



COLLATERAL SCARCITY:
AN APPROACH TO
PREVENTING MARKET
STRESS FROM BECOMING
CONTAGION

by

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I. INTRODUCTION

Since the financial crisis of 2007 and 2008, regulators around the world have been working diligently to strengthen policies to stabilize the global financial system and prevent or mitigate future crises. Policymakers are focused on several items to ensure regulatory changes attain their fundamental objectives:

- The underlying factors that lead to crisis
- Changing macroeconomic and financial market conditions
- The secondary impacts of enacted or pending policy changes

One specific secondary impact demands further exploration: the availability and use of various forms of acceptable collateral in capital market activities and other financial applications. That is the subject of this paper written by Treasury Strategies, Inc.¹

New regulations around the globe call for increased use of collateral, higher required collateral levels and larger haircuts for certain collateral instruments. Under stressed or rapidly changing market conditions, increased collateral demands could strain the very financial markets they are meant to stabilize.

It is useful to examine the amount of collateral that may be required under new regulations, the amount that may be available, and factors that may prevent collateral from being readily accessed. As this paper shows, there is compelling evidence to conclude that collateral scarcity may in fact arise during times of market stress.

Having demonstrated this, the paper considers one avenue to address such a potentially destabilizing factor: adjusting the policies for the types of collateral that are acceptable. Specifically, by treating Treasury-Only Money Market Mutual Funds (TMMFs) as functionally equivalent to Treasury Bills (T-Bills) for collateral purposes, regulators can reduce systemic risks associated with heightened global demand for high-quality collateral.

¹ Treasury Strategies, Inc. is the leading advisory firm in the areas of treasury management, payments and liquidity. We consult with the treasury departments of corporations as well as the major global and regional banks that provide services to those organizations.

II. THE PROBLEM: COLLATERAL SCARCITY MAY TURN STRESS INTO CONTAGION

Increased collateral requirements in global financial markets are meant to create greater safeguards against default, and thus maintain stability. However, during times of stress, a surplus of demand for high-quality collateral relative to the underlying supply may be a destabilizing factor. Either a ramp-up in demand for high-grade government securities or the rapid unwinding of positions could cause this destabilization, which could be the tipping point between market stress and a market crisis.

Initially, a collateral shortage will be more detrimental to smaller investors than to the largest, institutional investors. Ultimately though, if smaller market participants cannot access required collateral and must liquidate their positions, contagion is a very real possibility.

The figure below summarizes collateral access for these types of investors under normal and stressed market conditions.

Figure 1. Access to Collateral in Normal and Stressed Market Conditions

	FUNDS AND MAJOR INSTITUTIONAL INVESTORS	OTHER MARKET PARTICIPANTS ²
Normal Market Conditions	<ul style="list-style-type: none"> • Limited stock of available collateral • Access collateral through direct market channels 	<ul style="list-style-type: none"> • Limited stock of available collateral • Access collateral through market intermediaries
Stressed Market Conditions	<ul style="list-style-type: none"> • Strained stock of available collateral • Access collateral with some difficulty through direct market channels and alternate means • Stockpile collateral 	<ul style="list-style-type: none"> • Strained stock of available collateral • Limited, if any, alternate means to access collateral • If collateral unavailable, position must be unwound

Figure 1 shows that larger and more sophisticated investors will likely be able to meet their collateral requirements during times of market stress and increased collateral demand, though it may be more difficult and expensive. As such, these investors are likely to stockpile collateral in anticipation of stressed market conditions. For example, banks subject to Basel III are likely to hoard collateral well in excess of requirements as a precaution. They will not take any risk of coming up short. Under these conditions, collateral will concentrate with those most able to procure it.

2 In this paper, we use the term “other market participants” to differentiate between the broad range of investors in a market versus the very largest banks, fund companies and institutional investors that have multiple channels for accessing collateral. Other market participants include, but are not limited to: a) the trustees of small- and mid-sized pension funds, b) the corporate treasurers of small- and mid-sized businesses, c) local and regional governmental authorities, and d) individual investors.

The story is quite different for other market participants that rely on market intermediaries to acquire collateral. In times of stress, these investors are less likely to be able to access the collateral they need, and some may not be able or willing to bear rising collateral costs produced by sharp increases in demand.

Faced with increased need but increasingly unavailable collateral, these participants will be forced to sell their positions or incur the penalties of not meeting collateral requirements. A sell-off will drive prices down, and could further exacerbate market conditions and further increase collateral demand. This cycle will repeat itself until collateral demand outstrips supply, creating a negative spiral from a stressed market to a market in crisis.

