Banks' Dodd-Frank Costs vs. Earnings on Reserves

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The Dodd-Frank Act has imposed substantial costs on large commercial banks. This study analyzes the net financial impact on large banks from some of the quantifiable costs of the Act versus their earnings on excess reserves, which began in 2008. The limitations of this analysis include the costs of many provisions of Dodd-Frank that cannot be quantified and the assumptions that are necessary to develop the estimates. Major revisions to Dodd-Frank that would reduce bank costs are likely to result from the Treasury and financial regulators' studies ordered by the Trump Administration and potential enactment of The Financial Choice Act of 2017 under consideration by the Congress. As a percentage of assets, the largest eight banks earned considerably less from interest on excess reserves than their quantifiable costs to satisfy Dodd-Frank. Treasury Secretary Mnuchin has suggested reducing regulations for banks with assets below $250 billion. The banks with assets above $250 billion required the greatest amount of funds from the TARP program and they offer the greatest risks to the US and global economies.

INTRODUCTION

The Dodd-Frank Act was signed into law on July 21, 2010 to deal with regulatory weaknesses exposed by the financial crisis. It imposes substantial costs on commercial banks with assets above $50 billion. This study provides an analysis of some of the net financial impact on large US banks from quantifiable requirements of this legislation in contrast to their earnings on excess reserves. As a percentage of total assets, for large banks with assets below $250 billion, their interest on excess reserves (IOER) approximately offsets their Dodd-Frank costs. The costs for banks with assets above $250 billion significantly exceed their IOER.

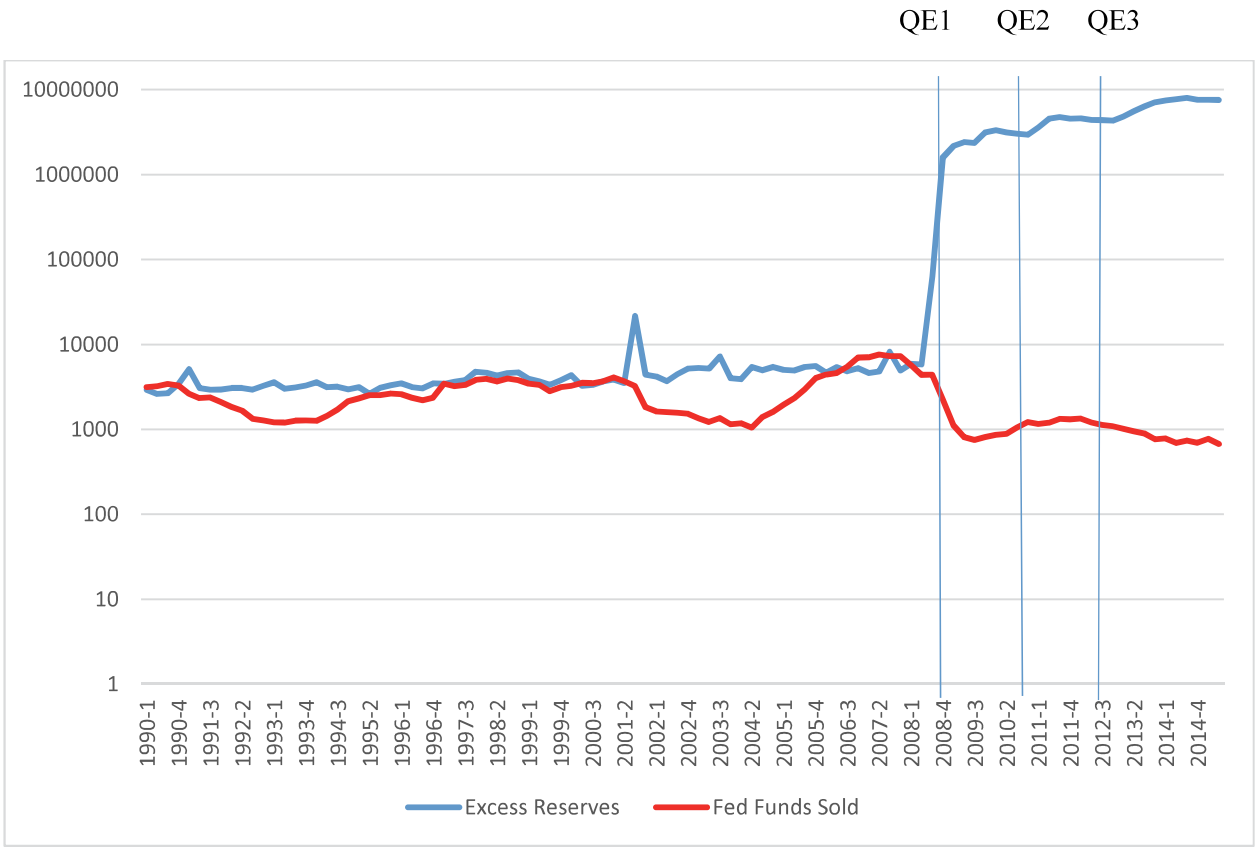
Some of the Dodd-Frank obligations with quantifiable costs include: paying deposit insurance premiums on more bank liabilities, developing "living wills" for approval by the FDIC and Federal Reserve, and satisfying stress test requirements by the Federal Reserve. Many of the Dodd-Frank effects (like the Volker Rule and the Durbin Amendment) cannot be quantified. Some of the restrictions and bank costs would be reduced if The Financial Choice Act, under current consideration by the US Congress, becomes law and if the federal financial regulators' analyses required by the Trump Administration eliminate provisions of Dodd-Frank.

