The Macroeconomic Outlook and Liability Management Strategies

Niso Abuaf

The current macroeconomic outlook presents a duality: On the one hand, Federal Reserve forecasters believe that short-term rates will remain excessively low (0-25 basis points) for a prolonged time period, possibly extending into 2015. On the other hand, the balance sheet of the Federal Reserve has nearly tripled ($850 billion versus approximately $3 trillion) since the onset of the great contraction of 2007 – 2009, possibly suggesting skyrocketing future inflation accompanied by skyrocketing interest rates. This duality intuitively suggests that an optimal funding strategy might consist of short-term borrowings (to exploit the low short-term rates) coupled with long-term borrowings (to hedge against rising inflation and interest rates). In this paper, I empirically demonstrate that a barbell funding strategy is indeed on the efficient frontier, and most efficient frontier strategies consist of the barbell with episodic inclusions of the 5-year, particularly under increased liquidity or funding risk eventualities. Once we delineate the efficient frontier, the Chief Financial Officer (CFO) can choose the optimal fixed versus floating mix based on his pain tolerance for declines in earnings per share (EPS) given likely moves in short term rates.

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■As stated in the abstract, the current macroeconomic outlook presents a duality: exceedingly low short-term interest rates in the medium term, offset by inflation and correspondingly higher interest-rate risk due to globally ballooning Central Bank balance sheets (see Ferguson, 2008). Federal Open Market Committee (FOMC) forecasters' views show that the fed-funds rate has a central tendency of 4%-2% real rate plus 2% inflation only beyond 2015.

The main reasons behind this very low interest-rate environment are twofold: first, the unemployment rate is significantly higher than its steady state level (slightly below 8% versus 5%), and second inflation is not significantly higher (maybe even lower depending on how you measure it) than its policy level of about 2% to 2.5% p.a. The Federal Reserve follows some version of the frequently-cited Taylor rule, or framework, which suggests that the Fed-Funds rate equals the long-run real rate (about 2%) plus the steady-state inflation rate (approximately 2% to 2.5%) and a weighted average of the gross domestic product (GDP) gap and the inflation gap. Though there are many interpretations of the Taylor rule, most economists would agree that the current environment implies a very low or even a negative Fed Funds rate that will remain as such until the unemployment rate is on its way to reaching its full-employment level. Under normal circumstances such an increase in base (or high-powered) money would have resulted in significant levels of inflation. Currently, however, because the money multiplier has declined significantly due to the 2007-2009 contraction, M1 and M2 have not grown as fast as high-powered money. And, heretofore inflation has not materialized. Nonetheless, global economic history suggests that inflation may hit suddenly and violently. Thus, this is

the current macroeconomic duality: very low interest rates projecting into the medium-term future offset by high-levels of inflation risk.

This duality intuitively suggests that an optimal funding strategy might consist of short term borrowings (to exploit the low short-term rates) coupled with long-term borrowings (to hedge against rising inflation and interest rates).

In this paper, I empirically demonstrate that a barbell funding strategy is indeed on the efficient frontier, and most efficient frontier strategies consist of the barbell with episodic inclusions of the 5-year, particularly under increased liquidity or funding risk eventualities. Once we delineate the efficient frontier, the Chief Financial Officer (CFO) can choose the optimal fixed versus floating mix based on his pain tolerance for declines in earnings per share (EPS) given likely moves in short term rates.

In addition to pain tolerance considerations in choosing his fixed versus floating strategy, the CFO also looks at comparables analysis of the industry he is operating at. Various industries will have differing fixed versus floating characteristics depending on their capital structures and the sensitivity of the particular industry to interest rates.

Most CFOs that I have had conversations with state that the most important choice in liability management is the fixed versus floating mix and not the maturity mix. Nonetheless, I posit that the maturity mix should be predicated on an efficient frontier type analysis combined with a stochastic determination of which instrument would be the likely winner over a planning horizon.

Section I of this paper summarizes the macroeconomic environment. After surveying the theory and the literature, Section II embarks on an experiment to construct funding portfolios using approximately 60 years of historical interest rates comprising approximately of 30 years of rising and 30 years of falling rates. Constructing portfolios of short, medium and long term instruments, Section II shows that most of the time, the efficient frontier portfolios consist of barbell strategies (i.e. very-short and very-long instruments). And, Section III concludes the paper.

