

# Reserve Requirements: A Modern Perspective

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**T**he Federal Reserve requires depository institutions to hold a minimum level of non-interest-earning reserves (vault cash or deposits at the Fed) in proportion to their depository liabilities. A cursory reading of typical money and banking textbooks would suggest that these requirements are there for a couple of reasons. For one, reserve requirements are a tool of monetary policy. Reductions in reserve requirements would allow the Fed to expand the money supply and lower interest rates. A second reason for the reserve requirements is to improve the safety and soundness of depository institutions. The higher the reserve requirement, the safer depository institutions are held to be.

Interestingly, this “conventional wisdom,” while still commonplace in academia, does not appear to be shared by the Federal Reserve—or other central banks, for that matter. This article challenges conventional wisdom from textbooks on both of the above points. First, it challenges the notion that reserve requirement ratio changes are simply one of three tools, along with the discount rate and open market operations, at the disposal of the Federal Reserve System for implementing monetary policy. The article argues that this view is too narrow. For one thing, it ignores the economic and financial significance of reserve requirements changes. Changes in reserve requirement ratios typically free up or absorb (depending on the change in reserve require-

ment ratios) far more reserves than desired by the Fed in a short time period. For another thing, if the Fed is targeting the federal funds rate, and if the Fed does not change its target for the funds rate at the time of the reserve requirement change, then it must offset the reserve requirement change impact if it wants to maintain the federal funds rate at its original target level. Consistent with this idea, the Fed routinely offsets the monetary policy effects of changes in reserve requirements. In other words, what the Federal Reserve gives with one hand by lowering reserve requirements, for example, it takes back with the other hand using contractionary open market operations.

This evidence raises an interesting question: If the Federal Reserve offsets the policy effects of reserve requirement changes, then why does it change the reserve requirement ratios to begin with? It is suggested that the Fed is frequently trying to achieve other, non-monetary-policy objectives when it changes reserve requirements. In particular, in 1992 the Federal Reserve used reserve requirement changes to bolster the financial health of depository institutions. This article provides testimony from the public record that when the Fed last officially changed reserve requirements, in 1992, it was attempting to ease the credit crunch of that time and improve the profitability of depository institutions without expanding the money supply or lowering interest rates. In this vein, there is a large body of empirical

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evidence indicating that changes in reserve requirement ratios result in significant changes in the value of equity for depository institutions.

Second, the article challenges the notion that higher reserve requirements necessarily lead to greater safety and lower default risk for depository institutions. Again, we investigate how the 1992 reserve requirement change affected interest rates and, more importantly, interest rate spreads that proxy for default risk premiums. We examine whether the reserve requirement reductions actually worsened the perceived safety of depository institutions, as conventional wisdom would suggest. We find no new evidence that the 1992 reserve require-

**There are a number of reasons to believe that reserve requirement changes rarely have been indicative of monetary policy initiatives.**

ment ratio reduction increased the perceived default risk of depository institutions at the time it was announced. In fact, proxies for default risk premiums for depository institutions actually narrowed at the time. This evidence contradicts the conventional wisdom that suggests lower reserve requirements would lead to higher default risk.

This article first examines the relationship between reserve requirement changes and monetary policy, with the aim of showing that reserve requirements are not a very useful monetary policy tool and have not been used for this purpose recently. The discussion next considers the more modern view of reserve requirements as a tax on depository institutions and summarizes a large and growing literature on the incidence of this tax. This evidence suggests that perceived bank profitability is inversely affected by announced changes in reserve requirement ratios. The article then develops the default risk issues associated with reserve requirement changes, providing new evidence that reserve requirement reductions are associated with a decline in default risk for financial institutions that issue reservable instruments.

### **Reserve Requirement Ratio Changes and Monetary Policy**

**W**e begin with the assertion that the Federal Reserve has not often changed reserve require-

ment ratios to accomplish monetary policy objectives.<sup>1</sup> There are a number of reasons to believe that reserve requirement changes rarely have been indicative of monetary policy initiatives. First is the recognition that even small changes in reserve requirement ratios can have large monetary policy effects. On February 18, 1992, the Federal Reserve announced a lowering of the reserve requirement ratio on transaction deposits to 10 percent from 12 percent for large depository institutions. Based on the reserve adjustment magnitude of the Federal Reserve Bank of St. Louis, it is estimated that this action freed up the equivalent of about \$7.3 billion in reserves (Anderson and Rasche 1996). The Fed would have had to buy over \$7 billion in government securities to have the same expansionary effects. Such a purchase would have been more than the Fed bought in all of 1991, for example. In other words, in a matter of a few moments, when the Fed changed reserve requirement ratios in February 1992, it provided the equivalent injection of reserves that it provided in the full preceding year. Because these large, discrete policy effects are generally undesirable, the Fed is forced to neutralize them.

Moreover, for most of the post–World War II period, the Federal Reserve has been stabilizing short-term interest rates in its day-to-day operations. In fact, only two weeks before the 1992 reserve requirement reduction announcement, the Federal Open Market Committee (FOMC) met on February 4 and 5, 1992, to discuss changing its interest rate target. Ritter (1993) summarizes this meeting as follows: “In setting policy for the weeks until the next meeting, there was a clear consensus that no dramatic action should be taken, particularly since significant easing had been taken in late 1991” (43). In other words, the FOMC had just voted not to change the target for the federal funds rate. This action meant that the expansionary effects of a reserve requirement reduction required an absorbing of reserves through open market operations. If the expansionary effects were not offset, then short-term interest rates would have fallen as a result of the increase in reserve availability. Thus, it is logical to anticipate, based on the Fed’s recent stabilization of short-term interest rates, that reserve requirement ratio changes will be accompanied by offsetting open market operations. For example, a reduction in reserve requirement ratios will lead to simultaneous open market sales while an increase in reserve requirement ratios will lead to simultaneous open market purchases. Thus, if the Federal Reserve were to announce a new reduction in reserve requirement ratios without also announcing a change in its federal funds target, the Federal Reserve could be expected

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to simultaneously sell government securities to offset the increase in excess reserve availability.