Earning IOER since 2008 has provided additional income to banks. The policy change addressed some inefficiencies within the financial system, increases market liquidity, and may reduce interest rate volatility. Setting interest rates on reserves supplements the Federal Reserve's monetary policy tools. Banks' returns on *excess reserves* are analyzed here because there is no economic decision for depository institutions to determine their required reserves.

Banks increased their reserves at the Fed immediately after they began earning interest on reserves. The increased bank reserves provided support for the Fed's three Quantitative Easing programs to stimulate the recovery from the financial crisis (see Figure 1).

A few background studies are discussed in Section II. Section III discusses the role of paying interest on reserves by the Federal Reserve. A model is developed to project large banks earning interest on reserves in Section IV. Some quantifiable bank costs that resulted from Dodd-Frank are estimated in Section V. The Conclusions follow.

FIGURE 1
QUANTITIES OF EXCESS RESERVES AND FED FUNDS SOLD



LITERATURE

Interest on Reserves

On October 13, 2006, President George W. Bush signed the *Financial Services Regulatory Relief Act of 2006* into law. One of the provisions permitted the Federal Reserve to pay interest on required as well as excess reserves held at Reserve Banks. The *Emergency Economic Stabilization Act of 2008,* enacted to

begin dealing with the financial crisis, accelerated the payment of interest on reserves to begin in October 2008, instead of October 2011 (Board of Governors of the Federal Reserve, 2008a).

When the Fed began paying interest on reserves, US unemployment was 6.5 percent and rising. The Fed was preparing to implement its first Quantitative Easing program in November 2008, and the FOMC was reducing its target Fed funds rate toward its eventual low, below 10 basis points (Figure 1).

There is an extensive, sophisticated literature on the monetary policy effects for paying interest on excess reserves. Sargent and Wallace (1985) contributed a framework for the analysis three decades ago. They argue that paying interest on reserves should not be independent of market interest rates, taxes, and debt levels. Frost (1971) developed a demand function for excess reserves with a kink at low interest rates. He claims the kink explains the large accumulation of excess reserves in the 1930s. His results are consistent with the US experience following the 2008 financial crisis.

Goodfriend (2002) discussed the role of paying interest on reserves for central banks to control interest rates and to improve the effectiveness of monetary policy. He argues paying interest on reserves is an effective policy instrument. Bech and Klee (2011) discuss paying interest on reserves as one approach to setting a floor on the target Fed funds rate. Nelson (2017) argues paying interest on excess reserves reduces interest rate volatility.

When the Fed began paying interest on reserves, banks dramatically increased their excess reserves (see Figure 1). Banks' additional reserves at the Fed approximately equaled half of the funds expended on Quantitative Easing (see Table 1). The Fed is reducing their holdings of long-term securities. Since December 2015, the FOMC has already raised its target Fed funds rate four times and an additional increase is expected in December 2017. Fed Chair Yellen (Board of Governors of the Federal Reserve, 2017a) testified that the rate is still below its neutral level to balance growth and inflation.

Regulatory Environment

The bank regulatory environment has changed dramatically over the past 35 years. The Depository Institutions Deregulation and Monetary Control Act of 1980 leveled the competitive "playing field" among various insured depository institutions and gave the Federal Reserve some of the broad regulatory authority it had sought for many years. The Riegle-Neal Interstate Banking Act of 1994 and the Gramm-Bliley-Leach Act of 1999 allowed commercial banks to expand their geographic and product markets, respectively. These Acts broadened the competitive environment that banks exploited during the following decades.

Dodd-Frank Regulatory Costs

The "regulatory costs" banks are incurring to satisfy Dodd-Frank were expected to exceed the returns on reserves for the largest banks. The capital requirements and the basis for insurance premiums for large banks have increased considerably. Numerous current proposals would reduce the Dodd-Frank obligations for banks with less than $50 billion in assets (see Mnuchin and Phillips, 2017).

Wall (2015a) points out "the (deposit insurance) assessment rate varies across banks from 2.5 to 45 basis points based on each bank's size and perceived risk to the FDIC." He discusses changes in capital requirements on short term funding and notes, "although the charge would apply only to the eight largest banks categorized as globally systemically important banks, the wholesale funding charge could nevertheless have a major impact on interest on excess reserves arbitrage."

THE ROLE OF INTEREST ON RESERVES

Bank Reserves

Banks increased their reserves at Federal Reserve Banks by approximately half of the resources the Fed eventually used to purchase long-term Treasury securities and mortgage backed securities during the Quantitative Easing (QE) and the Troubled Asset Relief Programs (see Figure 1 and Table 1). There was a dramatic increase in the quantity of excess reserves from less than $2 billion in October 2008 to $797 billion only three months later (January 2009).

