Leverage- and Cash-Based Tests of Risk and Reward With Improved Identification

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Leverage (L) — NOTHING NEW

- L is an integral part of the paradigm.
- **Central** building block of risk and reward.
- Even more basic, more universal, and clearer than market- or agg-consumption-beta.
  No sophistication required.
- Not just another empirical regularity in a zoo.
- L is central also in CF. (But not “sexy”.)

(PS: L is **corporate** leverage in my paper, not **investor** leverage.)

What do we already know?

references please

- Lots of L **theory** in AP and CF.
- Very little x-sect L **empirics** in AP.
- L Levels, Panel, FF1992:
  - Mk and Bk L are highly collinear. Incl both...
  - ...high *market*-L firms have high AvgRets.
  - ...high *book*-L firms have **low** AvgRets.
  - Both subsumed by BE/ME.
  - PS: My paper never includes both, yet (usually) neg with T< –3.

?! ⟹ Lack of/Low solo T must be omitted var:

- FF1998 dividends: information contamination?!?
- gomes-schmid:2010: riskier firms choose lower L

Test Usefulness

- L is an “instrument” changing risk and reward.
- L has implications for expected (X)returns.
  - If **exogenous**: risk $\uparrow$, reward $\uparrow$
    ...with good quantitative predictions: $\partial(E-rf)/\partial L \approx \partial\sigma/\partial L$
  - If **endogenous**: risk $\downarrow$, reward $\downarrow$.
  - But both always have identical sign!
- L has implications for priced and unpriced risk.
  - No universally agreed priced (beta factor) risk proxies.
  - Consider own volatility primarily as an indicator.
  - Exmpl: Both exposures (betas) and own sd are linear in L.
- L is
  - partly influenced by external (value) shocks (returns).
  - partly under the direct influence of management;
  - . . . + at times has pre-announced **discrete** changes,
  - . . . which can be used decontaminate simul-information

What Can This Paper Contribute?

1. Tests also examine (measures/indicators of) risks;
   - Does (volatility) risk increase or decrease in L?
   - Does L-induced risk then go with low or high avgrets?
2. improves on (empirical) identification of AP tests and even in large x-sect study, not just in dividends.
3. is primarily about changes and not levels of L.
4. pushes back at (fully) reflexive interpretations.
   - oh, we must have an error in our risk metric, of course;
   - oh, we must have an omitted variable;
   - oh, no longer a puzzle, we solved this (GS);
   - oh, we need more degrees of freedom, so that we can close the book on considering non-paradigm aspects.

Yes and No

My Paper is about:

- Description of historical associations
- ...in data set of primary interest to fin econ
- ...of solid theory.

- Not an Alpha Fishing Expedition
- Not a Trading Strategy
- Not Prediction.

Preview of Findings

- CRSP/Compustat Panel in 2016 ($\geq$1990).
- Considers three measures of L
  - 1-C/A, (D-C)/E, (L-C)/A (C=Cash)
- This study is not (primarily) about predicting future stock return moments with **leverage levels**, but with **leverage changes**.
  - Levels are often spurious. Firms are usually **very** different, even after many controls. Differenced regressions are less susceptible to omitted aspects than level regressions, because firms are more similar to themselves across years than they are across types of firms.

~~Not Shown~~ Findings: Levels

L level associations are background:

- AvgRets are not lower in market L **levels**.
  - as in Bhandari and $\approx$ FF1992.
- AvgRets are lower in book L **levels**.

PARADOX IN MEANS REMAINS FROM VIEW OF EXOG L THEORY

  - as in $\approx$ FF1992, explained in GS. $\leftarrow$paradox
- Not multicollinearity
  - stronger with RMW and CMA control
  - but HML control needed for mk* (FF1992)

~~Not Shown~~ Findings: Levels

New Minor Findings:

- BE/ME, HML do not subsume Bkflev, Bkliab
- Non-paradoxical AvgRet with market-L does not survive (HML) control.
  - $\Rightarrow$ All become paradoxical neg with controls.
- Cash in marketval-quoted terms is strong.

