Is there an equity duration premium?

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Introduction

Timing of cash-flows to equity ⟶ Duration Premium

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Timing of cash-flows to equity $\longrightarrow$ Duration Premium

Pricing of random cash flows in the near and distant future

- Recent evidence in favor of flat or upward-sloping term structure: Bansal et al. (2021) using dividend strips; Giglio et al. (2021) by estimating an SDF from cross-sectional data.

Introduction

Stock-level measure:

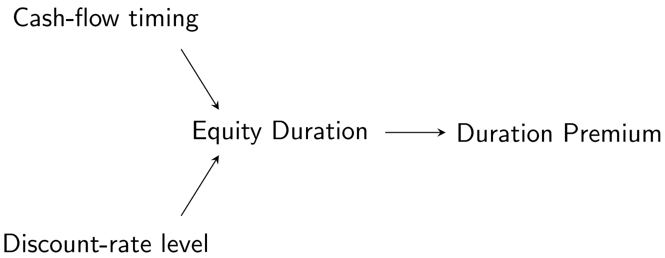
Equity Duration

Timing of cash-flows to equity ⟶ Duration Premium

Pricing of random cash flows in the near and distant future

- Recent evidence in favor of flat or upward-sloping term structure: Bansal et al. (2021) using dividend strips; Giglio et al. (2021) by estimating an SDF from cross-sectional data.
- ↯ Supposedly direct, stock-level measures: in the cross-section, long-*duration* stocks tend to have low returns (Weber, 2018; Gonçalves, 2021)
- ↯ At odds with asset pricing models

Wy try to reconcile these findings by analyzing the following concern of these established stock specific measures



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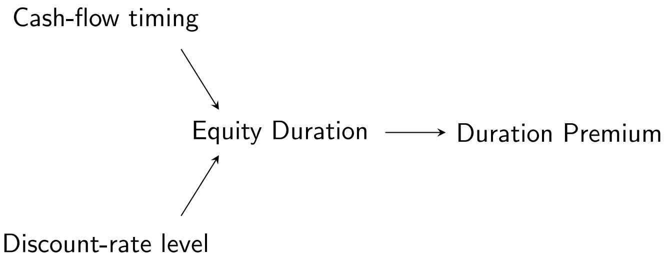

- Measures for the timing of cash flows to shareholders comprise of cash flow forecasts (1) and discount rate levels (2)
- The later is a concern once we analyze the cross-section of expected returns

What do we do about this concern?

- We disentangle discount-rate and timing information in the popular measures of Dechow et al. (2004), Weber (2018) and Gonçalves (2021) (as well as others) ...
- .. by introducing measures of pure timing (using only cash flow forecasts)

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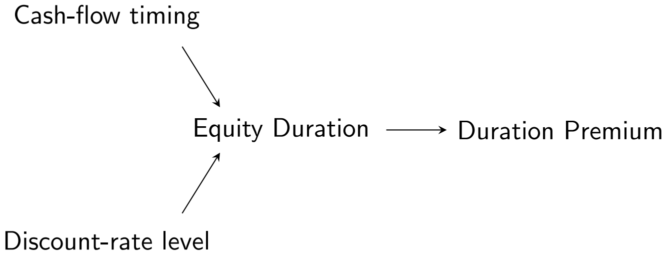

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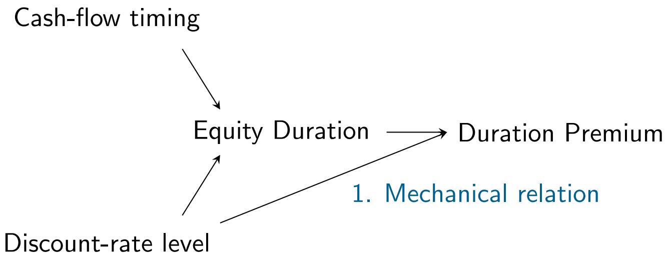

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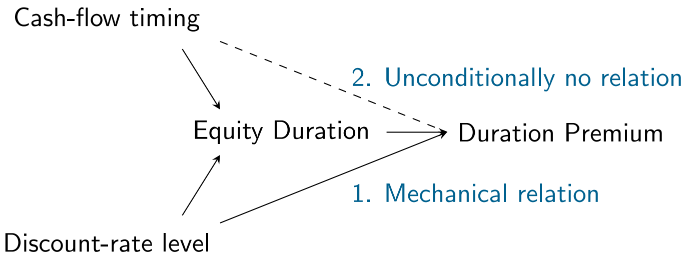

