



Post-money market reform: Considering trade-offs between short bond funds and institutional prime money market funds

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- U.S. institutional investors are increasingly considering the trade-offs between money market funds and short-term bond vehicles for the management of their liquidity reserves. The trend is a reflection of possible liquidity and accounting implications of money market reform due to take effect fully in October 2016, and concerns about the interest rate outlook.
- This paper evaluates these trade-offs by integrating both a historical return analysis and forward-looking simulations using the Vanguard Capital Markets Model® (VCMM). We consider the historical relationships of several fixed income options as well as the impact of the current low short-term interest rate environment.
- Although noting both the historical outperformance and the forecast higher expected returns of ultra-short- and short-term bond funds versus money market funds, our analysis suggests that investors who accept the additional interest rate and credit risk materially increase their probability of loss of principal. We furthermore observe that moving from a money market fund to an actively managed ultra-short- or short-term bond fund increases manager uncertainty due to the broader opportunity set of investments.

U.S. Securities and Exchange Commission rulings set to take effect in October 2016 will require floating net asset values (NAVs) on institutional prime money market funds, in addition to potential fees and other restrictions on investors to help ensure the funds' liquidity.¹ Investors in institutional prime money market funds who desire a certain level of principal protection because of short-term spending needs or liability obligations have a range of short-maturity, pooled fixed income options to consider. They can remain in their current investment vehicles; they can switch to government money market funds, which will not be subject to floating NAVs or potential fees and restrictions; or they can invest in either ultra-short- or short-term bond funds or securities as substitutes for their liquidity needs. Choosing among these options is nuanced and requires consideration of trade-offs among risks to preservation of capital, liquidity, and yield. **Figure 1** compares characteristics of these investment vehicles.

Given the prospect of higher yields that short-term bond funds might offer and their potentially increased flexibility, the small increase in fund duration may seem worth the risk. Based on both customized and industry indexes used for this study's analysis, we observed 60 and 140 basis points in respective yield advantages on average historically, for ultra-short and short-term credit investments relative to prime money market options.² However, moving from a tightly regulated money market fund to a short-term bond fund that is often actively managed presents key risk–return trade-offs that should be evaluated. This paper aims to help investors better understand these trade-offs, so that they can determine whether ultra-short- and short-term bonds may be appropriate for their liquidity pool of assets. We do not specifically address trade-offs between government/U.S. Treasury and prime money market funds, although we acknowledge that yield

(Continued on page 4)

Notes on risk

IMPORTANT: The projections or other information generated by the Vanguard Capital Markets Model® (VCMM) regarding the likelihood of various investment outcomes are hypothetical in nature, do not reflect actual investment results, and are not guarantees of future results. Distribution of return outcomes from the VCMM are derived from 10,000 simulations for each modeled asset class. Simulations are as of December 31, 2015. Results from the model may vary with each use and over time. For more information, see the appendix.

All investments are subject to risk, including the possible loss of the money you invest. Past performance is no guarantee of future returns. The performance of an index is not an exact representation of any particular investment, as you cannot invest directly in an index. There may be other material differences between products that must be considered prior to investing. Diversification does not ensure a profit or protect against a loss in a declining market. There is no guarantee that any particular asset allocation or mix of funds will meet your investment objectives or provide you with a given level of income.

Be aware that fluctuations in the financial markets and other factors may cause declines in the value of your account. Bond funds are subject to the risk that an issuer will fail to make payments on time, and that bond prices will decline because of rising interest rates or negative perceptions of an issuer's ability to make payments.

¹ Note: In the rulings due to take effect in October 2016, retail prime money market funds will not be subject to floating net asset values, but will have the potential for imposition of liquidity fees and redemption suspensions. By contrast, government money market funds will not be subject to floating net asset values, fees, or redemption suspensions.

² For much of this analysis, we constructed customized hypothetical bond indexes using data from Barclays POINT for the period January 1992 through September 2015. The sector composition for the ultra-short-term bond index was based on industry ultra-short-term bond-fund sector weights in the Morningstar database over the analysis period and the makeup of Vanguard Ultra-Short-Term Bond Fund. The U.S. government money market index combined U.S. Treasury and agency securities, while the prime money market index also included seasoned corporate bonds with 60-day weighted average maturities. Although the custom prime money market index matches the risk-factor sensitivities of a pure money market fund, seasoned corporate bonds used may have higher yields than commercial paper, which is a typical prime money market holding. This may upwardly bias historical prime money market return distributions presented in this paper's **Figure 2**. The short-term credit index was represented by the standard Barclays U.S. 1–5 Year Credit Bond Index.

