Predictable Price Pressure

Samuel Hartzmark
(University of Chicago)

David Solomon
(Boston College)

Democratize Quant

March 24th, 2022

Price impact of increased demand

- When more people attempt to exchange $20 bills for strawberries, the price of strawberries increases

- When more people attempt to exchange $20 bills for $100 bills, the price of $100 bills (in $20 bills) stays the same

- What do we predict when more people attempt to exchange $20 bills for shares of stocks?
  - Is the stock market like $100 bills? a stream of agreed-upon future cash flows of well-understood value?
  - Is the stock market like strawberries? more people arriving to the market with $20 bills influences its price?

What does finance theory predict?

- State of literature a bit puzzling
- Textbook finance: The stock market is like a $100 bill
  - EMH: Prices move due to information
    - Predictable uninformed shifts in demand don’t impact price
  - General equilibrium models: Minimal effect
    - A positive, but economically negligible increase in prices
- Investor known to have no private info, should be able to buy or sell any amount at current price

Price Pressure

- But: price pressure *can* move prices
  - Non-fundamental demand moves prices in some settings
- Difficult to directly test for price pressure
  - Trading shifts prices with possibility of private information
- Price pressure demonstrated using unusual events to rule out informed trading, typically for single name stocks
  - Index Additions Shleifer (1986); Harris and Gurel (1986), others Institutional demand Koijen and Yogo (2019); Ben-David, Li, Rossi & Song (2021) Fire sales Coval Stafford, Lou (2012) Ex-dates Hartzmark and Solomon (2013) Uninformed advisor Da, Larrain, Sialm and Tessada (2018) Aggregated institutional demand Koijen and Gabaix (2020)
- But how important is price pressure in common settings?
  - The general assumption is its absence, if it is not the focus

The ideal test

The setting where price pressure is *least* likely to occur

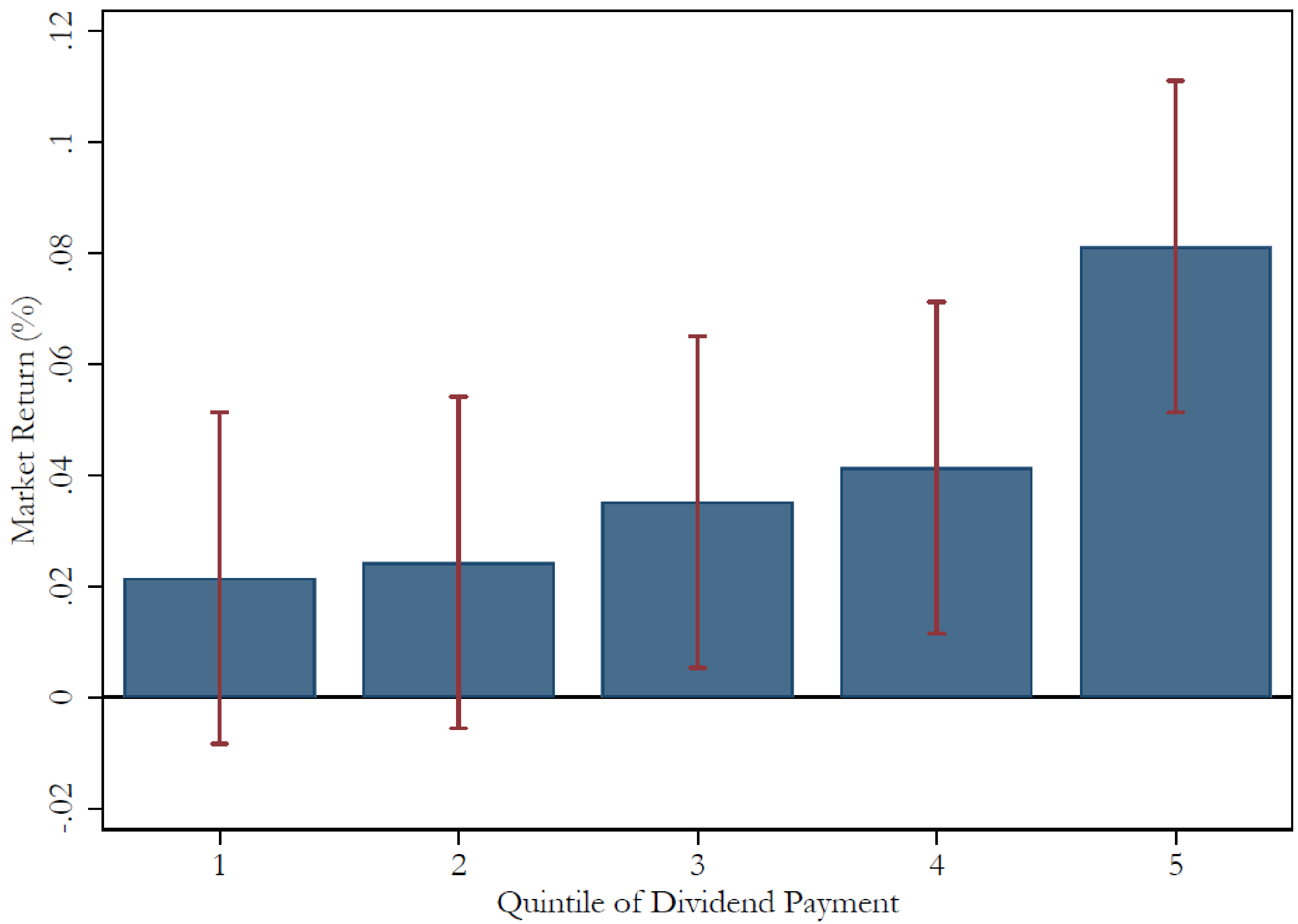
- Flows of money are uninformed and exogenous
- Flows are predictable in timing and amount
  - Thus ought to be understood as uninformed
- Flows are recurring normal event
  - Traders have many opportunities to learn
  - It's the standard business of liquidity providers
- Test assets are the deepest and most liquid available

If you *still* find price pressure in such a setting,
there's a good claim it is the reasonable null hypothesis

Price pressure from dividend payments

- This paper: Predictable buying due to dividend payments
- Investors are sent cash and predictably use some of it to invest in the market
- Dividend Payment known ~40 days prior
  - No economic news and happens all the time
- Predictable demand shift in both timing and amount
  - Ought to be understood as uninformed by market
- Are daily market returns higher when dividend payments are higher?

Paper in one picture



Results

- Predictable buying: Market higher when dividends paid
  - Market Returns: 18 bp on top 5 days; 10 bp on top 50
  - Stronger with greater predictable reinvestment, higher VIX, more recent years, and similar international
  - No short term (1 month) reversal
    - Longer (annual) cross-sectional partial reversal (~30 bp monthly)
  - Multiplier estimates: ~1.5-2.3 per dollar invested

- Predictable selling: Lower returns when stocks expensed
  - ~100 bp over four days for highest expense firms

Suggests default assumption should be price pressure

Dividend payments

- Announcement date (~43 days before payment)
  - Amount and other details announced - Legal obligation
  - All economic news related to dividend becomes public
- Ex-date (~22 days before payment)
  - First day stock trades without receiving dividend
  - All tax or catering motives from dividend resolved
- Payment date
  - Date cash is disbursed: No economically relevant news
- ~90% of trading days involve dividend payout

Market returns and div payments

$$Mkt_t = \alpha + \beta_0 DY_t + \beta_1 DY_{t-1} + \beta_2 DY_{t-2} + \beta_3 DY_{t-3} + \beta_4 DY_{t-4}$$

	Value Weighted			
	(1)	(2)	(3)	(4)
Mkt Div Pay[t-1,t]			59.50***	67.07***
			(3.32)	(3.47)
Mkt Div Pay[t]	55.76*	74.85**		
	(1.74)	(2.26)		
Mkt Div Pay[t-1]	60.04***	71.98***		
	(2.73)	(3.10)		
Mkt Div Pay[t-2]	23.59	35.98		
	(0.98)	(1.43)		
Mkt Div Pay[t-3]	14.56	25.73		
	(0.50)	(0.85)		
Mkt Div Pay[t-4]	53.96*	66.66**		
	(1.89)	(2.32)		
YM FE	No	Yes	No	Yes
R^2	0.00105	0.0503	0.000700	0.0498
Observations	24534	24534	24537	24537

Market returns and div payments

$$Mkt_t = \alpha + \beta_0 DY_t + \beta_1 DY_{t-1} + \beta_2 DY_{t-2} + \beta_3 DY_{t-3} + \beta_4 DY_{t-4}$$

LHS: CRSP daily value-weighted market returns

	Value Weighted			
	(1)	(2)	(3)	(4)
Mkt Div Pay[t-1,t]			59.50***	67.07***
			(3.32)	(3.47)
Mkt Div Pay[t]	55.76*	74.85**		
	(1.74)	(2.26)		
Mkt Div Pay[t-1]	60.04***	71.98***		
	(2.73)	(3.10)		
Mkt Div Pay[t-2]	23.59	35.98		
	(0.98)	(1.43)		
Mkt Div Pay[t-3]	14.56	25.73		
	(0.50)	(0.85)		
Mkt Div Pay[t-4]	53.96*	66.66**		
	(1.89)	(2.32)		
YM FE	No	Yes	No	Yes
R^2	0.00105	0.0503	0.000700	0.0498
Observations	24534	24534	24537	24537

Market returns and div payments

$$Mkt_t = \alpha + \beta_0 DY_t + \beta_1 DY_{t-1} + \beta_2 DY_{t-2} + \beta_3 DY_{t-3} + \beta_4 DY_{t-4}$$

RHS: Dividend payment

All dividends paid divided by prior day market cap

	Value Weighted			
	(1)	(2)	(3)	(4)
Mkt Div Pay[t-1,t]			59.50***	67.07***
			(3.32)	(3.47)
Mkt Div Pay[t]	55.76*	74.85**		
	(1.74)	(2.26)		
Mkt Div Pay[t-1]	60.04***	71.98***		
	(2.73)	(3.10)		
Mkt Div Pay[t-2]	23.59	35.98		
	(0.98)	(1.43)		
Mkt Div Pay[t-3]	14.56	25.73		
	(0.50)	(0.85)		
Mkt Div Pay[t-4]	53.96*	66.66**		
	(1.89)	(2.32)		
YM FE	No	Yes	No	Yes
R^2	0.00105	0.0503	0.000700	0.0498
Observations	24534	24534	24537	24537

