Price Pressure and the Turn-of-the-month Effect: Evidence from Retirement Accounts

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ASSA Annual Meeting
January 2022

Overview

- Turn-of-the-month (ToM) effect is the fact that stock returns are higher on days surrounding the turn of calendar months

- One popular explanation is that people typically get their salaries around end-of-the-month (Ogden, 1990)

  - Invest part of it in equities, e.g., through pension accounts

  - and their investment in equities creates price pressure around those days.

Overview

- We test this hypothesis
- Key: a hand-collected comprehensive sample of mutual funds contained in 401K retirement accounts in the US, matched to individual stocks these mutual funds hold
- Retirement savings constitute a substantial chunk of equity investments of the salaried today

Overview

- Explosive growth in retirement market.
  - E.g., grew 4 fold between 1990-2010, from 4 to 17 trillion $ (Cohen and Malloy, 2012)

U.S. Total Retirement Market Assets

Billions of dollars, end-of-period, 1990–2010

	IRAs	DC plans[a]	Private DB plans	State and local government pension plans	Federal pension plans[b]	Annuities[c]	Total
1990	636	892	922	742	340	391	3,923
1991	776	1,060	1,073	868	382	423	4,582
1992	872	1,161	1,098	957	426	473	4,988
1993	993	1,319	1,212	1,066	468	522	5,581
1994	1,056	1,406	1,303	1,117	512	526	5,920
1995	1,288	1,717	1,496	1,354	541	582	6,978
1996	1,467	1,961	1,623	1,538	606	626	7,820
1997	1,728	2,343	1,798	1,825	659	658	9,012
1998	2,150	2,640	1,948	2,063	716	818	10,335
1999	2,651	2,997	2,067	2,360	774	928	11,778
2000	2,629	2,869	2,020	2,340	797	951	11,606
2001	2,619	2,701	1,868	2,250	860	1,041	11,339
2002	2,533	2,475	1,656	1,974	894	1,001	10,532
2003	2,993[e]	2,984	1,977	2,396	958	1,125	12,434
2004	3,299	3,306	2,126	2,621	1,023	1,332	13,708
2005	3,652[e]	3,576	2,262	2,763	1,072	1,443	14,768
2006	4,207[p]	4,084	2,493	3,157	1,141	1,521	16,603
2007	4,784[p]	4,354	2,646	3,298	1,197	1,600	17,880
2008	3,585[e]	3,379	1,979	2,415	1,221	1,376	13,954
2009	4,251[e]	4,041	2,245	2,760	1,324	1,471	16,092
2010	4,710[e]	4,486	2,410	3,024	1,425	1,593	17,649

Overview

- Retirement accounts are about 48% of long-term mutual fund assets in 2010

Mutual Fund Retirement Account Assets as a Share of Mutual Fund Assets

Billions of dollars, end-of-period, 1990–2010

	All mutual funds			Long-term funds[a]			Money market funds		
	Retirement accounts[b]	Total	Share[c]	Retirement accounts[b]	Total	Share[c]	Retirement accounts[b]	Total	Share[c]
	$	$	%	$	$	%	$	$	%
1990	$208	$1,065	20%	$146	$567	26%	$62	$498	12%
1991	325	1,393	23	262	851	31	$62	542	12
1992	423	1,643	26	357	1,096	33	66	546	12
1993	588	2,070	28	509	1,505	34	79	565	14
1994	672	2,155	31	572	1,544	37	100	611	16
1995	925	2,811	33	804	2,058	39	121	753	16
1996	1,199	3,526	34	1,044	2,624	40	155	902	17
1997	1,574	4,468	35	1,421	3,409	42	153	1,059	14
1998	1,990	5,525	36	1,797	4,174	43	193	1,352	14
1999	2,590	6,846	38	2,363	5,233	45	227	1,613	14
2000	2,558	6,965	37	2,323	5,119	45	236	1,845	13
2001	2,430	6,975	35	2,151	4,690	46	279	2,285	12
2002	2,169	6,383	34	1,866	4,118	45	303	2,265	13
2003	2,767	7,402	37	2,492	5,362	46	275	2,040	13
2004	3,191	8,095	39	2,945	6,194	48	246	1,901	13
2005	3,575	8,891	40	3,319	6,864	48	255	2,027	13
2006	4,228	10,398	41	3,929	8,059	49	300	2,338	13
2007	4,770	12,002	40	4,397	8,917	49	373	3,086	12
2008	3,290	9,604	34	2,821	5,771	49	469	3,832	12
2009	4,141	11,120	37	3,740	7,804	48	401	3,316	12
2010	4,686	11,821	40	4,334	9,017	48	353	2,804	13

