Dynamics of yield gravity

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Abstract
The ability of yield to attract and direct deposits is the cornerstone of the banking system. However, as the findings in this paper demonstrate, the gravitational pull of yield is mediated by the level of financial stress and anxiety of depositors during times of economic downturn and stagnation. We describe an innovative Money Anxiety Index and the estimation of this index on a monthly basis. We find that interest rates on deposit accounts are much less effective in attracting and shifting deposits to term accounts. The dynamics of yield gravity increases interest expense on liquid accounts and hampers the ability of banks to comply with Basal III Net Stable Funding Ratio (NSFR) requirement of one-year liquidity.

Introduction

Liquidity is critical to the health of the banking industry (FDIC 2013), and yield is an instrument to attract liquidity to the banking system in the form of deposits. The ability to attract liquidity through deposits is based on the principle that money will gravitate toward the higher yield under equal risk levels. However, as this paper shows, the gravitational pull of yield diminishes under mediation of high money anxiety caused by distressed economic conditions.

The phenomenon of diminishing gravity of yield under elevated money anxiety conditions is a concern to the banking system because it has major implications on two areas that are critical to the health of the banking industry. The first is the ability to control interest expense in times of slim net interest margins due to relatively low lending rates. The second is the ability to comply with Basal III Net Stable Funding Ratio (NSFR) requirements, which puts heavier weight on deposits of one year or longer in term.

During the recession of December 2007 to June 2009 it became evident that the assertion that money gravitates toward the higher yield under equal risk level doesn't hold. Trillions of dollars gravitated toward lower yields of liquid accounts rather than earn higher yields with term accounts.

Furthermore, if there are circumstances when yield gravity diminishes, i.e. the ability of interest rates to attract money falls, these circumstances need to be studied and explored so that the banking industry is well aware of this phenomenon and prepares for it. Our goal is to explore a major factor that could have contributed to the reduction in the gravitational pull of interest rates on insured deposits during, and in the aftermath of, the Great Recession.

An important aspect of this paper is the advice to incorporate the lessons of behavioral economics (Schinckus, 2011) into the planning process and financial models of the banking industry. The notion that financial decisions by consumers are always based on rationale, and that the gravity of yield will always prevail, has been disproven. Modern behavioral economics theories in the last 40 years demonstrated the critical role that emotions, such as fear and anxiety, play in financial decisions. A major work in this area was presented in prospect theory (Kahneman & Tversky, 1979), which distinguishes between the emotional weight of winning and losing money.

Other sectors of the financial industry, such as the investment and equity markets, have adopted the insights of behavioral economics as part of their models. Moreover, they have

developed their own sub-segment of behavioral finances that deals with financial decisions under risk. Since deposits up to the insurance level of $250,000 per account holder per institution is risk free, the banking industry may consider encouraging financial institutions to adopt and incorporate the lessons of behavioral economics into their models.

Although deposits are risk free to depositors, they are not without risk for the financial institution. An ineffective pricing policy on deposits can push net interest margins to risky levels especially in times of low interest income from loans. Moreover, as this paper demonstrates, higher yields are not very effective in times of economic downturn and stagnation due to the mediating effect of money anxiety.

It is our hope that by presenting the findings of this paper to the banking industry, it will create awareness of the dynamics of yield gravity, and financial institutions will take measures to mitigate some of the risk factors associated with this phenomenon.

Problem Statement

This paper addresses two major challenges in today's banking system. The first is the ability to recognize and better manage interest expense on deposit accounts in light of the pressure on net interest margins from relatively low loan rates. The second is the implementation of the Basel III (FDIC 2013) requirement regarding Liquidity Coverage Ratio (LCR)[1] and Net Stable Funding Ratio (NSFR). We believe that the findings of this paper can be helpful in identifying and mitigating the risk associated with these two challenges.

The findings in this paper can help bankers to better face the problem of slim net interest margin by lowering interest expense on liquid accounts in times of high money anxiety. As this paper demonstrates, the relation between rates and balances of liquid accounts is inverse, which means that depositors continue to pile up money in liquid accounts despite lower rates. The analysis in this paper shows that during the examined period of December 2007 to December 2012, total balances of liquid accounts (checking, savings and money market) increased by 78.9 percent despite a decrease of 87 percent in the national average rate for these accounts.

The second major problem the findings of this paper may resolve is in regards to the Net Stable Funding Ratio (NSFR), which gives greater weight to liquidity of one year and over. Since higher levels of money anxiety promote a shift of deposits from term to liquid accounts, it presents a challenge to the banking system as less liquidity qualifies for the one-year term threshold. The findings in this paper can help bankers take preemptive measures to mitigate some of the shift from term to liquid accounts during times of high money anxiety due to declining economic conditions.

Research Questions

Research question 1

Is there a link between interest rates of liquid accounts and the level of financial stress and anxiety reflected in a Money Anxiety Index? Does the level of money anxiety increases as interest rates of liquid accounts decline due to worsening economic conditions.