I. The Macroeconomic Environment

The current macroeconomic environment is characterized by a persistently high unemployment rate (almost 8% versus 5%) and an anemic GDP growth rate that fails to create sufficient activity to absorb the unemployment gap. According to the well-known Okun rule, GDP has to grow by approximately two percentage points to soak up one percentage point of unemployment. This rule means that for unemployment to fall to its steady-state level of 5%, GDP has to grow by 9% in one year or by 4% for six years (assuming that the run rate of GDP is 3% per year); this is not happening.

According to another well-known rule (Taylor), or the Taylor framework, as New York Federal Reserve President William Dudley likes to refer to it, the Fed-Funds target rate equals the real rate plus core inflation plus a 50-50 weighted average of excess inflation (with positive influence) and the Okun factor (about two) times excess unemployment (with negative influence). In the current environment with unusually high unemployment and low inflation, some versions of the rule call for negative rates. Indeed, in an August 2012 interview on CNBC, St. Louis Federal Reserve President James Bullard has suggested that he is moving closer to support negative interest rates. This observation is yet another indication that short-term rates may stay low for a prolonged period.

The Taylor framework can be interpreted in a variety of ways, and is subject to numerous interpretations:

- The constants comprising the real rate and core inflation are not necessarily time invariant.
- The inflation and unemployment gaps do not necessarily have to have 50-50 weights.
- The above gaps do not necessarily need to be measured contemporaneously, but instead can be estimated over a forecast horizon.
- Inflation does not necessarily need to be measured with the consumer price index (CPI), but instead could be measured by another variable such as the personal consumption expenditures (PCE) deflator.

A full exploration of the Taylor rule is beyond the scope of this paper. For a full analysis of the Taylor rule, see Dudley (2012) and Bernanke (2010). Nonetheless, the major implication of the Taylor rule is that the Fed-Funds rate may remain very low for a prolonged time period, as summarized by the FOMC (March 2013):

- "In particular, the Committee decided to keep the target range for the federal funds rate at 0 to ¼% and currently anticipates that this exceptionally low range for the federal funds rate will be appropriate at least as long as the unemployment rate remains above 6.5%, inflation between one and two years ahead is projected to be no more than a half percentage point above the Committee's two percent longer-run goal, and longer-term inflation expectations continue to be well anchored."

Looking at this problem from another angle, we find that a simple regression analysis of the percentage change of year-on-year private payrolls versus percentage change of year-to-year private real investment in 1990-2011 suggests that the level of employment is highly correlated with private sector investment activity (adjusted R^2 of 87%).

Unfortunately, investment activity is at a lackluster level due to a combination of the uncertain political environment and the lack of perceived consumer demand.

The other leg of our macroeconomic duality is the growth of the Fed's balance sheet since the onset of the great contraction (from around $850 billion to around $3 trillion). Interestingly, this rate of increase has not flowed through to the M1 and M2 aggregates, primarily because of the contraction of the money multipliers due to our current economic malaise. Stated differently, a very large proportion of the base money created by the Fed has been sitting on the balance sheets of the commercial banks, and not being lent out (as of 4/24/2013, depository institutions had around $2 trillion in deposits at the Federal Reserve). However, as the recently deceased Anna Schwartz and the Nobel Prize-winning economist Milton Friedman (1971) have stated in their *Monetary History of the United States*, inflation is always and everywhere a monetary phenomenon. This statement forms the basis of the second leg of our macroeconomic duality, namely that inflation may spike up any time if the money multipliers revert to their long-term means, or if depository institutions start lending out their deposits held at the Fed.

Moreover, the pre versus post-contraction size of the balance sheet of the European Central Bank has also increased in a similar fashion to that of the Fed's (from around €1.2 Trillion to €3 Trillion). The central banks of the UK (total assets from around £100 billion to around £400 billion), and recently Japan (holdings of government securities from around ¥74 trillion to ¥134 trillion) have also been on similar growth sprees. Though forecasting is a risky undertaking, such central bank activity does indeed increase the probability of a global inflation.