Portfolio management can hardly explain banks' increased reserve holdings since selling Fed funds and/or investing in three-month Treasury Bills have similar returns and reserves are a risk-free bank asset. The difference between the original rate on reserves (25 basis points) and the lower returns on Fed funds sold and Treasury Bills (2009 – 2015) is shown in Figure 2.

Interest on Reserves As A Monetary Policy Tool

Paying interest on reserves enhances the Fed's monetary policy arsenal. From the inception, the rate (RRES) of 0.25 percent exceeded the Fed funds target rate (RFF), until December 2015 when the Fed began raising its target rate. Banks' quantity of excess reserves should be inverse to short-term market rates on alternative liquid assets, eventually becoming highly elastic as RFF approaches RRES.

Earning interest on reserves encouraged banks to increase their reserves and helped the Fed to control RFF. Banks would not be expected to lend much Fed funds in competitive financial markets at a rate below RRES. This flattened the demand curve for reserves after banks accumulated excess reserves and the Fed implemented its programs to stabilize the economy. Moreover, the Fed can increase RRES to encourage depository institutions to hold excess reserves, influencing overall market liquidity.

The Fed can coordinate open market operations and rates on reserves to implement interest rate policy while influencing the level of aggregate bank reserves (Goodfriend, 2002 and Gilbert, 1980). Goodfriend argued this should improve efficiency of the financial system's operations, both in the short-run and long-run. Moreover, bank reserve levels can be influenced to ameliorate shocks, broaden market liquidity, and stabilize the economy. Fed Chair Janet Yellen reiterated the importance of IOER as a monetary policy tool in her 2017 Congressional testimony (Board of Governors, 2017a).

Yield Curve and the Crisis

During and following the financial crisis, the FOMC implemented several critical policies concurrently. Quantitative Easing put downward pressure on the short-term Fed funds rate. Paying interest on reserves at a rate above the Fed funds rate discouraged banks from supplying markets with short-term funds.

The rate on reserves (RRES) is theoretically a floor to the RFF, since banks have little incentive to lend, even over-night, at a rate below RRES. The Fed created the floor for the Fed funds rate, relieving some of the downward pressure caused by Quantitative Easing (Wessel, 2009). Establishing a high fixed rate on reserves (three times the Fed funds rate) discouraged banks from funneling these funds into financial markets. Figure 2 shows that the Fed funds rate was lower than the rate on reserves from its implementation (2008 fourth quarter) through the middle of December, 2015.

Federal Reserve Balance Sheets

The increased excess bank reserves became new liabilities on the Fed's balance sheet. Table 1 contrasts selected balance sheet components aggregated across the 12 Federal Reserve Banks at year-end 2007 and 2015. The increase in reserve balances from $5.9 to $2,535.6 billion equaled about half of the Fed's Quantitative Easing purchases of long-term US government securities and mortgage backed securities, which increased from $507.9 to $4,233.8 billion. The Fed is beginning to reduce these holdings toward the end of 2017 without disrupting its progress to raise short-term rates toward neutral levels and maintaining low inflation for an economy operating near full employment.

The Fed determined RRES knowing they would eventually be raising the target Fed funds rate. The FOMC has already raised the Fed funds target four times. None of the regulators could have anticipated the proposed Dodd-Frank revisions that the White House and the Congress are suggesting for 2018.

TABLE 1
MAJOR FEDERAL RESERVE BALANCE SHEET COMPONENTS
(millions of $)

	December 2007	December 2015
US GOVERNMENT NOTES, BONDS & AGENCY SECURITIES	507,895	2,478,117
MORTGAGE BACKED SECURITIES (MBS)	0	1,755,674
USGs + AGENCIES + MBS	507,895	4,233,791
TOTAL ASSETS	893,818	4,489,593
(USGS+AGENCIES+MBS)/TOTAL ASSETS	56.8%	94.3%
RESERVE BALANCES AT FEDERAL RESERVE BANKS	5,865	2,535,562
TOTAL LIABILITIES	791,801	4,430,874
(USGs+AGENCIES+MBS)/(RESERV. BAL.)	8660%	167%

Sources: Federal Reserve Statistical Releases H.4.1, December 2007 and December 2015.

MODELING EXCESS RESERVES

Banks' returns on excess reserves have offset some Dodd-Frank regulatory costs. As Wall suggests (2015a, 2015b), some costs depend on the size of a bank, its CAMELS rating, and risk factors to meet capital requirements and pay increased deposit insurance premiums. The analysis here pertains to large banks assumed to have strong CAMELS ratings. The data are quarterly macro bank data from the FRED II St. Louis Federal Reserve's database and Statistics on Banking from the FDIC. The data span 1990-I to 2015-II, 102 observations.

Models are developed to estimate excess reserves (EX) as a function of banking and economic factors. Inflation (INF) and unemployment (U) are included as control variables to represent the primary Federal Reserve goals. Liquidity (L) is included because of its unique role in bank reserves' management and measured as the ratio of loans to deposits to link bank assets and liabilities. Fed funds sold are a substitute for banks' holding excess reserves and Fed funds purchased are banks' shortest-term source of funds. The aggregate Fed funds market is represented by the sum of Fed funds purchased and Fed funds sold (FF). The correlations among these variables are provided in Table 2.