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[1] The objective of the LCR requirement is to promote the short-term resilience of the liquidity risk profile of banks. It does this by ensuring that banks have an adequate stock of unencumbered high-quality liquid assets (HQLA) that can be converted easily and immediately in private markets into cash to meet their liquidity needs for a 30 calendar day liquidity stress scenario. The LCR will improve the banking sector's ability to absorb shocks arising from financial and economic stress, whatever the source, thus reducing the risk of spillover from the financial sector to the real economy. This document sets out the LCR standard and timelines for its implementation. See Basel III: The Liquidity Coverage Ratio and liquidity risk monitoring tools, January 2013

Research question 2

Is there a link between financial stress and anxiety, reflected in a Money Anxiety Index and balances of liquid accounts? Does the amount of balances in liquid accounts grows despite declining interest rates as money anxiety increases due to worsening economic conditions,

Research question 3

Is there a link between interest rates of term accounts and the level of financial stress and anxiety? Does the level of money anxiety rise as interest rates of term accounts decline due to worsening economic conditions?

Research question 4

Is there a link between financial distresses as it is reflected in the Money Anxiety Index and balances of term accounts? Does the amount of balances in term accounts decrease as money anxiety increases due to worsening economic conditions,

Literature Review
Interest Rates

In The Theory of Interest Rates, Irving Fisher (1930) suggests that interest rates are subject to adjustments based on multiple factors. The starting point is always the nominal value of the interest, which is the "face value" of the published interest rate. Then, Fisher suggests allowance for inflation, which reduces the nominal interest rate to its real level.

The present paper supports the notion that interest rates are dynamic based on external factors, but not the same factor Fisher suggested. Our notion is that interest rates on depository accounts alternate between two levels – nominal and gravitational. Nominal is the published interest rate, and gravitational is the ability of the interest to pull money, ability that diminishes when the level of money anxiety increases. In addition to inflation adjustment, Fisher suggests additional interest adjustment for risk level. However, since the context of this paper is limited to insured deposits, risk is not a factor.

Money Anxiety

In the Stress in America Survey (APA 2015), the American Psychological Association examines the state of stress across the country and tries to understand its impact. According to the survey conducted in August 2014 and published in February 2015: "Stress about money and finances appear to have a significant impact on Americans' lives. Nearly three quarters (72 percent) of adults report feeling stressed about money at least some of the time."

In reviewing the Stress in America Survey over the last eight years, we observed stress and anxiety over money consistently topped the chart of other causes of stress such as work, family and health (Figure 3). The survey shows that seven out of ten respondent reported that money is their top cause for stress and anxiety. Moreover, stress and anxiety over money increased to 76 percent of respondents in the time period of the Great Recession and declined to its pre-recession level of around 69 percent only in 2012.

This observation is consistent with the assertion that the level of money anxiety increases as the economy declines. This paper tests the mediating role that money anxiety has on the relations between interest rates and balances of depository accounts during times of economic distress. Such mediation, if any, will support the theory that the gravitational pull of interest rates is dynamic.

Emotions and Financial Decisions

The link between emotions, such as fear and anxiety, and financial decisions has been firmly established in the behavioral economics and finance literature (Ackert et al., 2003). Their findings are that "A newer branch of financial economics called behavioral finance applies lessons from psychology to financial decision making, but most of these studies have focused on cognitive biases rather than emotion." Moreover, when emotions and cognitive evaluations diverge, the emotional aspect is likely to have greater influence on behavior (Ness & Klass, 1994; Rolls, 1999).

The behavioral aspect of financial decision is relatively new and is generally dated back to the 1980s (Schinckus, 2008). The "battle" between the expected utility theory and prospect theory continues until today and it represents two schools of thoughts on financial decisions. Whereas the expected utility theory suggests that people make financial decisions based on expectations of reward, Kahneman and Tversky (1979) used experimental psychology to show that the expected utility theory is too abstract and general to describe reality. In prospect theory, Kahneman and Tversky show that emotions do play a role in financial decisions, and that people hate to lose more than they love to win.

Money Anxiety and Interest Rates

Robert J. Shiller, (Shiller, 2015), explores the link between people's feelings of uncertainty about the future and the unusual dynamics at work in today's economic world. Shiller states: "I suspect that there is a real, if still unsubstantiated, link between widespread anxieties and the strange dynamics of the economic world we live in today — a link that helps to explain why it's not just short-term interest rates that are very low, but long-term rates, too."

Shiller explains that despite low interest rates on savings, depositors continue to pile up their money in bank accounts: "One puzzle is that many people are willing to lock up their savings at these paltry rates for decades. When rates are this low, there may seem to be very little incentive for people to save. Yet according to the Bureau of Economic Analysis, personal saving as a fraction of disposable personal income stood at 4.9 percent for the United States in December."

Money Anxiety and the economy

In the context of this paper, financial anxiety is different from clinical anxiety, which is in the realm of psychiatry. In behavioral economics, financial anxiety is a normal human reaction to varying economic conditions (Geller, 2013).

The role of increased financial anxiety in the woes of the economy was cited by Yale economist Robert Shiller (Shiller 2011). According to Shiller, a major reason for the sluggish economy and deteriorating housing market is a *social epidemic that feeds into our anxiety.* He suggested that *"in the mind there is anxiety"* that holds people back from buying houses and increasing consumption.

It's very encouraging to see top economists recognize the role that financial anxiety plays in the direction of the economy. The link between the level of financial anxiety and the economy is very strong and significant, and the more we recognize and utilize consumer financial anxiety in economic and financial models, the greater our ability to understand and project shifts in economic conditions (Geller 2013).