There is strong empirical evidence that such offsetting has taken place for many years. Haslag and Hein (1989) provide evidence for the 1960–88 period, for example, that the Federal Reserve typically offsets reserve requirement ratio changes with open market operations through its holdings of government securities (the primary ingredient of the source base). They find that “when the Federal Reserve lowers reserve requirement ratios, a simultaneous contraction in the growth rate of the source base is typically undertaken” (11).

Further support of this position is offered by the most recent official change in reserve requirements in the United States. On February 18, 1992, when the Federal Reserve announced a lowering of the reserve requirement ratio on transaction deposits, Alan Meltzer, economics professor at Carnegie Mellon University and chairman of the Shadow Open Market Committee, stated: “I expect it is not a monetary policy move. It won’t affect money supply growth” (“Fed to cut reserve...” 1992). Meltzer did not see this action as an expansionary monetary policy move because of his expectation that the expansionary effects of the reserve requirement reduction would be offset by contractionary open market operations. According to the *American Banker*, Meltzer was not alone: “Most analysts think the Fed will use open-market operations to sop up the reserves and keep interest rates about where they are” (“Fed to cut reserve...” 1992).

If further evidence is needed, one need only turn to the words of the chairman of the Federal Reserve, Alan Greenspan. Two days after the Federal Reserve announcement of the 1992 reserve requirement reduction, Greenspan was testifying to Congress in his semi-annual Humphrey-Hawkins monetary policy report. The *Financial Times* summarizes his report as upbeat, “predicting early economic recovery” (“Greenspan sees early...” 1992). This economic backdrop would hardly appear to be the appropriate stage for the introduction of a new expansionary policy initiative. The summary of the testimony went on to state that Greenspan’s “bullish remarks about the economy may be interpreted as further evidence that the Fed is not contemplating

further easing of monetary policy in the near future. He confirmed that the reduction in reserve requirements for commercial banks announced on Tuesday was intended to boost bank profitability and ease the credit crunch rather than an easing of monetary policy” (“Greenspan sees early...” 1992). Since the Federal Reserve had not announced a decrease in its federal funds rate target along with the announced reduction in reserve requirements, the change in reserve requirement ratios should be properly viewed as no change in monetary policy.

### **Reserve Requirements as a Tax on Depository Institutions**

The summary of Greenspan’s testimony suggests that the Federal Reserve lowered reserve requirements on transaction deposits in 1992 to improve the profitability of depository institutions and thus encourage them to lend more. But how would lowering reserve requirements improve bank profitability? The answer is provided clearly by Greenspan. Again, the *Financial Times* summarizes Greenspan’s perspective in his Humphrey-Hawkins testimony by stating that “the requirement that banks hold non-interest-bearing reserves with the Fed amounted to a tax on banks” (“Greenspan sees benefits...” 1992). This statement suggests that if banks do not have to hold as much in non-interest-earning reserves, they would likely either lend the excess out or acquire new securities. In either case, such action should increase interest income and improve the profitability of banks because it would result in a larger asset base for which banks would earn their spread.<sup>2</sup>

Of course, recognizing that reserve requirements can be viewed as a tax does not answer the question, Who is going to gain when that tax is reduced? There is a literature that suggests that depository institutions will attempt to pass the reserve requirement tax on to their customers. However, there is some disagreement as to which customers, depositors or borrowers, bear the reserve requirement tax. The following discussion describes the main competing viewpoints on who bears the reserve requirement tax. The box on page 44 illustrates the market reaction in each of these three cases to a reduction in reserve requirements.

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1. In his congressional testimony of March 13, 2001, Federal Reserve Governor Laurence Meyer makes a case for reserve requirements being useful for monetary policy purposes (1) if the Federal Reserve were allowed to pay interest on reserves, (2) if banks could pay interest on demand deposits, and (3) if the Fed had greater latitude than currently provided by Congress in altering reserve requirement ratios. In light of this reasoning, the arguments in this paper should not be over-generalized to suggest that reserve requirement changes would never be useful for achieving monetary policy objectives.

2. Furfine (2001) provides evidence that banks with higher profitability pay lower interest rates on federal funds loans.

Who Bears the Tax? Three Views on the Market Reaction to Changes in Reserve Requirement Ratios

Many financial economists consider reserve requirements to be a tax on the financial institutions that issue reservable instruments. Institutions that are required to hold reserves in the form of vault cash or deposits with the Federal Reserve forgo the opportunity cost of those funds while they are held as required reserves because such funds are not available for loan or reinvestment and therefore earn no return for the institution.

While there is general consensus in the literature that reserve requirements are a tax, there is widespread disagreement as to who bears the tax and who benefits when reserve requirement ratios are relaxed. Early work in this area, represented by the first two theories described here, began with the assumption that financial institutions would pass the reserve requirement tax on to their customers. However, some believed the tax would be passed on to depositors in the form of lower yields on reservable instruments while others felt the tax would be passed to borrowers in the form of higher interest rates on loans.

