dots, 8$ for this draft and t being the time for bank i at each observation. There are also three logarithms of variables being used because these three variables were significantly higher numbers than the rest of the variables which were primarily ratios.

Return on Assets

The dependent variable in my model in profitability but in terms of financial institutions this is defined as return on assets. Banks can only profit based on the amount of assets that they have so the revenue that they generate based on what they have is an indicator of how profitable a financial institution is. This is particularly true for investment banks because this variable shows how much money the bank is making on the funds they have to potentially invest. Therefore, return on assets is used to show profitability. This variable is calculated by dividing net income by total assets of a bank. Every single piece of literature mentioned in this paper uses return on assets as a measure of profitability. Some also include return on equity but no piece of literature does not incorporate return on assets into their model. This paper leaves out return on equity because it would be redundant and is more applicable to commercial banks.

Total Assets

Total assets is defined as SIZE in the model because it is a measure of how big a financial institution is. The more assets a bank holds the more money the bank has to manage and this is an indicator of how large a bank is. Typically, larger banks are assumed to be able to profit more

since they have more assets to profit from. However, some literature (Hoffmann, 2011) have found that this is not necessarily the case. Regehr and Sengupta (2016) argued that the law of diminishing returns can be applied to the size of a bank. This means that banks will have a positive relationship between total assets and return on assets but at a decreasing rate and at some point having one more asset will not increase profitability. For this reason, I expect to find a positive relationship between SIZE and return on assets. It is also important to note that the logarithm of SIZE is used in the model. This is because the variable is in in trillions or billions of dollars and it much higher than most other variables. Therefore, beta 1 will be interpreted as the percentage increase that SIZE will increase to mean on more unit of profit.

Productivity Ratio

The productivity ratio (PROD) is a measure of how efficient a financial institution's employees are. The productivity ratio is calculated by net income divided by number of employees. This directly shows, on average, the amount of income each employee brings to the company per year. Many pieces of literature include a measure of productivity, (Islam and Nishiyama, 2016; Athanasoglou et al., 2008) both use productivity growth which basically measures not only the efficiency of the employees but also the talent level of the employees at a specific company. The more productive or the more talented a bank is will always mean the more profitable the bank will be. Therefore, I expect PROD and return on assets to have a positive linear relationship. This variable also uses the logarithm of productivity and this is because the variable is also much higher in scale to most of the other variables in the model. This means that beta 2 will be interpreted as the percentage increase in productivity it takes to increase return on assets by one

unit. Unfortunately, due to a lack of data in almost all banks before 2007 the variable will only be used in post financial crisis time period.

Capital Adequacy Ratio

The capital adequacy ratio (CAP) is a measure of a bank's capital and is important because it shows how much a bank is able to lose before losing deposits or in other words a bank's leverage over potential losses. The more a bank is able to lose the less risky it is for consumers to deposit their assets at the bank. It is measured in this paper as total equity divided by total assets. The issue with this variable is that the literature supports arguments for a positive and negative relationship. Positive relationships found by (Goddard et al., 2004; Bourke, 1989; Berger, 1995) support the bankruptcy cost hypothesis and signaling hypothesis. The bankruptcy cost hypothesis suggest that a bank expecting some exogenous factor will increase capital so that losses can be covered and profits can continue to increase. The signaling hypothesis suggests that banks will increase capital before to indicate hopeful future prospects meaning that they expect profits to increase. An example of this would be an acquisition because a bank would need to increase capital in order to acquire another asset that will increase profits. However, there is literature which dates back to Modigliani and Miler (1958) that supports a negative relationship between CAP and return on assets. If a bank has high capital ratios the bank could have a high opportunity cost for using that capital because they are missing out on potential growth situations. This could mean that banks that have a high capital ratio are not using their assets efficiently and therefore are less profitable. Since the literature supports both a positive and

negative relationship between CAP and return on assets, I do not expect a specific relationship in my model.

Interest Rate Margins

Interest rate margin (IntMar) is a measure of how well a bank manages its' investments compared to its debt costs. The interest rate margin of a bank is calculated by taking difference between interest income and interest costs and dividing that by total deposits. If the interest rate margin is above zero than banks are profiting from interest rates and if interest rate margin is negative than the bank is losing money due to interest rates. The higher the interest rate margin the more efficient the bank is at handling their investment and their debts which leads to more profits. Therefore, I expect a positive relationship between IntMar and return on assets.

This variable is one of my additions to the literature. Most of the literature includes interest rates as a macro-economic control variable. However, since the U.S. financial crisis interest rates have been extremely low so it is difficult to incorporate them into my second time period. Scheiber et al., 2016 studied the effects of ultra-low interest rates on bank profitability. They argue that the declines in interest income are more than compensated for by the declines in interest expenses. If banks are able to get creative by charging higher fees, lowering operating costs, and other revenue creating measures then bank profits can increase after an interest rate cut. Therefore, by using interest rate margins I am able to capture how adaptable banks were to the changing interest rate environment. I predict that since interest rates are lower that my second time period

the interest rates will have a higher beta coefficient than the first time period because their interest expenses will be lower.

Credit Risk

Credit Risk (CRED) is a measure of the amount of loans that a bank has and since there is never a guarantee that a loan will be paid back there is a certain amount of risk that comes with a loan. Banks expect that the money that loans will generate will pay back their current debts or could be profits. Credit risk is calculated by total loans divided by total assets. Some literature suggests that higher credit risk leads to lower profitability because banks will lose money when loans are not paid back (Athanasoglou et al., 2008; Pervan 2015). Therefore, banks must be careful when loaning out money and taking on risk. However, there is also literature (Naceur and Omran, 2011) that suggests that credit risk will lead to higher profits because more loans being given out will lead to higher cash flows in the future which means more profits. Due to the way this paper calculates credit risk by putting a large emphasis on the amount of loans not on the riskiness of loans I expect that CRED will have a positive relationship with return on assets for the second time period because banks were more careful about who they gave loans out to. As far as the pre-financial crisis it is unclear what type of relationship will be seen between CRED and return on assets.