Liquidity

Liquidity is the lifeline of the banking system and therefore, its most venerable component. As the financial crisis of 2008-2009 taught, liquidity ratios and sources are paramount to the stability of the banking system.

The Federal Deposit Insurance Corporation (FDIC 2013) issued a proposed rule that would implement a quantitative liquidity requirement consistent with the liquidity coverage ratio standard established by the Basel Committee on Banking Supervision. According to the FDIC proposed rule: "The requirement is designed to promote the short-term resilience of the liquidity risk profile of internationally active banking organizations," [moreover], "improving the banking sector's ability to absorb shocks arising from financial and economic stress, as well as improvements in the measurement and management of liquidity risk."

According to the new rule, depository institutions with total assets greater than $10 billion will comply with the Basel III Revised Liquidity Framework. According to Basel III revised, there are two new ratios that measure short-term and long term resilience. The first is the Liquidity Coverage Ratio (LCR), which requires banks to hold "high quality" liquid assets to cover net liquidity outflows in a 30-day period of stress. The second is the Net Stable Funding Ratio (NSFR),

which is the minimum acceptable amount of funding that a bank requires in order to safely finance lending activities over a one-year period.

In essence, the new liquidity rules address the quantity and quality of liquidity that banks need to achieve. On the quantity side, ratios of liquidity increase incrementally over a five-year period, and on the quality side, greater weight is given to consumer retail deposits over all other forms of deposits. Both requirements (LCR and NSFR) are an indication that the ability of financial institutions to attract consumer retail deposits of one-year in term or over is essential to the ability of the insured financial institution to comply with the Basel III revised rules.

Basel III was established mainly to improve banks' ability to absorb shocks such as the financial crisis of 2008-2009. New measures are being implemented in banking systems around the world that, among other things, are charging the capital requirements for banks, introduce new liquidity and funding measures, and implement a New leverage ratio.

There are two main aspects to the liquidity and funding requirements. The first is the Liquidity Coverage Ratio (LCR), which requires banks to hold a sufficient amount of "high quality" liquid assets to cover net liquidity outflows in a 30-day period of stress. And the second, which is the requirement most relevant in the context of this paper, is the Net Stable Funding Ratio (NSFR), which is the minimum acceptable amount of deposits that a bank requires to hold in order to safely lending activities for a period of at least one year.

The Net Stable Funding Ratio (NSFR) requirement basically rules out any deposit money in any liquid account and short-term certificate of deposits less than one year. This requirement is going to be very challenging for banks to implement during times of economic downturn due to the phenomenon of diminishing yield gravity that shows that higher depots rates do not necessarily pull money into term account due to high level of money anxiety. In other words, banks may not be able to fully comply with NSFR during recessionary times, which is the main reason this rule was created.

Hypotheses

The diagram in Figure 1 below is a graphical expression of the hypotheses that were developed for the present study.

H1. The lower the interest rates on liquid accounts, the higher the level of money anxiety.
H2. The higher the level of money anxiety, the higher the balances of liquid accounts.
H3. The lower the interest rates on term accounts, the higher the level of money anxiety.
H4. The higher the level of money anxiety, the lower the balances of term accounts.

*Figure 1: Hypothesis modeling*
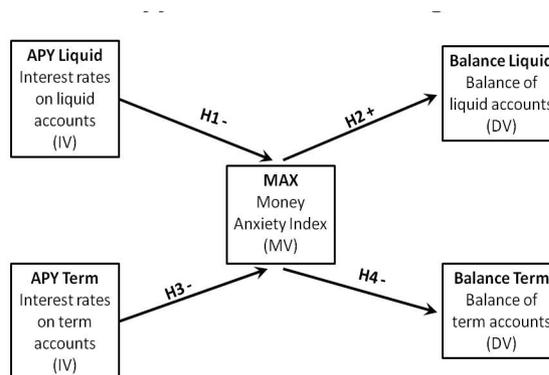
Methodology
APY and balance

The study focuses on FDIC insured deposits during the period of December 2007 to December 2012 – a time period of five years that covers the Great Recession and its aftermath. We studied the pattern of interest rates and balances of liquid accounts (checking, savings and money

market accounts), as well as non-jumbo term accounts consisting of certificate of deposits of one month and up to 60 month in term.

During the examined period, the national average interest rate of APV liquid accounts and of term accounts decreased at nearly the same rate, 87.0 percent and 87.9 percent respectively. During the same period the balances of term accounts decreased by 22 percent. Yet the balances of liquid accounts increased by 78.9 percent (Figure 2). What made this observation even more intriguing was that the average interest rate on term accounts during the examined period was 1.26 percent, over five times higher than the average interest rate on liquid accounts during the same time period at 0.23 percent.