Overview

- Retirement accounts are about a half of all mutual fund assets in 2010!

2010 Facts at a Glance

Total worldwide assets invested in mutual funds	**$24.7 trillion**
U.S. investment company total net assets	**$13.1 trillion**
Mutual funds	$11.8 trillion
Exchange-traded funds	$992 billion
Closed-end funds	$241 billion
Unit investment trusts	$51 billion
U.S. investment companies' share of:	
U.S. stocks	27%
U.S. municipal securities	33%
Commercial paper	45%
U.S. government securities	11%
U.S. household ownership of mutual funds	
Number of households owning mutual funds	51.6 million
Number of individuals owning mutual funds	90.2 million
Percentage of households owning mutual funds	44%
Median amount fund-owning households invested in mutual funds	$100,000
Median number of mutual funds owned	4
U.S. retirement market	
Total retirement market assets	$17.5 trillion
Percentage of households with tax-advantaged retirement savings	70%
IRA and DC plan assets invested in mutual funds	$4.7 trillion

Overview

- Shift from Defined Benefit (DB) plans to Defined Contribution (DC) plan

- Defined Benefit: employees guaranteed fixed benefits upon retirement
- Defined Contribution : employees allocate their contributions themselves among funds from a given list

- Typically, people behave very passively when it comes to these retirement accounts

- So, reasonable to think that huge chunks of passive money flowing into stocks held by retirement account funds is behind the Turn-of-the-month Effect

Data

- Hand collected data on mutual fund investment options in 401K plans from EDGAR
- 20,000+ excel files, downloaded by script, hand-matched and standardized by hand
- Sample 2000-2012, data at the company-mutual fund-year level.
- Once collected, matched funds listed to the following databases:
  - Thomson Reuters
  - CRSP
  - CRSP US Mutual Fund (MFDB)

Summary Statistics

Plan characteristics, by year

						Mean			Median				
Year	# firm	# unique matched funds	# items (include cash, common stock)	# funds	Matched # funds	Plan value	Fund value	Matched fund value	Plan value	Fund value	Matched fund value	matched %(value)	matched %(#)
2000	830	1246	17.3	14.2	8.0	294.8	202.5	95.5	57.7	45.2	23.3	47.1%	56.5%
2001	907	1058	19.8	16.5	7.0	289.9	200.6	100.6	54.4	41.7	15.3	50.1%	42.4%
2002	994	1150	20.8	17.5	7.2	294.8	198.7	77.0	57.9	42.5	13.9	38.8%	41.2%
2003	834	1257	22.2	18.8	8.8	296.9	211.0	84.6	57.6	43.9	18.3	40.1%	47.0%
2004	811	1340	22.1	19.0	9.3	327.6	237.0	108.5	73.9	57.6	28.3	45.8%	48.8%
2005	1185	1528	23.6	20.5	9.8	348.4	251.7	114.3	83.5	61.9	27.0	45.4%	48.1%
2006	986	1449	25.0	21.7	10.4	399.7	305.0	122.9	86.6	66.4	26.9	40.3%	47.9%
2007	931	1385	24.9	21.7	11.0	513.1	405.5	154.8	108.7	85.2	37.1	38.2%	50.7%
2008	899	1444	26.6	23.5	12.5	525.7	423.6	175.2	115.8	97.2	41.5	41.4%	53.4%
2009	879	1636	27.4	24.5	14.7	377.5	301.7	128.6	84.8	69.1	35.4	42.6%	60.0%
2010	844	1666	28.1	25.1	15.1	433.1	345.0	164.2	115.2	99.4	49.9	47.6%	60.0%
2011	807	1678	28.7	25.8	16.0	517.3	406.7	200.6	139.4	114.5	62.6	49.3%	62.0%
2012	787	1546	28.8	26.1	16.4	536.4	421.0	196.8	140.8	117.0	61.7	46.8%	63.0%
Total	1943	4692											

