An Analysis of Federal Reserve Interest Rates and Commercial Bank Failures Using Tableau v. 10.3

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Author Note

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Abstract

This project includes two datasets and demonstrate data cleaning, data analysis, data visualization or reporting, and dashboard summary using tools found in Tableau v. 10.3. The data will be cleaned of illegal values, uniqueness violations, misfielded values, duplicate values, and contradictory values. Through visualizations and explanations, project will be based on business intelligence and analysis of the Bank Failures and the Federal Reserve Interest Rate.

The failure of a commercial bank occurs when a bank is unable to meet its obligations to its depositors or other creditors because it has become insolvent or too illiquid to meet its liabilities. More specifically, a bank usually fails economically when the market value of its assets declines to a value that is less than the market value of its liabilities. In the U.S., deposits in savings and checking accounts are backed by the FDIC. Furthermore, each account owner is insured up to $250,000 in the event of a bank failure. When a bank fails, in addition to insuring the deposits, the FDIC acts as the receiver of the failed bank, taking control of the bank's assets and deciding how to settle its debts. The failure of a bank is generally considered to be of more importance than the failure of other types of business firms because of the interconnectedness and fragility of banking institutions (Amadeo 2018).

The Federal Reserve Bank (Fed) and the Federal Deposit Insurance Commission (FDIC) were created because of the repeated financial panics that afflicted the U.S. economy over the previous century, attempting to prevent severe economic disruptions due to bank failures and business bankruptcies. In addition to printing money, the Fed also received the power to adjust the discount rate, buy and sell U.S. treasuries, and most importantly adjust the interest rate at which banks are required to maintain and operate under. The Federal Funds Rate, or the Federal Funds Interest Rate, is the rate at which depository institutions lend funds maintained at the

Federal Reserve to one another overnight and has a major influence on the available credit and the interest rates in the United States. It is a measure to ensure the largest banking institutions do not find themselves short on liquidity (Doe 2015).

The focused datasets are titled, “Federal Reserve Interest Rates, 1954-Present” and “Commercial Bank Failures, 1934-Present”.The data deals with U.S. banking information from commercial banks collected by the FDIC as well as federal interest rates and other economic metrics provided by federal government agencies to include Federal Reserve Bank of St. Louis, the U.S. Bureau of Labor Statistics, and the U.S. Bureau of Economic Analysis. Finally, the project addresses data cleaning techniques, visualizations, dashboard, and storyline for the purposes of demonstrating expertise with Tableau v. 10.3. Key insights in the form of interesting questions are also addressed using the data analysis and reporting tools provided by Tableau v. 10.3. The key insights are as follows:

- How have the Effective Federal Funds Rate and the Inflation Rate changed over time?
- What kinds of Charter Type and Banking Institution fail the most?
- How have banks failed over time?
- What is the Loan to Deposit Ratio of banks when they fail?
- Where do banks geographically fail?

The Datasets: Federal Reserve Interest Rates, 1954-Present and Commercial Bank Failures, 1934-Present

The first dataset titled, "Federal Reserve Interest Rates, 1954-Present" is found on the url: https://www.kaggle.com/federalreserve/interest-rates. The file size is 40KB and is formatted in csv through .xlsx. The dataset's nine columns include string, floating point, and integer data types. The titles of the columns are as follows:

- Year
- Month
- Day
- Federal Funds Target Rate
- Federal Funds Upper Target
- Federal Funds Lower Target
- Effective Federal Funds Rate
- Real GDP (Percent Change)
- Unemployment Rate
- Inflation Rate

It's 905 rows track economic data including relevant economic data, actual (Effective) Federal Funds Rate, and objective or intended (Target) Federal Fund Rates, which are implemented by the Federal Reserve Bank to ensure financial security and the continuing operation of banks in the U.S. Considering that the Federal Funds Rate was created in 1954, the data is tracked monthly from 1954 to early 2017.

The second dataset titled, "Commercial Bank Failures, 1934-Present" is found on the url: https://www.kaggle.com/fdic/bank-failures/data. The file size is 431KB and is also formatted in

csv through .xlsx. The seventeen columns also include string, floating point, and integer data types. The titles of the columns are as follows:

- Financial Institution Number
- Institution Name
- Institution Type
- Charter Type
- Headquarters
- Headquarters City
- Headquarters State
- Failure Date
- Month
- Day
- Year
- Insurance Fund
- Certificate Number
- Transaction Type
- Total Deposits
- Total Assets
- Estimated Loss (2015)

The dataset's 3485 rows t rack each failure of a commercial bank, savings association, and savings bank since the establishment of the FDIC in 1933 until early 2017. Note that the data on Estimated Losses are not available for FDIC insured failures prior to 1986 or for FSLIC insured failures from 1934-88.

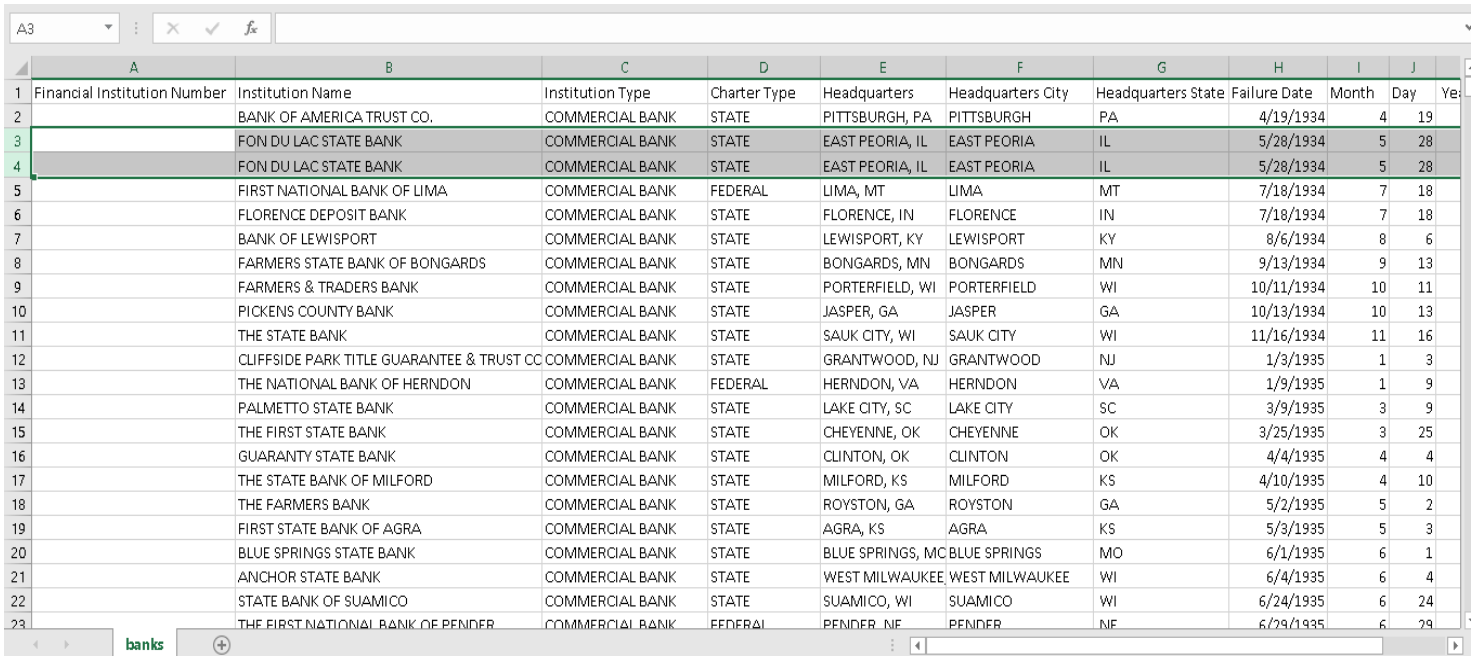
The two datasets will be joined and compared to visualize key points respectively using Tableau v.10.3. The analysis will highlight key features in each of the datasets and finally show how closely the Federal Reserve Interest Rate adjusts to bank failures.

Data Cleaning Problems and Techniques

The following are data cleaning or scrubbing techniques performed on each of the datasets to generally improve the accuracy and precision of the Tableau analysis. These sections focus on five data cleaning problems and the appropriate techniques used to solve them. The sections provide visual figures of the dataset before and after data cleaning with descriptions of the problem and implementation of the technique. The data cleaning was done with Excel 2016.

Data Duplications

Figure 1. Before Screenshot of Data Duplication



	A	B	C	D	E	F	G	H	I	J
1	Financial Institution Number	Institution Name	Institution Type	Charter Type	Headquarters	Headquarters City	Headquarters State	Failure Date	Month	Day
2		BANK OF AMERICA TRUST CO.	COMMERCIAL BANK	STATE	PITTSBURGH, PA	PITTSBURGH	PA	4/19/1934	4	19
3		FON DU LAC STATE BANK	COMMERCIAL BANK	STATE	EAST PEORIA, IL	EAST PEORIA	IL	5/28/1934	5	28
4		FON DU LAC STATE BANK	COMMERCIAL BANK	STATE	EAST PEORIA, IL	EAST PEORIA	IL	5/28/1934	5	28
5		FIRST NATIONAL BANK OF LIMA	COMMERCIAL BANK	FEDERAL	LIMA, MT	LIMA	MT	7/18/1934	7	18
6		FLORENCE DEPOSIT BANK	COMMERCIAL BANK	STATE	FLORENCE, IN	FLORENCE	IN	7/18/1934	7	18
7		BANK OF LEWISPORT	COMMERCIAL BANK	STATE	LEWISPORT, KY	LEWISPORT	KY	8/6/1934	8	6
8		FARMERS STATE BANK OF BONGARDS	COMMERCIAL BANK	STATE	BONGARDS, MN	BONGARDS	MN	9/13/1934	9	13
9		FARMERS & TRADERS BANK	COMMERCIAL BANK	STATE	PORTERFIELD, WI	PORTERFIELD	WI	10/11/1934	10	11
10		PICKENS COUNTY BANK	COMMERCIAL BANK	STATE	JASPER, GA	JASPER	GA	10/13/1934	10	13
11		THE STATE BANK	COMMERCIAL BANK	STATE	SAUK CITY, WI	SAUK CITY	WI	11/16/1934	11	16
12		CLIFFSIDE PARK TITLE GUARANTEE & TRUST CO	COMMERCIAL BANK	STATE	GRANTWOOD, NJ	GRANTWOOD	NJ	1/3/1935	1	3
13		THE NATIONAL BANK OF HERNDON	COMMERCIAL BANK	FEDERAL	HERNDON, VA	HERNDON	VA	1/9/1935	1	9
14		PALMETTO STATE BANK	COMMERCIAL BANK	STATE	LAKE CITY, SC	LAKE CITY	SC	3/9/1935	3	9
15		THE FIRST STATE BANK	COMMERCIAL BANK	STATE	CHEYENNE, OK	CHEYENNE	OK	3/25/1935	3	25
16		GUARANTY STATE BANK	COMMERCIAL BANK	STATE	CLINTON, OK	CLINTON	OK	4/4/1935	4	4
17		THE STATE BANK OF MILFORD	COMMERCIAL BANK	STATE	MILFORD, KS	MILFORD	KS	4/10/1935	4	10
18		THE FARMERS BANK	COMMERCIAL BANK	STATE	ROYSTON, GA	ROYSTON	GA	5/2/1935	5	2
19		FIRST STATE BANK OF AGRA	COMMERCIAL BANK	STATE	AGRA, KS	AGRA	KS	5/3/1935	5	3
20		BLUE SPRINGS STATE BANK	COMMERCIAL BANK	STATE	BLUE SPRINGS, MO	BLUE SPRINGS	MO	6/1/1935	6	1
21		ANCHOR STATE BANK	COMMERCIAL BANK	STATE	WEST MILWAUKEE	WEST MILWAUKEE	WI	6/4/1935	6	4
22		STATE BANK OF SUAMICO	COMMERCIAL BANK	STATE	SUAMICO, WI	SUAMICO	WI	6/24/1935	6	24
23		THE FIRST NATIONAL BANK OF PENDER	COMMERCIAL BANK	FEDERAL	PENDER, NE	PENDER	NE	6/29/1935	6	29

Figure 1. Before Screenshot of Data Duplication. The figure demonstrates data duplication because Fon Du Lac State Bank appears twice with the same values. Upon further investigation, the Failure Date as well as the Total Deposits and Assets are identical, revealing the duplication problem.

