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## Handle with care: distribution effects on the estimated cash flows to equity funds

### Abstract

In this paper, we compare the estimated monthly net cash flows to mutual fund following Sirri and Tufano (1998) and the reported net flows from the N-SAR filings. We show that the well accepted estimation of net flows would be underestimated when only small portion of the distribution from mutual funds are reinvested. The deviation of the reported net flows from the estimated net flows is significantly affected by the income distribution and the capital distribution at the 1 percent level but the underestimation of net flows is more sensitive to the capital distribution than the income distribution. Therefore, researchers should be cautious when they use the estimation formula for mutual fund flows especially in a month with distributions.

**Keywords:** estimated fund flows, reported fund flows, income distribution effect, capital distribution effect.

**JEL Classification:** G11, G21, G23.

### Introduction

As investor demand for mutual funds has increased substantially over the years, the net cash inflow to the mutual funds had increased from \$112 billion in 1991 to \$883 billion in 2007 in the U.S.<sup>1</sup>. Consequently, extensive academic research has examined the cash flows entering and exiting the mutual funds to gain a deeper understanding of the behavior of mutual fund investors (see Ippolito, 1992; Warther, 1995; Gruber, 1996; Sirri and Tufano, 1998; Zheng, 1999; Edelen and Warner, 2001; Bergstresser and Poterba, 2002; Indro, 2004; Barber, Odean and Zheng, 2005; Frazzini and Lamont, 2008; Johnson and Poterba, 2010; Jank, 2012; Khan, Kogan, and Serafeim, 2012; Lou, 2012; and Spiegel and Zhang, 2013).

Although the mutual fund industry has grown significantly over the last 70 years as we can see the growth of the total net assets in mutual funds of \$400 billion in 1940 to \$13 trillion in 2007, most of detailed information about the individual mutual funds has not been open to the public since that information could be used to interpret the operational skills of the fund. For example, mutual funds disclose their holding quarterly. Especially, the net cash flows to mutual fund, which are essential information to study the relation between the fund performance and the fund investor behavior, are commonly examined with the implied value following Sirri and Tufano (1998).

The net cash flows to mutual fund should be the difference between the cash inflows and outflows after considering the exchanges. The estimated net cash flow as defined by Sirri and Tufano (1998) is the net growth in fund assets beyond reinvested dividends. The difference between the actual fund

flows and the estimated flows would be negligible in general, especially when the flows are measured annually. However, the actual flows could be significantly different from the estimated flows depending on the treatment of distribution from the firms that the mutual fund holds.

In this paper, we compare the estimated monthly net cash flows to mutual fund following Sirri and Tufano (1998) and the reported net flows from the N-SAR filings. We find that the well accepted estimated net flows are significantly lower than the reported net flows in December. In December, the mean of the value weighted average estimated net flows to equity funds from the CRSP database was -0.1 percent while the reported cash inflow to equity funds is greater than the outflow in December resulting in the net flow of positive 0.3 percent for the matched sample funds. We show that the estimated net flow, which is the net growth in fund assets beyond reinvested dividends would be underestimated when only small portion of the distribution from mutual funds are reinvested. We also report that most mutual funds pay capital and income distribution in December, which is consistent with the significant dispersion between the estimated net flows and the reported net flows in that month.

In addition, we show that both the capital distribution and the income distribution would significantly underestimate the net cash flows to mutual funds. Our regression analysis shows that the deviation of the reported net flows from the estimated net flows is significantly affected by the income distribution and the capital distribution at the 1 percent level. When we include both distribution ratio variables in the model, however, we find that the significance of the income distribution disappeared while the capital distribution variable remains significant at the 5 percent level. This result implies that the difference between the estimated and the reported net flows is

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<sup>1</sup> See the Investment Company Fact Book (1991-2012).

more sensitive to the capital distribution than the income distribution. Finally, when we compare the mean estimated and reported net flows to equity funds for each capital distribution quintile in each calendar month, we find that the estimated net flows are statistically lower than the reported net flows at the 5 percent level or higher for funds paying larger capital distribution not only in December but also in such months as August, September, October, and November. This result supports our argument that the commonly used estimation formula for mutual funds flows following Sirri and Tufano (1998) would underestimate the flows when mutual funds pay capital distribution.

