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How Informative Is Floating NAV When Securities Trade Infrequently?

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Abstract

We examine if a floating net asset value (NAV) increases the transparency of risk for investors. Using closed-income fixed income funds we find little evidence that a floating NAV helps investors better understand the value and risk of a fund when a fund's assets trade infrequently. This potentially informs the debate regarding the adoption of a floating NAV in the money market industry. Our results suggest that it is unlikely that the benefits of floating NAV will outweigh the costs.

Keywords:

floating NAV, fixed income funds, money market funds, closed-end funds,

1. Introduction

Following the Lehman Brothers bankruptcy, Reserve Primary “broke the buck.”[1] This prompted some institutional investors to quickly withdraw their moneys from prime money market funds (MMFs), due to fears that they would also “break the buck,” exposing a weakness in the fundamental structure of the money market industry.[2] The Securities and Exchange Commission (SEC) responded to this revelation in 2010 by modifying rule 2a-7 of the Investment Act of 1940, requiring MMFs to improve the liquidity and credit quality of their portfolios.[3]

However, the changes enacted in 2010 did not address the $1 fixed net asset value (NAV) used by MMFs, which many worry hides the value of the fund's underlying portfolio. This issue continued to be debated after the 2010 policy changes, and lead to additional modifications. On July 23, 2014, the SEC adopted the following changes to the rules governing the MMF industry.[4]

The two primary changes in 2013 are:

1. Institutional nongovernment MMFs are required to sell and redeem shares based on the current market-based value of the securities in their underlying portfolios rounded to the fourth decimal place (e.g., $1.0000), that is, transact at a “floating” NAV.[5]
2. The boards of directors of nongovernment MMFs may impose a liquidity fee if a fund's weekly liquidity level falls below the required regulatory threshold, and may suspend redemptions temporarily, that is, to “gate” funds, under the same circumstances.

The SEC hopes that the change to a floating NAV will increase the transparency of MMF risk.[6]

However, it is unclear whether investors view changes in NAV as informative, with respect to risk, when reported NAV is based on estimated values of securities that trade infrequently, such as the securities held by MMFs. MMFs in the United States have used the fixed $1 NAV since the inception of MMFs, so we cannot empirically test the value of a floating NAV on MMFs. However, closed-end fixed income funds also hold securities that trade infrequently.[7] Therefore we explore whether a floating NAV is informative when securities trade infrequently in the closed-end fixed income fund industry, because as the Director of the Division of Market Regulation of the SEC said, “For investors, as well as regulators, the difficulty lies in establishing the prevailing market price for a bond.”[8]

We examine closed-end fixed income funds because they invest in assets that trade infrequently, and report an NAV based on the current (estimated) market price of the assets in their portfolio (floating NAV). Additionally, since closed-end funds do not transact with their investors directly, we are able to observe the market determined price of the closed-end fund's shares. Thus, closed-end fixed income funds allow us to observe a floating NAV based on estimated values of infrequently traded securities and a market determined share price, which proxies for the fund's shadow price. If a floating NAV makes risk more transparent and provides investors with information regarding the pricing of the fund, then we would expect that the direction of NAV changes are mirrored by similar directional changes in the fund's price.

We find that daily NAV changes and price changes have the same sign approximately 85% of the time. While this is consistent with the idea the investors find a floating NAV informative, the changes are based on closing prices and end of day NAVs. This means that while the changes cover the same period, closing prices are recorded before the end of day NAV is reported. Therefore, the results suggest that the market is aware of the same information as the managers before observing the NAV change.

As NAV is reported after closing prices are recorded, investors are unable to act on any information contained in the NAV change until the next day. Therefore, we examine the relation between the prior day's change in NAV

($close_{t-1}$-to-$close_t$) and the overnight change in price ($close_t$-to-$open_{t+1}$). We focus on those instances where the concurrent NAV and price changes disagree, as this is where NAV changes are likely to be the most informative. We find that the overnight price change moves opposite the prior days NAV change 48% of the time. This suggests that NAV changes provide little information to fund investors.