A dummy variable, INTR, represents effects since the Fed began paying interest on reserves; INTR=1 begins with the fourth quarter of 2008 with INTR= 0, previously. A recession dummy variable, REC, is also employed to test whether the US recession had a distinct impact from paying interest on reserves.

Excess Reserves Models

Table 3 provides t-statistics for coefficients of hypothesized independent variables to explain excess reserves, with autocorrelation removed via AR(1), or AR(1) and AR(2), as needed. Each model has an adjusted R-squared of 0.99, an F-statistic above 1500 and a Durbin-Watson statistic above 1.79. The autocorrelation is attributed to error term time trends and lagged reserve accounting. Lagged reserve accounting was first implemented by the Federal Reserve in 1968 and reinstituted in 1998 extending the lag to two-weeks. Required reserves are based on a bank's transactions deposit accounts from two prior weeks.

The coefficients of INTR and INTR interacted with another variable are statistically significant for each model. Model 8 in Table 3 shows that *after* the Fed began paying interest on reserves, four variables that are hypothesized to influence reserve levels have statistically significant coefficients. Without considering the payment of interest on reserves (INTR = 0), bank reserves were not affected by unemployment (U), inflation (INF), liquidity (L) and aggregate Fed funds activity (FF). None of the coefficients of these variables is statistically different from zero at any meaningful probability level; all of their coefficients round to 0.0.

Model 8 is re-estimated, eliminating the variables whose coefficients are not statistically different from zero at the 10 percent probability level. Removing autocorrelation with AR(1) is sufficient. The result is model 9, where U, INF, L, and FF all interact with INTR. Their coefficients are statistically significant at the 1 percent level and all have greater statistical significance than in model 8.

Excess reserves vary inversely with unemployment since the Fed has paid interest on reserves (INTR=1). When unemployment is rising, banks are not so likely to generate large increases in excess reserves because deposits are expected to grow slowly and retained earnings would hardly increase. When unemployment is declining and banks' deposits and retained earnings are increasing, banks can generate more excess reserves.

The coefficient of inflation is positive. The interest rate on excess reserves is set by the Fed at approximately the ceiling of its Fed funds target range. The Fisher equation explains interest rates as a real return on capital plus expected inflation, represented as a function of current and lagged inflation. With increases (decreases) in inflation and interest rates, banks are expected to increase (decrease) their excess reserves. If the interest rate on reserves is at least equal to the Fed funds rate, as it has been, holding excess reserves will be at least as attractive as many other money market holdings.

The liquidity ratio (loans/deposits) reflects banks' asset allocation of deposits to loans, approximately 70 - 75 percent. Excess reserves are expected to vary inversely with the liquidity ratio. Banks can be expected to hold less in excess reserves when it is highly profitable to lend an increasing share of their deposits and retained earnings. When lending is not so profitable, more deposits and retained earnings are likely to be held as excess reserves.

In the aggregate, banks sell approximately 33 percent more in Fed funds dollars than they purchase ($398 billion versus $225 billion at year-end 2016). When the Fed funds rate is lower or equal to the rate the Fed pays on excess reserves, which has usually been the case, banks may substitute at least some excess reserves for Fed funds sold. With a low rate on Fed funds, banks may be inclined to purchase Fed funds, but the ratio of Fed funds sold to Fed funds purchased should result in larger quantities of excess reserves when the Fed is paying an attractive rate on excess reserves.

Other variables are tested as potential significant determinants of excess reserves not captured among INF, U, L, FF and INTR. They include GDP growth (GDPGR), the Fed funds rate (FFR), quarters during a recession (RECES = 1), and the three-month Treasury Bill rate (TB3). None of these has a statistically significant coefficient to explain levels of excess reserves. There are relatively high correlations (Table 2) between unemployment and the Fed funds rate (-0.67) and the quantity of Fed funds and the Fed funds rate (0.64).

TABLE 2
CORRELATION MATRIX

	Excess Reserves	Fed funds rate	INF	U	GDPGR	L	FF
Excess Reserves	1.0						
Fed funds rate	-0.69	1.0					
Inflation (INF)	-0.46	0.57	1.0				
Unemployment (U)	0.49	-0.67	-0.30	1.0			
GDP Growth Rate (GDPGR)	-0.90	0.13	-0.1	-0.17	1.0		
Liquidity (L)	-0.22	-0.02	-0.1	-0.46	0.13	1.0	
Fed funds quantity (FF)	-0.50	0.64	0.40	-0.64	-0.07	0.52	1.0

TABLE 3
EXCESS RESERVES REGRESSION MODELS
(t - statistics of coefficients)

model	INTR	INF	U	L	FF	INTR*U	INTR*INF	INTR*L	INTR*FF	OTHER
1	8.51	3.06	1.83							
2	9.38	3.05	2.69	3.00						
3	7.68	3.09	1.64		-0.53					
4	8.50	3.05	2.54	2.94	-0.29					
5	-2.01	-0.46	-0.27	4.37	-0.65	3.14	4.04			
6	-3.13	-0.10	-0.37	-0.35		3.71	3.84	2.54		
7	51.43	-0.05	0.01		0.01	-25.05	16.28		-25.27	
8	23.17	0.06	0.07	0.07	0.03	-16.37	8.05	-2.99	-19.10	
9	23.89					-21.55	9.56	-3.48	-19.26	
10	18.65	0.14	0.19	0.21	0.07	-12.84	6.68	-3.12	-13.75	-0.07 GDPGR 0.09 INTR*GDPGR
11	15.21	0.09	0.15	0.12	0.08	-11.18	6.30	-2.43	-15.11	0.27 RECES 0.82 INTR*RECES