Figure 2. After Screenshot of the Data Duplication

	A	B	C	D	E	F	G	H	I	J	
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3		FON DU LAC STATE BANK	COMMERCIAL BANK	STATE	EAST PEORIA, IL	EAST PEORIA	IL	5/28/1934	5	28	
4		FIRST NATIONAL BANK OF LIMA	COMMERCIAL BANK	FEDERAL	LIMA, MT	LIMA	MT	7/18/1934	7	18	
5		FLORENCE DEPOSIT BANK	COMMERCIAL BANK	STATE	FLORENCE, IN	FLORENCE	IN	7/18/1934	7	18	
6		BANK OF LEWISPORT	COMMERCIAL BANK	STATE	LEWISPORT, KY	LEWISPORT	KY	8/6/1934	8	6	
7		FARMERS STATE BANK OF BONGARDS	COMMERCIAL BANK	STATE	BONGARDS, MN	BONGARDS	MN	9/13/1934	9	13	
8		FARMERS & TRADERS BANK	COMMERCIAL BANK	STATE	PORTERFIELD, WI	PORTERFIELD	WI	10/11/1934	10	11	
9		PICKENS COUNTY BANK	COMMERCIAL BANK	STATE	JASPER, GA	JASPER	GA	10/13/1934	10	13	
10		THE STATE BANK	COMMERCIAL BANK	STATE	SAUK CITY, WI	SAUK CITY	WI	11/16/1934	11	16	
11		CLIFFSIDE PARK TITLE GUARANTEE & TRUST CC	COMMERCIAL BANK	STATE	GRANTWOOD, NJ	GRANTWOOD	NJ	1/3/1935	1	3	
12		THE NATIONAL BANK OF HERNDON	COMMERCIAL BANK	FEDERAL	HERNDON, VA	HERNDON	VA	1/9/1935	1	9	
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18		FIRST STATE BANK OF AGRA	COMMERCIAL BANK	STATE	AGRA, KS	AGRA	KS	5/3/1935	5	3	
19		BLUE SPRINGS STATE BANK	COMMERCIAL BANK	STATE	BLUE SPRINGS, MC	BLUE SPRINGS	MO	6/1/1935	6	1	
20		ANCHOR STATE BANK	COMMERCIAL BANK	STATE	WEST MILWAUKEE	WEST MILWAUKEE	WI	6/4/1935	6	4	
21		STATE BANK OF SUAMICO	COMMERCIAL BANK	STATE	SUAMICO, WI	SUAMICO	WI	6/24/1935	6	24	
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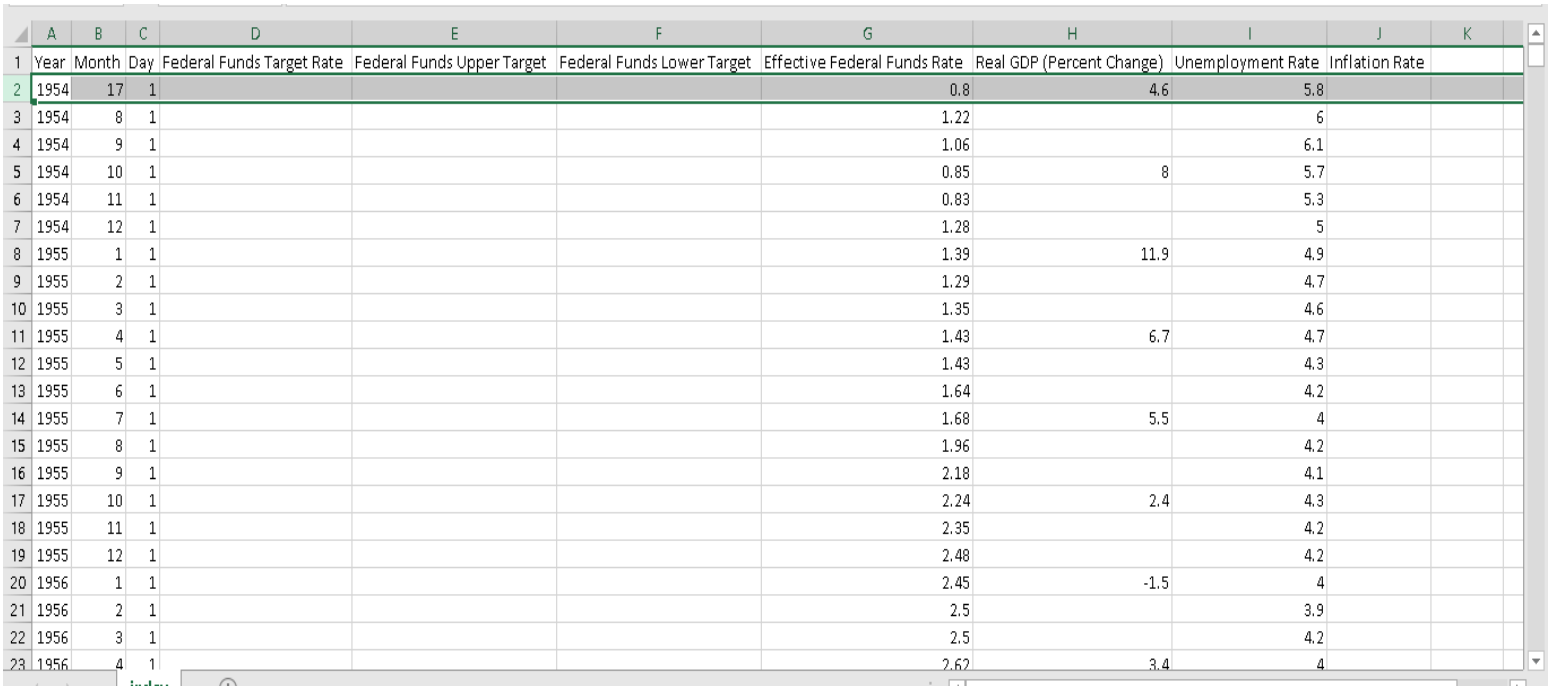
23		BANK OF GRANTVILLE	COMMERCIAL BANK	STATE	GRANTVILLE, GA	GRANTVILLE	GA	7/20/1935	7	20	

banks

Figure 2. After Screenshot of the Data Duplication. The redundant row is deleted, and the rows are shifted up through a simple transformation to maintain data accuracy and avoid potentially missing values with a blank row. This and other duplicates can be resolved can also be found using the Duplicate Rows module of Excel.

Illegal Values

Figure 3. Before Screenshot of Illegal Value



	A	B	C	D	E	F	G	H	I	J	K
1	Year	Month	Day	Federal Funds Target Rate	Federal Funds Upper Target	Federal Funds Lower Target	Effective Federal Funds Rate	Real GDP (Percent Change)	Unemployment Rate	Inflation Rate	
2	1954	17	1				0.8	4.6	5.8		
3	1954	8	1				1.22		6		
4	1954	9	1				1.06		6.1		
5	1954	10	1				0.85	8	5.7		
6	1954	11	1				0.83		5.3		
7	1954	12	1				1.28		5		
8	1955	1	1				1.39	11.9	4.9		
9	1955	2	1				1.29		4.7		
10	1955	3	1				1.35		4.6		
11	1955	4	1				1.43	6.7	4.7		
12	1955	5	1				1.43		4.3		
13	1955	6	1				1.64		4.2		
14	1955	7	1				1.68	5.5	4		
15	1955	8	1				1.96		4.2		
16	1955	9	1				2.18		4.1		
17	1955	10	1				2.24	2.4	4.3		
18	1955	11	1				2.35		4.2		
19	1955	12	1				2.48		4.2		
20	1956	1	1				2.45	-1.5	4		
21	1956	2	1				2.5		3.9		
22	1956	3	1				2.5		4.2		
23	1956	4	1				2.62	3.4	4		

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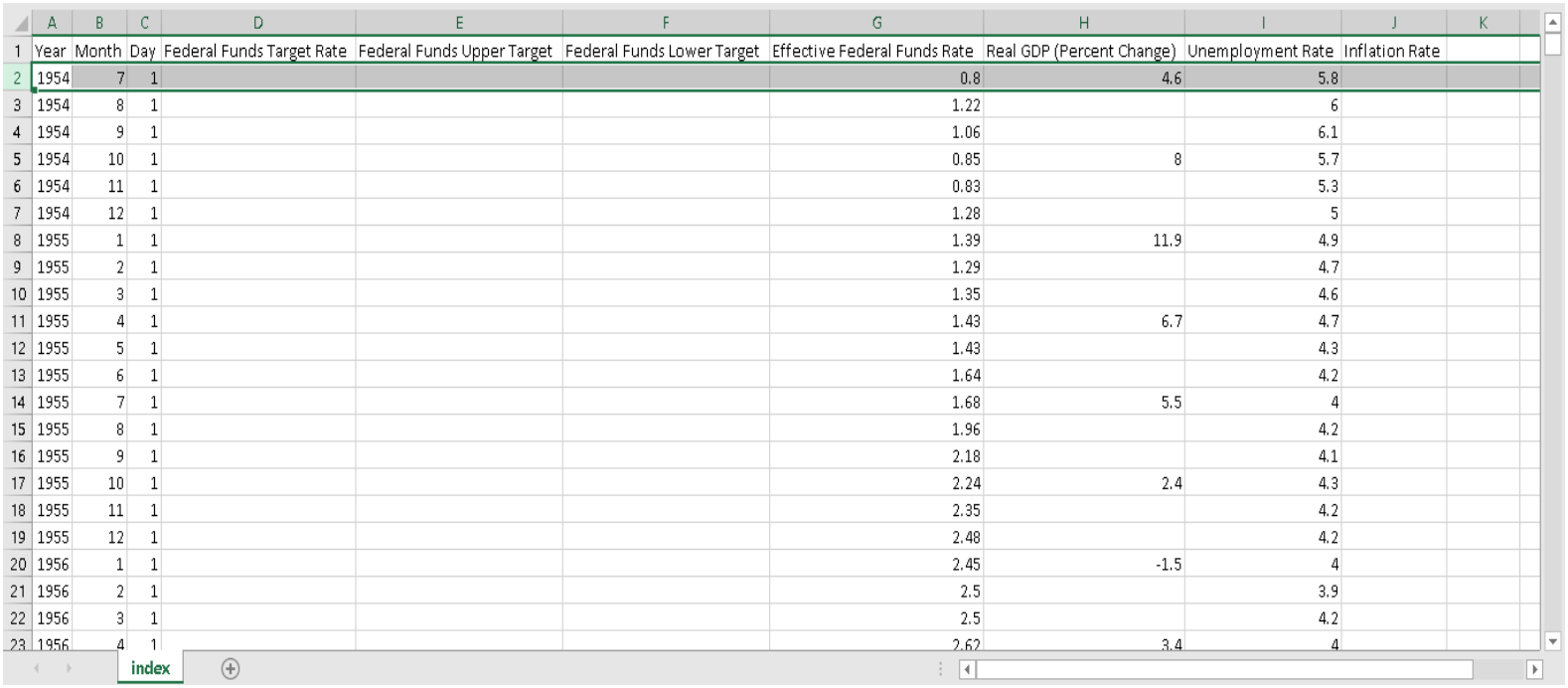
Figure 3. Before Screenshot of Illegal Value. The illegal value here is revealed through the second row where integer “17” is fielded under the Month column. This value is outside the domain range of the column which correctly restricts values from 1-12.