While bonds in general trade infrequently, Barclay, Hendershott and Kotz ([4]) provide evidence that longer term bonds trade less frequently then shorter term bonds. The fact that trading frequency is related to bond maturity leads us to explore if the informativeness of NAV changes is a function of the maturity of the closed-end fund's portfolio. We split funds into subsamples based on the duration (the available proxy for time to maturity) of their underlying portfolio, to explore the possible impact of time to maturity on our results. We first separate out those funds with durations under one year. This follows the traditional separation of money and capital markets at one year. We split the remainder of our sample into terciles based on the duration of their portfolios, leaving us with four duration subsamples. As in our full sample analysis we examine the frequency that overnight price changes are in the same direction as the prior day's NAV changes, when the prior day's NAV and price changes moved in opposite directions. We find results similar to our full sample results. The overnight price change is directionally consistent with the prior day's NAV change between 50% and 53%, again suggesting that a floating NAV offers investors little information. Moreover, the relatively consistent results suggest that the duration of the fund's portfolio has little influence on the information provided by NAV changes.

Simply comparing the direction of changes in NAV and prices may be too coarse an approach to detect subtle changes in investor inferences regarding the value of the fund's portfolio. Therefore, we explore the relation between price and NAV changes on a fund-by-fund basis using interval regression. We find a positive and significant relation between overnight price changes and NAV changes for 46% of funds, an insignificant relation for 47% of funds, and a negative relation for 7% of funds. This also suggests that changes in NAV provide little information to investors regarding fund pricing.

Last, we directly examine the ability of floating NAV to provide information about a fund's relative level of risk. Using the broadest definition of risk, variance, we explore the ability of NAV variance to predict the fund's risk the following month. We find that NAV variance provides little information regarding the subsequent risk of the fund. In general, our results suggest that a floating NAV provides little incremental information to investors regarding the price or risk associated with their investment in the fund; investors appear to be able to infer expected changes in portfolio NAV themselves from other market information.

2. Closed-end fixed income funds: Pricing and NAV

Both price and NAV reflect the value of a closed-end fund's share. While this suggests that the two should be equal, there are several reasons why the two may diverge: the illiquid nature of the portfolio securities, agency costs, and tax liability. The illiquid nature of the portfolio securities potentially makes it difficult for the fund to trade the security without moving the price. Agency costs refer to the potential that “management expenses incurred in running the fund are too high and/or the potential for subpar managerial performance reduces asset value” (Lee, Shleifer and Thaler, [14] , p. 75). Tax liability implies that NAV does not account for the imbedded capital gains liability that will be incurred if the fund sells assets, which have appreciated in value (Boudreaux, [7] ; Lee, Shleifer and Thaler, [14]). We believe these issues would lead to a relatively stable difference between a fund's reported NAV and its price, and should not play a major role in our investigations given our focus on daily changes in NAV and price.

In addition to potential differences in NAVs and prices, we will mention three other issues from the literature. The first is the general belief that the NAV represents the true value of the fund's portfolio (see Bodie, Kane and Marcus, [6] , p. 108). This belief is predicated on the nature of open-end equity funds, which tend to invest in

securities that trade frequently. The availability of recent transactions prices allows fund managers to use actual market prices in their calculation of NAV. This combined with the fact that open-end funds issue and redeem fund shares at NAV justify the belief that NAV reflects the true value of an open-end equity fund. However, in this study we examine closed-end fixed income funds, which tend to invest in securities that trade infrequently forcing the use of estimated security values in their NAV calculations. Additionally, closed-end funds do not issue or redeem shares at NAV. Instead, investors trade fund shares with each other on a market at a market determined price. Therefore, while NAV likely reflects an open-end equity fund's true value, for closed-end fixed income funds it represents the manager's estimated value of the fund.