Thus, in times of stress, collateral requirements expanding beyond the readily available supply could further destabilize markets – the exact opposite of their intended effect. While collateralization is designed to stabilize markets, once a stress situation has begun, the risk is contagion.

III. COLLATERAL REQUIREMENTS HAVE ALREADY OUTPACED THE UNDERLYING SUPPLY

Numerous studies over the past decade have estimated supply and demand for collateral. Virtually all conclude the supply of the highest-quality collateral is not growing as fast as the demand that could exist in times of market stress.

Pre-Crisis Collateral Supply Shortage

Even before the financial crisis, pricing on treasury securities suggested a scarcity of forms of high-quality collateral.

In his groundbreaking 2007 paper, John Bilson of the Illinois Institute of Technology measured the scarcity of U.S. Treasury securities by comparing the yield on treasury securities with yields on a portfolio of corporate debt hedged with credit default swaps. In theory, treasuries and the hedged corporate debt should both approximate the same risk-free yield. However, Bilson found that treasuries yielded 43 basis points less. He attributed this difference to demand for treasury securities that has been driven by regulatory and statutory requirements. Collateral demands, escrows, security deposits and other arrangements created specific demand for treasuries versus other financial instruments and drove down relative yields.³

More importantly, this yield discrepancy points to a scarcity in the supply of high quality collateral that existed before post-crisis reforms increased demand.

Factors Affecting Supply

Many factors have affected collateral demand and supply since the crisis. In examining these, it is important to look beyond total outstanding securities that qualify as collateral and rather to the subset of the total that is available to be used.

The overall supply of collateral is very large and expected to grow. As of May 2015, outstanding U.S. Treasury securities held by the public exceeded \$12.6 trillion.⁴ T-Bills and their functional equivalents account for roughly a quarter of this. As shown below, total T-Bills and other U.S. Government debt with maturity under one year is estimated at \$3.2 trillion at the end of 2014. This is expected to increase to \$3.6 trillion by the end of 2015.

³ The Relative Performance of Money Market Funds, Bilson, 2007.

⁴ US Treasury Securities Outstanding, SIFMA, May 2015.

Figure 2. Supply Balances of T-Bills and Other U.S. Government Debt with Maturities under One Year (\$B)⁵

	YE 2014	YE 2015	CHANGE
Treasury Coupons	1,608	1,825	14 %
Treasury FRNs	164	328	100 %
T-Bills	1,458	1,475	1 %
Total Treasuries	3,230	3,602	12 %

The overall supply of treasury securities has increased significantly from \$4.5 trillion at the end of 2007⁶ when Bilson observed a scarcity. But it is not clear whether that growth has been sufficient to meet the sizeable increases in demand since then. T-Bills and equivalents are the part of overall supply that will be under the most demand pressure, as the highest quality and most liquid type of collateral available.

Even if the collateral growth has been sufficient to meet increased demand, significant market bottlenecks immobilize a portion of these assets and reduce the collateral that is truly available. There are three significant contributing factors:

1. Long-Term Holders of Collateral

Primary holders of long-term assets that qualify as high-quality collateral may or may not make them available as collateral for short-term transactions. The holder must consider the tradeoff between obtaining yield enhancement versus risking delay in recalling the asset when required, as well as the default risk.

In a low-rate environment with a positive economic outlook, investors will be more likely to look for yield and more open to making assets available as collateral, thus increasing the collateral supply.⁷ However, economic conditions that would make an investor more cautious would effectively silo these same assets and quickly restrict supply.⁸

2. Operational Issues

Some collateral holders will keep a collateral buffer to mitigate settlement delays and other market errors. Such buffers, in excess of specific requirements, reduce collateral supply.⁹

⁵ US Money Market Outlook, JP Morgan, 2015.

⁶ SIFMA, May 2015.

⁷ Overheating in Credit Markets: Origins, Measurement, and Policy Responses, Stein, 2013.

⁸ Velocity of Pledged Collateral, Singh, 2011.

⁹ Singh, 2011.

This dynamic will likely be magnified in the short- to medium-term by the new OTC derivative markets supporting Dodd-Frank centrally cleared derivatives. Increased margin requirements will in turn increase the collateral held as a buffer.