For time, mostly omitted. Paper Table 1.

Preview of Findings

LEVERAGE CHANGES

Unified Preview of All Main Findings

- Vltlty increases with L **changes**.
  - as expected if ΔL is exogenous,
  - and often with quantitatively right magnitude.
- AvgRet decreases in L **changes** (paradoxical)

  — (mildly momentum-related, not ivol or hml related)
- Signs are opposite?!

- Same effects in tri-fecta: L$\uparrow$, Vltlty$\uparrow$, Mbeta$\uparrow$.
- Possibly stronger when due to managerial capstruct intervention.
- Even when known in advance and the change is sharp.

Plan

1. Panel Studies (CRSP/Comp)
2. Event Studies
   - Briefly Seasoned Equity Offerings
   - Detailed Dividend Payments
     - Dismiss various objections
3. Conclusion

Details: Full Panel Study

- All CRSP, Compustat. ≈1965–2016.
- Three base measures for L:
  - negcash: 1-cash/assets (narrow);
  - flev: netfindebt/(netfindebt+equity);
  - liab: netliabilities/assets (broad).
- Book- and market-based denom (for equity value).
- Levels, changes, xchanges (1/(1−x) is D/E), stock-return/firm-implied implied. (Previously asset-size controlled quartiles.) Many others.

Past-Return Adjusted Quartiles

4-5 months reporting delay before-after 2004:

- Fiscal Year: Jan-Dec 2010.
- Debt Ratio Change: Dec 2009 to Dec 2010
- Indep Variable Assumed Observed: May 2011.
- Predicting Returns: June 2011 to May 2012.
- Compustat Controls: pre-2010.
- Mom and Vltlty control 1: June 2010 to May 2011
- Mom and Vltlty control 2: June 2009 to May 2010

(AvgR also held constant in sort)

Summary Stats of Level Ratios

	mknegcash	bknegcash	mkflev	bkflev
Mean	0.91	0.86	0.24	0.27
SD	(0.13)	(0.18)	(0.25)	(0.26)
SD(X,T)	(0.11,0.06)	(0.15,0.07)	(0.24,0.11)	(0.25,0.11)

	mkliab	bkliab
Mean	0.37	0.41
SD	(0.27)	(0.26)
SD(X,T)	(0.25,0.11)	(0.25,0.10)

cor between vars and schg vars is about 20-40%
cor between lev and liab (and changes) is high, around 70-90%.
cor between cash and lev-liab is smaller (around 30-50%).
autocor, but principally a panel regression

Main Test Portfolio

- Within each year,
- First sort by two-years lagged average return (earlier firm size),
- Within groups of four, show return statistics by Q4 – Q1, e.g., as the time-series return on a spread portfolio.

(by L levels at first, later by L changes)

Financial L: Avg Mo Returns Q4-Q1

	Lvl mkfliab		Lvl bkfliab	
Indep Factor Controls	Alpha	(T-stat)	Alpha	(T-stat)
Constant	–0.01	(–0.10)	–0.19	(–2.78)
+XMKT	0.03	(+0.43)	–0.17	(–2.51)
+SMB+HML	–0.18	(–3.01)	–0.31	(–5.41)
+RMW+CMA	–0.23	(–3.79)	–0.36	(–6.36)
+UMD	–0.17	(–2.74)	–0.32	(–5.44)
FM (not on pfios, but stocks)	Coef	(T-stat)	Coef	(T-stat)
Leverage Quartiles	–0.01	(–0.21)	–0.07	(–2.55)
... +10 vars†	–0.05	(–2.68)	–0.07	(–3.26)
Leverage Values	–0.04	(–0.19)	–0.48	(–2.63)
... +10 vars	–0.51	(–3.31)	–0.51	(–3.82)

† be/me, me, inv (%chgA), op prof, 3 rets, 3 sds.

- "Depends."
- But MkNegCash: –4.6 to –6.8. BkNetCash: –2.5 to –5.0.