Hypothesis I

- First, we test for the continued existence of the ToM effect in US equity markets in the period for which we have 401K plan data:

- Hypothesis I:

  - H_0 *(ToM_Existence)*: There exists a ToM effect during the period under study.

Question: Does the Turn-of-the-Month Effect still exist?

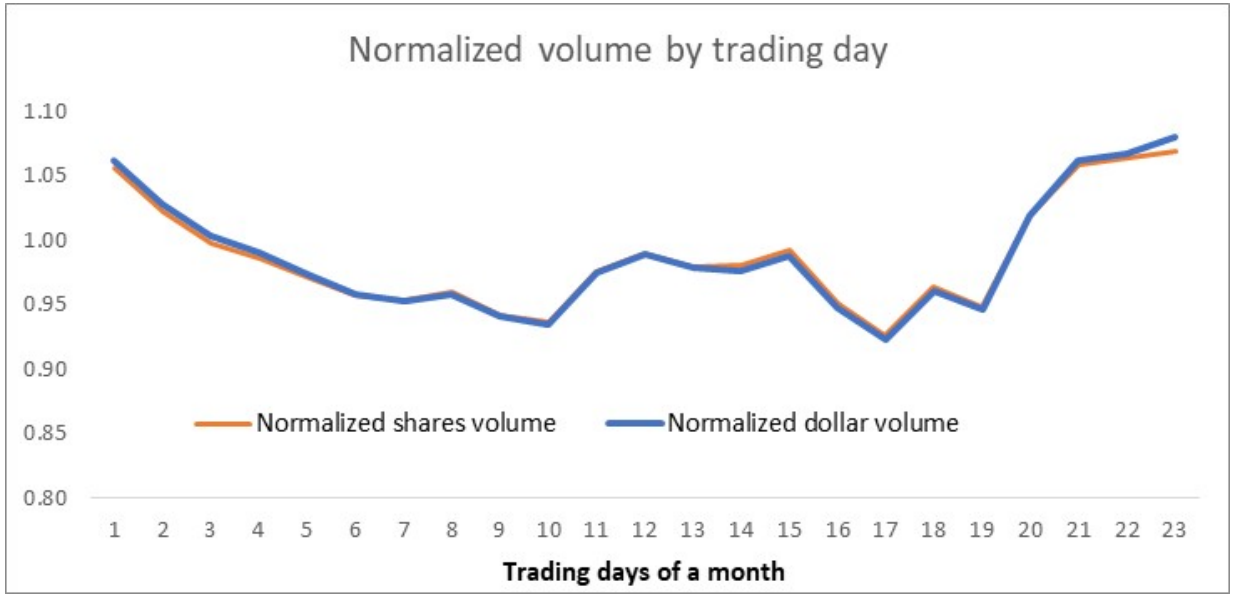

Figure 1: Volume around Turns-of-the-Month

Empirical Methodology

- Hypothesis I: *H_0 (ToM_Existence)*: There exists a strong ToM effect, even for the period under study.
  - Using stock returns:

$$Return_t = \beta_0 + \beta_1 . ToM\_dummy_t + \beta_2 . X_{i,t-1} + \varepsilon_{i,t}$$

  - ToM effect exists if $\beta_1 > 0$.