II. Seeking Efficient Frontier Portfolios

A. Theory and Literature Survey

According to the seminal Miller and Modigliani (1958, 1961) (M&M) theorem and its logical extensions, in perfect capital markets with no taxes; no transaction costs; no bankruptcy or distress costs; no agency costs; no information asymmetries and no signaling; no accounting illusions; no clientele effects; no behavioral-finance type irrationalities or imperfections of any sort; no impediments to capital-markets access; and no market under or over-reactions, the structure of debt as this decision relates to the maturity profile and the fixed versus floating mix of debt has no impact on the value of the firm. It follows that for debt structure and liability management decisions to matter, one or more of the above "imperfections" that the M&M theorem abstracts from need to matter.

Indeed, as reported in Servaes, Tufano, Ballingall, Crockett, and Heine (2006):

- *"Generally, volatile cash flows are costly because they increase expected tax costs and exacerbate information asymmetries.*
- *Floating rate debt is generally cheaper than fixed rate debt but may lead to increased volatility.*
  - *If, however, interest rates are positively correlated with cash flows and/or negatively correlated with investment needs, floating rate debt may reduce volatility by acting as a partial natural hedge.*
- *The debt maturity decision is driven by the desire to mitigate rollover risk and a variety of other factors relating to risk transfer between debt and equity investors.*
- *The currency mix of debt is driven by the desire to reduce the risk associated with foreign assets. Cash flows and earnings as well as various market and regulatory factors such as market depth and relative taxes.*
- *The choice between public debt and bank debt is affected by relative transaction costs and a variety of factors relating to information asymmetries.*

Survey Results – Servaes et al. (2006)

- *Firms are very sophisticated when it comes to debt structure. More than half of the firms have specific targets for fixed/floating mix, short-term/long-term debt, average maturity, duration, and the fraction of borrowing done from the banking sector.*
- *Pricing is the most important element when considering debt structure and the issuance of hybrids.*
  - *Firms consider current pricing as well as current prices relative to expectations and relative to historical norms. As such, firms often take a view on future price movements when structuring their debt.*
  - *Firms often decide on the structure of their debt without fully considering the firm's assets. This is especially the case when firms decide on the fixed/floating mix of debt.*
  - *When it comes to deciding on maturity structure and debt currency mix. The structure of the firm's assets is more important, but even for those elements of debt structure, pricing factors receive a lot of weight.*
- *Overall, the link between academic and practitioner considerations is weaker than anticipated."*

Also, Brobst and Huang (2002) report that of the Fortune 100 non-financial companies they have examined, more than

56% of their hedged debt carries a fixed rate. These authors also report that:

"In general, the higher a company's credit rating, the lower the share of fixed-rate debt it carries (except for non-investment grade and non-rated companies).

For many industries, the range of debt mixes is substantial; indicating that optimal debt mix is not widely agreed upon for a given industry. Only retail, telecommunications, utility and non-energy commodity and chemical industries demonstrate reasonably homogenous debt mixes across all observed companies. All industries except manufacturing have an average fixed-debt proportion above 50%.

In general, companies use more floating-rate debt when other financial measures indicate sufficient financial strength to endure additional interest-rate exposure. However, even accounting for these attributes, the proportions of fixed- and floating-rate debt vary widely, suggesting that there is no scientific answer to the question of what is an appropriate debt mix. "

Consistent with the implications of the M&M theorems, Chava and Purnanandam (2006) report:

"We find that Chief Financial Officer's (CFO's) (not CEO's) incentive has a strong influence on firm's debt structure. These effects are especially strong for CFOs that are not subject to high monitoring by board members, CEOs, or corporate control market. Our findings suggest that agency problems at the level of non-CEO executives may be an important driver of various corporate decisions."

Though the academic understanding on the optimal maturity mix of debt has been evolving, in my opinion, it fails to provide a playbook for CFOs. For example, Stohs and Mauer (1996) write:

- "We examine the empirical determinants of debt maturity structure using a maturity structure measure that incorporates detailed information about all of a firm's liabilities. We find that larger, less risky firms, with longer-term asset maturities use longer-term debt. Additionally, debt maturity varies inversely with earnings surprises and a firm's effective tax rate, but there is only mixed support for an inverse relation with growth opportunities. We find strong support for the prediction of a non-monotonic relation between debt maturity and bond rating: firms with high or very low bond ratings use shorter-debt."