The second issue relates to several papers: Chalmers, Edelen and Kadlec ([9]), Greene and Hodges ([13]), and Zitzewitz ([18]), which find exploitable trading opportunities at open-end funds that fail to account for nonsynchronous trading when calculating NAV. Again, as we study closed-end funds we do not feel this is an issue because closed-end funds do not issue and redeem fund shares at their reported NAV.[9] Interestingly, the profitable trading opportunities, in the open-end funds, arise because the managers at these funds are relying on “stale” prices, which suggest that NAVs may be less than fully informative, in the absence of recent transaction prices.

The third issue relates to the use of estimated values in NAV calculations. Morgan Keegan & Company provides an example of concerns associated with the use of estimated values. While a full description of the SEC actions against Morgan Keegan is beyond the scope of this paper, we note that the SEC alleges that Morgan Keegan violated their own stated valuation procedures. Specifically, they allege that the fair market value estimates of the funds’ assets were made by low level employees who lacked the training and experience necessary to make these determinations. Fund accountants relied on “price adjustments” provided by portfolio managers with little or no supporting documentation. Last, the valuation committee failed to ensure that estimated asset prices were updated periodically. While this is a single company, it does show the potential issues associated with relying on a fund's own estimates of the value of the securities in its own portfolio.

3. Data

We use the Morningstar Direct database to compile a list of U.S. closed-end fixed income funds (161), which existed between January 2006 and December 2012. We collect the asset mix of each fund's investment portfolio from Morningstar. Table 1 presents the average investment portfolio mix yearly to show any variation through time.[10] As one would expect, the majority of each portfolio is invested in corporate bonds. Additionally, the portfolio mix is relatively constant throughout our sample period.

Table 1 Sample descriptive statistics: Portfolio composition

This table presents the average percentages of fund assets invested in each asset class by year. Each column represents a year in our sample. Column 1 lists the types of securities held. The numbers shown in columns 2–8 show the average percentage of portfolio invested.

	2006	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Corporate bonds	51.98	60.97	55.71	55.82	50.94	53.06	45.10
Bank loans	5.77	4.39	6.22	7.77	5.10	6.58	10.22
Preferred stock	9.79	8.14	9.45	9.30	8.54	8.60	8.13
Municipals	0.28	0.16	0.26	0.65	1.54	3.42	3.41
Cash	11.71	10.56	9.74	10.64	6.68	4.27	7.02
Non-U.S. Govt.	0.00	0.00	0.00	0.01	7.71	9.02	6.91
Agency MBS	9.08	6.27	7.93	5.28	3.00	3.06	3.16
Non-agency MBS	2.01	1.47	2.54	2.75	4.86	4.36	4.81
Other	9.38	8.03	8.16	7.77	11.63	7.64	11.24

1 MBS, Mortgage Backed Securities.

Morningstar only reports monthly prices and NAVs. As we examine whether floating NAV provides timely information about risk, we require higher frequency data. Therefore, we collect daily opening and closing prices and closing NAV data from Bloomberg. This is the highest frequency data available because funds only report NAV at the end of each day.

Table 2 provides descriptive statistics on NAV, closing price and spread (NAV – price) of the closed-end fixed income fund sample. The sample contains 214,936 fund days with a mean spread of $0.39. The sample median spread is $0.50 with the quartiles at –$0.09 and $1.12. As expected, these statistics indicate that closed-end fixed income funds generally trade at a discount relative to their NAV.

Table 2 Sample descriptive statistics: Fund NAV, price and spread

This table reports the descriptive statistics for our sample of 214,936 closed-end fixed income fund days between 2006 and 2012. NAV represents the fund managers' estimated value of a share of the fund at the end of the day. Price represents the end of day price of a share of the fund on the open market. Both of these are collected from Bloomberg. Spread is calculated as NAV price.