Results #1: Does the Turn-of-the-Month Effect still exist?

	EWRETD				VWRETD			
	1926-2017	<=1980	>1980	2000-2012	1926-2017	<=1980	>1980	2000-2012
TOM	0.16	0.185	0.124	0.131	0.129	0.157	0.085	0.081
	(9.50)***	(7.90)***	(5.31)***	(2.49)**	(7.55)***	(7.24)***	(3.11)***	(1.36)
_cons	0.054	0.054	0.054	0.038	0.018	0.01	0.03	0.004
	(7.29)***	(5.27)***	(5.39)***	(1.66)*	(2.34)**	(1.03)	(2.48)**	(0.13)
R^2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
N	24,289	14,958	9,331	3,269	24,289	14,958	9,331	3,269

Yes

ToM still there, especially on an equal weighted basis, i.e., it is likely stronger for smaller stocks

Main Hypothesis

- Main Hypothesis:

Stocks held by retirement account plans—that get passive inflows at the turn of the month— have stronger turn-of-the-month returns

- H_0 *(Flow_induced_ToM)*: There is a positive relationship between proportion of a stock held by 401K mutual funds and the ToM effect it experiences

Question: What is the relation between the ToM Effect and 401K exposure of stocks

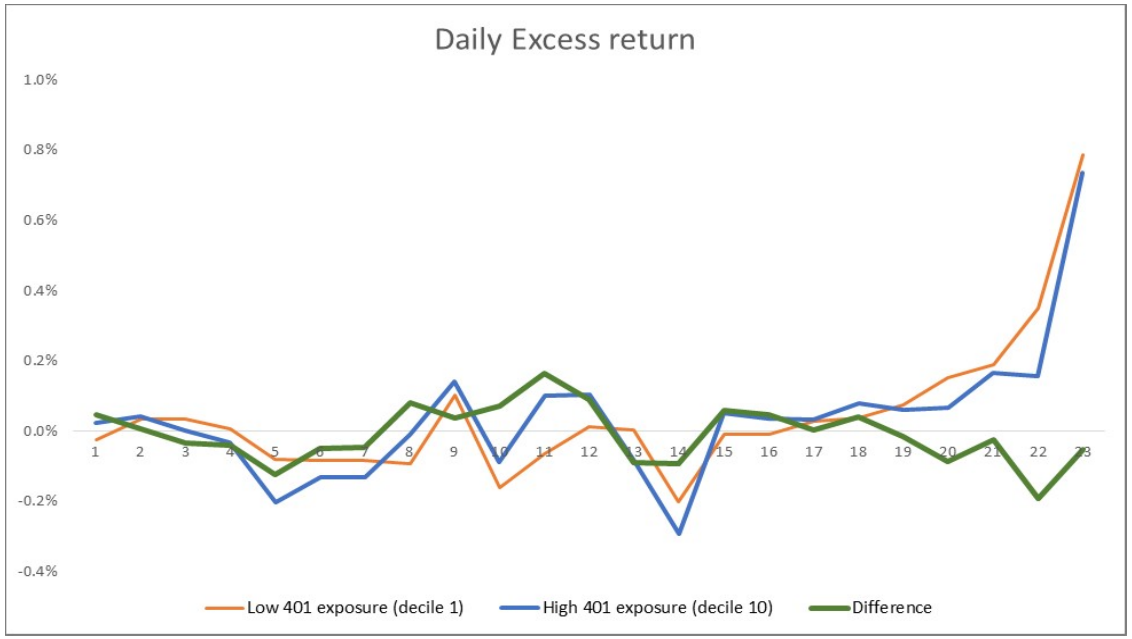

Figure 2: Daily excess returns, by 401(K) exposure of stocks

Backed up by regression-based evidence

- Hypothesis II: *H_0 (Flow_induced_ToM)*: There is a positive relationship between proportion of a stock held by 401K mutual funds and the ToM effect it experiences

  - $r_{i,t} = \beta_0 + \beta_1 . \text{ToM} + \beta_2 . \text{ToM*Cap\_from\_401K}_{i,t} + \beta_3 . X_{i,t} + \varepsilon_{i,t}$

  - If $\beta_2 > 0$, then stocks that are held more by 401K plans show a stronger ToM effect.