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L Changes Now

Summary Stats For SCHGs: Table 2

	Δmknegcash	Δbknegcash	Δmkflev	Δbkflev
Mean	–0.001	0.005	0.009	0.007
SD	(0.085)	(0.086)	(0.12)	(0.12)
SD(X)	(0.074)	(0.077)	(0.11)	(0.11)
SD(T)	(0.070)	(0.075)	(0.10)	(0.10)

	Δmkliab	Δbkliab
Mean	0.011	0.009
SD	(0.12)	(0.11)
SD(X)	(0.11)	(0.10)
SD(T)	(0.11)	(0.10)

Reduction in Cash Holdings (Increasing NegCash = L)

	Δmknegcash		Δbknegcash	
	Q1 vs Q4		Q1 vs Q4	
ΔL Q Means	–0.07	+0.06	–0.05	+0.07
SD Net Lagged[2]	49.5	49.1	49.0	49.0
SD Net Lead	49.7	49.8	48.5	50.6
Compound Raw Lagged[2]	15.8	15.5	15.8	15.5
Compound Raw Lead	15.3	12.8	14.7	12.6

- Sort gave good control for lagged[2] performance
- Mildly increasing risk for Q4. ≈constant for Q1.
- Declining AvgRets for Q4 (relative to Q1).
- ...but pooled classifications are not great tests.

Reduction in Cash: Avg Mo Returns

	Δmknegcash		Δbknegcash	
BJS/FF LQ	Alpha	(T-stat)	Alpha	(T-stat)
Constant	–0.24	(–5.72)	–0.22	(–5.90)
+XMKT	–0.24	(–5.87)	–0.23	(–6.16)
+SMB+HML	–0.22	(–5.48)	–0.24	(–6.47)
+RMW+CMA	–0.20	(–4.31)	–0.21	(–5.61)
+UMD	–0.20	(–3.71)	–0.18	(–4.61)
FM	Coef	(T-stat)	Coef	(T-stat)
LQ Quartiles$_{\times 3}$	–0.082	(–6.63)	–0.069	(–5.85)
... +10 vars	–0.070	(–6.24)	–0.063	(–6.20)
L Values	–1.93	(–5.55)	–1.36	(–4.50)
... +10 vars	–1.55	(–5.05)	–1.21	(–4.93)

- Strong. (PS: even stronger for compound rets due to σ.)

Reduction in Cash: Avg Mo Returns

	Δmknegcash		Δbknegcash	
BJS/FF LQ	Alpha	(T-stat)	Alpha	(T-stat)
Constant	–0.24	(–5.72)	–0.22	(–5.90)
+XMKT	–0.24	(–5.87)	–0.23	(–6.16)
+SMB+HML	–0.22	(–5.48)	–0.24	(–6.47)
+RMW+CMA	–0.20	(–4.31)	–0.21	(–5.61)
+UMD	–0.20	(–3.71)	–0.18	(–4.61)
FM	Coef	(T-stat)	Coef	(T-stat)
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L Values	–1.93	(–5.55)	–1.36	(–4.50)
... +10 vars	–1.55	(–5.05)	–1.21	(–4.93)

- Strong. (PS: even stronger for compound rets due to σ.)

Broader: Increase in Financial L

	Δmkfliab Q1 vs Q4		Δbkfliab Q1 vs Q4	
ΔL Q Means	–0.08	+0.10	–0.08	+0.10
SD Net Lagged[2]	49.0	47.5	48.4	47.7
SD Net Lead	46.7	51.7	47.2	50.7
Compound Raw Lagged[2]	15.8	15.5	15.8	15.5
Compound Raw Lead	15.0	13.0	14.8	12.3

- Good control for lagged[2] performance
- Increasing volatility "risk" (⇒ Worse Buy-And-Hold Returns.)
- Declining AvgRets

