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Timing Loans, Cash Equivalents and Investment Grade Securities: Evidence from the Commercial Banking Industry

George Woodward

College of Business and Administration, University of Colorado at Colorado Springs, CO 80918 USA

Abstract

This paper examines the forecasting ability of US commercial banks and the consequent shift of assets between cash and noncash assets and between bonds and loans of varying maturities. Because an examination of market timing has never been performed for commercial banks, I provide an extensive justification for this study in the Introduction. I employ the quadratic programming technique of Sharpe (1992) to infer the investment policies of a sample of US commercial banks. This technique will give estimates of changes in allocations in the investment classes across market conditions. Sharpe's technique allows us to represent a manager's actual investment portfolio as a hypothetical portfolio of passive index funds that best replicate the return series of the bank over time. With this technique I am able to provide numerical estimates of timing activity as measured by changes in the allocations across various market conditions. A fund that exhibits positive (perverse) timing will have a higher (lower) average percentage of the portfolio allocated to cash on days when returns to cash are higher (lower) than noncash returns.

JEL classification: G11; G17; G21; G28

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1. INTRODUCTION

There is an enormous volume of academic literature on the market timing ability of equity and hybrid mutual funds. Some recent work has also examined the timing ability of hedge funds and fixed income funds. Yet, no published work to date has examined the market timing ability of other financial institutions. In particular, commercial banks provide a special interest since they perform many of the same functions as mutual funds and, as discussed in subsequent paragraphs, have a greater incentive and capacity to time their investments across maturities and risks. Also, given our current global financial crisis this investigation becomes all the more important.

Examining the timing ability of any financial institution is of an academic interest since any forecasting skill discovered would shed doubt on the efficient markets hypothesis. For commercial banks in particular there is some added significance to the investigation of timing ability. In light of the recent financial crisis there has been a heightened interest in bank performance with a special focus on financial risk management. And performance and risk are directly related to timing ability since banks that successfully time their investments increase shareholder returns while simultaneously diminishing the risk of the investments. At the extreme, a bank that exhibits perfect forecasting ability will eliminate all risk, both systematic and idiosyncratic, since the idiosyncratic risks will have been diversified away, while enjoying maximum possible returns. Further, the underlying goal behind the managerial policies of any financial institution is to maximize the wealth of the shareholders. Therefore banks as well as mutual funds should attempt to make decisions that maximize the price of the institutions shares, and successful asset timing is one potential way to achieve this result.

Most studies indicate that institutional money managers lack forecasting ability. However, some recent studies that used high frequency data, conducted by Chance and Helmer (2001), Glassman and Riddick (2006) and Chen (2005) indicate that some managers may have more forecasting skill than was previously indicated. In this study we examine whether or not commercial banks also exhibit this skill using high frequency data.

Perhaps an examination of timing ability for the commercial banking industry has been avoided due to a general perception that such an investigation is inappropriate given this industries stringent regulatory environment, restricted investment opportunity set, highly leveraged liability structure, special risks - such as interest rate, liquidity and credit risks- and since the balance sheet of the banking industry is managed through central bank excess reserve manipulations. In the following paragraphs I will argue that these differences may in fact increase the capacity and the incentives to forecast markets and thus time investments for the commercial banking industry.

Regulation based restrictions on the potential investments of commercial banks focus primarily on solvency, liquidity and diversification aspects. First, banks are required to have minimum reserves in vault cash and deposits at other banks, including the Federal Reserve Bank. Second, banks are required to hold high grade debt securities and must diversify their assets in the sense that no more than ten percent of their loans can be made to any single borrower.