Figure 1. Comparing characteristics of money market funds, ultra-short-term and short-term bond funds, and stable value funds

Type	Underlying investments	Term/duration	Accounting method	Liquidity
Money market funds (U.S. government and prime)	U.S. Treasury bills and notes, U.S. government-agency securities, repurchase agreements, and (prime only) commercial paper, certificates of deposit (CDs), time deposits, and municipal bonds.	Maximum 60-day weighted average maturity.	U.S. government and retail prime: amortized cost, which smooths price movements. Institutional prime: market value (effective October 14, 2016).	U.S. government: Can redeem shares any time. Institutional and retail prime: Potentially up to 2% redemption fees and ten-day redemption suspensions, if weekly liquid assets drop below 30% (according to SEC rulings due to take effect October 14, 2016). The regulations further require that if weekly liquid assets fall below 10% of total assets, non-U.S. government funds must impose a 1% liquidity fee, unless the board of directors determines it would not be in the fund's best interest.
Ultra-short-term bond funds	Treasury and agency securities, corporate bonds, asset-backed securities, and residential and commercial mortgage-backed securities.	Average duration or average effective maturity of approximately 1 year.	Market value.	Can redeem shares any time.
Short-term bond funds	May vary in accordance with mandate—some funds may hold only government securities, while others include short-term corporate securities, asset-backed securities, and residential and commercial mortgage-backed securities.	Average duration of 2–3 years.	Market value.	Can redeem shares any time.
Stable value funds	A short-term option used almost exclusively in 401(k) plans. The funds invest in U.S. government and corporate bonds, typically with maturities of 1–5 years, which are wrapped by insurers to allow for stable value withdrawals. Stable value funds may also hold guaranteed investment contracts and money market funds.	Average duration of 1–3 years.	Book-value accounting, which smooths price movements.	Participants can redeem shares any time, subject to equity wash rules. Plan sponsors may have restrictions on fully eliminating the fund from a plan.

Notes: Stable value funds are generally available only in defined-contribution and other types of saving plans. Since they are not broadly owned beyond retirement plans, stable value funds are not evaluated in this paper. See LaBarge (2009; 2011) for further discussion of stable value fund characteristics.

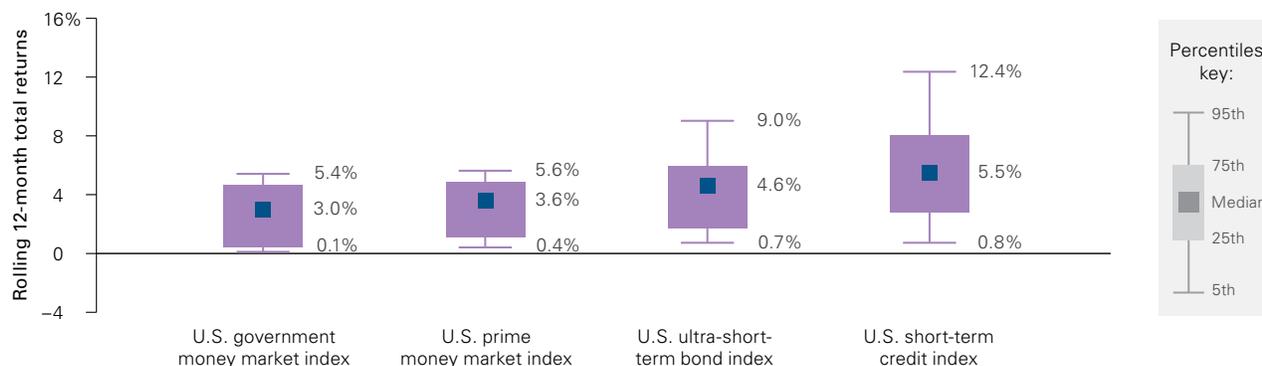
Source: Vanguard.

spreads between them have historically been quite modest. For instance, the SEC yield differential between Vanguard Prime Money Market Fund (Investor Shares) and Vanguard Federal Money Market Fund (Investor Shares) has averaged 5 bps annually since 1995 (Source: Vanguard calculation). Some institutional investors may also be considering the impact of redemption fees and suspensions on their prime money market funds. The potential imposition of such fees/suspensions is a function of whether weekly liquid assets fall below a 30% threshold level and is also subject to the discretion of the fund's board of directors. Although we do not address factors affecting the occurrence of fees/suspensions in this paper, we encourage investors who remain in prime money market funds to monitor the percentage of weekly liquid assets in their funds.

