The Economic Value of Money Market Funds in and Around the Financial Crisis of 2008

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Abstract

MMFs have been a popular vehicle for both investors and borrowers. However, during the 2008 financial crisis, the Reserve Primary Money Fund was forced to drop their NAV below a dollar. The MMF business was highly stressed with many investors rushing to withdraw their investments. The situation stabilized when the U.S. Treasury stepped in and provided a guarantee to all investors in MMFs that the government would not allow the NAVs to fall below one dollar. After the incident, there has been a wide ranging discussion within the investment community and its government regulators over the appropriate regulation of MMFs. During the recent debate, one topic that has not been extensively discussed is the economic value of the MMF business to the investors and borrowers in the industry. In this research, we estimate the demand for MMF funds by borrowers and the supply of MMFs funds by investors. Using concepts similar to the concept of consumers and producers surplus, we estimate the investors' and borrowers' surplus from the existence of the MMF business. In the empirical section of the paper, we estimate the supply and demand curves in the MMF business. These estimates then allow us to estimate the investors' and borrowers' surplus. Some commentators have suggested that recent regulatory changes have resulted in an increased spread between borrowing and lending rates in the MMF business of 0.1 percent. Our model allows us to estimate the economic loss from 0.1 percent to 1 percent from the regulation. While the fact that the regulation causes economic loss does not mean that it should not be implemented, it is important for regulators to determine if the benefits of the increased regulatory burden and worth the costs incurred.

Keywords: Money Market Funds, Economic Value, Regulation, Financial Crisis

1. Introduction to Money Market Mutual Funds

Money market mutual funds (MMFs) are also known as money funds or money market funds. MMFs are regulated by the Securities and Exchange Commission (SEC) in the United States, under Rule 2a-7. [1] Regulations adapted from the Investment Company Act Protection of 1940 allow MMFs to offer deposit like instruments that are traded at a fixed one dollar net asset value (NAV). The stable price per share is attractive to investors, and can be perceived as a cash equivalent or as an alternative to a bank's deposit accounts including checking accounts, saving accounts, money market deposit accounts and time deposit accounts, even though the MMFs are not insured by The Federal Deposit Insurance Corporation (FDIC). MMFs are required to restrict their asset holdings to short duration fixed income instruments with high credit quality. (Seligman 1983; Koppenhaver and Sapp 2005; Investment Company Institute 2009, 17).

The amount invested in MMFs[2] increases rapidly during the financial crisis of 2008 comparing to the total investment in all commercial banks in the United States[3]. By restricting assets to instruments of short duration and high credit quality, the MMFs typically offer a very high probability of not "breaking the buck." This feature is especially difference to investments in equities and long term bonds where losses can exceed 10 percent in a single day. MMFs also offer advantages to borrowers since they provide a broad and deep source of funds during periods in which bank lending may be limited.

Since MMFs operate as an intermediary between investors and borrowers, those funds are very useful especially to small investors and mid-size borrowers, who have limitations on how to invest in multiple markets and in large quantities. The models used in this study are based on the literature of the demand and supply for MMFs and an actual model of the investors' and borrowers' surplus in the MMFs market.

The study illustrates that the supply curves are considered "elastic" or changes in the yields of MMFs have a relatively large effect on the quantity of the assets that the investors want to invest. Whereas the demand curves are considered "inelastic" or change in the yields of MMFs have a relatively small effect on the quantity of the assets that borrowers demanded. With same change in yield, the change in asset demand is less than the change in assets supplied. It can also be hypothesized that the borrower has less power in driving the yields of the MMFs, since they have options only related to funds, and are restricted more so than investors.

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[1] Corresponding to references in the bibliography. Swirsky (2008) and The University of Cincinnati College of Law (n.d.) provide an excellent information about Rule 2a-7.

[2] Total assets investments in MMFs are total share class investments in billions of dollars. Data is from Crane, Money Fund Intelligence.

[3] Total investments at all commercial banks are collected from data For further information of, please refer to the Board of Federal Reserve System's H.8 release,
http://research.stlouisfed.org/ fred2/series/INVEST?cid=99.

2. The Mechanism of Money Market Mutual Funds

Not only MMFs are the instruments that attract lenders who are after liquidity, and a safe source of income, but also they are the instruments that attract borrowers who need short-term cash by selling securities or borrow funds. In this sense, MMFs are described as a repository for short-term funds.

In order to find the value of the MMFs for both borrowers and investors, the calculation of the equilibrium value for demand and supply curve for MMFs is required. The demand and supply curves are identified from tracing factors that shift one curve without manipulating the other.

Lam et al. (1989), Dow and Elmendorf (1998), Farinella and Koch (1999) and Ball (2001, 2002) suggested that the amount of MMFs that lenders supply is negatively related to the yield of saving deposits and the yield of government debts such as three month United States Treasury bills. Therefore, the supply function can be simply described as a function of the difference between the yield of the MMFs and the yield of three month United States Treasury bills. An increase in the yield of the three-month Treasury bills would cause investors to pull their money out of the money market mutual fund, and place their money into an alternative investment such as the Treasury bills. This would result in a smaller quantity of funds and a higher yield. In order to enumerate the higher yield, one would have to determine the slope of the supply curve.

MMFs allow borrowers including private companies, governments, government agencies, depository institutions, and banks to acquire temporary cash by issuing short-term debts with the maturity less than a year including commercial paper, Treasury bills, certificates of deposit, and repurchase agreements. According to Copeland and Rappaport (2009), today MMFs are riskier with the higher yields than that in the previous MMFs. Municipalities who have issued debt instruments have relatively higher risk to those securities they hold. However, borrowing through MMFs is still considered cheaper than issuing similar debt with bank guarantees. The interest rates that banks charge can be in the range of 0.1 percent to more than 2 percent, or they can even be higher than the overall debt offering.

The yield of AAA bonds was chosen as the relative interest rate used in the demand function in this study. The demand function can therefore be explained as a difference between the yield of the money market mutual fund and the yield of AAA bonds. If we were to see an increase in bond rates, this would stimulate the borrowers to issue their owned bonds, commercial paper, or any short term instrument as their source of funds, hence the increase in demand for MMFs. This in turn would cause an increase in yield, as well as an increase in quantity. In order to enumerate the higher yield, one would have to determine the slope of the demand curve.

In determining the simple model for money market demand and supply curves, one can think of the event that an investor supplies his money to trade in the MMFs as the event that he expects to gain the interest from the borrowers such as sophisticated hedge funds and banks as in a standard matching model. In order to identify the demand and supply curves, some shift factors for demand should influence demand without influencing supply, and some shift factors for supply should influence supply without influencing demand. Since there are many shift factors that influence the demand and supply curves, the objective of this study is not to obtain the best fit. It is complicated to predict the numerical value of assets being invested in MMFs because of a large number of factors that collectively affect these assets. However, these other factors may be difficult to predict or identify independently. In addition, there are a number of possible errors involved in gathering and computing these shift factors. The contribution of this study is to estimate the main value of the

MMFs. Therefore, after reviewing the previous research, we assume that money market mutual fund investors allocate their money into a three-month United States Treasury bills as an alternative method of investment, which directly influences the supply of MMFs. In addition, the borrowers are assumed to issue AAA bonds as an alternative source of funds, which directly influences the demand for MMFs.

The exponential regression model or the log-linear model is used in supply function and demand function to measure elasticity of the total amount of assets invested in MMFs with respect to the yield different between MMFs and three-month Treasury bills in supply function and the yield differential between AAA bonds and MMFs in demand function, respectively. The elasticity is the percentage change in the total amount of assets invested in money market mutual fund for a small percentage change in these independent variables in supply function and demand function, respectively.