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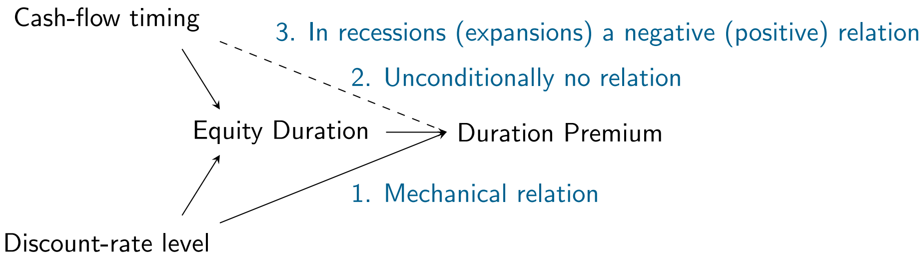

Roadmap

Roadmap

- Established empirical measures of cash-flow duration
- Versions of established measures that do not suffer from DR contamination

Established empirical measures of cash flow duration

Duration mixes up information on timing and DR levels

- Duration of a stock: Weighted average payment date of *future* cash flows to equity

$$DUR_t = \sum_{i=1}^{T} i \cdot w_i$$

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$$DUR_t = \sum_{i=1}^{T} i \cdot w_i = \sum_{i=1}^{T} i \frac{\frac{C_{t+i}}{(1+r)^i}}{\sum_{i=1}^{T} \frac{C_{t+i}}{(1+r)^i}}$$

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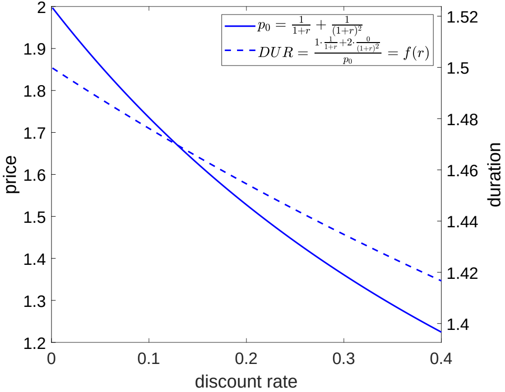

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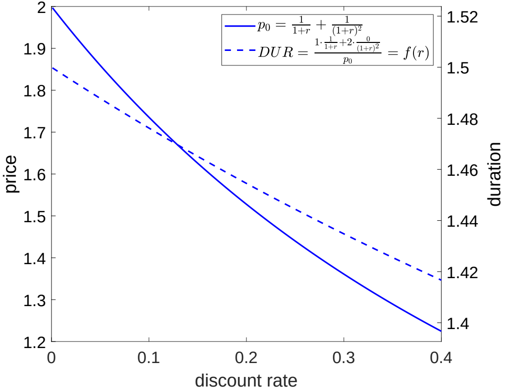

- DUR becomes a decreasing function of discount rates derivation
- Empirical evidence on cross-sectional joint distribution of expected return and duration **must find** $Corr(f(r_i), g(r_i)) \neq 0$
- ... even if we knew all inputs (which we don't).

Empirical measures of cash flow duration

$$DUR_t = \sum_{i=1}^{T} i \cdot w_i = \sum_{i=1}^{T} i \frac{\frac{C_{t+i}}{(1+r)^i}}{\sum_{i=1}^{T} \frac{C_{t+i}}{(1+r)^i}} = \frac{1}{P_t} \sum_{i=1}^{T} i \frac{C_{t+i}}{(1+r)^i}$$

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Dechow et al. (2004) equity duration

- Forecast future cash flows CF_{t+i} with an AR-1 process
- r is set uniformly and exogenously
- **But** they infer the value of future cash flows after a finite forecasting horizon with market prices
- $P = f(r)$, so $\frac{\partial DUR_j^{DSS}}{\partial P_j} > 0$ and thus $\frac{\partial DUR_j^{DSS}}{\partial r_j} < 0$

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Gonçalves (2021) equity duration

- Forecast future cash flows CF_{t+i} with an VAR process
- Estimate r such that discounted future cash flows match prices using a forecasting horizon of 1000 years
- Again we have $\frac{\partial DUR_j^{GON}}{\partial r_j} < 0$

Original duration measures yield negative relation between DUR and mean returns

Original duration measures yield negative relation between DUR and mean returns. But what is the driver? How much of it is mechanical?

