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KENAN-FLAGLER
BUSINESS SCHOOL

The Short Duration Premium

Andrei S. Gonçalves

AFA 2020

The Paper in a Nutshell...

- Longer-term (risky) cash flows have lower risk premia

  (Binsbergen, Brandt, and Koijen (2012); Binsbergen and Koijen (2017); Giglio, Maggiori, and Stroebel (2015); Giglio, Maggiori, Stroebel, and Weber (2018))

- How does cash flow maturity impact stock expected returns?

  (Dechow, Sloan, and Soliman (2004); Lettau and Wachter (2007, 2011); Hansen, Heaton, and Li (2008); Da (2009); Chen (2011); Weber (2018))

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- This paper
  - Constructs novel measure of equity cash flow duration
  - Explores the **short duration premium**
  - Duration subsumes Value and Profitability
  - The short duration premium is explained by reinvestment risk

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Variation in $\mathbb{E}[r] \implies$ Reinvestment Risk

FINANCIAL TIMES

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Pensions: Low yields, high stress

In the first article of a series, the Financial Times examines a creeping social and political crisis

"Low bond yields and expensive stocks are a challenge to everyone's retirement..."

"...if future returns drop by only two percentage points...savers will need to put aside almost 15 per cent of their income..."

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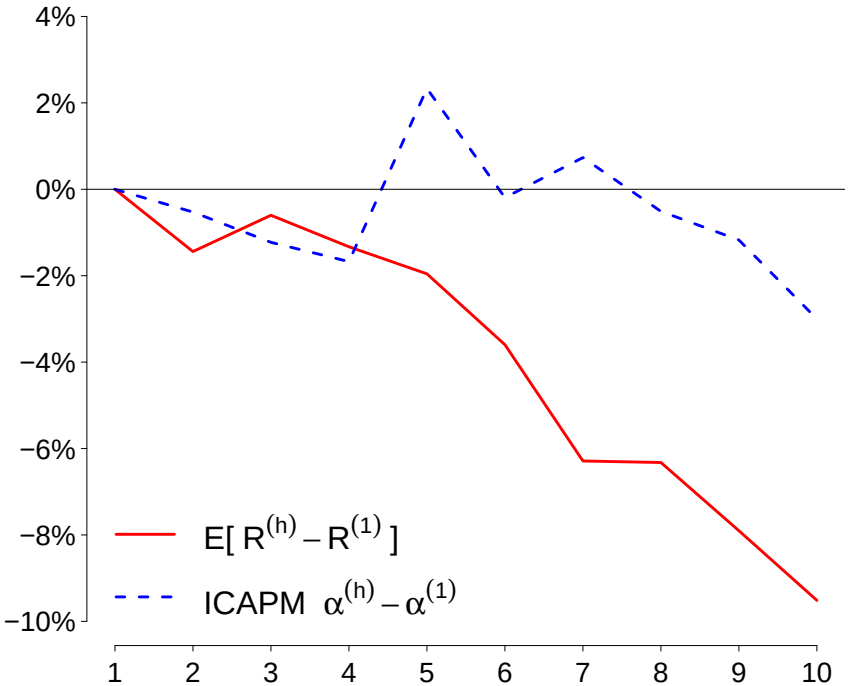
- **ICAPM**: variation in investment opportunities
  - Merton (1973); Campbell (1993, 1996); Ferson and Harvey (1999); Brennan, Wang, and Xia (2004); Campbell and Vuolteenaho (2004); Petkova (2006); Campbell, Polk, and Vuolteenaho (2009); Campbell, Giglio, Polk, and Turley (2017); Bali and Engle (2010); Cederburg (2019)...

Main Results

- There is a short duration premium
- The premium is captured by an ICAPM (reinvestment risk)
- Duration subsumes Value and Profitability

Main Results

Equity Duration Deciles



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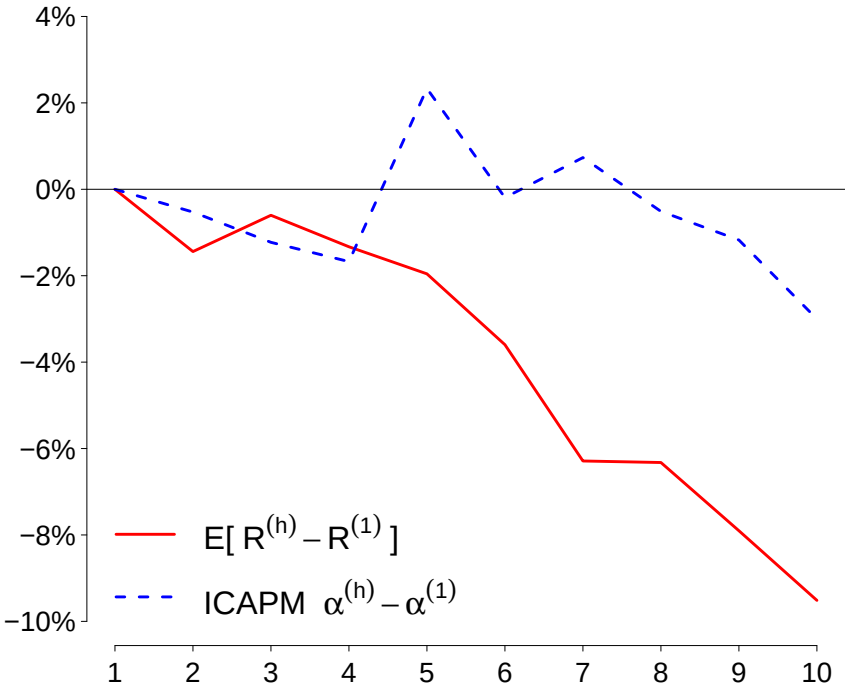