2.1 Supply Function:

$$Q^s = K_s \exp^{(\beta_0 + \beta_1 (MMF_s - TB3))} \quad (1)$$

where,

Q^s represents the total amount of assets invested in MMFs in supply function,

q_s represents the natural log of the total amount of assets invested in MMFs in supply function,

K_s represents the net worth of investors. It is a constant term in supply function,

$\beta_1 > 0$ and represents the constant of the supply function,

β_1 represents the coefficient of the supply function,

MMF_s represents the annualized 7-day yields of Crane 100 Index of MMF,

TB3 represents three-month Treasury bills.

From equation (1), we take the natural logarithm of both sides of the equation, as well as denoting the entire equation by the symbol q_s, giving us

$$\ln(Q^s) = q_s = (\ln(K_s) + \beta_0) + \beta_1 (MMF_s - TB3)$$

Since $\ln(K_s)$ is a constant, we can rewrite that

$$\ln(Q^s) = q_s = \beta_{0k} + \beta_1 (MMF_s - TB3) \quad (2)$$

where,

$$\beta_{0k} = \ln(K_s) + \beta_0$$

2.2 Demand Function:

$$Q^d = K_d \exp^{(\gamma_0 + \gamma_1 (MMF_d - AAA))} \quad (3)$$

s we can see from Figure 6.2 that γ_1 is less than zero, we want to get the positive γ_1 for simple calculation. Therefore, we can rewrite the equation (3) as;

$$Q^d = K_d \exp^{(\gamma_0 + \gamma_1 (AAA - MMF_d))} \quad (4)$$

where,

Q^d represents the total amount of assets invested in MMFs in demand function,

q_d represents the natural log of the total amount of assets invested in MMFs in demand function,

K_d represents the net worth of the borrowers. It is a constant term in demand function,

$\gamma_1 > 0$ and represents the constant of the demand function,

γ_1 represents the coefficient of the demand function,

MMF_d represents the annualized 7-day yields of Crane 100 Index of MMFs,

AAA represents three-month Moody's Seasoned Aaa Corporate Bond Yield.

From equation (4), we take the natural logarithm of both sides, as well as denoting the entire equation to be represented by a single variable q_d, giving us

$$\ln(Q^d) = q_d = (\ln(k_d) + \gamma_0) + \gamma_1(AAA - MMF_d)$$

Since $\ln(K_d)$ is a constant, we can rewrite that

$$\ln(Q^d) = q_d = \gamma_{0k} + \gamma_1(AAA - MMF_d) \quad (5)$$

where,

$$\gamma_{0k} = \ln(K_d) + \gamma_0$$

In equation (1) and (2), there are two unknowns; β_{0k} and β_1 . Moreover, there are two unknowns; γ_{0k} and γ_1 in equation (4) and (5).

The equilibrium value of MMFs occurs when investors are willing to put their assets into MMFs, which is equal to a monetary value that money borrowers are required to have at a certain yield. This yield is called the equilibrium yield. It will tend not to change unless demand or supply of the MMFs change. When the yield is above the equilibrium point there is a surplus of supply as supply exceeds demand. In other words, the demand and supply are imbalanced resulting in disequilibrium and generating oversupply. Therefore, the equilibrium function can be written as;

2.3 Equilibrium function:

In terms of quantity invested in the MMFs,

$$\ln(Q^s) = q_s = \ln(Q^d) = q_d = \ln(Q^*) = q^* \quad (6)$$

In terms of yields,

$$MMF_s = MMF_d = MMF^* \quad (7)$$

where,

Q^s and Q^d represent the total amount of assets invested in MMFs in supply function and demand function respectively,

q_s and q_d represent the natural log of the total amount of assets invested in MMFs in supply function and demand function respectively,

Q^* represents the total amount of assets invested in MMFs in the equilibrium function,

q^* represents the natural log of the total amount of assets invested in MMFs in the equilibrium function,

MMF_s and MMF_d represent the yield of MMFs in supply function and demand function respectively,

MMF^* represents the yield of MMFs in the equilibrium function.

Whereas the yield is below the equilibrium point there is a shortage in supply as demand exceeds supply. In other words, there are out of balance between demand and supply, which also cause the disequilibrium and generate over demand or shortages supply. When there is disequilibrium in the market, the yield and the amount of assets invested in MMFs will be adjusted back to the equilibrium value so that both investors and borrowers agree. The area under the horizontal line of the equilibrium yield and above the supply curve is called supply surplus as illustrated in Figure 1. Supply surplus is the difference between what investors actually receive at the certain interest rate or yield that they invest in the MMFs and what they are willing to invest in these funds.

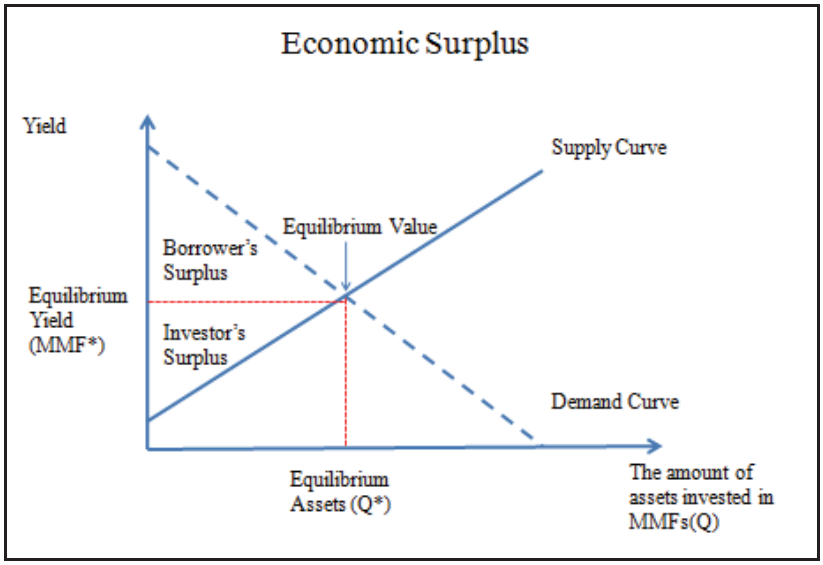


Figure 1 Economic Surplus

3. The Economic Equilibrium Model of MMFs

As mentioned above, shift factors for both demand and supply are used to identify the supply and demand curves. The demand shift factors should influence demand without influencing supply and the supply shift factors influence supply without influencing demand. We assume that MMFs investors will allocate their money into a three-month United States Treasury bills as an alternative method of investment, and that AAA bonds directly influence the demand of MMFs as an alternative source of funds.

Taking the first two functions into account, one can then use this to determine when the equilibrium in the market place occurs. This occurs when the supply is equal to the demand, and in equating the three equations (equation (2); $q_s = \beta_{0k} + \beta_1(MMF_s - TB3)$, equation (4); $q_d = \gamma_{0k} + \gamma_1(AAA - MMF_d)$ and equation (6); $q_s = q_d$), we can derive the equation as follows:

$$\beta_{0k} + \beta_1(MMF^* - TB3) = \gamma_{0k} + \gamma_1(AAA - MMF^*) \quad (8)$$

The next step is to rearrange MMF* to be on the same side then we have;

$$MMF^* = \frac{\gamma_{0k} - \beta_{0k}}{\beta_1 + \gamma_1} + \frac{\beta_1}{\beta_1 + \gamma_1} TB3 + \frac{\gamma_1}{\beta_1 + \gamma_1} AAA \quad (9)$$

The equilibrium function (8) shows us that both the Treasury bills and the AAA bonds affect the yield of the MMFs. From the equilibrium function, if the supply curve is infinitely elastic $(\beta_1 \to \infty)$, then the equilibrium yield will be equal to the three month Treasury bill rate, and if the demand curve is infinitely elastic $(\gamma_1 \to \infty)$, then the equilibrium yield will be equal to the AAA bond yield. The quantities of assets in the MMFs would then be determined by the demand and supply curve respectively. In addition, the sum of the coefficients of the explanatory variables in equilibrium function equal one.

