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BANK PROFITABILITY FOR US AND

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2008 -2017

by

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ABSTRACT

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2008 -2017

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Although price stability is the main objective of most central banks, they also have an interest in promoting banking sectors that are both stable and efficient. Previous studies have found that bank profitability is positively associated with the monetary policy rate which indicates a traditional banking profitability pattern. This paper aims to determine whether the traditional banking profitability pattern has been followed by US and European banks through studying the relationship between monetary policy and bank performance for the 10 largest US and European Banks after the 2008 financial crisis. The model is estimated from univariate regression analysis of the bank performance measures of the largest banks in US and Euro area along with the policy rates of the respective regions for the past decade. The results indicate that the large European banks do follow the traditional

banking profitability pattern and the large US banks do not follow the traditional banking

profitability pattern.

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CHAPTER 1

INTRODUCTION

Following the 2008 financial crisis, profitability of US and European banks fell dramatically as many large banks experienced losses and bankruptcy. Financial stability is a precondition for a healthy economy so monetary institutions had to intervene to restore financial stability. Before the financial crisis both US and European banks had high profitability levels, now only US banks have regained prior high profitability levels while European banks still have relatively weak profitability levels (Schildbach and Wenzel and Speyer, 2013).

Previous studies on the link between monetary policy and bank profitability have shown a positive association between the policy rates and bank profitability (Hancock, 1985, Demirgüç-Kunt and Huizinga, 1998, Alessandri and Nelson, 2014, Claessens et al. 2018). The positive association of monetary policy rates and bank profitability indicates a pattern of traditional banking profitability. This evidence seems to convey that US banks follow the traditional bank profitability pattern (interest rate spread) as US policy rates have also been closer to "normal" levels (i.e., above zero). However, US commercial banks are heavily dependent on investment banking, so they should also not reflect traditional bank profitability pattern. In contrast, European banks are still primarily dependent on traditional banking so their profits would better mirror the traditional bank profitability pattern (Guglar and Peev, 2018). Traditional banking profitability is primarily dependent

on relationship lending, core deposiunding, balance sheet and other traditional sources of revenue. Our study will test which of these statements is true.

The empirical analysis is based on panel data of the largest commercial banks in US and Europe for the period 2008–2017. Interest rate spread is not measured directly so we estimate it from bank profitability measures e.g. ROE, ROA, NIM, and ROE-NIM. The measures of profitability used in our study are return on assets (ROA), return on equity (ROE) net interest margin (NIM) and return on equity-net interest margin (ROE-NIM). Our analysis indicates that the traditional banking profitability pattern, as we define it here, is observable in the European banks and is not observable in the largest US banks.

The remainder of the paper is organized as follows. We review the differences in monetary policy between Federal Reserve and European Central Bank as well as the differences in banking sector of US and Europe in Section 2. We also review the relevant literature regarding the link between profitability of banks and monetary policy in Section 2. Section 3 presents the data, methodology and different variables used in the paper. The results of the regression analysis and summary statistics are discussed in Section 4. Finally, Section 5 concludes the paper.

CHAPTER 2

LITERATURE REVIEW

<u>2.1 Banking Sector of US and Euro Area</u>

US and European banks are different in size and business models. In US, non-banking alternatives like shadow banking have grown quickly in the past decade which has resulted in the decline of commercial loans (DiSalvo and Johnston, 2015). So, commercial banks in US depend less on traditional banking systems for financing and more on investment banking. European banks follow a more traditional banking system and bank's capacity to provide credit is still vital to the financial health (DiSalvo and Johnston, 2015). Europe also has a larger banking sector compared to US. US has a large number of smaller banks (Federal Reserve, 2002). According to Demirgüç-Kunt and Huizinga, bank concentration ratio positively affects bank profitability, and larger banks tend to have higher margins (1999).