The rest of this paper is organized as follows. Section 1 describes the data from the CRSP database and the N-SAR filings. Section 2 reports the difference between the estimated and the reported net flows. In Section 3, the effect of distribution from mutual funds on the underestimation of the net flows are rigorously examined. Final section concludes the study.

## 1. Data

This study examines the accuracies of the estimated cash flows to mutual funds from the CRSP database that are commonly used in the previous literature by comparing them against the reported cash flows to mutual funds. To do this, we measured the net cash flows to U.S. domestic equity mutual funds over the fourteen-year period beginning in January 1994 through December 2007<sup>1</sup>. The sample is based on the mutual fund database compiled by Center for Research in Security Prices Survivor Bias Free Mutual Fund Data base (hereafter referred to as CRSP database) and mutual funds' N-SAR filings with the U.S. Securities and Exchange Commission (SEC).

The CRSP database provides the fund share class level information on monthly total net assets (TNA), monthly returns, asset classes (equity vs. bond fund), style objectives, and names for all open-end mutual funds. We include 15,283 U.S. domestic equity fund classes from January 1994 to December 2007 in this study<sup>2</sup>. To avoid the possible upward bias in the reported returns of the smallest funds, we eliminate funds with less than \$15 million in assets under management following previous literature (See Elton, Gruber, and Blake, 2001; and Chen, Hong, Huang and Kubik, 2004). In doing so, we have 9,278 equity fund classes reported in the CRSP database.

All mutual funds are required to file N-SARs with the SEC every six months based on their fiscal year.

N-SAR filings contain information on the dollar amount of new sales, reinvestment of dividends and distributions, other sales, and redemptions for each month covered by the filing. N-SAR filings also identify the total net assets of mutual funds at the end of the period that is covered by the filing. Due to data availability, we collect all N-SARs pertaining to calendar years 1994 through 2007 from the SEC's Edgar website<sup>3</sup>. We then match a fund's N-SAR filing with the CRSP database based on the fund and family names.

N-SARs report the monthly dollar flows in and out of mutual funds at the fund level, but the CRSP mutual fund database treats the fund share classes as different entities. Therefore, we manually identify the share classes of a fund according to fund names and calculate total net asset values and monthly fund returns at the fund level to match them to the N-SAR filings. As a result, we obtain matched mutual fund level data containing 3,346 domestic equity funds over the period from January 1994 to December 2007.

Table 1. Descriptive statistics for U.S. domestic equity funds

	Monthly	Matched	Unmatched	All
Net asset value (\$ million)	mean	728.3	576.6	649.8
	(median)	(107.4)	(106.5)	(106.9)
Return (%)	mean	0.65	0.71	0.68
	(median)	(0.94)	(0.95)	(0.95)
Capital distribution (%)	mean	0.38	0.42	0.40
	(median)	(0.00)	(0.00)	(0.00)
Income distribution (%)	mean	0.06	0.08	0.08
	(median)	(0.00)	(0.00)	(0.00)

Source: CRSP database and author's estimations.

Table 1 reports descriptive statistics of matched and unmatched equity mutual fund classes reported in the CRSP database. Out of 9,278 fund classes, the matched sample consists of 6,322 fund classes between CRSP database and N-SAR filings with the SEC. On average, the matched funds manage greater assets than the unmatched funds but they generate lower returns and make lower distributions. The median of each statistic, however, shows the matched and unmatched funds have similar characteristics.

## 2. Estimated and reported cash flows to mutual funds

We estimate the monthly net cash flows to mutual funds using the data from CRSP database. Since the CRSP database does not directly report the flows, we infer net flows from fund returns and total net assets reported by CRSP following Sirri and Tufano (1998) and Frazzini and Lamont (2008). At the end of each month, we compute the net flows for fund *i*

<sup>1</sup> The sample data examined in this study is limited to year 2007 due to the data availability. However, as there has been no change for the way how both N-SAR filings and CRSP mutual fund data base are composed since 2007, it is reasonable to believe that the issue being examined in this paper would have the same significance today.