The minimum reserve requirement is seldom binding since most of the time banks hold excess reserves. Further, the minimum is set so low that it would usually be imprudent to let the reserves fall below this level. Furthermore, banks are not much different from mutual funds in terms of this requirement since at their own discretion both types of financial institutions need to hold a minimum of cash reserves and other liquid assets to accommodate sudden withdrawals. Mutual funds commonly hold between 4% and 5% of total assets in money market securities to provide liquidity necessary to meet potential redemptions of shares. In fact, in this regard it seems that mutual funds are at a bigger disadvantage since shareholder redemptions are accommodated directly by the mutual fund itself, while commercial bank equity share redemptions take place in the secondary market. Also, the debt component of the commercial bank liabilities is mostly long term and therefore poses minimal liquidity threat. Furthermore, to accommodate sudden excessive deposit withdrawals banks can raise funds by issuing large denomination CDs, by borrow from other banks and by borrowing at the discount window. In addition, the US banks have deposit insurance from FDIC. Note also that the ability to securitize assets such as auto and mortgage loans can also enhance a banks liquidity position. Therefore it seems that for the banking industry discretionary excess reserves are likely to be associated with attempts at timing cash versus noncash assets as well as for liquidity purposes. For the mutual fund industry, on the other hand, excess reserves are more likely to be associated with liquidity needs for redemption purposes than for timing cash versus noncash assets. The reason the commercial banking industry receives greater attention on the liquidity issue is that although for individual banks there is no more liquidity risk than exists for individual mutual funds, for the system as a whole this is not the case. A sudden withdrawal or an impairment of the asset side of the balance sheet can cause liquidity problems for both types of firms. However, in the aggregate, contagion and a loss of confidence in the banking sector can cause much bigger systemic problems for the economy as a whole.

On the diversification issue, there is no tendency for this requirement to be any more binding for banks than for mutual funds since both industries are required by law to diversify their assets and both are inclined to self regulate in favor of a diversified portfolio.

Although banks are required to invest in high grade securities and must maintain a certain level of liquidity in their portfolio, mutual funds are constrained to the asset classes described in their prospectus and must also maintain some liquid assets in their portfolio. In fact, for some funds the focus is narrowed down to investment grade fixed income securities. Blake, Elton and Gruber (1993) for example examine the timing ability of mutual funds that restrict their investments almost exclusively to debt instruments. Therefore, it seems that this aspect is of little concern.

The high leverage of the banking industry makes an examination of market timing all the more relevant since leverage magnifies the gains/losses to successful/perverse timing. Thus, the benefits/losses due to timing are magnified giving statistical tests of timing ability greater power to distinguish the signal from the noise. So, I believe the funding or liability structures of the mutual fund and banking industries actually favors the later in terms of the validity and power of an examination of market timing ability.

Another set of issues that may affect the validity of an examination of forecasting ability for the banking industry are the special risks faced by banks, such as liquidity risk, interest rate risk, credit risk and market risk. In the discussion that follows I shall conclude that these risks in fact enhance the banking industries capacity and incentives to time asset classes.

The minimum reserve requirement and liquidity risk issue has already been discussed in a previous paragraph. In that discussion it was concluded that liquidity risk is of less concern for individual banks than for individual mutual funds.

Interest rate risk is a risk that distinguishes banks from mutual funds. Given that a bank's assets tend to be of longer maturities than its liabilities banks face the risk that the value of their assets will fall more than the value of their liabilities thereby reducing the bank's capital. So, if bank's can time maturities they can achieve significant gains. In fact, interest rate risk provides the primary basis/reason for timing long term bonds and loans versus shorter term securities and cash. If a bank expects interest rates to consistently decrease over time it should consider allocating most of its funds to rate insensitive assets such as long term and medium term loans and long term securities irrespective of its liability or funding structure. As previously mentioned higher leverage magnifies the gains/losses due to successful/perverse timing thus making successful timing all the more important.

Credit risk is a risk that distinguishes banks from equity mutual funds and to a lesser extent from fixed income funds. Timing the returns on debt instruments is a simultaneous timing of credit default since timing an up market is timing good conditions for returns and also credit risk. When interest rates are forecast to rise banks should divest themselves of long term securities and loans since higher interest rates will impair the value of these assets and increase default risk. Since banks should endeavor to manage their assets so as to simultaneously maximize the returns on the assets while minimizing credit risk, successful timing is a worthwhile endeavor. Credit cards offer the highest net interest margin above the banks cost of funds followed by consumer loans. Therefore, if the bank focuses on credit cards or consumer loans they will earn a high rate of return if all loans are repaid fully and on time. So, if banks purchase these assets prior to an economic upswing, defaults will be low and they will have been obtained at a discount. And if they expect the economy to experience a downturn they should collateralize their loans and sell them just before the price drops.