Loan to Deposit Ratio

The loan to deposit ratio (LD) is a measure of how much cash a bank can come up with in the short term to pay debts or unexpected costs. Having a lower loan to deposit ratio means that banks are better equip to handle exogenous shocks like the financial crisis because it means that the bank has a lower amount of loans handed out. A lower loan to deposit ratio is also known as being more liquid due to the fact they are calculated inversely. Therefore, when bank customers started to default on their loans a more liquid bank would still be able to pay its debts. This will allow banks to continue to profit even though it is losing money on some of its' loans so a lower loan to deposit ratio would imply higher profits during times of distress (Hoffman, 2011). This relationship suggests a negative relationship between loan to deposit ratio and bank profitability. However, Islam and Nishiyama, 2016 find evidence in Asian banks that a higher liquidity ratio reduces the loanable funds of a bank which reduces the earning potential of the bank. This implies a positive relationship between loan to deposit ratio and profitability. The issue with that is it might not be applicable to my study since banks in Asia did not have a large number of customer defaulting on loans and liquidity was not necessary to help pay back debt. Therefore, due to the large amounts of losses on loans I predict that loan to deposit ratio will have a negative relationship with bank profitability after the financial crisis.

Herfindahl-Hirschman index

The Herfindahl-Hirschman index (HHI) is a measure of market concentration in the banking industry. The more concentrated a market is the less competition there is. There are two theories

that support that a higher market concentration will lead to higher bank profits. The structure-conduct performance hypothesis suggests that more concentration means more collusion and that this will lead to uncompetitive prices and higher profits. The efficient-structure hypothesis suggests that banks that are more efficient will acquire less efficient banks and that higher profits are actually driving higher concentration. Regardless only a few studies in literature have found a significant relationship between HHI and profitability (Delis et al., 2008; Naceur, Omran., 2011). The studies that have found a significant relationship also disagree on the sign as mentioned in the literature review section of this paper. It depends on whether or not market regulation is included in the study (Naceur, Omran., 2011) or if the country of focus is capable of regulating collusion between banks (Delis et al., 2008). Therefore, I do not expect to find a particular significant relationship for HHI but it is important to include because it is the only industry-specific control variable that is used in my model and most literature.

Macro-Economic Variables

In order to control for changing macro-economic environments, it is important to include variables that incorporate the status of the economy. Variables like gross-domestic product growth rate, unemployment, and inflation give a snapshot of how healthy the economy is. Typically, banks are able to profit more in healthier economies because it means that more people are able to invest their money and require the services that banks offer. Higher GDP growth rate increase the supply and demand for loans and deposits meaning that banks will profit more (Pervan et al., 2015). However, Tan and Floros (2012) argue that a higher GDP growth rate brings in more competition to the banking industry so banks actually profit less when GDP

growth rate is higher. The recent trend of GDP growth rate in the U.S. actually seems to have no correlation with banks return on assets (Figure 8), that along with the literature implications suggest that the relationship between GDP growth rate and profitability could be either positive or negative.

Inflation is another macro-economic variable that help show the health of an economy. The theory in the literature is that high inflation rates are associated with high loan interest rates and therefore higher profits. However, if the inflation is unexpected and banks are slow to increase interest rates, bank costs could grow faster than bank revenues causing the reverse relationship. In Asian banks inflation has a positive impact on bank profitability indicating that bank managers anticipated inflation while their customers did not (Islam, Nishiyama, 2016). However, in the Middle East and North Africa the bank managers were slow to adjust rates with inflation causing inflation shocks to be passed on through deposit rates and the banks bearing the cost of inflation (Naceur, Omran, 2011). When banks bear the cost of inflation there is a negative relationship between the two. Therefore, the relationship between inflation and bank profitability in the U.S. will depend on if bank managers in the U.S. correctly anticipate inflation.

Lastly, unemployment is a macro-economic variable that indicates a country's participation in the economy and it has the most straightforward relationship with bank profitability. The unemployment rate has a negative effect on bank profitability because lower unemployment means there is a more efficient labor force and higher productivity within banks (Regehr, Sengupta 2016). Similarly, lower unemployment could lead to more demand for financial services. All in all, macroeconomic variables such as GDP growth rate, inflation, and

unemployment are indicators of bank profitability. All the variables have been proven to have a significant relationship with bank profitability in some way meaning that they are vital to include. Typically, the relationship depends on whether or not banks are expecting some type of exogenous shock and if they are prepared for it. Due to the unexpected financial crisis, the results for the U.S. in recent years could be much different than the literature that observes data from before 2008.

Robustness Checks

In order to determine that my model is robust it is vital to include two robustness checks. The first is testing for multicollinearity by using variance inflation factors (VIF). For my first time period there is no multicollinearity because no variables have a VIF over 5 (Table 2). Furthermore, there is no multicollinearity in the second time period because no variable has a VIF over 5 (Table 3). There is multicollinearity once international and domestic banks are separated but that can be ignored due to the inherent bias of separating the sample. The other robustness check that must be done is the Hausman test. Since my data is panel data it is necessary to determine whether fixed effects or random effects results are robust. By using the null and alternative hypotheses as follows:

$$H_0 : FE = RE$$

$$H_A : FE \neq RE$$

If the null hypothesis is true then fixed effects (FE) and random effects (RE) are similar and fixed effects is used, if not then random effects is true. Using a two-tailed test implies that the probability of the two being equal must be 2.5% or below to use fixed effects. After running all

the tests, I only use fixed effects in one regression, which is the second time period for domestic banks. All other regressions use random effects. (Table 4).

Results

The results in Table 5 show that not many of variables are significantly related to bank profitability for primary dealers. The R squared is also very low which means that the goodness of fit of the model is poor. This is a discouraging result but could be explained by bias. Primary dealers consist of eight US banks and fifteen international banks which mean that there will be many more observations for international primary dealers which will skew results. Furthermore, international primary dealers are much larger than domestic primary dealers (Table 6) which can also skew results to be bias towards international banks. In order to test whether or not this is true I separated out foreign and domestic primary dealer into two separate groups. Table 7 contains the results for the international primary dealers and the domestic primary dealers once separated out.

International (domestic) banks were determined by where the headquarters are located. Some studies (Pasiouras, Kosmidou., 2007) separate banks based on where the majority of their assets are held but this information is very difficult to obtain. However, studies that only look at one specific country (Athanasoglou, P, et al., 2008; Dietrich, A., & Wanzenried, G. 2011; Hoffmann. 2011; Tan & Floros, 2012) all determine that banks are domestic if they are headquartered there. This is because those banks are regulated in different way that if they were located in some other country. Another popular way to separate out international bias is to include a slope dummy for certain variables that have different relationships with profitability depending on which country

the bank is located (Saona, 2016). However, this slope dummy is only useful when examining a specific variable and this paper is not examining the differences in one specific variable so this method is not useful. Therefore, this paper uses the methods of the literature that looks specifically at one country because it is more focused to the U.S. banking industry.