**Bank Depositors**

Fabozzi and Thurston (1986) state that depositors bear the reserve requirement tax in the form of lower yields on reservable securities. They argue that rates on reservable instruments, for example, CDs, should be equal to the market-determined rate on otherwise identical non-reservable instruments multiplied by one minus

the required reserve ratio. The nonreservable rate is assumed to be exogenous, so bank demand for reservable time deposits is perfectly elastic. Within this framework a reduction in reserve requirement ratios would result in an increase in yields on the reservable instruments. Chart A illustrates the reaction of CD yields to a decline in reserve requirement ratios within the Fabozzi and Thurston framework. The lower reserve requirement tax causes interest rates on reservable CDs to increase from  $i$  to  $i^*$ . This higher rate stimulates demand for reservable instruments as the demand curve shifts upward from  $D$  to  $D^*$ .

**Bank Borrowers**

Fama (1985) and James (1987) independently found no evidence of an inverse relationship between reserve ratio changes and CD yields. Finding no evidence that the tax is passed on to bank depositors, they infer that the tax must be passed on to bank borrowers in the form of higher loan rates. This relationship is illustrated in Chart B, where a decline in the reserve requirement ratio results in a decline in the cost of funds (from  $i$  to  $i^*$ ) to banks who are now willing to supply more loanable funds (as represented by the supply curve shift from  $S$  to  $S^*$ ).

**Bank Shareholders**

More recent work in this area has focused on the reaction of bank stock prices to changes in

CHART A

Reaction of CD Yields within the Fabozzi and Thurston Framework

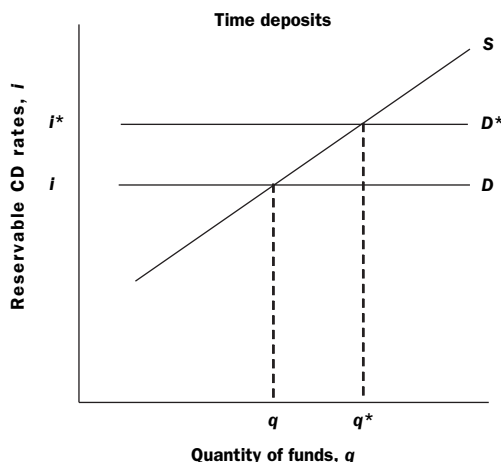
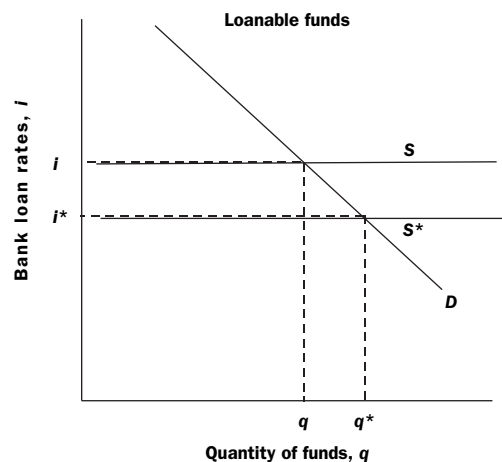


CHART B

Relationship between Reserve Ratio Changes and Banking Lending Rates

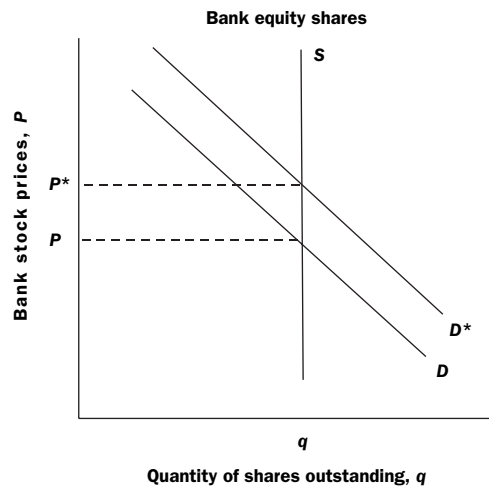


reserve requirements. While the previously discussed theories assumed a partial equilibrium framework in which banks would pass the reserve requirement tax on to their customers, this theory acknowledges that the high level of competition in the deposit and loan markets, coupled with accessible substitutes for borrowers and lenders, might prohibit banks from passing the tax to customers. In this case a change in reserve requirement ratios would be inversely related to bank profitability because bank profitability would be lower when reserve requirement ratios are high and vice versa. Chart C illustrates the impact of a reserve requirement reduction within the context of this theory. Lower reserve requirements lead market participants to expect an increase in bank profits. Bank equity shares become more desirable to market participants as profit expectations are revised upward. This expectation of increased bank profitability leads to an increased demand for bank equity shares as the demand curve shifts from  $D$  to  $D^*$ , resulting in an increase in bank stock prices (from  $P$  to  $P^*$ ). Since the market is expected to adjust profit expectations rapidly following an announced change in reserve requirements, the

supply of outstanding bank equity shares is constant in the short run. So the overall impact of a reserve ratio reduction is to increase the profitability and share prices of banks.

### CHART C

#### Stock Price Reaction



Black (1975) and Fabozzi and Thurston (1986) argue that the reserve requirement tax is passed on to depositors of reservable instruments in the form of lower yields. As such, the 1992 reduction in this tax should have coincided with an associated increase in yields on deposits. Fama (1985) and James (1987), however, find no evidence that past changes in reserve requirements resulted in changes in yields on deposits. Given this lack of evidence, they infer that the reserve requirement tax is passed on to bank borrowers in the form of higher interest rates on loans. In the case of a reserve requirement reduction, as in 1992, the tax burden is lowered, and Fama and James would predict a decline in lending rates passed on to bank borrowers.