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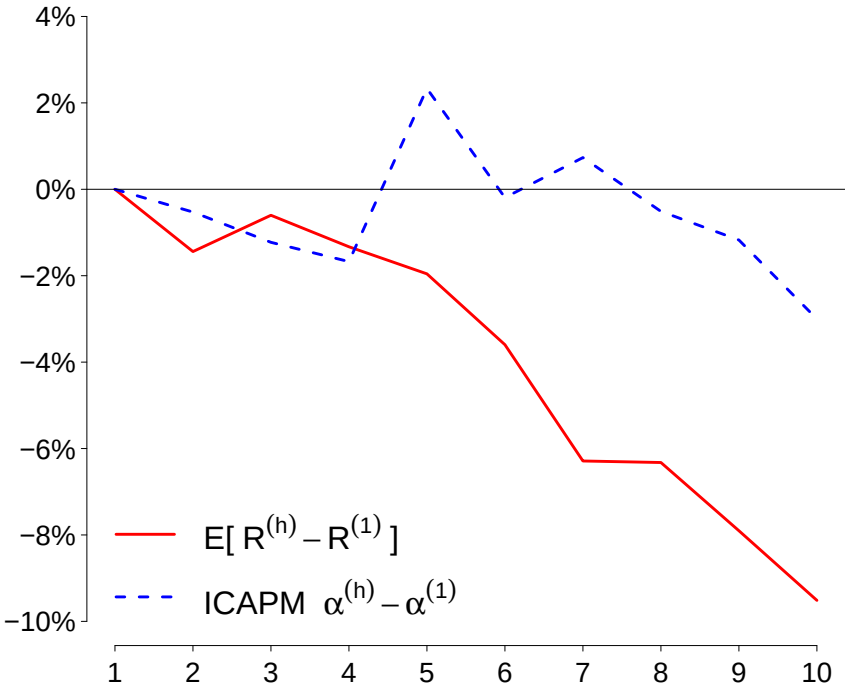
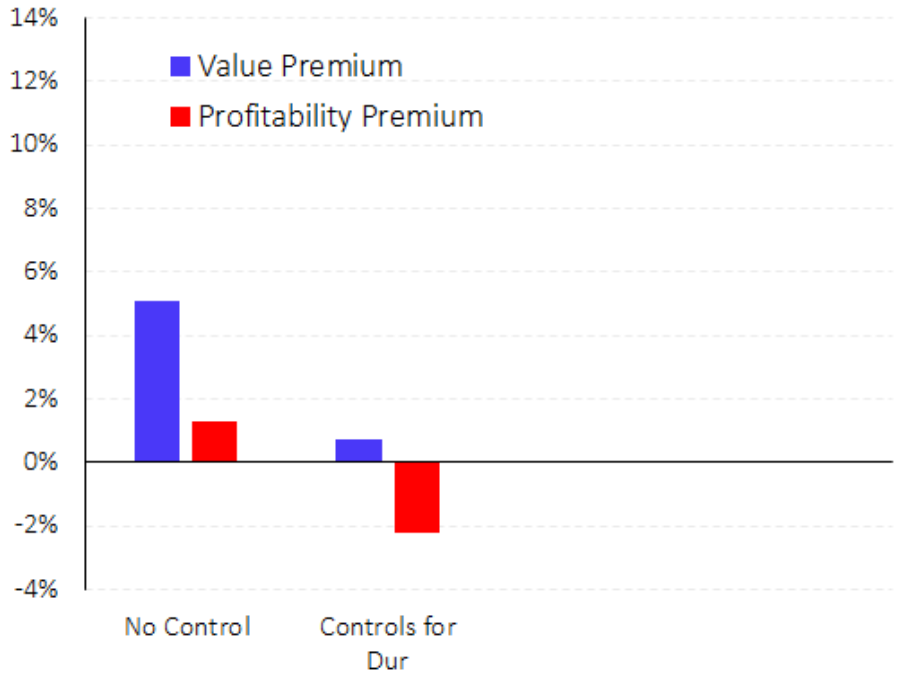