Figure 2: Percentage change in total balances and average APY 2008-2012
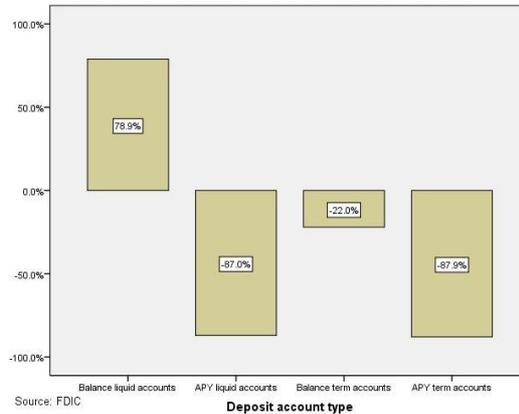
Money Anxiety Index

In reviewing the American Psychological Association's Stress in America Survey (APA 2015), it is evident that stress and anxiety over money topped the chart of other causes of stress such as work, family, and health (Figure 3). The survey shows that seven out of ten respondents reported that money is their top cause for stress and anxiety. Moreover, we observed that stress and anxiety over money increased to 76 percent of respondents in the time period of the Great Recession and declined to its pre-recession level of around 69 percent only in 2012.

Figure 3: Money tops sources of stress 2007-2014
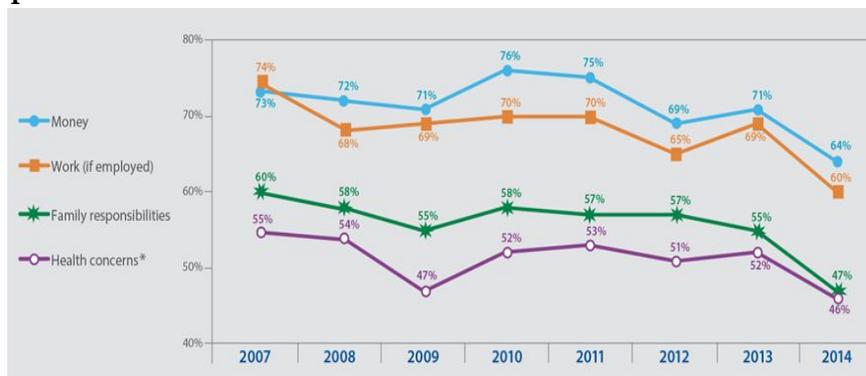
Source: APA 2015

The observation that money is a leading cause of stress and anxiety in America prompted us to search for ways to measure the relations between money stress and anxiety, and interest rates and balances of deposit accounts in insured institutions. We examined some of the existing consumer confidence indices, but noted that they are subjective in nature because they are based on responses to questionnaires rather than hard data.

Our decision to explore an alternative to a survey-based index of financial stress and anxiety was based in part on Shiller's (Shiller, 2015) assertion that "Such fears are not measured by the usual

consumer confidence indexes. The University of Michigan Consumer Sentiment Index reached its highest level since 2004 in January. But this index, and others like it, looks ahead only into the short term and report about perceived aggregate conditions rather than individual risks."

Financial anxiety is a latent variable that cannot be directly observed or measured. However, we can observe it indirectly by measuring its impact on other variables - in our case interest rates and balances of deposits. Therefore, we decided to explore an instrument that will allow us to use objective hard data to check the relations among financial stress and anxiety, and rates and balances of deposit accounts.

Since there were multiple economic indicators that could have relations with the level of financial anxiety, we opted to use Structural Equation Modeling (SEM), which takes into account the modeling of interactions, nonlinearities, correlated independents, measurement error, correlated error terms, multiple latent independents each measured by multiple indicators, and one or more latent dependents also each with multiple indicators[2].

Money Anxiety Index – historical perspective

The Money Anxiety Index was developed using Structural Equation Modeling (SEM) with a large sample size of monthly economic indicators meeting the required measures of fit. Chart I below portrays the behavior of the Index since January 1959.

The Money Anxiety Index consists of major economic indicators published monthly by the U.S. Department of Commerce. These major economic indicators were selected for inclusion in the Money Anxiety Index because they meet the goodness of fit criteria of the SEM testing. The economic indicators, or variables, that are part of the Money Anxiety Index, don't include any banking interest rate, balances data or any Federal Reserve interest rate information.

The Money Anxiety Index reflects monthly measurements of the level of consumers' financial anxiety. It spans from January 1959 to date. Historically, the Money Anxiety Index fluctuated from a high of 135.3 during the recession of the early 1980s, to a low of 38.7 in the mid-1960s. The 50-year average is 70.7 (July 1980 = 100).

Another major consideration in the initial development of the Money Anxiety Index was to use the largest data set available from governmental sources in order to reduce the possibility of sampling error. The variables of the Money Anxiety Index consist of data set from the U.S. Department of Commerce starting in January of 1959 - over 50 years of economic data. This large data set allowed us to clearly observe how consumer financial anxiety fluctuated through seven different economic cycles of recessions and recovery.

Moreover, the use of such large data set allowed us to observe variations in the levels of consumer financial anxiety among the various recessions, and to establish the highest and lowest points of consumer financial anxiety over the past 50 years. The Index spans from January 1959 to date, and it fluctuated from a high of 135.3 during the recession of the early 1980s to a low of 38.7 in the mid-1960s. The 50-year average is 70.7, and July 1980 is the index's baseline of 100.

During the study period 2008 – 2012 the mean level of the index was 87.38 and the index range was between 58.8 (May 2008) and 100.82 (June 2012).

Since the variables that were used in the estimation of the Money Anxiety Index include no banking interest rates or balances nor the Fed funds interest rate, the Money Anxiety Index can be used as an independent variable in measuring its relations to rates and balances of deposit accounts.