Since the sum of the two coefficients equal one,

$$\frac{\beta_1}{\beta_1+\gamma_1}+\frac{\gamma_1}{\beta_1+\gamma_1}=1 \quad (10)$$

Therefore,

$\frac{\beta_1}{\beta_1+\gamma_1}TB3+\frac{\gamma_1}{\beta_1+\gamma_1}AAA$ can be rearranged as;

$$\frac{\gamma_1}{\beta_1+\gamma_1}(AAA-TB3)+TB3 \quad (11)$$

Replace (10) in equation (8), we have the equilibrium function in term of the yield of the MMFs as;

$$MMF^*-TB3=\frac{\gamma_{0k}-\beta_{0k}}{\beta_1+\gamma_1}+\frac{\gamma_1}{\beta_1+\gamma_1}(AAA-TB3) \quad (12)$$

To identify the equilibrium function in term of the amount of assets invested in the MMFs, we employ equation (6); $MMF_s = MMF_d = MMF^*$

From equation (2); $\ln(Q^s)=\beta_{0k}+\beta_1(MMF_s-TB3)$, we can rearrange the equation in term of MMFs that;

$$MMF_s=\left(\frac{\ln(Q^s)-\beta_{0k}}{\beta_1}\right)+TB3 \quad (13)$$

And from equation (5); $\ln(Q^d)=\gamma_{0k}+\gamma_1(AAA-MMF_d)$, we can rearrange the equation in term of MMFs that;

$$MMF_d=-\left(\frac{\ln(Q^d)-\gamma_{0k}}{\gamma_1}\right)+AAA \quad (14)$$

Since we know that $MMF_s=MMF_d=MMF^*$, therefore;

$$\left(\frac{\ln(Q^*)-\beta_{0k}}{\beta_1}\right)+TB3=-\left(\frac{\ln(Q^*)-\gamma_{0k}}{\gamma_1}\right)+AAA \quad (15)$$

From equation (15), we can rearrange $\ln(Q^*)$ or q^* in one side, then we have

$$\ln(Q^*)=q^*=\frac{\beta_1\gamma_{0k}+\beta_{0k}\gamma_1}{\beta_1+\gamma_1}+\frac{\beta_1\gamma_1}{\beta_1+\gamma_1}(AAA-TB3) \quad (16)$$

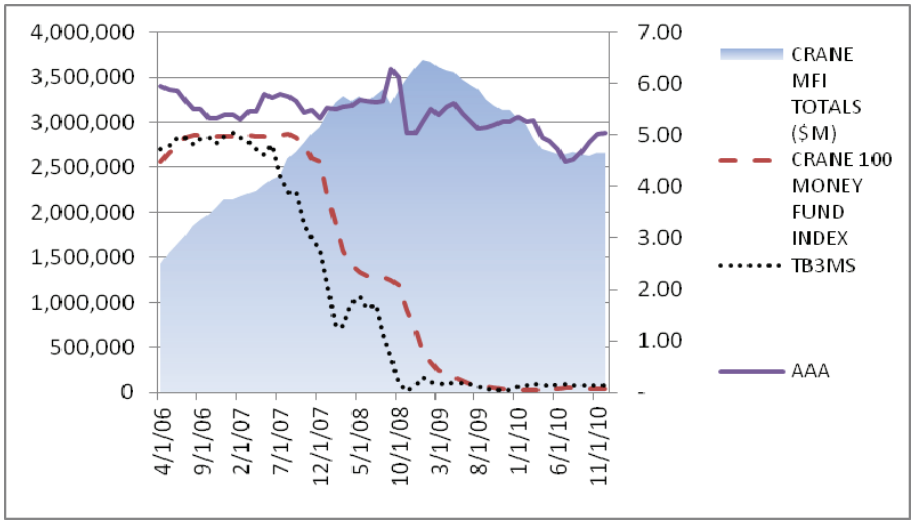
From the equation (16)[4], the total amount of assets invested in MMFs at equilibrium depends upon the different between the yield of AAA bonds and the yield of three-month Treasury bills. If there is an increase in the yield of AAA bonds, the borrowers assume to shift their cost of funds to issue money market products. Similarity, if there is a decrease in the yield of three-month Treasury bills, investors assume to shift their funds to invest in MMFs.

[4] From equation (16), we can get the total amount of assets invested in MMFs at equilibrium by taking exponential of the logarithmic function. Therefore,

$$Q^*=\exp(q^*)=\exp\left[\frac{\beta_1\gamma_{0k}+\beta_{0k}\gamma_1}{\beta_1+\gamma_1}+\frac{\beta_1\gamma_1}{\beta_1+\gamma_1}(AAA-TB3)\right]$$

4. Data

The following analysis is based on monthly historical data over the crisis period from April 2006 to December 2010[5], containing fifty seven monthly observations, in order for us to investigate the equilibrium condition. The MMF yield is represented by the Crane 100 money fund index yield, which are the average returns for 100 largest taxable MMFs including both retail and institutional funds.[6] TB3 and AAA yields are taken from the Fred database distributed by the Federal Reserve Bank of St. Louis, which are defined as TB3MS or Three-Month Treasury Bill: Secondary Market Rate and AAA or Moody's Seasoned Aaa Corporate Bond Yield, respectively.[7] The fifty seven monthly observations are illustrated in Figure 2.



Source: Crane Database and Federal Reserve Economic Data (FRED)

Figure 2 Observation Periods

[5] Crane Data started to collect MMF data since April 2006.

[6] See Appendix B: Crane 100 Money Fund Index for more information.

[7] Data are available at Federal Reserve Economic Data (FRED) from Federal Reserve Bank of St. Louis.
http://research.stlouisfed.org/fred2/categories/22

5. Regression Analysis

To find the MMF yield at equilibrium or MMF* from equation (12);

$$MMF^* - TB3 = \frac{\gamma_{0k} - \beta_{0k}}{\beta_1 + \gamma_1} + \frac{\gamma_1}{\beta_1 + \gamma_1}(AAA - TB3)$$

Let

$$MMF^* - TB3 = \delta_0 + \delta_1(AAA - TB3) \quad (17)$$

where,

$$\delta_0 = \frac{\gamma_{0k} - \beta_{0k}}{\beta_1 + \gamma_1}, \text{ and } \delta_1 = \frac{\gamma_1}{\beta_1 + \gamma_1}$$

A regression was run on equation (17) from April 2006 to December 2010. The result is shown below.

$$MMF^* - TB3 = 0.3119 + 0.0321^*(AAA - TB3) \quad (18)$$

t-statistics (1.7581) (0.7105)

where,

Standard Error = 0.6441, $r^2 = 0.0091$.

From equation (18), we can rewrite the model after moving TB3 to the right side as following;

$$MF^* = 0.3119 + 0.9679TB3 + 0.0321AAA \quad (19)$$

The results exhibit that MMF yields are influenced by both supply and demand. In particular, an increase in AAA bond yields will encourage borrowers to switch their short term demand for funds into money market instruments; this will cause the yield on MMF's to rise over the yield on Treasury bills. The coefficient of TB3 is higher than that of AAA. This can be explained that investors are more interest rate sensitive than the borrowers or that Treasury bills are a closer substitute than long term AAA bonds. The high coefficient close to one of three-month Treasury bills represents the close substitute of MMFs to three-month Treasury bills. When the yields of the three-month Treasury bills increase in value, the corresponding yields of the MMFs also increase in value. Therefore, this allows for more money to be situated within MMFs. In contrast however, when the yields of AAA-bonds increase, the yields of MMFs increase only slightly, which thereby indicates that MMFs are within an investors market. In essence, the borrower has much less power in driving the yields of the MMFs.