Fixed income investors are compensated for bearing three primary types of risks—duration or term risk, credit risk, and risk from negative convexity.³ More specifically:

Term premium is the compensation required for bearing the risk that interest rates do not evolve as expected; credit bonds are issued at a positive yield spread over comparable-maturity U.S. Treasury bonds to compensate investors for possible default;⁴ and callable bonds and those with prepayment risk are characterized as having a negatively convex price and yield relationship (i.e., duration may extend [or shorten] as interest rates rise [or fall], causing underperformance) for which investors also require compensation. Although investors can expect to earn additional yield for bearing these risks, exposure to them also creates additional return volatility in the portfolio. Money market funds and conservative ultra-short- and short-term bond portfolios are generally exposed to interest rate and credit risk. Ultra-short- and short-term bond funds may also have modest negative-convexity risk, to the extent that they hold mortgage-backed securities. In **Figure 2**, when evaluating the trailing 12-month return distributions of the bond indexes, it is evident that, as the term of the underlying investments

Figure 2. Higher median returns accompany wider return distributions



Notes: Chart represents hypothetical gross return distributions for Vanguard-created, customized indexes based on trailing 12-month gross returns from Barclays POINT for January 1992 through September 2015. See footnote 2 for description of the customized indexes.

Sources: Vanguard calculations, based on data from Barclays POINT.

³ Other risks for fixed income investors may include liquidity risk and counterparty, reinvestment, and collateral risk, to the extent that a fund uses derivatives and engages in securities lending.

⁴ Studies have documented that yield spreads of credit bonds are larger than have been justified by subsequent default rates. Explanations for additional credit spread include liquidity costs and a general risk premium. See Ng and Phelps (2011) and Elton, Gruber, and Mann (2001).

increases from money market securities to short-term bonds, the historical result has been higher returns throughout the distribution. At the same time, we recognize that these higher returns have been associated with a notably wider distribution of outcomes.

The increased uncertainty in the return distributions of the ultra-short- and short-term bond indexes arises primarily from differences in the duration of their interest rate and credit risk. A decomposition of historical returns by type of risk is instructive in establishing a risk profile. A fixed income portfolio's excess return, defined as the portfolio's total return less the total return of a duration-matched U.S. Treasury security, isolates return behavior from credit exposure. One can similarly observe return behavior relative to exposure to key interest rates

(i.e., observing duration-matched Treasury bond returns). **Figure 3** illustrates two primary points in relation to the decomposition of return behavior over a 15-year subset of our overall analysis period.

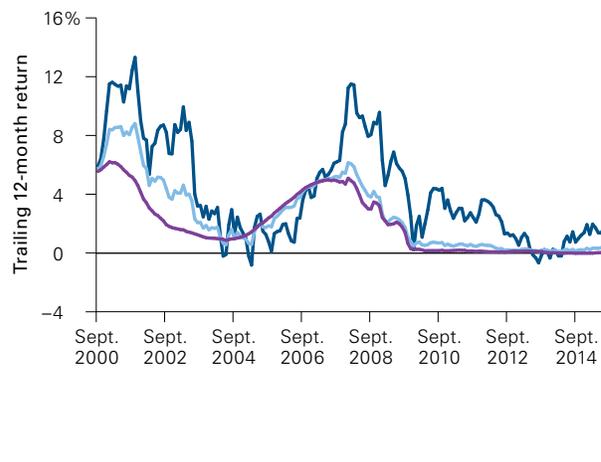
- As Figure 3a highlights, when comparing credit risk of money markets versus ultra-short-term and short-term bond indexes during the global financial crisis of 2007–2009, the ultra-short- and short-term credit indexes suffered significant losses from credit exposure before rebounding after the crisis, while the mark-to-market money market index experienced little, if any, volatility. Given the extremely short-duration profiles of conservatively managed prime money market funds, it would take a much larger widening in credit spreads for these funds to experience losses.⁵

Figure 3. During the global financial crisis, ultra-short-term bond index credit returns behaved similarly to those of short credit, while since the crisis the corresponding return behavior from interest rate exposure has been closely aligned with that of the prime money market index

a. Returns attributed to credit exposure



b. Returns attributed to interest rate exposure



Notes: Chart represents hypothetical monthly gross return data for Vanguard-created, customized indexes based on Barclays POINT for a subset of our analysis period: September 2000 through September 2015. (Note that despite our study's overall analysis period of 20-plus years, this chart disregards results for the early years as unremarkable.) See footnote 2 for description of the customized indexes.