3. Re-Hypothecation Effects

A major aspect of collateral supply is the ability for collateral to be reused within the market. In an ideal scenario, all collateral would be able to be re-hypothecated, which would increase the available supply. In practice, however, regulations that prevent collateral re-hypothecation pull it out of the system as soon as it becomes encumbered. For example, ISDA has estimated that roughly 15% of all OTC derivative collateral that could be re-hypothecated is otherwise restricted.¹⁰

Additionally, this restriction becomes more prevalent in times of stress. Between 2007 and 2011, the amount of available collateral in the market dropped an estimated 42%.¹¹

Evidence already suggests the formation of a bottleneck on treasury securities that will limit equal access for all market participants, even if the underlying supply is sufficient. A recent study performed by Deutsche Bank estimates that the portion of marketable treasury securities held by securities brokers is declining to levels not seen for 30 years. In the first quarter of 2015, this portion was down to around 4% after a peak of nearly 20% in 2008. The last time brokers held under 5% of marketable treasury securities was the late 1980s.¹² This is a likely indicator that treasury securities have already begun moving onto the balance sheets of large institutional investors, such as global banks, to satisfy Basel III requirements, and away from dealers who were a key source of available supply to the market. It also means that the supplies of high-quality collateral available to investors with limited capital markets access are the lowest they have been on a percentage basis in a generation.

Factors Affecting Demand

1. Increased Regulation of OTC Derivative Trading

In the early stages of the 2008 crisis, many market observers viewed non-transparent OTC derivatives as a source of great concern, because they enabled risks to be transmitted and magnified throughout the shadow banking system.¹³ Efforts to correct this include regulations around initial margin and centralized clearing, to reduce risk and improve transparency. These regulations are expected to increase global demand for OTC trading-related collateral to \$0.8–\$2.0 trillion in normal market conditions and \$1.8–\$4.6 trillion in a stress scenario.¹⁴

10 Margin Survey/Market Review of OTC Derivative Bilateral Collateralization Practices, ISDA, 2011.

11 Singh, 2011.

12 Now's not the time for a liquidity crisis, Slezak, 2015.

13 Anderson & Joeveer, 2014.

14 TBAC, 2013.

Central clearing also entails more stringent requirements for initial margin collateral, which many existing OTC derivatives trades do not meet. While data is extremely limited, market experts believe that the majority of clients in bilateral OTC trades did not provide initial margin collateral before this requirement was implemented.

A second major component of OTC derivative regulations is a higher bilateral margin requirement for non-centrally-cleared derivatives. (Having lower margin requirements for centralized clearing than for non-centralized clearing was intended to drive more derivatives trading to centralized clearing.) Similar to the centralized clearing requirement, this will significantly increase global demand for high-quality collateral to an estimated \$0.8–\$1.2 trillion in normal market conditions and \$1.8–\$4.1 trillion in a stress scenario.¹⁵

During periods of economic stress, asset prices would be expected to fall. This would create additional (variation) margin calls. With market-wide increases in margin posting activity, high and sustained spikes in demand for high-quality collateral would be likely to accompany any economic stress event that negatively impacts asset prices.¹⁶

2. Basel III Banking Regulations

Basel III requires banks to hold more high-quality and liquid assets than ever before. The Liquidity Coverage Ratio (LCR) ensures that banks can weather a major market event by holding low-risk liquid assets against potential funding outflows. This will drive increased global demand for high-quality assets, estimated at \$1.0–\$2.5 trillion. This demand is not impacted by economic conditions, because the requirements must be met continuously and do not change in different environments.¹⁷

3. Decrease in Reserves Held at the Federal Reserve

The period immediately following the financial crisis saw an historical increase in the size of the Federal Reserve's balance sheet. In November 2008, the Fed began paying banks interest on excess reserves. This gave banks economic incentive to leave more money at the Fed than required, something that was not common practice. As the short-term rates continued to decrease, the rate paid on excess reserves became more attractive and bank funds flowed into the Fed at record levels. From 2008 to 2015, reserves at the Fed grew from under \$100 billion to \$3.1 trillion.¹⁸

Fed economists are now projecting the impacts of normalizing its balance sheet, a process that could be completed by 2021. Normalization will include draining the excess reserves.¹⁹ Figure 3 below shows a projection of reserves between 2015 and 2025. This projection, published in the *International Journal of Central Banking*, shows reserves decreasing by \$3.0 trillion by 2021, parallel to the increase from 2008 to 2014.