Equation (17) contain 4 unknown parameters. In order to find the value in the supply function and demand function, we need to find the value of β_{0k} , β_1, γ_{0k} , and γ_1. With the fixed coefficient (β_1 and γ_1), the constant terms (β_{0k} and γ_{0k}) in supply function and demand function are allowed to change through time. This technique is to let the constant term consist of the error term. An equation is needed. From equation (16); $\ln(Q^*) = q^* = \frac{\beta_1\gamma_{0k} + \beta_{0k}\gamma_1}{\beta_1 + \gamma_1} + \frac{\beta_1\gamma_1}{\beta_1 + \gamma_1}(AAA - TB3)$

Let

$$\ln(Q^*) = \phi_0 + \phi_1(AAA - TB3) \quad (20)$$

Where,

$$\phi_0 = \frac{\beta_1\gamma_0 + \beta_0\gamma_1}{\beta_1 + \gamma_1}, \text{ and } \phi_1 = \frac{\beta_1\gamma_1}{\beta_1 + \gamma_1}$$

A regression was run using the same data. The result is shown below.

$$\ln(Q^*) = 14.4661 + 0.1023 * (AAA - TB3) \quad (21)$$
$$(0.0370)\ (0.0094)$$
$$[390.9922]\ [10.8631]$$

where,

Standard Error = 0.1343, $r^2 = 0.6821$.

The result of the regression is significant. The r-square, together with the t-statistics of both constant and the coefficient, is significantly high.

With 4 equations; derived from equations (18), and (21), 4 unknowns can be solved.

First, plug in $\delta_1 = \frac{\gamma_1}{\beta_1 + \gamma_1} = 0.0321$ from equation (19) into equation (21).

$$\phi_1 = \frac{\beta_1\gamma_1}{\beta_1 + \gamma_1} = \beta_1\delta_1 = \beta_1 * 0.0321 = 0.1023$$

Therefore $\beta_1 = \frac{0.1023}{0.0321} = 3.1883$

Since $\delta_1 = \frac{\gamma_1}{\beta_1 + \gamma_1} = 0.0321$, then $\gamma_1 = (\beta_1 + \gamma_1) * 0.0321$,

Move γ_1 to the left and plug in β_1, then we have

$$\gamma_1 = \frac{\beta_1 * 0.0321}{0.9679} = \frac{3.1883 * 0.0321}{0.9679} = 0.1057$$

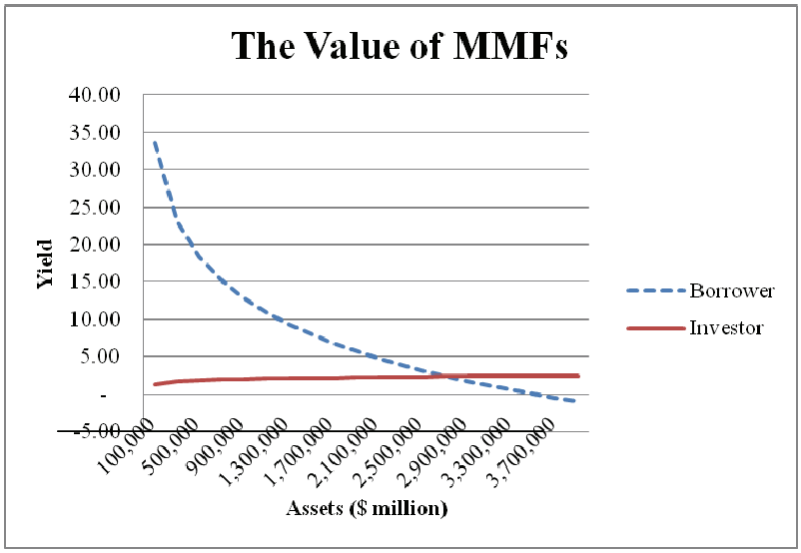
With the fixed coefficient, the constant terms, which consist of the error term in supply function and demand function, are allowed to change through time. The next step is to solve for β_{0k} and γ_{0k} in each period across time. From equation (2); $\ln(Q^s) = q_s = \beta_{0k} + \beta_1(MMF - TB3)$, plug in all data in each period, we can solve for β_{0k} across time that;

$$\beta_{0k\,t} = q_{s_t} - \beta_1(MMF_t - TB3_t) \quad (22)$$

And from equation (4); $\ln(Q^d) = q_d = \gamma_{0k} + \gamma_1(AAA - MMF)$, plug in all data in each period, we can solve for γ_{0k} across time that;

$$\gamma_{0k_t} = q_{d_t} - \gamma_1(AAA_t - MMF_t) \quad (23)$$

The average MMF yield at equilibrium or MMF* through the period from April 2006 to December 2010 is equal to 2.37 percent and the average assets invested in MMFs at equilibrium or Q* is equal to $2,796,891 million dollars. The demand curve and supply curve using the value of β_1 = 3.1883, and γ_1 = 0.1057, and the average of β_{0k_t} = 13.4716, γ_{0k_t} = 14.4991 are illustrated in Figure 3.



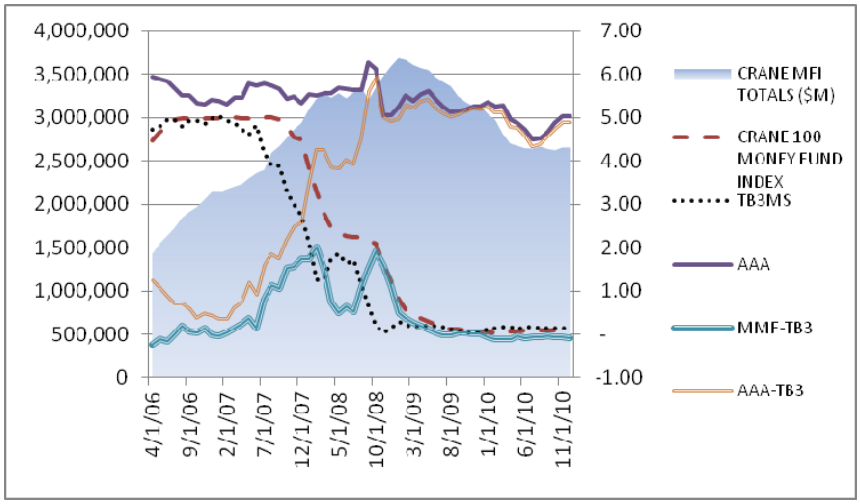
Source: Crane Database and Federal Reserve Economic Data (FRED)

Figure 3 The Equilibrium in the MMFs

The above figure shows that the demand curve is steeper or less elastic than the supply curve. In other word, with the same change in yield, the change in assets demanded when TB3 is constant is less than the change in assets supplied, when AAA is constant. Generally the demand for goods and services for which no substitutes exist are inelastic. This can therefore be explained by that fact that borrowers have options pertaining to their source of funds, and are more restricted than that of their investors.

During the financial crisis between the dates of July 2007 until December 2008 it was evident that there was an unusual increasing gap in yield between MMF and TB3. (See Figure 4.). The increase in these spreads raised the cost of borrowing and initiated the Temporary Guarantee Program regulated by Federal Reserve. At the same time, the spread between the corporate AAA bonds and the TB3 was increasing tremendously through time. Issuing AAA bonds is considered very expensive compared to issuing short-term instruments, because investors demand higher interest rates to compensate for the higher default risks. At the same time, the financial crisis caused a number of investors to shift their assets to safe and liquid products. As a result the assets in MMFs increased by $800 billion from the end of July 2007 through August 2008.