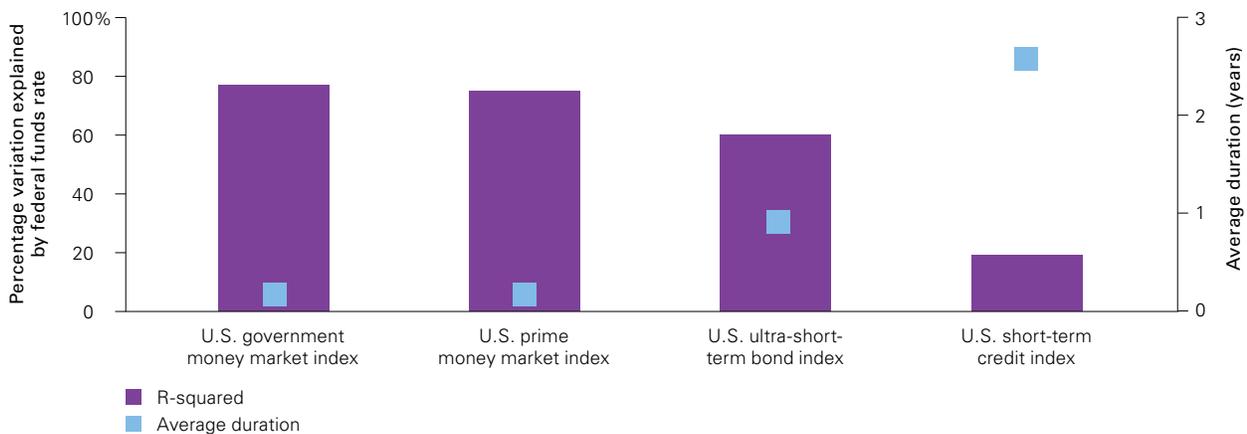
Sources: Vanguard calculations, based on data from Barclays POINT.

⁵ See Glocke, Hammer, and Ameriks (2012) for commentary on how Vanguard's conservative money market investment management approach was instrumental during the financial crisis of 2007–2009.

- When reviewing return behavior with respect to interest rate exposure since the financial crisis, returns of both the prime money market index and the ultra-short index have been anchored near zero (see Figure 3b). The tight performance is due partly to the fact that the U.S. Federal Reserve has kept the target federal funds rate at extremely low levels since late 2008, and only began the move to “normalize” interest rate policy in mid-December 2015. As Figure 4 depicts, the federal funds rate level has explained 75% of the variation in money

market duration-matched Treasury bond returns. By comparison, the federal funds rate level has explained 60% of the variation in ultra-short bond duration-matched Treasury returns and only 19% of the variation in short-term credit returns. The Fed’s move to begin policy normalization from the zero-lower-bound level will likely mean that the behavior of the ultra-short-term bond index return as a result of interest rate exposure will revert to its pre-global financial crisis volatility.

Figure 4. As duration increases, federal funds rate level explains less return variation from interest rate exposure



Notes: This hypothetical illustration does not reflect returns of any specific investment. Data cover January 1992 through September 2015. Vanguard-calculated R-squared for each customized index represents percentage of variation from trailing 12-month duration-matched U.S. Treasury bond returns that is explained by federal funds rate. Average duration is based on Barclays POINT calculations for the analysis period. See footnote 2 for description of the customized indexes.

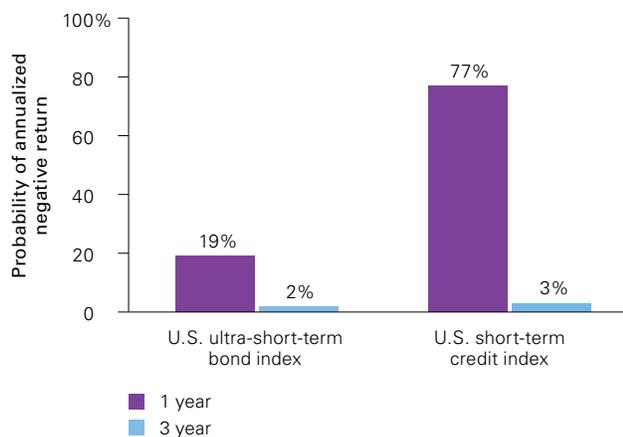
Sources: Vanguard calculations, based on data from Bloomberg and Barclays.

