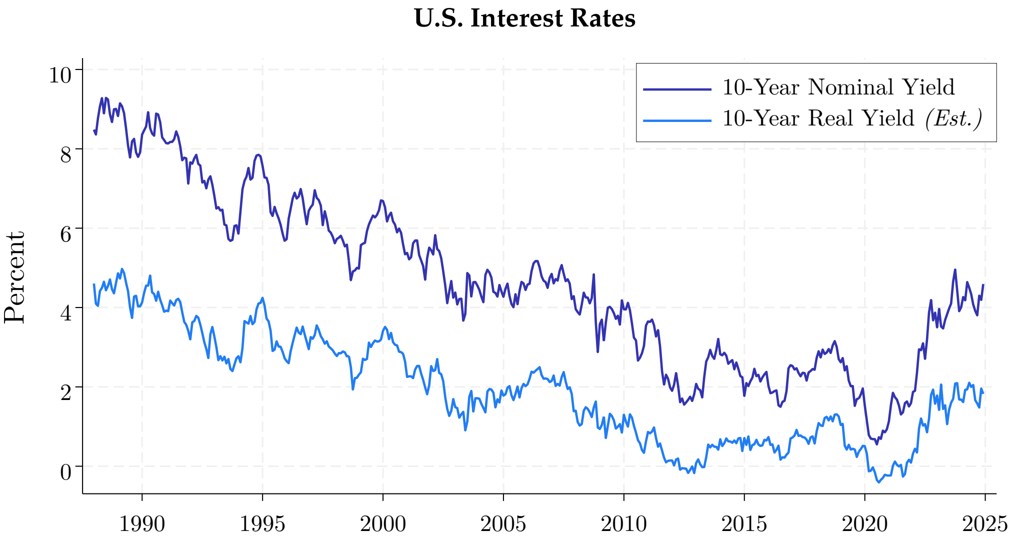
Equity Duration and Interest Rates

Niels J. Gormsen
Chicago Booth & NBER

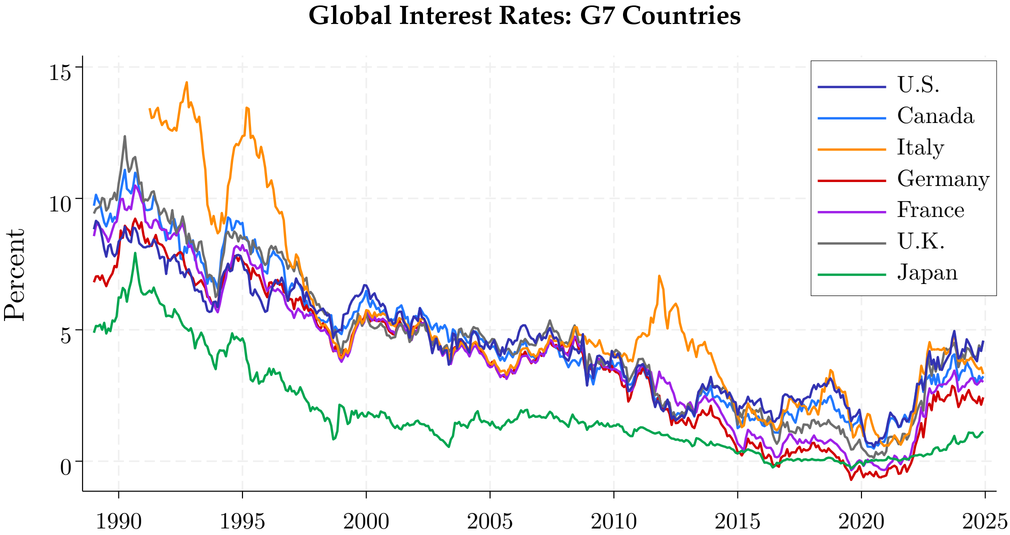
Eben Lazarus
UC Berkeley Haas

March 2025

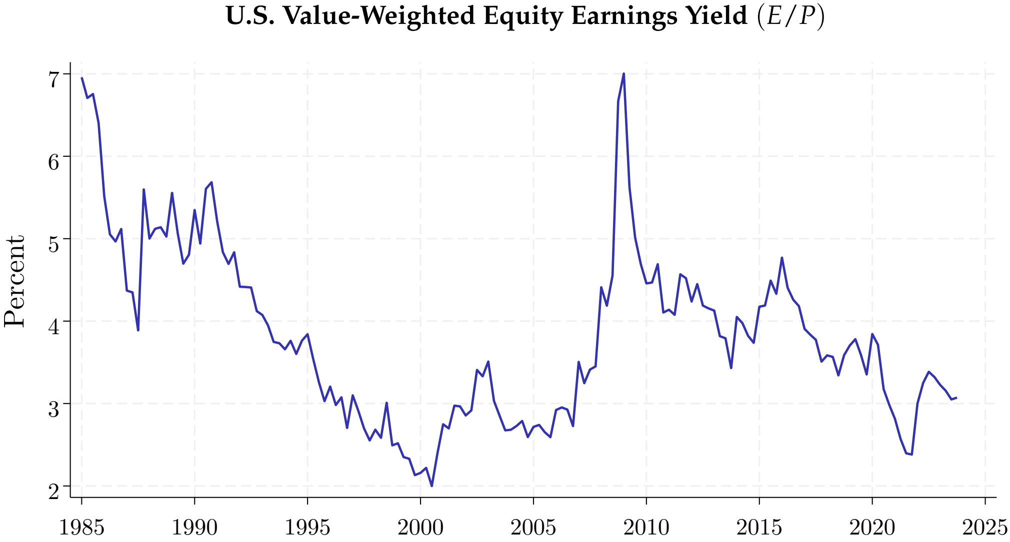
Well-Known Trends: Declining Interest Rates. . .



Well-Known Trends: Declining Interest Rates. . .



. . . and Increasing Domestic Stock Valuations



What Should We Make of These Trends?

Tempting line of reasoning:

- Equity is a long-duration claim
- Interest rates $\searrow$ $\Longrightarrow$ discount rates $\searrow$ $\Longrightarrow$ equity prices $\nearrow$