Result #2a: Relation between the ToM Returns and 401K exposure of stocks

	return (%)						
TOM	0.104	0.139	0.12	0.125	0.137	0.192	0.199
	(1.70)*	(2.39)**	(2.03)**	(2.17)**	(2.38)**	(3.26)***	(1.58)
TOM*stk401wt		-0.16	-0.146	-0.15	-0.157	-0.083	-0.08
		(1.84)*	-(1.62)	(-1.71)*	(-1.81)*	(-1.33)	(-1.3)
MOM (t-12,t-2)			-0.06	-0.046			
			(3.93)***	(5.52)***			
Ret (t-1)			-0.027	-0.029			
			-(0.37)	-(1.02)			
BEME			-0.166	-0.145			
			(7.39)***	(18.64)***			
Price			(0.00)	(0.00)			
			-(1.10)	(1.96)**			
Log(Size)			0.032	0.031			
			(1.98)**	(4.55)***			
Stk401wt			-0.082	-0.039			
			(1.73)*	(2.12)**			
IO*TOM						-0.129	-0.106
						(1.85)*	(-1.46)
MOM*TOM							0.026
							(0.76)
Ret1m*TOM							0.011
							(0.06)
BEME*TOM							0.008
							(0.27)
Price*TOM							0.00
							(0.31)
Logsize*TOM							-0.003
							(-0.33)
Fixed effect	Firm*month	Firm*month	Firm	Firm, month	Firm*month	Firm*month	Firm*month
R^2	0.04	0.04	0	0.01	0.04	0.04	0.04
N	12,040,032	12,040,032	10,019,371	10,019,371	11,932,846	11,881,504	10,019,370

Turn-of-the-month Returns and 401(K) Exposure

Result #2b: Relation between the ToM Volume Effect and 401K exposure of stocks

	Normalized shares volume						
TOM	0.087	0.09	0.087	0.087	0.089	0.091	0.166
	(10.78)***	(9.70)***	(9.21)***	(9.24)***	(9.65)***	(7.78)***	(6.63)***
TOM*stk401wt		-0.013	-0.011	-0.011	-0.012	-0.009	-0.007
		(-1.09)	(-0.89)	(-0.89)	(-1.03)	(-1.07)	(-0.8)
MOM (t-12,t-2)			0.001	0.001			
			(0.63)	(2.37)**			
Ret (t-1)			-0.003	-0.004			
			(-0.44)	(-2.54)**			
BEME			0	-0.001			
			(0.23)	(-1.4)			
Price			0	0			
			(0.19)	(0.48)			
Log(Size)			0.004	0.004			
			(1.54)	(5.67)***			
Stk401wt			0.006	0.003			
			(1.14)	(1.30)			
IO*TOM						-0.005	0.012
						(-0.47)	(-1.13)
MOM*TOM							-0.004
							(1.46)
Ret1m*TOM							0.015
							(0.84)
BEME*TOM							-0.009
							(-2.49)**
Price*TOM							0.000
							(3.07)***
Logsize*TOM							-0.006
							(-3.84)***
Fixed effect	Firm*month	Firm*month	Firm	Firm, month	Firm*month	Firm*month	Firm*month
R^2	0.01	0.01	0	0	0.01	0.01	0.01
N	12,047,578	12,047,578	10,026,231	10,026,231	11,940,335	11,888,993	10,026,229

Turn-of-the-month Volume and 401(K) Exposure

Issue: Liquid vs less-liquid stocks

- Maybe there are no patterns for the average stock, but is there a pattern for less liquid stocks, where price pressure is likely to have the most impact?