However, there still might be another bearer of the reserve tax burden. There is much recent evidence suggesting that at least a portion of the tax is not passed on to borrowers or depositors but rather is passed on to, or absorbed by, bank shareholders. Kolari, Mahajan, and Saunders (1988); Slovin, Sushka, and Bendeck (1990); Osborne and Zaher (1992); Cosimano and McDonald (1998); and Stewart and Hein (2002) all provide evidence suggesting that

increases (reductions) in reserve requirements lead to lower (higher) bank stock prices.

Kolari, Mahajan, and Saunders (1988) suggest that reserve requirement changes, when they are viewed as being permanent, can have significant effects on bank stock prices. The researchers provide evidence that increases in reserve requirements resulted in lower returns to bank holding company stocks than to the market as a whole for the 1972–81 period.

Slovin, Sushka, and Bendeck (1990) add to this evidence by considering the impact of reserve requirement changes on equity returns for banks over the 1972–86 period. This study also examines the impact of these changes on the equity returns for manufacturing, communications, public utilities, and nonbank financial firms. The evidence supports the proposition that reserve requirements are a tax on depository institutions because bank equity prices change in response to reserve requirement changes. Slovin, Sushka, and Bendeck also find little evidence of monetary policy effects as manufacturing, communications, and public utility returns exhibit no reaction to reserve requirement changes, suggesting that there are few macroeconomic effects from these

changes. But the study does find that nonbank financial firms' equity returns react in an opposite manner to the announced reserve requirement changes compared to bank returns. This evidence is interpreted to mean that the reserve requirement tax actually shifts financial activity between the banking and nonbanking financial sectors.

Osborne and Zaher (1992) provide evidence that announcements of reserve requirement changes prior to the December 1990 reserve requirement change resulted in significant abnormal stock returns for large commercial banks, especially when time deposit, as opposed to demand deposit, reserve requirements were changed. Stewart and Hein

bank stock returns. Viewing a reserve requirement ratio change as solely a monetary policy move ignores this influence on depository institutions. It would behoove us to broaden the characterization of reserve requirement changes and understand that the Federal Reserve appears to change reserve requirements for reasons other than influencing monetary policy and that these changes have a direct impact on bank stock returns.

### **Evidence on the 1992 Reserve Requirement Ratio Changes and Perceived Bank Safety**

Traditional discussions of reserve requirements frequently characterize these regulations as providing liquidity for financial institutions as they deal with depositors that wish to withdraw funds from their accounts. This characterization can be misleading. Bank reserves have traditionally been thought of as a source of liquidity for banks that allows them to meet the withdrawal needs of their customers and reduce their overall risk of default. This perception may be true in the case of excess reserves, but it is false where required reserves are concerned. Required reserves do not provide any substantive liquidity because banks are required to replenish them prior to the end of a two-week maintenance period if they are depleted below the required level. So required reserves are more appropriately thought of as a liability to the institutions holding them rather than an asset.

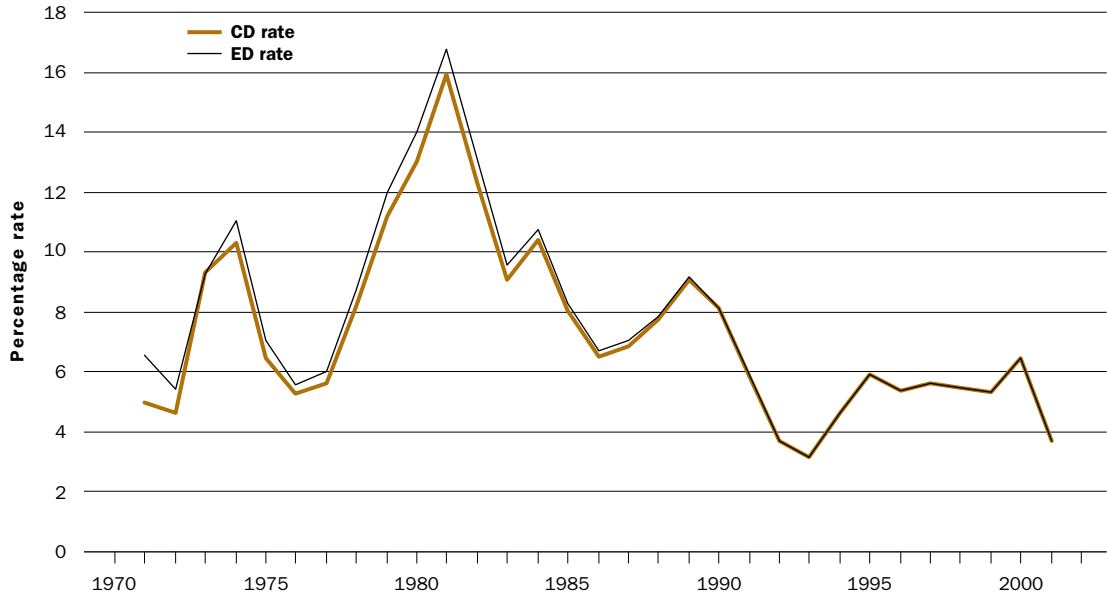
However, contrary to the conventional wisdom, increasing reserve requirements may ultimately increase the risk of financial institution failure. As Alan Greenspan has stated, greater reserve requirements are likely to reduce the profitability of banks by increasing the proportion of nonearning assets they must hold. Moreover, greater reserve requirements reduce financial institutions' true liquidity and correspondingly increase their total cost of short-term funds, again leading to a reduction in bank profitability. Also, with a given dividend payout policy for the bank, reduced profitability means that additions to equity capital will be lower and banks will not be as well capitalized as they would have been.