Market risk is another risk that banks encounter but mutual funds are exposed to this risk as well. Market risk results from changes in the value of securities due to changes in financial market conditions such as interest rate movements, exchange rate movements, and changes in equity prices. However, this is the type of risk we are most interested in timing. Therefore these are the risks we require in order to give value to the investigation of market timing ability of commercial banks. Forecasts of economic growth are associated with credit risk while forecasts of interest rates are associated with interest rate risk. Ideally, banks should use an aggressive approach when attempting to capitalize on favorable conditions for either of these variables but insulate themselves during expected adverse conditions.

Thus, if bank managers expect a strong economy they can boost earnings by shifting into risky loans and securities that pay a high return. If the economy is strong as expected only a small percentage of the loans will default. However, if the banks forecast turns out wrong (perverse timing) the revised asset portfolio will be more susceptible to a weak economy. An inaccurate forecast will have less effect on more conservative banks that maintain a larger portion of very safe loans and securities. If the economy strengthens as predicted, however, these banks will not benefit as much as the bank that assumed more unconditional risk.

Another very important issue that I shall now address is monetary policy and its effect on a bank's timing of assets. Excess reserves management by the Federal Reserve Bank involves raising and lowering the required reserve ratio, raising and lowering the discount rate, or open market sales and purchases of government securities, with the latter being the most commonly used monetary policy tool of the Fed. But this actually provides another basis for banks to time the market. If a bank forecasts a surge in excess reserves due to open market purchases, it should use any excess cash it may already have or liquidate T-bills and use the proceeds to purchase longer term assets since the anticipated surge in reserves will lower interest rates thereby causing T-Bonds to subsequently rise in price. Once the surge in reserves does indeed take place the bank can then replenish its cash balances or repurchase T-Bills to replace those that were sold. Of course they could also accomplish this with repurchase agreements. On the other hand, if the bank forecasts massive open market sales, the bank should liquidate mortgages, collateralize loans and sell them in the secondary market, and sell long-term bonds before the reserves are withdrawn from the banks and interest rates rise causing bond prices to fall. With the proceeds from the sales, the bank could buy T-bills or hold the excess cash as a means of topping the reserves back up to the pre-open market sales levels. This is simultaneously timing interest rates and credit default since the lower interest rates will lead to a lower default rate, ceteris paribus.

Subsequent to a massive open market purchase by the Fed, banks will suddenly be flush with cash. This could mistakenly be associated with a bank's deliberate timing of cash versus noncash assets and would likely contribute to an indication of perverse timing since interest rates would subsequently fall and long term asset prices would therefore rise and this is precisely the time to be invested more in long term assets than in cash. However, mutual funds have a similar problem since cash will rise and fall as a result of share purchases and redemptions. With this concern Ferson and Schadt (1996) assessed the market timing ability of a sample mutual funds using a conditional model that controlled for nondiscretionary cash flows in their assessments. They concluded that the negative correlation between mutual fund conditional betas and expected market returns is related to the flows of net new money into mutual funds. Clearly, changes in the conditional betas of the funds should be negatively related to changes in net new money flows, and cash holdings are positively correlated with net new money flows. This may provide a partial explanation for the perverse timing found by research that employed an unconditional approach to their analysis since a rise in the market may be reflective of a rise in investor confidence and therefore a greater amount of money flowing into funds.

I now address one last concern that I anticipate from the reader. One may argue that an examination of market timing ability for mutual funds is most appropriate since investors pay fees to have their portfolios managed by investment professionals. The fund typically hires a management company to manage the portfolio for an annual fee that usually ranges from 0.2% to 1.5% of assets. Thus, shareholders are paying these managers to achieve better investment performance than they can achieve on their own. If the fund cannot outperform a passive benchmark the fees charged are not justified. For banks there should be similar concerns. Bank managers and investment analysts receive salaries and commissions. If the returns they generate on behalf of the equity share holders are no better than can be achieved on their own through leveraged investments in a set of broad index funds, bank managers too cannot justify their salaries and commissions.