	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	**D10-D1**
						DUR^{DSS}					
r^e	0.83	0.89	0.79	0.80	0.56	0.63	0.65	0.70	0.71	0.38	**-0.45**
	(3.72)	(4.33)	(4.18)	(4.29)	(3.10)	(3.33)	(3.63)	(3.73)	(3.29)	(1.28)	**(-2.00)**
α^{FF5}	-0.02	0.08	0.02	0.01	-0.14	-0.12	-0.06	0.08	0.13	-0.07	-0.05
	(-0.20)	(0.94)	(0.24)	(0.19)	(-1.81)	(-1.56)	(-0.87)	(1.32)	(1.80)	(-0.54)	(-0.33)
						DUR^{GON}					
r^e	1.06	0.80	0.77	0.73	0.76	0.69	0.72	0.77	0.61	0.49	**-0.63**
	(4.32)	(3.39)	(3.47)	(3.46)	(4.06)	(3.70)	(3.36)	(3.87)	(3.10)	(2.10)	**(-2.84)**
α^{FF5}	0.06	-0.11	-0.11	-0.16	-0.01	-0.07	-0.11	0.08	-0.05	-0.01	-0.07
	(0.55)	(-1.04)	(-1.14)	(-1.67)	(-0.14)	(-0.97)	(-1.34)	(0.98)	(-0.82)	(-0.06)	(-0.46)

Measures of pure cash-flow timing

Measures of pure timing

We introduce discount-rate free versions of DSS and GON: Measures of pure cash-flow timing $Dur(\bar{r}, t)$ to break the mechanical link

- Based on DSS (Dechow et al., 2004; Weber, 2018)
  - **DUR-FIP:** "forecast-implied prices": replace price in DSS formula with the price implied by cash-flow forecasts, a uniform post-forecast horizon growth rate and the DSS discount rate.
  - **DUR-FIP-TZZ:** "forecast-implied prices, Tengulov et al. (2019) LASSO forecast": replace price in DSS formula by price implied by cash-flow forecasts, a LASSO forecast of stock-specific growth rates and the DSS discount rate.

- Based on GON (Gonçalves, 2021)
  - **DUR-GON-NMI:** "no market information": version of GON duration *without* using market-based predictors, without matching DR to market prices
  - **DUR-GON-NDR:** "no discount-rate matching": version of GON duration *with* using market-based predictors, without matching DR to market prices

Measures of pure timing yield spread in earnings growth (similar results for cash-flows to equity growth)

	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	**D10-D1**
	DUR^{FIP} (DSS with prices implied by the model, uniform growth rate)										
$EBITDA_{t,t+5}$	8.46	8.01	7.72	7.75	7.90	8.38	8.60	10.50	13.68	16.49	**8.03**
	(24.17)	(21.73)	(25.95)	(22.10)	(23.31)	(21.25)	(22.18)	(25.67)	(28.29)	(33.76)	**(20.93)**
$EBITDA_{t,t+10}$	7.79	7.81	7.64	7.74	7.91	8.24	8.36	9.32	11.06	12.66	**4.86**
	(26.24)	(31.96)	(32.43)	(33.43)	(39.82)	(33.25)	(39.00)	(40.56)	(34.97)	(37.80)	**(16.73)**
	$DUR^{FIP-TZZ}$ (DSS with forecast implied prices and stock specific growth rates (LASSO))										
$EBITDA_{t,t+5}$	6.07	6.72	6.68	7.05	7.16	7.99	8.30	10.11	13.23	15.79	**9.72**
	(17.19)	(17.12)	(17.53)	(20.14)	(19.09)	(20.02)	(19.63)	(22.76)	(27.97)	(29.95)	**(25.09)**
$EBITDA_{t,t+10}$	6.11	6.69	7.04	6.96	7.38	7.68	8.17	8.95	10.92	12.12	**6.00**
	(23.13)	(27.14)	(29.80)	(30.74)	(30.68)	(37.11)	(33.76)	(33.04)	(31.53)	(29.49)	**(16.99)**
	$DUR^{GON-NMI}$ (GON without any market price information)										
$EBITDA_{t,t+5}$	7.36	7.05	7.45	7.81	7.63	8.00	8.78	9.95	12.35	14.54	**7.18**
	(19.47)	(18.00)	(19.36)	(22.37)	(19.32)	(19.72)	(19.69)	(18.46)	(24.53)	(29.57)	**(19.62)**
$EBITDA_{t,t+10}$	7.25	6.92	6.92	7.13	7.10	7.44	7.89	8.39	9.87	11.52	**4.28**
	(30.49)	(28.86)	(29.94)	(30.38)	(33.29)	(34.65)	(38.12)	(28.43)	(33.46)	(31.22)	**(14.10)**
	$DUR^{GON-NDR}$ (GON without calibrating the DR to market prices)										
$EBITDA_{t,t+5}$	7.61	7.51	7.52	8.05	8.02	8.39	8.94	10.25	11.56	13.33	**5.73**
	(17.76)	(18.55)	(18.79)	(20.54)	(19.93)	(20.44)	(20.00)	(21.87)	(23.31)	(26.69)	**(11.84)**
$EBITDA_{t,t+10}$	7.40	7.06	7.04	7.12	7.66	7.58	7.96	8.48	9.26	10.88	**3.48**
	(26.31)	(27.65)	(32.00)	(26.37)	(36.65)	(36.27)	(34.76)	(34.96)	(30.56)	(30.22)	**(9.91)**