	N	Min	P25	Mean	Median	P75	Max	Std
NAV	214,936	1.23	8.41	13.16	12.71	16.69	74.85	7.54
Price	214,936	0.85	7.89	12.77	12.09	16.08	92.35	8.25
Spread	214,936	–24.25	–0.09	0.39	0.5	1.12	13.44	1.61

A large body of work examines closed-end fund prices and NAVs and finds that these two time series are co-integrated.[11] To ensure the consistency of our sample with the prior literature, we examine the co-integration of NAV and price in our data. In unreported tests we find that NAV and price are co-integrated, with stationary error terms, for approximately 93% of the funds in our sample.[12] Having confirmed that NAV and price are co-integrated in our sample, we next move to our primary research question of whether or not a floating NAV improves the transparency of risk

4. Analysis

Our data set includes daily closing market prices and daily NAVs for the closed-end fixed income funds in our sample. The daily NAV represents the closing value of the fund's portfolio, as reported by management. The market closing price provides investors' estimate of the closing value of the fund's portfolio. As mentioned previously, closing prices are reported before NAV, due to the need for management to estimate NAV.

We first examine how often investor's valuation changes agree with those of the fund's managers. In Table 3, we report how frequently the change in price has the same sign as the change in NAV. We find the 85.74% of the concurrent changes have the same sign. In other words, for approximately seven of eight days NAV and price move in the same direction. This suggests that seven of eight times investors had the necessary information to determine the direction of the value change reported by management, and hints that investors may not find NAV changes informative.

Table 3 Daily changes in NAV and price

This table consists of the full sample. Column 2 shows the number of fund days the sign of the change in price from close to close matches the contemporaneous sign of the change in NAV from close to close. Column 3 gives the percentage of the fund days with different or the same signs.

	N	Percent
Different sign	30,650	14.26%

Same sign	184,286	85.74%
Total	214,936	

However, because closing prices are recorded before a fund reports its closing NAV, examining concurrent change does not allow investors to observe the change in NAV. Therefore, to examine how investors respond to NAV changes we explore how daily NAV changes relate to the overnight price change (closing price at time t to opening price at t + 1).

If NAV provides information to investors then we would expect that overnight price changes would follow the NAV change. If investors do not find NAV changes informative then an efficient market would predict that the overnight price change should be in the same direction as the previous day's NAV change 50% of the time. Table 4 provides the frequency at which an NAV change is followed by an overnight price change of the same sign. The results show that the overnight change has the same sign as the preceding NAV change 43.62% of the time. This is consistent with an efficient market, and investors learning little if anything from changes in the fund's NAV.

Table 4 Daily NAV changes and subsequent overnight price changes

This table consists of the full sample. Column 2 shows the number of fund days the sign of the change in NAV from close to close matches the sign of the following overnight change in price. Column 3 gives the percentage of the fund days with different or the same signs.

	N	**Percent**
Different sign	121,098	56.38%
Same sign	93,676	43.62%
Total	214,774	

However, the entire sample may not be the place to ask this question, as concurrent price and NAV changes are in the same direction for about 86% of our sample. NAV is likely to be most valuable when concurrent NAV and price move in opposite directions. In Table 5, we limit our sample to those instances when concurrent price change and NAV change have different signs. The NAV change and the subsequent overnight price change have the same sign 52.48% of the time. With a sample size of 30,650 a frequency of 52.48% is likely statistically different from 50%, but the question is whether a floating NAV improves the transparency of risk for investors. Having the same sign 52.48% of the time is unlikely to provide investors with any additional comfort about the amount of risk in their investment.

Table 5 Overnight price changes following contemporaneous NAV and price change disagreements

This table consists of the subset of fund days when the contemporaneous change in price and change in NAV go in opposite directions. Column 2 shows the number of fund days the sign of the change in NAV from close to close matches the following overnight sign of the change in price from close to open. Column 3 gives the percentage of the fund days with different or the same signs.