Taylor et al. (2008) explained that the yield difference that increased counterparty risk between banks contributed to the rise in spreads and found no empirical evidence that the new term auction facility (TAF) had reduced spreads.



Source: Crane Database and Federal Reserve Economic Data (FRED)

Figure 4 Yield Difference

6. Economics of Surplus

6.1 Investor Surplus

Investor surplus is the difference between the yield that investors, both retail investors and institutional investors, are willing to accept to invest in the MMFs. It is the yield that investor are willing to receives, which is the equilibrium market yield for each dollar invested.

From the supply function in equation (2); $\ln(Q^s) = \beta_{0k} + \beta_1(MMF - TB3)$ and then rearrange function in equation (13); $MMF^S = \left(\frac{\ln(Q^S) - \beta_{0k}}{\beta_1}\right) + TB3$. We integrate the supply function from Q0 to Q* on both sides as,

$$\int_{Q0}^{Q^*} MMF^s = \int_{Q0}^{Q^*}\left(\frac{\ln(Q^S) - \beta_{0k}}{\beta_1}\right) + \int_{Q0}^{Q^*} TB3 \qquad (24)$$

And solve for the equation (See Appendix A)

$$\int_{Q0}^{Q^*} MMF^s = \frac{1}{\beta_1}\left[Q\ln Q - Q\right]_{Q0}^{Q^*} - \frac{\beta_0}{\beta_1} Q\Big|_{Q0}^{Q^*} + TB3 * Q\Big|_{Q0}^{Q^*} \qquad (25)$$

Therefore, the supply surplus = $MMF^*(Q^* - Q^0) - \int_{Q0}^{Q^*} MMF^S$ (26)

6.2 Borrower Surplus

Borrower surplus is the difference between the yield that borrowers such as governments, banks, conduits, and corporations are willing to pay for the source of funds.
It is the yield that borrowers are willing to pay, which is the market yield or the yield at the equilibrium for each dollar.

From the demand function in equation (4); $\ln(Q^d) = \gamma_{0k} + \gamma_1(AAA - MMF)$

And then rearrange function in equation (14); $MMF^D = -\left(\frac{\ln(Q^D) - \gamma_{0k}}{\gamma_1}\right) + AAA$,

Then we integrate the demand function from Q0 to Q* on both sides as,

$$\int_{Q0}^{Q^*} MMF^D = -\int_{Q0}^{Q^*}\left(\frac{\ln(Q^D) - \gamma_{0k}}{\gamma_1}\right) + \int_{Q0}^{Q^*} AAA \qquad (27)$$

And solve for the equation

$$\int_{Q0}^{Q^*} MMF^D = -\frac{1}{\gamma_1}[Q\ln Q - Q]\Big|_{Q0}^{Q^*} + \frac{\gamma_{0k}}{\gamma_1} Q\Big|_{Q0}^{Q^*} + AAA * Q\Big|_{Q0}^{Q^*} \qquad (28)$$

Therefore, the borrower surplus = $\int_{Q0}^{Q^*} MMF^D - MMF^*(Q^* - Q^0)$ (29)

6.3 The Numerical Value of MMF's Surplus

If there is no government intervention, borrowers and investors can match their requirement at the market equilibrium. Both borrowers and investors gain benefit from free trade. In each trade, borrowers receive demand surplus, and investors receive supply surplus. The value of the MMFs can be estimated based upon the total value of the surplus of the borrower's demand and the surplus of the investor's supply.

In this study, we calculate the average numerical value of MMFs and the average parameters from investors' supply function in equation (2); $\ln(Q_t^s) = q_{st} = \beta_{0kt} + \beta_{1t}(MMF_{st} - TB3_t)$ and borrowers' demand function in equation (5); $\ln(Q_t^d) = q_{dt} = \gamma_{0kt} + \gamma_{1t}(AAA_t - MMF_{dt})$. The results from the calculations are shown in Table 1.

Table 1 The Average Value of Assets Invested in MMFS and Annualized Yields at Equilibrium in Each Period

Period	4/2006 - 12/2010	2006	2007	2008	2009	2010
Q* (million dollars)	2,796,891	1,809,657	2,472,670	3,304,044	3,421,163	2,730,110
MMF* (%)	2.37	4.87	4.89	2.38	0.28	0.07
TB3 (%)	1.95	4.88	4.17	1.15	0.14	0.14
AAA (%)	5.39	5.60	5.55	5.61	5.33	4.93
MMF-TB3 (%)	0.42	-0.01	0.72	1.23	0.13	-0.07
AAA-MMF (%)	3.02	0.74	0.66	3.23	5.06	4.85

Source: Crane Database and Federal Reserve Economic Data (FRED)

In Table 1, the average assets invested in the MMFs at equilibrium are close to three trillion dollars at 2.37 percent average yields at equilibrium between April 2006 and December 2010. The average spread between the yields of MMFs and those of three-month Treasury bills is at 0.42 percent. The average spread between the yields of AAA bonds and those of MMFs is 3.02 percent.

During the market crash including the meltdown of Reserve Primary Fund in 2008, the average amount of assets invested in the MMFs at equilibrium rose up to over three trillion dollars. As the governments restrict the short-term interest rates during the crisis, the spread between the yields of the MMFs and the three-month Treasury bills became wider. The average spread between the MMFs and three-month Treasury bills increased dramatically from -0.01 percent in 2006 to 1.23 percent in 2008. However, the spread reduces to -0.07 percent after the crisis in 2010. In addition, the average spread between the yields of AAA bonds and those of the MMFs increased from 0.74 percent in 2006 to 3.23 percent during the crisis in 2008. The then spread continued to rise to 5.06 percent and 4.85 percent in 2009 and 2010 respectively.

The average amount of assets in the MMFs at equilibrium increased during the 2008-2009 crisis when the yields at equilibrium reduced from 4.89 percent in 2007 to 2.38 percent and 0.28 percent in 2008 and 2009, respectively. However, when we take a closer look to the amount of assets in the MMFs at equilibrium in 2009, the equilibrium amount of assets invested in MMFs at the beginning of the year is approximately $3.7 trillion dollars while those assets at the end of the year is only $3.1 trillion dollars. This can be explained that investors withdrew about $553 billion dollars out of money market mutual fund in 2009 because of the low interest rates that are close to zero.

In Table 2, the average value of the constant terms β_{0k} and γ_{0k} from the supply function in equation (2); $\ln(Q^s) = \beta_{0k} + \beta_1(MMF - TB3)$ and the demand function in equation (5); $\ln(Q^d) = \gamma_{0k} + \gamma_1(AAA - MMF)$ are presented.

Table 2 The Average Value of the Constant Terms in Supply Function and Demand Function, When the Slope β_1 is Fixed at 1.2448 and the Slope γ_1 is Fixed at 0.1304

Period	4/2006 - 12/2010	2006	2007	2008	2009	2010
β_{0k}	13.47	14.44	12.41	11.08	14.62	15.05
γ_{0k}	14.50	14.32	14.65	14.67	14.51	14.31

In Table 3, the borrower surplus, investor surplus and the value of MMFs are determined in terms of million dollars. Before the crisis in 2006 and 2007, the borrower surplus, are approximately $171 billion dollars and $233 billion dollars, respectively. The investor surplus are approximately $5.6 billion dollars and 7.8 billion dollars in 2006 and 2007, respectively As the government restriction policy on short-term interest rates during the crisis led to a wide spread as shown in Table 1, the value of borrower surplus and investor surplus increased dramatically. In 2008, the borrower surplus and investor surplus increase to $312 billion dollars and $10.4 billion dollars, respectively. Consequently, the borrower surplus, are approximately $324 billion dollars during 2009. The surplus value of the MMFs increases to $10.7 billion dollars during 2009.