<u>2.2 Monetary Policy of the Federal Reserve and European Central Bank</u>

The primary objective of the European Central Bank as set forth in the statute is to "maintain price stability" (ECB Statute, Article 2). Similarly, the Federal Reserve Act of 1913 states that Federal Reserve System has three main policy goals: "maximum employment, stable prices and moderate long-term interest rates" (Section 2A). Although, the structure of ECB and Federal Reserve is quite similar, ECB is generally considered relatively more independent than the Fed (Tuckwell & Mendonca, 2016). ECB and Fed use similar tools for monetary policy, but there are many differences in the way both the

central banks operate. ECB has a more decentralized approach to monetary policy compared to Fed as many of the functions are delegated to national central banks of the member states (Tuckwell & Mendonca, 2016). Federal Reserve operates monetary policy in a more centralized manner. The main tools used by ECB and Fed for monetary policy are open market operations, reserve requirements and discount window. The ECB policy rate is equivalent to a minimum refinancing operations rate (MRO) which banks can finance at short term. The key interest rate of US is fed funds rate which is the rate at which fed funds are traded overnight by the depository institutions.

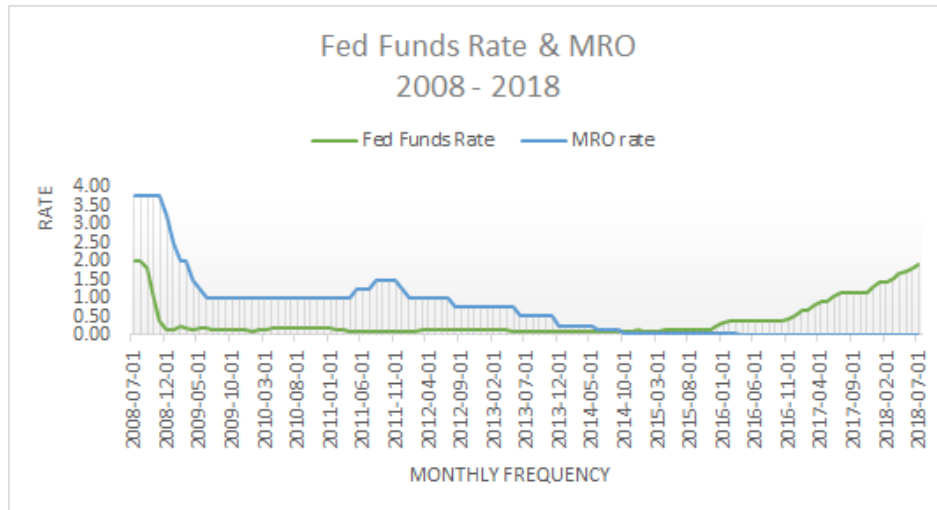Figure 2.1: Fed Fund Rate and Main Refinancing Operations Rate from 2008 to 2018

2.3 Link between Monetary Policy and Bank Profitability

The main objective of most central banks is price stability. The objectives of financial stability and price stability are ultimately complementary as the health of the banking system is connected to the overall performance of economy (Bernanke and Gertler, 1995).

The relationship between bank performance and monetary policy has been studied with similar results. Samuelson (1945), Hancock (1985) and Demirgüç-Kunt and Huizinga (1998) are among the first studies to relate bank profitability to macroeconomic indicators, and in particular interest rates. Samuelson (1945) mentions a direct link between banks and monetary policy stating that "The banking system as a whole is immeasurably helped rather than hindered by an increase in interest rates . . . and commercial banks would profit more than savings banks" (p. 25). Hancock (1985) studied 18 US banks between 1973-78 and found a positive link between bank profitability and interest rate. Demirgüç-Kunt and Huizinga (1999) used bank data from 80 countries for the years 1988-95 and found that banking interest margins and profitability are positively associated with the interest rate level, particularly for developing countries where deposits are remunerated below market interest rates. English (2002) studied the interest rate risks of banks in 10 industrialized countries between 1979-2001 and found mixed impact of interest rate changes on interest margins of commercial banks. The author notes the impact of interest rates on net interest income seems unlikely to affect the overall health of the banking sector as most banks manage to control their exposure to the volatility in the yield curve.