<sup>2</sup> I exclude the international funds, natural resources funds, and index funds.

<sup>3</sup> <http://www.sec.gov/edgar.shtml>.

(*Estimated Net Flows<sub>i,t</sub>*) as the dollar value of difference between new issues and redemptions

divided by the size of the fund at the beginning of the month using:

$$Estimated\ Net\ Flows_{i,t} = \frac{TNA_{i,t} - TNA_{i,t-1} \times (1 + r_{i,t}) - MGN_{i,t}}{TNA_{i,t-1}}, \tag{1}$$

where  $TNA_{i,t}$  is fund  $i$ 's total net assets at time  $t$ , and  $r_{i,t}$  is the raw return of fund  $i$  in period  $t$ , and  $MGN_{i,t}$  is the increase in total net assets due to mergers during the period  $t$ . Following the standard practice in the literature, we assume that inflows and outflows occur at the end of the month<sup>1</sup>.

Net cash flows, by definition, can be affected by inflows and outflows, respectively. By using the combined database from the CRSP and N-SAR filings, we are able to identify monthly cash inflows and outflows to mutual funds separately. *Inflow* is defined as:

$$Inflows_{i,t} = \frac{Sales_{i,t}}{TNA_{i,t-1}}, \tag{2}$$

where  $Sales_{i,t}$  is the amount of new money invested into a fund over a month. *Outflow* is defined as:

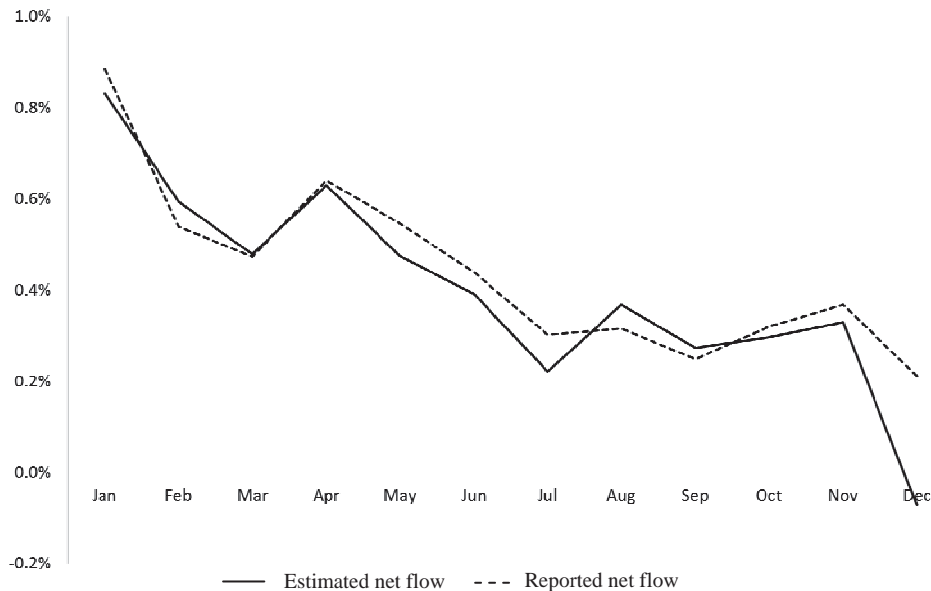
$$Outflow_{i,t} = \frac{Redemptions_{i,t}}{TNA_{i,t-1}}, \tag{3}$$

where  $Redemptions_{i,t}$  is the amount of money withdrawn from a fund over a month. Thus, we define the reported net flows for a matched fund, *Reported Net Flows*, as:

$$Reported\ Net\ Flows_{i,t} = Inflows_{i,t} - Outflows_{i,t}. \tag{4}$$

We eliminate those observations that appear to have data entry errors from the sample. Specifically, we exclude observations with Net Flows, Inflow, or Outflow that is less than -90 percent or greater than 100 percent, leaving me with a final sample of 186,229 equity fund-month observations<sup>2</sup>.