In 2010, the borrower surplus decreased to approximately $258 billion dollars and the investor surplus decreased to $8.6 billion dollars. The results confirm with the result in Table 1 that the yields of MMFs and the spread between those yields and the three-month Treasury bills had dropped dramatically right after the crisis, while the spread between the AAA-bonds and those yields increased dramatically due to financial panic and the borrowers' ability to restore the flow of credit. There was a fear in investors where they felt that corporate borrowers would have to declare bankruptcy due to an inability to roll over the commercial paper that they had placed their money into their MMFs.

Table 3 Borrower Surplus, Investor Surplus and the Value of MMFS (Million Dollars)

Period	4/2006 - 12/2010	2006	2007	2008	2009	2010
Borrower Surplus	264,504	171,140	233,842	312,465	323,541	258,188
Investor Surplus	8,772	5,676	7,755	10,363	10,730	8,563
Value of the MMFs	273,276	176,816	241,597	322,829	334,272	266,751

6.4 The Yield Elasticity of Investors and Borrowers

In order to explain the sensitivity of the amount of MMFs assets holding to change in its yield, one can compare the yield elasticity of investors and borrowers in each period. In other words, the elasticity of Q with respect to MMF is the change in Q when MMF increases by one percent (Wooldridge 2006).

The yield elasticity model for investors, which depends on the value of MMF, is

$$The\ Elasticity\ of\ Investors = \frac{dQ/Q}{dMMF/MMF} = \frac{MMF}{Q} * \frac{dQ}{dMMF}$$

We take derivative of Q with respect to MMF from equation (1), we have $\frac{dQ}{dMMF} = \beta_1 Q$

Therefore, $The\ Elasticity\ of\ Investors = \frac{MMF}{Q} * \beta_1 Q = MMF\beta_1$

Also the yield elasticity model for borrowers, which depends on the value of MMF, is

$$The\ Elasticity\ of\ borrowers = \frac{dQ/Q}{dMMF/MMF} = \frac{MMF}{Q} * \frac{dQ}{dMMF}$$

We take derivative of Q with respect to MMF from equation (4), we have $\frac{dQ}{dMMF} = -\gamma_1 Q$

Therefore, $The\ Elasticity\ of\ Borrowers = \frac{MMF}{Q} * -\gamma_1 Q = -MMF\gamma_1$

The results are presented in Table 4.

Table 4 The Elasticity of Investors and Borrowers

Period	4/2006 - 12/2010	2006	2007	2008	2009	2010
Investors	7.56	15.52	15.59	7.58	0.88	0.23
Borrowers	-0.25	-0.51	-0.52	-0.25	-0.03	-0.01

From Table 4, one can see that investors are considered "elastic" or changes in the yields of MMFs have a relatively large effect on the quantity of the assets that the investors want to invest. The result confirmed with Gordon and Pennacchi (1992) that the elasticity of investors' supply increases than that before 1961. Whereas borrowers are considered "inelastic" or changes in the yields of MMFs have a relatively small effect on the quantity of the assets that borrowers demanded. During 2006 and 2007, investors' elasticity is high. This can be explained that investors are sensitive to the interest rate. They prefer to invest in a fund that offers higher interest rates. One can also see the diminishing trend of the elasticity of investors and borrowers through time. In the post-crisis, the elasticity is very low for both investors and borrowers. The elasticity of borrowers is close to zero in 2010.

The main reason for the dramatic decrease in the yield of the MMFs after the crisis initial was due to the monetary intervention by the U.S. Federal Reserve, which reduced the value of the fed funds target rate, thereby affecting all the related rates. One can see that the regulations affected the borrowers' demand surplus more than the investors' supply surplus. The reason that demand surplus reduced more than supply surplus can be explained by the fact that the borrowers have more restricted access to source of funds, such as issuing bonds or obtaining short-term financing.

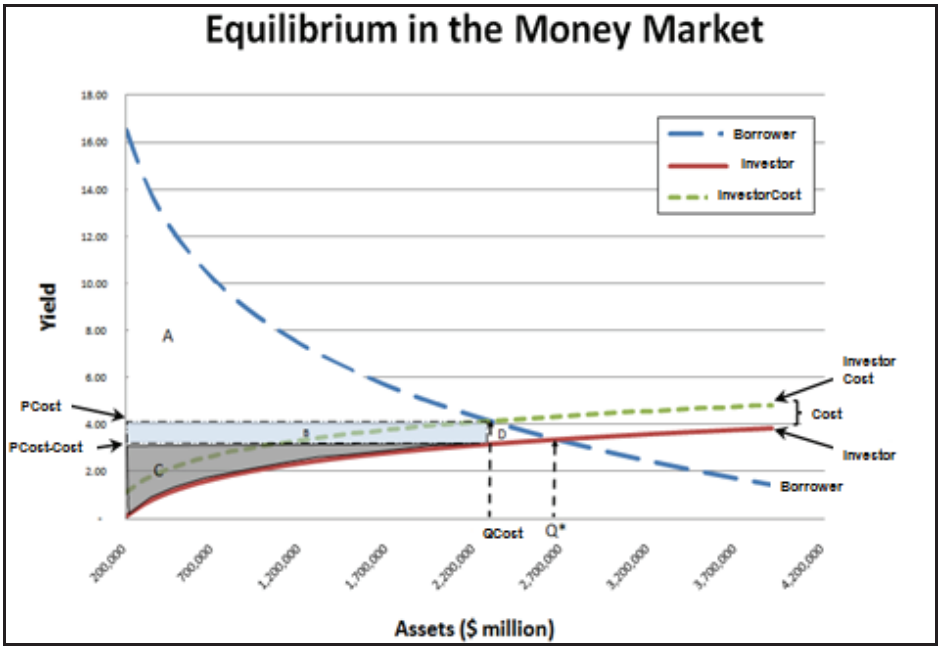
7. The Effect of the New Money Market Mutual Funds Policy by SEC

As mentioned earlier that the SEC released a memorandum on January of 2010, which stated that MMFs would have a requirement whereby they would need to have a minimum of ten percent of their assets in extremely liquid securities on a daily basis. In addition, they would also need thirty percent of their assets to be in an extremely liquid security on a weekly basis, as well as the requirement that they also shorten the maturity life of their holdings on average. This in essence, would cause a fund to shift and restrict their maximum weighted average of their fund's portfolio, causing an average drop of fund portfolio maturation to move from 90 days to 60 days.

Peter Crane (2010), the president of Crane Data, opposed the memorandum on January of 2010. He estimated that the change will most likely result in a reduction in the total yield of MMFs by approximately 0.1 percentage points. What he mentioned has been proved in Table 1, as one can see that the average yield of MMFs is reduced from 0.28 percent in 2009 to 0.07 percent in 2010. In addition, he expected that more people would pull their money out of MMFs because of the already low rates. There had been an evidence where there was over seven hundred billion dollars pulled out of the various MMFs from 2009 to 2010.

To see the impact of the new regulation to the MMFs proposed by SEC, the effect of a 0.1 percent tax on MMFs is illustrated in Figure 5.[8]

[8] The chart is not to scale and is only displayed to illustrate the surplus and loss.



Source: Crane Database and Federal Reserve Economic Data (FRED)

Figure 5 The Effect of an Increase in 0.1 Percent Cost

The regulatory change causes a reduction of both investors and borrowers surplus. This is a cost for investors and borrowers who have left the market, since they face lower yields on investments and higher costs for borrowing in the alternative markets. If the government were to tighten the policy that increases the cost and reduces the yield by 0.1 percent from the investors within a closed equilibrium system, this will cause a shift in the supply curve from supply to InvesterCost and increase yield to PCost and decrease the assets to QCost (as shown in Figure 5). If investors are concerned with a reduction in yields, then they are willing to invest in the MMFs at the same amount of their assets only if they can receive the higher yields equal to the regulation imposed.