Timing or DR level as drivers?

Are these pure measures of cash flow timing related to expected returns?

Timing or DR level as drivers?

	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D10-D1
	DUR^{FIP} (DSS with prices implied by the model, uniform growth rate)										
r^e	0.62	0.60	0.61	0.50	0.65	0.58	0.69	0.55	0.64	0.55	-0.07
	(3.22)	(3.38)	(3.36)	(2.78)	(3.71)	(3.05)	(3.68)	(2.64)	(2.80)	(1.94)	(-0.37)
α^{FF5}	0.04	0.12	0.02	-0.02	-0.02	-0.06	0.04	-0.02	-0.05	-0.11	-0.15
	(0.68)	(2.41)	(0.26)	(-0.39)	(-0.24)	(-0.66)	(0.51)	(-0.29)	(-0.53)	(-0.88)	(-1.14)
	$DUR^{FIP-TZZ}$ (DSS with forecast implied prices implied and stock specific growth rates (LASSO))										
r^e	0.81	0.66	0.71	0.61	0.69	0.73	0.73	0.67	0.55	0.57	-0.24
	(4.18)	(3.52)	(3.53)	(3.10)	(3.43)	(3.57)	(3.74)	(2.98)	(2.29)	(2.03)	(-1.16)
α^{FF5}	-0.02	0.17	-0.09	0.10	-0.03	-0.00	-0.01	0.05	0.14	0.10	0.12
	(-0.25)	(1.88)	(-0.96)	(1.24)	(-0.33)	(-0.03)	(-0.12)	(0.40)	(1.39)	(0.88)	(0.77)
	$DUR^{GON-NMI}$ (GON without any market price information)										
r^e	0.63	0.66	0.43	0.76	0.61	0.67	0.78	0.72	0.77	0.61	-0.03
	(3.04)	(3.26)	(1.94)	(3.94)	(2.83)	(3.21)	(3.87)	(3.06)	(3.14)	(1.99)	(-0.11)
α^{FF5}	-0.08	0.12	-0.15	0.11	-0.10	-0.04	0.09	0.02	0.05	0.00	0.08
	(-0.99)	(1.44)	(-1.84)	(1.24)	(-1.19)	(-0.42)	(1.11)	(0.17)	(0.46)	(-0.01)	(0.47)
	$DUR^{GON-NDR}$ (GON without calibrating the DR to market prices)										
r^e	0.53	0.65	0.71	0.64	0.67	0.69	0.84	0.78	0.76	0.62	0.09
	(2.70)	(3.33)	(3.50)	(3.22)	(3.02)	(3.13)	(3.77)	(3.44)	(3.07)	(2.03)	(0.34)
α^{FF5}	-0.19	-0.04	0.07	-0.06	0.11	0.14	0.31	0.01	0.07	-0.03	0.16
	(-2.61)	(-0.52)	(0.84)	(-0.81)	(1.33)	(1.49)	(2.70)	(0.14)	(0.71)	(-0.22)	(0.90)

Return spreads and the Business cycle

Standard models suggest dependence of equity term structure on business cycle.