After the 2008 Financial Crisis, the zero lower bound interest rate environment was observed for the first time in several countries and it sparked a fascination in the academic world towards the effect of low interest rate environment on bank profitability due to the lack of research on it. Genay and Podjasek (2014) study the US banking sector and find that low interest rates and flatter yield curves are associated with lower bank profitability measures such as net interest margins and return on assets which is particularly true for smaller banks. However, their analysis also notes that as long as low interest rates result in

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better economic outcomes, their net effects on bank's profitability may become positive. Borio et al. (2017) took a slightly different approach from previous studies by using a sample of 109 large international banks instead of focusing on specific countries between 1995 and 2012. Borio et al. (2017) studied the effects of monetary policy on the bank performance measures such as return on assets, interest rate income and loss provisions. They find that the impact of interest rates on banks' NIM is much stronger at lower levels and it is demonstrated through an inverted U shape. They also note that there is a positive association between short-interest rates and return on assets. Alessandri and Nelson (2014) study 44 UK banks from 1992-2009 and provide the same results that high interest rates are associated with large interest income margins. They explain that in response to higher interest rates, banks raise their lending rates, although they reduce their lending volume through a strengthening in their lending standards. However, they also find that the short-run impact of an increase in short-term market rates affects the interest income negatively. Claessens et al. (2018) used a sample of 3385 banks from 47 countries from 2005 to 2013 and found similar results that low interest rates reduce overall bank profitability. Their study showed that a decrease in interest rate by one percentage point results in an 8 basis points lower net interest margin. Campmas (2018) also investigated the effect of policy interest rates and bank prudential behavior on profitability of 26 European countries from 1999 to 2015 and saw a positive association of policy rates with net interest margins of banks particularly in low interest rate environment. However, this positive association is removed when banks cover their risks better. Cross-country studies as well as various country-specific studies support the positive association of interest rates with banks' net interest margins.

CHAPTER 3

DATA AND METHODOLOGY

<u>3.1 Determinants of Bank Profitability</u>

According to European Central Bank, bank performance is defined as the capacity to generate sustainable profits (2010). The most commonly used measures to assess performance and forecast trends for banks are return on equity (ROE) and return on assets (ROA). ROE and ROA measure the company's return on investment in a format that is easily comparable with other institutions. ROA is a ratio of net income produced by total assets during a period of time. In other words, it measures how efficiently a company can manage its assets to produce profits. ROE is used by a company's shareholders as a measure of their return on investment. It measures the amount of a company's income that's returned as shareholder equity. One drawback of ROE as a performance measure is that it is not risk sensitive and fails to take into account the long-term impact of performance ("Beyond ROE", 2010). A good performance measurement framework should incorporate more forward-looking indicators and be less prone to manipulation from the markets performance indicator as we are investigating the effect of low policy interest rates on bank performance (Borio et al., 2017, Claessens et al., 2017, Campmas, 2018, Alessandri and Nelson, 2018). Net interest margin (NIM) is the difference between interest earned and interest expended as a percentage of a bank's assets. Our study utilizes ROA, ROE, NIM and ROE_NIM as bank profitability measures.

3.2 Monetary Policy Indicator

Following Demirgüç-Kunt and Huizinga (1998), Ben S. Bernanke and Mark Gertler (1995), and others, we utilize the policy interest rates as an indicator of the stance of monetary policy. We use federal fund rate as an indicator of monetary policy in US and main refinancing operations rate from ECB as an indicator of monetary policy of countries in EU. Since, we focus on the period from 2008 - 2017, we can monitor the complete reaction of variables to the low interest rate environment.