In Figure 1, we plot the mean of the value weighted average estimated net flows and reported net flows to equity funds by month<sup>3</sup>. In general, both estimated and reported net flows are close to each other in each month except December. Net flows to equity funds are the highest in January and these flows generally decrease until December. The negative estimated net flows in December are quite surprising given the sharp growth of the mutual fund markets. Also, the reported net flows are quite different from the estimated net flows in December. Since the reported net flows are the actual cash flows to mutual funds, we suspect the equation (1) for estimating the net cash flows to mutual fund has a severe flaw.



Source: Author's calculation.

**Fig. 1. Net flows to mutual funds by month**

<sup>1</sup> Previous literature including Zheng (1999), Sapp and Tiwari (2004), and Frazzini and Lamont (2008) examined the mutual fund flows under this assumption.

<sup>2</sup> We used various cutoffs of flows, but the results are qualitatively the same.

<sup>3</sup> In this study we report the results using the value weighted average flows to equity funds. We also reran all the analyses with the equally weighted average flows and the results are qualitatively the same.

In Table 2, we report the mean estimated and reported net flows to equity funds by month for the matched sample and the entire sample from CRSP database and N-SAR filings. We also report the mean difference between both variables and the relevant t-statistics. In December, the mean of the value weighted average estimated net flows to equity funds from the CRSP database was -0.1

percent during the sample period. However, as presented in Figure 1, the reported cash inflow to equity funds is greater than the outflow in December resulting in the net flow of positive 0.3 percent for the matched sample funds and positive 0.2 percent for the entire sample funds. Also, this difference is statistically significant at the 5 percent level or higher.

Table 2. Difference between estimated and reported net flows

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Matched sample	Reported net flows	0.92	0.59	0.56	0.72	0.64	0.54	0.38	0.39	0.31	0.41	0.42	0.34
	Estimated net flows	0.76	0.48	0.44	0.50	0.41	0.31	0.15	0.32	0.21	0.21	0.25	-0.11
	Difference	0.16 (0.57)	0.11 (0.53)	0.11 (0.63)	0.22 (1.34)	0.23 (1.26)	0.23 (1.37)	0.23 (0.93)	0.08 (0.35)	0.10 (0.52)	0.19 (1.20)	0.17 (1.24)	0.46*** (3.02)
Entire sample	Reported net flows	0.88	0.54	0.47	0.64	0.55	0.44	0.30	0.31	0.25	0.32	0.37	0.21
	Estimated net flows	0.83	0.59	0.48	0.63	0.47	0.39	0.22	0.37	0.27	0.30	0.33	-0.07
	Difference	0.05 (0.20)	0.05 (-0.29)	0.01 (-0.03)	0.01 (0.07)	0.07 (0.40)	0.05 (0.30)	0.08 (0.33)	-0.05 (-0.26)	-0.03 (-0.13)	0.02 (0.17)	0.04 (0.32)	0.28** (2.10)