Financial L: Avg Mo Returns

	Δmkfliab		Δbkfliab	
BJS/FF LQ	Alpha	(T-stat)	Alpha	(T-stat)
Constant	–0.18	(–2.75)	–0.28	(–6.38)
+XMKT	–0.20	(–3.12)	–0.30	(–7.00)
+SMB+HML	–0.32	(–5.53)	–0.35	(–8.25)
+RMW+CMA	–0.30	(–4.87)	–0.32	(–7.53)
+UMD	–0.17	(–2.65)	–0.26	(–5.75)
FM	Coef	(T-stat)	Coef	(T-stat)
LQ Quartiles$_{\times 3}$	–0.065	(–2.72)	–0.088	(–5.66)
... +10 vars	–0.032	(–2.52)	–0.045	(–4.43)
L Values	–1.03	(–2.90)	–1.12	(–4.83)
... +10 vars	–0.72	(–3.63)	–0.43	(–2.96)

- Strong. (PS: even stronger for compound rets due to σ.)

Financial L: Avg Mo Returns

	Δmkfliab		Δbkfliab	
BJS/FF LQ	Alpha	(T-stat)	Alpha	(T-stat)
Constant	–0.18	(–2.75)	–0.28	(–6.38)
+XMKT	–0.20	(–3.12)	–0.30	(–7.00)
+SMB+HML	–0.32	(–5.53)	–0.35	(–8.25)
+RMW+CMA	–0.30	(–4.87)	–0.32	(–7.53)
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- Strong. (PS: even stronger for compound rets due to σ.)

Even Broader: Increase in Liabilities

	Δmkliab Q1 vs Q4		Δbkliab Q1 vs Q4	
ΔL Q Means	–0.07	+0.11	–0.07	+0.10
SD Net Lagged[2]	49.4	47.9	48.9	48.2
SD Net Lead	47.3	51.8	47.7	51.1
Compound Raw Lagged[2]	15.8	15.5	15.8	15.5
Compound Raw Lead	14.6	13.1	14.7	12.5

- Good control for lagged[2] performance
- Increasing volatility "risk" (⇒ Worse Buy-And-Hold Returns.)
- Declining AvgRets

(⇒ Worse Buy-And-Hold Returns.)

Total Liabilities: Avg Mo Returns

	Δmkliab		Δbkliab	
BJS/FF LQ	Alpha	(T-stat)	Alpha	(T-stat)
Constant	–0.20	(–2.77)	–0.24	(–6.03)
+XMKT	–0.21	(–3.21)	–0.26	(–6.68)
+SMB+HML	–0.34	(–5.58)	–0.29	(–7.68)
+RMW+CMA	–0.32	(–4.82)	–0.26	(–6.59)
+UMD	–0.17	(–2.50)	–0.19	(–5.11)
FM	Coef	(T-stat)	Coef	(T-stat)
L Quartiles$_{\times 3}$	–0.064	(–2.50)	–0.081	(–5.59)
... +10 vars	–0.023	(–1.66)	–0.029	(–2.88)
L Values	–0.88	(–2.22)	–1.08	(–4.00)
... +10 vars	–0.55	(–2.51)	–0.39	(–2.40)

- Strong. (PS: even stronger for compound rets due to σ.)

Total Liabilities: Avg Mo Returns

	Δmkliab		Δbkliab	
BJS/FF LQ	Alpha	(T-stat)	Alpha	(T-stat)
Constant	–0.20	(–2.77)	–0.24	(–6.03)
+XMKT	–0.21	(–3.21)	–0.26	(–6.68)
+SMB+HML	–0.34	(–5.58)	–0.29	(–7.68)
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- Strong. (PS: even stronger for compound rets due to σ.)