Holding all else equal, this logic works. . .but all else is not equal:

- Empirically, stock–bond correlation is often **negative**, not positive
- Rates are endogenous and can change for multiple structural reasons
- Each channel should affect equity differently

Our goal: Decompose Δr to estimate pass-through & importance of each component to equity

What Should We Make of These Trends?

Tempting line of reasoning:

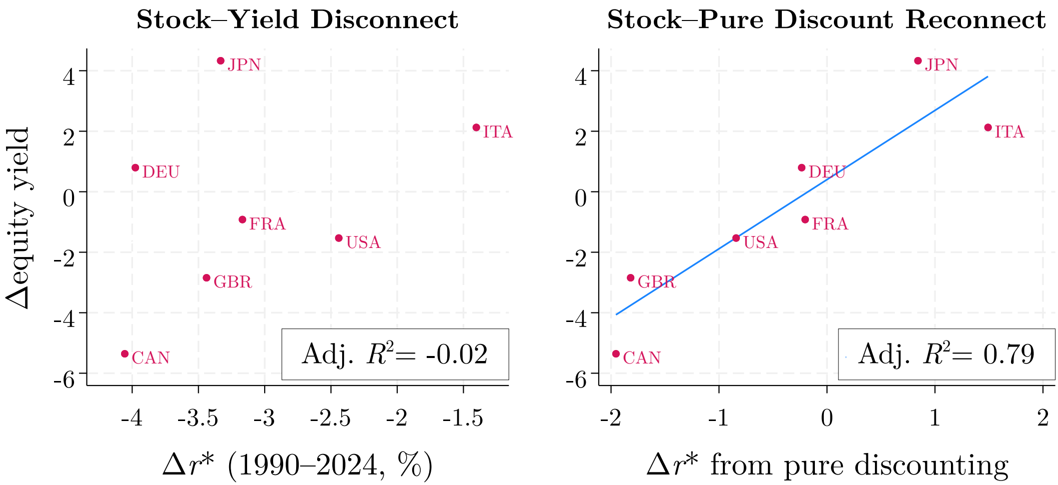
- Interest rates $\searrow$ $\Longrightarrow$ discount rates $\searrow$ $\Longrightarrow$ equity prices $\nearrow$

Holding all else equal, this logic works. . .but all else is not equal.