From the Table 7 it is clear to see that there is an international bias. The results from the international bank sample are nearly the same as the overall results for the pooled sample. The first time periods for both the pooled and international sample only have unemployment as significant and both have similar coefficients. In the second time period capital adequacy and productivity are positive and significant. The R-squared for the international banks is also very low just like the overall sample results while domestic banks have a very high R-squared. This implies that additional factors impact foreign bank profitability. Williams (2003) explains this phenomenon by stating that foreign banks are being affected both by the markets in which they are operating and the fact that they are owned by a foreign entity. This suggests that when looking at a specific economy it is difficult to capture everything that is influencing the profitability of a foreign bank because of difference in management and regulations. The similarities between both the pooled results and international results for both coefficients and R-squared suggest that there is an international bias in the pooled sample. International bias is something that is commonly found in literature. Both Goddard et al. (2004) and Pasiouras, Kosmidou (2007) find international bias when pooling domestic and foreign banks. Both studies looked at banks in the European Union and found less significant results with less explanatory factor. These results are identical to the results that I found and once the studies separated out foreign and domestic banks they started to see the expected results from the domestic banks. For

the rest of the results section I will be examining the domestic results because they are more significant while exhibiting the overall U.S. banking industry trends which means they offer more insight to policy makers and bank managers.

One bank specific variable that has a different relationship with profitability before and after the financial crisis for U.S. primary dealers is interest rate margin. After the crisis there is a positive relationship between interest rate margin and profitability. This positive impact of interest rate margins in bank profitability agrees with (Hoffman, 2016) which is the only paper to use this variable. The difference in significance means that banks were profiting off the low interest rate environment by charging slightly higher interest rates when giving out loans. This shows that bank managers adapted well to changing macro-economic scenarios. Furthermore, interest rate margins did not have a significant relationship with profitability before the financial crisis which supports my theory that bank strategies have changed since the financial crisis. Before the crisis, interest rates were increasing as seen in Figure 1. In this type of environment banks tend to diversify their portfolios and try to make money somewhere besides through interest rate margins because interest rate costs are much higher. The difference between the two time periods proves that theory because of the insignificant relationship during times of increasing federal reserve interest rates and a positive relationship with a lower federal reserve interest rate environment. The sample data for domestic primary dealers is also similar to overall banking industry's trend which can be seen by comparing Figure 2 with Figure 1. Since the financial crisis the interest rate margin trends are almost identical just like the return on asset trends (Figure 3) which suggests that these results could apply to the entire U.S. banking industry. The conclusion that can be drawn from this difference in relationship is that banks prefer to make

money from interest rates in low federal reserve interest rate environments but tend to diversify their portfolios when the federal reserve interest rates are increasing.

Another bank specific variable that has changed its' relationship with profitability since the financial crisis is capital adequacy. Before the financial crisis capital adequacy had a positive relationship with profitability which supports the franchise value hypothesis. This conclusion suggests that U.S. primary dealers with more capital have more access to cheaper and less risky sources of funds and better asset markets meaning more profits. Also, this study did not control for banks without bankruptcy costs and literature has shown that can make the relationship between capital adequacy and profitability positive (Berger, 1995). Since the financial crisis capital adequacy is insignificant with bank profitability which could be attributed to the fact that banks have been holding more capital (Figure 7) since the financial crisis. This change in strategy supports the bankruptcy hypothesis but due to the fact that bank profitability fluctuated so much it is difficult to find a causality and therefore this is more of a long-term strategy after the crisis. Before the crisis banks did not anticipate the losses that were seen and once many loans were defaulted on it was vital to have more capital in order to pay off other debts. Therefore, banks with higher capital were able to maintain better profitability than banks with less capital which is why there is a significant positive relationship between capital adequacy and profitability.

The last bank specific variable that has a different relationship with profitability before and after the crisis is the loan to deposits ratio. The ratio is insignificant before the crisis but has a significant negative relationship after the financial crisis. This makes sense due to the fact that

banks in the U.S. have been giving out more loans every year but at a decreasing rate after the financial crisis in order to be risk averse (Rudegeair, 2017). Due to the amount of loans that defaulted and caused banks to lose a lot of money it has created a risk averse strategy in the industry as a whole. The U.S. primary dealers have been following the same trend (Figure 4) which, along with increasing deposits, implies that the loan to deposit ratio has been decreasing since the financial crisis. Since the loan to deposit ratio has been decreasing while profitability is increasing (Figure 3) it suggests a negative relationship. This supports my hypothesis that banks have changed strategy since the crisis. Loaning out money at a decreasing rate shows that banks have altered the way they have increased profitability and it is not by giving out more loans but by giving out the right loans.

The most interesting finding in this paper is the fact that market concentration is significant since the financial crisis. Many of the case studies on market concentration in the banking industry shows that the variable has no relationship with bank profitability when using the Herfindahl-Hirschman Index (Athanasoglou, 2008; Dietrich, Wanzenried., 2011; Hoffman, 2011; Pervan et al., 2015; Islam, Nishiyama, 2016). However, theoretically the variable should have a relationship with profitability because as markets become more concentrated there is either more collusion or more aggressive competition. I find evidence supporting that the increase in market concentration in the U.S. banking industry (Figure 5) has been increasing profitability for banks. This supports the structure-conduct performance hypothesis and suggests that since the financial crisis the U.S. banking industry has reached a point of concentration where banks are able to collude in order to be more profitable. This could be due to the fact that several banks have been acquired which can be seen by a large spike in the market concentration during the post-financial

crisis U.S. banking industry (Figure 5). It could also be explained by the fact that bank size has increased for large banks, including my sample (Figure 6), and that has caused other banks to be pushed out of the market. This is an interesting finding because there has been a large political focus on regulating large banks and making sure that they are not too big to fail. However, the US primary dealers, which are all in the top 30 U.S. banks ranked by assets, have been getting larger. The growth of bank size has decreased, which can be seen by a flatter line since 2008 in Figure 6, but it is still increasing meaning that banks are getting larger just at a decreasing rate. Therefore, the policy that has been implemented has only slowed bank growth but not stopped it. Therefore, due to bank market concentration reaching an all-time high in recent history and bank continually getting larger it is certain that since the financial crisis the primary dealers, and potentially the other banks that have survived, have been able to profit more from higher market concentration.