Owing to the importance of initial yield levels for subsequent bond returns, we next evaluated forward-looking expectations for principal loss across the selected investment options using the Vanguard Capital Markets Model (VCMM), Vanguard’s proprietary financial simulation engine (see also notes on page 2 and the appendix, for more information on the VCMM).⁶ Figure 5 measures the probability of experiencing negative returns over one- and three-year periods during the following ten years. The figure indicates that, over a one-year horizon, the probability of loss from taking longer-duration interest

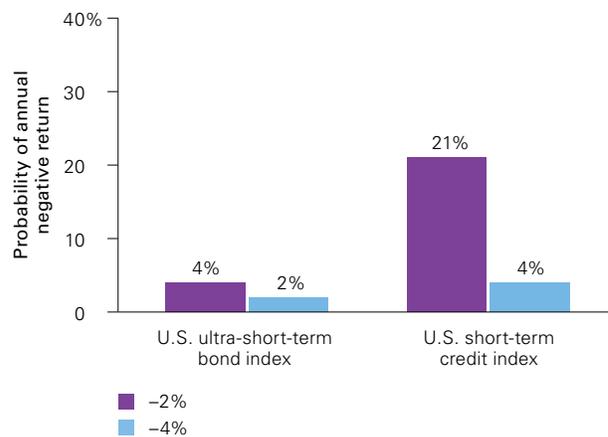
rate and credit risk is expected to be greater than was observed in the historical time period summarized earlier in Figure 2. During that two-decade-plus span, money market index total returns were positive in each rolling 12-month period, while the ultra-short- and short-term credit indexes only experienced negative trailing 12-month returns during the global financial crisis. The difference in the forward outlook is a result of the current low interest rate environment in which comparatively lower yields provide a smaller cushion from price volatility when an investor is seeking to protect principal.⁷

Figure 5. Negative returns increase in likelihood and potentially in magnitude as maturity of bond holdings increases

a. Potential for negative return



b. Magnitude of potential negative return over one year



Notes: These hypothetical illustrations do not reflect returns of any specific investment. See footnote 2 for description of the customized indexes cited here. Money market indexes are not shown in this chart because they displayed less than a 1% probability of loss over a one-year horizon.

Sources: Vanguard, based on VCMM return forecast distributions as of December 31, 2015.

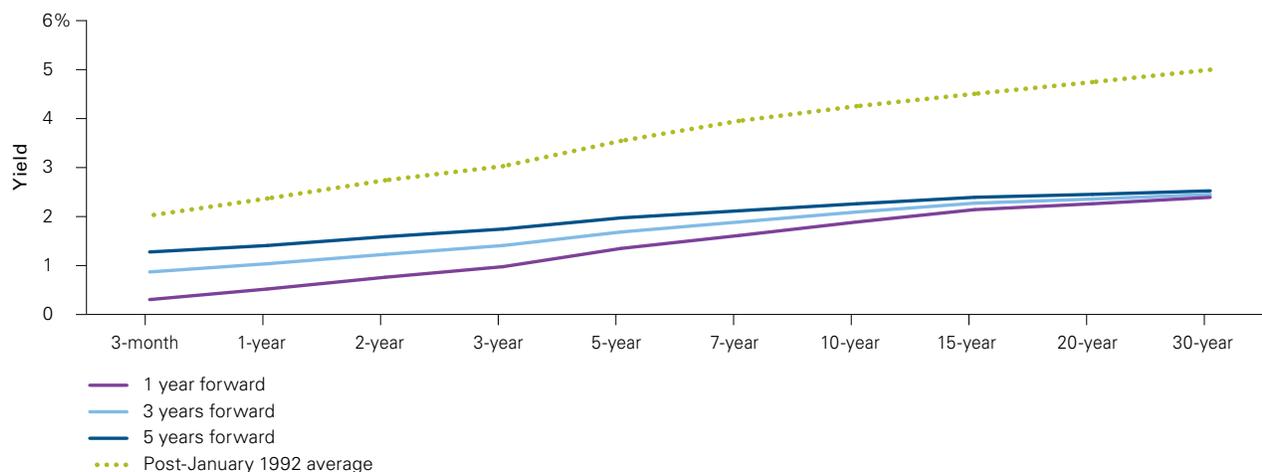
⁶ The VCMM simulates forward-looking return distributions for a wide array of global asset classes and is designed to help clients make effective asset allocation decisions. (See also Davis et al. [2014] for more information about the model’s design and characteristics.)

