

Black's "Leverage Effect" Is Not Due to Leverage

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Empirical fact and model

- Fact: Stock return volatility rises after price falls
- Model [Black 76,...]:

σ_t , r_t estimated over non-overlapping 21-day windows

$$\Delta\sigma_{t,t-k} = \alpha + \lambda \cdot r_{t-1} + \varepsilon_t$$

→ $\lambda < 0 \equiv$ “**inverse relation**” in this talk,
“leverage effect” in [Black 76,...]

Black's explanation of inverse relation

- Financial leverage (debt/equity):
price $\downarrow \Rightarrow$ equity value $\downarrow \Rightarrow$ leverage $\uparrow \Rightarrow$
risk exposure $\uparrow \Rightarrow$ volatility \uparrow
- Operating leverage (fixed costs):
fixed costs \Rightarrow income falls less than expenses \Rightarrow
equity value \downarrow , volatility \uparrow
- Empirical tests conflicting: [Christie 82], [Duffee 95],...
- Our question: Is inverse relation due to leverage?

Is inverse relation due to financial leverage?

- Our idea: Compare inverse relation in **no-debt** and **with-debt** firms
- Data: CRSP daily stocks, Compustat quarterly, '73-'10

debt := long-term debt + current liabilities + pref stock

no-debt data: **debt = 0** for all quarters → 200 firms

with-debt data: **debt ≠ 0** for any quarter → 20000 firms
pick 200 at random, match no-debt mkt cap quintiles

Results

- Run $\Delta\sigma_{t,t-k} = \alpha + \lambda \cdot r_{t-1} + \varepsilon_t$ for each firm and equal-wt. portfolio of firms in **no-debt** and **with-debt** datasets

REGRESSION STATISTIC		CROSS-FIRM AVERAGE	EQUAL-WT. PORTFOLIO
NO DEBT	λ	-0.51	-0.94
	t-stat	(-1.26)	(-3.48)
	R ²	1.8%	2.4%
WITH DEBT	λ	-0.63	-0.80
	t-stat	(-1.74)	(-2.97)
	R ²	2.7%	1.7%

- Inverse relation** not correlated with **financial leverage**

No-debt firms: Is inverse relation due to **operating leverage (OL)**?

- Standard OL measure: $OL = \Delta \text{ earnings} / \Delta \text{ sales}$

Run $\Delta\sigma_{t,t-k} = \alpha + \lambda \cdot r_{t-1} + \varepsilon_t$ by OL quintile

NO DEBT		
OL QUINTILE	CROSS-FIRM AVERAGE λ	EQUAL-WT. PORTFOLIO λ
Low	-0.4	-1.1
Q2	-0.5	-1.0
Q3	-0.4	-1.0
Q4	-0.7	-1.3
High	-0.6	-0.9

- No-debt firms: **inverse relation** not correlated with **OL**
Result robust to [Novy-Marx 07] OL measure

Conclusion

- Conclusion: in **no-debt** firms, **inverse relation** present, not driven by operating leverage
- Inverse relation also present in artificial markets [Hens et al. 09], FX markets [McKenzie 02]
- **Conjecture**: driven by path-dependent risk perception
“leverage effect” → “**fear factor**”!

Thank you!

Results With Another OL Measure

- [Novy-Marx '07]: $OL := OCost / Book\ Assets$
 $OCost := COGS + Selling, General, Admin\ Expenses$

NO DEBT		
OL QUINTILE	CROSS-FIRM AVERAGE λ	EQUAL-WT. PORTFOLIO λ
Low	-0.5	-1.0
Q2	-0.7	-1.3
Q3	-0.7	-1.0
Q4	-0.5	-1.0
High	-0.6	-0.8

- No-debt firms: inverse relation not correlated with OL