Figure 4. After Screenshot of Illegal Value



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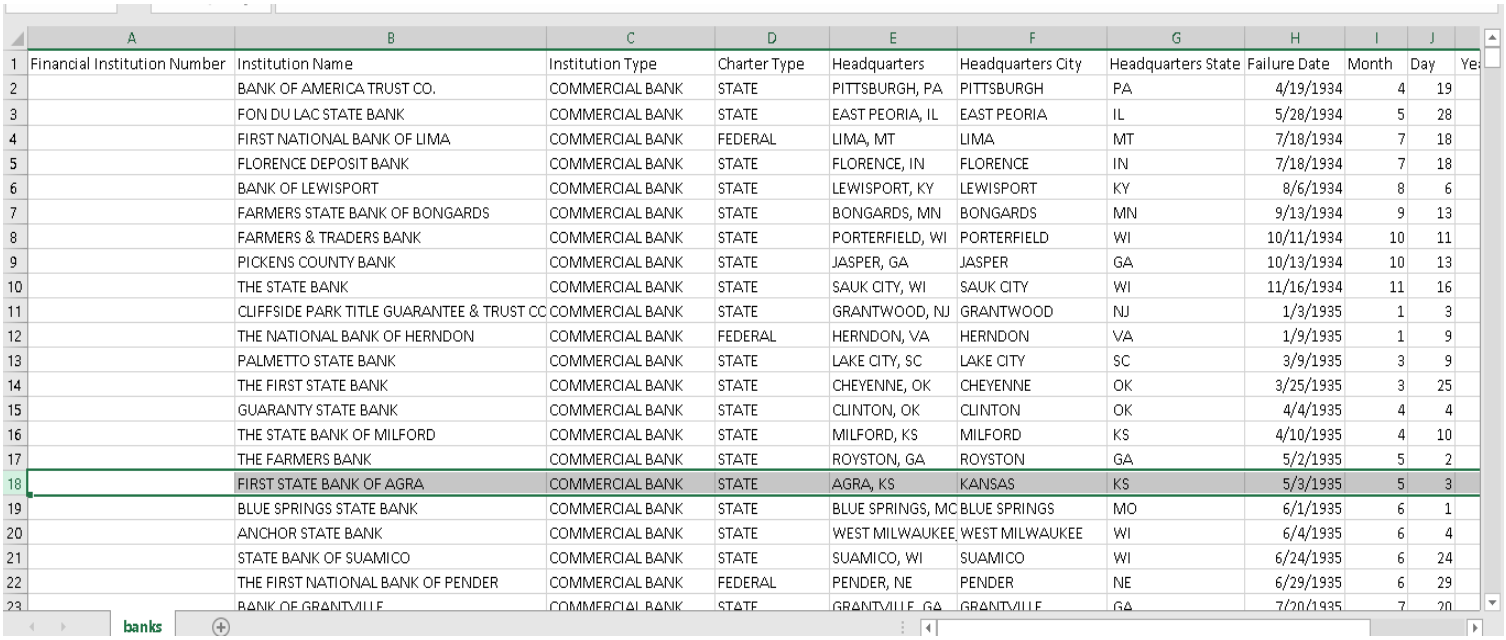
21	1956	2	1				2.5		3.9		
22	1956	3	1				2.5		4.2		
23	1956	4	1				2.62	3.4	4		

index

Figure 4. After Screenshot of Illegal Value. Changing the illegal month value requires verification or research to value it correctly within the domain range. Replacing the value with a random number or null would jeopardize the integrity of the data even just as one row. Upon further investigation of data sources, the correct value for the month date of this Federal Reserve Interest Rate is “7” (July).

Misfielded Values

Figure 5. Before Screenshot of Misfielded Values



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7		FARMERS STATE BANK OF BONGARDS	COMMERCIAL BANK	STATE	BONGARDS, MN	BONGARDS	MN	9/13/1934	9	13	
8		FARMERS & TRADERS BANK	COMMERCIAL BANK	STATE	PORTERFIELD, WI	PORTERFIELD	WI	10/11/1934	10	11	
9		PICKENS COUNTY BANK	COMMERCIAL BANK	STATE	JASPER, GA	JASPER	GA	10/13/1934	10	13	
10		THE STATE BANK	COMMERCIAL BANK	STATE	SAUK CITY, WI	SAUK CITY	WI	11/16/1934	11	16	
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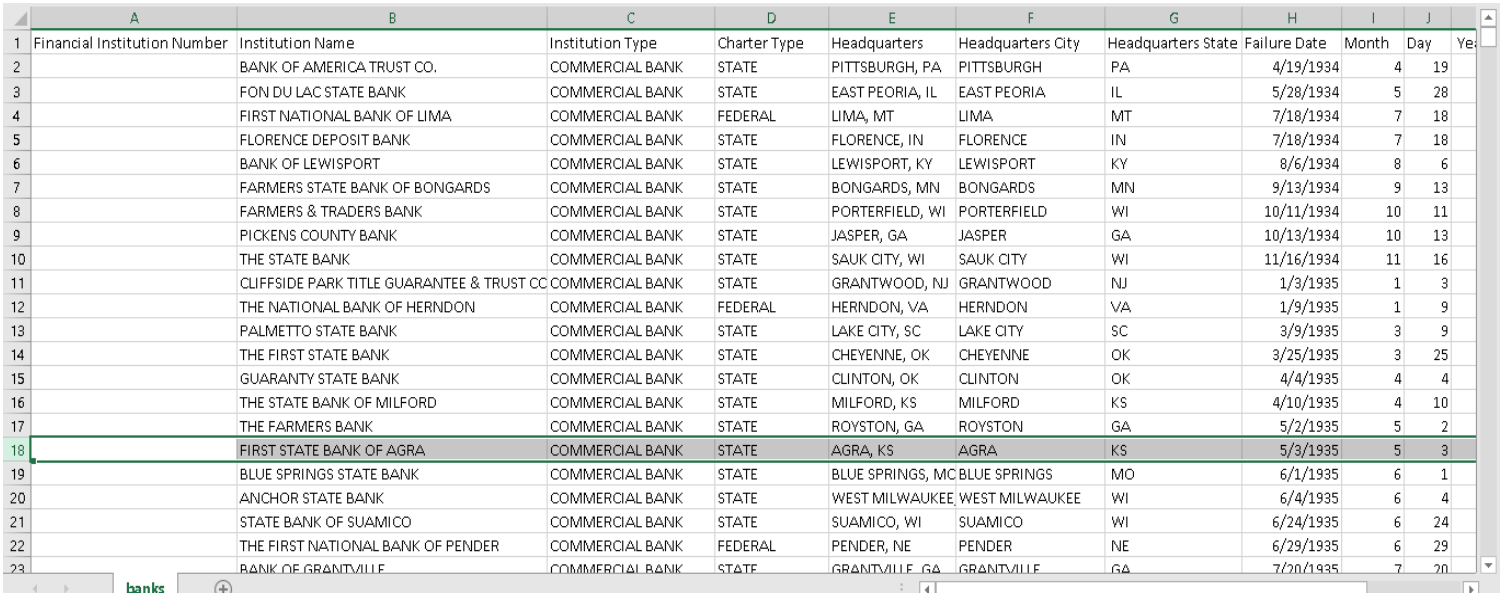
22		THE FIRST NATIONAL BANK OF PENDER	COMMERCIAL BANK	FEDERAL	PENDER, NE	PENDER	NE	6/29/1935	6	29	
23		BANK OF GRANTVILLE	COMMERCIAL BANK	STATE	GRANTVILLE, GA	GRANTVILLE	GA	7/20/1935	7	20	

banks

Figure 5. Before Screenshot of Misfielded Values. The misfielded value is “KANSAS” under Headquarters City for First National Bank of Agra. While there is a Kansas City in Kansas, the row is identified by the First National Bank of Agra and the Headquarters column clearly reads, “Agra, KS”.

Figure 6. After Screenshot of Misfielded Values.



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9		PICKENS COUNTY BANK	COMMERCIAL BANK	STATE	JASPER, GA	JASPER	GA	10/13/1934	10	13	
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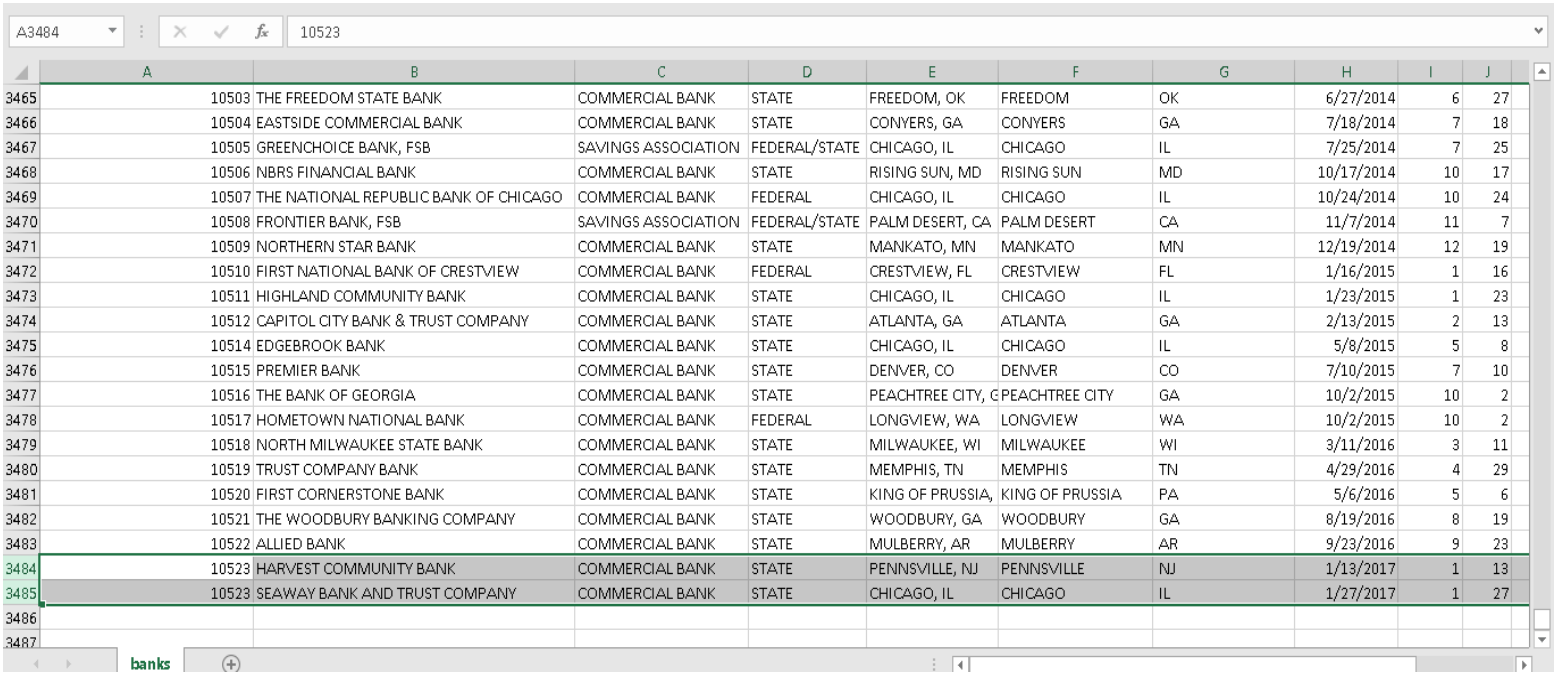
banks

Figure 6. After Screenshot of Misfielded Values. After verification, the misfielded value is replaced by the correct value, “Agra”, supporting the integrity of the dataset. The verification was done by cross-referencing with the original source.