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[2] According to North Carolina State University (2010) SEM may be used as a more powerful alternative to multiple regression, path analysis, factor analysis, time series analysis, and analysis of covariance. That is, these procedures may be seen as special cases of SEM, or, to put it another way, SEM is an extension of the general linear model (GLM) of which multiple regression is a part.

We used economic data provided by the Bureau of Economic Analysis (BEA 2015) of the U.S. Department of Commerce as the independent variable, and bank deposit data from the FDIC as the dependent variable. The dependent variables we used in the structural equation modeling consisted of FDIC (2015) data of national averages of interest rates and total balances for each account type. We used the national average interest rates on checking, savings and money market accounts, as well the national average interest rates of term accounts (certificates of deposits) including one, three, six, 12, 24, 36, 48 and 60 months. The IV APY Liquid consists of the average interest rate of the three liquid accounts, and the IV APY Term consists of the average interest rate of term accounts.

For total balances, we used the three levels provided by the FDIC of balances of up to one year as short term, balances of one to three years as midterm and balances of over three years as long term. For term balances, we used only non-jumbo accounts (up to $100,000) to be consistent with the national average interest rates of non-jumbo accounts. For the DV Balance Liquid, we used the sum of total balances of all liquid accounts and the DV Balance Term consists of the sum total of all non-jumbo term accounts.

We tested various combinations of independent variables using AMOS until we were able to achieve the required goodness of fit (Table 1). Goodness of fit test determines if the model being tested should be accepted or rejected[3]. The fitness indices are listed below.

Table 1: Money Anxiety Index goodness of fit

Model	CMIN	NFI	IFI	CFI	PCLOSE
Default model	48.982	0.96	0.961	0.961	0
Saturated model	0	1	1	1	
Independence model	1235.074	0	0	0	0

CMIN (Model chi-square) - The chi-square value should not be significant if there is a good model fit.

NFI (normed fit index) - Normed varies from 0 to 1, with 1= perfect fit.

IFI (incremental fit index) - Should be equal to or greater than .90 to accept the model.

CFI (comparative fit index) - Compares the existing model fit with a null model which assumes the indicator variables in the model are uncorrelated. CFI close to 1 indicates a good fit.

PCLOSE (P-Value for Test of Close Fit) - tests the null hypothesis that RMSEA is no greater than .05.

The results of the goodness-of-fit tests (Table 1) confirm that the model we tested was accepted, and the existence of a latent variable. It follows that the latent variable is a factor that can be measured indirectly by the relations between the economic indicators as the independent variables and rates and balances of deposit accounts as dependent variables. Recall that in the American Psychological Association survey (APA 2015), the level of money anxiety reported increased during and in the aftermath of recessionary times. Therefore, since money anxiety increases during economic downturn, and as the existence of a latent variable that impacts deposit rates and balances of deposit accounts during recessionary times was confirmed, we conclude that the latent variable is money anxiety.

Furthermore, since the decrease in the gravitational pull of interest rates in the reported period of 2008-2012 (Figure 2) was very massive and consisted of a decrease of 87% in interest rates on liquid deposits while balances of liquid accounts increased by 79%, it is conceivable that this phenomenon included a large number of depositors since it involves trillions of dollars. This finding

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[3] The choice of *which test to use* is a matter of dispute among methodologists. Jaccard and Wan (1996) recommend use of at least three fit tests. Kline (1998) recommended at least four tests.

is consistent with the findings of the APA (2015) survey, which shows that during aftermath of the recession, in 2010, 76% of the respondents indicated that money is causing them the greatest fear and anxiety.

In order to verify that the strong and significant relations between the MAI and the balances and rates of liquid and term accounts during the examined period of 2008 to 2012 is not due a random event that occurs only during a recession or economic stagnation, we also tested the relations between the MAI and the balances and rates of liquid and term accounts in the time period prior to the beginning of the Great Recession in the U.S. in December of 2007.

We examined the time period between July 2003, the earliest time data on balances are available from the FDIC to November 2007, and the month prior to the beginning of the Great recession in December of 2007. During this period of about four and a half years, the U.S. economy was in an expansion mode, and the MAI declined.

The correlation table below shows that the relations between the MAI and rates and balances of liquid and term accounts are very strong and highly significant. Moreover, since the MAI declined during the economic expansion of 2003 to 2007, as consumers had greater financial confidence in the economy, rates and balances of liquid and term accounts have grown substantially. We can see that all four correlation coefficients are negative representing inverse relations between declining level of money anxiety and increasing rates and balances of deposits. The strong and significant relations between the MAI and rates and balances of liquid and term accounts during a separate and different time period from the recessionary time we will examine in the data analysis demonstrates the applicability and validity of the MAI as a predictor of deposit rates and balances.