Bank Returns

Model 9 is employed to estimate expected excess reserves and bank returns assuming target values for the independent variables. The analysis is developed for 2016 for three groups of banks; 11 banks with assets between $50 and $100 billion; 17 banks with assets between $100 and $250 billion; and 8 banks with assets above $250 billion. The assumptions for these three large sized bank groups for 2016 are: INTER = 1, INFL = 2.0 (the Fed target) and U = 4.9 (the January 1, 2016 rate). The Fed funds level is assumed to be the beginning value for 2016. Liquidity (loans/deposits) is 0.895, 0.719, or 0.636, according to the three bank size categories, respectively. AR(1) = 0.0243, the median from the estimated model for 2014-I to 2015-II.

The expected levels of excess reserves are provided in Table 4. The expected level of excess reserves [E(RES/N)] per bank for the three group mean sizes are 0.3025, 0.2007, and 0.4314, respectively. When banks earned 25 basis points on their reserves, their returns as a percentage of mean assets appear in the far right column. For the three size groups, the bank returns on excess reserves as a percentage of mean bank assets in each size group are 0.0985%, 0.0339%, and 0.0110%, respectively. Smaller values as size increases are a result of larger mean size denominators. Returns are virtually the same when medians replace means.

TABLE 4
EXCESS RESERVES GROSS RETURNS TO BANKS

ASSET SIZE Billions $	BANKS	MEAN SIZE Billions $	LOANS/ DEPOSITS	E(RES/N): ARs @ means	BANK RETURNS AS % OF MEAN TA (25 bp on RES/N)
50-100	11	76.8	0.895	0.3025	0.0985%
100 - 250	17	148	0.719	0.2007	0.0339%
250 +	8	977.5	0.636	0.4314	0.0110%

DODD-FRANK IMPACTS

Dodd-Frank imposed new regulations and substantial costs on every major bank. The largest banks have incurred the most significant costs. The revenues large banks earn on their reserves are contrasted with some of their increased regulatory costs and impacts of Dodd-Frank in this section. The Financial Choice Act of 2017 and Trump Administration regulatory studies (see Mnuchin and Phillips, 2017) propose to reduce or eliminate regulatory costs of numerous Dodd-Frank requirements.

Dodd-Frank changed how banks' deposit insurance premiums are determined. The largest banks are also required to satisfy Federal Reserve stress testing (CCAR) and to develop "living will" analyses for the FDIC and the Fed to measure their ability to withstand a future crisis. When Dodd-Frank was enacted, the Federal Reserve also modified its Regulation E, to restrain banks' service charges on consumer overdrafts. Many other nonquantifiable requirements such as the Volker Rule and the Durbin Amendment have influenced large bank resource allocations and are likely to be modified if the Financial Choice Act becomes law.

Costs of Deposit Insurance

The FDIC Improvement Act of 1991 required the FDIC to implement risk-based deposit insurance. The premium rate, p, is determined by the riskiness of the bank, approximated by its CAMELS rating and the FDIC's regulatory rating. For banks with a CAMELS rating of 1 or 2 and a strong regulatory rating, p = 9 basis points per $100 insured deposits was a maximum.

Until 2011, the FDIC calculated a bank's deposit insurance premium (DIP) as the insurance premium rate, p, times the eligible level of deposit balances in domestic accounts and accounts in U.S. Territories (DD). A bank's deposit insurance premiums (DIP) before the enactment of Dodd-Frank was approximately

$$DIP = p\ DD.$$

Dodd-Frank requires deposit insurance premiums to be applied to much of a bank's total liabilities. The difference is considerable for large banks that attract much of their funds and other liabilities from sources other than domestic deposits to support their assets (TA).

The revised approach to determine the deposit insurance premiums (DIP*) is approximated by

$$DIP^* = p\,[TA - \text{Tangible Capital}]$$

Intangible capital can be approximated by intangible assets.

Dodd-Frank increased the basis for determining deposit insurance premiums substantially for the largest banks (see Table 5). For large banks

$$DIP^* = p\,[TA - \text{Tangible Capital}] = p\,[TA - (\text{Total Capital} - \text{Intangible Capital})]$$
$$\approx p\,[TA - (\text{Total Capital} - \text{Intangible Assets}] \approx p\,[\text{Total Liabilities}] > p\,[\text{Domestic Deposits}]$$

The greatest impact is for the 8 largest banks with assets above $250 billion, whose domestic deposits are only 61.90 percent of their total assets minus intangible assets.