	N	**Percent**
Different sign	14,565	47.52%
Same sign	16,085	52.48%
Total	30,650	

4.1. Duration

Our results to this point suggest that a floating NAV provides investors little, if any, additional information about the risk of their investment. This is likely because the assets in the fund's portfolio trade infrequently forcing the

use of estimated values in the NAV calculations. A general scarcity of trades in the fixed income securities market is noted by Bessembinder, Maxwell and Venkataraman ([5]), Warga ([15] , [16]), and Warga and Welch ([17]). However, it has been noted that trading frequency is inversely related to a bond's time to maturity (see Barclay, Hendershott and Kotz, [4]), which suggests that the maturity of the bonds in a fund's portfolio could influence how informative investors find manager's NAV estimates. While we are unable to observe the fund's portfolio maturity directly, Morningstar does provide portfolio duration. We use duration as a proxy for time to maturity and examine whether portfolio duration, as a proxy for trading frequency, is related to the information content of floating NAV.

We begin the duration-based analysis by first separating out funds with durations of less than one year. We separate out funds that invest in ultra-short term investments as this represents the traditional boundary between money market instruments and capital market instruments. Once we remove these ultra-short funds, we divide the remaining funds into terciles based on the duration of their portfolios, giving us four duration subsamples.

Having created our four duration groups, we examine the frequency with which overnight price changes follow the prior day's NAV changes, when the prior day's price and NAV moved in opposite directions. Table 6 presents the results of this analysis. Panel A reports the results for those funds with a duration of less than one year. We find that the NAV change is followed by an overnight price change of the same sign 52.52% of the time. Panel B reports the results for the shortest duration tercile, and finds that when NAV and price move in opposite directions, the overnight price change has the same sign as the NAV change only 50.10% of the time. Panel C, the middle duration tercile, reports that the direction of the overnight price change is consistent with the prior day's NAV change 53.05% of the time. Last Panel D, reports the result for the longest duration tercile, and finds that the NAV change is followed by an overnight price change of the same sign 50.24% of the time. These results suggest that regardless of the fund's duration investors do not find NAV changes informative. Additionally, the relative consistency of our results across subsamples suggests that the duration, and therefore, the difference in trading frequency among assets that trade infrequently do not impact how investors view NAV changes.

Table 6 Overnight price changes analysis for different duration portfolios

This table presents the results of our duration subsample analysis. We limit the sample to those days when concurrent price and NAV changes moved in different directions. We then separate the sample into four duration groups, and present the frequency with which the direction of the overnight price change is consistent with the prior day’s NAV change. Panel A presents the results for those funds with durations of under a year. Panel B presents the results for the low duration tercile. Panel C presents the middle duration tercile. Panel D presents the longest duration tercile.

	N	**Percent**
Panel A		
Different sign	1,414	47.48%
Same sign	1,564	52.52%
Total	2,978	
Panel B		
Different sign	2,634	49.90%
Same sign	2,645	50.10%
Total	5,279	
Panel C		
Different sign	2,783	46.95%
Same sign	3,145	53.05%
Total	5,928	

Panel D		
Different sign	2,444	49.76%
Same sign	2,468	50.24%
Total	4,912	

4.2. Regression analysis

Our focus on the coarse measure of the direction of NAV and price changes could obscure a more subtle relation between NAV changes and price changes. To examine whether a more subtle relation exists we estimate the following regression model:

$$\Delta Pricet, i = \alpha + \beta \Delta NAVt - 1, i + \varepsilon i,$$

where

$$\Delta Pricet = lnopeningpricet + 1 - lnclosingpricet$$

and

$$\Delta NAVt - 1 = lnNAVt - lnNAVt - 1.$$

Estimating this model with ordinary least squares has potential econometric problems due to the discrete nature of price changes and the continuous nature of information changes. To address the discrete nature of the dependent variable, we use an interval regression model that uses a range as the dependent variable to predict the value of the outcome variable. Using a range of half a cent below and above the change in price allows the dependent variable to move in a continuous manner. For example, instead of forcing the dependent variable to be $1.50, we allow it to be between $1.495 and $1.505. Thus, we control for the possibility of small pieces of information in the independent variable (changes in NAV) leading to information value of less than $0.01 in prices.