Thus, there appear to be two competing theories as to how reserve requirement changes might affect the perceived risk of financial failure for depository institutions. To shed light on which of these two theories seems to be most consistent with the data, we examine the relative movement of short-term interest rates following the February 18, 1992, Federal Reserve announcement that the reserve requirement ratio on net transaction deposits would be reduced from 12 percent to 10 percent for deposit

**As Alan Greenspan has stated, greater reserve requirements are likely to reduce the profitability of banks by increasing the proportion of nonearning assets they must hold.**

(2002) and Cosimano and McDonald (1998) examine the market reaction to the 1990 reserve requirement reduction, and both find evidence consistent with the expected profitability of banks increasing following the reserve requirement reduction. The 1990 reserve requirement reduction eliminated reserve requirements on large, nonpersonal time deposits and net eurocurrency liabilities. Stewart and Hein find evidence of abnormal share price appreciation for bank shareholders following the announcement of the reduction. However, they find no evidence of any reaction in stock returns in the utility, communication, nondepository credit, broker-dealer, or insurance industries. Cosimano and McDonald also consider the 1990 reduction of reserve requirements on eurodollar liabilities and nonpersonal time deposits. They find positive abnormal returns for large commercial banks around the time of the announcement. They also find a significant positive relationship between the size of the bank and the magnitude of abnormal returns.

In summary, there is increased recognition that reserve requirements can best be thought of as a tax, but there is also considerable disagreement as to who ultimately bears this tax. The majority of the most recent empirical work in this area provides considerable evidence to suggest that changes in reserve requirement ratios represent significant events for

**CHART 1****Three-Month CD and Eurodollar Rates**

Source: Federal Reserve Bank of St. Louis FRED® database, <<http://research.stlouisfed.org/fred/>>

amounts exceeding \$42.2 million. We examine the relative movement of interest rates on Treasury bill futures contracts and eurodollar futures contracts around the time of this announcement. We consider interest rates on futures contracts because the announcement was for a reduction of the reserve requirement ratio beginning April 2, 1992. By considering interest rates on contracts that mature after the reduction was fully in place, we are able to gauge the immediate financial market reaction to the announcement when it was made.

We use the interest rate on Treasury bill futures contracts as a benchmark rate and use the interest rate on eurodollar futures contracts as a measure of deposit rates for depository institutions. Eurodollars are simply dollar-denominated time deposits in institutions outside of the United States. Many of these institutions are indeed U.S. controlled but are physically outside the United States. It is our contention that these interest rates are representative of deposit rates in the United States, and since there are no actively traded domestic CD futures contracts in the United States, the eurodollar futures rate is the best rate for our purpose. Chart 1 shows that, indeed, since the late 1980s, three-month eurodollar rates and CD rates have hardly been distinguishable.

Moreover, the eurodollar futures contracts for which we use the rates and prices were very actively traded in the United States at the Chicago Mercantile Exchange, as were the Treasury bill futures contracts.

If the reserve requirement reduction were viewed as leading to a greater risk of failure for depository institutions, as convention would seem to argue, we would expect the eurodollar interest rate to rise relative to the Treasury bill interest rate. On the other hand, the competing theory would suggest the eurodollar rate would not rise but may fall relative to the Treasury bill rate. The difference between the eurodollar futures rate and the Treasury bill futures rate is known as the *TED* spread.<sup>3</sup> This relationship is stated formally in equation (1).

$$(1) \text{TED}_{i,t} = \text{EDR}_{i,t} - \text{TBR}_{i,t}$$

$\text{TED}_{i,t}$  represents the magnitude of the *TED* spread for contracts with maturity  $i$ , priced at time  $t$ , and  $\text{EDR}_{i,t}$  and  $\text{TBR}_{i,t}$  represent the rate on eurodollar futures contracts and Treasury bill futures contracts, respectively, with maturity  $i$  at time  $t$ . If a reduction in reserve requirements made U.S. depository institutions financially more risky, the *TED* spread would be expected to increase following the reduction

3. The *TED* spread is traditionally defined as the Treasury bill futures price minus the eurodollar futures price. As both futures prices are 100 minus the respective interest rate, the *TED* spread can equivalently be represented as the eurodollar interest rate minus the Treasury bill rate.

TABLE

**Mean Treasury Bill, Eurodollar Futures, and TED Spread Rates before and after the 1992 Reserve Requirement Change Announcement: Mann-Whitney Test**

Series	Maturity (in 1992)	Mean before (Feb. 13–14, 1992) percentage	Mean after (Feb. 18–19, 1992) percentage	Mann-Whitney statistic	p-value
<i>TBR</i>	June	3.920	3.983	7.0	.0607
<i>TBR</i>	Sept.	4.215	4.280	7.0	.0607
<i>TBR</i>	Dec.	4.750	4.820	7.0	.0607
<i>EDR</i>	June	4.390	4.410	6.5	.1104
<i>EDR</i>	Sept.	4.775	4.800	6.5	.1104
<i>EDR</i>	Dec.	5.475	5.505	7.0	.0607
<i>TED</i>	June	0.470	0.445	7.0	.0607
<i>TED</i>	Sept.	0.560	0.535	7.0	.0607
<i>TED</i>	Dec.	0.725	0.695	7.0	.0607

Note: *TBR* is the rate on Treasury bill futures contracts, *EDR* is the rate on eurodollar futures contracts, and *TED* is the difference between the rate on eurodollar futures contracts and Treasury bill futures contracts.