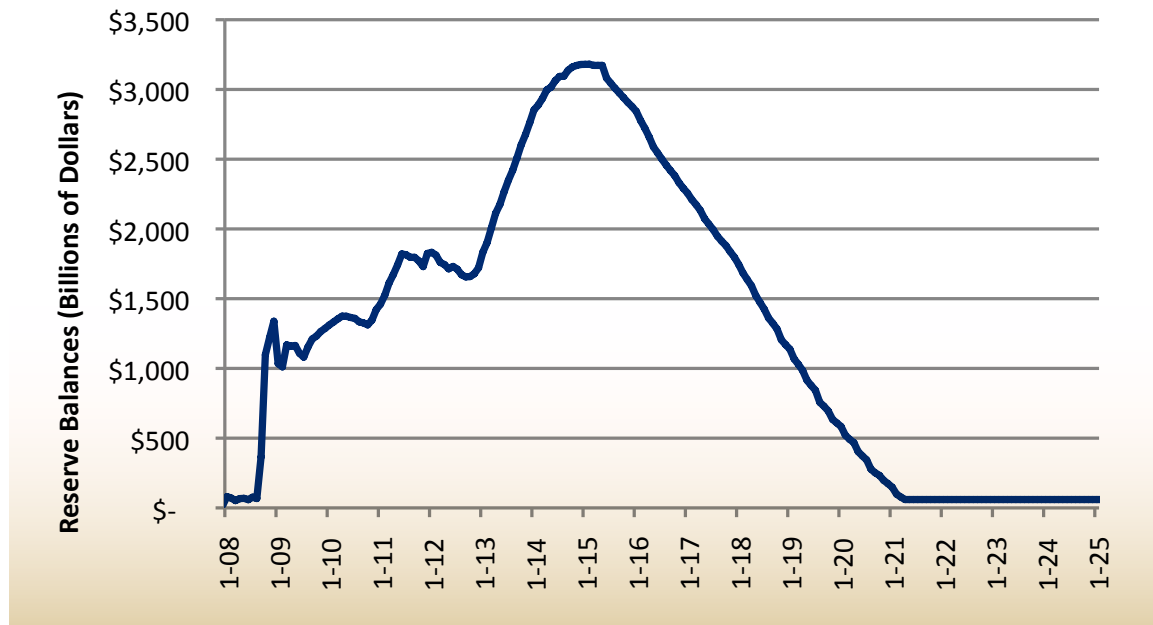
15 TBAC, 2013.

16 Lopez, Mendes and Vikstedt, 2013.

17 TBAC, 2013.

18 The IMF's Prediction, the Federal Reserve and the \$2.6 Trillion Time Bomb, Auerbach, 2015.

19 Carpenter, et al., 2015.

Figure 3. Historical and Projected Levels of Bank Reserves at the Federal Reserve, 2008 to 2025²⁰**Description**

Levels of reserve balances held at the Federal Reserve from January 2008 to January 2025. Data between 2008 and 2015 reflect actual balances while data after 2015 are projections published by Federal Reserve economists in the *International Journal of Central Banking*.

As the Fed reduces rates on excess reserves to shrink its balance sheet, banks will begin to seek substitute investments with more attractive rates in which to place their funds. T-Bills have a similar risk and liquidity profile, and will be an attractive option for banks once yields become higher than the rate paid on excess reserves. Additionally, T-Bills and excess reserves are both treated as HQLA for Basel III purposes, so banks will be able to shift funds into T-Bills and still meet those requirements.

While not all the \$3 trillion that is expected to run off the Fed's balance sheet will end up in T-Bills, it is likely a significant portion will do so once yields become relatively competitive. Since the total available stock of treasury debt with maturity under one year is around \$3.2 trillion, this increase in demand will likely strain this collateral supply.

4. Economic Uncertainty

In general, during times of economic stress or uncertainty, investors migrate from riskier investments to less risky, more liquid assets. Such "flight-to-quality" flows will increase demand for high-quality assets for purposes other than collateralization. Because these flows depend on unforeseen scenarios, it is impossible to estimate their magnitude.²¹

²⁰ Carpenter et al., 2015.

²¹ TBAC, 2013.

Impacts of Collateral Scarcity

Demand for high-quality collateral is not currently greater than supply. Yet, the factors above indicate that reduced supply and increased demand could cause a relative scarcity of collateral during normal market conditions within a few years. Additionally, market stress conditions are highly likely to lead to demand being greater than not just accessible collateral, but the total supply of collateral.²²

Collateral scarcity will create many issues, as discussed below.

1. Increased Funding Costs

One potential impact of collateral scarcity is that funding costs will rise.²³ A significant increase in margin calls will require firms to keep larger cash balances on hand to meet them.²⁴ As well, a lack of certainty around intraday obligations and settlements will increase intraday exposures and funding squeezes during times of extreme market stress, also prompting firms to maintain higher precautionary balances.²⁵

2. Collateral Prices

High-quality collateral prices will rise in periods of relative scarcity.²⁶ This directly impacts a firm's cost-benefit analysis of any given trade. As mentioned previously, treasury securities were yielding 43 basis points below the default adjusted or risk-free corporate bond yield before the financial crisis and subsequent reform.²⁷ This low yield is, in effect, an artificially high price caused by the various requirements compelling investors to hold these securities, a dynamic that will be magnified in conditions of increasing scarcity of high-quality collateral.