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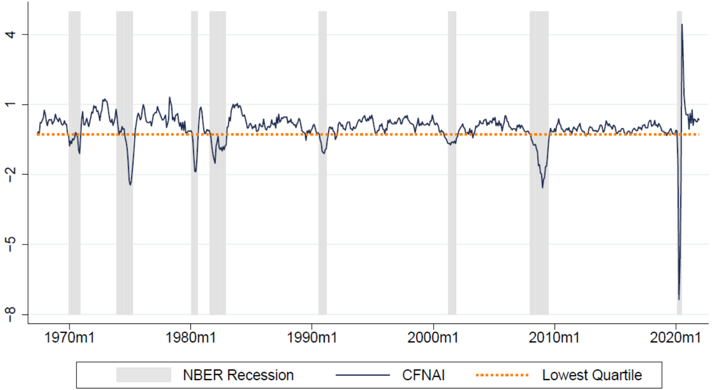
Standard models suggest dependence of equity term structure on business cycle. We consider returns conditional on levels of Chicago Fed's CFNAI indicator.
Lower quartile roughly equivalent to NBER recessions:



Visible in the cross-section of stocks?

Conditional spreads

r^x	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D10-D1	$\Delta = \bar{r} - r^{D10-D1}$
					DUR^{FIP} (DSS with prices implied by the model, uniform growth rate)							
r^{low}	0.89	0.54	0.49	0.31	0.37	0.33	0.23	0.26	0.11	0.11	**-0.79**	**1.03**
	(1.98)	(1.25)	(1.03)	(0.68)	(0.75)	(0.71)	(0.42)	(0.49)	(0.19)	(0.16)	**(-1.88)**	**(2.40)**
					$DUR^{FIP-TZZ}$ (DSS with prices implied by the model, stock specific growth rate estimated with LASSO)							
r^{low}	0.84	1.05	0.62	0.59	0.50	0.31	0.26	0.33	0.35	-0.05	**-0.89**	**1.20**
	(1.89)	(2.36)	(1.24)	(1.19)	(0.92)	(0.58)	(0.52)	(0.57)	(0.61)	(-0.07)	**(-1.99)**	**(2.59)**
					$DUR^{GON-NMI}$ (GON without any market price information)							
r^{low}	0.89	0.57	0.41	0.65	0.23	0.58	0.38	0.17	0.30	-0.29	**-1.18**	**1.42**
	(2.08)	(1.37)	(0.89)	(1.39)	(0.47)	(1.22)	(0.80)	(0.30)	(0.53)	(-0.42)	**(-2.29)**	**(2.87)**
					$DUR^{GON-NDR}$ (GON without calibrating the DR to market prices)							
r^{low}	0.73	0.79	0.58	0.56	0.37	0.32	0.49	0.39	0.05	-0.20	**-0.93**	**1.22**
	(1.77)	(1.99)	(1.31)	(1.21)	(0.72)	(0.65)	(0.95)	(0.73)	(0.09)	(-0.29)	**(-1.74)**	**(2.32)**