Source: Tick Data, Inc.

in reserve requirements. Depositors would require higher interest rate compensation to bear the increased risk that the institution would fail and they would be unable to get their deposits back in full. Such a finding would be consistent with a higher premium on eurodollar deposit yields relative to Treasury securities.

We gathered daily closing interest rates on the Treasury bill and eurodollar futures contracts for three different contract delivery dates (June, September, and December 1992), all maturing after the reserve requirement reduction was fully in place. We gathered the interest rates for these contracts around the time of the Federal Reserve announcement. Since the announcement was made on February 18, we compare the average *TED*, *EDR*, and *TBR* two days before the announcement (February 13 and 14) and two days after the announcement (February 18 and 19) for each of the maturities.<sup>4</sup> A relatively short window is used because we have no clean way of controlling for other events that may impact short-term interest rates. The Mann-Whitney test statistic is used because of the relatively few distributional assumptions required.

The table provides the various two-day means of our two short-term interest rate futures contracts and the *TED* spread, as well as our test statistics, for the two business days before the announcement and the two business days immediately after the announcement. The first thing to note is that short-term interest rates generally rose following the announcement. Such an occurrence is consistent with the view that the announcement was not an example of expansionary monetary policy. If the

move were truly an indication of expansionary monetary policy, one would expect short-term interest rates to fall. For all three maturities, the Treasury bill futures interest rate increased significantly (at the 10 percent level) following the announcement. On average, the Treasury bill rates were almost 7 basis points higher for the two days following the announcement than for the two prior business days.

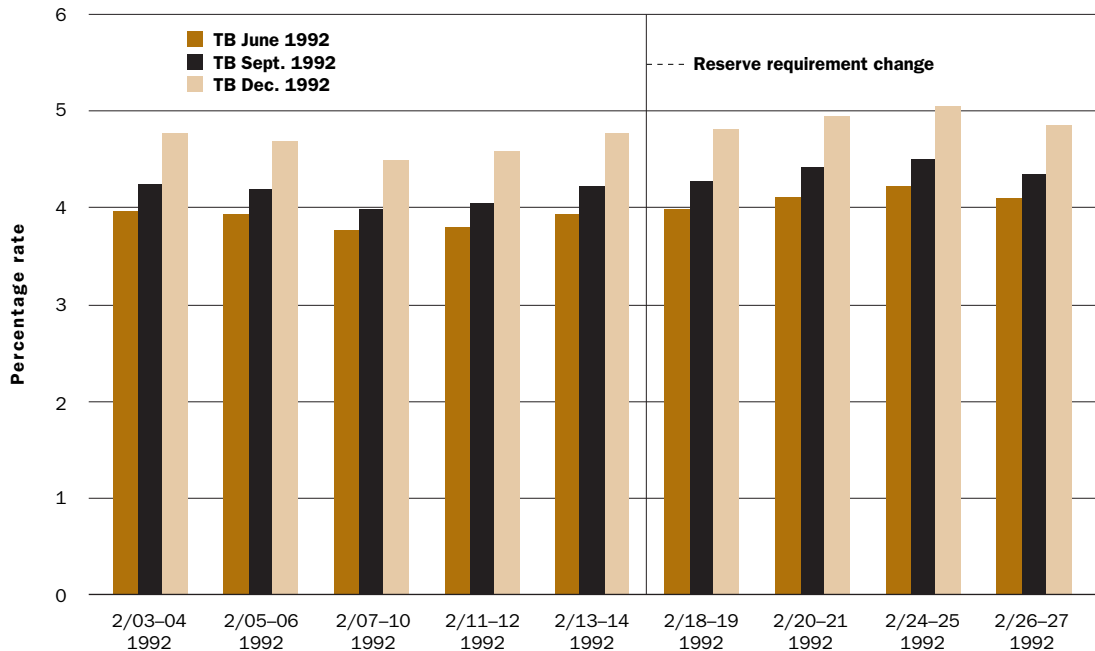
Chart 2 further shows that the increase in the Treasury bill futures rates continued over the next couple of weeks as well. It is unclear whether or not one should associate the subsequent Treasury bill rate increases with the reserve requirement announcement. On the one hand, if this market is truly efficient, as most believe, there should not be any delayed response to information releases such as this. On the other hand, the change in reserve requirements is not a very frequent event, and, as we have argued in this article, there is not a clear consensus on how reserve requirement changes should affect depository institutions and the financial markets within which they operate. Regardless, there is no evidence here to suggest that the change resulted in lower short-term interest rates because the Treasury bill rate on these three futures contracts clearly rose after the announcement.

The table further shows that eurodollar futures rates also increased for all three maturities. But here the increase was neither as large (nor as statistically significant) as the increase in Treasury bill futures rates. On average, the eurodollar futures rates were only about 3 basis points higher following the announcement. This increase was not statistically significant at the 10 percent level for the



## CHART 2

### Treasury Bill Futures Rates, Two-Day Intervals, February 1992



Source: Tick Data, Inc.