- Hypothesis III:

  - *H_0 (Liquidity, flows, and ToM)*: The 401K fund-held proportion of market cap of a stock is related to its ToM effect if the stock is less liquid.

Empirical Methodology

- Hypothesis III: *H_0 (Liquidity, flows, and ToM)*: The 401K fund-held proportion of market cap of a stock is related to its ToM effect if the stock is less liquid

- $r_{i,t} = \beta_0 + \beta_1 . \text{ToM} + \beta_2 . \text{ToM*Liquidity}_{i,t} + \beta_3 . \text{ToM*Cap\_from\_401K}_{i,t} * \text{Low\_Liquidity}_{i,t} + \beta_4 . X_{i,t}$

  - If $\beta_3 > 0$, then less liquid stocks that are held by 401K plans show a stronger ToM effect.

Result #3: The Role of Liquidity

Liquidity Measures in our Sample

Correlations			
	amihud	bidask	fzeros
amihud	1	0.482	0.216
bidask	0.482	1.000	0.735
fzeros	0.216	0.735	1.000

Liquidity measures are correlated.

However, their correlations are not high, so separate tests using these different measures in isolation have independent value

Result #3a: The Role of Liquidity

Continuous Liquidity Measures

	Daily return (%)								
TOM	0.102	0.138	0.123	0.056	0.083	0.074	0.051	0.08	0.07
	(1.65)*	(2.31)**	(2.08)**	(0.8)	(1.29)	(1.13)	(0.68)	(1.16)	(1.01)
TOM*Amihud	0.139	0.068	0.159						
	(0.62)	(0.29)	(0.66)						
TOM*Amihud*stk401wt		-0.211	-0.611						
		(-0.43)	(-1.33)						
Amihud	-3.917	0.441	0.617						
	(-0.12)	(0.01)	(4.96)***						
Amihud*stk401wt		-83.431	0.088						
		(-0.4)	(0.37)						
TOM*BidAsk				4.296	3.809	3.712			
				(2.34)**	(2.70)***	(2.39)**			
TOM*BidAsk*stk401wt					-0.085	0.289			
					(0.02)	(0.07)			
BidAsk				48.235	-2.186	5.808			
				(0.36)	(-0.02)	(7.59)***			
BidAsk*stk401wt					507.732	1.139			
					(1.05)	(0.91)			
TOM*Fzeros							1.228	1.058	1.041
							(2.22)**	(2.36)**	(2.18)**
TOM*Fzeros*stk401wt								0.211	0.409
								(0.25)	(0.43)
Fzeros							26.033	18.628	1.239
							(1.23)	(0.82)	(4.67)***
Fzeros*stk401wt								162.527	0.59
								(1.02)	(1.94)*
TOM*stk401wt		-0.159	-0.146		-0.097	-0.094		-0.103	-0.1
		(-1.80)*	(-1.65)*		(-1.17)	(-1.09)		(-1.21)	(-1.14)
Stk401wt			-0.038			-0.048			-0.061
			(2.02)**			(2.52)**			(3.11)***
Fixed effect	Firm*month	Firm*month	Firm, month	Firm*month	Firm*month	Firm, month	Firm*month	Firm*month	Firm, month
Other controls	yes	yes	yes	yes	yes	yes	yes	yes	yes
R^2	0.04	0.04	0.01	0.04	0.04	0.01	0.04	0.04	0.01
N	12,040,765	12,040,765	10,026,169	12,034,628	12,034,628	10,019,652	12,040,765	12,040,765	10,026,169

Result #3b: The Role of Liquidity

Liquidity Groups (high vs. low)