3. Operational Complexity

Operational and reporting challenges accompany the new regulations. The increased transparency and need for more frequent margin calls will require significant investment from all market participants. This could prevent some firms from engaging in hedging activities they would normally have undertaken in the former regulatory environment.²⁸ This either leaves them exposed to more risk or prevents them from making the investment that would have been hedged.

4. Access Inequity

Another impact of collateral scarcity is that some firms will have more access to collateral than others. Large financial institutions such as global banks and hedge funds effectively control much of the collateral supply, due to their substantial trading activity. Additionally, these financial institutions are the primary providers of collateral transformation services such as securities lending, asset swaps, and repos, which other firms

22 TBAC, 2013; Levels and Capel, 2012.

23 Trends, Risks and Opportunities in Collateral Management, DTCC, 2014.

24 DTCC, 2014.

25 DTCC, 2014.

26 Levels and Capel, 2012.

27 Bilson, 2007.

28 DTCC, 2014.

rely on to exchange assets into acceptable collateral for their own trading activity. As increased margin requirements are phased in, more trading activity is expected to flow through these large financial institutions and similarly, more collateral transformation services will be demanded by other firms in the market. This could create concentration risk in the market by further consolidating collateral trading with a small group of financial institutions.²⁹

5. Margin Spirals

During periods of extreme financial stress, a shortage of collateral compounded with increased margin requirements could trigger margin spirals. In an effort to meet margin calls, firms (and in particular financial institutions that control much of the collateral supply) will likely need to liquidate some non-eligible collateral or lower-quality collateral assets. This may cause further price declines in an already-stressed market, leading to additional margin calls.³⁰

Price declines could become severe enough that some lower-quality collateral (e.g., corporate bonds) and non-eligible collateral assets would experience a credit downgrade. This could increase the required haircut for posting lower-quality assets as collateral, or simply make those assets ineligible. Again, increased haircuts or the need to replace collateral entirely would bring additional margin calls.

Since large financial institutions, such as global banks and hedge funds, control much of the supply for high-quality collateral, a margin spiral in a few market institutions can easily lead to widespread market duress.³¹

29 Lopez, Mendes and Vikstedt, 2013.

30 Lopez, Mendes and Vikstedt, 2013.

31 Lopez, Mendes and Vikstedt, 2013 and Singh, 2011.

IV. TREASURY MONEY MARKET FUNDS AS FUNCTIONALLY EQUIVALENT COLLATERAL

This section examines whether Treasury-Only Money Market Funds (TMMFs) can be considered functionally equivalent to T-Bills. Allowing TMMFs as collateral would ease many of the issues related to T-Bill scarcity. TMMFs currently have \$231.9B in assets.³² Allowing them as collateral would make a material portion of supply newly available to investors – around 7% of the \$3.2 trillion in treasury debt with maturities less than one year. Additionally, TMMFs are already widely available to financial market participants that do not have direct access to capital markets.

To be functionally equivalent, TMMFs must demonstrate the following:

- Similar or equivalent credit quality
- Similar or equivalent ability to liquidate in the event of a default
- Similar or equivalent operational capability to be posted as collateral
- Similar or equivalent price stability

Due to their design and current market practices, TMMFs are equivalent in credit quality, liquidity and operational capability to be posted as collateral. Because TMMFs invest exclusively in T-Bills, TMMFs and T-Bills have extremely similar, if not equivalent, credit quality.

TMMFs are also *more* liquid than T-Bills because Fund Managers are likely to have the cash available to redeem shares versus having to sell T-Bills to raise the funds.