⁷ We simulated money market proxy index and ultra-short- index excess returns using VCMM Monte Carlo techniques. Forward-looking total-return distributions were simulated by adding money market index excess returns to the 3-month T-bill forecast and the ultra-short- bond index excess returns to the 1-year Treasury forecast. Short-term credit index return distributions were previously modeled and forecast in the VCMM (see also the appendix).

Only the money market indexes continue to exhibit nearly certain principal protection (unless an investor chooses to withdraw in a period when a liquidity fee is imposed), while relative probabilities for loss and loss magnitude increase as investors move along the maturity spectrum to short-term bond indexes. If an investor's time horizon, however, exceeds the duration of a money market fund, allowing him or her to tolerate greater return volatility, the investor can be rewarded for taking on the longer-term interest rate and credit risk. **Figure 6** illustrates the median

yield curve one, three, and five years forward as forecast by the VCMM. Although the future expected yield curves are flatter and the levels are lower relative to history, their upward-sloping nature is indicative of an initial yield advantage for longer-term bonds of similar credit risk.⁸ Initial yield advantages do not guarantee outperformance, however, because adverse interest rate and credit-spread movements may cause negative price changes that offset the yield advantage.

Figure 6. Forward-looking view suggests flatter yield curves and lower yield levels relative to history



Notes: This hypothetical illustration does not reflect results of any specific investment. Chart reflects VCMM median yield-curve forecasts. Median projected yield curves over the cited horizons match forward yield curves implied by U.S. Treasury bond yield curve as of December 31, 2015.

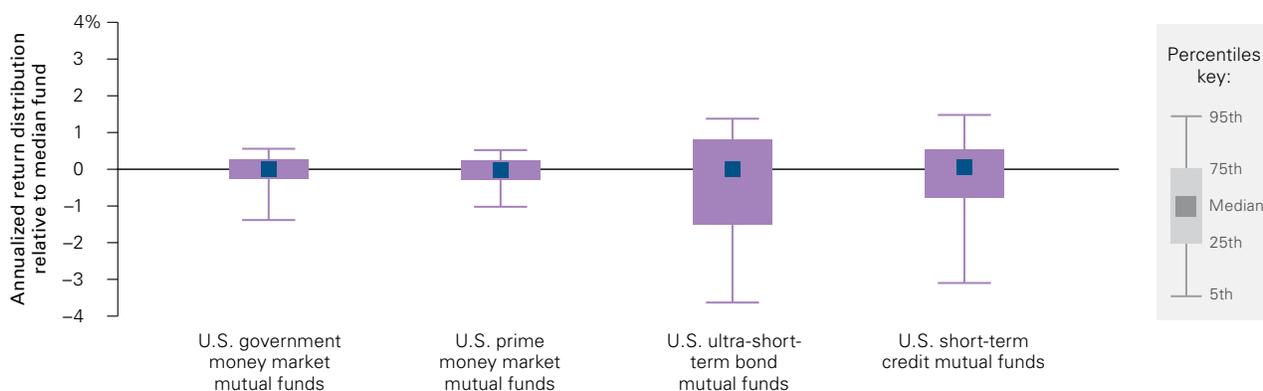
Sources: Vanguard, based on VCMM yield-curve forecast distributions. "Post-January 1992 average" is based on data from Thomson Reuters Datastream.

⁸ For an explanation of why the VCMM median projected yield curve is expected to be lower than the historical average, see Davis et al. (2015). See Davis et al. (2012) for further discussion about bond investing in a rising rate environment.