Conditional spreads

r^x	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D10-D1	$\Delta = \bar{r} - r^{D10-D1}$
					DUR^{FIP} (DSS with prices implied by the model, uniform growth rate)							
r^{low}	0.89	0.54	0.49	0.31	0.37	0.33	0.23	0.26	0.11	0.11	**-0.79**	**1.03**
	(1.98)	(1.25)	(1.03)	(0.68)	(0.75)	(0.71)	(0.42)	(0.49)	(0.19)	(0.16)	**(-1.88)**	**(2.40)**
r^{high}	0.41	0.31	0.49	0.37	0.50	0.43	-0.02	0.54	0.70	1.32	**0.91**	**-1.08**
	(0.59)	(0.48)	(0.74)	(0.59)	(0.73)	(0.59)	(-0.03)	(0.82)	(0.81)	(1.34)	**(1.76)**	**(-1.96)**
					$DUR^{FIP-TZZ}$ (DSS with prices implied by the model, stock specific growth rate estimated with LASSO)							
r^{low}	0.84	1.05	0.62	0.59	0.50	0.31	0.26	0.33	0.35	-0.05	**-0.89**	**1.20**
	(1.89)	(2.36)	(1.24)	(1.19)	(0.92)	(0.58)	(0.52)	(0.57)	(0.61)	(-0.07)	**(-1.99)**	**(2.59)**
r^{high}	0.45	0.25	0.09	0.26	0.05	0.35	0.36	0.16	0.69	1.48	1.03	**-1.18**
	(0.60)	(0.36)	(0.12)	(0.34)	(0.06)	(0.48)	(0.43)	(0.18)	(0.80)	(1.25)	(1.59)	**(-1.83)**
					$DUR^{GON-NMI}$ (GON without any market price information)							
r^{low}	0.89	0.57	0.41	0.65	0.23	0.58	0.38	0.17	0.30	-0.29	**-1.18**	**1.42**
	(2.08)	(1.37)	(0.89)	(1.39)	(0.47)	(1.22)	(0.80)	(0.30)	(0.53)	(-0.42)	**(-2.29)**	**(2.87)**
r^{high}	0.17	0.00	0.02	0.17	0.18	0.18	0.37	0.35	0.07	0.54	0.36	-0.57
	(0.25)	(0.01)	(0.02)	(0.25)	(0.24)	(0.24)	(0.56)	(0.49)	(0.09)	(0.57)	(0.65)	(-0.86)
					$DUR^{GON-NDR}$ (GON without calibrating the DR to market prices)							
r^{low}	0.73	0.79	0.58	0.56	0.37	0.32	0.49	0.39	0.05	-0.20	**-0.93**	**1.22**
	(1.77)	(1.99)	(1.31)	(1.21)	(0.72)	(0.65)	(0.95)	(0.73)	(0.09)	(-0.29)	**(-1.74)**	**(2.32)**
r^{high}	-0.07	-0.00	-0.11	0.35	0.22	0.71	0.54	0.62	0.37	0.53	0.60	-0.72
	(-0.11)	(-0.01)	(-0.16)	(0.49)	(0.32)	(0.95)	(0.81)	(0.79)	(0.47)	(0.56)	(0.98)	(-1.04)

Conclusion

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- Use of discount rates to explain discount rates.

Appendix

Appendix

Analytical derivation

$$\frac{\partial DUR}{\partial R} = -\left(\sum_{s=1}^{T}\frac{C_s}{R^s}\right)^{-2}\left(-\sum_{s=1}^{T}s\cdot\frac{C_s}{R^{s+1}}\right)\sum_{s=1}^{T}s\frac{C_s}{R^s} - \left(\sum_{s=1}^{T}\frac{C_s}{R^s}\right)^{-1}\sum_{s=1}^{T}s^2\frac{C_s}{R^{s+1}}$$

$$= \frac{1}{R}DUR^2 - \left(\sum_{s=1}^{T}\frac{C_s}{R^s}\right)^{-1}\left(\sum_{s=1}^{T}s^2\frac{C_s}{R^{s+1}}\right) \tag{1}$$

$$= \frac{1}{R}\left(\sum_{s=1}^{T}\frac{C_s}{R^s}\right)^{-2}\left[\left(\sum_{s=1}^{T}s\frac{C_s}{R^s}\right)^2 - \left(\sum_{s=1}^{T}s^2\frac{C_s}{R^s}\right)\sum_{s=1}^{T}\frac{C_s}{R^s}\right] \tag{2}$$

The expression in (2) is negative if the term in square brackets is negative. This term can be expressed as

$$\sum_{s=1}^{T}\left(s\frac{C_s}{R^s}\right)^2 + 2\sum_{i<j,j\leq T} i\frac{C_i}{R^i}j\frac{C_j}{R^j} - \sum_{s=1}^{T}\left(s\frac{C_s}{R^s}\right)^2 - \sum_{i<j,j\leq T}(i^2+j^2)\frac{C_i}{R^i}\frac{C_j}{R^j} \tag{3}$$

$$= \sum_{i<j,j\leq T}\frac{C_i}{R^i}\frac{C_j}{R^j}(2ij - i^2 - j^2) = -\sum_{i<j,j\leq T}\frac{C_i}{R^i}\frac{C_j}{R^j}(i-j)^2, \; < 0 \text{ for } T > 1 \tag{4}$$

back

Original duration measures yield spread in CF growth

Sorts on original duration measures generate sort on cash-flow growth, at least for EBITDA growth