Monthly Vltlty Auto-Regressions (Tbl3)

Lev Measure	Method	Fama-Macbeth-Like Regressions a	ρ_1	ρ_2	γ	%Positive
Δmknegcash	Coefficients	0.004	0.724	0.175	**0.004**	**87**
	(NW(2) T-stat)	(7.00)	(25.39)	(9.30)	**(4.89)**	
Δbknegcash	Coefficients	0.004	0.721	0.176	**0.007**	**92**
	(NW(2) T-stat)	(7.04)	(25.64)	(9.60)	**(9.07)**	
Δmkflev	Coefficients	0.004	0.702	0.195	**0.011**	**100**
	(NW(2) T-stat)	(7.31)	(27.53)	(11.55)	**(10.51)**	
Δbkflev	Coefficients	0.004	0.714	0.184	**0.008**	**98**
	(NW(2) T-stat)	(7.10)	(26.01)	(10.11)	**(12.44)**	
Δmkliab	Coefficients	0.004	0.701	0.195	**0.012**	**100**
	(NW(2) T-stat)	(7.10)	(27.63)	(11.79)	**(11.38)**	
Δbkliab	Coefficients	0.004	0.714	0.183	**0.009**	**100**
	(NW(2) T-stat)	(6.96)	(25.92)	(10.11)	**(12.89)**	

- Clear vol increases with ΔL, but tiny for Δmknegcash.

Not Shown

- Table 4: When firms increase both L and volatility, AvgRets are also (later) lower.
- Table 5: Managerial-caused L changes may be better predictors than stock-based changes (but both are negative).
  - explains why book-based works better than market-based!?
- Table 6: D/(D+E) or D/E. No difference.
- Table 7: “Spans” on AvgRet Factors:
  - hml alpha is spanned by xmkt, smb, rmw, cma, umd
  - smb is spanned by L changes (but not vice-versa)
  - umd is half-spanned by L changes (vice-versa alreadys shown)
- And/But
  - Size 1000 matters much for Δnegcash, less for others.
  - Financial Crisis 2008-2011 — flips. huh?

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To Remember

- Firms which increase L have subsequently higher equity volatility. $\uparrow$
- Firms which increase L have subsequently lower arithmetic AvgRets. $\downarrow$
- Empirical Evidence: $\uparrow, \downarrow$.
- Not Gomes-Schmid L endogeneity: $\Leftrightarrow \downarrow, \downarrow$
- Not exogenous L: $\Leftrightarrow \uparrow, \uparrow$
- Evidence pushes the puzzle one level further. Need explanation w/o volatility as free param

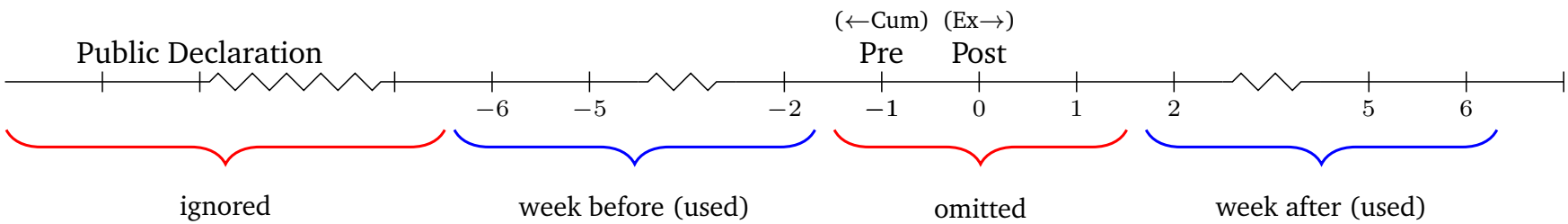
Not shown: Happens not to be due to IVOL effect. Not just lev-vol, with ER following. Not just existing effects. Robust but with variations, e.g., firm-size, etc.

Not Clean Enough?

- Maybe L changes, later AvgRets and Vltlty respond to something else. (What? Anything?)
- Maybe there is spurious slow coincidental accumulation of sunspots.
- Maybe there is information contamination.
- Maybe the measures are noisy, the errors are more correlated than we think, maybe I just got something wrong.

- ...if we only had a quasi-experimental (quasi-exogenous) shock to leverage, so as to measure risk and reward changes...
- ...what's a "quasi-exog" shock to beta to measure causal influence?

Event Studies Now



- Discrete change known in advance
  $\rightarrow$ no news release at event (contamination).
- Short interval — not much non-L-chg related activity
- (If precommitted, all risk change is on existing equity)
- But, much narrower context, possibly a different phenomenon.