We estimate the regression model for every fund in our sample to determine the frequency that changes in NAV are able to predict changes in price. We report the summary results from the regressions in Table 7. Table 7 reports that for the entire sample that β is positive and significant for 46% of the funds in our sample. While this suggests that changes in NAV may be informative for investors in some funds, whether or not it is informative for any single fund is no better than a coin flip.

Table 7 Interval censored regression analysis

This table shows the results of the interval censored regressions. Row 1 is the full sample of funds. Each column represents the percentage of funds that have a negative significant, insignificant, or positive significant beta for the regression Ln(Price)t,t = α + β(Ln(NAV)t−1,i+εi) . Because it is an interval censored regression, the dependent variable is a range of a half-a-cent above and below the given change in price. Row 2 represents funds with average effective durations of less than one year. Rows 3–5 show results of the regressions for all funds with average effective durations of more than one year. These three groups are divided into terciles. Tercile 1 funds have the lowest duration of the three groups. Tercile 2 funds are the middle group. Tercile 3 funds have the longest average effective durations.

	Negative	**Insignificant**	**Positive**
Full sample	7%	47%	46%
Less than 1 year	0%	50%	50%
Tercile 1	4%	46%	50%
Tercile 2	11%	50%	39%
Tercile 3	8%	52%	40%

We again break our sample into the four duration subsamples to examine the impact that duration may have on the informativeness of NAV changes. Across all four subgroups β is insignificant for between 46% and 52% of funds. This finding suggests that duration differences do not inform NAV changes, and suggests that NAV provides little, if any, information to investors.

4.3. NAV variance

Our analysis to this point has focused on whether a floating NAV provides immediate information to investors. Another way to examine the question of transparency of risk in funds is whether the volatility of floating NAV is a predictor of future volatility.

In this section, we explore the ability of this month's fund risk to predict next month risk. Specifically, we calculate each fund's monthly NAV variance. We then rank each fund each month into terciles based on its calculated variance. We test whether knowing which risk tercile the fund was in last month helps an investor predict which risk tercile the fund will be in this month.

Table 8, Panel A, reports the frequency with which a fund in the lowest NAV variance tercile is in the lowest NAV variance tercile the next month. We find that a fund will continue in the low risk tercile only 7.16% of the time. Table 8, Panel B, shows a similar result for the high risk tercile. This suggests that observing the variance on a fund's NAV provides little information regarding the variance of its NAV next month.

Table 8 NAV variance analysis

This table presents the results of our analysis regarding the consistency of a fund's NAV risk. Panel A presents the frequency with which a fund in the low NAV variance tercile in month t – 1 will be in the low NAV variance tercile in month t. Panel B presents the frequency that a fund in the high NAV variance tercile in month t – 1, is in the high NAV variance tercile in month t.

	N	**Percent**
Panel A		
Different tercile	3,397	92.84%
Same tercile	262	7.16%
Total	3,659	
Panel B		
Different tercile	3,334	92.46%
Same tercile	272	7.54%
Total	3,606	

Table 9 reports the ability of last month's NAV variance to predict this month's price variance. Similar to the results presented in Table 9 , we find that funds in the low risk NAV tercile are in the low risk price tercile in the following month only 7.35% of the time. The frequency drops to 7.15% for the high risk terciles. These results suggest that a floating NAV is likely to provide little, if any, transparency with respect to risk.

Table 9 NAV and price variance analysis

This table presents the results of our analysis regarding the ability of a funds NAV variance to predict the variance of the fund's price in the following month. Panel A presents the frequency with which a fund in the low NAV variance tercile in month t – 1 will be in the low price variance tercile in month t. Panel B presents the frequency that a fund in the high NAV variance tercile in month t – 1, is in the high price variance tercile in month t.