Traditional market timing models analyze funds as if they are composed of only stocks and treasury bills and evaluate performance by focusing on the choice between stocks and cash. Although appropriate for pure equity funds, the traditional models, such as that proposed by Treynor and Mazuay (1966) and Merton (1987) and their adaptations, are not appropriate for an investigation of timing ability for banks. Recently Boney, Comer and Kelly (2009) examined the ability of bond fund managers to shift assets between bonds and cash and across bonds of different maturities in order to capture the changes in their relative returns. They did not infer skill based on the convexity of the fund's returns relative to a benchmark factor model but instead estimated timing activity by changes in bank manager allocations across market conditions. Using this approach we will focus on the specific allocations across bonds of different maturities and across short and long term loans. Since holdings based measures of skill such as that prescribed by Grinblatt and Titman (1989) is not available for commercial banks, we infer timing ability from the individual banks return series. Like Boney, Comer and Kelly (2009) who infer timing ability for bond funds, we employ the Sharpe (1992) quadratic programming methodology. Since cash reserves do not earn interest, timing will be measured as a rebalancing across cash equivalents such as T-bills and other noncash interest earning assets. This is comparable to mutual fund studies since mutual funds hold very little cash and measures of market timing are assessed in terms of rebalancing across cash equivalents such as T-bills versus longer term less liquid assets. In this paper we take a more detailed look at timing behavior than can be inferred from traditional models. We want to examine timing behavior across our bond maturity indices and across loan maturities. In addition to choosing their broad asset allocation between cash and noncash assets, managers can engage in a separate timing decision where they determine how to allocate assets across maturities. Although changes in cash allocations may reflect a combination of timing strategies, cash maintenance decisions and monetary policy effects, changes in percentages allocated to the three bond maturity indices and to the various loan maturities are likely immune to such liquidity motivated trading or monetary policy effects.

The paper is organized as follows: Section 2 discusses our commercial bank sample and the indexes used to represent the investment set. Section 3 discusses the methodology employed to investigate the market timing ability of our sample of commercial banks. Section 4 provides a discussion of the empirical results and Section 5 provides some concluding remarks.

2. COMMERCIAL BANK SAMPLE AND INDEX FUNDS

Our commercial bank sample is composed of five hundred commercial banks selected from the??? data base. I start the sample on January 1, 1994 and end the sample on September 1, 2007 in order to have a sufficiently large number of banks and to eliminate the noisy data generated after the inception of the financial crisis. In order to be included in the sample, a bank must survive for a minimum of three years under with no change in management. This allows a long enough time series for our technique to be implemented. Once this minimum survival period is met, the bank is included in the sample, and I collect returns for the bank from the beginning of the sample period until the bank changes management or ceases to exist. The banks management is checked annually using the December 31 ????? for each year to verify that the banks management is unchanged. The sample is constructed so that survivorship bias does not exist. However, the sample does suffer from look-ahead-bias. Look-a-head bias exists because a minimum survival period is necessary in order to have a sufficient amount of data for the estimation procedure. As discussed in Carhart et. al (2002), a minimum survival period tends to bias results in favor of successful timing since the banks that do not survive tend to be poor performers.

Daily bank returns are obtained from ????? database. This provides an improvement over most prior studies that involved mutual funds and monthly data since, evidence provided by Goetzmann et. al (2000) and Bollen and Busse (2001) indicate that higher frequency data is preferable. Table 1 provides descriptive statistics for the banks in the sample.