Market returns and div payments

Strong positive effect on payment date (*t*) and prior day (*t-1*)

	Value Weighted			
	(1)	(2)	(3)	(4)
Mkt Div Pay[t-1,t]			59.50***	67.07***
			(3.32)	(3.47)
Mkt Div Pay[t]	55.76*	74.85**		
	(1.74)	(2.26)		
Mkt Div Pay[t-1]	60.04***	71.98***		
	(2.73)	(3.10)		
Mkt Div Pay[t-2]	23.59	35.98		
	(0.98)	(1.43)		
Mkt Div Pay[t-3]	14.56	25.73		
	(0.50)	(0.85)		
Mkt Div Pay[t-4]	53.96*	66.66**		
	(1.89)	(2.32)		
YM FE	No	Yes	No	Yes
R^2	0.00105	0.0503	0.000700	0.0498
Observations	24534	24534	24537	24537

Market returns and div payments

Weakly positive effects continue throughout the week

Note: *t-4* effect largely from early sample periods

	Value Weighted			
	(1)	(2)	(3)	(4)
Mkt Div Pay[t-1,t]			59.50***	67.07***
			(3.32)	(3.47)
Mkt Div Pay[t]	55.76*	74.85**		
	(1.74)	(2.26)		
Mkt Div Pay[t-1]	60.04***	71.98***		
	(2.73)	(3.10)		
Mkt Div Pay[t-2]	23.59	35.98		
	(0.98)	(1.43)		
Mkt Div Pay[t-3]	14.56	25.73		
	(0.50)	(0.85)		
Mkt Div Pay[t-4]	53.96*	66.66**		
	(1.89)	(2.32)		
YM FE	No	Yes	No	Yes
R^2	0.00105	0.0503	0.000700	0.0498
Observations	24534	24534	24537	24537

Market returns and div payments

Are results driven by d/p predicting market returns?

	Value Weighted			
	(1)	(2)	(3)	(4)
Mkt Div Pay[t-1,t]			59.50***	67.07***
			(3.32)	(3.47)
Mkt Div Pay[t]	55.76*	74.85**		
	(1.74)	(2.26)		
Mkt Div Pay[t-1]	60.04***	71.98***		
	(2.73)	(3.10)		
Mkt Div Pay[t-2]	23.59	35.98		
	(0.98)	(1.43)		
Mkt Div Pay[t-3]	14.56	25.73		
	(0.50)	(0.85)		
Mkt Div Pay[t-4]	53.96*	66.66**		
	(1.89)	(2.32)		
YM FE	No	Yes	No	Yes
R^2	0.00105	0.0503	0.000700	0.0498
Observations	24534	24534	24537	24537

Market returns and div payments

Probably not: YM FE yields stronger results

Also controls for calendar month effects

	Value Weighted			
	(1)	(2)	(3)	(4)
Mkt Div Pay[t-1,t]			59.50***	67.07***
			(3.32)	(3.47)
Mkt Div Pay[t]	55.76*	74.85**		
	(1.74)	(2.26)		
Mkt Div Pay[t-1]	60.04***	71.98***		
	(2.73)	(3.10)		
Mkt Div Pay[t-2]	23.59	35.98		
	(0.98)	(1.43)		
Mkt Div Pay[t-3]	14.56	25.73		
	(0.50)	(0.85)		
Mkt Div Pay[t-4]	53.96*	66.66**		
	(1.89)	(2.32)		
YM FE	No	Yes	No	Yes
R^2	0.00105	0.0503	0.000700	0.0498
Observations	24534	24534	24537	24537

Market returns and div payments

Analysis focuses on Market Div Payment[*t-1*,*t*]

Payment date and day prior seem to be main drivers

	Value Weighted			
	(1)	(2)	(3)	(4)
Mkt Div Pay[t-1,t]			59.50***	67.07***
			(3.32)	(3.47)
Mkt Div Pay[t]	55.76*	74.85**		
	(1.74)	(2.26)		
Mkt Div Pay[t-1]	60.04***	71.98***		
	(2.73)	(3.10)		
Mkt Div Pay[t-2]	23.59	35.98		
	(0.98)	(1.43)		
Mkt Div Pay[t-3]	14.56	25.73		
	(0.50)	(0.85)		
Mkt Div Pay[t-4]	53.96*	66.66**		
	(1.89)	(2.32)		
YM FE	No	Yes	No	Yes
R^2	0.00105	0.0503	0.000700	0.0498
Observations	24534	24534	24537	24537

Market returns and div payments

Magnitude: 1 SD of Div Pay -> 3.2 bp higher returns

78% higher market returns (4.1 bp average)

	Value Weighted			
	(1)	(2)	(3)	(4)
Mkt Div Pay[t-1,t]			59.50***	67.07***
			(3.32)	(3.47)
Mkt Div Pay[t]	55.76*	74.85**		
	(1.74)	(2.26)		
Mkt Div Pay[t-1]	60.04***	71.98***		
	(2.73)	(3.10)		
Mkt Div Pay[t-2]	23.59	35.98		
	(0.98)	(1.43)		
Mkt Div Pay[t-3]	14.56	25.73		
	(0.50)	(0.85)		
Mkt Div Pay[t-4]	53.96*	66.66**		
	(1.89)	(2.32)		
YM FE	No	Yes	No	Yes
R^2	0.00105	0.0503	0.000700	0.0498
Observations	24534	24534	24537	24537

Market returns and div payments

Are results capturing attribute of dividend paying firms on payment day?

Repeat analysis on firms that did _NOT_ pay dividends

	(1)	(2)
Mkt Div Pay[t-1,t]	57.39***	65.12***
	(3.16)	(3.34)
YM FE	No	Yes
Value Weight	Yes	Yes
Equal Weight	No	No
R^2	0.000644	0.0494
Observations	24537	24537

Market returns and div payments

Results driven by firms that did not pay dividend

Consistent with minimal reinvestment

Hartzmark and Solomon 2019

	(1)	(2)
Mkt Div Pay[t-1,t]	57.39***	65.12***
	(3.16)	(3.34)
YM FE	No	Yes
Value Weight	Yes	Yes
Equal Weight	No	No
R^2	0.000644	0.0494
Observations	24537	24537

Abnormal dividend measure

Are results capturing day-to-day fluctuation in market price?

	Value Weighted	
	(1)	(2)
Market Abnormal Div[t-1,t]	0.00698***	0.00786***
	(3.39)	(3.58)
YM FE	No	Yes
R^2	0.000499	0.0497
Observations	24266	24266

Abnormal dividend measure

Abnormal dividend: Payment relative to

prior year daily average (skipping prior month)

	Value Weighted	
	(1)	(2)
Market Abnormal Div[t-1,t]	0.00698***	0.00786***
	(3.39)	(3.58)
YM FE	No	Yes
R^2	0.000499	0.0497
Observations	24266	24266