3.3 Data Sources

The data are obtained from three widely used sources over the period 2008–2018. Data on fed fund rate is obtained from Federal Reserve Economic Data. The frequency of data is modified to quarterly from monthly through using average as the aggregation method. Data on main refinancing operations rate is obtained from European Central Bank's Statistical Data Warehouse with a quarterly frequency. Data on U.S. and European banks is obtained from the commercial bank dataset in Compustat from Wharton Research Data Services. Compustat primarily uses SEC filings to draw its data, which are standardized to allow for better comparisons. The dataset for commercial banks obtained is specified to contain total assets, total equity, total income and total net interest margin.

3.4 Sample Selection

In our study we focus on the largest commercial banks in US and Europe based on their total assets as large banks with assets above $1 billion represent the dominant share of banking assets in Europe and the U.S. (DiSalvo and Johnston, 2015). We use two sets of bank data: 3 largest banks and 10 largest banks. We choose the 10 largest US commercial

banks based on the Federal Reserve Statistical Release report on large commercial banks (2018).

Table 3.1: The Ten Largest Commercial Banks in the US

Company	Total Assets ($Billion)
JPMorgan Chase Bank & Co.	2,533.60
Bank Of America Corp.	2,281.23
Wells Fargo Bank	1,951.76
Citigroup	1,842.47
US Bancorp	462.04
TD Bank	380.91
PNC Financial Services Group	380.77
Bank Of New York Mellon Corp.	371.76
Capital One	365.69
State Street Corp.	238.43

We choose the 10 largest European commercial banks based on data from S&P Global Market Intelligence (2018). Based on Table 3.1 and 3.2, we can easily infer that European banks are much bigger in size compared to US banks.

Table 3.2 The Ten Largest Banks in Europe

Company	Total Assets ($Billion)
HSBC Holdings	2,100.13
BNP Paribas	1,963.34
Credit Agricole Group	1,763.17
Deutsche Bank	1,470.38
Banco Santander	1,446.15
Barclays PLC	1,275.62
Societe Generate	1,275.13
Group BPCE	1,259.42
Lloyds Banking Group	914.14
ING Group	846.22

3.5 Methodology

We want to see if US and European banks follow the traditional banking pattern which means that monetary policy rates would have a positive link with interest rate spread of banks. In our model, we substitute interest rate spread with profitability measure of banks. In our regression analysis, correlation coefficient, $\beta_{i,j}$, shows the link between the policy rates and bank profitability. β_{Euro} is the average coefficient estimate for European banks and β_{US} is the average coefficient estimate for US banks.

First, we calculate the ROE and ROA of each bank from the total income, total equity and total assets in SAS. Then, we run regression separately for each bank to find the coefficient. We adopt the following model to find the correlation between policy rates and bank performance measures:

$$Bank\ performance\ measure_{i,j,t} = intercept_{i,j} + \beta_{i,j}(r_{j,t}) + \varepsilon_{i,j,t}$$

Bank performance measure$_{i,t}$ is the bank's profitability i at time t in the country j, measured by ROA, NIM, ROE and NIM-ROA. The variable $r_{j,t}$ defines the policy interest rate in country j at time t. $\varepsilon_{i,j,t}$ is the unpredictable random disturbance term. The coefficient $\beta_{i,j}$ is sumed for all the banks in US into β_{US} and for all the banks in Europe into β_{Euro}. We tested the significance of the link between policy rates and profitability measures through a t test.

<div align="center">3.6 Variables Definition</div>

In this study, we use three different variables to measure the profitability of banks:

Return on assets, denoted *ROA,* is defined as a profit before tax divided by total assets. This ratio measures income generated by the assets financed by the bank.

Net interest margin, denoted *NIM,* is defined as the net interest income divided by total assets. It represents the amount earned on interest activities.

Return on equity, denoted *ROE,* is defined as the net income divided by equity. This variable measures the generated profits from the capital.