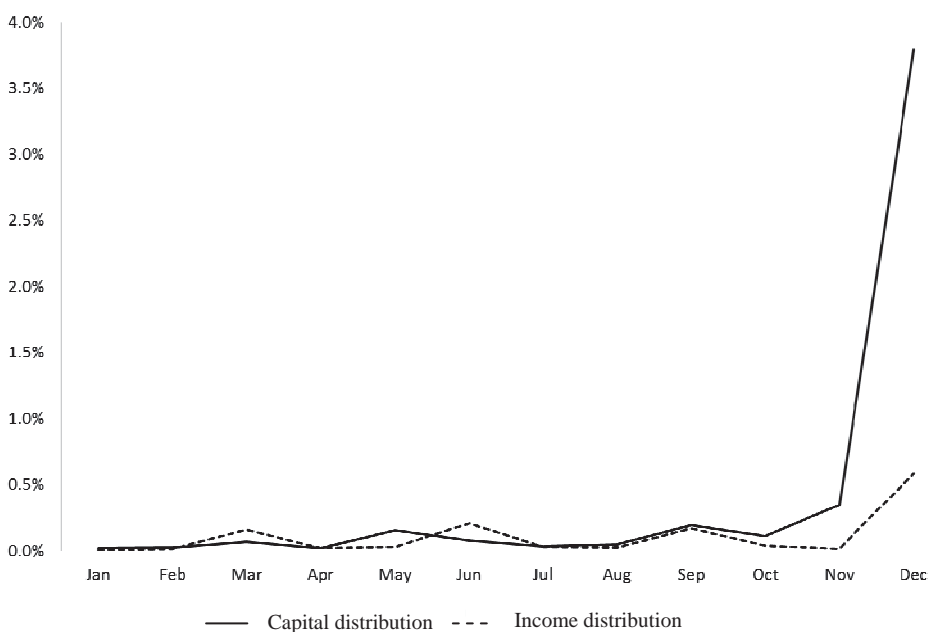
Source: CRSP database and author’s estimations

Note: The asterisks, \*, \*\*, and \*\*\* indicate significance at the 10%, 5%, and 1% level, respectively.

This inconsistency can be caused by the distribution and reinvestment amount. When we use the formula to estimate the net flows in equation (1), we subtract the multiplied amount of the total net asset value in the previous month by one plus return from the total net asset value at the end of the month. Since the total net asset value at the end of the month contains only the reinvestment amount and the monthly return is adjusted for the entire distribution, the difference between the entire distribution and the reinvestment amount would reduce the estimated net flows to mutual funds in December.

For instance, suppose a fund with 100 shares and the net asset value of \$10 per share decided to make a

distribution of \$1 per share. Assuming that there were no sales or redemptions over the month and the monthly raw return is zero, the distribution adjusted return would still be zero. If investors decided to reinvest only \$50 out of their entire distribution of \$100, the total net asset value at the end of the month would be \$9,950, while the total net asset value at the beginning of the month multiplied by one plus the monthly return would be \$10,000. As a result, the estimated net flows would be negative \$50, while the reported net flows are zero because there were no sales or redemptions. From this simple example, we suggest that the estimated net flows using the equation (1) would be understated in a month with distributions.



Source: CRSP database and author’s estimations.

Fig. 2. Capital distribution and income distribution by month

### 3. Distribution effects

To examine whether the relatively low estimated net flows in December are related to the distribution schedule, we plot the mean of the value weighted capital distribution ratio (capital distribution) and income distribution ratio (income distribution) by month in Figure 2. We calculate capital distribution (income distribution) as the amount of capital gain (income dividend) distribution per share divided by the reinvestment price. Figure 2 shows that income distributions are made mostly at the end of each quarter and the most of capital distributions are made in December.

If investors reinvest most of their received distributions to the mutual fund, we would observe that the estimated net flows are close to the difference between reported sales and redemptions. On the other hand, if investors do not reinvest the distributions to the fund at all, then the difference between estimated and reported net flows would be considerable. We find a number of examples that are consistent with this relation between the reinvestment and the understated estimated net flows in a month with distributions. For example, Fidelity Balanced Fund reported sales of \$643,454,000, redemption of \$497,030,000, and the reinvested distribution of \$402,336,000 in December 2007 to the SEC. According to the CRSP database, they reported the monthly return of 0.15%, the capital distribution ratio of 0.15%, and the income distribution ratio of 0.61% in the same month. The total net assets of the fund increased

from \$27,053 million to \$27,227 million over the period. The estimated net flows using the equation (1) are 0.50%, which is close to their reported net flows of 0.54%. Over the same period, Thornburg Core Growth Fund reported the net flows of 4.44% with zero reinvested distribution. The estimated net flows for the fund are 3.95% which is 0.49% lower than the reported net flows. In summary, the estimated net flows according to the equation (1) would understate the net flows for a month with reinvested distributions. These understated net flows might affect the results reported in previous studies.