The index model employed in this study requires US Treasury bond indices and Mortgage backed securities indices. We obtain daily observations on the following Barclays data:

United States Treasury Bills with remaining maturity less than one year,
Barclays United States Treasury Bills with remaining maturity from one and three years,
Barclays United States Treasury Bills with remaining maturity from five to seven years,
Barclays United States Treasury Bills with remaining maturity from seven to ten years,
Barclays United States Treasury Bills with remaining maturity from ten to twenty years,
Barclays United States Treasury Bills with remaining maturity of greater than twenty years,
Barclays United States Asset-Backed Security Home Equity,
Barclays United States Aggregate: Mortgage-Backed Federal Home Loan Mortgage Corporation 20 Year,
Barclays United States Unvl Commercial Mortgage-Backed Securities Excluding Erisa+HY,
Barclays United States HY Composite
Barclays Intermediate United States Government/Credit
Barclays Intermediate United States Aggregate Long Government/Credit

3. METHODOLOGY

I employ the quadratic programming technique of Sharpe (1992) to infer the investment policies of a sample of commercial banks. This technique will give estimates of changes in allocations in the investment classes across market conditions. Sharpe's technique allows us to represent a manager's actual investment portfolio as a hypothetical portfolio of passive index funds that best replicate the return series of the bank over time. With this technique I am able to provide numerical estimates of timing activity as measured by changes in the allocations across various market conditions. I focus on two separate decisions by the bank manager 1) the broad allocation between Treasury bills versus other interest earning assets and 2) specific allocations across various bond and loan maturities. Successful timing is achieved when the fund reallocates to capture the higher returns.

I assume the daily returns for each bank can be represented by the following k-factor model:

$$r_{i,t} = \sum_{j=1}^{k} b_{j,t} r_{j,t} + \varepsilon_{j,t} \qquad (1)$$

Where

$r_{i,t} =$ *total return of bank i*

$b_{j,t} =$ *exposure of bank i to class j*

$r_{j,t} =$ *total return of asset class j*

$\varepsilon_{j,t} =$ *unexplained component of bank i*

We solve the following quadratic program for each bank to estimate the average exposure to each asset class over the given observation window:

$$\min\left[\operatorname{var}\left(r_{i,t} - \sum_{j=1}^{k} b_{j,t} r_{j,t}\right)\right] \qquad (2)$$

Subject to

$0 \le b_{j,t} \le 1 \quad \forall\ j$

$$\sum_{j=1}^{k} b_{i,j} = 1$$

The bij are estimates of the positive portfolio weights on the passive indices. I approximate the bank's actual portfolio allocations as weights on the passive indices that represent the various asset classes available to the banks. Blake, Elton and Gruber (1993) applied this technique to a sample of high quality bond funds and found that the estimated weights were very similar to the actual reported annual weights of the sample. This technique has also been applied to hedge fund data by Fung and Hsieh (1997), Brown et. al ((1999), Brown et. al (2000) Agarwal and Naik (2000) and Dor et al (2006).

I propose a model based on the return indices available from Barclays. The Barclays indices are the most comprehensive market weighted indices available. I am interested in an index model that represents bonds of differing maturities and Barclays provides indices for the following maturities: 1)US Treasury Bills with less than a year to final maturity, 2) Treasury securities with 1 to 3 years to final maturity, 3) Treasury securities with 3 to 5 years to final maturity, 4) Treasury securities with 5 to 7 years to final maturity, 5) Treasury securities with 7 to 10 years to final maturity, 6) Treasury securities with 10 to 20 years to final maturity, 7) US asset backed security Home Equity 7) US Unvl Commercial Mortgage backed securities, 8) US HY Composite, 9) Intermediate US Government/credit, 10) US Aggregate Long Government/Credit.