Equity Issues (Event Study)

Issuing	Avg 4-day Daily Volatility	Avg 4-day Daily Ret – Mkt
–6 to –3	4.63%	–0.041% (×4)
~~–2 to +2~~	~~5.04~~	~~–0.045%~~
+3 to +6	3.46%	+0.078% (×4)
	↓	↑ (T ≈ 5)
	makes sense	same paradox

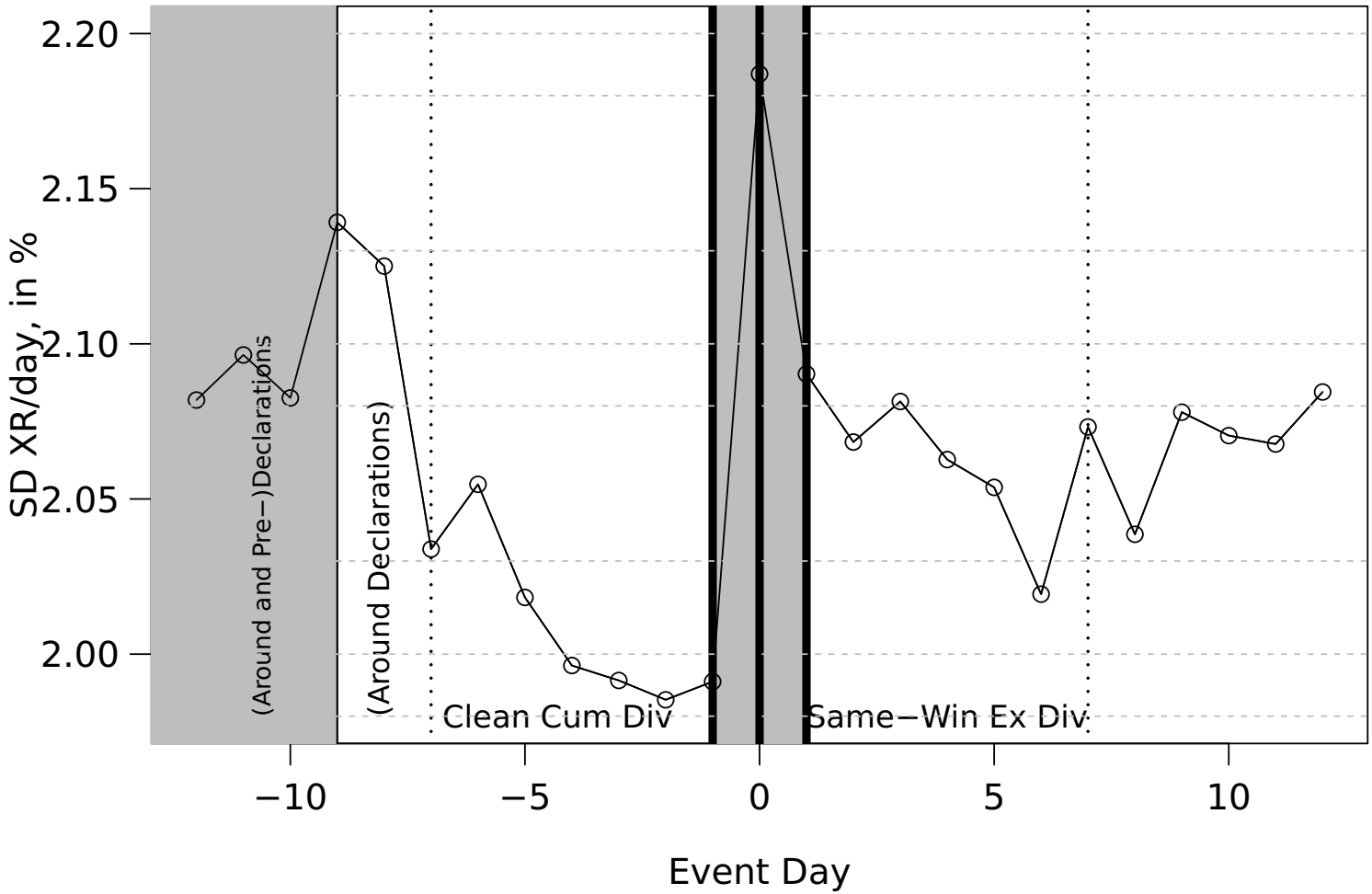
N ≈ 7,700 issues

- Announced long ago,
- **but** maybe a little selection on completion
- PS: (how could this explain low risk and high avgret?)