Concluding Remarks

The financial crisis was detrimental to the entire U.S. economy including the banking industry. Profitability across the entire industry plummeted (Figure 3), several banks went bankrupt, and many people were laid off. This caused bank management across the entire industry to adapt to changing macro-economic environments and change up their strategies. This paper set out to find out exactly how bank strategies have changed since the financial crisis. By using the primary dealers at the Federal Reserve Bank of New York as a subset of investment banks this paper was able to determine that U.S. primary dealers have changed strategy. International primary dealers create a bias with little significance due to the fact that their strategies are wide spread because

they operate in several markets. However, it is clear that U.S. primary dealers' profitability strategy has been affected by the crisis and their results might have implications for the entire U.S. banking industry due to similar trends. Interest rate margins show that banks have been able to adapt well to the low federal funds rate which has led to interest rate margins positively impacting bank profitability. U.S. primary dealers support the signaling and bankruptcy hypotheses before the crisis but there is no significance after the crisis due to banks wanting to be risk averse. Decreasing loans in the industry has caused a negative relationship between loans to deposit ratio and profitability which suggests banks are being more careful with handing out loans to customers. Lastly, market concentration has reached a point in the banking industry where collusion has started to occur signifying that banks are charging uncompetitive prices. This could be detrimental to the economy as a whole and is where this paper suggests a policy recommendation. There should be some sort of regulation that will decrease the amount of market concentration. One suggestion is to stop banks from continually growing or potentially enforcing competitive prices in the industry.

As in any economics paper this paper also comes with its limitations. One of the biggest limitations is the amount of banks observed. Ideally this study would have had the time to collect data on all U.S. banks to determine a clearer picture on the industry as a whole. Even though the trends of the U.S. primary dealers could imply that the results are applicable to the entire industry that cannot be determined for certain. Another limitation is the fact that data for banks is difficult to access and that diminished the number of observations and which variables could be used. Data limitations also made it unable to differentiate international and domestic banks in the most efficient manner. Ideally banks would be separated by placement of assets but that data is

not easily accessible. Instead this paper determined international and domestic banks by where the headquarters of the banks were located which is an acceptable way just not the most efficient. Lastly, all of the literature on bank profitability uses a GMM estimator model to control for endogeneity which this paper does not because the model is extremely complicated and unnecessary for this paper.

Due to the limitations of this paper it is clear that there is room for future research. The first area that could be explored would be to run this double time period model on the entire industry to determine exactly how the U.S. banking industry has had to change strategy. Another route for future research would be to determine exactly which regulations have had the most effect on bank profitability. It is clear that bank profitability strategies have changed but this is partly due to the regulations put in place on the industry since the financial crisis. This paper does not take into account the regulations besides the fact that there are two time periods, one before regulation and one during. It would be possible to include dummy variables or cost variables that account for specific regulations. Once that is done they could be added to the model for determinants of bank profitability to understand which regulations are most effective. From there it would be clear the types of regulations that would shape the banking industry to be the way that is most beneficial for the overall economy. All in all, this paper is a great start to determining how the banking industry has changed and from there it is possible to figure out why it is changing which would help regulate the industry in the most efficient manner.

Tables:

Table 1 Primary Dealers

Bank Name	Domestic?
JP Morgan	Yes
Wells Fargo	Yes
Morgan Stanley	Yes
Bank of America	Yes
Goldman Sachs	Yes
CitiGroup	Yes
TD Bank	No
Barclays	No
Bank of Nova Scotia	No
Bank of Montreal	No
BNP Paribas	No
Deutsche	No
HSBC	No
RBC	No
RBS	No
Societe Generale	No
Credit Suisse	No
Daiwa Securities	No
Mizuho	No

Table 2: VIF for time period 1

Pooled 2000-2007	
Variables	VIF
InterestRateMargins	3.03
Loan to Deposit	2.35
Credit Risk	1.92
Inflation	1.57
HHI	1.5
GDP Growth	1.37
Capital Ratio	1.36
Unemployment	1.32
Size	1.13

Table 3: VIF for time period 2

Pooled 2008-2016	
Variables	VIF
GDP Growth	4.01
HHI	3.85
Loan to Deposit	2.67
Credit Risk	2.19
Productivity	1.92
Capital Ratio	1.91
Unemployment	1.58
Size	1.49
Inflation	1.38
InterestRateMargins	1.28

Table 4: Hausman test results:

	Hausman Tests					
	Pooled		International		Domestic	
	2000-2007	2008-2016	2000-2007	2008-2016	2000-2007	2008-2016
Prob>chi2	0.9944	0.5721	0.9808	0.9996	0.041	0.000
Model	Random Effects	Fixed Effects				

Table 5: Pooled Results

VARIABLES	(2000-2007) ROA	(2008-2016) ROA
Size	-0.317 (0.356)	0.201 (0.129)
Loan to Deposit	-1.732 (3.124)	-0.452 (0.306)
Credit Risk	5.187 (3.889)	0.361 (0.645)
Interest Rate Margin	0.116 (0.159)	0.140*** (0.0322)
Capital Adequacy	-0.180 (0.279)	0.146*** (0.0332)
Productivity	-	0.269* (0.142)
HHI	-1.317 (2.249)	0.149 (0.353)
Unemployment	-1.775** (0.716)	0.0214 (0.0146)
GDP Growth	0.506 (0.413)	0.00296 (0.0237)
Inflation	-0.516 (1.014)	0.0840 (0.0783)
Constant	22.51 (14.38)	-8.201*** (3.121)
Observations	121	138
R-Squared	8.7%	5.2%

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 6: International Bank Size and Number of Observations

Average Size of Bank (Millions)		
	US Banks	International
All Years	1,130,226	15,378,642
2000-2007	788,052	13,935,917
2008-2016	1,472,399	16,821,367

Number of Observations			
	Total	US Banks	International
2000-2007	152	56	96
2008-2016	171	63	108

Table 7: International vs. Domestic Results

VARIABLES	International		Domestic	
	(2000-2007)	(2008-2016)	(2000-2007)	(2008-2016)
	ROA	ROA	ROA	ROA
Size	-0.393 (0.539)	0.0104 (0.168)	-0.102 (0.142)	-0.440 (0.387)
Loan to Deposit	-5.254 (5.991)	0.517 (0.655)	0.370 (0.311)	-1.219*** (0.416)
Credit Risk	12.79 (9.166)	0.444 (0.805)	0.912 (0.597)	1.207 (1.266)
Interest Rate Margin	1.243 (1.528)	-0.0179 (0.0986)	0.0124 (0.0145)	0.146*** (0.0356)
Capital Adequacy	-1.305 (0.964)	0.123** (0.0609)	0.111** (0.0463)	0.0878 (0.0602)
Productivity	- (0.964)	0.406** (0.183)	-	0.392* (0.216)
HHI	-2.229 (3.495)	0.00272 (0.424)	0.347 (0.317)	1.140* (0.620)
Unemployment	-2.690** (1.082)	0.0387** (0.0188)	-0.114 (0.0888)	-0.0419 (0.0298)
GDP Growth	0.686 (0.613)	0.000493 (0.0298)	0.0844* (0.0504)	0.0312 (0.0370)
Inflation	-0.734 (1.504)	0.0544 (0.0955)	0.0234 (0.125)	0.0783 (0.116)
Constant	35.61 (23.66)	-6.437* (3.421)	-1.097 (1.808)	-6.803 (5.704)
Observations	80	81	42	57
R-Squared	13.5%	2.4%	66.6%	51.2%