In Table 5 during April 2006 to December 2010, the implicit cost by the SEC rule shifts the supply curve up ranging by 0.1 percent to 1 percent. At 0.1 percent increase in cost, the equilibrium assets from April 2006 to December 2010 decrease from $2,796,891 million dollars to $2,768,411 million dollars. At 1 percent increase in cost, the equilibrium assets decrease to $2,524,799 million dollars during the same period. At 0.1 percent increase in cost, investors in MMFs perceive yields after tax imposed decrease from 2.47 percent to 2.37 percent during the same period. On the other hand, borrowers perceive their borrowing cost increase from 2.37 percent to 2.47 percent during the same period. One can see that during 2009 and 2010 the actual yields investors perceived are close to zero.

Table 5 The Average Value of Assets Invested in MMFS and Annualized Yields at Equilibrium in Each Period

Period	4/2006 - 12/2010	2006	2007	2008	2009	2010
Q* (million dollars)	2,796,891	1,809,657	2,472,670	3,304,044	3,421,163	2,730,110
0.1% Increase						
Qcost (million dollars)	2,768,411	1,791,230	2,447,492	3,270,401	3,386,327	2,702,311
Actual Yields Borrowers Perceived (%)	2.47	4.97	4.99	2.47	0.37	0.17
Actual Yields Investors Perceived (%)	2.37	4.87	4.89	2.37	0.27	0.07
0.2% Increase						
Qcost (million dollars)	2,740,222	1,772,991	2,422,571	3,237,100	3,351,846	2,674,795
Actual Yields Borrowers Perceived (%)	2.57	5.06	5.08	2.57	0.47	0.27
Actual Yields Investors Perceived (%)	2.37	4.86	4.88	2.37	0.27	0.07
0.3% Increase						
Qcost (million dollars)	2,712,320	1,754,937	2,397,903	3,204,139	3,317,716	2,647,559
Actual Yields Borrowers Perceived (%)	2.66	5.16	5.18	2.67	0.57	0.36
Actual Yields Investors Perceived (%)	2.36	4.86	4.88	2.37	0.27	0.06
0.4% Increase						
Qcost (million dollars)	2,684,702	1,737,068	2,373,486	3,171,513	3,283,933	2,620,600
Actual Yields Borrowers Perceived (%)	2.76	5.26	5.28	2.77	0.66	0.46
Actual Yields Investors Perceived (%)	2.36	4.86	4.88	2.37	0.26	0.06
0.5% Increase						
Qcost (million dollars)	2,657,365	1,719,380	2,349,318	3,139,219	3,250,494	2,593,916
Actual Yields Borrowers Perceived (%)	2.86	5.35	5.38	2.86	0.76	0.56
Actual Yields Investors Perceived (%)	2.36	4.85	4.88	2.36	0.26	0.06
0.6% Increase						
Qcost (million dollars)	2,630,30	1,701,87	2,325,39	3,107,25	3,217,39	2,567,50

Period	4/2006 - 12/2010	2006	2007	2008	2009	2010
	6	3	6	4	6	3
Actual Yields Borrowers Perceived (%)	2.95	5.45	5.47	2.96	0.86	0.65
Actual Yields Investors Perceived (%)	2.35	4.85	4.87	2.36	0.26	0.05
0.7% Increase						
Qcost (million dollars)	2,603,523	1,684,543	2,301,718	3,075,614	3,184,635	2,541,360
Actual Yields Borrowers Perceived (%)	3.05	5.55	5.57	3.06	0.95	0.75
Actual Yields Investors Perceived (%)	2.35	4.85	4.87	2.36	0.25	0.05
0.8% Increase						
Qcost (million dollars)	2,577,013	1,667,390	2,278,281	3,044,297	3,152,208	2,515,483
Actual Yields Borrowers Perceived (%)	3.15	5.64	5.67	3.15	1.05	0.85
Actual Yields Investors Perceived (%)	2.35	4.84	4.87	2.35	0.25	0.05
0.9% Increase						
Qcost (million dollars)	2,550,772	1,650,412	2,255,082	3,013,298	3,120,111	2,489,869
Actual Yields Borrowers Perceived (%)	3.24	5.74	5.76	3.25	1.15	0.94
Actual Yields Investors Perceived (%)	2.26	4.76	4.78	2.27	0.17	-0.04
1% Increase						
Qcost (million dollars)	2,524,799	1,633,607	2,232,120	2,982,615	3,088,340	2,464,516
Actual Yields Borrowers Perceived (%)	3.34	5.84	5.86	3.35	1.24	1.04
Actual Yields Investors Perceived (%)	2.34	4.84	4.86	2.35	0.24	0.04

After the SEC enforced a new requirement that causes an increase in cost, the demand surplus drops to A as illustrated in Figure 5. Also the supply surplus drops to C. Unlike tax imposed regulation, this regulation creates an extra cost by reducing the yields to the investors and has no benefit to government revenue. Therefore, the total loss occurred is B+D. The numerical results are shown in Table 6.

Table 6 The Average Value of the MMFS After an Increase in Cost (Million Dollars)

Period	4/2006 - 12/2010	2006	2007	2008	2009	2010
0.1% Increase						
Demand Surplus (A)	261,810	169,398	231,461	309,284	320,247	255,559
Supply Surplus (C)	8,683	5,618	7,677	10,258	10,621	8,476
Value of the MMFs (A+C)	270,493	175,016	239,137	319,541	330,868	264,035
Loss (B+D)	2,783	1,800	2,460	3,287	3,404	2,716
0.2% Increase						
Demand Surplus (A)	259,144	167,673	229,104	306,135	316,986	252,957
Supply Surplus (C)	8,595	5,561	7,598	10,153	10,513	8,389
Value of the MMFs (A+C)	267,739	173,234	236,702	316,288	327,499	261,346
Loss (B+D)	5,537	3,583	4,895	6,541	6,773	5,405
0.3% Increase						
Demand Surplus (A)	256,506	165,965	226,771	303,017	313,758	250,381
Supply Surplus (C)	8,507	5,504	7,521	10,050	10,406	8,304
Value of the MMFs (A+C)	265,013	171,470	234,292	313,067	324,164	258,685
Loss (B+D)	8,263	5,346	7,305	9,762	10,108	8,066
0.4% Increase						
Demand Surplus (A)	253,894	164,276	224,462	299,932	310,564	247,832
Supply Surplus (C)	8,421	5,448	7,444	9,947	10,300	8,219
Value of the MMFs (A+C)	262,314	169,724	231,906	309,879	320,864	256,051
Loss (B+D)	10,962	7,092	9,691	12,949	13,408	10,700
0.5% Increase						
Demand Surplus (A)	251,309	162,603	222,176	296,878	307,401	245,308
Supply Surplus (C)	8,335	5,393	7,369	9,846	10,195	8,136
Value of the MMFs (A+C)	259,643	167,996	229,545	306,724	317,596	253,444
Loss (B+D)	13,633	8,821	12,052	16,105	16,676	13,307
0.6% Increase						
Demand Surplus (A)	248,750	160,947	219,914	293,855	304,271	242,810
Supply Surplus (C)	8,250	5,338	7,294	9,746	10,091	8,053
Value of the MMFs (A+C)	257,000	166,285	227,208	303,601	314,362	250,863
Loss (B+D)	16,276	10,531	14,390	19,228	19,909	15,888
0.7% Increase						
Demand Surplus (A)	246,217	159,308	217,675	290,863	301,173	240,338
Supply Surplus (C)	8,166	5,284	7,219	9,647	9,989	7,971