Dividend Payment Event Study

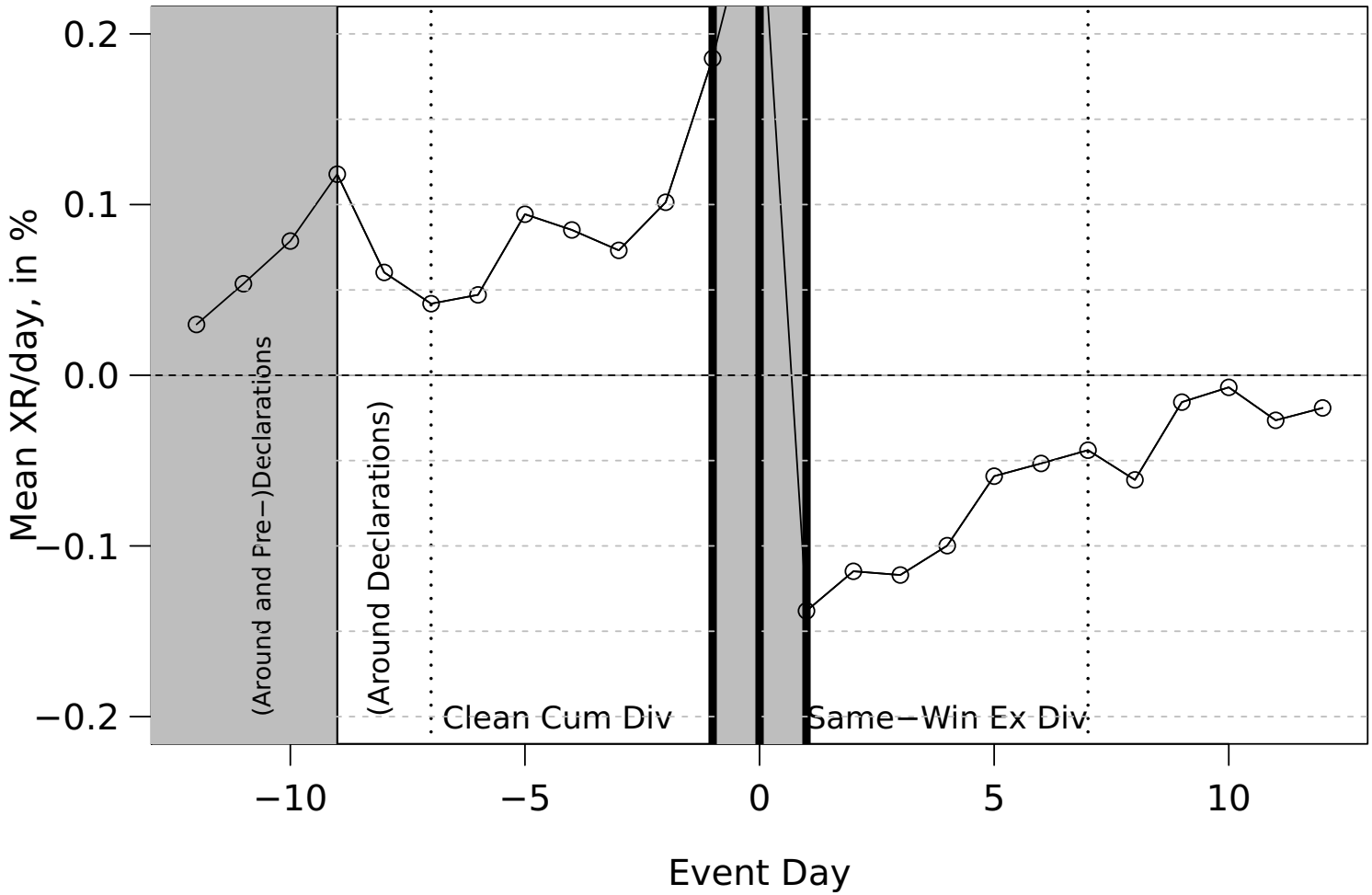
- Declared days ago. Ex date = 0.
  - Not just expected. Commits pay in 2-3 weeks.
- This is **the** M-M argument in action.
  - Before cum, stock price is for cash-cum-projects together.
    After ex, all the same, but cash is in your pocket.
  - Think de-facto defeasance on day of declaration.
  - Proven: Obvious if firm waits to liquidate until day. But works also if firm waits with risk divestment until cum-ex day. *(Any risk remains with remaining residual equity only.)*
  - Proven: Unrelated to L concept (operational, financial, total, etc.); all that matters is Dvd. Pre ER/Vol captures both.