Uniqueness Violation

Figure 7. Before Screenshot of Uniqueness Violation



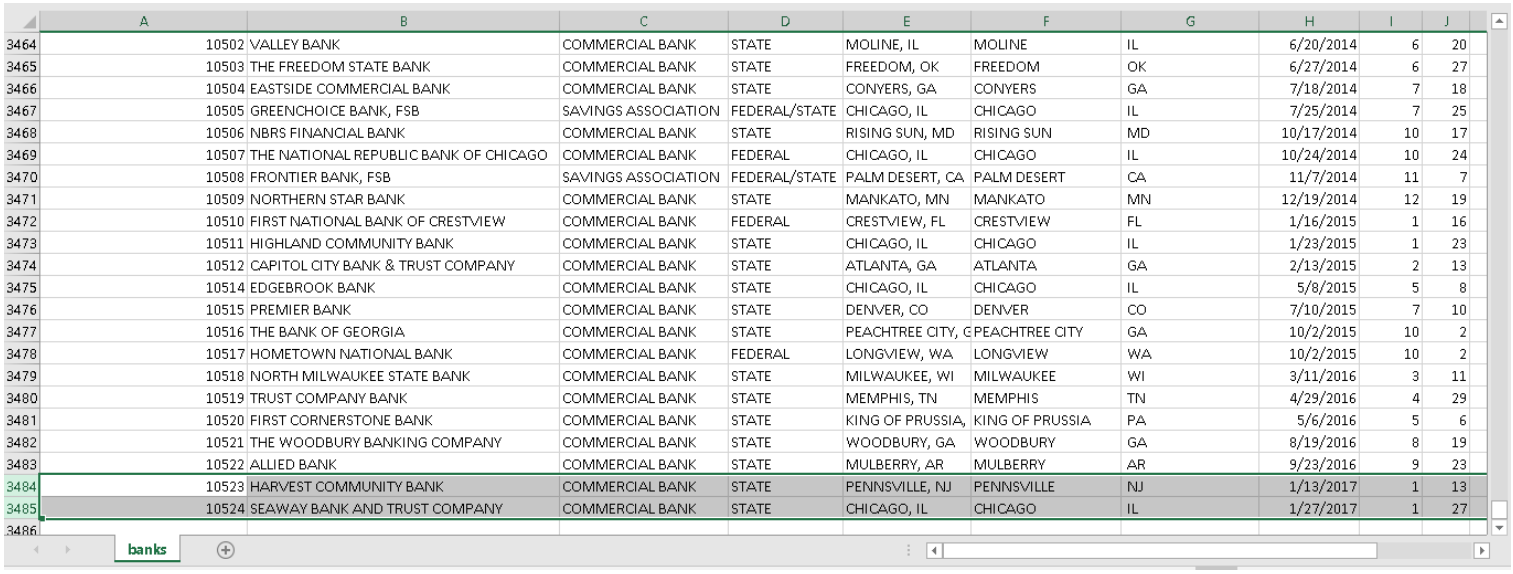
A3484 | 10523

	A	B	C	D	E	F	G	H	I	J
3465	10503	THE FREEDOM STATE BANK	COMMERCIAL BANK	STATE	FREEDOM, OK	FREEDOM	OK	6/27/2014	6	27
3466	10504	EASTSIDE COMMERCIAL BANK	COMMERCIAL BANK	STATE	CONYERS, GA	CONYERS	GA	7/18/2014	7	18
3467	10505	GREENCHOICE BANK, FSB	SAVINGS ASSOCIATION	FEDERAL/STATE	CHICAGO, IL	CHICAGO	IL	7/25/2014	7	25
3468	10506	NBRS FINANCIAL BANK	COMMERCIAL BANK	STATE	RISING SUN, MD	RISING SUN	MD	10/17/2014	10	17
3469	10507	THE NATIONAL REPUBLIC BANK OF CHICAGO	COMMERCIAL BANK	FEDERAL	CHICAGO, IL	CHICAGO	IL	10/24/2014	10	24
3470	10508	FRONTIER BANK, FSB	SAVINGS ASSOCIATION	FEDERAL/STATE	PALM DESERT, CA	PALM DESERT	CA	11/7/2014	11	7
3471	10509	NORTHERN STAR BANK	COMMERCIAL BANK	STATE	MANKATO, MN	MANKATO	MN	12/19/2014	12	19
3472	10510	FIRST NATIONAL BANK OF CRESTVIEW	COMMERCIAL BANK	FEDERAL	CRESTVIEW, FL	CRESTVIEW	FL	1/16/2015	1	16
3473	10511	HIGHLAND COMMUNITY BANK	COMMERCIAL BANK	STATE	CHICAGO, IL	CHICAGO	IL	1/23/2015	1	23
3474	10512	CAPITOL CITY BANK & TRUST COMPANY	COMMERCIAL BANK	STATE	ATLANTA, GA	ATLANTA	GA	2/13/2015	2	13
3475	10514	EDGEBROOK BANK	COMMERCIAL BANK	STATE	CHICAGO, IL	CHICAGO	IL	5/8/2015	5	8
3476	10515	PREMIER BANK	COMMERCIAL BANK	STATE	DENVER, CO	DENVER	CO	7/10/2015	7	10
3477	10516	THE BANK OF GEORGIA	COMMERCIAL BANK	STATE	PEACHTREE CITY, G	PEACHTREE CITY	GA	10/2/2015	10	2
3478	10517	HOMETOWN NATIONAL BANK	COMMERCIAL BANK	FEDERAL	LONGVIEW, WA	LONGVIEW	WA	10/2/2015	10	2
3479	10518	NORTH MILWAUKEE STATE BANK	COMMERCIAL BANK	STATE	MILWAUKEE, WI	MILWAUKEE	WI	3/11/2016	3	11
3480	10519	TRUST COMPANY BANK	COMMERCIAL BANK	STATE	MEMPHIS, TN	MEMPHIS	TN	4/29/2016	4	29
3481	10520	FIRST CORNERSTONE BANK	COMMERCIAL BANK	STATE	KING OF PRUSSIA,	KING OF PRUSSIA	PA	5/6/2016	5	6
3482	10521	THE WOODBURY BANKING COMPANY	COMMERCIAL BANK	STATE	WOODBURY, GA	WOODBURY	GA	8/19/2016	8	19
3483	10522	ALLIED BANK	COMMERCIAL BANK	STATE	MULBERRY, AR	MULBERRY	AR	9/23/2016	9	23
3484	10523	HARVEST COMMUNITY BANK	COMMERCIAL BANK	STATE	PENNSVILLE, NJ	PENNSVILLE	NJ	1/13/2017	1	13
3485	10523	SEAWAY BANK AND TRUST COMPANY	COMMERCIAL BANK	STATE	CHICAGO, IL	CHICAGO	IL	1/27/2017	1	27
3486										
3487										

banks

Figure 7. Before Screenshot of Uniqueness Violation. This reveals that the primary identifiers of two different records are not unique. The Financial Institution Number of both banks are the same, “10523”. Uniqueness violations create redundancies and precision errors during ETL, incorrectly extracting multiple rows for the one query.

Figure 8. After Screenshot of the Uniqueness Violation.



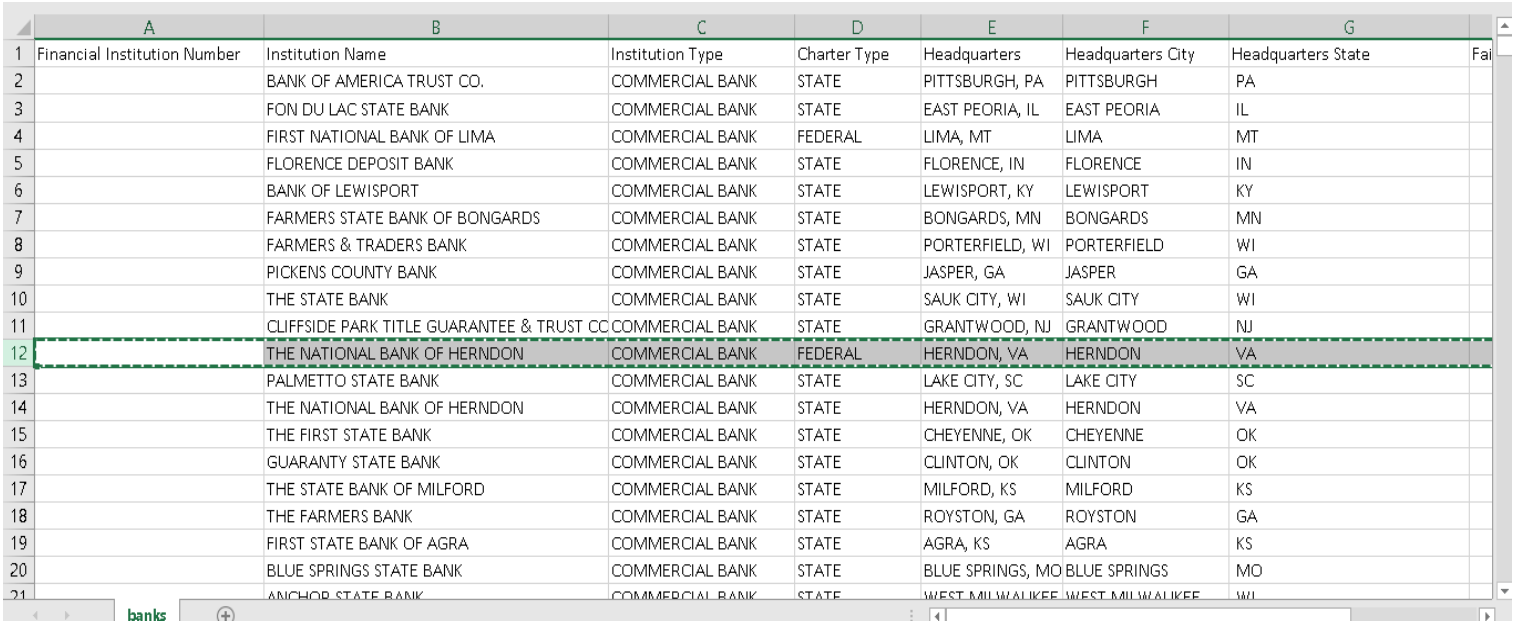
	A	B	C	D	E	F	G	H	I	J
3464	10502	VALLEY BANK	COMMERCIAL BANK	STATE	MOLINE, IL	MOLINE	IL	6/20/2014	6	20
3465	10503	THE FREEDOM STATE BANK	COMMERCIAL BANK	STATE	FREEDOM, OK	FREEDOM	OK	6/27/2014	6	27
3466	10504	EASTSIDE COMMERCIAL BANK	COMMERCIAL BANK	STATE	CONYERS, GA	CONYERS	GA	7/18/2014	7	18
3467	10505	GREENCHOICE BANK, FSB	SAVINGS ASSOCIATION	FEDERAL/STATE	CHICAGO, IL	CHICAGO	IL	7/25/2014	7	25
3468	10506	NBRS FINANCIAL BANK	COMMERCIAL BANK	STATE	RISING SUN, MD	RISING SUN	MD	10/17/2014	10	17
3469	10507	THE NATIONAL REPUBLIC BANK OF CHICAGO	COMMERCIAL BANK	FEDERAL	CHICAGO, IL	CHICAGO	IL	10/24/2014	10	24
3470	10508	FRONTIER BANK, FSB	SAVINGS ASSOCIATION	FEDERAL/STATE	PALM DESERT, CA	PALM DESERT	CA	11/7/2014	11	7
3471	10509	NORTHERN STAR BANK	COMMERCIAL BANK	STATE	MANKATO, MN	MANKATO	MN	12/19/2014	12	19
3472	10510	FIRST NATIONAL BANK OF CRESTVIEW	COMMERCIAL BANK	FEDERAL	CRESTVIEW, FL	CRESTVIEW	FL	1/16/2015	1	16
3473	10511	HIGHLAND COMMUNITY BANK	COMMERCIAL BANK	STATE	CHICAGO, IL	CHICAGO	IL	1/23/2015	1	23
3474	10512	CAPITOL CITY BANK & TRUST COMPANY	COMMERCIAL BANK	STATE	ATLANTA, GA	ATLANTA	GA	2/13/2015	2	13
3475	10514	EDGEBROOK BANK	COMMERCIAL BANK	STATE	CHICAGO, IL	CHICAGO	IL	5/8/2015	5	8
3476	10515	PREMIER BANK	COMMERCIAL BANK	STATE	DENVER, CO	DENVER	CO	7/10/2015	7	10
3477	10516	THE BANK OF GEORGIA	COMMERCIAL BANK	STATE	PEACHTREE CITY, G	PEACHTREE CITY	GA	10/2/2015	10	2
3478	10517	HOMETOWN NATIONAL BANK	COMMERCIAL BANK	FEDERAL	LONGVIEW, WA	LONGVIEW	WA	10/2/2015	10	2
3479	10518	NORTH MILWAUKEE STATE BANK	COMMERCIAL BANK	STATE	MILWAUKEE, WI	MILWAUKEE	WI	3/11/2016	3	11
3480	10519	TRUST COMPANY BANK	COMMERCIAL BANK	STATE	MEMPHIS, TN	MEMPHIS	TN	4/29/2016	4	29
3481	10520	FIRST CORNERSTONE BANK	COMMERCIAL BANK	STATE	KING OF PRUSSIA,	KING OF PRUSSIA	PA	5/6/2016	5	6
3482	10521	THE WOODBURY BANKING COMPANY	COMMERCIAL BANK	STATE	WOODBURY, GA	WOODBURY	GA	8/19/2016	8	19
3483	10522	ALLIED BANK	COMMERCIAL BANK	STATE	MULBERRY, AR	MULBERRY	AR	9/23/2016	9	23
3484	10523	HARVEST COMMUNITY BANK	COMMERCIAL BANK	STATE	PENNSVILLE, NJ	PENNSVILLE	NJ	1/13/2017	1	13
3485	10524	SEAWAY BANK AND TRUST COMPANY	COMMERCIAL BANK	STATE	CHICAGO, IL	CHICAGO	IL	1/27/2017	1	27
3486										

banks

Figure 8. After Screenshot of the Uniqueness Violation. Upon verification it is found that the second bank's Financial Institution Number was actually "10524". The value is replaced, and the records are normalized so that each row has unique primary identifiers.