Value & Profitability Premia



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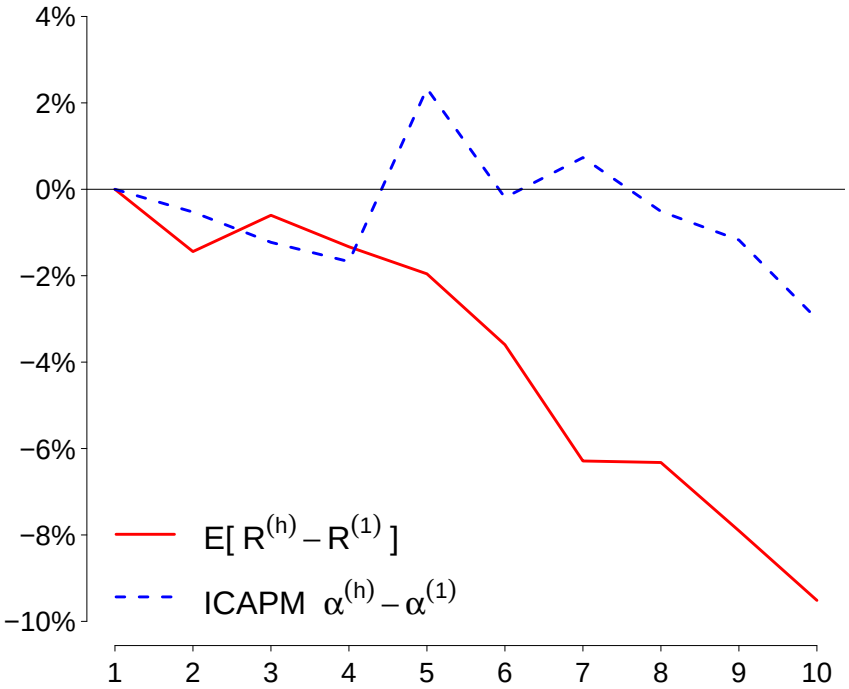

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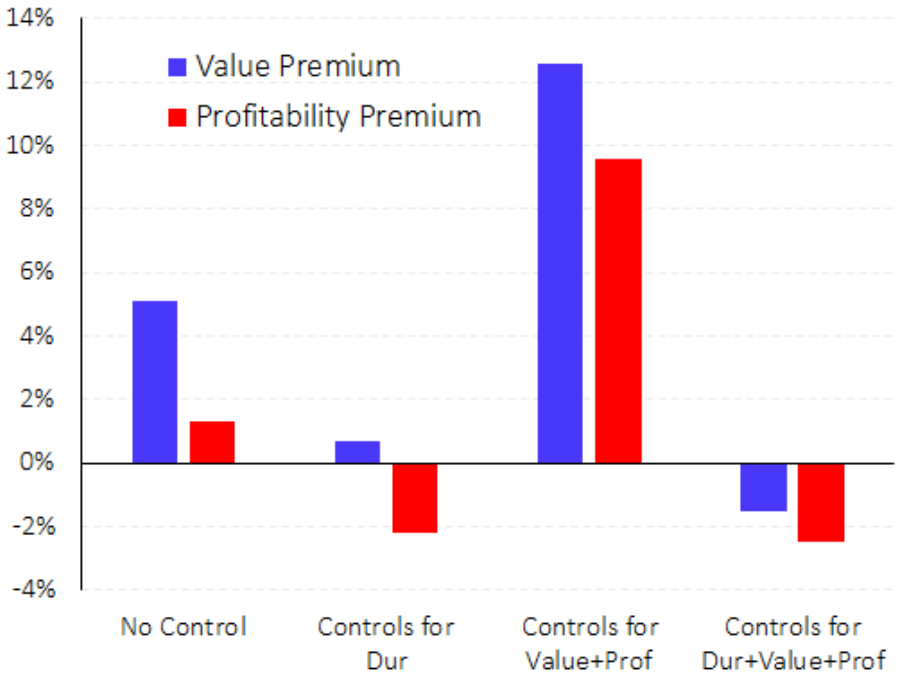

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Outline

Defining and Measuring Equity Duration

- Duration is a weighted average of cash flow maturities:

$$Dur_t = \sum_{h=1}^{\infty} w_{t,h} \cdot h$$

where

$w_{t,h} = (\mathbb{E}_t [CF_{t+h}] \cdot e^{-h \cdot dr_t}) / V_t$

$\sum_{h=1}^{\infty} w_{t,h} = 1$

- $CF = PO$ (payout = dividends + repurchases - issuances)
- $V = ME$, which implies:

$$ME_t = \sum_{h=1}^{\infty} \mathbb{E}_t [PO_{t+h}] \cdot e^{-h \cdot dr_t}$$

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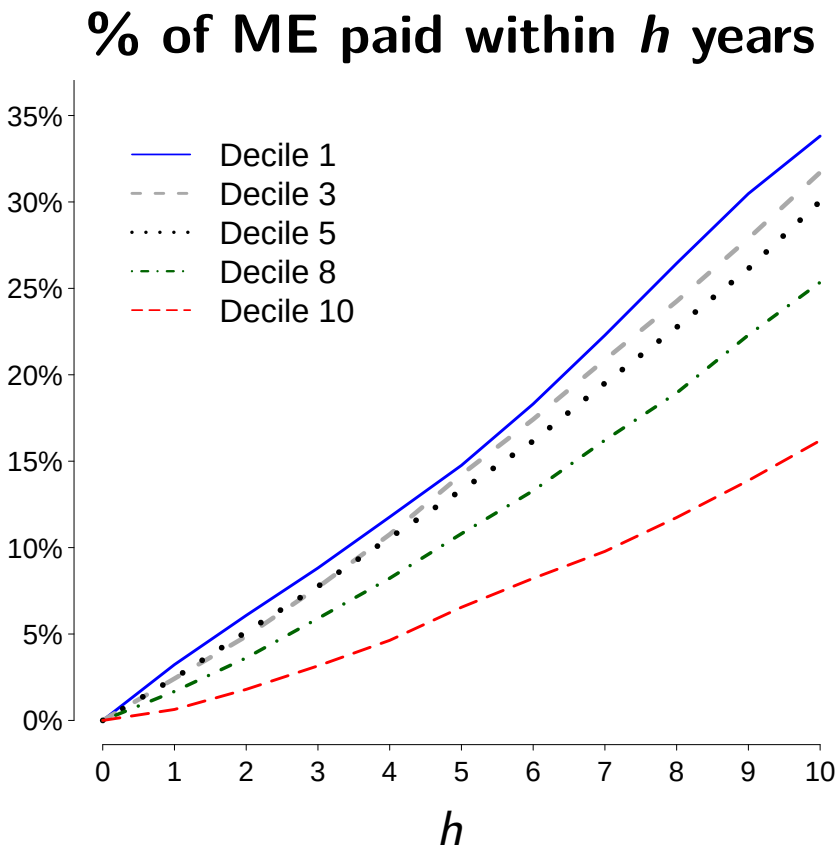
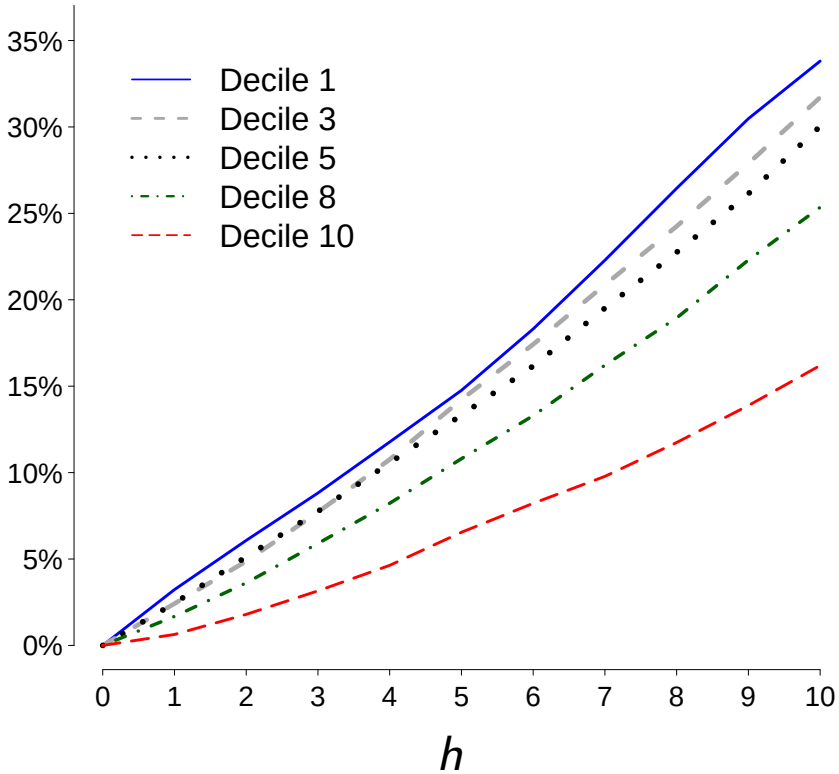
Validating Equity Duration Portfolios



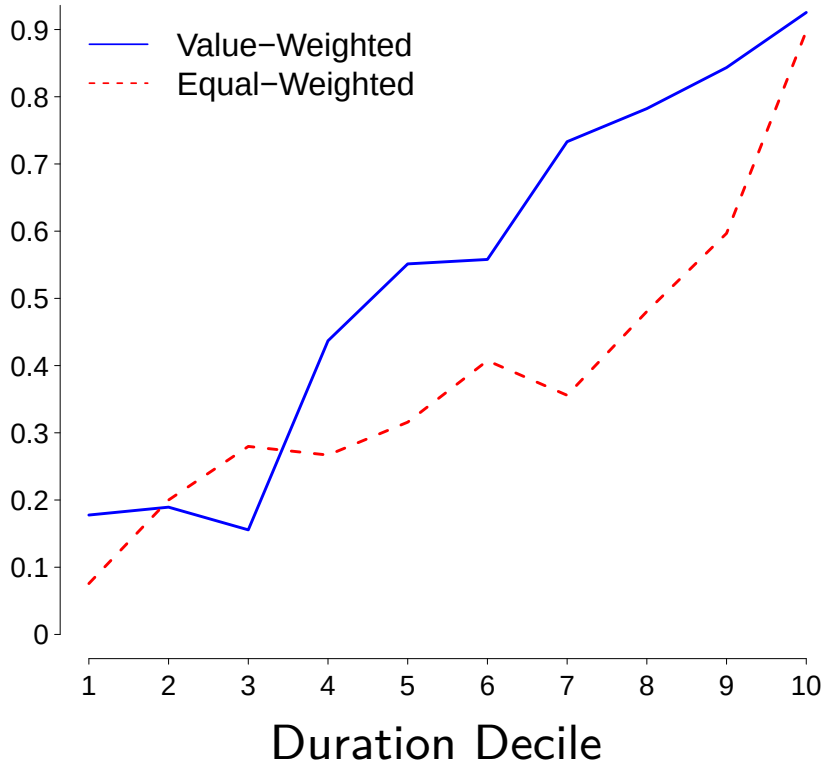
- Shorter duration firms have a larger fraction of firm value associated with short term cash flows
- Longer duration firms comove more with the equity term structure $(R_{Equity} - R_{Div})$