Period	4/2006 - 12/2010	2006	2007	2008	2009	2010
Value of the MMFs (A+C)	254,383	164,592	224,894	300,509	311,161	248,309
Loss (B+D)	18,893	12,224	16,703	22,319	23,110	18,442
0.8% Increase						
Demand Surplus (A)	243,710	157,686	215,458	287,901	298,106	237,891
Supply Surplus (C)	8,083	5,230	7,146	9,548	9,887	7,890
Value of the MMFs (A+C)	251,792	162,916	222,604	297,449	307,993	245,780
Loss (B+D)	21,484	13,900	18,993	25,379	26,279	20,971
0.9% Increase						
Demand Surplus (A)	241,228	156,080	213,264	284,969	295,071	235,468
Supply Surplus (C)	8,000	5,176	7,073	9,451	9,786	7,809
Value of the MMFs (A+C)	249,229	161,257	220,338	294,421	304,857	243,278
Loss (B+D)	24,047	15,559	21,260	28,408	29,415	23,473
1% Increase						
Demand Surplus (A)	238,772	154,491	211,093	282,068	292,066	233,071
Supply Surplus (C)	7,919	5,124	7,001	9,355	9,687	7,730
Value of the MMFs (A+C)	246,691	159,615	218,094	291,423	301,753	240,801
Loss (B+D)	26,585	17,201	23,503	31,406	32,519	25,950

From Table 6, at 0.1 percent increase in cost, one can see that the new policy reduced the value of the MMFs. The loss from the inefficiency of the market is approximately 2.72 billion dollars in 2010, which takes 1.02 percent of the value of the MMFs before the regulation was imposed. If the new policy caused 1 percent increase in cost to the MMFs, the loss from the inefficiency of the market can be up to approximately 26 billion dollars in 2010.

The regulation imposed is mainly effected on the intra-marginal borrowers and investors who have few alternatives available for them. For the large investors in MMFs, they can respond to the regulation by shifting funds out of money funds and investing in similar alternative yields such as direct investments in short-term securities or deposits in offshore Eurodollar accounts. For any investors and borrowers who have limited choice of investments, even though they have to pay higher cost for the regulation policy, the MMFs are still a considerable and favorable choice for them.

8. Conclusion

This paper attempts to estimate the value of the MMFs for both money borrowers and investors through the calculation of the equilibrium value for demand function and supply function of the funds. The demand function and supply function are identified from tracing factors that shift one curve without manipulating the other. We assume that MMF investors will allocate their money into a three-month United States Treasury bills as an alternative method of investment. We also assume that AAA bonds directly influence the demand of MMFs as an alternative source of funds.

Investors who place their money into MMFs do not consider AAA bonds as an alternative investment due to their different characteristics such as their ability to maintain a stable price per share. In addition, the borrowers who obtain short-term financing through MMFs do not consider three-month Treasury bills as substitute investment.

The exponential regression model or the log-linear model is used in supply function and demand function to measure elasticity of the total amount of assets invested in MMFs with respect to the yield difference between MMFs and three-month Treasury bills (MMF-TB3) in the supply function and the yield difference between AAA bonds and MMFs (AAA-MMF) in the demand function, respectively.

Without any restrictions, the value of the MMFs can be estimated based upon the total value of the surplus of the borrower's demand and the surplus of the investor's supply. This research also attempt to estimate the economic costs of restrictions on the MMFs, such as a new requirement to hold assets that were of a greater liquidity as well as greater quality, as well as letting all potential investors know the true value of their assets per share on a more frequent basis applied to the MMFs.

Since January 27, 2010, the U.S. Securities and Exchange Commission announced new regulations placed upon MMFs. The financial reform was intended to increase the flexibility of MMFs during economic suffering, reducing the risks of the existing funds to break the buck, facilitating the orderly liquidation of a money market mutual fund that breaks or is about to break the buck to meet redemption requests, and provide SEC detailed and timely information about the performance of the funds.

This regulation is estimated to create an extra cost by reducing the total yields of MMFs to the investors and has no benefit to business and government revenue. The result is that the new policy would most likely cause a loss of economic efficiency and trigger institutional investors to move their funds in alternative investments that offer higher interest rates. Investors who seek the returns and businesses, which borrow from the money market, are primarily hurt by the policy because they cannot take advantage of these alternatives.

References

Ball, Laurence. (2001). "Another Look at Long-Run Money Demand." Journal of Monetary Economics 47.1, 31-44.

Ball, Laurence. (2002). "Short-Run Money Demand." National Bureau of Economic Research Working Paper Series.

Chiang, Alpha C., and Kevin Wainwright. (2005). Fundamental Methods of Mathematical Economics. 4th ed. McGraw-Hill/Irwin.

Copeland, Rob, and Liz Rappaport. (2009). "New Security Shifts Risk to Borrower." The Wall Street Journal. June 15, 2009.

Crane, Peter. (2009a). "Money Voices: Don't mess with $1 NAV." Ignites, February 2009.

Crane, Peter. (2009b). "Money Markets and Money Funds: Is it safe to go back in the water?" Crane Data LLC. www.cranedata.com, March 2009.

Dow, J. P., and D. W. Elmendorf. (1998). "The Effect of Stock Prices on the Demand for Money Market Mutual Fund." Finance and Economic Discussion Series from Board of Governors of the Federal Reserve System (U.S.), no. 24.

Farinella, J.A., and T. W. Koch. (1999). "The Demand for Taxable and Tax-Exempt Money Market Mutual Funds." Journal of Macroeconomics 21, 335-353.

Gorton, Gary, and George Pennacchi. (1993). "Money Market Mutual Funds and Finance Companies: Are They the Banks of the Future?" In Structural Change in Banking, edited by M. Klausner, pp. 173-227. White, Irwin Publishing.

Investment Company Institute. (2008). "Investment Company Fact Book." www.icifactbook.org.

Investment Company Institute. (2009). Report of the Money Market Working Group.

Koppenhaver, G. G., and Travis R. A. Sapp. (2005). "Money Funds or Markets? Valuing Intermediary Services." Journal of Financial Services Research 27:1, 51-76.

Lam, Chun H., Rajat Deb, and Tom Fomby. (1989). "Deregulation and the demand for money market mutual funds." Journal of Macroeconomics 11:2, 297-308.

Mizen, Paul. (2008). "The Credit Crunch of 2007-2008: A Discussion of the Background, Market Reactions, and Policy Responses." Federal Reserve Bank of St. Louis Review, 531-567.

Seligman, Barnard. (1983). Money Market Funds. Praeger.

Swirsky, Joan. (2008) Rule 2a-7: A Map Through the Maze for the Money Market Professional. Philadelphia, PA: Stradley Ronan LLC.

Taylor, John B., and John C. Williams. (2008). "A Black Swan in the Money Market." National Bureau of Economic Research Working Paper Series.
The Group of Thirty. (2009). "Financial Reform: A Framework for Financial Stability."

The President's Working Group on Financial Markets. (2008). "Progress Update on March Policy Statement on Financial Market Developments." Policy Statement on Financial Market Developments.

Treasury Strategies. (2008). "The Case for the Sufficiency of Rule 2a-7 in Governing Money Market Mutual Funds." Chicago, IL: Treasury Strategies.

U.S. Securities and Exchange Commission. (2010). "SEC Approves Money Market Fund Reforms to Better Protect Investors." For Immediate Release 2010-14. http://www.sec.gov/news/press/2010/2010-14.htm.

Volcker, Paul A. (2008). "Rethinking the Bright New World of Global Finance." International Finance 11.1, 101-107.