ROE-NIM is a combination of *Return on Equity* and *Net Interest Margin.* This variable takes into account the profit from interest activities for shareholders. NIM-ROE is calculated using the following equation:

ROE-NIM = ((NIM*lag-assets*0.01)/(lag-equity))*100

CHAPTER 4

RESULTS AND DISCUSSION

This section introduces and comments on the results. First, we run simple regressions to examine the effects of central bank's policy interest rates on the different bank profitability measures of each bank. Then, we analyze the overall effect on the bank profitability of 3 largest and the 10 largest banks. Finally, we investigate whether the relationship between interest rates and profitability is statistically significant through a t test.

Table 4.1: Correlation Coefficients and their p Values from Regression Analysis

Profitability measure	Data set	US		Europe	
		Correlation	P value	Correlation	P value
NIM	Top 3 banks	0.1579304	0.116	0.2970903	0.012
	Top 10 banks	0.087819	0.323	0.025089	0.628
ROA	Top 3 banks	0.1522116	0.151	-0.0145135	0.937
	Top 10 banks	0.1057743	0.262	-0.3067542	0.003
ROE	Top 3 banks	2.828379	0.101	16.60027	0.001
	Top 10 banks	1.789883	0.143	6.084051	0.007
ROE-NIM	Top 3 banks	2.846525	0.089	18.72787	0.000
	Top 10 banks	1.564387	0.182	7.325509	0.000

Our results indicate a strong positive correlation between European bank profitability measures ROE and ROE-NIM with statistically highly significant p values (Table 4.1). There was very weak correlation from US banks profitability measures with a slight trend towards statistical significance (Table 4.1).
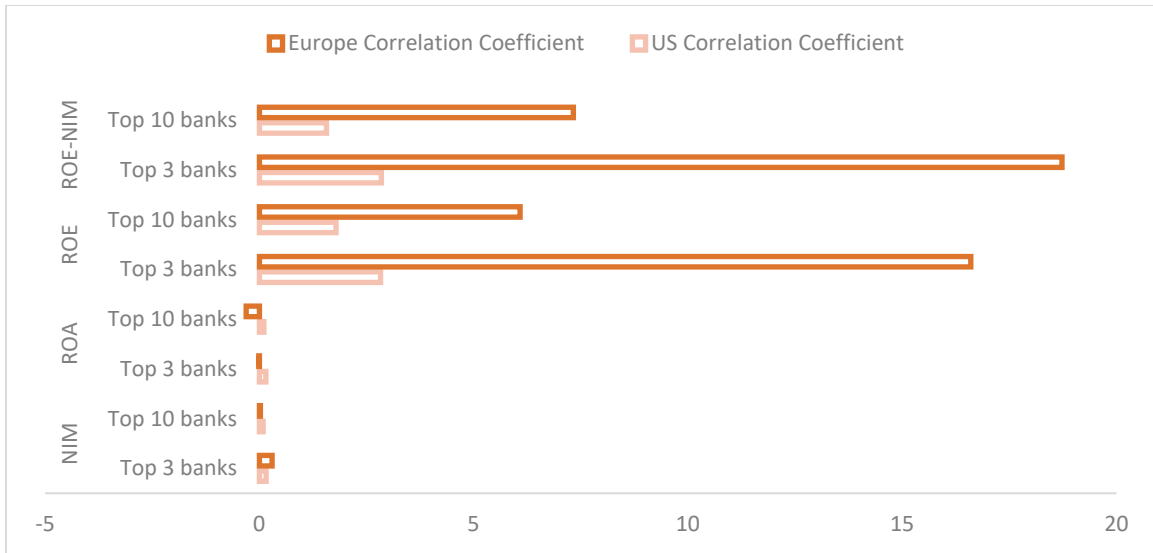
Figure 4.1: Comparison of US and European Correlations

Our results are in line with expectations and literature. European banks depend more on traditional banking activities so their profitability levels will be more affected by the change in interest rates. The results show that the ROE and ROE-NIM of European banks have a positive association with ECB policy rates which proves that European banks do follow the the traditional bank profitability trend. The negative correlation of ROA of European bank the shows possibility of an outlier.