Validating Equity Duration Portfolios

% of ME paid within *h* years



Exposure to Equity Term Structure



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The Short Duration Premium

Decile	$\overline{r}_{t\to t+1}$	
Short	12.9%	
2	11.7%	
3	12.2%	
4	11.3%	
5	10.9%	
6	9.1%	
7	7.0%	
8	7.0%	
9	5.5%	
Long	3.7%	
L-S	-9.2%	
(t_{L-S})	(-3.79)	

▸ Equal-Weighted ▸ Link 20Y Rolling Window

The Short Duration Premium

Decile	$\overline{r}_{t\to t+1}$	$\overline{r}_{t\to t+5}$	$\overline{r}_{t+4\to t+5}$	
Short	12.9%	11.8%	11.6%	
2	11.7%	11.1%	10.7%	
3	12.2%	11.6%	11.4%	
4	11.3%	10.2%	8.1%	
5	10.9%	9.2%	7.4%	
6	9.1%	8.8%	8.8%	
7	7.0%	7.3%	7.7%	
8	7.0%	6.8%	6.8%	
9	5.5%	6.5%	7.3%	
Long	3.7%	4.7%	8.6%	
L-S	-9.2%	-7.1%	-3.0%	
(t_{L-S})	(-3.79)	(-3.97)	(-1.46)	

▸ Equal-Weighted ▸ Link 20Y Rolling Window

The Short Duration Premium

Decile	$\bar{r}_{t\to t+1}$	$\bar{r}_{t\to t+5}$	$\bar{r}_{t+4\to t+5}$	$\bar{r}^{Large}_{t\to t+1}$	
Short	12.9%	11.8%	11.6%	10.4%	
2	11.7%	11.1%	10.7%	9.8%	
3	12.2%	11.6%	11.4%	10.7%	
4	11.3%	10.2%	8.1%	10.6%	
5	10.9%	9.2%	7.4%	6.0%	
6	9.1%	8.8%	8.8%	6.6%	
7	7.0%	7.3%	7.7%	5.7%	
8	7.0%	6.8%	6.8%	5.6%	
9	5.5%	6.5%	7.3%	4.8%	
Long	3.7%	4.7%	8.6%	3.2%	
L-S	-9.2%	-7.1%	-3.0%	-7.2%	
(t_{L-S})	(-3.79)	(-3.97)	(-1.46)	(-2.55)	

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The Short Duration Premium

Decile	$\bar{r}_{t\to t+1}$	$\bar{r}_{t\to t+5}$	$\bar{r}_{t+4\to t+5}$	$\bar{r}^{Large}_{t\to t+1}$	$\bar{r}/\sigma$	α_{CAPM}	α_{5F}	α_q
Short	12.9%	11.8%	11.6%	10.4%	0.67	5.5%	0.8%	2.9%
2	11.7%	11.1%	10.7%	9.8%	0.65	4.7%	1.6%	3.2%
3	12.2%	11.6%	11.4%	10.7%	0.72	5.5%	2.2%	3.1%
4	11.3%	10.2%	8.1%	10.6%	0.69	4.6%	2.4%	2.9%
5	10.9%	9.2%	7.4%	6.0%	0.65	4.3%	2.4%	2.7%
6	9.1%	8.8%	8.8%	6.6%	0.57	2.7%	0.7%	1.0%
7	7.0%	7.3%	7.7%	5.7%	0.43	0.2%	0.2%	0.4%
8	7.0%	6.8%	6.8%	5.6%	0.41	-0.3%	-0.3%	0.2%
9	5.5%	6.5%	7.3%	4.8%	0.30	-2.6%	-2.6%	-1.2%
Long	3.7%	4.7%	8.6%	3.2%	0.18	-5.0%	-4.3%	-3.8%
L-S	-9.2%	-7.1%	-3.0%	-7.2%	-0.61	-10.5%	-5.1%	-6.8%
(t_{L-S})	(-3.79)	(-3.97)	(-1.46)	(-2.55)	[0.00]	(-3.94)	(-2.91)	(-3.08)

▸ Equal-Weighted ▸ Link 20Y Rolling Window

Duration, Value, Profitability, Investment, and Size

Var	[1]		
Dur	-9.1%		
	(-4.09)		
$\frac{BE}{ME}$	5.1%		
	(2.12)		
Gprof	1.3%		
	(0.58)		
Ag	-3.9%		
	(-2.11)		
Size	-4.3%		
	(-1.82)		

▸ Equal-Weighted ▸ 50 Port ▸ Fama-MacBeth Reg

Duration, Value, Profitability, Investment, and Size

Var	[1]	[2]	[3]	[4]	[5]	
Dur	-9.1%	-10.2%	-12.7%	-10.6%	-10.2%	
	(-4.09)	(-4.27)	(-4.48)	(-4.13)	(-4.44)	
$\frac{BE}{ME}$	5.1%	0.7%				
	(2.12)	(0.23)				
Gprof	1.3%		-2.2%			
	(0.58)		(-0.85)			
Ag	-3.9%			-3.0%		
	(-2.11)			(-1.29)		
Size	-4.3%				-2.7%	
	(-1.82)				(-1.06)	

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Var	[1]	[2]	[3]	[4]	[5]	[6]
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	(-4.09)	(-4.27)	(-4.48)	(-4.13)	(-4.44)	
$\frac{BE}{ME}$	5.1%	0.7%				12.6%
	(2.12)	(0.23)				(3.29)
Gprof	1.3%		-2.2%			9.6%
	(0.58)		(-0.85)			(2.70)
Ag	-3.9%			-3.0%		
	(-2.11)			(-1.29)		
Size	-4.3%				-2.7%	
	(-1.82)				(-1.06)	