Rauh and Sufi (2010) continue:

- "Furthermore, cross-sectional correlations between traditional determinants of capital structure (such as profitability) and different debt types are heterogeneous. These findings suggest that an understanding of corporate capital structure necessitates an understanding of how and why firms use multiple types, sources, and priorities of corporate debt."

In their recent review, Graham and Leary (2011), point out that the research on the optimal maturity mix of debt is incomplete:

- "For example, is it more important to understand a firm's ratio of total debt to value or whether the debt is composed of short-term debt, long-term debt or a debt substitute? While difficult to determine, the value-relevance of these issues might help guide the profession going forward."

B. The Experiment

Our experiment relies on approximately 60 years of US interest rates, April 1953 to Nov 2011. Up until late-summer to early-fall 1981, US interest rates trended up, primarily driven by rising inflation. Since then, the trend has reversed itself, primarily by falling inflation, but also by declining real interest rates, particularly after the onset of the 2007 - 2009 great contraction.

Because issuing long-term (short-term) is beneficial in a rising (falling) interest rate environment, the liability management decision is effectively a forecasting exercise. This conclusion would not hold in an environment where interest rates might either be increasing or decreasing. As such, we test our portfolios in various environments.

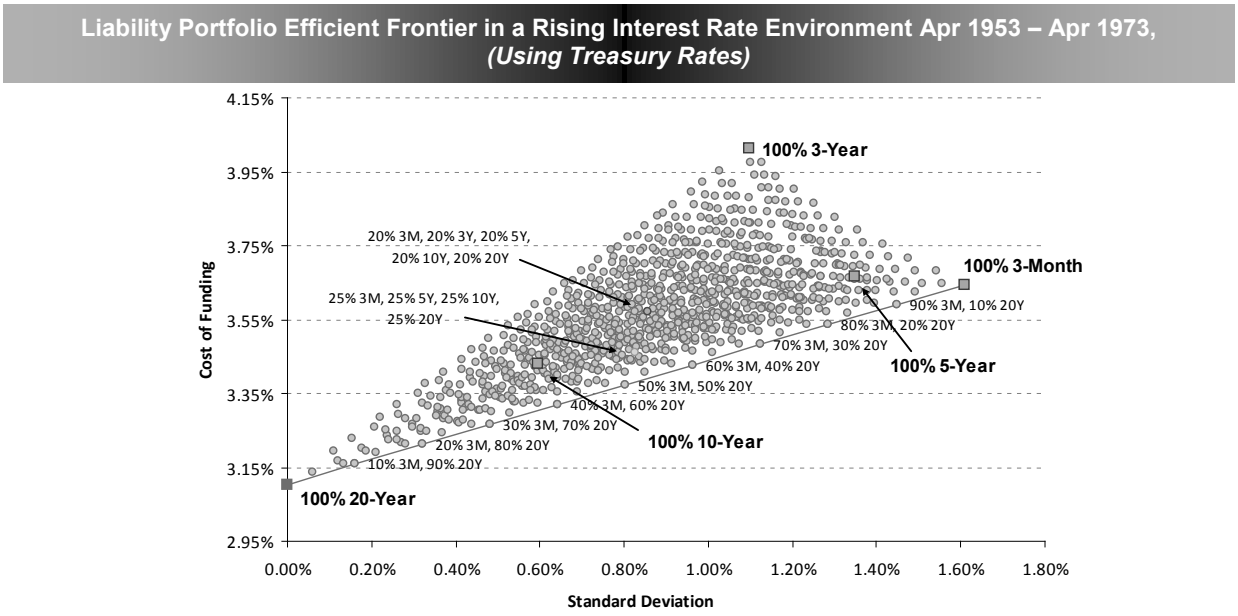
Our experiment consists of building all the possible combinations of portfolios consisting of five instruments (3M, 3Y, 5Y, 10Y, and 30Y) in ten percentage point increments, and calculating the cost and standard deviation associated with each portfolio:

- The three-month (3M) (representing the shortest maturity).
- The three-year (3Y) (we could alternatively have used the one-year).
- The five-year (5Y).
- The ten-year (10Y).
- The 20-year (20Y) (representing the longest maturity, we would have liked to use the 30-year but this data series is not continuous as there have been episodes when the US Treasury has not issued the 30-year).