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 3: Variables

Variable	Measurement/Source	Variable Type	Expected Relationship
<i>Independent Variables</i>			
Inflation	Data from FRED	Macro-Economic	positive/negative
GPDGR	Data from FRED	Macro-Economic	positive/negative
Unemployment	Data from FRED	Macro-Economic	negative
HHI	Data from U.S. government	Industry-Specific	positive/negative
Capital Adequacy Ratio	Total stock holder equity/assets	Bank-Specific	positive/negative
Size	Total Assets	Bank-Specific	positive
Productivity Ratio	Net Income/Number of employees	Bank-Specific	positive
Interest Rate Margin	(interest income - interest expense)/total deposits	Bank-Specific	positive
Credit Risk	Net loans/total assets	Bank-Specific	positive/negative
Loan to Deposit Ratio	Loans/Total deposits	Bank-Specific	positive/negative
<i>Dependent Variable</i>			
Return on Assets	Net Income/Total Assets	Bank-Specific	

Figures:

Figure 1: Interest Rates compared with Bank interest rate margins

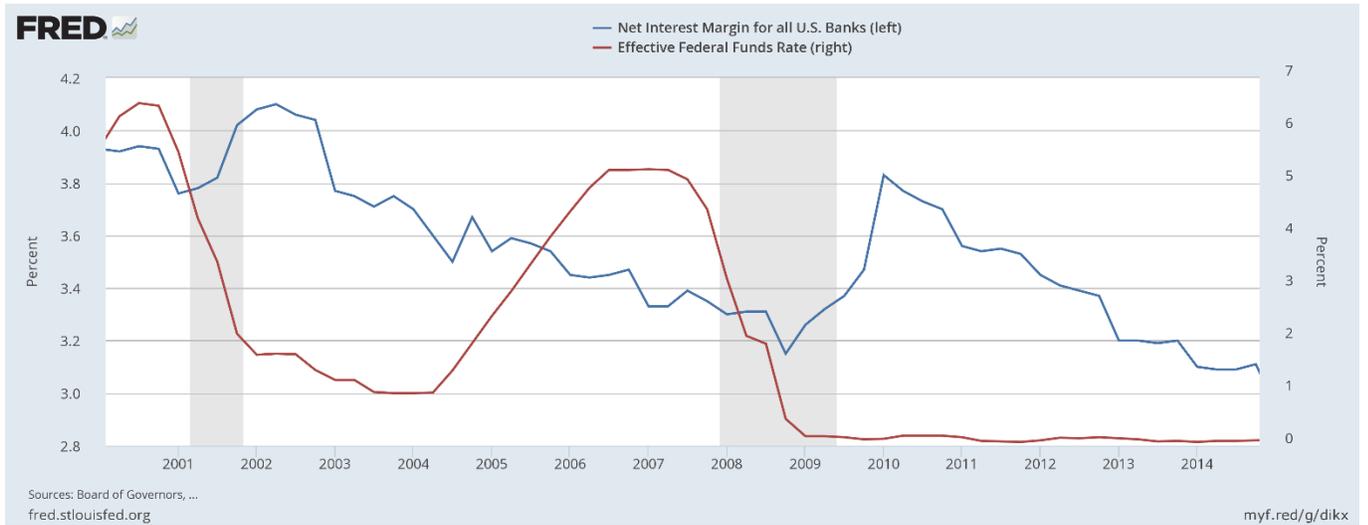


Figure 2: Interest Rates compared with Bank interest rate margins (Sample Data)