	Daily return (%)								
TOM	0.082	0.135	0.114	0.079	0.131	0.112	0.081	0.127	0.106
	(1.17)	(1.69)*	(1.48)	(1.13)	(1.63)	(1.47)	(1.11)	(1.55)	(1.36)
TOM*rAmihud	0.043	0.006	0.018						
	(1.47)	(0.12)	(0.38)						
TOM*rAmihud*stk401wt		0.048	0.031						
		(0.65)	(0.45)						
rAmihud	-0.008	0.082	0.174						
	(-0.04)	(0.36)	(9.62)***						
rAmihud*stk401wt		-0.583	-0.039						
		(-0.72)	(-1.69)*						
TOM*rBidAsk				0.048	0.011	0.02			
				(1.67)*	(0.21)	(0.43)			
TOM*rBidAsk*stk401wt					0.057	0.039			
					(0.70)	(0.51)			
rBidAsk				-0.037	-0.098	0.118			
				(-0.09)	(-0.24)	(7.42)***			
rBidAsk*stk401wt					0.427	-0.042			
					(0.25)	(-1.82)*			
TOM*rFzeros							0.044	0.019	0.032
							(1.38)	(0.38)	(0.7)
TOM*rFzeros*stk401wt								0.019	-0.003
								(0.28)	(0.05)
rFzeros							1.253	0.259	0.088
							(0.77)	(0.51)	(5.88)***
rFzeros*stk401wt								18.473	-0.045
								(0.75)	(2.34)**
TOM*stk401wt		-0.17	-0.147		-0.169	-0.148		-0.157	-0.133
		(-1.4)	(-1.25)		(-1.36)	(-1.24)		(-1.35)	(-1.2)
Stk401wt			0.004			-0.002			-0.012
			(0.17)			(-0.08)			(-0.5)
Fixed effect	Firm*month	Firm*month	Firm, month	Firm*month	Firm*month	Firm, month	Firm*month	Firm*month	Firm, month
Other controls	yes	yes	yes	yes	yes	yes	yes	yes	yes
R^2	0.04	0.04	0.01	0.04	0.04	0.01	0.04	0.04	0.01
N	12,040,765	12,040,765	10,026,169	12,034,628	12,034,628	10,019,652	12,040,765	12,040,765	10,026,169

Bad data or match quality driving non-results?

- Maybe we have a very noisy measure of what are retirement account funds
- Typically target-date funds are default funds in a majority of 401K plans
    - We design an “out-of-sample” test using target-date fund holdings

‘Out-of-sample’ test using Target-date funds

- We check Ogden’s hypothesis using holdings of target-date funds

- Hypothesis IV:

  - H_0 *(Target-date_Funds_ToM)*: There is a positive relationship between proportion of a stock held by Target-date mutual funds and the ToM effect it experiences.

Empirical Methodology

- Hypothesis IV: H_0 *(Target-date_Funds_ToM)*: There is a positive relationship between proportion of a stock held by Target-date mutual funds and the ToM effect it experiences.

  - For Hypothesis IV, we use the same technique, but only count target-date funds, which are typically used as default funds in 401K plans.

Result #4: Out-of-sample evidence: Target Date Funds

Target date funds and the Turn-of-the-Month Effect

	Daily return in %						
TOM	0.084	0.147	0.136	0.141	0.148	0.148	0.603
	(1.31)	(2.52)**	(2.30)**	(2.46)**	(2.52)**	(2.33)**	(3.27)***
TOM*Targetwt		-0.089	-0.085	-0.086	-0.089	-0.087	-0.106
		(-1.35)	(-1.28)	(-1.32)	(-1.35)	(-1.36)	(-1.59)
MOM (t-12,t-2)			0.011	0.012			
			(0.57)	(1.13)			
Ret (t-1)			0.004	-0.151			
			(0.03)	(-2.90)***			
BEME			0.001	-0.001			
			(0.05)	(-0.14)			
Price			0.0000	0.0000			
			(0.31)	(0.49)			
Log(Size)			-0.21	-0.195			
			(-8.27)***	(-15.98)***			
Targetwt			0.026	0.003			
			(0.68)	(0.14)			
IO*TOM						-0.007	0.132
						(-0.11)	(2.10)**
MOM*TOM							0.051
							(1.03)
Ret1m*TOM							0.255
							(0.85)
BEME*TOM							-0.01
							(-0.42)
Price*TOM							0.0000
							(0.18)
Log(Size)*TOM							-0.039
							(-3.19)***
Fixed effect	Firm*month	Firm*month	Firm	Firm, month	Firm*month	Firm*month	Firm*month
R^2	0.04	0.04	0	0.01	0.04	0.04	0.04
N	10,264,386	10,264,386	9,666,205	9,666,205	10,258,747	10,067,166	9,599,521