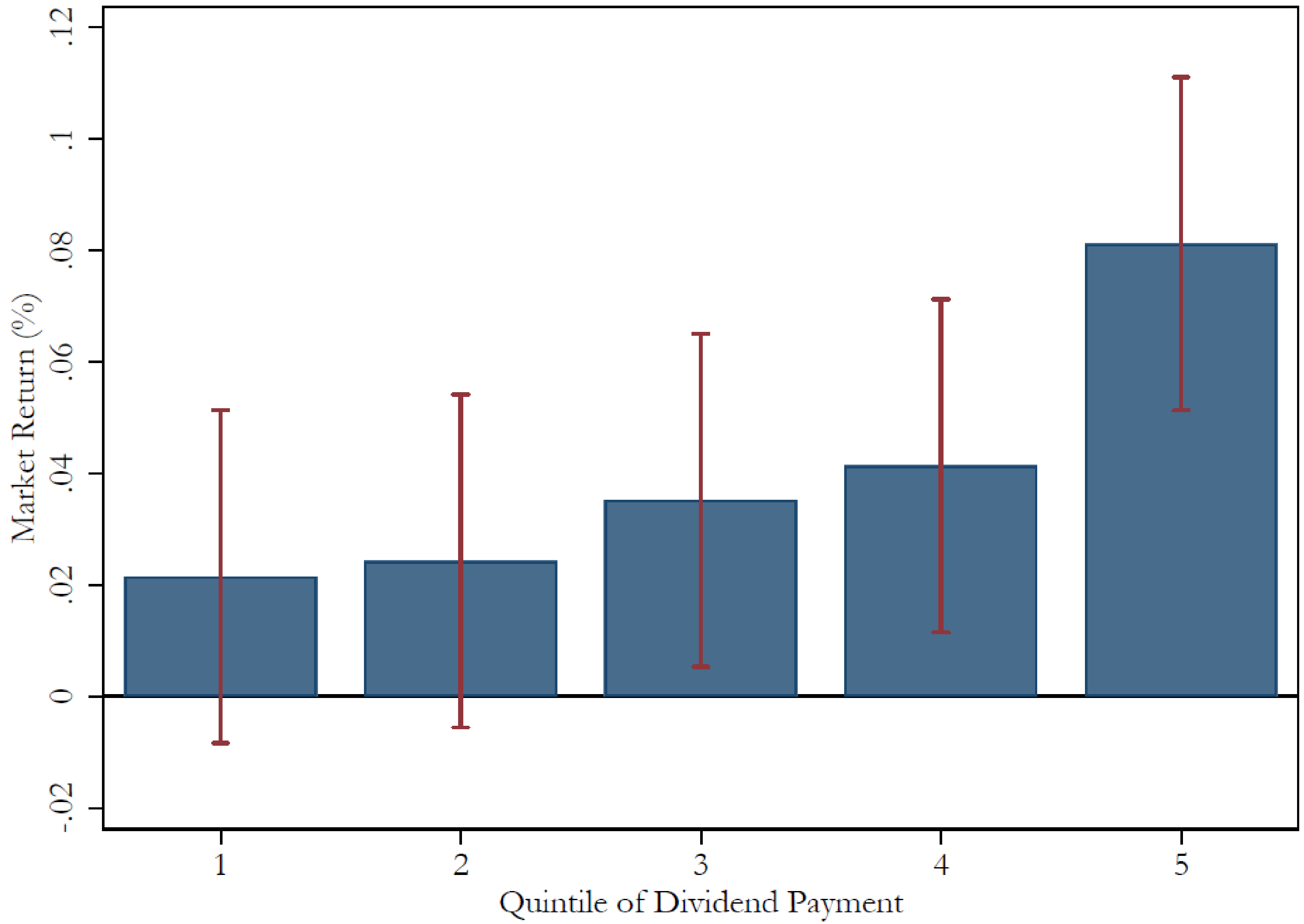
Abnormal dividend measure

Similar results using abnormal dividend measure

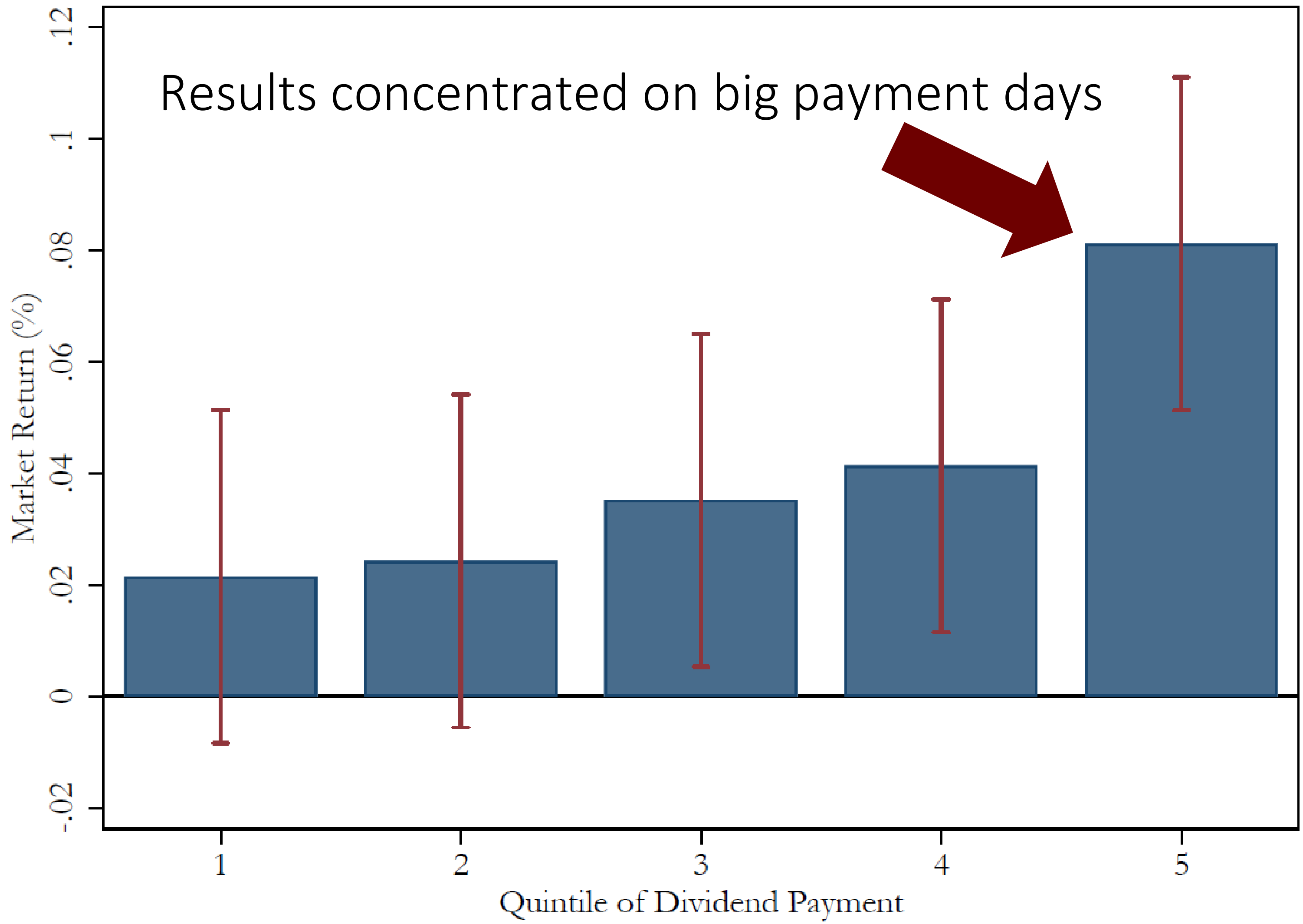
Daily market price variation doesn't account for results

	Value Weighted	
	(1)	(2)
Market Abnormal Div[t-1,t]	0.00698***	0.00786***
	(3.39)	(3.58)
YM FE	No	Yes
R^2	0.000499	0.0497
Observations	24266	24266

Abnormal dividend measure



Abnormal dividend measure



Big dividend payment days

Examine days with large payments (relative to prior year)

Ex-ante knowable and tradable

$$Mkt_t = \alpha + \beta(Top\ X\ Days)$$

	Top 5 Days		Top 50 Days	
Top Days	0.128***	0.143***	0.0482***	0.0593***
	(2.99)	(3.23)	(3.34)	(3.93)
YM FE	No	Yes	No	Yes
Value Weight	Yes	Yes	Yes	Yes
Equal Weight	No	No	No	No
R^2	0.000516	0.0497	0.000464	0.0497
Observations	24287	24287	24287	24287

Big dividend payment days

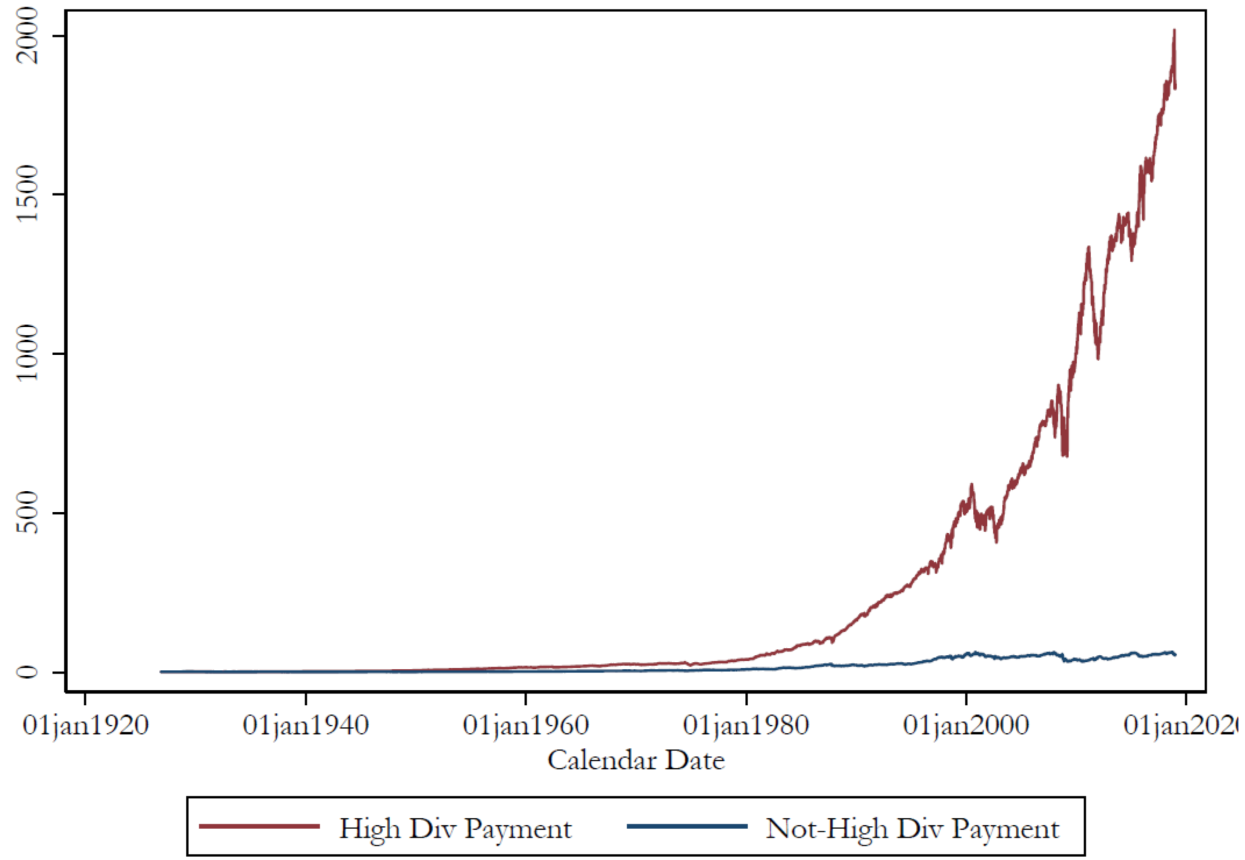
14 bp higher returns if in top 5 days

6 bp higher returns if in top 50 days

	Top 5 Days		Top 50 Days	
Top Days	0.128***	0.143***	0.0482***	0.0593***
	(2.99)	(3.23)	(3.34)	(3.93)
YM FE	No	Yes	No	Yes
Value Weight	Yes	Yes	Yes	Yes
Equal Weight	No	No	No	No
R^2	0.000516	0.0497	0.000464	0.0497
Observations	24287	24287	24287	24287