In order to examine whether the difference between the reported and estimated net flows is affected by the distributions, we report the OLS regression results in Table 3. The dependent variable is the difference between average reported net flows and estimated net flows in each month and the explanatory variables are the income distribution ratio and the capital distribution ratio as defined above. In both matched and entire sample, the deviation of the reported net flows from the estimated net flows is significantly affected by the income distribution and the capital distribution at the 1 percent level. Especially, when we include both distribution ratio variables in the model, we find that the significance of the income distribution disappeared while the capital distribution variable remains significant at the 5 percent level. Thus, the difference between the estimated and the reported net flows is more sensitive to the capital distribution than the income distribution.

Table 3. Distribution effects on the difference between reported and estimated net flows

Explanatory variables	Matched sample			Entire sample		
	Model1	Model2	Model3	Model4	Model5	Model6
Intercept	0.141*** (6.538)	0.159*** (8.131)	0.148*** (6.870)	-0.010 (-0.563)	0.012 (0.791)	-0.001 (-0.068)
Income distribution	0.493*** (4.609)		0.202 (1.205)	0.450*** (5.094)		0.199 (1.524)
Capital distribution		0.076*** (5.031)	0.054** (2.252)		0.066*** (5.560)	0.046** (2.578)
N	168	168	168	168	168	168
Adj. R <sup>2</sup>	0.108	0.127	0.130	0.130	0.152	0.159

Source: CRSP database and author's estimations.

Note: The asterisks, \*, \*\*, and \*\*\* indicate significance at the 10%, 5%, and 1% level, respectively.

As we observe in Table 2, the difference between the estimated and the reported net flows are statistically significantly different only in December, the month that the capital distribution from mutual funds are concentrated in, as we see in Figure 2. However, if the underestimated net flows are affected by the capital distribution, then we would observe the significant difference for those mutual funds that pay capital distributions in other calendar months as well. In each month, we sorted the sample funds based on their capital distribution and measured the estimated net flows and the reported net flows.

In Table 4, we report the mean estimated and reported net flows to equity funds for each capital distribution quintile in each calendar month for the matched sample funds. We also report the mean difference between both flows and the relevant t-statistics. In December, the estimated net flows are statistically lower than the reported net flows at the 5 percent level or higher for funds paying larger capital distribution, as in 4th and 5th quintiles. Also, Table 4: The difference between estimated and reported net flows in each capital distribution quintile funds by calendar month in august, september, october, and november,

we observe the significantly underestimated net flows for funds paying larger capital distributions in the 5th quintile. This result supports our argument that the commonly used estimation formula for mutual funds flows in equation (1) would underestimate the flows when mutual funds pay capital distribution.

Table 4. The difference between estimated and reported net flows in each capital distribution quintile funds by calendar month