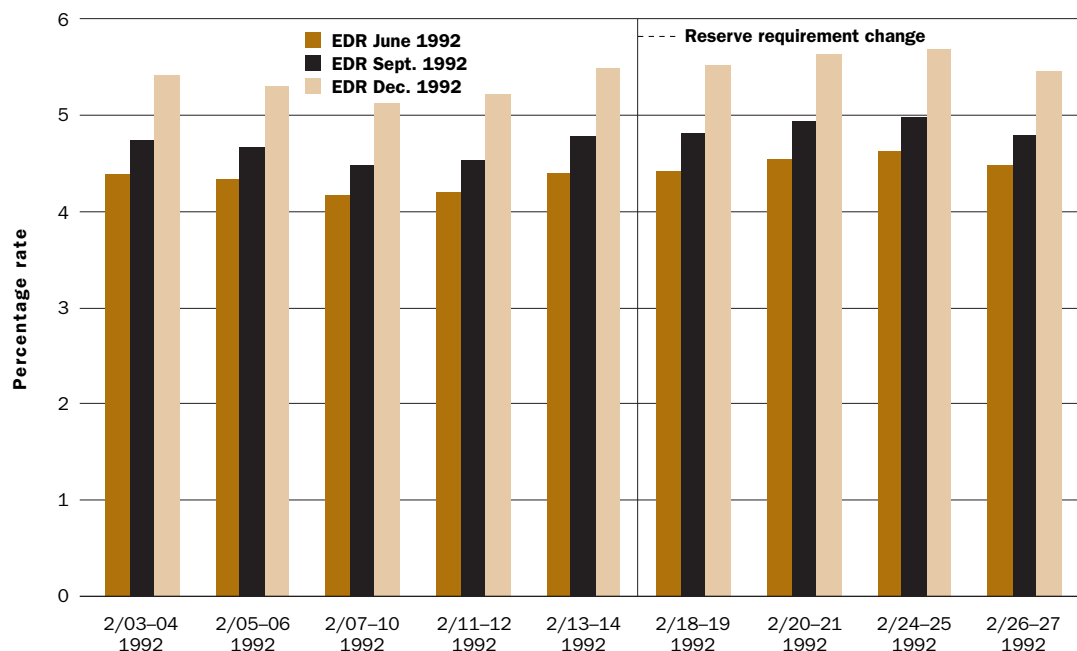
June and September 1992 contracts but was significant at the 10 percent level for the December 1992 contract. Chart 3 also shows that the increase in eurodollar rates continued over the next few days, similar in direction to the change in the Treasury bill futures rates but changing by smaller magnitudes.

The theoretical framework of Fabozzi and Thurston (1986), as outlined in the previous section, states that the reserve requirement tax would be borne by depositors. Since current law prohibits paying interest on demand deposits, we ask if other bank depositors were provided higher interest rates as a result of the 1992 cut in the reserve requirement on transaction deposits. We use the eurodollar interest rate to proxy the explicit interest paid to bank depositors. The Fabozzi and Thurston framework would suggest that, in the case of a reserve requirement reduction, deposit rates should rise. On this point, their framework would appear to be supported by the data as, indeed, the eurodollar rates rose in 1992 following the announced reduction. Two important issues prevent us from declaring the

theory supported by the data. First, in most cases, the eurodollar futures rate increased by a very small and statistically insignificant magnitude. However, more importantly, Fabozzi and Thurston suggest that deposit rates should rise relative to nondeposit interest rates. On this point, their theory is not supported because nondeposit rates rose more than deposit rates following the announcement.

We now consider the relative moves in rates, as measured by the *TED* spread, a measure of relative financial risk. The table shows that the *TED* spread declined significantly (at the 10 percent level) for all three maturities. On average, the *TED* spread was about 3 basis points smaller after the announcement. Since both rates increased, the decline in the *TED* spread indicates, as detailed above, a relatively larger rate increase for Treasury bills than for eurodollar deposits. This finding is inconsistent with the view that the decrease in reserve requirements resulted in greater concerns about the default potential for depository institutions. In fact, the findings are more consistent with the view that reserve

4. February 13 and 14, 1992, were a Thursday and Friday, respectively. Financial markets were then closed on the weekend, February 15 and 16, and remained closed on President's Day, February 17. Thus, the announcement was made on Tuesday, February 18. To assure that there were no other significant events that might have caused movements in these short-term interest rates, we did a *Wall Street Journal* search, which revealed no other events with obvious implications for these short-term rates and the *TED* spread.

**CHART 3****Eurodollar Futures Rates, Two-Day Intervals, February 1992**

Source: Tick Data, Inc.

requirements might impair the safety and soundness of financial institutions.

The 3 basis point reduction in the *TED* spread is admittedly small, but the economic significance of this change should not be minimized. Each 1 basis point move in either the Treasury bill futures contract or the eurodollar futures contract translates into a \$25 change in the value of the contract. Thus, the 3 basis point move in the *TED* spread would translate into a \$75 change in value. Moreover, the margin for taking a position in the *TED* is generally quite small as the *TED* spread itself is far less volatile than the two separate futures contracts. Being on the right side of this move in the day could have easily yielded a 25 percent return on a two-day position, for example, if the initial margin on establishing a *TED* position were \$300.

Chart 4 shows that the reduction in the *TED* spread documented in the table also continued over the next few trading days. By the end of February, the *TED* spread had fallen by some 9 to 12 basis points from the peak observed the two days prior to the reserve requirement announcement. Over the more extended period, the economic significance of the reduction in the *TED* spread is thus even larger than detailed above.

Finally, we should note that Stewart and Hein (2002) document very similar behavior of these two short-term interest rates following the 1990 reserve

requirement reduction on nonpersonal time deposits and eurodollar borrowings. In this case, both rates also increased after the announcement, and the *TED* spread declined, but by a larger magnitude than documented above.