Contradicting Records

Figure 9. Before Screenshot of Contradicting Records

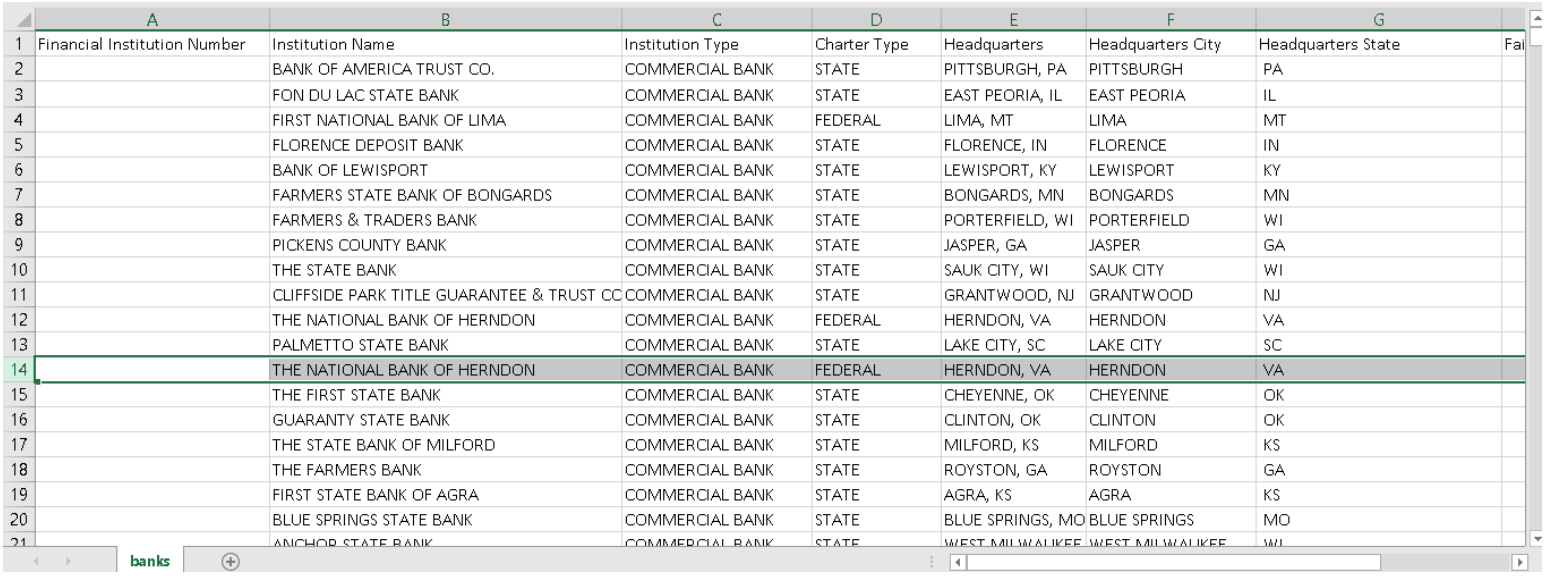


	A	B	C	D	E	F	G
1	Financial Institution Number	Institution Name	Institution Type	Charter Type	Headquarters	Headquarters City	Headquarters State
2		BANK OF AMERICA TRUST CO.	COMMERCIAL BANK	STATE	PITTSBURGH, PA	PITTSBURGH	PA
3		FON DU LAC STATE BANK	COMMERCIAL BANK	STATE	EAST PEORIA, IL	EAST PEORIA	IL
4		FIRST NATIONAL BANK OF LIMA	COMMERCIAL BANK	FEDERAL	LIMA, MT	LIMA	MT
5		FLORENCE DEPOSIT BANK	COMMERCIAL BANK	STATE	FLORENCE, IN	FLORENCE	IN
6		BANK OF LEWISPORT	COMMERCIAL BANK	STATE	LEWISPORT, KY	LEWISPORT	KY
7		FARMERS STATE BANK OF BONGARDS	COMMERCIAL BANK	STATE	BONGARDS, MN	BONGARDS	MN
8		FARMERS & TRADERS BANK	COMMERCIAL BANK	STATE	PORTERFIELD, WI	PORTERFIELD	WI
9		PICKENS COUNTY BANK	COMMERCIAL BANK	STATE	JASPER, GA	JASPER	GA
10		THE STATE BANK	COMMERCIAL BANK	STATE	SAUK CITY, WI	SAUK CITY	WI
11		CLIFFSIDE PARK TITLE GUARANTEE & TRUST CC	COMMERCIAL BANK	STATE	GRANTWOOD, NJ	GRANTWOOD	NJ
12		THE NATIONAL BANK OF HERNDON	COMMERCIAL BANK	FEDERAL	HERNDON, VA	HERNDON	VA
13		PALMETTO STATE BANK	COMMERCIAL BANK	STATE	LAKE CITY, SC	LAKE CITY	SC
14		THE NATIONAL BANK OF HERNDON	COMMERCIAL BANK	STATE	HERNDON, VA	HERNDON	VA
15		THE FIRST STATE BANK	COMMERCIAL BANK	STATE	CHEYENNE, OK	CHEYENNE	OK
16		GUARANTY STATE BANK	COMMERCIAL BANK	STATE	CLINTON, OK	CLINTON	OK
17		THE STATE BANK OF MILFORD	COMMERCIAL BANK	STATE	MILFORD, KS	MILFORD	KS
18		THE FARMERS BANK	COMMERCIAL BANK	STATE	ROYSTON, GA	ROYSTON	GA
19		FIRST STATE BANK OF AGRA	COMMERCIAL BANK	STATE	AGRA, KS	AGRA	KS
20		BLUE SPRINGS STATE BANK	COMMERCIAL BANK	STATE	BLUE SPRINGS, MO	BLUE SPRINGS	MO
21		ANCHOR STATE BANK	COMMERCIAL BANK	STATE	WEST MILWAUKEE	WEST MILWAUKEE	WI

banks

Figure 9. Before Screenshot of Contradicting Records. Looking closely at records 12 and 14 for The National Bank of Herndon, we see that the Charter Types contradict one another. The contradictions confuse record 14 as Charter Type, “STATE”.

Figure 10. After Screenshot of Contradicting Records



	A	B	C	D	E	F	G
1	Financial Institution Number	Institution Name	Institution Type	Charter Type	Headquarters	Headquarters City	Headquarters State
2		BANK OF AMERICA TRUST CO.	COMMERCIAL BANK	STATE	PITTSBURGH, PA	PITTSBURGH	PA
3		FON DU LAC STATE BANK	COMMERCIAL BANK	STATE	EAST PEORIA, IL	EAST PEORIA	IL
4		FIRST NATIONAL BANK OF LIMA	COMMERCIAL BANK	FEDERAL	LIMA, MT	LIMA	MT
5		FLORENCE DEPOSIT BANK	COMMERCIAL BANK	STATE	FLORENCE, IN	FLORENCE	IN
6		BANK OF LEWISPORT	COMMERCIAL BANK	STATE	LEWISPORT, KY	LEWISPORT	KY
7		FARMERS STATE BANK OF BONGARDS	COMMERCIAL BANK	STATE	BONGARDS, MN	BONGARDS	MN
8		FARMERS & TRADERS BANK	COMMERCIAL BANK	STATE	PORTERFIELD, WI	PORTERFIELD	WI
9		PICKENS COUNTY BANK	COMMERCIAL BANK	STATE	JASPER, GA	JASPER	GA
10		THE STATE BANK	COMMERCIAL BANK	STATE	SAUK CITY, WI	SAUK CITY	WI
11		CLIFFSIDE PARK TITLE GUARANTEE & TRUST CC	COMMERCIAL BANK	STATE	GRANTWOOD, NJ	GRANTWOOD	NJ
12		THE NATIONAL BANK OF HERNDON	COMMERCIAL BANK	FEDERAL	HERNDON, VA	HERNDON	VA
13		PALMETTO STATE BANK	COMMERCIAL BANK	STATE	LAKE CITY, SC	LAKE CITY	SC
14		THE NATIONAL BANK OF HERNDON	COMMERCIAL BANK	FEDERAL	HERNDON, VA	HERNDON	VA
15		THE FIRST STATE BANK	COMMERCIAL BANK	STATE	CHEYENNE, OK	CHEYENNE	OK
16		GUARANTY STATE BANK	COMMERCIAL BANK	STATE	CLINTON, OK	CLINTON	OK
17		THE STATE BANK OF MILFORD	COMMERCIAL BANK	STATE	MILFORD, KS	MILFORD	KS
18		THE FARMERS BANK	COMMERCIAL BANK	STATE	ROYSTON, GA	ROYSTON	GA
19		FIRST STATE BANK OF AGRA	COMMERCIAL BANK	STATE	AGRA, KS	AGRA	KS
20		BLUE SPRINGS STATE BANK	COMMERCIAL BANK	STATE	BLUE SPRINGS, MO	BLUE SPRINGS	MO
21		ANCHOR STATE BANK	COMMERCIAL BANK	STATE	WEST MILWAUKEE	WEST MILWAUKEE	WI

banks

Figure 10. After Screenshot of Contradicting Records. The records are verified that the National Bank of Herndon is in fact a “FEDERAL” charter type bank and the values no longer contradict. When many of these contradictions exist, it can create inaccuracies especially when drilling down into the data to view the number of bank failures by type.

Data Visualization and the Five Key Points

How have the Effective Federal Funds Rate and the Inflation Rate changed over time?

Figure 11. Total Average Effective Federal Funds Rate and Inflation Rate by Year

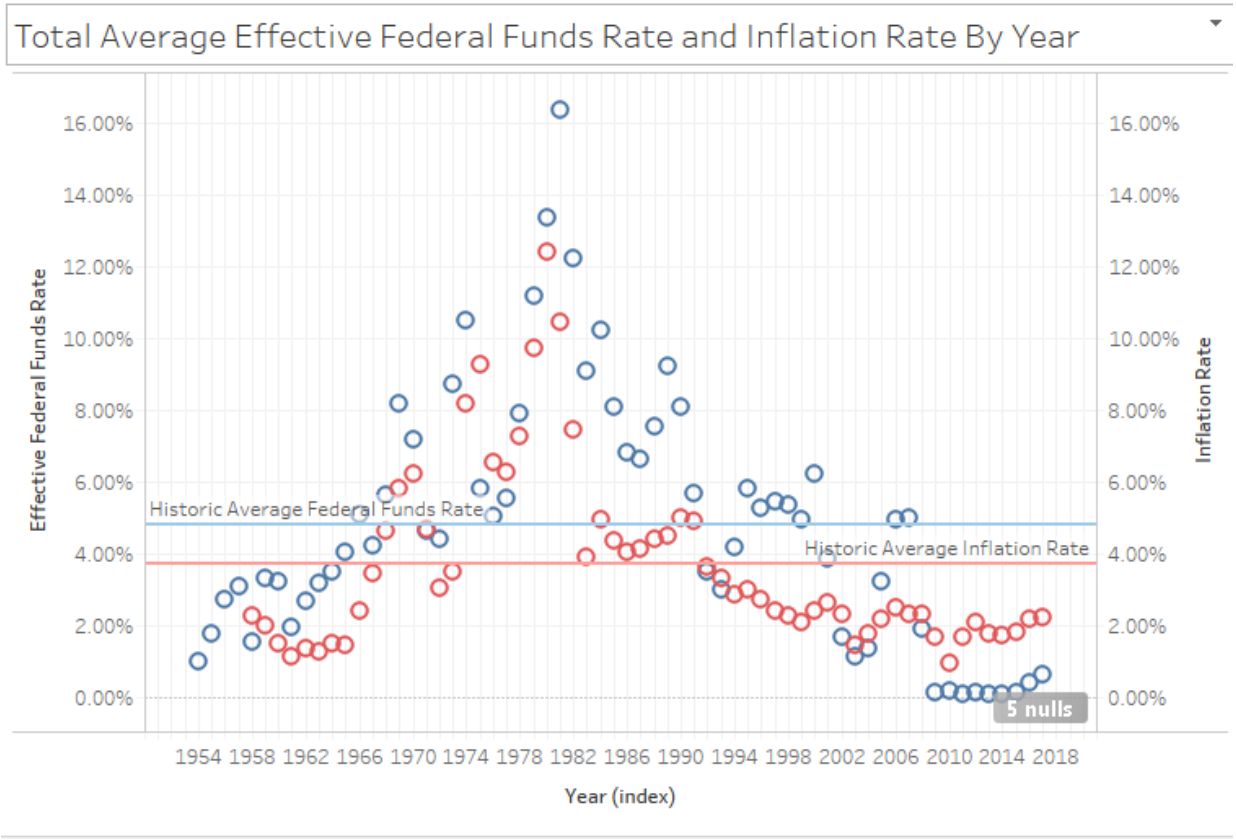


Figure 11. Average Effective Federal Funds Rate and Inflation Rate by Year. The visualization includes scatter plot, dual axis chart, reference line, and dates. The scatter plot reveals average rates per date of year continuous and the reference line shows the overall historic average rate. The visualization compares the changes of the Federal Funds Interest Rate and the Inflation rate through the implementation of the dual axis chart for easy comparison between the two rates. It reveals that the two rates closely change at similar rates over time. During early 1980s, it reveals record highs well above the historic averages with the Federal Funds Rate at 16.38% and the Inflation Rate at 12.43%. This period marked the beginning of the 1980s Recession.