For the three largest size categories, the impacts of Dodd-Frank *changing* the basis for calculating deposit insurance premiums from total deposits to nearly total liabilities are summarized in Table 6. The *increase* in deposit insurance premiums is approximately

$$\Delta DIP = DIP^* - DIP = p\,[\text{Total Liabilities} - \text{Domestic Deposits}]$$

ΔDIP and ΔDIP/banks are calculated, assuming p = 6.6 basis points (FDIC 2015 annual report). The largest impacts per bank is for the largest banks. The cost per bank as a percentage of assets is 0.0070 percent for banks with assets between $50 and $100 billion, 0.0073 percent for banks with assets between $100 and $250 billion, and 0.0239 percent for banks with assets above $250 billion.

TABLE 5
BANK CHARACTERISTICS FOR 2015
(billions of $ by size category)

	ALL BANKS	< $1 BILL	$1-$10 BILL	$10 - $50 BILL	$50 - 100 BILL	$100 - $250 BILL	$250 BILL +
BANKS	5338	4762	485	55	11	17	8
TOTAL ASSETS (TA)	14893	1102	1391	1256	796	2526	7823
TOTAL CAPITAL	1682	122	162	144	98	327	829
INTANGIBLE ASSETS	350	5	25	29	17	78	196
TOTAL LIABILTITIES	13210	980	1229	1111	698	2202	6990
TOTAL DEPOSITS	11349	925	1111	994	607	1891	5820
DOMESTIC DEPOSITS (DD)	10065	925	1107	983	605	1725	4720
TOTAL LOANS	8061	709	941	809	543	1359	3700
TA - INTANGIBLE ASSETS	14543	1097	1366	1227	779	2450	7624
LOANS / DEPOSITS	0.710	0.766	0.847	0.814	0.895	0.719	0.636
INTANGIBLE ASSETS / TOTAL ASSETS	2.35%	0.45%	1.80%	2.31%	2.14%	3.09%	2.51%
DOMESTIC DEPOSITS / TA - INTANG. ASSETS	69.2%	84.3%	81.0%	80.1%	77.7%	70.4%	61.90%
NET INCOME / TOTAL ASSETS	1.021%	0.998%	1.078%	0.955%	0.879%	0.946%	1.049%

TABLE 6
DEPOSIT INSURANCE COSTS OF DODD-FRANK
(assets, liabilities, and deposits in billions of $)

	$50 - 100 BILL	$100 - $250 BILL	$250 BILL +
BANKS	11	17	8
TOTAL ASSETS (TA)	796	2528	7820
TOTAL LIABILTITIES (TL)	698	2202	6990
DOMESTIC DEPOSITS (DD)	605	1725	4720
TL - TD	93	477	2270
ΔDIP = p[TL-DD] p =6.6 bp	0.6138	3.1482	14.9820
ΔDIP/ BANKS (%)	0.0558	0.1852	1.8728
(ΔDIP/BANKS)/TA	0.0070%	0.0073%	0.0239%

ΔDIP = INCREASED COST OF DEPOSIT INSURANCE

Stress Test (CCARs) Analysis

Dodd-Frank requires the Federal Reserve to perform stress tests -- Comprehensive Capital Analysis and Reviews (CCARs) -- on large banks to test whether their capital can withstand seriously adverse economic conditions. For 2016, the Federal Reserve tested 33 bank holding companies with $50 billion or more in total consolidated assets (Board of Governors of the Federal Reserve, 2016).

The stress tests are different from banks' "living wills," which are designed to prescribe how a large bank or bank holding company could be decomposed to avoid a substantial government bailout if an institution were in danger of failing. Requiring a "living will" is an attempt to assure that no bank is "too big to fail."

The Fed's CCAR evaluations of the large banks for 2015 were satisfactory, but not so favorable for 2016. For 2015 only Bank of America (Rexrode and Chaudhuri, 2015) was required to raise new capital and resubmit its plans. The Fed's review of the Bank's revised plan was satisfactory. Bank of America spent $100 million to develop its 2015 resubmission (Cumming, 2015). Citigroup spent $180 million (0.0096 percent of its assets) in the second half of 2014 to prepare its 2014 submission (Cumming, 2015). At the end of June 2016, Morgan Stanley was required to submit a revised capital plan (Tracy and Borak, 2016. Deutsche Bank and Santander US failed the tests, were prohibited from paying dividends and stock buybacks, and were required to develop new plans (Tracy and Borak, 2016). For 2017, all 34 large banks satisfied the stress tests and the banks have been permitted to increase dividends and buy back shares (Hoffman and Tracy, 2017).

Banks' financial costs and human resource investments are considerable to satisfy annual CCARs. There are some anecdotal and financial information from one study (Anderson, 2013). Anderson

projected CCAR costs of 0.019 as a percent of bank assets (Table 7, column 4) for three banks with assets above $50 billion based on midpoints of bank size and CCAR costs. Data for the larger banks with assets between $56 and $65 billion are based on inputs from Zions, Comerica and Huntingbankshares. Anderson estimated the three banks' expenditures to be between $10 and $12 million and 0.019 as a percentage of assets.

A confidential study of 39 large banks by a major analytics firm estimated a similar cost to Anderson's CCAR costs as a percent of assets. These estimates are consistent with the $180 million (0.0096 percent of total assets) that Citibank reported spending on its CCAR *resubmission* in the second half of 2014 (Sterngold, 2015).