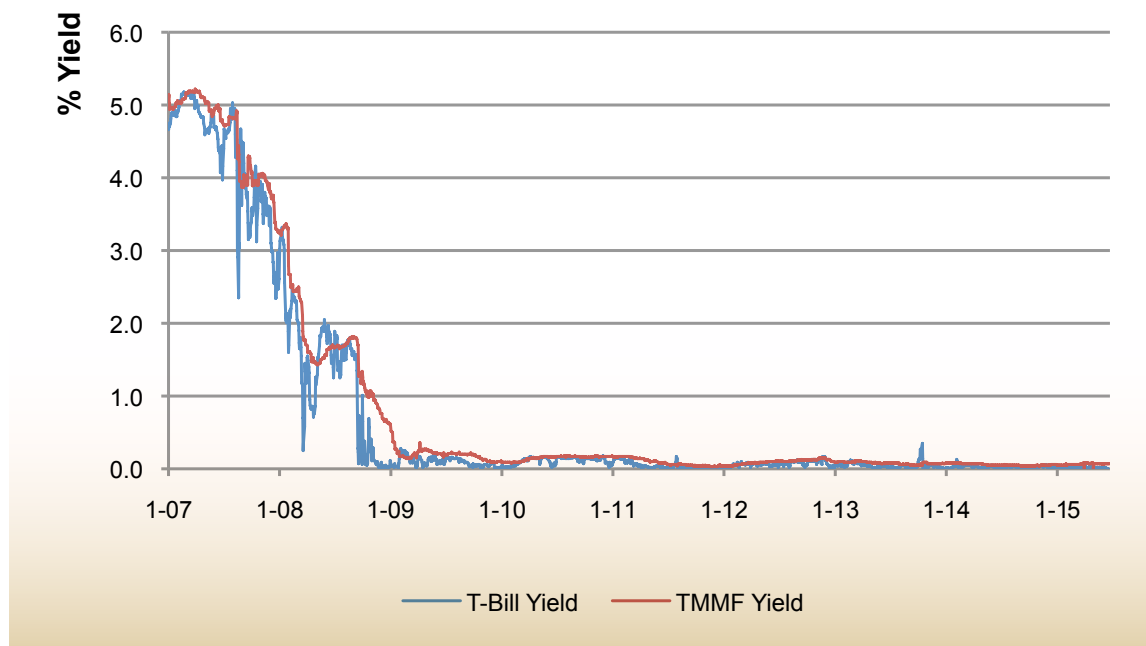
Finally, TMMFs are already accepted as collateral by two major derivatives clearinghouses in the U.S., CME Clearing and the Options Clearing Corporation. This indicates that the operational capabilities are already in place to post shares as collateral.

To compare price stability, we review the daily yields between 4-week T-Bills and a benchmark TMMF.³³ Figure 4 below compares the yields of the benchmark TMMF to T-Bills between 2007 and 2015. The analysis demonstrates that TMMFs meet the price stability criteria for functional equivalence.

While TMMF yields followed the same general trend as T-Bill yields, day-to-day swings in yield were similar in size, if not smaller. This is especially clear in the period between 2008 and 2009 where yields decreased from 5% to around 0.01% due to the decreases in market rates.

³² CraneData, Institutional Treasury Money Fund Index, May 2015.

³³ The benchmark TMMF used for our analysis is the Federated U.S. Treasury Cash Reserves Fund. Our analysis uses the gross yield before management fees or waivers are applied. This approach captures the full volatility of the underlying portfolio.

Figure 4. Daily Yield Analysis of T-Bills and Benchmark TMMF, 2007 to 2015**Description**

Comparison of annualized daily yields of 4-week T-Bills and the Federated U.S. Treasury Cash Reserves Fund from January 2007 through June 2015. Sources: U.S. Treasury, Federated Investors

It is important that collateral holds its value during time of specific market stress, not just over extended periods of time. To measure this, we examined the five most significant stress events between 2008 and 2014. For each event, we measured the standard deviation of yields on the 4-week T-Bills and the benchmark TMMF for 30 days before and after the event.

The following analysis looks at the following five market stress events:

- 2008 Market Crash, September 2008
- U.S. Debt Limit Crisis/Treasury Downgrade, August 2011
- Operation Pillar of Defense, November 2012
- US Debt Limit Showdown, October 2013
- Flash Crash in Treasuries, October 2014

September 2008: Height of Financial Crisis

After multiple major financial institution failures and near-failures in the first three quarters of 2008, markets were in deep turmoil over concerns about AIG, Merrill Lynch and Lehman Brothers. The U.S. government was able to stabilize liquidity crises at AIG and Merrill, but Lehman Brothers had to declare bankruptcy shortly after. The following week brought intense stress conditions for all money market instruments.

Analysis of the period surrounding September 2008 demonstrates TMMFs' stability during these intense stress conditions. From August to December 2008, TMMF assets grew by 56%. So while many other asset classes had significant outflows, TMMFs were a safe haven. This period saw the largest percentage monthly TMMF inflows from 2007 to 2015.

This is compelling evidence that TMMFs are no more susceptible to financial panics than T-Bills themselves, and that TMMFs are in fact a destination for a flight to quality.

The standard deviation of yields was *higher* for T-Bills than for the benchmark TMMF during this time. For the study period, the standard deviation was 1.1667% for T-Bills vs. only 0.5021% for the benchmark TMMF.