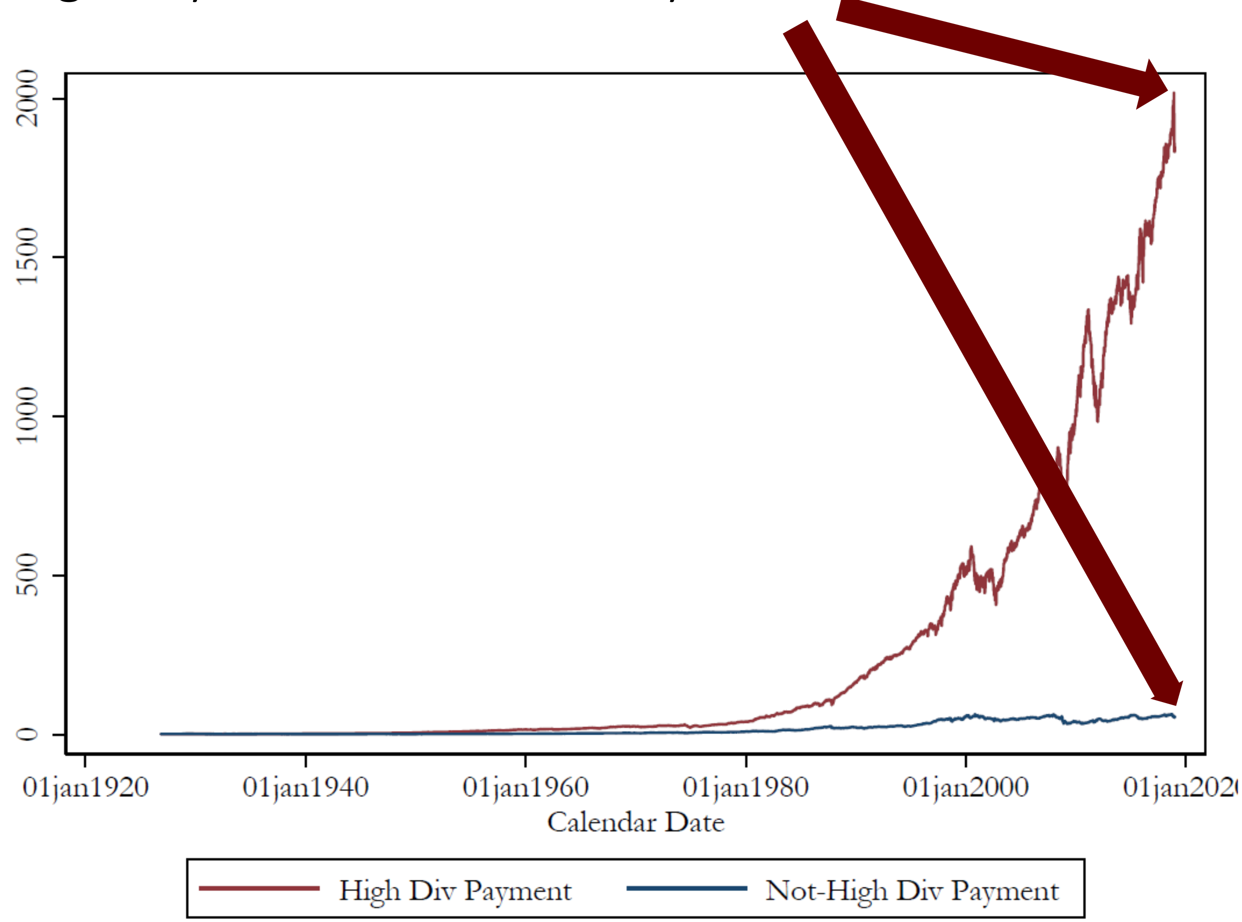
$1 investment on big dividend payment days

- Red: Market if payment[t,t-1] top 50; rf otherwise
- Blue: Market if payment[t,t-1] NOT top 50; rf otherwise



$1 investment on big dividend payment days

- Values as of 2020
  - High days: $1,849; Other days: $56



Additional Results

- Results not driven by known calendar predictability
  - Results hold with day of the week & turn of the month FE
    Lakonishok and Smidt 1988
  - Note: Monthly patterns already controlled for
- Results not driven by macro announcements
  - Results hold controlling for FOMC announcements
    Lucca and Moench 2015
  - Results hold controlling for other macro announcements
    Savor and Wilson 2013
- Results stronger when liquidity lower (VIX higher)

International Evidence

Are results unique to the US?

Run analysis on 58 international markets

	(1)	(2)	(3)	(4)
Mkt Div Pay[t-1,t]	20.30**	30.21***	22.65***	26.89***
	(2.19)	(3.59)	(3.02)	(4.50)
Country YM FE	No	Yes	No	Yes
Date	No	No	Yes	Yes
R^2	0.0000330	0.0611	0.268	0.309
Observations	237185	237070	236775	236660

International Evidence

Similar (slightly smaller) effect to US

	(1)	(2)	(3)	(4)
Mkt Div Pay[t-1,t]	20.30**	30.21***	22.65***	26.89***
	(2.19)	(3.59)	(3.02)	(4.50)
Country YM FE	No	Yes	No	Yes
Date	No	No	Yes	Yes
R^2	0.0000330	0.0611	0.268	0.309
Observations	237185	237070	236775	236660

International Evidence

Effect similar after controlling for date FE

Variation across markets from dividend on same date

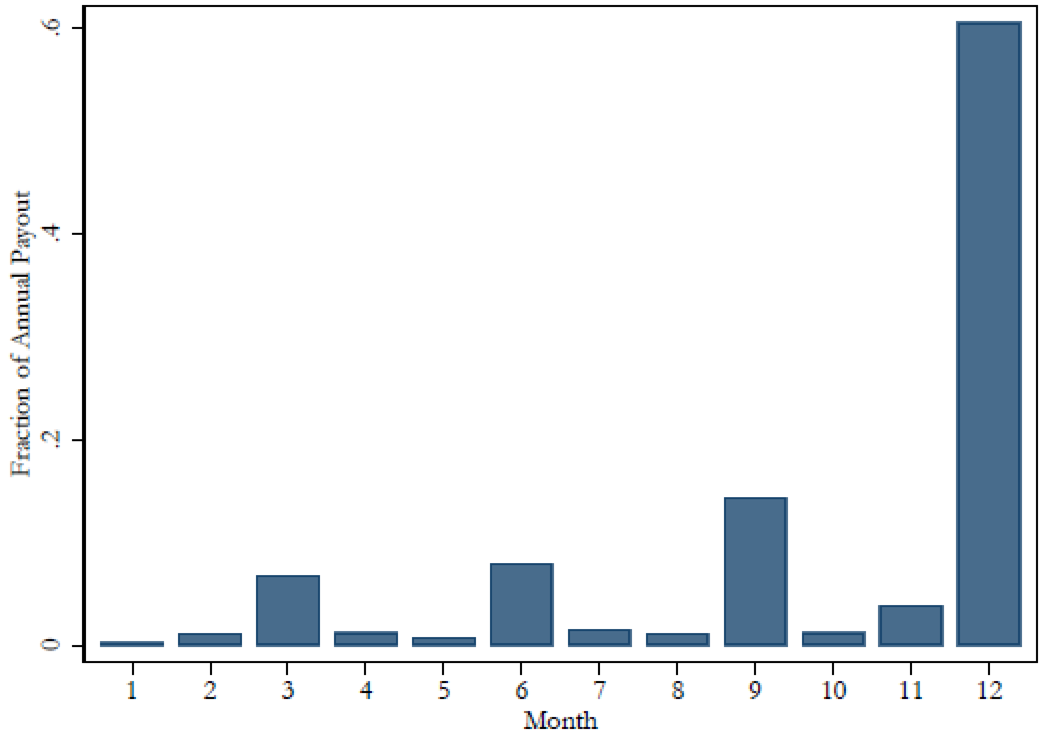
	(1)	(2)	(3)	(4)
Mkt Div Pay[t-1,t]	20.30**	30.21***	22.65***	26.89***
	(2.19)	(3.59)	(3.02)	(4.50)
Country YM FE	No	Yes	No	Yes
Date	No	No	Yes	Yes
R^2	0.0000330	0.0611	0.268	0.309
Observations	237185	237070	236775	236660

When are dividends predictably reinvested?

- Price pressure should vary based on the amount of reinvestment of the dividend payment
- If an investor needs cash there's no reason to reinvest
- Investor such as mutual funds and ETFs likely account for most reinvestment
  - Retail investors don't generally reinvest dividends
- When do mutual funds and ETFs predictably need cash?
  - When they predictably need to send it to investors

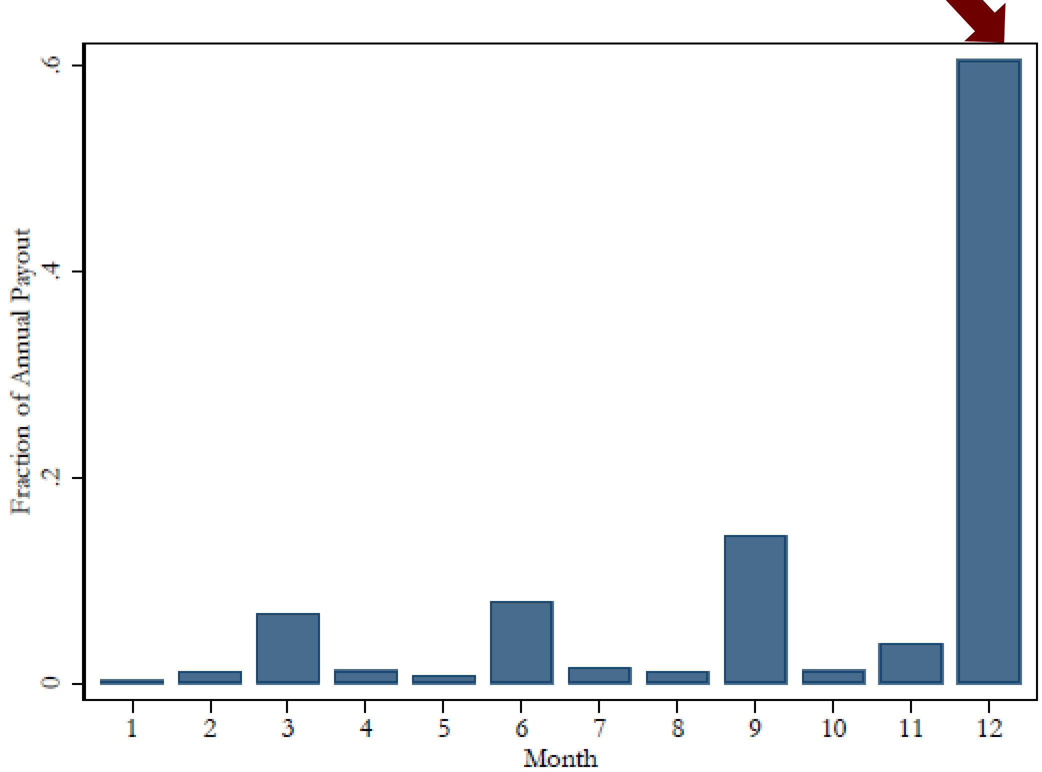
When do funds distribute payouts?