Table 2 - Pearson Correlation Coefficients 2003 - 2007

		Balance liquid accounts	APY liquid accounts	Balance term accounts	APY term accounts
Money Anxiety Index	Pearson Correlation	-.640	-.525	-.576	-.666
	Sig. (2-tailed)	.000	.000	.000	.000
Balance liquid accounts (mm)	Pearson Correlation		.598	.687	.815
	Sig. (2-tailed)		.000	.000	.000
APY liquid accounts	Pearson Correlation			.970	.912
	Sig. (2-tailed)			.000	.000
Balance term accounts (mm)	Pearson Correlation				.959
	Sig. (2-tailed)				.000

It is also important to compare the behavior of rates and balances of liquid and term accounts in the pre-recession period (Figure 6 below) with the behavior of the same variables during and in the aftermath of the Great Recession (Figure 2 above). Clearly, rates (APY) of both liquid and term accounts are on the rise, which is typical during times of economic expansion. Moreover, APY of term accounts has increased by 117 percent in the pre-recession period compared with a decline of 87.9 percent during and in the aftermath of the Great Recession.

Another interesting observation is that balances of term accounts increased more than liquid accounts, 50.4 and 39.3 percent respectively, compared to a completely reversed situation during and in the aftermath of the recession, when term balances declined 22.0 percent and liquid balances increased by 78.9 percent.

The testing and validation of the MAI as a very strong and highly significant factor in the relations between the economic environment and rates and balances of deposits is an important step in demonstrating the dynamics of yield gravity. It is clear from the behavior of rates and balances pre and post-recession that rates by itself is not the only factor impacting the shifts in consumer preference for deposits, but rather, the level of money anxiety that is generated by the economic environment is impacting consumers' decisions on bank deposits.

Data Testing and Analysis
Pearson Correlation Coefficients
Table 3 below presents the Pearson correlation coefficients of the variables for the period 2008 – 2012 in the hypothesis modeling.

Table 3 - Pearson Correlation Coefficients 2008- 2012

		Balance liquid accounts	APY liquid accounts	Balance term accounts	APY term accounts
Money Anxiety Index	Pearson Correlation	.553	-.803	-.385	-.801
	Sig. (2-tailed)	.000	.000	.002	.000
Balance liquid accounts	Pearson Correlation		-.896	-.840	-.888
	Sig. (2-tailed)		.000	.000	.000
APY liquid accounts	Pearson Correlation			.656	.997
	Sig. (2-tailed)			.000	.000
Balance term accounts	Pearson Correlation				.661
	Sig. (2-tailed)				.000

Hypotheses testing

APY Liquid and Money Anxiety Index (MAI) Correlation
H1. APY Liquid is negatively associated with MAI. The higher the level of money anxiety (MAI), the lower the interest rates on liquid accounts (APY Liquid). This hypothesis test explores whether an increase in the level of money anxiety has an impact on the interest rates of liquid accounts.

An examination of the relationship between the independent variable APY Liquid and the mediating variable MAI reveals a correlation coefficient of -0.803, and high significance level with $\alpha < 0.01$.

A negative correlation coefficient between APY Liquid and MAI is expected because money anxiety increases during recessionary times, when the Federal Reserve lowers the funds rate to stimulate the economy. Based on the results of this test, H1 is supported, and we can generalize that the higher the level of money anxiety, the lower the interest rates of liquid accounts.

Money Anxiety Index (MAI) and Balance Liquid Correlation
H2. MAI is positively associated with Balance Liquid. The higher the level of money anxiety (MAI), the higher the balances of liquid accounts (Balance Liquid). This hypothesis is testing the relationship between the level of money anxiety and balances of liquid accounts.

An examination of the relationship between the DV Balance Liquid and the MV MAI reveals a correlation coefficient of 0.553 and high significance level with $\alpha < 0.01$. Based on the results of this test, H2 is supported.

This is an important finding because it supports the notion that at higher level of money anxiety, people keep depositing money in liquid accounts despite the relatively low rates. This finding also shows that the gravitational power of yield diminishes during high levels of money anxiety because rates of liquid accounts are transitionally lower than those of term accounts.

APY Term and Money Anxiety Index (MAI) Correlation
H3. APY Term is negatively associated with MAI. The higher the level of money anxiety (MAI), the lower the interest rates on term accounts (APY Term). This hypothesis test explores

whether an increase in the level of money anxiety has an impact on the interest rates of term accounts.

An examination of the relationship between the IV APY Term and the MV MAI reveals a correlation coefficient of -0.801, and high significance level with $\alpha < 0.01$.

A negative correlation coefficient between APY Term and MAI is expected because money anxiety increases during recessionary times, when the Federal Reserve lowers the funds rate to stimulate the economy. Based on the results of this test, H1 is supported, and we can generalize that the higher the level of money anxiety, the lower the interest rates of term accounts.

*Money Anxiety Index (MAI) and Balance Term Correlation*

H4. MAI is negatively associated with Balance Term. The higher the level of money anxiety (MAI), the lower the balance of term accounts (Balance Term). This hypothesis is testing the relationship between the level of money anxiety and balances of term accounts.

An examination of the relationship between the DV Balance Term and the MV MAI reveals a correlation coefficient of -0.385 and high significance level with $\alpha < 0.05$. Based on the results of this test, H4 is supported.

This is an important finding because it supports the notion that at higher levels of money anxiety, people deposit less money in term accounts despite relatively higher rates. This finding also shows that the gravitational power of yield diminishes during high levels of money anxiety because rates of term accounts are transitionally higher than those of liquid accounts.

Figure 7 provides a diagrammatic summary of the results. All four hypotheses were not rejected at significant levels. Linear regression of each of these relationships confirmed the highly significant relationships between each of these four variables and the Money Anxiety Index for the period 2008-2012.