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Duration, Value, Profitability, Investment, and Size

Var	[1]	[2]	[3]	[4]	[5]	[6]	[7]
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	(-4.09)	(-4.27)	(-4.48)	(-4.13)	(-4.44)		(-3.03)
$\frac{BE}{ME}$	5.1%	0.7%				12.6%	-1.5%
	(2.12)	(0.23)				(3.29)	(-0.28)
Gprof	1.3%		-2.2%			9.6%	-2.5%
	(0.58)		(-0.85)			(2.70)	(-0.52)
Ag	-3.9%			-3.0%			
	(-2.11)			(-1.29)			
Size	-4.3%				-2.7%		
	(-1.82)				(-1.06)		

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Var	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Dur	-9.1%	-10.2%	-12.7%	-10.6%	-10.2%		-13.9%	-15.8%
	(-4.09)	(-4.27)	(-4.48)	(-4.13)	(-4.44)		(-3.03)	(-2.62)
$\frac{BE}{ME}$	5.1%	0.7%				12.6%	-1.5%	-4.1%
	(2.12)	(0.23)				(3.29)	(-0.28)	(-0.59)
Gprof	1.3%		-2.2%			9.6%	-2.5%	-2.9%
	(0.58)		(-0.85)			(2.70)	(-0.52)	(-0.50)
Ag	-3.9%			-3.0%				-3.8%
	(-2.11)			(-1.29)				(-1.03)
Size	-4.3%				-2.7%			-3.0%
	(-1.82)				(-1.06)			(-1.05)

▸ Equal-Weighted ▸ 50 Port ▸ Fama-MacBeth Reg

Outline

The ICAPM SDF: Reinvestment Risk is Priced

- Investors maximize $\mathbb{E}_t[\frac{1}{1-\gamma} \cdot W_{t+H}^{1-\gamma}]$
- With no labor income or consumption in the next H years:
- Expected wealth shocks = current wealth shocks (market risk) + news about long-term expected returns (reinvestment risk)
- The ICAPM SDF:

where $\lambda_{\mathbb{E}r} = (\gamma - 1) \cdot (1 - \phi_r^{H-1})/(1 - \phi_r)$

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- With no labor income or consumption in the next H years:

$$W_{t+H} = W_t \cdot R_{w,t\to t+H}$$

$$\Downarrow$$

$$\mathbb{E}_t[w_{t+H}] = w_t + \mathbb{E}_t[r_{w,t\to t+H}]$$

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$$\begin{array}{rcl} W_{t+H} & = & W_t \cdot R_{w,t\to t+H} \\ & \Downarrow & \\ \mathbb{E}_t[w_{t+H}] & = & w_t + \mathbb{E}_t[r_{w,t\to t+H}] \end{array}$$

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- Investors maximize $\mathbb{E}_t[\frac{1}{1-\gamma} \cdot W_{t+H}^{1-\gamma}]$
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$$\begin{array}{rcl} W_{t+H} & = & W_t \cdot R_{w,t\to t+H} \\ & \Downarrow & \\ \mathbb{E}_t[w_{t+H}] & = & w_t + \mathbb{E}_t[r_{w,t\to t+H}] \end{array}$$

- Expected wealth shocks = current wealth shocks (market risk) + news about long-term expected returns (reinvestment risk)
- The ICAPM SDF:

$$\begin{aligned} -\tilde{m}_t &= \gamma \cdot \tilde{r}_{w,t} + (\gamma-1) \cdot \tilde{\mathbb{E}}_t \left[\Sigma_{h=1}^{H-1} r_{w,t+h}\right] \\ &= \gamma \cdot \tilde{r}_{w,t} + \lambda_{\mathbb{E}r} \cdot \tilde{\mathbb{E}}_t r_w \end{aligned}$$

where $\lambda_{\mathbb{E}r} = (\gamma-1) \cdot (1-\phi_r^{H-1})/(1-\phi_r)$

The ICAPM SDF: Reinvestment Risk is Priced

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ICAPM αs and βs

Decile	$\bar{r}$		
Short	13.5%		
2	12.1%		
3	12.9%		
4	12.2%		
5	11.6%		
6	9.9%		
7	7.2%		
8	7.2%		
9	5.6%		
Long	4.0%		
L-S	-9.5%		
(t_{L-S})	(-3.28)		

▸ Equal-Weighted ▸ ICAPM Estimation ▸ S

ICAPM αs and βs

Decile	$\bar{r}$	α_{ICAPM}	
Short	13.5%	0.0%	
2	12.1%	-0.5%	
3	12.9%	-1.2%	
4	12.2%	-1.7%	
5	11.6%	2.3%	
6	9.9%	-0.2%	
7	7.2%	0.7%	
8	7.2%	-0.5%	
9	5.6%	-1.2%	
Long	4.0%	-3.0%	
L-S	-9.5%	-3.0%	
(t_{L-S})	(-3.28)	(-1.00)	