We source our data from the *Federal Reserve Board (FRB) Selected Interest Rates Publication - H.15*. All the

Figure 1. The Efficient Frontier – a Corporate Treasurer's Perspective

In a rising interest rate environment, the efficient frontier is simply the 100% 20Y.



Source: Federal Reserve, calculations by Ramirez & Co. (see text for details)

time series are continuous, except for the 20-year which has missing data from January 1987 to September 1993. I replaced the missing data points by interpolating the ten-year and thirty-year interest rates.

Figures 1-4 plot the cost of funding (internal rate of return) and standard deviation of each portfolio in our experiments. For example, in Figure 1 where the time horizon is 20 years, the 100% 20-year portfolio has zero standard deviation. And, as intuitively expected, the 100% 3-Month funding portfolio has the highest standard deviation.

C. Experimental Results

Figure 1 illustrates the efficient frontier from a corporate treasurer's perspective in a rising interest rate environment, from April 1953 to April 1973, using treasury rates. As expected, during periods of rising interest rates, as observed in the US from 1953 to 1973, issuing long-term debt proves to be an outright winner over shorter-term options. This strategy provides issuers with the lowest interest rate volatility and the lowest cost of funding. Stated differently, the efficient frontier consists of one point. And, this is a special case of a barbell strategy consisting only of one leg, the longest instrument.

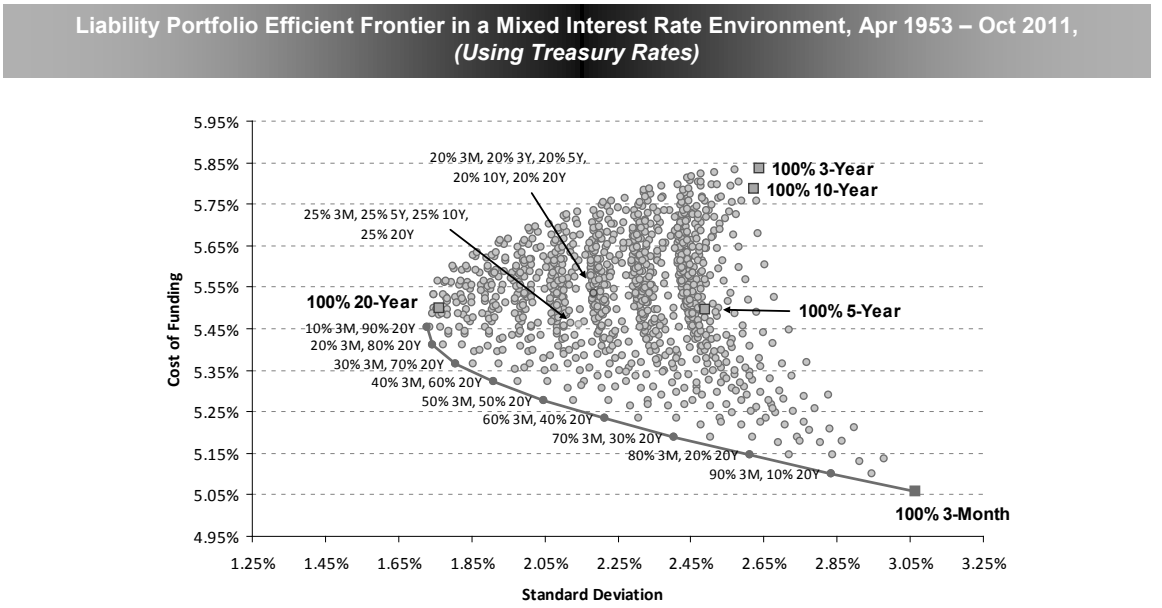
Figure 2 illustrates the efficient frontier facing a corporate treasurer during periods of both rising and falling interest rates as observed in the US from 1953 to 2011. As illustrated in Figure 2, the efficient frontier largely consists of a barbell strategy of 3-month and 20-year instruments. The one exception is the 100% 3M point which still can be considered as a barbell strategy consisting of a 100% 3M and 0% 20Y. As expected, the 100% 3M point has the lowest cost but the highest standard deviation. Interestingly, the 100% 20Y strategy is not too far away from the efficient frontier. Moreover, the flat maturity profile strategy (20% 3M, 20% 3Y, 20% 5Y, 20% 10Y, and 20% 20Y) that might be viewed as very close to the first choice of many treasurers and CFOs is far removed from the efficient frontier. Moreover the 100% 10Y strategy is significantly farther away from the efficient frontier than the 100% 5Y strategy. As we shall see later on under other experimental circumstances, to the extent that we move away from the barbell, the 5Y and not the 10Y will have a role to play.