	N	**Percent**
Panel A		
Different tercile	3,390	92.65%

Same tercile	269	7.35%
Total	3,659	
Panel B		
Different tercile	3,348	92.85%
Same tercile	258	7.15%
Total	3,606	

5. Conclusion

This paper examines whether a floating NAV improves the transparency of risk when the securities in the fund's portfolio trade infrequently. We examine this question using closed-end fixed income fund data, because these data are uniquely qualified to address this question. Specifically, closed-end fixed income funds invest in securities that trade infrequently; the funds are required to report their NAV daily, and investors trade closed-end fixed income share in a market.

We fail to find evidence that a floating NAV helps investors better understand how the portfolio's value changes, or predicts the relative risk of the fund. This suggests that requiring MMFs to switch to a floating NAV is likely to provide limited transparency on risk. If the argument is that simply seeing NAV fluctuate will make investors aware of risk, then limiting its implementation to institutional funds would seem redundant. Anyone able to invest $1 million in a money market account is likely to be financially sophisticated, which suggests they already understand that MMFs are risky.

New regulations should be evaluated in a cost/benefit analysis. Our results suggest that MMF investors will not derive any additional information about the risk or value of their MMF investment from floating the NAV. With little benefit from floating the NAV the best we can hope is that the required change to a floating NAV for prime institutional MMFs is benign. Alternatively, the change could be destructive. An April 6, 2015, Wall Street Journal article discusses BlackRock reducing their MMF offerings from around 50 funds to around 30 funds and converting some prime MMFs to government MMFs, which are not required to use a floating NAV, in response to the change in regulations (Burne, [8]). Also, Fidelity is converting three prime MMFs to government MMFs, while JP Morgan Asset Management is simply changing its prime fund to a floating NAV, and Federated is shortening the maturity of some of its prime MMFs. Given our results, movement away from prime MMFs raises the question of whether this regulatory change is destructive. The possibility of being destructive is particularly important because the multitrillion dollar prime MMF sector is an important source of short-term funding for both financial and nonfinancial firms (see Chernenko and Sunderam, [11]).

Footnotes

1 Reserve Primary was forced to write down the value of the Lehman's commercial paper it held.

2 See Akay, Griffiths and Winters (2014b) for an analysis of the demise of Reserve Primary fund, which shows the fragility of the MMF structure. See Akay, Griffiths, Kotomin and Winters (1) for a discussion of the Federal Reserve's AMLF program to address the issues for MMFs holding Asset-Backed CP.

3 See Akay, Griffiths and Winters (2014a) for a discussion of the changes to rule 2a-7 in January of 2010.

4 The goal of these changes is to "improve their ability to manage and mitigate potential contagion from such redemptions, and increase the transparency of their risks, while preserving, as much as possible, their benefits." From page 1 of SECURITIES AND EXCHANGE COMMISSION, 17 CFR Parts 230, 239, 270, 274 and 279, Release No. 33-9616, IA-3879; IC-31166; FR-84; File No. S7-03-13,RIN 3235-AK61, Money Market Fund Reform; Amendments to Form PF.

5 Note that the summary of the final rule uses the term "institutional nongovernment" MMFs while the detailed discussion of the floating NAV uses the term "institutional prime" MMFs. The term "prime" is the industry description for the funds that the SEC is focused on for floating NAV. The SEC uses the term

"nongovernment" because they include in this designation some other types of MMFs that are not major segments of the market.

6 The switch to a floating NAV is also supposed to mitigate the first mover advantage. This is accomplished mechanically as investors now enter and leave the fund at the prevailing market prices.

7 Bessembinder, Maxwell and Venkataraman (5) examine institutional trading of corporate bonds and report less than 50 trades per bond issue over a six-month period.

8 This quote is from Bessembinder, Maxwell and Venkataraman (5).

9 Also, Greene and Hodge (13) only find evidence of these trading opportunities in open-end international funds.

10 All of the categories of assets reported in Table trade infrequently.

11 For example, Chang, Eun and Kolodny (10) and Gasbarro, Johnson and Zumwalt (12).

12 Gasbarro, Johnson and Zumwalt (12) find co-integration of price and NAV on 95% of the closed-end fixed income funds they examine. They note that most funds are co-integrated but that there are exceptions.

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