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ICAPM αs and βs

Decile	$\bar{r}$	α_{ICAPM}	β_r	
Short	13.5%	0.0%	0.67	
2	12.1%	-0.5%	0.66	
3	12.9%	-1.2%	0.72	
4	12.2%	-1.7%	0.90	
5	11.6%	2.3%	0.85	
6	9.9%	-0.2%	0.90	
7	7.2%	0.7%	0.74	
8	7.2%	-0.5%	0.83	
9	5.6%	-1.2%	0.92	
Long	4.0%	-3.0%	1.19	
L-S	-9.5%	-3.0%	0.52	
(t_{L-S})	(-3.28)	(-1.00)	(4.92)	

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ICAPM αs and βs

Decile	$\bar{r}$	α_{ICAPM}	β_r	$\beta_{\mathbb{E}r}$	
Short	13.5%	0.0%	0.67	-0.42	
2	12.1%	-0.5%	0.66	-0.49	
3	12.9%	-1.2%	0.72	-0.47	
4	12.2%	-1.7%	0.90	-0.92	
5	11.6%	2.3%	0.85	-1.27	
6	9.9%	-0.2%	0.90	-1.29	
7	7.2%	0.7%	0.74	-1.27	
8	7.2%	-0.5%	0.83	-1.36	
9	5.6%	-1.2%	0.92	-1.68	
Long	4.0%	-3.0%	1.19	-2.27	
L-S	-9.5%	-3.0%	0.52	-1.85	
(t_{L-S})	(-3.28)	(-1.00)	(4.92)	(-8.02)	

▸ Equal-Weighted ▸ ICAPM Estimation ▸ S

ICAPM αs and βs

Decile	$\bar{r}$	α_{ICAPM}	β_{r}	$\beta_{\mathbb{E}r}$	β_{dp}	β_{poy}
Short	13.5%	0.0%	0.67	-0.42	-0.24	-0.18
2	12.1%	-0.5%	0.66	-0.49	-0.25	-0.19
3	12.9%	-1.2%	0.72	-0.47	-0.26	-0.21
4	12.2%	-1.7%	0.90	-0.92	-0.29	-0.30
5	11.6%	2.3%	0.85	-1.27	-0.34	-0.46
6	9.9%	-0.2%	0.90	-1.29	-0.37	-0.39
7	7.2%	0.7%	0.74	-1.27	-0.38	-0.33
8	7.2%	-0.5%	0.83	-1.36	-0.43	-0.37
9	5.6%	-1.2%	0.92	-1.68	-0.44	-0.39
Long	4.0%	-3.0%	1.19	-2.27	-0.56	-0.51
L-S	-9.5%	-3.0%	0.52	-1.85	-0.31	-0.33
(t_{L-S})	(-3.28)	(-1.00)	(4.92)	(-8.02)	(-3.43)	(-2.37)

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Outline

Further Results

1. Time variation in the short duration premium
2. Government and Corporate Bond Portfolios
3. Comparison Between *Dur* and Duration from Dechow, Sloan, and Soliman (2004)
4. Short Duration Premium: Alternative Duration Measures
5. General Robustness

Outline

Conclusion

- Stocks of firms with short duration cash flows pay a premium (long-lived and present among the largest firms)
- Value and profitability premia can be explained by the lower cash flow duration of value and profitable companies.
- The short duration premium is consistent with the ICAPM (reinvestment risk)
- Future research can further explore implications for:

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Time Variation in the Short Duration Premium

- $Dur_t = -(\partial P_t / \partial dr_t)/P_t$, which is directly related to $-\beta_{\mathbb{E}r}$

$\sigma(Dur)$				
Low				
Moderate				
High				
R^2				

Equal-Weighted Time Series

Time Variation in the Short Duration Premium

- $Dur_t = -(\partial P_t / \partial dr_t)/P_t$, which is directly related to $-\beta_{\mathbb{E}r}$

$\sigma(Dur)$	$\bar{r}_e$			
Low	6.9% (-)			
Moderate	7.9% (0.17)			
High	5.9% (-0.14)			
R^2	-4.6%			

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- $Dur_t = -(\partial P_t / \partial dr_t)/P_t$, which is directly related to $-\beta_{\mathbb{E}r}$

$\sigma(Dur)$	$\bar{r}_e$	$\bar{r}_{10-1}$		
Low	6.9% (-)	-4.8% (-)		
Moderate	7.9% (0.17)	-5.6% (-0.15)		
High	5.9% (-0.14)	-20.8% (-2.29)		
R^2	-4.6%	11.1%		

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Time Variation in the Short Duration Premium

- $Dur_t = -(\partial P_t / \partial dr_t)/P_t$, which is directly related to $-\beta_{\mathbb{E}r}$

$\sigma(Dur)$	$\bar{r}_e$	$\bar{r}_{10-1}$	β_r	
Low	6.9% (-)	-4.8% (-)	0.49 (-)	
Moderate	7.9% (0.17)	-5.6% (-0.15)	0.52 (0.11)	
High	5.9% (-0.14)	-20.8% (-2.29)	0.53 (0.18)	
R^2	-4.6%	11.1%		

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$\sigma(Dur)$	$\bar{r}_e$	$\bar{r}_{10-1}$	β_r	$\beta_{\mathbb{E}r}$	
Low	6.9%	-4.8%	0.49	-1.01	
	(-)	(-)	(-)	(-)	
Moderate	7.9%	-5.6%	0.52	-1.35	
	(0.17)	(-0.15)	(0.11)	(-0.25)	
High	5.9%	-20.8%	0.53	-2.55	
	(-0.14)	(-2.29)	(0.18)	(-1.19)	
R^2	-4.6%	11.1%			