Month	Variable	Zero capital distribution	Quintile 1 (Low)	Quintile 2	Quintile 3	Quintile 4	Quintile 5 (High)
		Net flows	Net flows	Net flows	Net flows	Net flows	Net flows
January	Reported	0.94	3.04	1.57	1.73	1.48	2.22
	Estimated	0.78	2.55	0.36	0.82	0.26	0.91
	Difference	0.16 (0.55)	0.48 (0.21)	1.21 (0.54)	0.90 (0.44)	1.22 (1.24)	1.31 (0.74)
February	Reported	0.58	0.63	1.61	1.21	0.89	1.60
	Estimated	0.47	0.26	1.50	1.42	1.36	-2.55
	Difference	0.11 (0.53)	0.37 (0.51)	0.11 (0.13)	-0.21 (-0.16)	-0.47 (-0.55)	4.15 (0.73)
March	Reported	0.58	0.96	-1.94	-0.02	-0.07	1.60
	Estimated	0.45	1.84	1.17	0.20	0.40	0.96
	Difference	0.13 (0.66)	-0.88 (-0.93)	-3.11 (-1.58)	-0.22 (-0.40)	-0.47 (-0.60)	0.65 (0.40)
April	Reported	0.73	1.95	-2.19	-2.32	0.88	0.92
	Estimated	0.52	0.05	-0.37	-2.61	-0.48	-0.23
	Difference	0.21 (1.23)	1.90 (0.55)	-1.83 (-0.76)	0.30 (0.13)	1.35 (0.75)	1.15 (0.74)
May	Reported	0.66	2.47	1.85	2.72	4.11	0.43
	Estimated	0.44	4.70	2.68	1.91	0.01	-0.60
	Difference	0.21 (1.05)	-2.22 (-1.50)	-0.83 (-0.59)	0.80 (0.40)	4.09* (1.82)	1.03 (1.27)
June	Reported	0.52	0.72	2.07	1.25	0.83	0.15
	Estimated	0.31	0.14	1.22	0.28	-0.34	-0.80
	Difference	0.21 (1.22)	0.58 (0.96)	0.85 (0.74)	0.97 (1.04)	1.18 (1.54)	0.95 (1.63)
July	Reported	0.38	1.76	1.93	2.54	0.60	0.32
	Estimated	0.16	1.43	0.72	0.70	-0.30	1.26
	Difference	0.23 (0.94)	0.34 (0.18)	1.21 (0.46)	1.85 (0.79)	0.90 (1.24)	-0.94 (-0.31)
August	Reported	0.39	3.33	1.25	0.94	0.70	0.20
	Estimated	0.32	3.56	0.46	0.34	-0.44	-1.84
	Difference	0.07 (0.31)	-0.23 (-0.07)	0.80 (0.69)	0.61 (0.51)	1.14 (1.60)	2.04* (1.81)
September	Reported	0.30	1.21	-0.02	0.54	1.01	0.63
	Estimated	0.20	1.38	0.74	1.54	0.01	-0.95
	Difference	0.10 (0.53)	-0.17 (-0.22)	-0.76 (-0.66)	-1.00 (-0.82)	1.00 (0.99)	1.58* (2.00)
October	Reported	0.41	0.86	3.09	0.38	0.02	0.55
	Estimated	0.22	0.82	-0.82	0.24	-0.88	-0.83
	Difference	0.19 (1.14)	0.04 (0.02)	3.91 (1.64)	0.14 (0.20)	0.90 (1.58)	1.38** (2.18)
November	Reported	0.42	0.53	0.62	0.55	0.28	0.22
	Estimated	0.30	0.57	0.15	-0.35	-0.67	-1.72
	Difference	0.12 (0.94)	-0.04 (-0.10)	0.48 (0.81)	0.89 (1.67)	0.95* (1.95)	1.94* (2.07)
December	Reported	0.26	1.01	0.42	0.58	0.44	0.01
	Estimated	-0.01	1.06	0.40	0.24	-0.37	-1.70
	Difference	0.27 (1.16)	-0.05 (-0.20)	0.02 (0.07)	0.35 (1.11)	0.82** (2.79)	1.71**** (5.83)

Source: CRSP database and author's estimations.

Note: The asterisks, \*, \*\*, and \*\*\* indicate significance at the 10%, 5%, and 1% level, respectively.

## Conclusion

In this paper, we compare the estimated monthly net cash flows to mutual fund following Sirri and Tufano (1998) and the reported net flows from the N-SAR filings. We show that the estimated net flow, which is the net growth in fund assets beyond reinvested dividends would be underestimated when only small portion of the distribution from mutual funds are reinvested. We also report that most mutual funds pay capital and income distribution in December, which is consistent with the significant dispersion between the estimated net flows and the reported net flows. The deviation of the reported net flows from the estimated net flows is significantly affected by the income distribution and the capital

distribution at the 1 percent level but the under-estimation of net flows is more sensitive to the capital distribution than the income distribution. Finally, we find that the estimated net flows are statistically lower than the reported net flows at the 5 percent level or higher for funds paying larger capital distribution not only in December but also in such months as August, September, October, and November. This result supports our argument that the commonly used estimation formula for mutual funds flows following Sirri and Tufano (1998) would underestimate the flows when mutual funds pay capital distribution. Therefore, researchers should be cautious when they use the estimation formula for mutual fund flows especially in such a month with distributions as December.

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