Figure 7: Correlation Coefficients
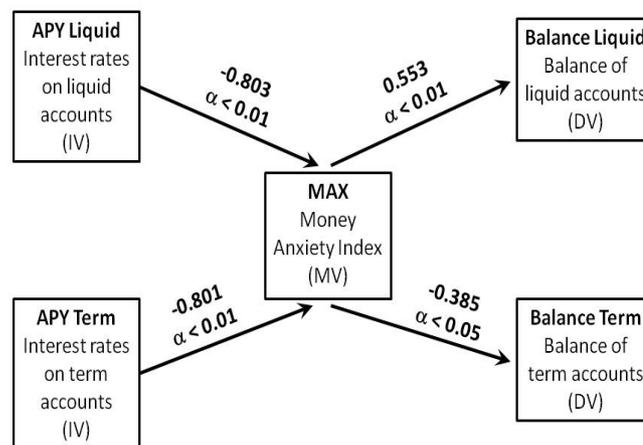
Mediation Tests: MAI and APY Liquid

We conducted a mediation test to examine whether MAI (Money Anxiety Index) has a mediating effect on APY Liquid (interest rates of liquid accounts), and found that there is mediation between the independent variable APY Liquid and the MAI. The results of the regression suggest that MAI is negatively affected by APY Liquid with a slope coefficient of -72.794 and a significance level of $\alpha < 0.01$ (Table 4).

Table 4: Mediation tests: MAI and APY Liquid

Model Summary					
Model		R	R Square	Adjusted R Square	Std. Error of the Estimate
1		.803	.644	.638	6.933724720
a. Predictors: (Constant), APY liquid accounts					

ANOVAb						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	5134.102	1	5134.102	106.790	.000
	Residual	2836.516	59	48.077		
	Total	7970.618	60			
a. Predictors: (Constant), APY liquid accounts						
b. Dependent Variable: Money Anxiety Index						

Coefficientsa						
Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	103.974	1.835		56.676	.000
	APY liquid accounts	-72.794	7.044	-.803	-10.334	.000
a. Dependent Variable: Money Anxiety Index						

Mediation Tests: APY Liquid, Balance Liquid, and MAI

The regression of APY Liquid and the DV Balance Liquid provided the following estimates: Balance Liquid = 7,331,039 – 230,706 APY Liquid. The slope coefficient is highly significant with α < 0.01. When MAI was inserted in order to test whether MAI has any influence on the relationship between APY Liquid and Balance Liquid the regression results were:
 Balance Liquid = 7,331,039 – 7,230,706 APY Liquid – 41,482 MAI. The coefficient of MAI is statistically significantly different from zero. MAI, the Money Anxiety Index is thus mediating between APY Liquid (interest rates of liquid accounts) and Balance Liquid (balances of liquid accounts).

Mediation Tests: MAI and APY Term

Table 5: Mediation tests: MAI and APY Term

Model Summary					
Model		R	R Square	Adjusted R Square	Std. Error of the Estimate
1		.801	.641	.635	6.964012666
a. Predictors: (Constant), APY term accounts					

ANOVAb						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	5109.267	1	5109.267	105.351	.000
	Residual	2861.351	59	48.497		
	Total	7970.618	60			
a. Predictors: (Constant), APY term accounts						
b. Dependent Variable: Money Anxiety Index						

Coefficientsa						
Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	103.094	1.771		58.200	.000
	APY term accounts	-12.517	1.219	-.801	-10.264	.000
a. Dependent Variable: Money Anxiety Index						

We conducted a mediation test to examine whether MAI (Money Anxiety Index) has a mediating effect on APY Term (interest rates of term accounts), and found that there is mediation between the IV APY Term, and the MAI. The results of the regression suggest that MAI is negatively affected by APY Liquid with a slope coefficient of -12.517, and with a significance level of $\alpha < 0.01$ (Table 5).

Mediation Tests: APY Term, Balance Term, and MAI

Regression results of IV APY Term and the DV Balance Term (Table 4) were:

Balance Term = 888,631 + 145,718 APY Term. The slope coefficient is highly significant with $\alpha < 0.01$. Inserting MAI to test what, if any, influence MAI has on the relationship between APY Term and Balance Term, the regression results were:

Balance Term = 888,631 + 145,718 APY Term + 5,654 MAI. The coefficient of MAI is statistically different from zero. The Anxiety Index is thus mediating between APY Term (interest rates of liquid accounts) and Balance Term (balances of liquid accounts).

A final test refers to the ratio between the balances of liquid deposits and the balance of term deposits. During the 2007-2012 period the ratio between the two balances fluctuated between 3.8 at the beginning of the period to 8.84 at the end of the period. The Money Anxiety Index explains more than one third (R-squared = 0.35) of the variance of this ratio. The regression coefficient of MAI is highly significant.

Discussion and Implications

The financial crisis of 2008-2009 and the lingering recovery since then presented the banking system with new realities pertaining to deposit accounts. On one hand, the revised Basel III (FDIC 2013) requirements, which were designed to strengthen the liquidity position of financial institutions, calls for higher ratios of liquidity, especially those of one year or longer in term. On the other hand, the gravitational pull of interest rates on deposit accounts diminishes during times of economic downturn and stagnation, which hampers the ability of financial institutions to shift liquidity to term accounts.