August 2011: U.S. Debt Limit Crisis/Downgrade of U.S. Government Credit Rating

In August 2011, following a bruising congressional battle over the debt ceiling, Standard and Poor's took the unprecedented action of downgrading the U.S. government credit rating from AAA to AA+. This was after issuing a negative outlook earlier in the year. This is an important assessment period for T-Bills and TMMFs, because both are strongly linked to the government's credit rating. For this analysis, we look at yield and asset data from June 2011 to December 2011.

T-Bill yields experienced large percentage swings over a short time, moving from 0.01% on July 20, to 0.16% on July 29, and back to 0.01% on August 3. This short-term disruption in T-Bill yields did not flow through to the benchmark TMMF, which maintained steady yields between 0.04% and 0.07% during this period.

TMMF assets experienced their largest one-month outflow during this time, declining 10.8% between June and July of 2011, before the downgrade. They saw a 17% inflow during the month of the downgrade. Overall, TMMF assets grew nearly 25% during the second half of 2011, one of the highest periods of duress for U.S. government debt. In contrast, Prime Money Market Fund assets declined each month of this same period except one, with a total outflow of 13.1% across the period.

The standard deviation of T-Bill yields during this period was 0.0071%, versus 0.0001% for the benchmark TMMF.

This market event should have been detrimental to U.S. federal government securities. Yet, it actually produced a net inflow into TMMFs. At the same time, the wide T-Bill yield fluctuations were not mirrored in the benchmark TMMF yields, which remained constant over the stress period.

November 2012: Operation Pillar of Defense

The Israel-Gaza conflict reached a flashpoint in November 2012. On November 14, Israel launched its “Pillar of Defense” initiative, which lasted over a week. International tensions were high. The capital markets were not immune from this tension.

T-Bill yields experienced large percentage swings, moving from 0.06% on November 1, to 0.17% on November 28, and down to 0.02% on December 13. This short-term yield disruption did not flow through to the benchmark TMMF, which maintained steady yields between 0.12% and 0.15% during this period.

The standard deviation of T-Bill yields was 0.0849% during this period, versus 0.0212% for the benchmark TMMF.

Again, this illustrates TMMF resilience during major market events, and particularly market events that impact the value of the underlying assets of TMMFs.

October 2013: U.S. Debt Limit Showdown

Markets were again on edge as the Congress and the President dug in over debt limits. This brinkmanship, as before, unnerved the markets.

T-Bill yields experienced a large percentage swing, moving from 0.03% on September 30, to 0.32% on October 15, down to 0.01% on October 17. This short-term disruption in yields did not flow through to the benchmark TMMF, which stayed between 0.05% and 0.09%.

The standard deviation of T-Bill yields was 0.0353% during this period, versus 0.0212% for the benchmark TMMF.

October 2014: Treasury Flash Crash

On October 15, 2014, the treasury securities market experienced a “flash crash” where liquidity evaporated in Treasury futures, causing prices to skyrocket and yields to plummet. Daily trading counts hit all-time highs as investors quickly responded to the unexpected price change. Trading volumes surpassed those experienced during the 2008 Lehman Brothers collapse and the 2011 downgrade of U.S. debt.

To understand how this event impacted TMMFs, we analyzed TMMF yield and asset flow data and compared against T-Bill yields.

TMMF assets were down 1.87% during October. This was well within the standard deviation for percentage inflows and outflows during the entire 2007–2015 period. Total outflows for the September 2014 to January 2015 period were only 0.52%.

The standard deviation of T-Bill yields was 0.0021% during this period, versus 0.0071% for the benchmark TMMF. This marks the only stress period of the five where the benchmark TMMF had a higher standard deviation than T-Bills, but only by an infinitesimal amount.

While TMMFs experienced outflows during this stress event, they were minimal. Again, this illustrates TMMF resilience during major market events that impact the value of the underlying assets of TMMFs.

The table below illustrates two points pertinent to the relative quality of these instruments as collateral:

- Across all five stress events, the standard deviations for yield (as a proxy for price stability) were miniscule.
- The benchmark TMMF yields were *more* stable than T-Bills themselves in all but one of the events.

Figure 5. Standard Deviation of Yields (in Percentage Points)

EVENT	DATE	4-WEEK T-BILLS ³⁴	BENCHMARK ³⁵ TMMF
2008 Market Crash	Sept. 2008	1.1667	0.5021
U.S. Debt Limit Crisis/ Treasury Downgrade	Aug. 2011	0.0071	0.0001
Operation Pillar of Defense	Nov. 2012	0.0849	0.0212
U.S. Debt Limit Showdown	Oct. 2013	0.0353	0.0141
Flash Crash in Treasuries	Oct. 2014	0.0021	0.0071

Description

Chart depicts standard deviation of daily yields expressed in basis points over the period beginning 30 days preceding the event and ending 30 days following the event, based on Treasury Strategies' analysis.