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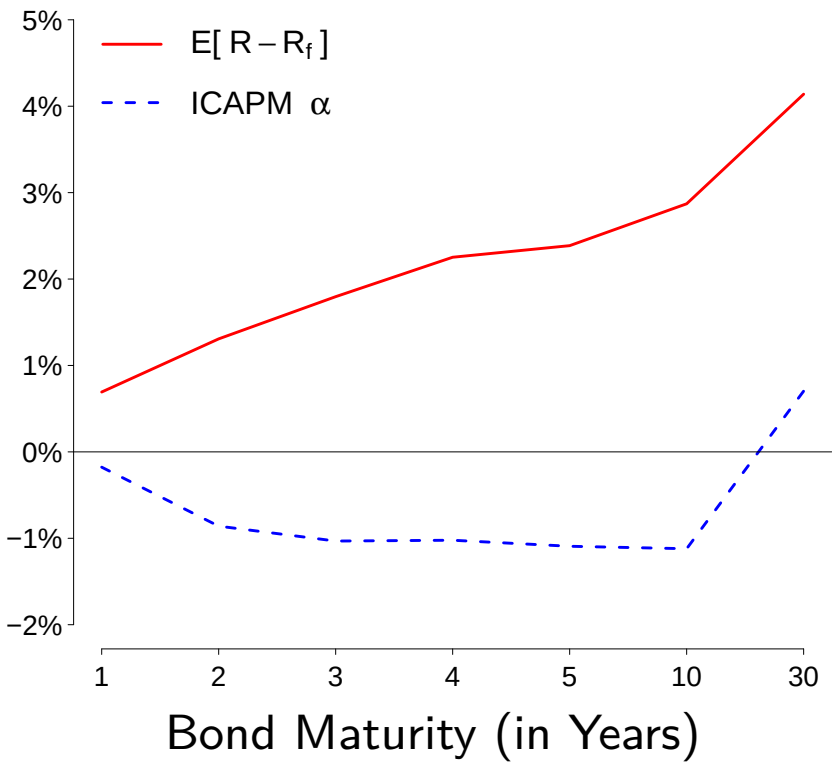
- $Dur_t = -(\partial P_t / \partial dr_t)/P_t$, which is directly related to $-\beta_{\mathbb{E}r}$

$\sigma(Dur)$	$\bar{r}_e$	$\bar{r}_{10-1}$	β_r	$\beta_{\mathbb{E}r}$	β_{dp}	β_{poy}
Low	6.9%	-4.8%	0.49	-1.01	-0.18	0.58
	(-)	(-)	(-)	(-)	(-)	(-)
Moderate	7.9%	-5.6%	0.52	-1.35	-0.47	-0.41
	(0.17)	(-0.15)	(0.11)	(-0.25)	(-1.15)	(-1.84)
High	5.9%	-20.8%	0.53	-2.55	-0.51	-0.89
	(-0.14)	(-2.29)	(0.18)	(-1.19)	(-1.34)	(-2.72)
R^2	-4.6%	11.1%				

▸ Equal-Weighted ▸ Time Series

Bond Portfolios

Government Bond Portfolios



Bond Portfolios

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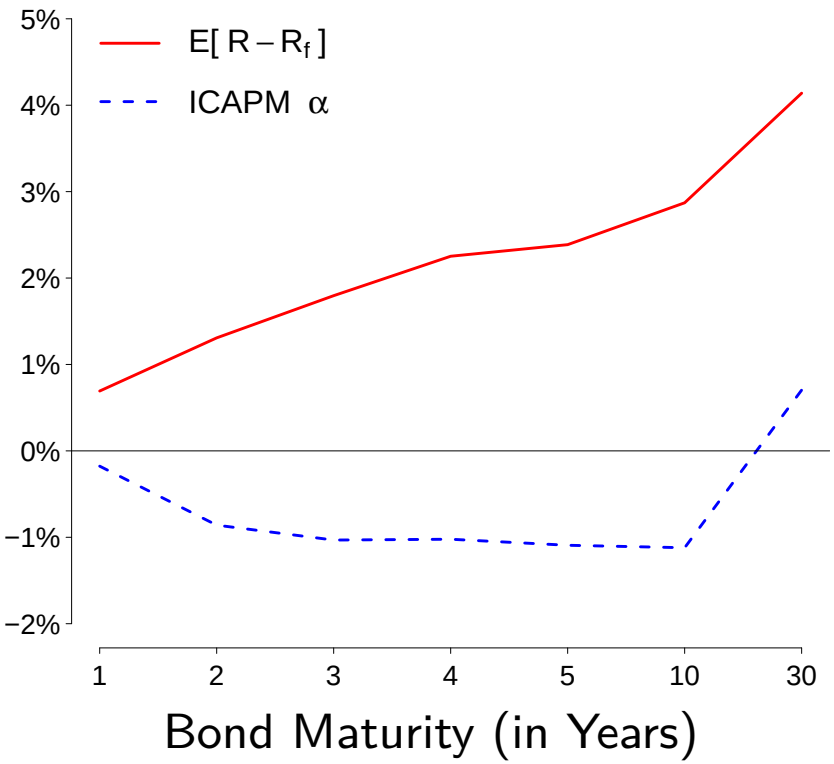

Long-Mid Corporate Bond Portfolios