The findings of this study provide greater insight into the dynamics of interest rates during times of high money anxiety, which occur during recessionary times and their aftermath. Although the banking system has no control over economic cycles, understanding and recognizing the dynamics of yield gravity can help bankers mitigate some of the liquidity and interest expense risks associated with higher levels of money anxiety during times of economic downturn.

The findings point to inverse relations between interest rates of liquid accounts and balances of liquid accounts mediated by the level of money anxiety. This means that when the U.S. economy is either in a decline or is stagnant, depositors are likely to deposit new money in liquid accounts, and/or shift rollover money from term accounts to liquid accounts in disregard to the relatively lower interest rates paid on liquid accounts. This means that yield, in and of itself, has a diminishing capacity to attract deposits to term accounts during times of elevated money anxiety and thus, bankers need to rethink their strategy for acquiring and maintaining proper liquidity and interest expense levels.

Implications

The two main implications of the findings in this paper are related to interest expense on deposit accounts and compliance with Basal III Net Stable Funding Ratio (NSFR). In a way, both issues are related because the diminishing gravitational pull of interest rates to direct deposits to term accounts could hamper the ability of banks to fully comply with the ability to have enough liquidity of one year of more in term.

Recognition of the dynamics of yield gravity is the starting point in developing measures to offset the adverse impact diminishing yield of gravity has on interest expense and long-term liquidity. On the yield side, financial institutions should implement pricing models that incorporate the economic environment as a mediating variable, thus ensuring that the interest rates they are

offering, especially on liquid accounts, are not higher than they should be, relative to the state of the economy.

On the liquidity side, specifically in regards to compliance with the Stable Funding Ratio (NSFR) requirement, financial institutions can use marketing and product features to compensate for the diminishing gravitational pull of yield during times of economic downturn and stagnation. Possible incentives could include waving some account fees in return for time commitment of deposits.

We don't know exactly when recession will occur, but we do know that recessions are inevitable. It is also safe to assume that the same dynamics in the yield gravity will repeat itself once the next recessionary cycle starts. Since the findings of this paper demonstrate the mediation effect of money anxiety on deposit accounts during times of economic downturn, the implications should be incorporated into the pricing and liquidity models of financial institutions.

References

Ackert, F. Lucy, Church, K. Bryan, & Deaves, Richard (2003), Economic Review - Federal Reserve Bank of Atlanta. *Atlanta: Second Quarter 2003. Vol. 88, Iss. 2.*

APA (2015), American Psychological Association, Stress in America Survey, August 2014, published February 2015.

Basel III (2013), The Liquidity Coverage Ratio and liquidity risk monitoring tools, January *2013*

BEA (2015), Bureau of Economic Analysis, U.S. Department of Commerce, National data 2008-2012.

Camerer, C., & Loewenstein, G. (2002), Behavioral Economics: Past, Present, and Future, working paper, Carnegie-Mellon University.

FDIC (2013), Liquidity Coverage Ratio: Liquidity Risk Measurement, Standards, and Monitoring. Notice of proposed rulemaking with request for public comment. 12 CFR Part 329, RIN 3064-AE04.

FDIC (2015), Federal Deposit Insurance Corporation, Statistics on Depository Institutions Report, December 2015.

Fisher, Irving (1930), *The Theory of Interest, as Determined by Impatience to Spend Income and Opportunity to Invest it*. New York, NY: *Macmillan*, 1930.

Geller, Dan (2013), Money Anxiety: How financial uncertainty changes consumer behavior and the economy. Sarasota, FL: *First Edition Design Publishing* 2013.

Jaccard, James and Choi K. Wan (1996), LISREL approaches to interaction effects in multiple regressions. Thousand Oaks, CA: Sage Publications. In spite of the title, this monograph deals directly with SEM using LISREL

Kahneman, Daniel, & Tversky, Amos (1979), Prospect Theory: An Analysis of Decision Under Risk. *Econometrica, Vol. 47, No. 2*, pp. 263-292.

Kline, Rex B. (1998a), Principles and practice of structural equation modeling. NY: Guilford Press.

Kline, Rex B. (1998b), Software programs for structural equation modeling: AMOS, EQS, and LISREL. *Journal of Psychoeducational Assessment* (16): 343-364.

NCSU (2010) Structural Equation Modeling: Statnotes, North Carolina State University: http://faculty.chass.ncsu.edu/garson/PA765/structur.htm

Ness, R.M., & Klass, R. (1994), Risk perception by patients with anxiety disorders. *Journal of Nervous and Mental Disease* 182:466-70.

Rolls, Edmund T. (1999), The Brain and Emotion. Oxford: Oxford University Press.

Schinckus, C. (2008), The Financial Simulacrum. *Journal of Socio-Economics, Vol. 37*, No. 3, pp. 1076-1089.

Shiller, J. Robert (2011), TV interview, *Wealthtrack* with reporter Consuelo Mack, September.

Shiller, J. Robert (2015), Anxiety and Interest Rates, *Yale Insights, New York Times op-ed*, February 8.

Schinckus, Christophe (2011), Archeology of Behavioral Finance, *IUP Journal of Behavioral Finance*. Hyderabad: Jun 2011. Vol. 8, Iss. 2, 16 pgs.