³⁴ Treasury Strategies analysis of yields on 4-week T-Bills from the Federal Reserve's H.15 report.

³⁵ Treasury Strategies analysis of gross yields on the Federated U.S. Treasury Cash Reserves fund. Separately, we studied whether using shadow NAVs would increase the standard deviation of the TMMF. Data were only available from Oct. 10, 2013 through July 2, 2015. Using those shadow NAVs would increase the standard deviations but only by 0.0019 percentage points which would have an immaterial impact on this analysis and not change any conclusions.

V. CONCLUSION

Regulators must attend to the secondary effects of newly implemented regulations. Otherwise, unchecked secondary effects could destabilize the markets meant to be strengthened. An example of this possibility is the new collateral requirements enacted by many regulatory bodies.

Increased levels and quality of collateral should increase financial market stability. Yet, this will not happen if new demands for collateral outpace the underlying supply. The effects of collateral scarcity will be more detrimental for market participants that rely on intermediaries to procure collateral, participants such as pension fund trustees, corporate treasurers and regional governmental authorities. They do not have the ability to tap alternate sources of collateral when the supply is under pressure. This lack of access and the associated concentration of collateral among large investors may quickly turn market stress into market crisis.

Compelling evidence suggests that the supply of treasury securities, a widely used and very important form of collateral, will not grow enough to keep pace with the growth in demand. Scarcity of treasury securities was observed before the financial crisis and before stricter collateral regimes were put in place. Collateral demand increases, driven by new regulatory requirements and market growth, are likely to outpace growth in the supply of collateral.

Multiple factors have combined to significantly increase collateral demand. Some of these include the overall growth of financial markets, the creation of OTC derivatives markets and Basel III banking regulations. Global demand for high-quality collateral from OTC derivatives markets is estimated at \$1.8–\$4.6 trillion; demand related to Basel III requirements is estimated at \$1.0–\$2.5 trillion. These are only two of the drivers, but they account for \$3 to \$5 trillion of new collateral demand.

Compared to the trillions of dollars of demand increase, available pools of high-quality collateral do not appear sufficient. At year-end 2014, T-Bills and other U.S. treasury securities with a maturity under one year totaled \$3.2 trillion. While these are not the only types of high quality collateral, they are a major component of supply.

Collateral scarcity can be addressed by restricting financial markets activity or increasing collateral supply with expanded acceptable forms. Obviously, the latter is preferred. If other forms of functionally equivalent, high-quality collateral can be identified, they should be permitted to help maintain the health of financial markets.

TMMFs are a strong functional equivalent to T-Bills. TMMFs are equivalent in credit quality, liquidity and operational capability. From 2007 to 2015, a period with several market stress events, TMMFs maintained absolute yields similar to T-Bills. They also had less yield variance than T-Bills and maintained stable asset levels relative to other types of money funds. Their demonstrated stability in yield and asset levels satisfies all the criteria to establish functional equivalence.

Allowing TMMFs to be used as collateral would increase the available collateral supply and create additional access points for market participants with otherwise limited sources. TMMFs currently hold about 7% of available treasury debt with maturity under one year, which is currently not available to investors for collateral purposes. Treating TMMFs as functionally equivalent to T-Bills would make this material portion of total supply available. Additionally, many smaller investors such as trustees of small- to mid-sized pension funds and corporate treasurers already have access to TMMFs.

The problem of collateral scarcity is real, and the impacts are potentially devastating. Fortunately, one straightforward solution can ease pressure on collateral supply without creating undue risks in financial markets. TMMFs are functionally equivalent to T-Bills and are accessible by investors of all sizes and levels of sophistication. We propose that the use of Treasury-Only Money Market Funds as collateral be expanded and allowed in all situations that now permit Treasury Bills as collateral.

ABOUT TREASURY STRATEGIES, INC.

Treasury Strategies, Inc. is the leading advisory firm in the areas of treasury management, payments and liquidity. Our clients include CFOs and treasurers of large- and medium-sized corporations and state/local governments. We also consult with the major global and regional banks that provide services to service the treasurer and CFO chains within these organizations.

In addition to our consulting work, we have been active in our advocacy regarding the impacts of financial regulation. Our partners have testified multiple times to the U.S. House of Representatives Committee on Financial Services on the Dodd-Frank Act and the Volcker Rule. We have also published multiple articles and white papers on the impacts of changes in money fund regulations.

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