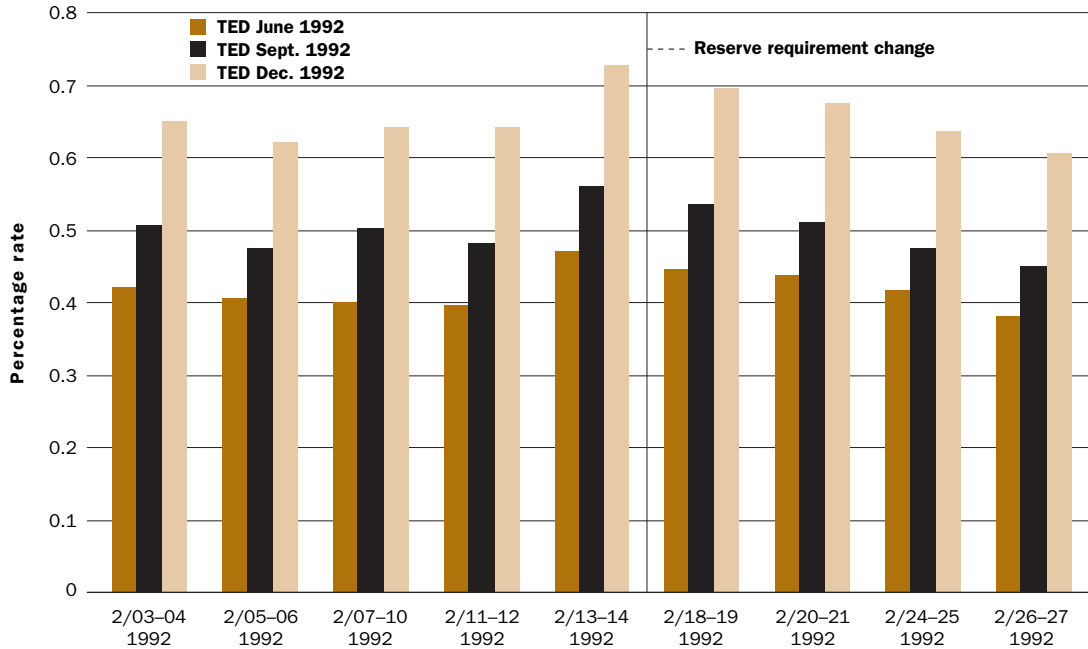
The evidence on the *TED* spread is inconsistent with the conventional wisdom that reserve requirements make depository institutions safer. Indeed, the evidence suggests the opposite is more likely to be the case, with lower reserve requirements resulting in depository institutions that are perceived as safer because of increased profit potential.

### Conclusions and Implications

An application of the basic principles of most money and banking textbooks to predict the outcome of the 1992 reduction in reserve requirements on transaction deposits would be in error on certain points and misleading on others. First, most textbooks would categorize the change as an example of expansionary monetary policy. However, as indicated in this article, short-term interest rates generally rose after the announcement rather than fell, as an expansion in monetary policy would suggest. Thus, the predicted change suggested by most textbooks in the area would be in error. Second, textbook discussions would generally ignore the impact that the change was likely to have on bank stock prices. However, according

**CHART 4**

**TED Spread, Two-Day Intervals, February 1992**



Source: Tick Data, Inc.

to statements of Federal Reserve officials, the 1992 reserve requirement change was intended to improve the anticipated profitability of depository institutions. Moreover, there is extensive evidence indicating that prior changes in reserve requirements were associated with subsequent changes in bank stock returns. Textbook emphasis on monetary policy considerations would have ignored this impact altogether.

Finally, from a regulatory perspective, reserve requirements are traditionally viewed as making depository institutions relatively safer. Thus, a reduction in these requirements should suggest greater concerns about the financial health of such institutions. Yet evidence in this article indicates that the exact opposite occurred. Following the 1992 announcement of the reserve requirement reduction, the *TED* spread—a traditional proxy for the risk of deposit institutions—narrowed significantly rather than increased. This outcome suggests to us that financial markets did not view the

change as increasing the riskiness of depository institutions, as tradition might suggest.

This article argues that reserve requirement ratio changes should not be viewed simply as a tool for monetary policy or as a tool used to directly alter the liquidity of financial institutions. This view raises the question, What is the purpose of the reserve requirement ratio? We believe that the value of reserve requirements, as a source of liquidity or a tool of monetary policy, is indeed recognized today to be less than previously thought by many central banks. As evidence in support of this view, some central banks—such as those in Canada, Great Britain, and New Zealand—have recently eliminated cash reserve requirements altogether.<sup>5</sup> Even in the United States, the Federal Reserve has recently allowed depository institutions to reduce the cost of reserve requirements by sweeping reservable accounts into nonreservable accounts.<sup>6</sup> Thus, one could argue that reserve requirements have effectively been reduced in the United States.<sup>7</sup>

5. Sellon and Weiner (1997) describe the reserve requirement structure in these countries and the implementation of monetary policy therein.  
 6. Anderson and Rasche (2001) provide a good description of such sweep programs and the extent to which they have reduced effective reserve requirements. Bennett and Peristiani (2002) ask the broader question of whether today's reserve requirement structure requires institutions to hold more in reserve than they would voluntarily.  
 7. Haslag (1998) discusses the role of seigniorage—the revenues earned from creating new money—in monetary policy. Haslag looks internationally, across countries, to assess the typical reliance on seigniorage revenue. He finds that countries with combinations of high rates of money growth and high reserve requirements tend to rely especially heavily on seigniorage revenue.

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