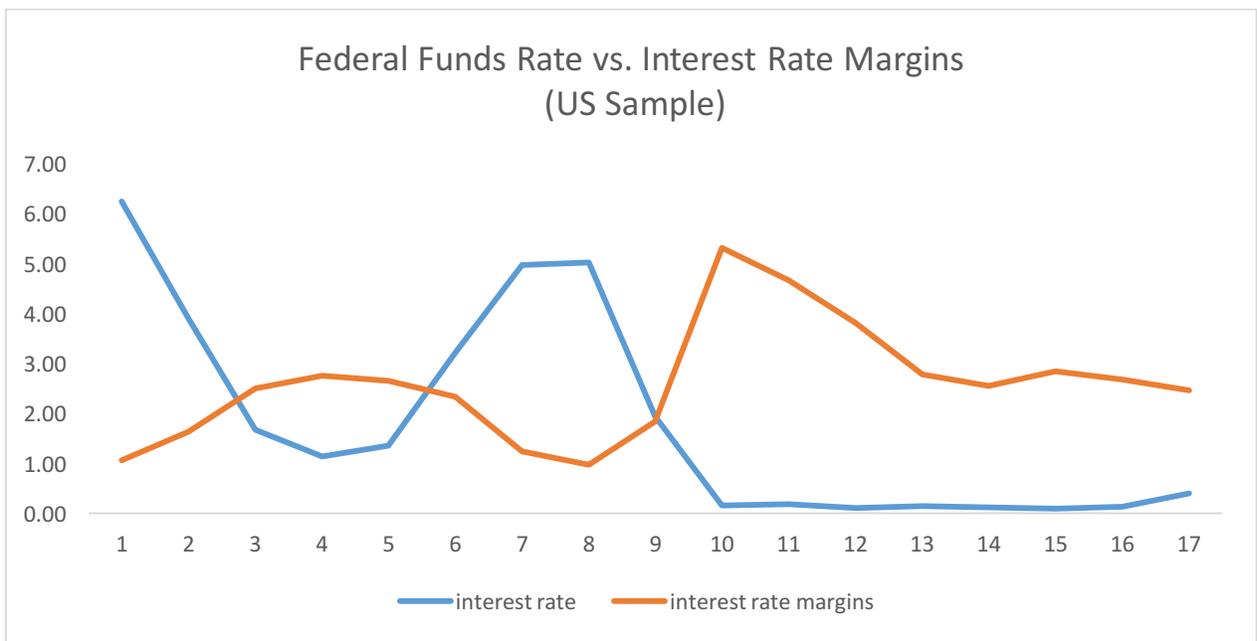


Figure 3: ROA industry to sample comparison

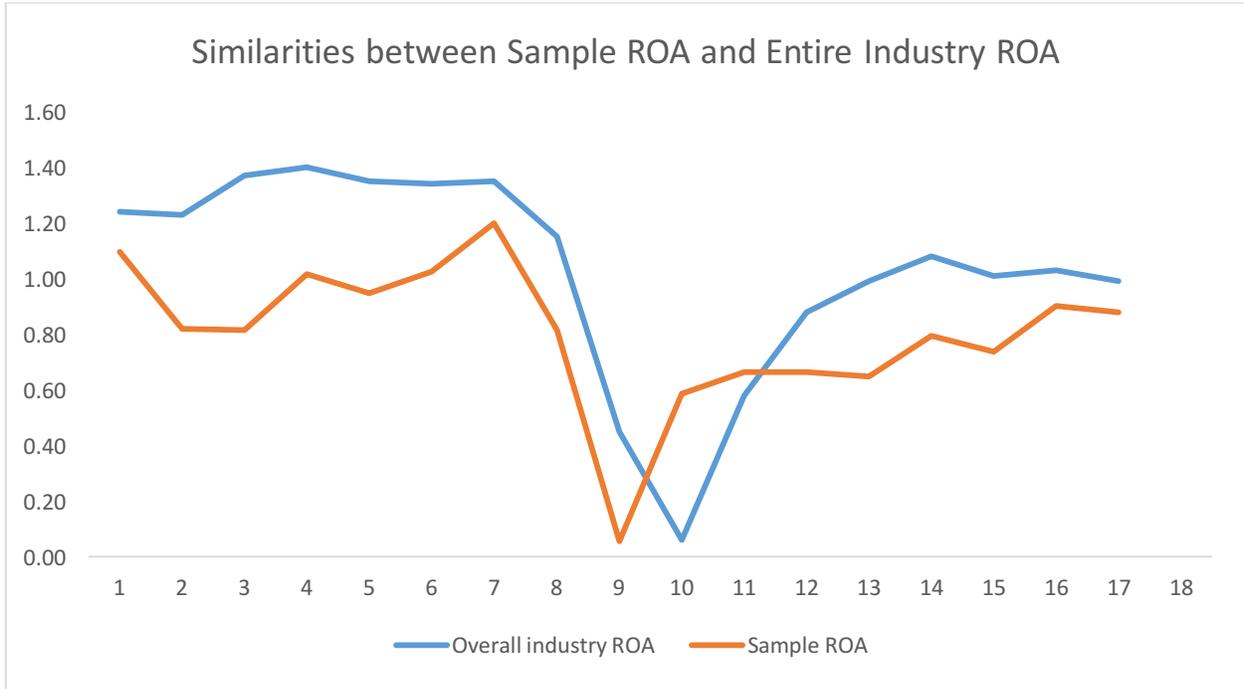


Figure 4: Diminishing Loan to Deposit Ratio

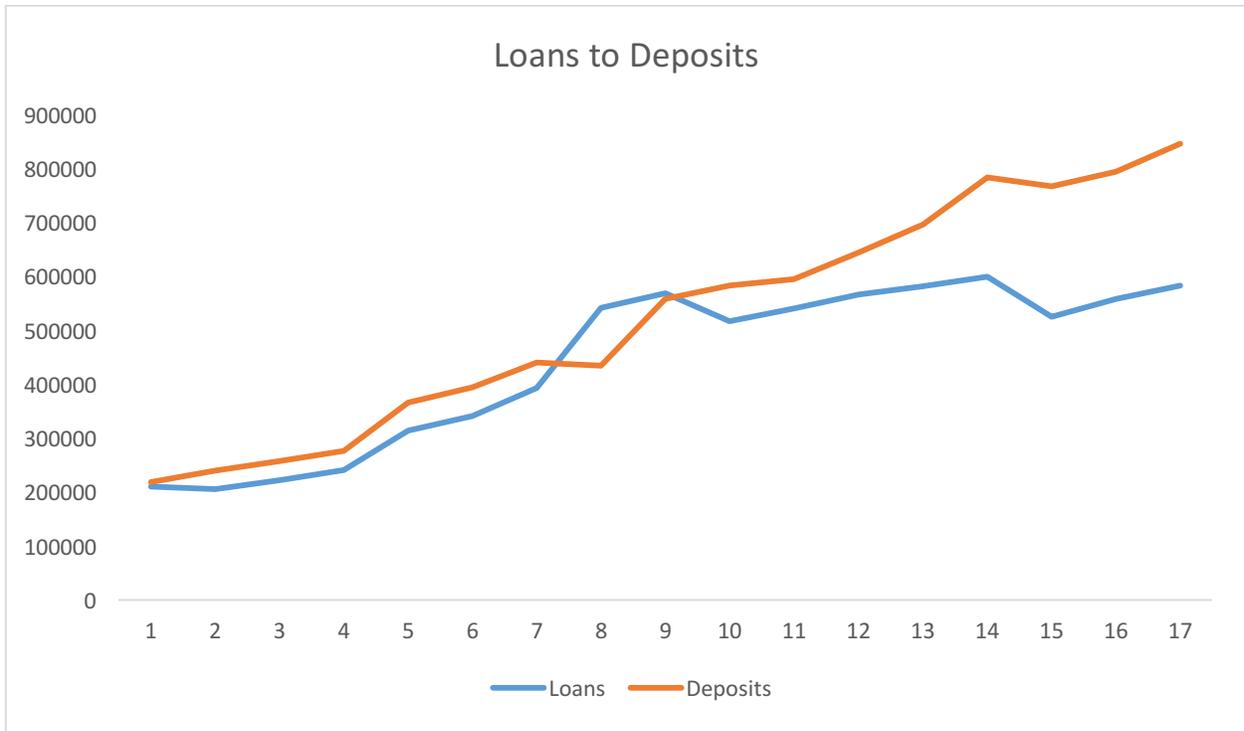


Figure 5: Banking Sector Market Concentration