Therefore I propose the following index model:

$$\begin{aligned} r_i = {} & b_{i,tb} r_{tb} + b_{i,gc103} r_{gc103} + b_{i,gc305} r_{gc305} + b_{i,gc507} r_{gc507} + b_{i,gc7010} r_{gc7010} \\ & + b_{i,gc10020} r_{gc10020} + b_{i,abhe} r_{abhe} + b_{i,ucmb} r_{ucmb} + b_{hy} r_{i,hy} + b_{i,igc} r_{igc} + b_{i,\lg c} r_{\lg c} + \varepsilon_i \end{aligned} \quad (3)$$

where

r_i = total return for bank i

r_{tb} = total return on the short Treasury index

r_{gc103} = total return on the 1 − 3 year government / credit ind
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r_{gc305} = total return on the 3 − 5 year government / credit index

r_{gc507} = total return on the 5 − 7 year government / credit index

r_{gc7010} = total return on the 7 − 10 year government / credit index

$r_{gc10020}$ = total return on the 10 − 20 year government / credit index

r_{abhe} = total return on US asset backed security home equity

r_{ucmb} = total return on US commercial mortgage backed securities

r_{hy} = total return on HY composite

r_{igc} = total return on intermediate US government / credit

$r_{\lg c}$ = total return on long US government / credit

The Treasury index is used to represent the cash component of the bank's portfolio. Sharpe (1992) states that his technique works well under the following three conditions: 1) the asset classes included in the model are mutually exclusive, 2) the asset classes represented by the indices exhaust the investment set of the bank manager, and 3) the returns of the indices are weakly correlated and have significantly differing variances.

We conduct two sets of tests. First we examine the timing ability between cash and noncash assets. Then we examine timing ability across the bond and loan maturity spectrum.

A fund that exhibits positive (perverse) timing will have a higher (lower) average percentage of the portfolio allocated to cash on days when returns to cash are higher (lower) than noncash returns. To assess this ability to reallocate funds to the asset class that will provide a greater return I partition the daily return to cash and noncash assets, estimate the portfolio allocations across the partitions and examine the average portfolio weights held by the bank in each partition. The initial test examines timing across cash and noncash assets by examining the banks tendency to switch across these two broad classes in anticipation of higher returns. Thus, I partition the data into two groups as follows:

$$\begin{aligned} S_1 &: r_{tb} = \max(r_{tb}, r_{gc103}, r_{gc305}, r_{gc507}, r_{gc7010}, r_{gc10020}, r_{gc20+}, r_{abhe}, r_{cmbs}, r_{hy}, r_{igc}, r_{\lg c}) \\ S_2 &: r_{tb} = \min(r_{tb}, r_{gc103}, r_{gc305}, r_{gc507}, r_{gc7010}, r_{gc10020}, r_{gc20+}, r_{abhe}, r_{cmbs}, r_{hy}, r_{igc}, r_{\lg c}) \end{aligned} \tag{4}$$

The first set consists of the returns when the T-bill return is greater than the returns on all the other representative indices and the second set contains all the multivariate observations when the T-bill provides the smallest return of all the index series. I apply Sharpe's quadratic program as defined in equation (2) and the twelve index model from equation (3) to estimate each bank's exposure to the Treasury bill index across the two partitions. I then calculate each bank's average cash adjustment as

$$cash\ adjustment = b_{i,tb}(S_1) - b_{i,tb}(S_2) \tag{5}$$

A positive value of this cash adjustment variable potentially indicates market timing ability. However, it could also be the result of variations in asset values due to changing market conditions or other nondiscretionary cash flow variations. Thus, I must compare the average cash adjustment variable of each bank to the average cash adjustment of a synthetic passive fund with similar investment characteristics. *More on how to construct the passive synthetic fund later.*

Next, taking a more detailed look at timing behavior, we examine whether banks are successful at shifting allocations to bonds and loans of differing maturities across changes in the government/credit yield curve. Again we use the quadratic program and the index model defined in equation (3) for each bank across the two partitions. For each bank we calculate the short bond adjustment and the long bond adjustment as follows:

$$\begin{aligned} short\ bond\ adjustment &= b_{i,gc105}(normal\ \ yield\ \ curve) - b_{i,gc105}(inverted\ \ yield\ \ curve) \\ long\ bond\ adjustment &= b_{i,gc20+}(normal\ \ yield\ \ curve) - b_{i,gc20+}(inverted\ \ yield\ \ curve) \end{aligned} \tag{6}$$

A negative short bond adjustment and a positive long bond adjustment reflect successful timing ability.

4. Empirical Results

5. Conclusion

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