Is there any evidence at all on daily trading patterns related to retirement account holdings?

- We examine every single calendar day of the month:
  - Purely exploratory, data-dredging exercise
- Try to understand whether stocks held most heavily by retirement funds have significantly high returns on any of these days
- Find that the middle-of-the-month days show a different pattern

Result #5: Retirement Funds and a Mid-month effect

Retirement flows and a Mid-Month Effect?

	Daily return in %						
midm	-0.021	-0.032	-0.029	-0.025	-0.032	-0.041	-0.313
	(-0.26)	(-0.41)	(-0.35)	(-0.32)	(-0.41)	(-0.48)	(-1.99)**
midm*D_Highwt		0.052	0.05	0.05	0.052	0.048	0.051
		(2.33)**	(2.20)**	(2.21)**	(2.33)**	(1.73)*	(1.81)*
MOM (t-12,t-2)			-0.058	-0.046			
			(3.81)***	(5.52)***			
Ret (t-1)			-0.03	-0.029			
			(-0.41)	(-1.02)			
BEME			-0.172	-0.146			
			(-7.15)***	(-18.71)***			
Price			-0.00	0.00			
			(-0.78)	(2.10)**			
Log(Size)			0.028	0.031			
			(1.65)*	(4.48)***			
D_Highwt			-0.035	-0.037			
			(-6.29)***	(-7.79)***			
IO*TOM						0.017	-0.132
						(0.13)	(-0.98)
MOM*TOM							-0.05
							(-1.11)
Ret1m*TOM							-0.19
							(-0.92)
BEME*TOM							-0.054
							(-1.41)
Price*TOM							0.00
							(3.00)***
Log(Size)*TOM							0.031
							(2.76)***
Fixed effect	Firm*month	Firm*month	Firm	Firm*month	Firm*month	Firm*month	Firm*month
R^2	0.04	0.04	0.00	0.04	0.04	0.04	0.04
N	12,047,586	12,047,586	10,026,169	10,026,169	12,047,586	11,996,162	10,026,168

Result #5: Retirement Funds and a Mid-month effect

- Stocks exposed to retirement flows have significantly higher returns in the middle of the trading month
- This is true for days 10 and 11 (out of 23 typical trading days) of the month, which correspond to the middle week of the calendar month
- We consistently find that average stock returns are not significantly different on average on middle-of-the-month days
- But returns on stocks held by retirement funds are on average 5 basis points higher in the middle of the month
    - This is a new finding in this literature, although the magnitude is not very big

Result #5: Retirement Funds and a Mid-month effect

- Why? Two possibilities:

- It takes time (typically up to a week, sometimes longer) for the funds to get money from pension plan contributions

  - This lag moves the price-pressure into the middle of the month from the beginning of the month

- Retirement fund managers know that there is a ToM effect in the market, and they rationally anticipate that adding their large buy orders during the ToM days would exacerbate the price pressure

  - So they hold on to retirement account money for a few days into the month to get better prices

Conclusion

- In this study, we hand collect publicly available data from the SEC's Edgar database on regulatory filings of retirement savings plans (Form 11-K) in the US.

- The plan filings include information on the mutual funds that are included as savings options, and the employees' allocation to these funds, for each individual company.

- Using this sample, we find no evidence to support the hypothesis that systematic month-end flows, related to the monthly payment cycle, causes the ToM effect.