Figures 1 and 2 are based on risk-free treasury rates. To capture the riskiness associated with credit spreads, Figure 3 uses data based on swap rates (due to data limitations, we use swap rates as proxies for corporate rates). For the period from May 1994 to October 2011, using swap rates, the barbell strategy starts to deviate slightly from the efficient frontier. In the midrange, for example, the efficient frontier is very close to the even maturity portfolio. To be precise, the evenly distributed 3M, 5Y, and 20Y portfolio is exactly on the efficient frontier. This observation suggests that the 3M, 5Y, and 20Y instruments may be the main instruments in determining the efficient frontier.

To allow for illiquidity, or the possibility of "market

Figure 2. The Efficient Frontier – A Corporate Treasurer's Perspective (*Continued*)

In a mixed interest rate environment, the efficient frontier is the simple barbell.



Source: Federal Reserve, calculations by Ramirez & Co (see text for details).

closures," Figure 4 uses shock-adjusted swap rates (where we add 500 basis points to regular swap rates during from September 2008 to September 2009) crisis. In this case, the barbell strategy moves farther away from the efficient frontier. As in the unadjusted swap case, the evenly distributed 3M, 5Y, and 20Y instruments may be the main instruments making up the efficient frontier. As expected, the 10Y instrument has very limited representation on the efficient frontier.

If we eliminate the 3Y and the 10Y as inefficient instruments, what we might call as the modified evenly distributed portfolio (33% 3M, 33% 5Y, and 33% 20Y) is on the efficient frontier in the midrange of the curve. At the low-cost end of the curve, the efficient frontier largely consists of the 3M and 5Y instruments. At the low standard deviation end of the curve, the efficient frontier largely consists of the 3M, 5Y, and 20Y instruments, with occasional showings of the 10Y.

D. Where to be on the Efficient Frontier (Fix versus Floating)

Our discussion heretofore has been about defining the efficient frontier. This determination, however, is not sufficient for the corporate treasurer or CFO as he has to determine exactly where on the efficient frontier he needs to be. From a microeconomic perspective, we need to think of the efficient frontier as a production possibilities curve, or a utility function curve. To determine where on the efficient frontier we can operate, we introduce the concept of "pain tolerance." That is, we need to know how much pain the CFO can tolerate if interest rates rise and the company is exposed to floating rates. In my experience, most CFOs will not tolerate more than a 5% - 10% decrease in EPS due to interest rate increases.

In this light, we explore the speed with which short term rates can move. In the period since 1990 to the present, we have experienced three major periods where short-term rates (3M Libor) have moved significantly over a few years:

- 3.19% (2/93) to 6.50% (12/94), or 331 bps in one year ten months.
- 4.97% (1/99) to 6.81% (9/00), or 184 bps in one year eight months.
- 1.11% (3/04) to 5.48% (6/06), or 437 bps in two years and three months.

Moreover, corporate spreads are negatively correlated with quarter-on-quarter annualized percentage changes in GDP (R^2 of 59%). In this respect, the CFO is partially hedged in that when the economy does well, the risk-free rate will likely go up, but credit spreads will likely go down; and conversely.

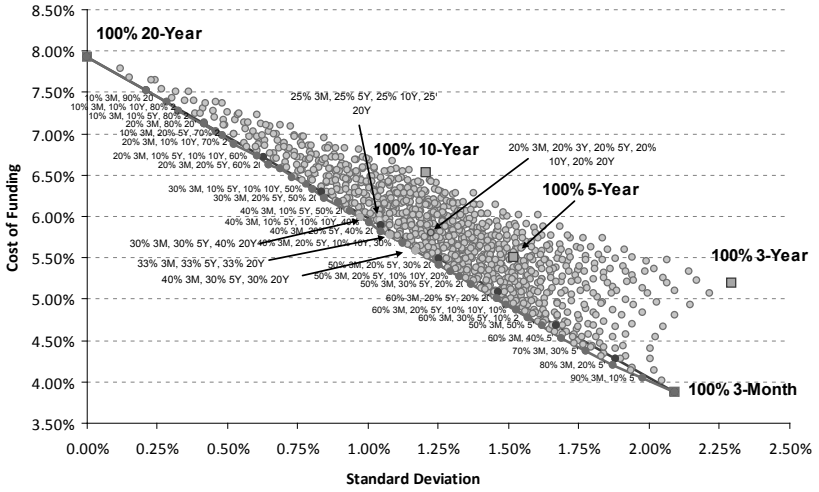
E. Choosing among Alternative Maturities