Average fraction of annual payout occurring each month



When do funds distribute payouts?

Most of annual payouts occur at end year



Returns throughout the year

Re-run regression separately for each quarter of the year

	(1)	(2)
Q1*Mkt Div Pay	134.8**	
	(2.40)	
Q2*Mkt Div Pay	54.92*	
	(1.68)	
Q3*Mkt Div Pay	73.78**	
	(2.44)	
Q4*Mkt Div Pay	12.01	
	(0.35)	
Not December*Mkt Div Pay		82.91***
		(3.89)
December*Mkt Div Pay		-48.92
		(-1.25)
YM FE	Yes	Yes
R^2	0.0501	0.0501
Observations	24537	24537

Returns throughout the year

Strongest effect occurs at beginning of the year (Q1)

	(1)	(2)
Q1*Mkt Div Pay	134.8**	
	(2.40)	
Q2*Mkt Div Pay	54.92*	
	(1.68)	
Q3*Mkt Div Pay	73.78**	
	(2.44)	
Q4*Mkt Div Pay	12.01	
	(0.35)	
Not December*Mkt Div Pay		82.91***
		(3.89)
December*Mkt Div Pay		-48.92
		(-1.25)
YM FE	Yes	Yes
R^2	0.0501	0.0501
Observations	24537	24537

Returns throughout the year

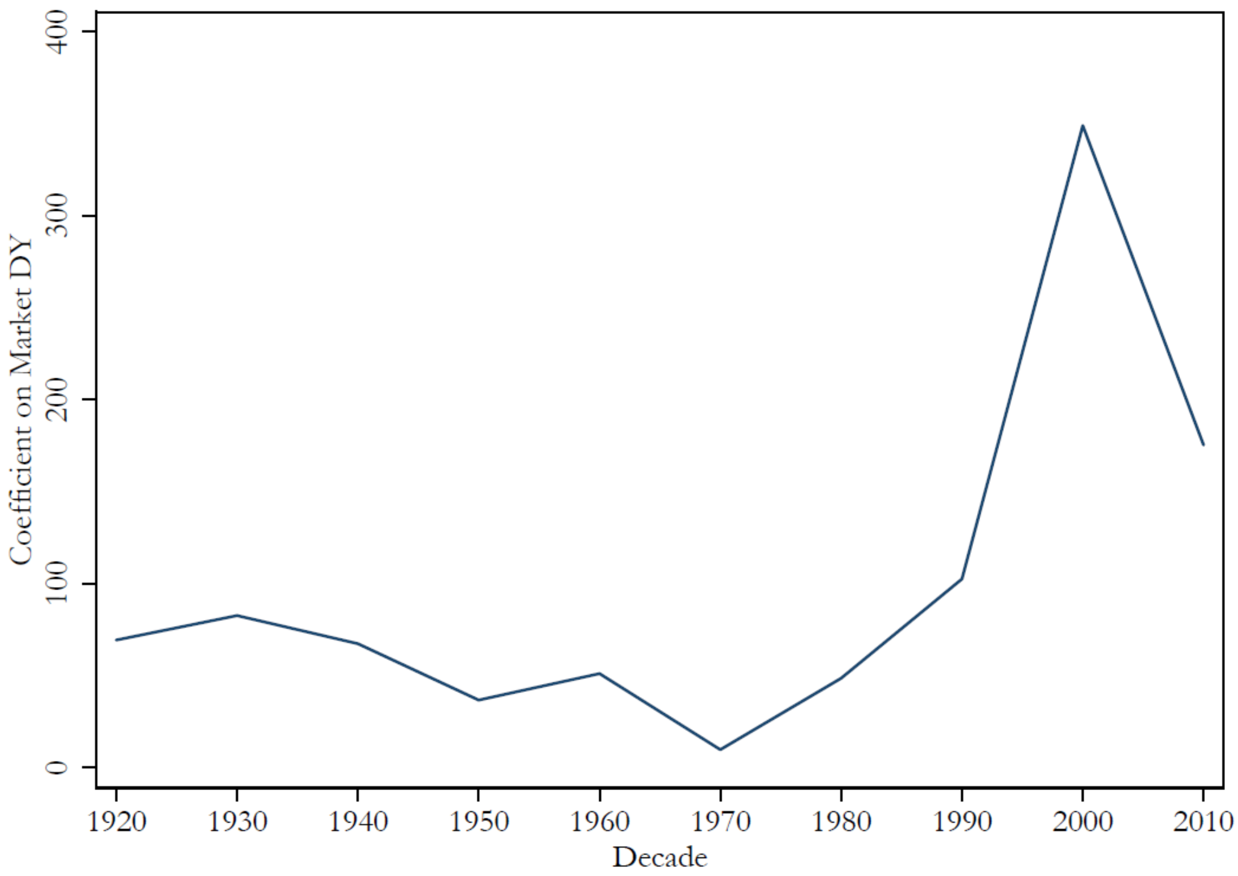
Weakest effect occurs at end of the year (Q4)

	(1)	(2)
Q1*Mkt Div Pay	134.8**	
	(2.40)	
Q2*Mkt Div Pay	54.92*	
	(1.68)	
Q3*Mkt Div Pay	73.78**	
	(2.44)	
Q4*Mkt Div Pay	12.01	
	(0.35)	
Not December*Mkt Div Pay		82.91***
		(3.89)
December*Mkt Div Pay		-48.92
		(-1.25)
YM FE	Yes	Yes
R^2	0.0501	0.0501
Observations	24537	24537

Time series variation

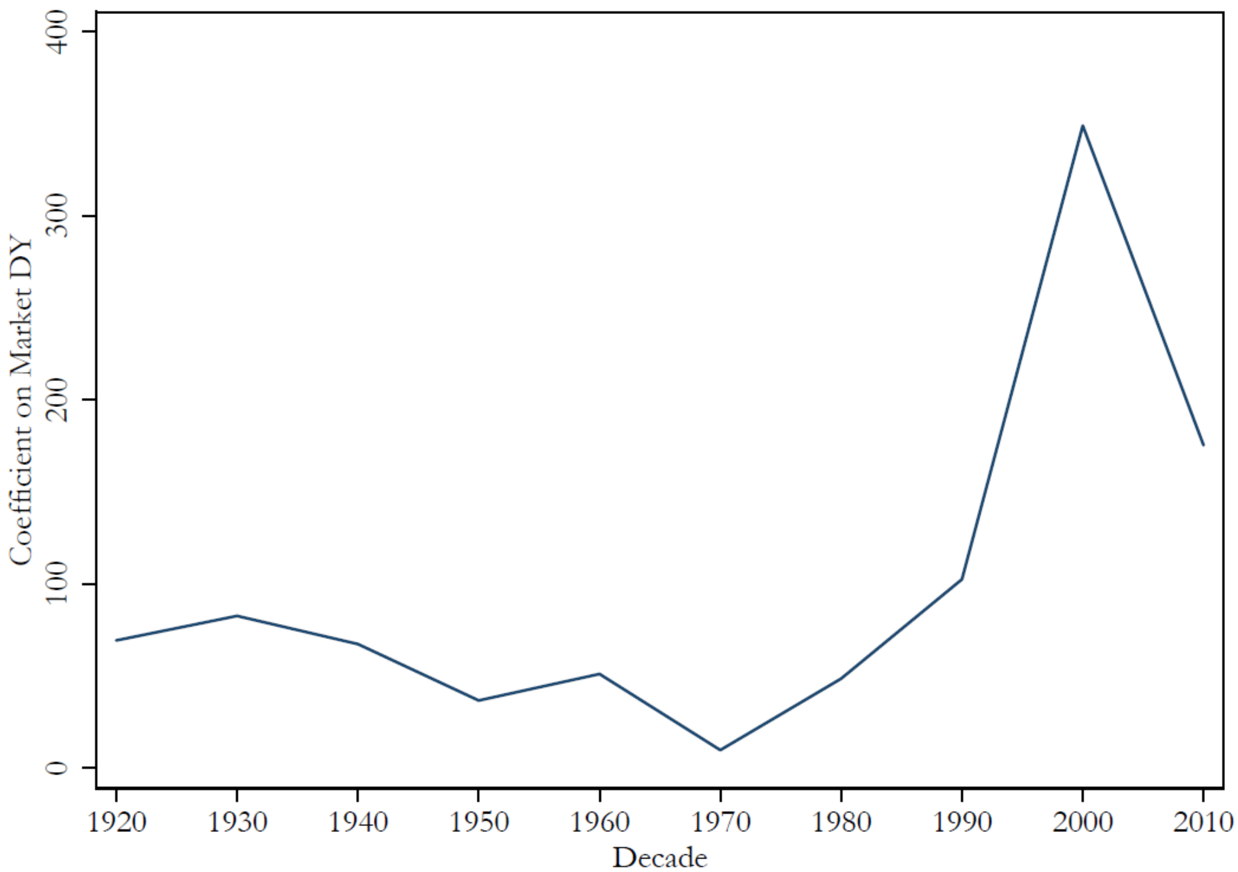
- Recent periods have seen dramatic growth in investment vehicles likely to reinvest dividends quickly
  - For example mutual funds and ETFs
- Expect patterns to become more pronounced as these products become more popular
- Run analysis separately each decade and plot coefficients