On the other hand, US banks don't depend on traditional banking activities so their profitability levels will depend less on interest rates. Thus, US banks profitability measures don't have a generally insignificant reaction to the Federal Reserve's policy rates. This result might be due to the fact that the banks included in our sample are large and these large banks may be relatively insulated from interest rate margins due to their investment banking activity. Genay and Podjasek (2014) showed that the profitability of small US banks are more sensitive to this measure.

CHAPTER 5

CONCLUSION

Previous studies have shown a positive relation between policy rates and bank profitability. The positive association of policy rates and bank profitability would be indicative of the traditional banking profitability pattern. We examined the effects of monetary policy rates on the profitability of largest US and European banks during the 2008-2017 period. Our analysis suggests that profitability of the largest European banks follows the traditional banking pattern, but the profitability of the largest US banks does not follow the traditional banking pattern. More specifically return on equity and return on equity-net interest margin were the measure of profitability affected by the policy rates. As the policy rate of ECB has remained zero lower bound following the financial crisis, the profitability of European banks has also remained low.

Our results reveal an important observation on US banks that the pattern of profitability is dependent on bank size. Future studies can take a closer look at difference in profitability patterns in small and large banks in US and see how they differ based on their business models.

APPENDIX A

RESGRESSION ANALYSIS RESULT

RESULT FROM US BANKS

Table 1. The summary statistics of the top 3 US banks.

Variable	Observations	Mean	Std. Dev.	Min	Max
fedfundr	120	0.4225	0.6479175	0.07	3.18
ecbr	120	0.855	1.082527	0	4.25
assets	132	1907654	505932.4	485901	2577148
equity	132	172250.7	51536.98	46187	250136
lag_assets	132	1858409	570308.4	40457	2577148
lag_equity	132	167472.5	56368.44	4894	250136
nim	132	2.912576	0.7567121	2.03	4.95
roe_nim	132	33.44383	12.28878	16.3622	80.27019
roa_total	132	3.263133	1.426246	2.111964	15.5991
roe_total	132	36.9379	15.53993	20.27533	128.9523

Table 2. The correlation matrix of top 3 US banks.

	nim	niq	roa_to~l	roe_to~l	roe_nim	lag_equity	lag_assets
nim	1.0000						
niq	-0.1551	1.0000					
roa_total	0.9826	0.0179	1.0000				
roe_total	0.8655	-0.0859	0.8493	1.0000			
roe_nim	0.8636	-0.2011	0.8238	0.9917	1.0000		
lag_equity	-0.9121	0.1442	-0.8942	-0.9069	-0.9033	1.0000	
lag_assets	-0.9081	0.1191	-0.9076	-0.6962	-0.6873	0.8635	1.0000
fedfundr	0.1442	-0.1160	0.1320	0.1505	0.1561	-0.2756	-0.2743

Table 3. The summary statistics of the top 10 US banks.

Variable	Observations	Mean	Std. Dev.	Min	Max
fedfundr	280	0.4225	0.6463674	0.07	3.18
ecbr	280	0.855	1.079938	0	4.25
assets	352	957109.1	823315.9	99848	2577148
equity	352	84285.68	75831.59	7467	250136
lag_assets	352	937965	821742.8	17089.05	2577148
lag_equity	352	82566.07	75440.98	1231.868	250136
nim	343	2.597085	0.9211442	0.91	4.95
roe_nim	343	29.81503	12.37958	8.348537	80.27019
roa_total	343	2.890645	1.241217	-0.308575	15.5991
roe_total	343	32.97654	14.34859	-3.66464	128.9523

Table 4. The correlations matrix of top 10 US banks.