What kinds of Charter Type and Banking Institution fail the most?

Figure 12. Total Sum of Bank Failures by Institution and Charter Type

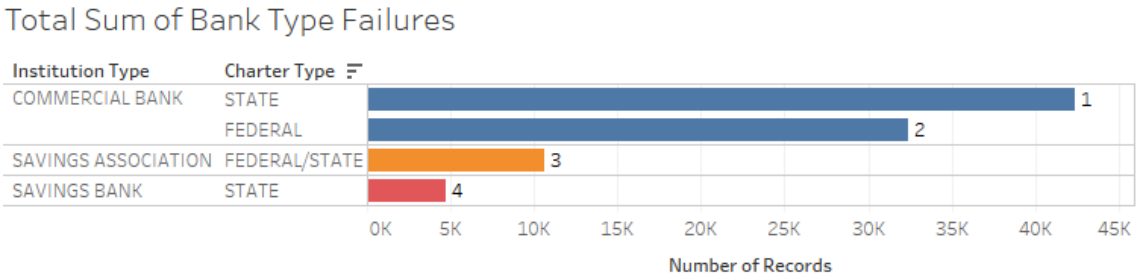


Figure 12. Total Bank Failures by Institution and Charter Type. This visualization includes rank. The visualization breaks down bank failures by Institution Type and Charter Type. Due in part to the rank feature, it reveals the order from most to least of bank failure precedence as follows: State Commercial Banks, Federal Commercial Banks, Federal/State Hybrid Savings Associations, and State Savings Banks. Furthermore, State Commercial Banks are the biggest loser, having the most bank failures at a total of 42,348, and State Savings Banks are the smallest winner, having the least bank failures at a total of 4,716, from 1934-2017. This can be used to target specific types of banks at risk with particularly more conservative policy to avoid failure.

How have banks failed over time?

Figure 13. Total Bank Failures Over Time

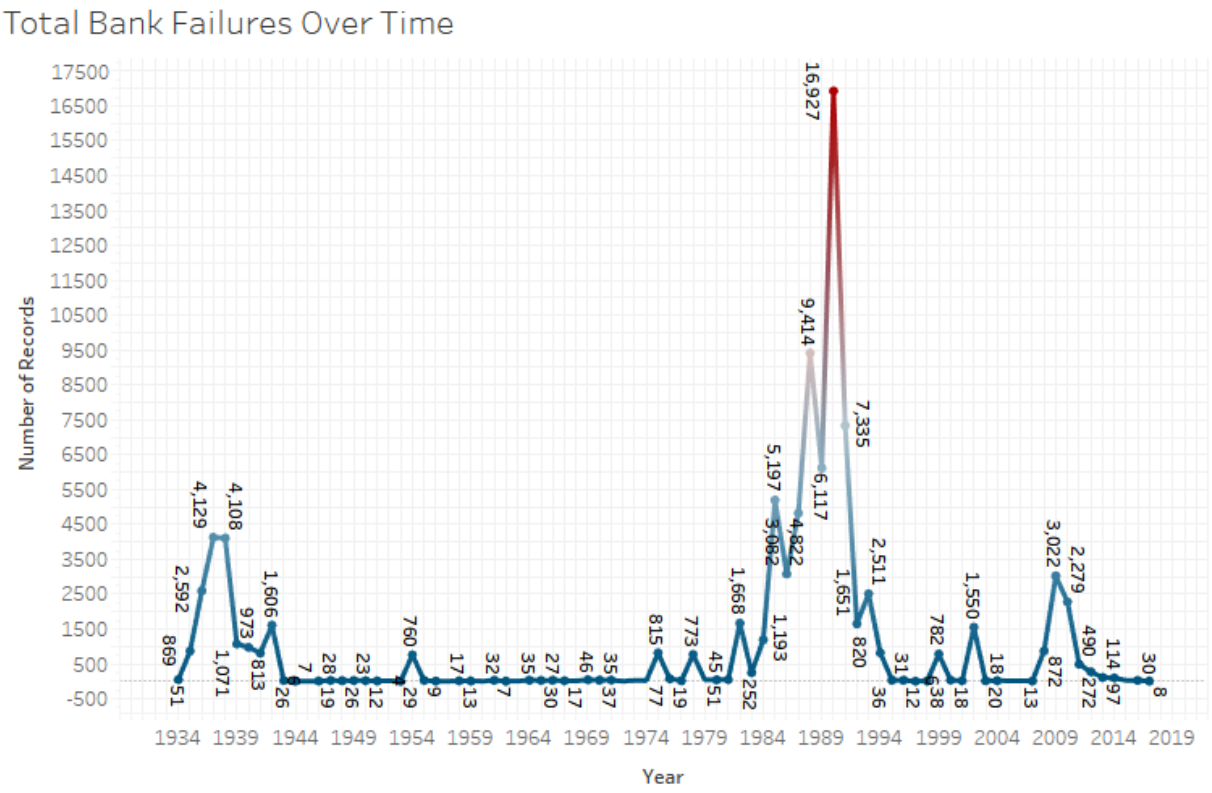


Figure 13. Bank Failures Over Time. This visualization includes forecast trend lines and dates. The charted trend lines show the number of bank failures per date of year continuous. It reveals a large period between 1944- 1980 having very low numbers of bank failures. During this same time, the economic boom of WW2 as well as Space Age generation created a thriving economy. On the other hand, the chart reveals that between 1985-1993, the number of bank failures reached a historic high of 16,927 as shown by the red peak. The metrics of this period are due to the Economic Recession of the 1980s.

What is the Loan to Deposit Ratio of banks when they fail?

Figure 14. Total Average LTD Ratio of Failed Banks by Year

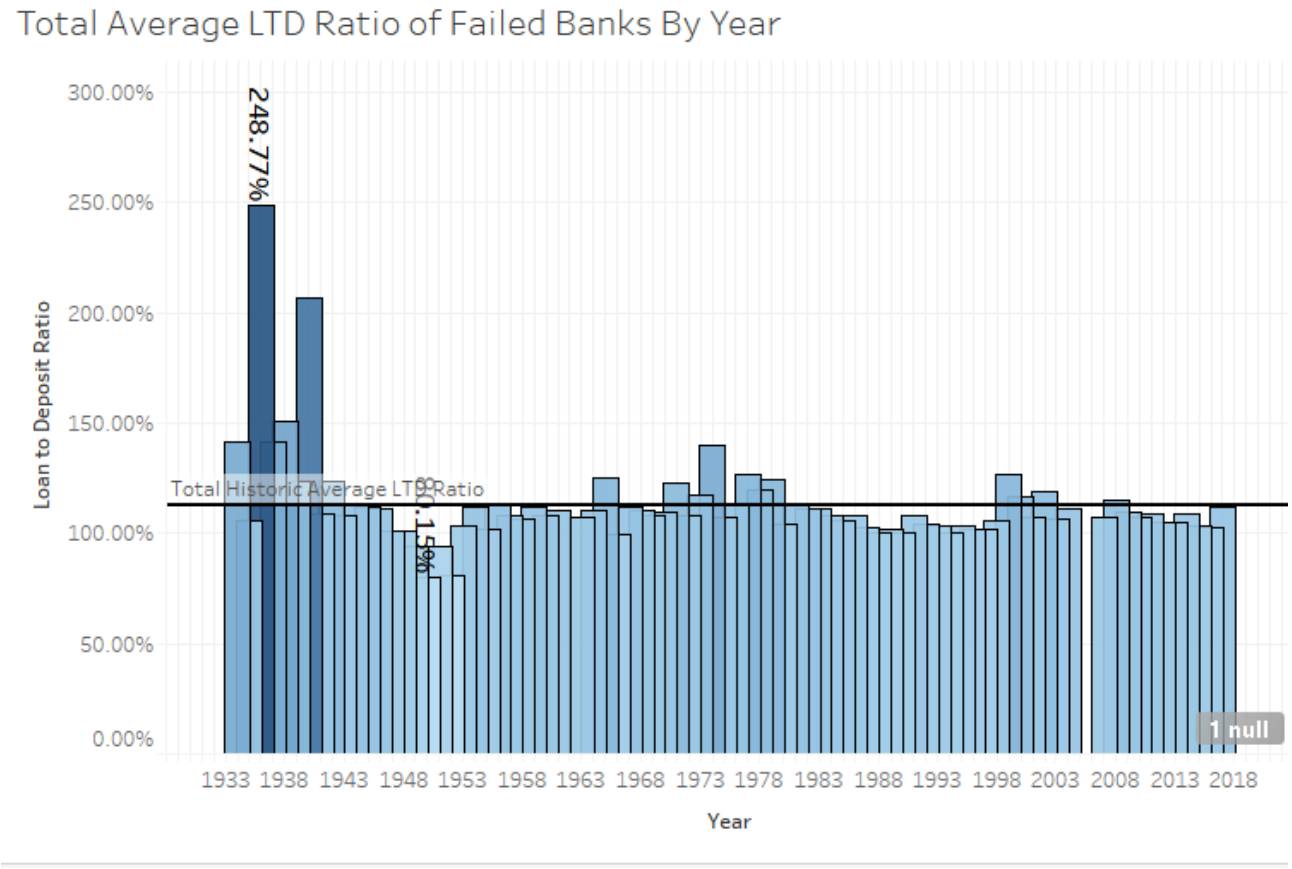


Figure 14. Average Total Loan to Deposit Ratio by Year. This visualization includes histogram, dates, reference line, and calculated field. The histogram demonstrates the changes of the Average Total of LTD ratio using a calculated field equal to Total Assets divided by Total Deposits. The LTD ratio is a common statistic to determine a banks liquidity. The histogram includes labels of the max and min valued at 248.77% and 80.1%. These measures are found from the Total Average LTD of failed banks per date of year continuous. Through the reference line value named Total Historic Average LTD Ratio, this chart also reveals that most banks fail with an LTD ratio of 112.96%. While the benchmark LTD ratio is roughly between 80-90%, this can be used to judge early on when banks are at risk of failure.

Where do banks geographically fail?