Time series variation



Time series variation

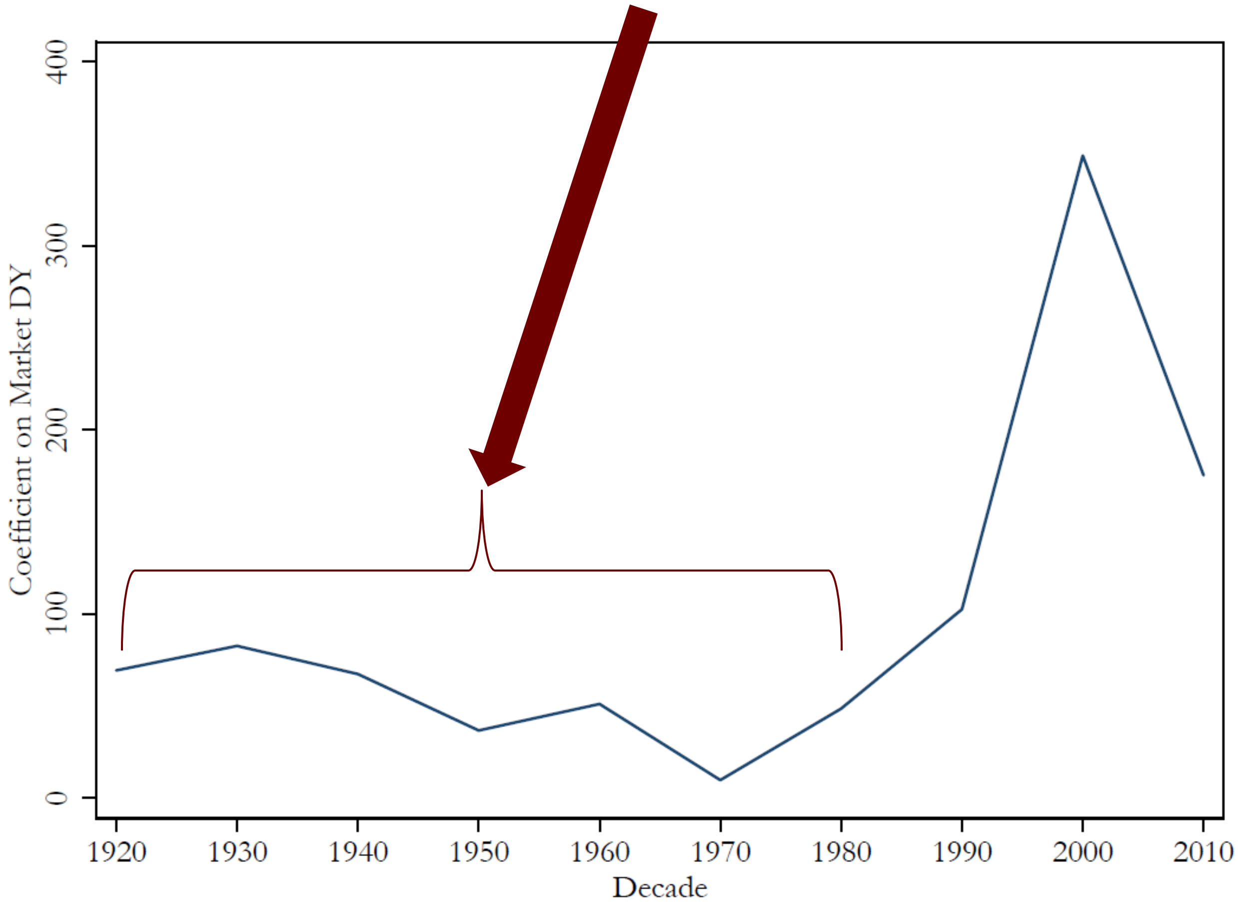
Every decade has a positive coefficient on dividend payment



Time series variation

Through the 1980s:

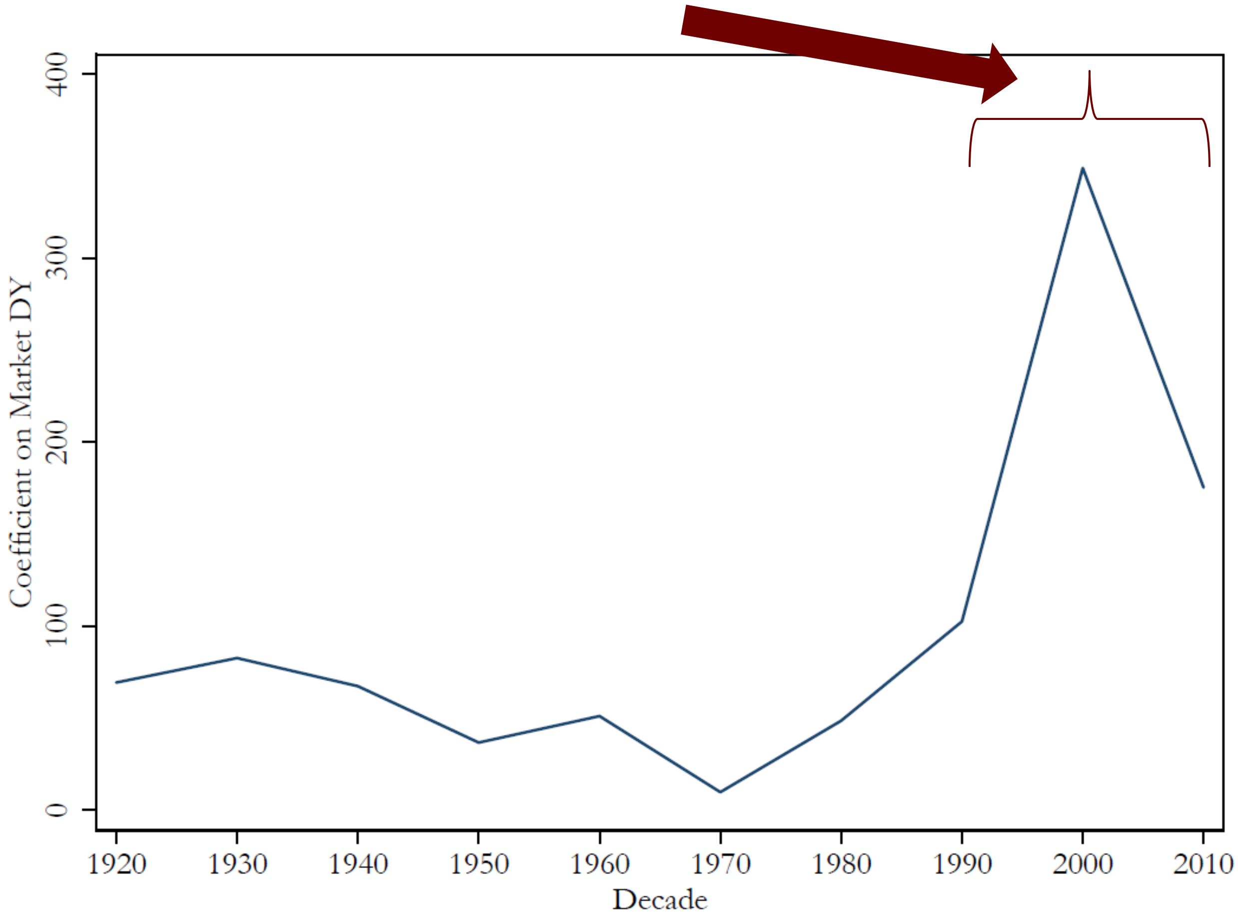
Mean coefficient ~50



Time series variation

1990s onward: Shift towards mutual funds and ETFs

3 largest coefficients, each above 100

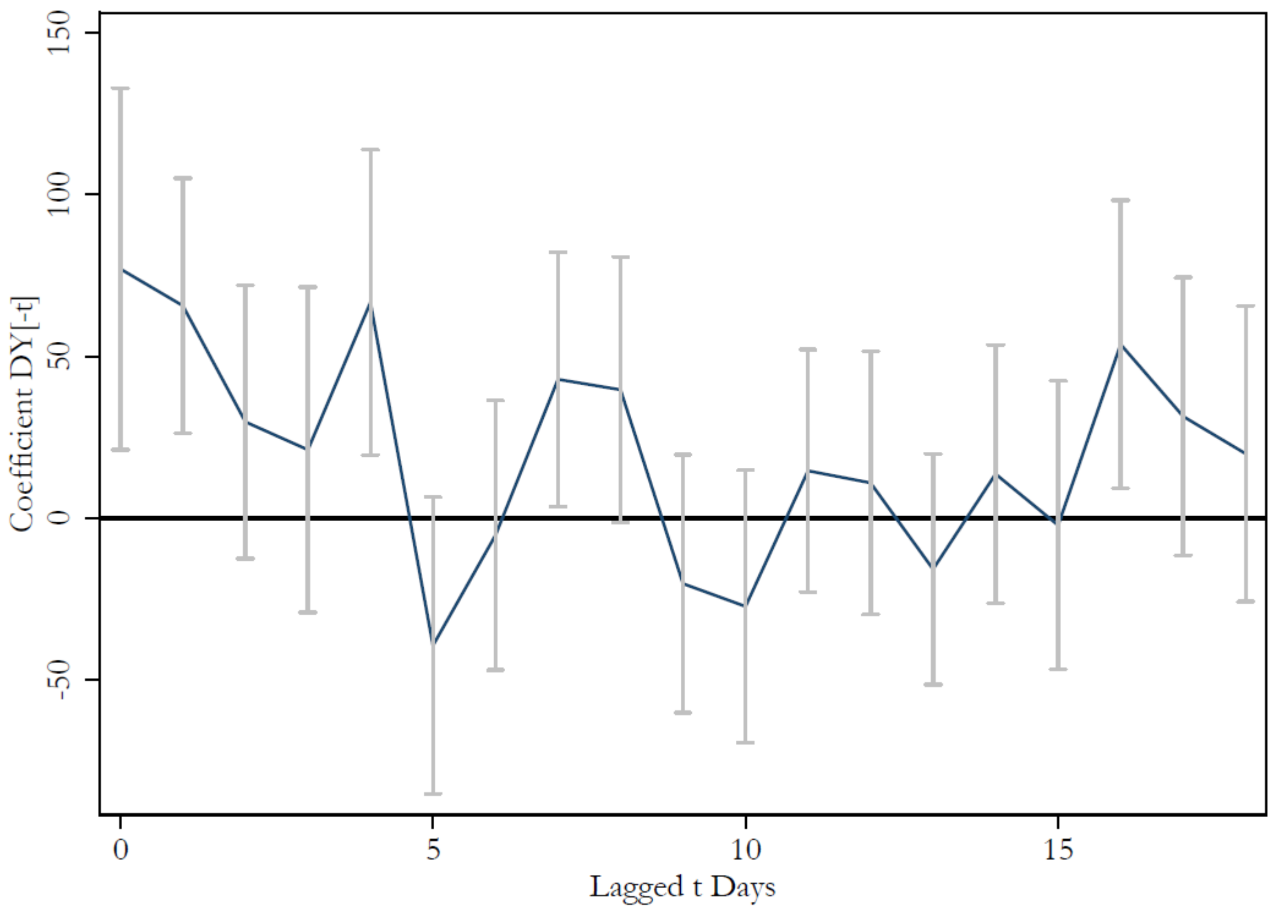


Reversals

- Do the results represent a permanent or transitory increase in price?
  - Initial regressions suggest no reversal in the first week