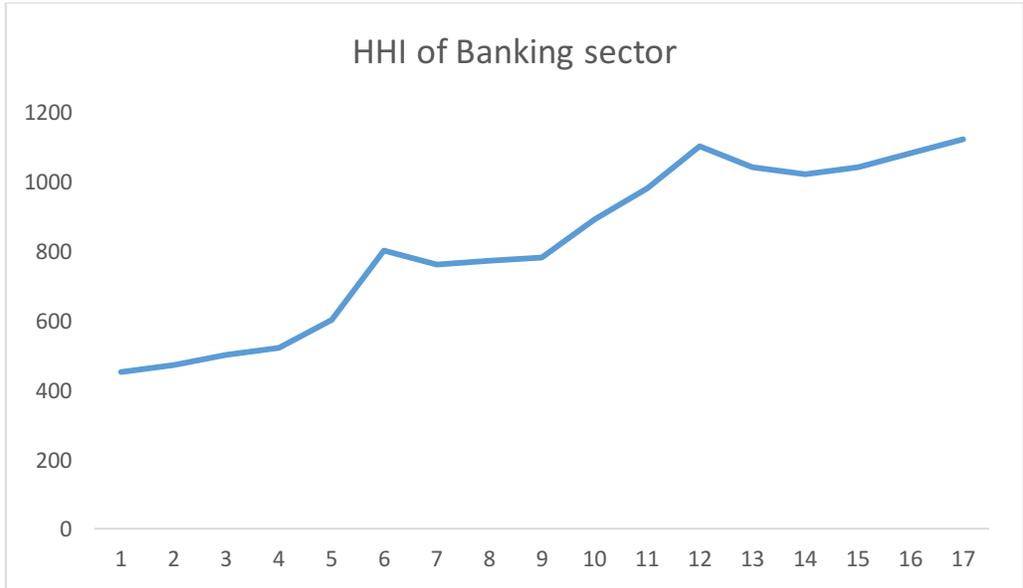


Figure 6: Bank Size for US Primary Dealers

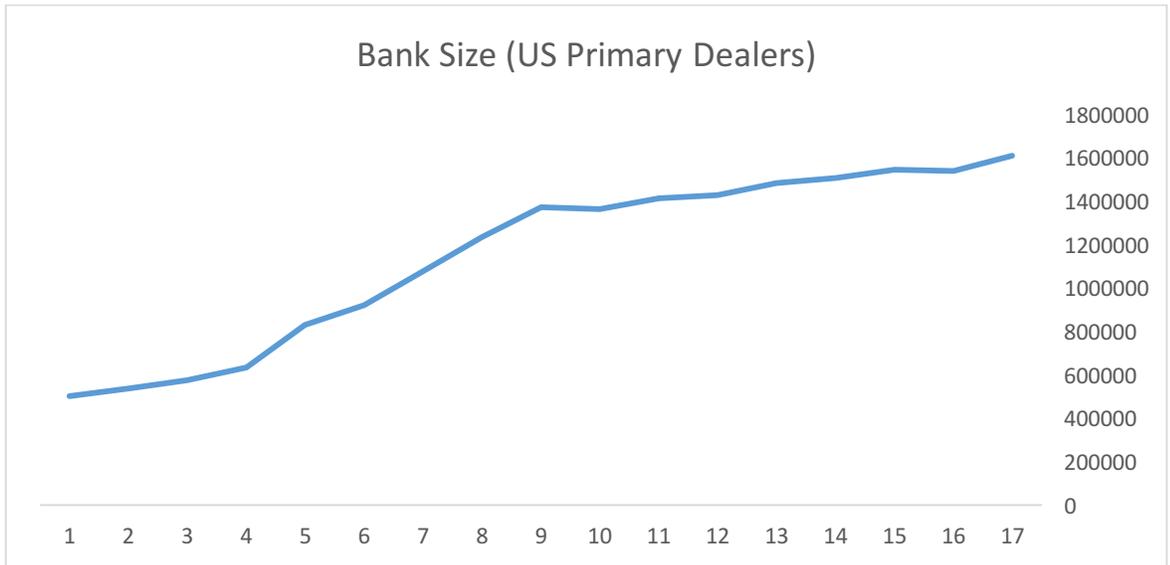


Figure 7: Capital Adequacy to ROA (US Sample)

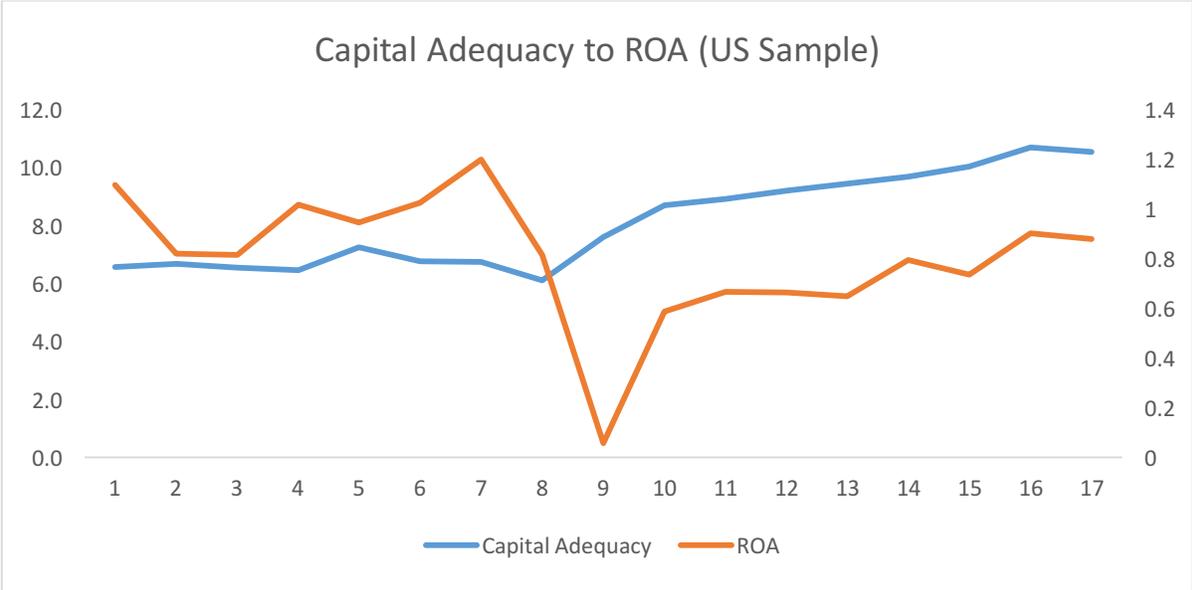
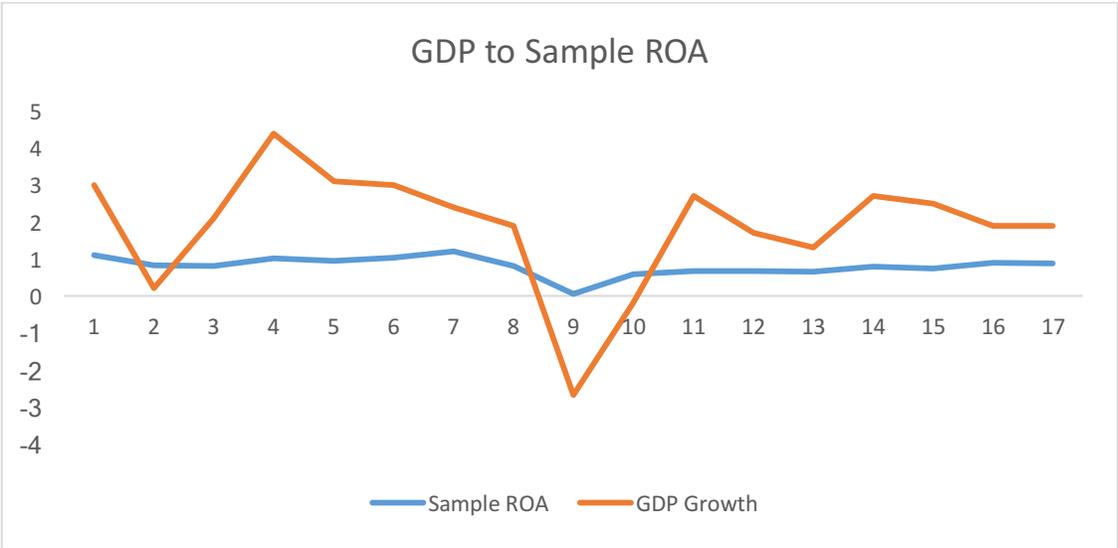