TABLE 7
ANECDOTAL CCAR COSTS PER $ ASSETS

column 1	column 2	column 3	column 4 **
millions $ CCAR costs	Assets Billions $	col. 1/col. 2 midpoints	CCAR costs % of Assets
$10-$12 *	$56 - $65	11.0/58	0.019%
$5 - $8	$40 - $50	6.7/45	0.015%
$1.5 - $3.0	$10 - $20	2.25/15	0.015%
$0.6 - $1.2	$5 - $9	0.9/7	0.013%

* Based on three banks: Zions, Comerica, Huntingbankshares
** See Anderson (2013)

"Living Will" Requirements

During his confirmation hearings to become Chair of the FDIC, Martin Gruenberg (2012) gave his perspective on the resolution of failing banks and his expectations for banks and bank holding companies to develop "living wills." The data are sparse to estimate the costs for large US banks and international banks operating in the US to satisfy the "living will" provision of Dodd-Frank. The Choice Act proposes to replace the FDIC's Orderly Liquidation Authority with strict requirements of the US bankruptcy code.

The FDIC and the Federal Reserve require large banks to develop an annual feasible liquidation plan ("living wills") by July 1 of each year. The plan must include liquidation provisions for domestic banks as well as their foreign subsidiaries (Board of Governors of the Federal Reserve 2016). In May 2012, Dan Ryan, Financial Services Advisory Practice Leader at PricewaterhouseCoopers, suggested that a bank's plan could require a range of 2,000 – 4,000 pages, depending on the complexity of the bank.

Henry and Clark (2012) projected that eventually the FDIC would require more than 100 banks to submit "living wills." They reported that the initial submissions for these banks would require 1.3 million hours of work and their annual maintenance would require 267,544 hours.

Initially the FDIC required fewer than 40 banks to develop "living wills." For 2015, only Citibank submitted a plan that was accepted by the FDIC. For 2016, Wells Fargo failed its submission and the resubmission of its living will (Tracy and Glazer, 2016).

Estimates for initial costs and annual maintenance for the largest banks are developed by the authors in Exhibit 1. They are consistent with the study by the Government Accountability Office (2016). It is likely that the banks will need to assign several senior staff and numerous midlevel and support staff to

complete their annual submissions. Including benefits and supporting overhead, it is estimated that the typical large bank allocates 5.04 senior person years costing an average of $350,000 per person per year for initial submissions and 1.04 person years for annual maintenance submissions.

In 2016 dollars, Exhibit 1 indicates that initial submission costs are approximately 0.00732 percent of bank assets and annual maintenance costs would be approximately 0.0015 percent of bank assets. Allocating the initial costs over five years, the annual costs to satisfy the Dodd-Frank "living will" requirement are estimated to be 0.0030 percent of assets.

This cost is assumed to apply to all banks with assets above $50 billion, which is probably a significant underestimate for banks with assets above $250 billion. The estimate of 0.0030 percent of bank assets is based on the various modest assumptions in Exhibit 1. These calculations are within the range of estimates that have been offered by a 2016 Government Accountability Office study (Government Accountability Office, 2016).

EXHIBIT 1

Living Will Banks
124 Largest banks Median bank assets $25,758 million #62 First Tennessee Bank #63 First Merit Bank Executive annual salary, benefits and support $350,000

Initial Cost for 124 Banks
1.3 million hours 2080 working hours per year 5.04 person years per bank [(1.3 million hrs./2080)/124] $1,764,000 salaries and benefits per bank ($350,000 x 5.04) Cost per bank as % of assets .00685% = ($1,764,000/$25,758 millions) .00732 % in 2016 dollars (2012-2016 assumed annual inflation 1.5%)

Annual Maintenance
267,544 hours 1.04 person years per bank [(267,544 hrs./2080/124] $364,000 salaries and benefits per bank ($350,000 x 1.04) Cost per bank as % of assets 0.00141% = ($364,000/$25,758 million) 0.00150% in 2016 dollars (2012-2016 assumed annual inflation 1.5%)

Annual Maintenance + Amortize Initial Costs Over 5 Years
0.0030%=[(0.00732%/5)+0.00150%]

Consumer Overdraft Fees

The Federal Reserve's revision of Regulation E to restrict consumer overdraft fees is an additional impact of Dodd-Frank on large banks. In May 2008, the Fed proposed revising its Regulation DD to restrict consumer overdraft fees. The proposal was withdrawn later that year and replaced by a proposal to revise Regulation E to limit consumer overdraft fees on *both* ATM and one-time debit card transactions. The Fed announced the final rules in November 2009, which became effective July 1, 2010, three weeks before Dodd-Frank was signed into law.

It was unnecessary for these revisions to be included in Dodd-Frank. The effects of the revision to Regulation E are included in this analysis as an impact of Dodd-Frank.

The impact of the revision appears on banks' income statements as service charges on deposit accounts. For 2015, Table 8 shows the fee incomes plus service charges are estimated to be 69.12 percent of that income in 2009 for banks with assets between $50 and $100 billion, 93.11 percent for banks with assets between $100 billion and $250 billion, and 89.45 percent for banks with assets above $250 billion. The decline from 2009 to 2015 is calculated as a percentage of the average 2009 and 2015 bank assets. The bank revenue losses are 0.00064 percent, 00018 percent, and 0.00033 percent of assets for the three groups of banks in order of ascending size, respectively.