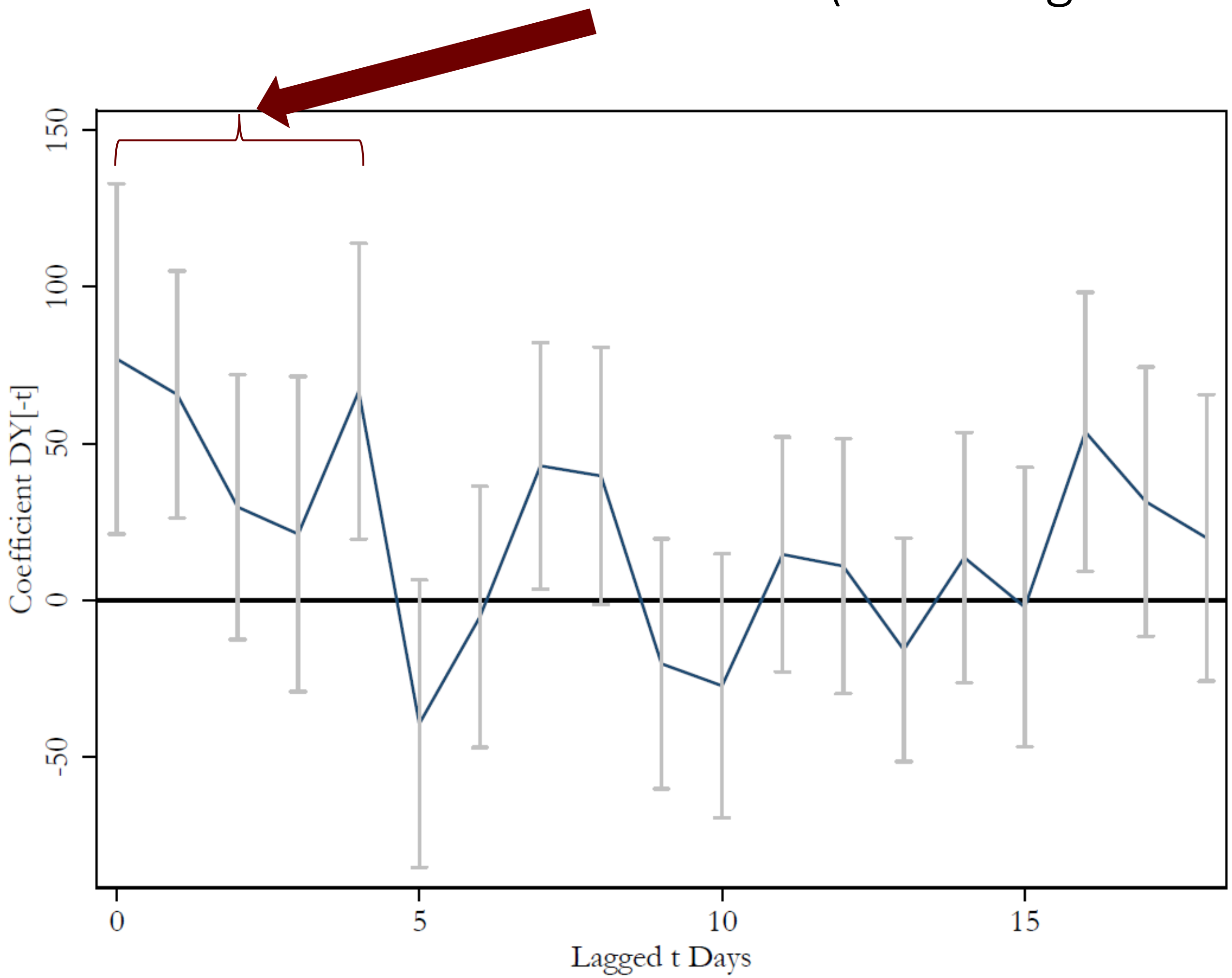
- Re-run analysis examining the 4 weeks following dividend payment

Reversals



Reversals

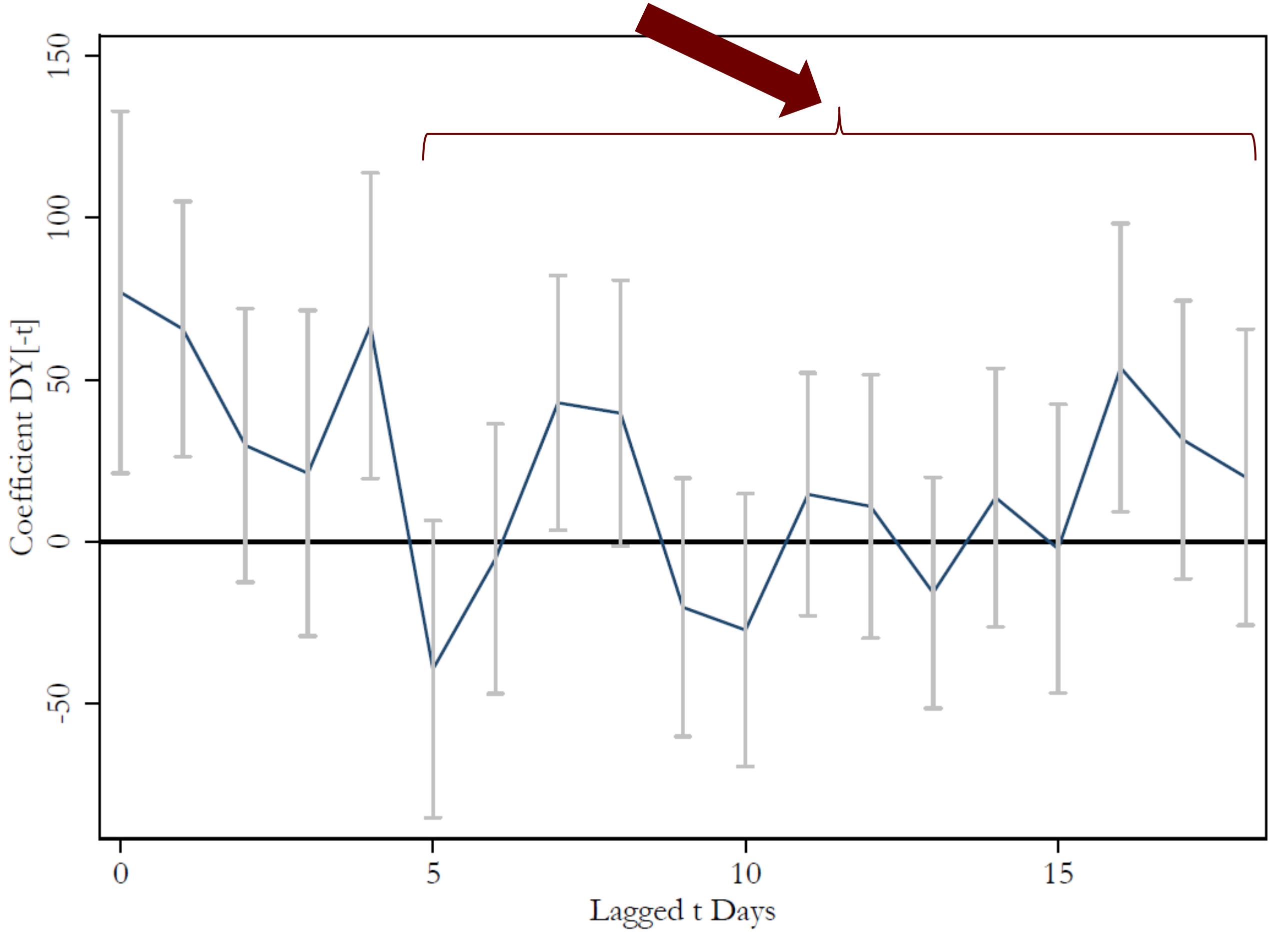
Positive effects in the first week (initial regressions)



Reversals

No reversal in next 3 weeks (+7 avg coefficient)

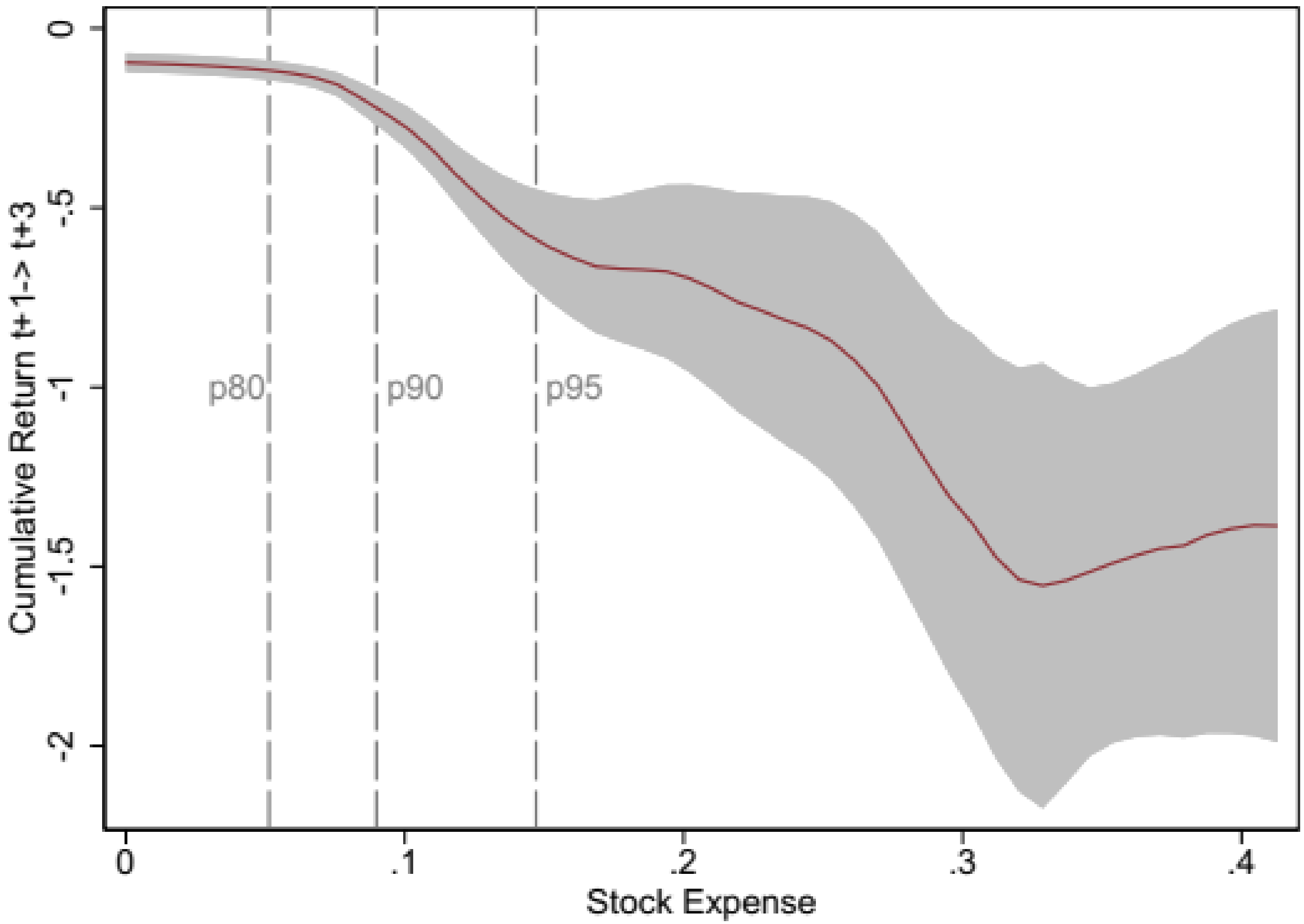
Consistent with more reinvestment or permanent impact