Figure 15. Map of Cities with Count of Bank Failures

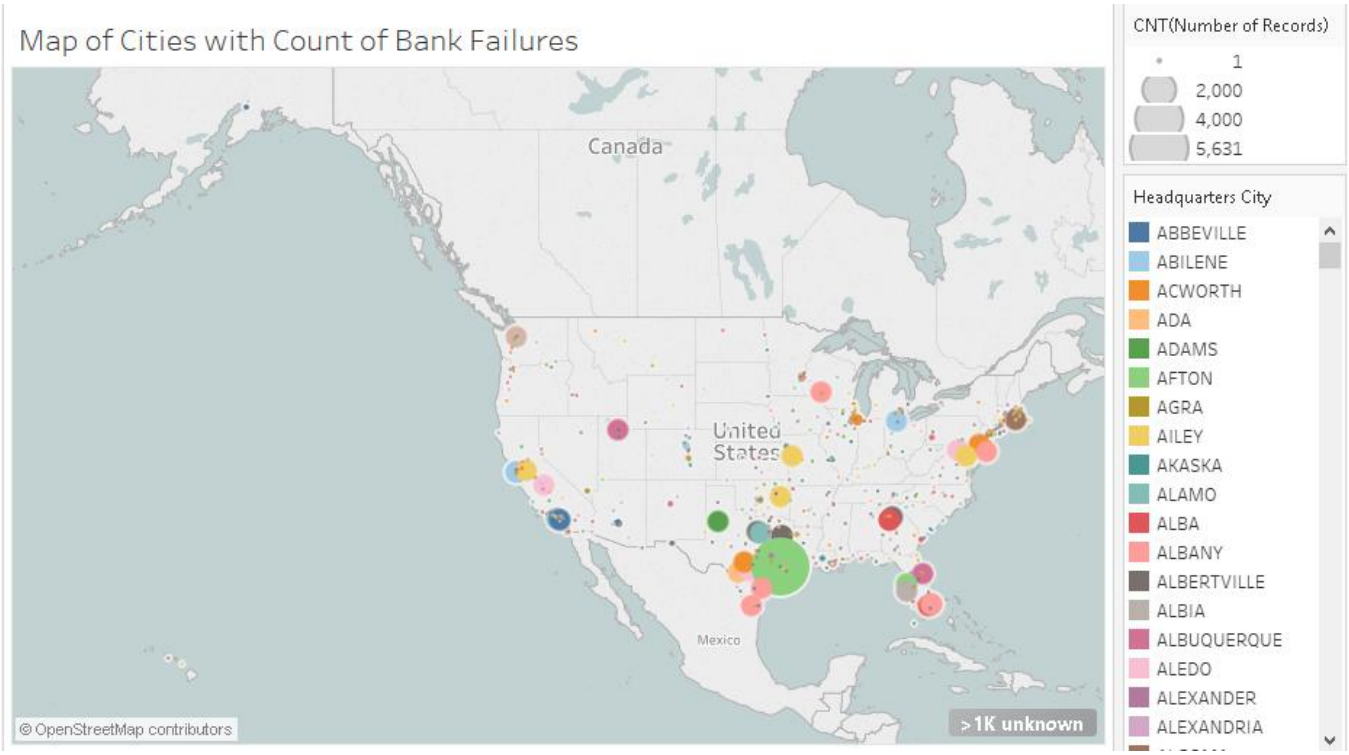


Figure 15. Map of Cities with Count of Bank Failures. This visualization includes a geographic map to reveal the number of bank failures per Headquarters City in the U.S. While the colors reveal different cities, the size reveals the volume of bank failures. The city of Houston, Texas leads the pack with 5,631bank failures while Dallas, Texas comes in second with 1,761 bank failures and Lehighton, Pennsylvania comes in third with 1,506 bank failures from 1934-2017. This visualization allows policy executives to pinpoint crucial Headquarters City and address bank failure problems there.

Dashboard Summary

The dashboard summary includes pertinent visualizations providing analysis and descriptions on key points regarding bank failures, the Federal Reserve Interest Rate, and key economic metrics.

Figure 16. Dashboard with New Additional Charts

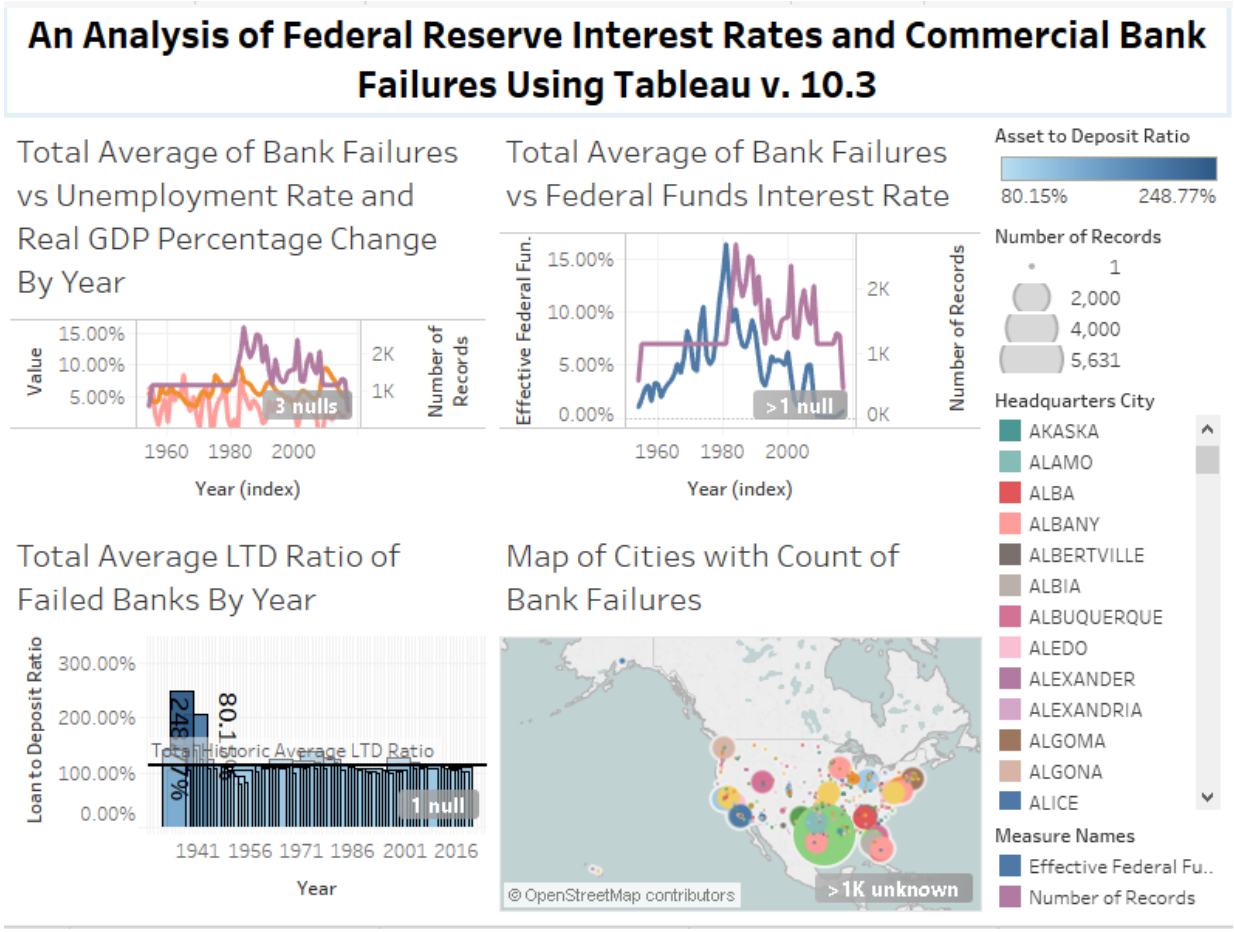


Figure 16. Dashboard with New Additional Charts. The dashboard features two new visualizations seen and explained previously as well as two new additional charts called, “Total Average of Bank Failures vs Unemployment Rate and Real GDP Percentage Change” and “Total Average of Bank Failures vs Federal Funds Interest Rate”.

Figure 17. Total Average of Bank Failures vs Unemployment Rate and Real GDP Percentage Change by Year

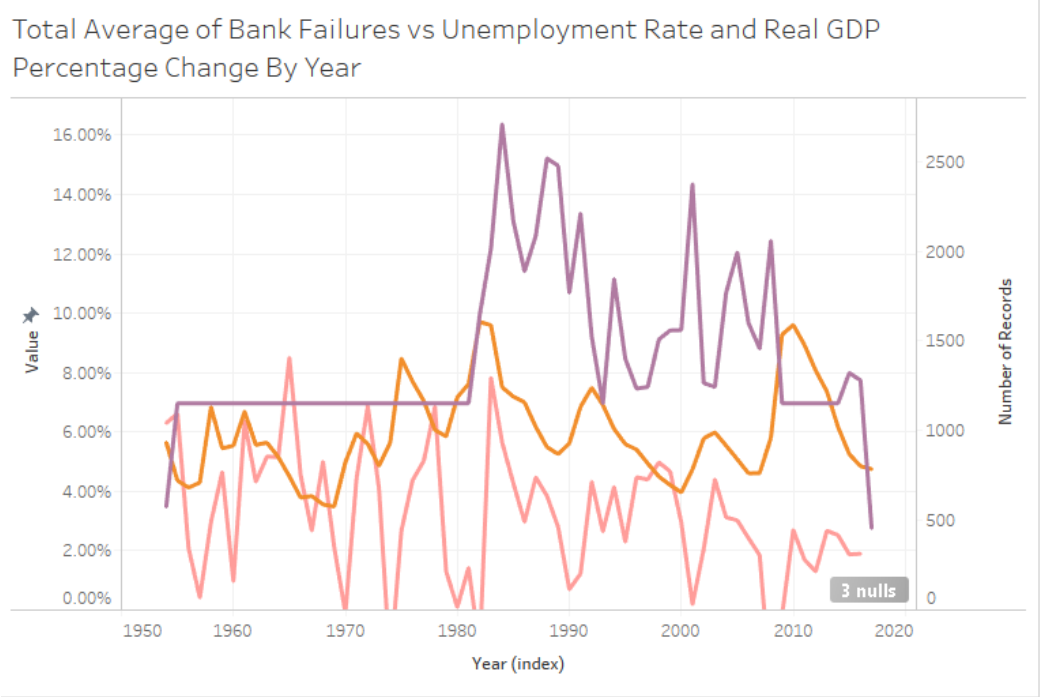


Figure 17. Total Average of Bank Failures vs Unemployment Rate and Real GDP Percentage Change by Year. This new visualization includes forecast trend lines, dual axis, and dates. It compares the number of bank failures to two key economic metrics, Unemployment and Real GDP Percentage Change. Examining the period from 1954-2017, the chart exhibits generally regular rising and falling of the two key economic metrics despite very drastic changes in the number of bank failures especially during the 1980s. This supports that although instances of bank failures reflect poor institutional operation, the overall effect of bank failures on these metrics are minimal.

Figure 18. Total Average of Bank Failures vs Federal Funds Interest Rate

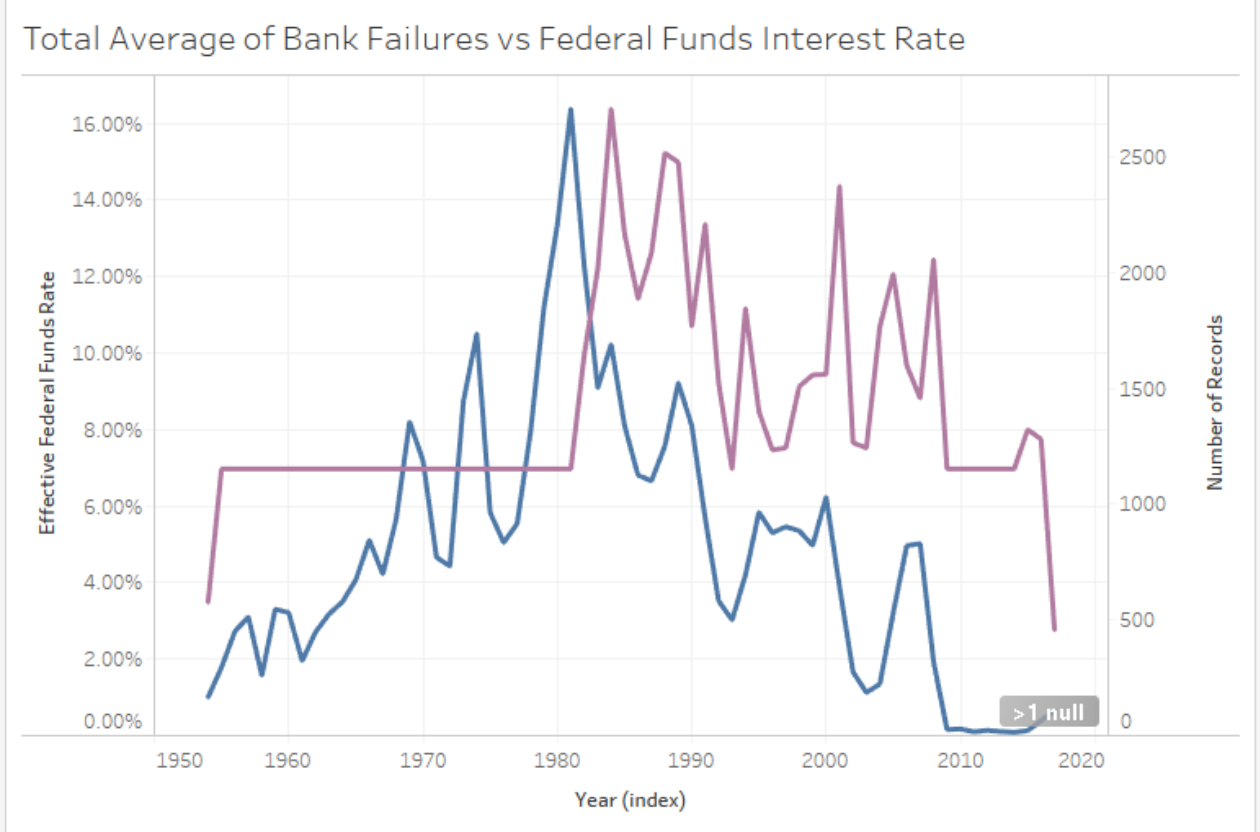
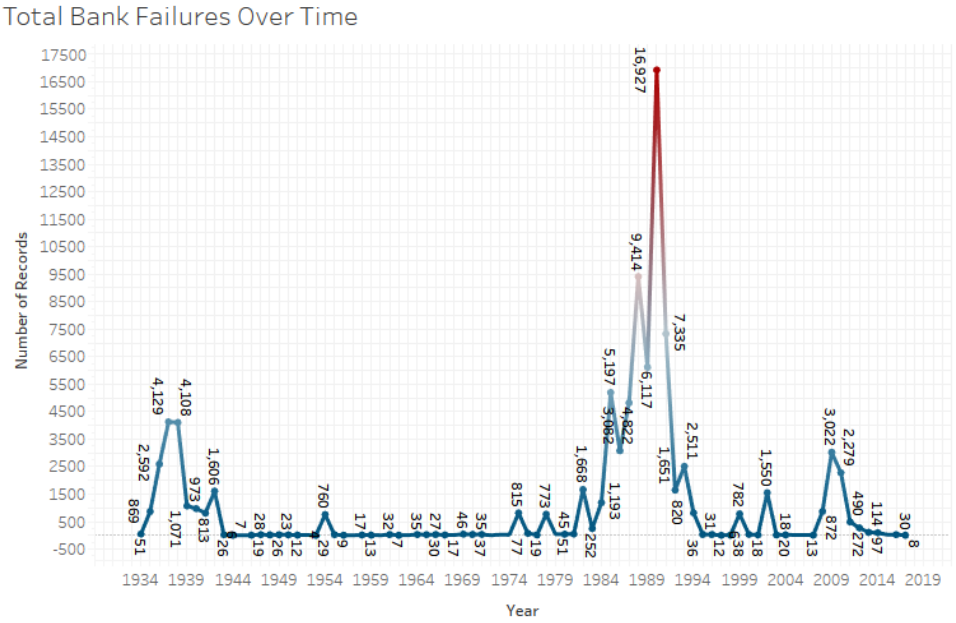