In addition to differences in market risk that may result from moving to ultra-short-term or short-term bond funds from money market funds, implementation risk may also increase in the form of manager uncertainty.⁹ Although money market funds will remain tightly regulated by the SEC, and have a much more limited investment opportunity set than other investment options discussed here (see the descriptions in Figure 1), the U.S. ultra-short- and short-term bond fund opportunity set is derived from the more heterogeneous capital markets, spanning longer terms and crossing various credit sectors. As such, managers have much more discretion in terms of yield-curve positioning and credit risk-taking, and may also

consider the negative-convexity risk premium, which is typically obtained through purchases of U.S. agency and non-agency residential mortgage-backed securities (RMBS).¹⁰ Although most ultra-short-term bond funds have durations of about 1 year, and the duration of most short-term funds is between 2 and 3 years, variation in portfolio positioning relative to the yield curve and credit risk may be obscured by looking at the “duration” metric alone. As a result, and as **Figure 7** depicts, there is wider dispersion of returns among the cross-section of managers, which suggests greater manager uncertainty when selecting an active manager.

Figure 7. Extending maturities beyond money markets increases manager uncertainty



Notes: Return distributions based on data provided by Morningstar for mutual funds domiciled in the United States from January 1992 through August 2008. Returns after August 2008 were removed due to zero-lower-bound federal funds rate policy. This Fed policy established a near-zero return environment for money market funds and created the perception of increased dispersion. We adjusted return distributions in this chart so that the median is at zero, to emphasize dispersion. Thus, as stated, the numbers presented are not actual return experiences.

Sources: Vanguard calculations, based on data from Morningstar, Inc.

⁹ Investors may choose to index a short-term bond portfolio, which largely negates manager uncertainty, but our recent review of ultra-short-term bond funds in the Morningstar database indicated that passive implementation was not available.

¹⁰ MBS investors have exposure to nonlinear interest rate risk in the form of duration extension and contraction risk. See Rowley (2013) for further discussion of MBS security characteristics.

Conclusion

The possible liquidity and accounting implications of expected money market reform have led investors to evaluate ultra-short-term and short-term bond funds as substitutes for their cash management needs. As this paper has demonstrated, the decision to extend investment duration in this manner requires an understanding of the risk–return trade-offs. Although history suggests higher expected returns as investors add duration and credit risk to a bond portfolio—a contention that is also supported by forward-looking simulations from the Vanguard Capital Markets Model—we see the additional risk as two-fold: first, greater risk to principal protection from the longer-duration interest rate and credit exposure and, second, risk from manager uncertainty. Given the ongoing low interest rate environment, we would expect a material increase in the probability for principal loss, while investor selection of active management in longer-term capital markets could lead to wider dispersion in return outcomes compared with those of money market managers.

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Appendix. About the Vanguard Capital Markets Model

IMPORTANT: The projections or other information generated by the Vanguard Capital Markets Model regarding the likelihood of various investment outcomes are hypothetical in nature, do not reflect actual investment results, and are not guarantees of future results. VCMM results will vary with each use and over time.

The VCMM projections are based on a statistical analysis of historical data. Future returns may behave differently from the historical patterns captured in the VCMM. More important, the VCMM may be underestimating extreme negative scenarios unobserved in the historical period on which the model estimation is based.

The VCMM is a proprietary financial simulation tool developed and maintained by Vanguard's Investment Strategy Group. The model forecasts distributions of future returns for a wide array of broad asset classes. Those asset classes include U.S. and international equity markets, several maturities of the U.S. Treasury and corporate fixed income markets, international fixed income markets, U.S. money markets, commodities, and certain alternative investment strategies. The theoretical and empirical foundation for the VCMM is that the returns

of various asset classes reflect the compensation investors require for bearing different types of systematic risk (beta). At the core of the model are estimates of the dynamic statistical relationship between risk factors and asset returns, obtained from statistical analysis based on available monthly financial and economic data. Using a system of estimated equations, the model then applies a Monte Carlo simulation method to project the estimated interrelationships among risk factors and asset classes as well as uncertainty and randomness over time. The model generates a large set of simulated outcomes for each asset class over several time horizons. Forecasts are obtained by computing measures of central tendency in these simulations. Results produced by the tool will vary with each use and over time.

The primary value of the VCMM is in its application to analyzing potential client portfolios. VCMM asset-class forecasts—comprising distributions of expected returns, volatilities, and correlations—are key to the evaluation of potential downside risks, various risk–return trade-offs, and the diversification benefits of various asset classes. Although central tendencies are generated in any return distribution, Vanguard stresses that focusing on the full range of potential outcomes for the assets considered is the most effective way to use VCMM output.

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