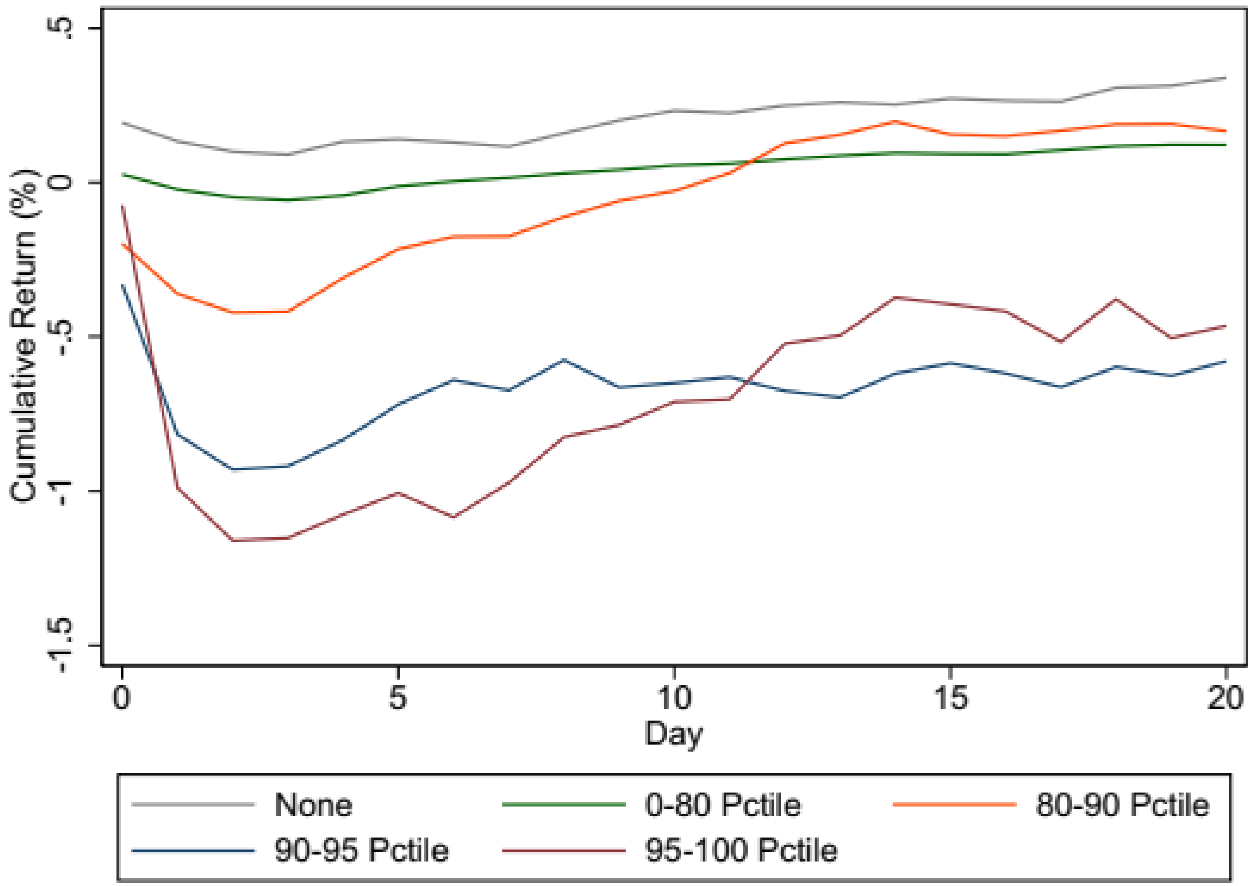
Selling pressure

- Predictable selling pressure should have a similar effect
  - Focus on buying pressure because of identification
  - Turn to cross-section to demonstrate influence of predictable selling
- Predictable selling based on stock compensation
  - Employees receiving stock have incentives to sell ASAP
  - Companies have blackout periods where employees can't sell – usually lifted after earnings announcement
- Are returns lower after blackout periods for firms with higher stock compensation?

Selling pressure



Selling pressure



Selling pressure

Were graphs capturing news from earnings announcement?

Use stale data from the prior quarter

	(1) (t=0, t+3)	(2) (t+1, t+3)	(3) (t+4, t+10)	(4) (t+4, t+20)
Stock Expense >0-80 Pctile	-0.184***	-0.00182	-0.0112	0.0301
	(-3.69)	(-0.05)	(-0.27)	(0.50)
Stock Expense 80-90 Pctile	-0.332***	-0.101	0.238***	0.0965
	(-2.93)	(-1.36)	(2.70)	(0.76)
Stock Expense 90-95 Pctile	-0.774***	-0.236**	0.152	0.477**
	(-4.83)	(-2.04)	(1.19)	(2.37)
Stock Expense 95-100 Pctile	-1.165***	-0.875***	0.455**	0.924**
	(-5.50)	(-5.77)	(2.06)	(2.46)
Constant	0.0987**	-0.0500	0.0819**	0.0465
	(2.24)	(-1.34)	(2.03)	(0.79)
t=0 Return	No	Yes	Yes	Yes
R^2	0.000453	0.000656	0.000289	0.000458
Observations	300456	300473	299789	298274

Selling pressure

Funds with more expenses have lower returns post blackout

Over 75 bp above 90th pctile in 4 days based on stale data

	(1) (t=0, t+3)	(2) (t+1, t+3)	(3) (t+4, t+10)	(4) (t+4, t+20)
Stock Expense >0-80 Pctile	-0.184***	-0.00182	-0.0112	0.0301
	(-3.69)	(-0.05)	(-0.27)	(0.50)
Stock Expense 80-90 Pctile	-0.332***	-0.101	0.238***	0.0965
	(-2.93)	(-1.36)	(2.70)	(0.76)
Stock Expense 90-95 Pctile	-0.774***	-0.236**	0.152	0.477**
	(-4.83)	(-2.04)	(1.19)	(2.37)
Stock Expense 95-100 Pctile	-1.165***	-0.875***	0.455**	0.924**
	(-5.50)	(-5.77)	(2.06)	(2.46)
Constant	0.0987**	-0.0500	0.0819**	0.0465
	(2.24)	(-1.34)	(2.03)	(0.79)
t=0 Return	No	Yes	Yes	Yes
R^2	0.000453	0.000656	0.000289	0.000458
Observations	300456	300473	299789	298274

Multiplier

- How much does $1 of investment shift market cap?
- Gabaix and Koijen (2020) get numbers around 5
- We know dollars *available* to be reinvested, but need estimate of actual proportion reinvested
  - With 100% reinvestment multiplier is 0.67 (coefficient)
- Use Fed data on investor group sizes and estimate reinvestment rates
- Multiplier estimates of 1.5-2.3
  - Estimates of aggregate reinvestment from 30%-46%

Assessing the Multiplier

- Multipliers of 1.5-2.3
  - Above 1: at odds with most models
- Smaller than Gabaix and Koijen (2020) estimates of ~5
  - Different methodology – institutional demand from granular instrumental variables vs dividend reinvestment
    - »
- Impact of dividend flows are large and puzzling in Gabaix and Koijen (2020) model
  - Dividend flows are *predictable*. Gabaix and Koijen (2020) predicts large magnitudes for unanticipated flows

Implications

- Results suggest price pressure is plausible null hypothesis
  - Found in setting market most likely to get it “right”
- Provides “half” a theory
  - Doesn’t explain demand shifts: why people have different valuations / willingness to pay for assets
- Makes predictions in settings where textbook models struggle to provide meaningful insight
  - Where fundamental value is absent or trade is based on non-fundamental motives

So what?

- Understanding trading dynamics is a key component of understanding asset prices
- Predicting flows (even uninformed) can help predict returns
  - E.g. ESG based flows, index rebalancing, demographic changes, Fed influence, 401k deposits…
- Effects can have an impact even for the aggregate market
- A tool to explain situations where fundamental value is absent or hard to define
  - E.g crypto, meme stocks…

Conclusion

- Examine settings where the market has the ***best*** chance of behaving consistent with textbook theories
  - Predictability of trades in most liquid assets gives arbitrageurs the best chance of offsetting impact
- Predictable buying and selling predicts returns
- Suggests price pressure is a reasonable null hypothesis
  - Price pressure is a potential explanation for many phenomena that are puzzles under standard finance theory
- Understanding *why* is of great interest