	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	**D10-D1**
Panel B: **Cash flows to equity $E_t - [B_{t+1} - B_t]$ growth**											
DUR^{DSS}											
$CFEG_{t,t+5}$	15.65	15.58	14.83	15.61	16.08	14.67	17.00	16.65	18.58	17.88	**2.24**
	(20.09)	(20.14)	(18.30)	(18.93)	(18.54)	(17.60)	(21.65)	(19.79)	(18.87)	(15.66)	**(2.53)**
$CFEG_{t,t+10}$	10.39	11.49	10.75	10.23	10.49	10.32	11.49	11.65	12.61	11.58	**1.18**
	(22.60)	(19.36)	(21.45)	(24.09)	(25.90)	(23.36)	(26.86)	(24.58)	(22.62)	(19.27)	**(2.30)**
DUR^{GON}											
$CFEG_{t,t+5}$	18.50	16.58	16.18	15.89	14.37	16.22	16.65	17.61	17.92	18.97	0.47
	(21.47)	(21.00)	(20.32)	(19.28)	(18.08)	(20.96)	(21.36)	(19.93)	(22.91)	(20.43)	(0.56)
$CFEG_{t,t+10}$	12.67	11.21	10.96	11.07	11.24	10.92	11.20	11.55	12.67	12.55	-0.12
	(23.58)	(21.78)	(24.48)	(24.69)	(24.11)	(23.06)	(23.48)	(27.37)	(23.55)	(24.28)	(-0.29)

Back

Measures of pure timing yield spread in CFE growth (II) Back

	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	**D10-D1**
	DUR^{FIP} (DSS with prices implied by the model, uniform growth rate)										
$CFEG_{t,t+5}$	16.26	15.92	15.48	15.49	16.17	15.67	15.68	16.33	17.04	20.81	**4.55**
	(18.43)	(18.63)	(17.62)	(19.68)	(20.41)	(18.95)	(19.71)	(19.34)	(18.53)	(16.89)	**(5.36)**
$CFEG_{t,t+10}$	10.69	11.54	11.39	11.60	10.98	11.00	10.81	11.72	10.99	12.51	**1.82**
	(22.39)	(24.74)	(25.85)	(25.27)	(24.68)	(19.84)	(22.76)	(23.17)	(21.51)	(19.52)	**(4.09)**
	$DUR^{FIP-TZZ}$ (DSS with forecast implied prices and stock specific growth rates (LASSO))										
$CFEG_{t,t+5}$	12.00	14.91	15.06	16.24	17.12	17.58	17.48	16.93	18.33	20.17	**8.17**
	(12.87)	(17.06)	(16.29)	(20.18)	(19.50)	(19.14)	(19.02)	(18.97)	(19.58)	(17.32)	**(8.79)**
$CFEG_{t,t+10}$	8.93	11.25	12.30	12.45	12.22	11.65	11.31	12.11	11.85	12.19	**3.26**
	(17.07)	(24.65)	(28.38)	(27.21)	(24.61)	(23.19)	(24.52)	(22.98)	(22.18)	(21.66)	**(7.02)**
	$DUR^{GON-NMI}$ (GON without any market price information)										
$CFEG_{t,t+5}$	15.05	17.44	17.58	16.34	18.26	17.02	16.86	17.64	17.61	18.01	**2.96**
	(14.47)	(20.58)	(20.26)	(20.80)	(24.07)	(20.88)	(20.97)	(23.74)	(21.10)	(17.74)	**(3.41)**
$CFEG_{t,t+10}$	11.13	12.31	12.38	11.86	11.53	12.08	11.98	11.82	11.28	11.57	0.44
	(20.66)	(23.86)	(27.17)	(26.25)	(28.64)	(24.76)	(26.38)	(25.43)	(20.75)	(19.50)	(1.01)
	$DUR^{GON-NDR}$ (GON without calibrating the DR to market prices)										
$CFEG_{t,t+5}$	15.75	17.84	18.05	17.08	17.32	17.47	16.55	18.77	16.23	17.43	**1.69**
	(14.97)	(19.11)	(21.80)	(21.74)	(19.14)	(27.54)	(25.56)	(21.79)	(20.72)	(19.00)	**(1.97)**
$CFEG_{t,t+10}$	11.37	12.42	12.49	11.79	11.76	11.95	12.05	11.76	11.51	10.86	-0.51
	(20.18)	(23.97)	(27.32)	(23.34)	(27.98)	(26.38)	(28.78)	(22.83)	(20.77)	(20.98)	(-1.13)

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