Let's assume that BBB-rated utilities can issue 10Y, 20Y, and 30Y paper at respectively 3.74%, 4.28%, and 4.38%. If

Figure 3. The Efficient Frontier – A Corporate Treasurer's Perspective (*Continued*)

With the introduction of credit spreads, the efficient frontier morphs into the barbell plus the 5Y.

Liability Portfolio Efficient Frontier, May 1994 – Oct 2011,
(Using SWAP Rates)

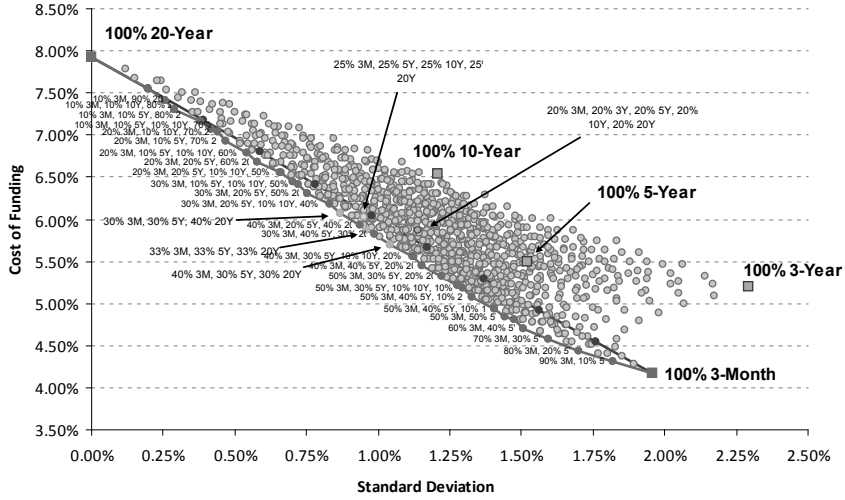


Source: Federal Reserve, Bloomberg, calculations by Ramirez & Co. (see text for details).

Figure 4. The Efficient Frontier – A Corporate Treasurer's Perspective (*Continued*)

Increasing illiquidity risk increases the importance of the 5Y.

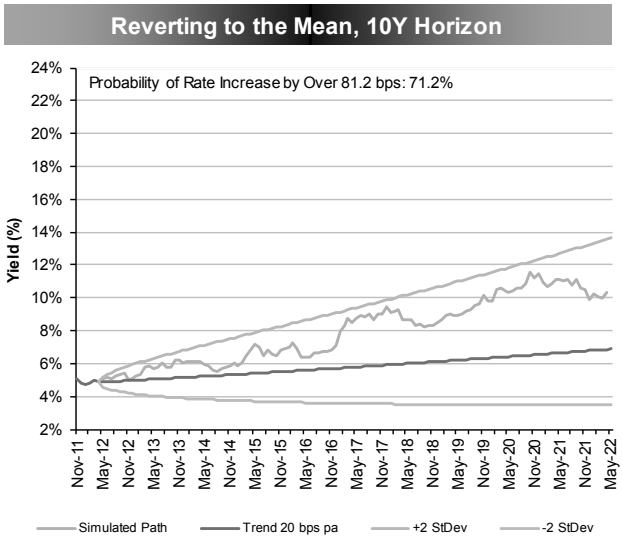
Liability Portfolio Efficient Frontier, May 1994 – Oct 2011,
(Using Shock-Adjusted SWAP Rates)



Source: Federal Reserve, calculations by Ramirez & Co. (see text for details)

Figure 5. Breakeven Rates for 30Y versus 10Y plus 20Y

If we expect rates to move up by approximately 200 bps over 10years, issuing 30Y today, has a better than 70% chance of being the winning strategy.