TABLE 8
RELATIVE DIFFERENCE IN CONSUMER FEES 2009 VS. 2015

	$50 - $100 Billion Banks			$100 - $250 BILLION BANKS			$250 + BILLION BANKS		
	'(000)	RATIO TO	(000000)	'(000)	RATIO TO	'(000000)	'(000)	RATIO TO	(000000)
year	FEES + CHARGES	2009	ASSETS	FEES + CHARGES	2009	ASSETS	FEES + CHARGES	2009	ASSETS
2015	1528.2	0.6912	1052.5	4889.9	0.9311	2525.8	19285.6	0.8945	7822.6
2014	1848.6	0.8361	878.2	4260.9	0.8114	2048.7	18669.5	0.8660	8101.3
2013	2264.3	1.0242	1012.0	4392.7	0.8364	1914.6	18103.4	0.8397	7552.9
2012	2245.9	**1.0158**	**1178.9**	4464.2	0.8501	1887.2	17976.5	0.8338	7342.6
2011	1968.1	**0.8902**	1032.2	4491.1	0.8552	1842.7	17936.9	0.8320	6916.7
2010	2000.4	**0.9048**	944.9	4745.2	0.9036	1678.4	19900.8	0.9231	6393.6
2009	2210.9	1.0000	1064.5	5251.6	1.0000	1607.5	21559.5	1.0000	5845.1
2009-2015 LOSS	$\frac{2210.9 - 1528.2}{.5(1052.5+1064.5)*1000} = 0.00064\%$			$\frac{5251.6 - 4889.9}{.5(2525.8+1607.5)*1000} = 0.00018\%$			$\frac{21559.5 - 19285.6}{.5(7822.6 + 5845.1)*1000} = .00033\%$		

CONCLUSIONS

Expediting the payment of interest on reserves has been an effective monetary policy tool to accompany Quantitative Easing to deal with the financial crisis. Earning interest on reserves has induced banks to hold considerably more excess reserves, while providing greater liquidity to the financial system. Dodd-Frank requires the banks to satisfy higher deposit insurance premiums, the "living will" requirement, Federal Reserve stress tests, and includes many nonquantifiable costs.

Estimated costs of Dodd-Frank developed in this study are conservative and exclude many costly provisions. Two provisions, for example, for which there are insufficient data, are banks' lost income due to the Durbin Amendment limiting interchange fees (Wang, 2012 and Getter, 2017) and the Volker Rule restricting proprietary trading (*The Economist*, 2015). The bank costs to satisfy these provisions are billions of dollars. The Financial Choice Act of 2017, passed by the House or Representatives, proposes to repeal both of these restrictions.

For 2015, the net income percent of assets that large banks earn is approximately 1.0 percent (Table 9, line 1). The summary of the analyses for interest on reserves and Dodd-Frank costs for three groups of large banks are presented in Table 9. The limitations of this analysis include the costs of many provisions of Dodd-Frank that cannot be quantified and the assumptions that are necessary to develop the estimates.

The quantifiable costs estimated in this study for banks with assets above $250 billion to satisfy their Dodd-Frank obligations are approximately four times their estimated earnings on reserves (0.0462% vs. 0.0110%, respectively). These results reflect their unique products and the global markets in which the eight largest US banks compete.

For banks with assets in the $50 - $100 billion range, their quantifiable costs to satisfy Dodd-Frank are well below their expected earnings from interest on reserves (0.0296% vs. 0.0985%, respectively) For banks with assets between $100 and $250 billion, their aggregated costs are somewhat below their expected returns on reserves (0.0295% vs. 0.0339%, respectively).

Treasury Secretary Mnuchin recommended that the Senate Banking Committee reduce regulations for banks with assets below $250 billion (Mnuchin and Phillips, 2017). The 2017 proposed legislation and report from the U.S. Treasury would repeal much of Dodd-Frank and reduce large banks' costs. Many of the changes can be implemented by regulators without new legislation.

TABLE 9
SUMMARY DODD-FRANK COSTS TO BANKS

	$50 - 100 BILL	$100 - $250 BILL	$250 BILL +
NUMBER OF BANKS (2015)	11	17	8
BANK NET INCOME/TA (TABLE 5)	0.8790%	0.9463%	1.0490%
EXCESS RESERVES MEAN BANK RETURN/MEAN TA (TABLE 4)	0.0985%	0.0339%	0.0110%
ΔDEP INSURANCE COST/TA (TABLE 6)	0.0070%	0.0073%	0.0239%
CCAR COSTS/TA (TABLE 7)	0.0190%	0.0190%	0.0190%
ΔSERVICE CHARGES ON DEPOSITS/TA (TABLE 8)	0.00064%	0.00018%	0.00033%
COSTS TO PREPARE LIVING WILLS (EXHIBIT 1)	0.0030%	0.0030%	0.0030%
SUM OF COSTS AS % OF ASSETS	0.0296%	0.0295%	0.0462%
TOTAL COSTS / NET INCOME	0.0337%	0.0312%	0.0441%

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