Figure 8: GDP growth to Pooled ROA



References

- Aboura, S., & Lepinette, E. (2015). Do banks satisfy the modigliani-miller theorem? *Economics Bulletin*, 35(2), 924-935.
- Allen N. Berger. (1995). The relationship between capital and earnings in banking. *Journal of Money, Credit and Banking*, 27(2), 432-456. Retrieved from <http://www.jstor.org/stable/2077877>
- Athanasoglou, P. P., Brissimis, S. N., & Delis, M. D. (2008). Bank-specific, industry-specific and macroeconomic determinants of bank profitability. *Journal of International Financial Markets, Institutions & Money*, 18(2), 121-136. doi:10.1016/j.intfin.2006.07.001
- Ben Naceur, S., & Kandil, M. (2009). The impact of capital requirements on banks' cost of intermediation and performance: The case of egypt. *Journal of Economics and Business*, 61(1), 70-89. doi:10.1016/j.jeconbus.2007.12.001
- Bourke, P. (1989). Concentration and other determinants of bank profitability in europe, north america and australia. *Journal of Banking and Finance*, 13(1), 65-79. doi:10.1016/0378-4266(89)90020-4
- David Wheelock. (2016). Are banks more profitable when interest rates are high or low? Retrieved from <https://www.stlouisfed.org/on-the-economy/2016/may/banks-more-profitable-interest-rates-high-low>
- Delis, M. D., Staikouras, K. C., & Varlagas, P. T. (2008). On the measurement of market power in the banking industry. *Journal of Business Finance & Accounting*, 35(7-8), 1023-1047. doi:10.1111/j.1468-5957.2008.02098.x

- Dietrich, A., & Wanzenried, G. (2011). Determinants of bank profitability before and during the crisis: Evidence from Switzerland. *Journal of International Financial Markets, Institutions & Money*, 21(3), 307-327. doi:10.1016/j.intfin.2010.11.002
- Goddard, J., Molyneux, P., & Wilson, J. O. S. (2004). The profitability of European banks: A cross-sectional and dynamic panel analysis. *The Manchester School*, 72(3), 363-381. doi:10.1111/j.1467-9957.2004.00397.x
- Islam, M. S., & Nishiyama, S. (2016). The determinants of bank profitability: Dynamic panel evidence from South Asian countries. *Journal of Applied Finance and Banking*, 6(3), 77-97. Retrieved from <http://search.proquest.com/docview/1789066652>
- Levine, R., Loayza, N., & Beck, T. (2000). Financial intermediation and growth: Causality and causes. *Journal of Monetary Economics*, 46(1), 31-77. doi:10.1016/S0304-3932(00)00017-9
- Modigliani, F., & Miller, M. (1958). The cost of capital, corporation finance and the theory of investment. *American Economic Review*, 48(3), 261-297.
- Naceur, S. B., & Omran, M. (2011). The effects of bank regulations, competition, and financial reforms on banks' performance. *Emerging Markets Review*, 12(1), 1-20. doi:10.1016/j.ememar.2010.08.002
- Paolo Saona Hoffmann. (2011). Determinants of the profitability of the US banking industry. *International Journal of Business and Social Science*, 2(22) Retrieved from <http://search.proquest.com/docview/906488016>

- Pasiouras, F., & Kosmidou, K. (2007). Factors influencing the profitability of domestic and foreign commercial banks in the european union. *Research in International Business and Finance*, 21(2), 222-237. doi:10.1016/j.ribaf.2006.03.007
- Pervan, M., Pelivan, I., & Arnerić, J. (2015). Profit persistence and determinants of bank profitability in croatia. *Economic Research-Ekonomska Istraživanja*, 28(1), 284-298. doi:10.1080/1331677X.2015.1041778
- Regehr, K., & Sengupta, R. (2016). Has the relationship between bank size and profitability changed? *Federal Reserve Bank of Kansas City Economic Review*, 101(2), 49-72.
- P. Rudgeair. (2017, Apr 12,). 5 things to watch from bank earnings. *Dow Jones Institutional News* Retrieved from <http://search.proquest.com/docview/1886889657>
- Saona, P. (2016). Intra- and extra-bank determinants of latin american banks' profitability. *International Review of Economics and Finance*, 45, 197-214. doi:10.1016/j.iref.2016.06.004
- Tan, Y., & Floros, C. (2012). Bank profitability and GDP growth in china: A note. *Journal of Chinese Economic and Business Studies*, 10(3), 267-273. doi:10.1080/14765284.2012.703541
- Thomas Scheiber, Maria Silgoner, & Caroline Stern. (2016). *The development of bank profitability in denmark, sweden, and switzerland during a period of ultra-low and negative interest rates.* ()