Source: Bloomberg, Thomson Financial, Ramirez &Co. calculations (see text for details).
Note: Based on volatility of 3.10% per month (10.76% annualized), per ML BBB/A 15+ Industrial Index

Source: Ramirez & Co. estimates.

From 1984 to the present, corporate yields have trended down at an approximate rate of 20 bps per year. Mean-reversion of rates would suggest that the likelihood of an over 81.2 bps increase in long-term rates is 71%

the 20Y rate increases to 5.10% and beyond in 10 years, a current 30-year funding would be more cost efficient. This is approximately an 81 bps increase from the assumed 20Y level.

Depending on one's view of the behavior of interest rates, we can calculate the probability of such a move. If we assume that the natural logarithm of interest rates follow a random walk with drift, the drift term and the volatility of interest rates determine this probability. We calculate a volatility of 10.76% per year based on the standard error of the autoregression of the logarithm of the long-term Merrill Lynch utility yield index. As such, for a volatility of 10.76% per year:

- A zero bps per year drift term implies a 33% probability of breaching the breakeven rate (this assumes that the best forecast of future yield curves is the current yield curve).
- A 20 bps per year drift term implies a 71% probability of breaching the breakeven rate (roughly this assumes that future yield curves will revert to their historical means, see Figure 5).
- And, a drift term of 50 bps per annum implies a 95% probability of breaching the break even rate (this assumes that modest inflation takes over in the future).

III. Conclusion

According to the seminal M&M theorem, in perfect capital markets, the liability management (maturity profile of debt and fix versus floating mix) does not affect firm value. As such, the liability management decision matters only insofar as the perfect market conditions are relaxed. As outlined in the body of the paper, there are many imperfections that may violate the M&M perfect-market conditions.

In this paper, I only focus on a few of these imperfections. First and foremost is the current macroeconomic environment and the duality it presents: Exceedingly short-term rates coupled with the enormous increase in the size of the Fed's balance sheet, portending significant future inflation risk. Stated differently, macroeconomic variables such as the real rate of interest (as of 4/26/2013 US TIPS rates are 5Y-1.43%, 7Y-0.97%, 10Y-0.68%, 20Y 0.01%, and 30Y 0.42% versus a long-term average of 2% for 3M and 3% for 20Y), the unemployment rate, and the Fed's balance sheet fund rate are significantly above or below their long-term historical averages implying that the market expectations hypothesis may not hold. This anomaly suggests that liability managers who have mean - reversion type expectations may rely on breakeven analysis to form their own judgments. Indeed, as reported in Abuaf (2012), a number of marquee academic institutions have been issuing 100-year bonds in the belief,

in my opinion, that real rates will revert to their long term levels (moving from less than one percent to the long-term three percent), and that inflation will move significantly above 2%, as expressed by Allan Meltzer. So, the first leg of the economic duality implies long – term funding.

The second leg of the economic duality, on the other hand implies short-term funding, particularly given that the majority of the FOMC members are forecasting an increase in the Fed – Funds rate only in 2015 (as of April 2013, 18/19 FOMC forecasters are expressing a view of 0.5% or above versus the current 0%-0.25%).

Framing the above economic intuition within the context of modern portfolio theory, I construct funding portfolios consisting of short, medium and long-term instruments. Using historical data, I demonstrate that efficient portfolios (that is those with the lowest funding costs and lowest standard deviations) largely consist of combinations of the shortest and longest-term instruments, also known as barbell strategies.

In a few exceptional cases where rollover risk may increase due to market disruptions, barbell strategies may be made less risky by incorporating medium-term notes such as the 5-year.

The efficient frontier in and of itself does not provide sufficient guidance to the liability manager regarding to where on the efficient frontier he needs to be. In making this decision, the manager relies on comparables and EPS sensitivity analyses, and the market's appetite for the securities he will issue.

As stated in the literature, higher-rated companies will use more floating-rate debt (because their pain tolerance levels can shoulder more increases in interest rates due to their relatively low-debt levels), and conversely. Low-rated companies that cannot, or find it very costly to issue long-term debt will obviously revert to shorter-term alternatives. Analogously, lower-rated companies will tend to have longer weighted-average maturity portfolios, until the point that the market will not allow them to issue longer-term debt.■

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