Volatility (DivYield > 2%)



as if exogenous, as before.

Average Returns (DivYield > 2%)



same paradox as before

Dividend Payment Event Study

Div-Yield 2% or more:

	Evt Day	$\sum \lvert R \rvert$	$\sum R$
Cum	–6 to –2	6.31%	+0.40%
Ex	+2 to +6	6.51%	–0.84%
		$\uparrow$	$\downarrow (T \approx 5)$
		makes sense	same paradox

N=34,616 (out of 239,684)

- For mean, Section 4.1, Hartzmark and Salomon (2016)
  Plug: HS and HHS rank among my favorite papers of few years
  , except they were not in the CFR.

Dividend Payment Event Study

Div-Yield 2% or more:

	Evt Day	$\sum \lvert R \rvert$	$\sum R$
Cum	–6 to –2	6.31%	+0.40%
Ex	+2 to +6	6.51%	–0.84%
		$\uparrow$	$\downarrow (T \approx 5)$

makes sense — same paradox

N=34,616 (out of 239,684)

- For mean, Section 4.1, Hartzmark and Salomon (2016)
  Plug: HS and HHS rank among my favorite papers of few years
  , except they were not in the CFR.

Not Shown

- Not sensitive to many measure variations, winsorization, etc.
- Not calendar related. Not different by years
- Taxable and non-taxable dividends the same
- Unrelated to regularity of dividends
- Unrelated to existing L
- Unrelated to cum-ex return
- Unrelated to trading volume

Complete Puzzle

Increases in L anticipate (more) volatile later returns.

$\Rightarrow$ There is more risk.

Increases in L anticipate lower later AvgRets.

1. Investors cherish something about these stocks?! What?
2. Investors are still too exuberant and later disappointed.

*Together, increases in L anticipate **really** low compound excess rates of returns.*

Survey Evidence — Not Yet

- Ask investors and finance pro(f)s what useful characteristics makes them want to purchase these stocks.
- Who likes buying these stocks that
  - Increased their leverage,
  - Increased their volatility,
  - Increased their market-beta,
  - and then have higher volatility and lower average and compound rates of return?

Why do you do this? What does it hedge?

What characteristics are you cherishing?

Where does this leave the paradigm?

Paradigm theory needs not just explain lower AvgRegs with more L, but:

1. Lower AvgRet

+2. ...with higher volatility (risk)

+3. ...but without information contamination

+4. ...and even when due to discrete changes

Good luck!

Theory can chalk this off as “not applicable domain,” but not easily as “just some more degrees of freedom and we will have caught it.”

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Conclusion

- Important. L is central in AP and CF.
- Leverage has been strangely under-emphasized in empirical AP.
  - Not sexy QE or/or technical enough?
- Leverage can facilitate superior tests of primary AP paradigm. (More soon.)
- Paper has added three more levels distance between leverage puzzle and explanation:
  - Risk (Volatility)
  - Changes, not just levels. Discrete mngrl choices, not just slowly covariant measures.
  - Information contamination control