	nim	niq	roa_to~l	roe_to~l	roe_nim	lag_equity	lag_assets
nim	1						
niq	0.1435	1					
roa_total	0.9789	0.2102	1				
roe_total	0.8759	0.1948	0.8761	1			
roe_nim	0.8826	0.1355	0.848	0.9851	1		
lag_equity	0.0455	0.6389	0.0205	0.0333	0.0522	1	
lag_assets	0.0677	0.6393	0.038	0.1183	0.1395	0.979	1
fedfundr	0.0593	-0.0581	0.0673	0.0877	0.08	-0.0844	-0.075

RESULT FROM EUROPEAN BANKS

Table 5. The summary statistics of top the 10 European banks

Variable	Obs	Mean	Std. Dev.	Min	Max
fedfundr	120	0.4225	0.647918	0.07	3.18
ecbr	120	0.855	1.082527	0	4.25
assets	113	2497731	322820.2	1673976	3643585
equity	113	108420	43960.01	42735.51	193597
lag_assets	113	2467583	425100.9	151371.7	3643585
lag_equity	113	106968.7	45407.69	15324.59	193597
nim	33	2.00576	0.659394	0.72	3.08
roe_nim	25	38.6068	15.44397	21.55732	79.8189
roa_total	25	1.74223	0.55271	0.780023	2.73486
roe_total	25	38.5637	15.31078	21.27056	81.2331

Table 6. The correlation matrix of top 3 European banks.

	nim	niq	roa_to~l	roe_to~l	roe_nim	lag_equity	lag_assets
nim	1						
niq	0.7555	1					
roa_total	0.9869	0.8497	1				
roe_total	-0.0982	0.0502	-0.0596	1			
roe_nim	-0.255	-0.1581	-0.2353	0.9724	1		
lag_equity	0.6953	0.5287	0.6888	-0.6436	-0.7512	1	
lag_assets	0.3335	0.2338	0.3447	0.3162	0.2945	0.2689	1
ecbr	-0.0041	-0.1167	-0.017	0.6526	0.73	-0.4368	0.5002

Table.7 The summary statistics of top the 10 European banks.

Variable	Obs	Mean	Std. Dev.	Min	Max
fedfundr	300	0.4173	0.6315	0.07	3.18
ecbr	300	0.807	1.059951	0	4.25
assets	276	1969316	600583.5	637436.6	3879172
equity	275	91880.58	35182.27	13731.63	193597
lag_assets	275	1944869	641497.4	2340.298	3879172
lag_equity	274	90514.73	36628.8	111.08	193597
nim	105	2.15857	0.46063	0.72	3.08
roe_nim	80	40.3285	9.578392	21.55732	79.8189
roa_total	81	2.06482	0.490345	0.780023	3.13597
roe_total	80	39.9372	10.12218	21.27056	81.2331

Table 8. The correlation matrix of top 10 European banks.

	nim	niq	roa_to~l	roe_to~l	roe_nim	lag_equity	lag_assets
nim	1						
niq	0.2585	1					
roa_total	0.9442	0.5494	1				
roe_total	0.2209	0.2855	0.3088	1			
roe_nim	0.1194	-0.0059	0.1241	0.95	1		
lag_equity	-0.1526	0.2563	-0.076	-0.5526	-0.6411	1	
lag_assets	-0.6019	0.0992	-0.4975	-0.1038	-0.0973	0.6936	1
ecbr	-0.3658	-0.0661	-0.3305	0.3017	0.3842	-0.0331	0.449

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Juveria Muhammad graduated *summa cum laude* from the University of Texas at Arlington with an Honors Bachelor of Business Administration in Finance in May 2019. She was a part of the Honors College, Beta Gamma Sigma Business Honor Society, and Financial Management Association National Honor Society as well as being on the College of Business' Dean's Honor Roll every semester. Juveria worked as a Financial Literacy Specialist at the Financial Literacy Organization and as a Mentor at the InspirED Outreach during her time as a student at UTA. Her research interests include monetary policy, banks and financial crisis.