Figure 18. Total Average of Bank Failures vs Federal Funds Interest Rate. The second new visualization in the dashboard includes forecast trend lines, dual axis, and dates as well. The visualization compares the number of bank failures to the Federal Funds Interest Rate. It reveals how closely they are affected by each other. The logic is that the Effective Federal Funds Rate is implemented to make sure that banks have enough liquidity and do not fail. However, the chart shows significant increases during 1972-1974 when the rate was increased from 4.43%-10.50% and during1976-1981 when the rate was increased from 5.04%-16.38%, followed by the steepest peak in the number of bank failures the U.S. has ever seen. Only after the rate was decreased significantly did the number of bank failures decrease. It is shown that during the 1950,1960, and 2000s when the Federal Funds Rate is low, the number of bank failures is also low.

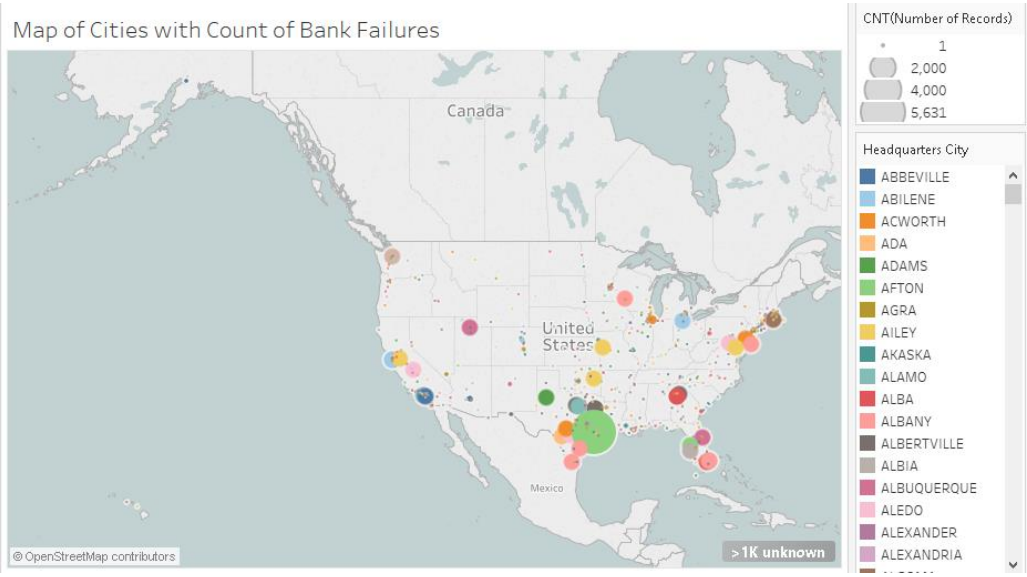
Storyline Summary: Using Tableau Analysis for Real World Problem

Suppose that we are now in the year 2019; It is President Donald Trump's final year in office, Kanye West starts his campaign for president, Elon Musk is still trying to reach Mars and find aliens, and the U.S. is experiencing the third largest recorded number of banks failures at over 7,500. In this hypothetical situation, we are faced with potentially disastrous conditions like economic periods in the past. While the figure is small compared to the first largest recorded number of bank failures during 1990 at nearly 17,000, it is still shocking considering that during 2015 the number was only 29 as seen in the figure below titled "Total Bank Failures Over Time".



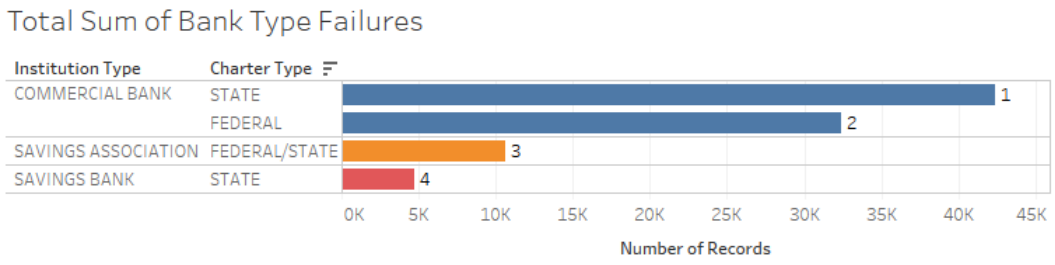
"Total Bank Failures Over Time" reveals the forecast trend line of the historic number of bank failures. The chart helps determine if this hypothetical 2019 peak in the number of bank failures is just a normality or abnormality like during 1990 when five of the fifteen largest banks failed along with thousands of others (Keenan 2017). It determines this keeping track of the past data and allowing us to track into the future and compare important points in the chart against one another.

Now that the peak in the number of bank failures can be determined as a problem or abnormality, more information is needed to determine parts of the root of the problem. The geographic map of the Headquarter cities also helps support the determination. The geographic map tells us if the area is prone to bank failures, areas like Houston, Texas seen below with over 5,000 bank failures during 1934-2017.



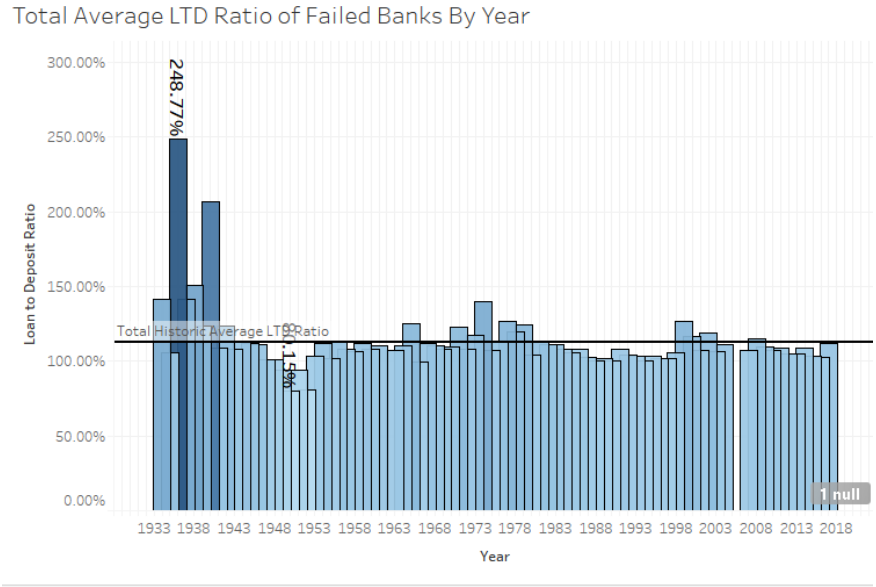
This interactive map allows us to hover over regions and drill down into U.S. cities where bank headquarters have failed to operate. It further provides a point of reference into solving the problem, but more data can still be extracted to support final decisions.

The following chart “Total Sum of Bank Failures” shows the number of the types of banks that have failed in the past and ranks these quantities. From the data, the number one most failed bank type was State Commercial Banks with 42,348 failures and the least was State Savings Banks at 4,716.



When regulatory agencies like the Federal Reserve bank create decisions on policies to keep banks operating, charts like this leave us with the correctly filtered information to target subjects that need to be addressed. Here, the bar graph reveals that regulatory efforts should largely be focused on State Commercial Banks.

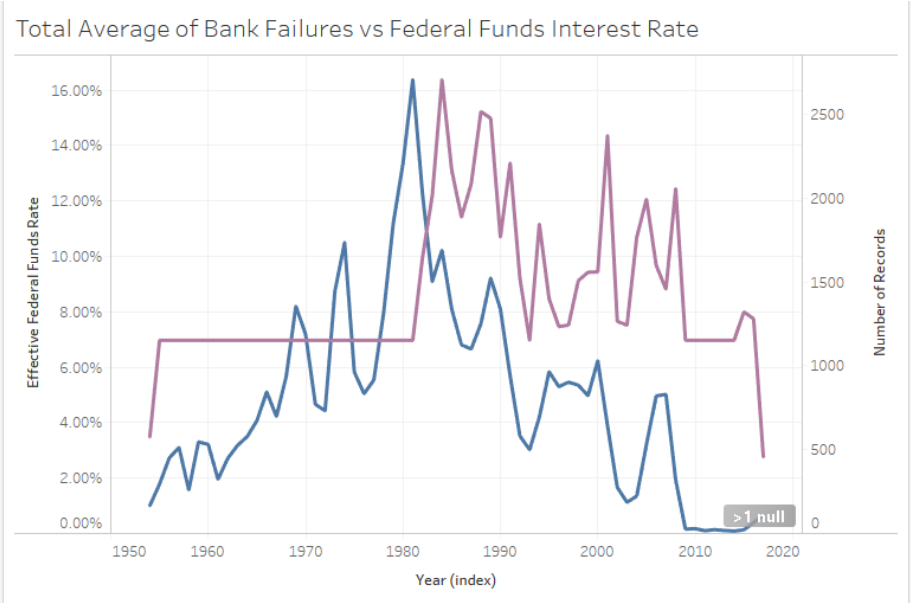
So far, the problem has been identified through historic data and the problem's origin has been classified geographically and institutionally. The next step attempts to create a real solution to this storyline's hypothetical peak.



The LTD demonstrates the measure of a banks liquidity and the typical benchmark is 80-90% (Trefis 2016). From the chart above, we find that the historic average LTD ratio of failed banks is

112.96%. This reveals to us that banks operating at an LTD near this mean value should be identified, assessed, controlled, and monitored to prevent future failure.

The following figure compares the average number of bank failures to the Federal Funds Rate during the time the rate was created in 1954 until the data was most recently collected in 2017.



From this data we find that whenever the Federal Funds Rate was increased, the Total Average Number of Banks Failures also increased. For example, when Federal Funds Rate was increased to 16.38%during 1981, the Total Average Number of Bank Failures more than doubled from 1981-1984. This also occurred in 2006 when the Federal Funds Rate was increased to 4.96% from 1.35% in 2004, the Total Average Number of Bank Failures nearly doubled again from 2007-2008. This period marked the Great Recession, the largest recession since the banking crisis of the 1980s (Summa 2008).

In conclusion, the visualizations of the storyline are demonstrations of data that have real business value. Tableau allows us to create precise and accurate deliverables from data to highlight key insights and solve real world problems.

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