How do changes in rates transmit to equity valuations? Answer in two steps:

1. *Simple theoretical decomposition for any change in rates*
   - A fall in r^* reflects: **(i) pure discount rate** $\searrow$, (ii) expected growth $\searrow$, or (iii) uncertainty $\nearrow$
   - Bonds and stocks move 1-for-1 **only under (i)**. Stocks unchanged w/ (ii), and *neg.* cov. w/ (iii).
2. *Empirical implementation: Panel of countries & long-term forecasts from Consensus Econ.*
   - Decompose changes in r into 3 theoretical components & estimate pass-through to equities

Preview of Main Results: Long-Term Decomposition



Preview of Main Results

- **Strikingly good fit** for equity changes when isolating the pure discounting part of yield changes
  - Macro–AP works well at long horizons!

- In U.S., passthrough of Δr^* to equities has been only about 35% *(less elsewhere)*

- Also show decomposition works for explaining:
  1. Higher-frequency stock–bond comovement *(and return forecasting)*
  2. Duration-sorted portfolio returns
     (higher-dur. stocks more exposed to pure discount shocks $\rightarrow$ significant X-S duration dispersion)

- $\frac{\partial \text{equity}}{\partial(\text{pure discount part of } r)}$ $\rightarrow$ direct estimate of equity duration. Preliminary: $\widehat{Dur}_{\text{US}} \gtrsim 19$ years.

Implications for a Range of Literature

Understanding bond $\to$ stock relation matters for:

1. **Equity premium measurement:** How has equity performed relative to a long-term risk-free claim? [van Binsbergen 2024; Andrews–Gonçalves 2020]
   - We find a significant equity premium vs. duration-matched pure discounting claim
2. **Household wealth & inequality:** Numerous papers argue much of the rise in inequality reflects paper gains from declining r^* [Catherine, Miller, Sarin 2023; Greenwald, Leombroni, Lustig, Van Nieuwerburgh 2023]
   - To assess this, need to know how much of Δr^* was from pure discounting change *(we find 35%)*
3. **Assessing policy responses:** After MP shock, are stock returns larger or smaller than we'd expect purely given long-term yield change? [Bernanke–Kuttner 2005; Nakamura–Steinsson 2018; Nagel–Xu 2024]
   - Many assume perfect passthrough, so that $\frac{\partial \text{price}}{\partial r} =$ equity duration [Kroen, Liu, Mian, Sufi 2024]
   - But if expected growth changes as a result of MP shock, this no longer works
   - We unpack these separate responses across announcements

Roadmap

General Decomposition for Interest-Rate Changes

- **Goal:** Decomposition of changes in trend real rate r^* [Bauer & Rudebusch 2020]
  - Won't consider term premium or infl. risk directly [Campbell, Pflueger, Viceira 2020; Chernov, Lochstoer, Song 2023]
- **Stochastic discount factor** $M_{t+1} \Longrightarrow$ gross risk-free rate $R^f_{t+1} = 1/\mathbb{E}_t[M_{t+1}]$. Logs:

$$r^f_{t+1} = -\mathbb{E}_t[m_{t+1}] - \underbrace{L_t(M_{t+1})}_{\text{conditional entropy of SDF}}$$

[similar start point: Backus, Foresi, Telmer 2001; Jiang, Krishnamurthy, Lustig 2024; Hassan, Mertens, Wang 2024]

- **Additive decomposition** for log SDF [Hansen 2012]

$$m_{t+1} = \underbrace{-\rho_t}_{\substack{\text{predetermined}\\ \text{trend}}} - \underbrace{f(X_{t+1}) - f(X_t)}_{\substack{\text{stationary diff.}\\ \text{for Markov } X}} + \underbrace{\varepsilon_{t+1}}_{\substack{\text{mean 0}\\ \text{martingale diff.}}}$$

  - ρ_t: shifts IMRS m_{t+1} in all states $\Longleftrightarrow$ **time discount rate**
  - X_t: interpret as determining **cash flow process**, so $f(X_{t+1}) - f(X_t)$ is MU from CF growth
  - ε_{t+1}: from martingale component of SDF

General Decomposition for Interest-Rate Changes

- **Goal:** Decomposition of changes in trend real rate r^*
- **Stochastic discount factor** $M_{t+1} \Longrightarrow$ gross risk-free rate $R^f_{t+1} = 1/\mathbb{E}_t[M_{t+1}]$. Logs:

$$r^f_{t+1} = -\mathbb{E}_t[m_{t+1}] - \underbrace{L_t(M_{t+1})}_{\text{conditional entropy of SDF}}$$

- **Additive decomposition** for log SDF [Hansen 2012]

$$m_{t+1} = \underbrace{-\rho_t}_{\substack{\text{predetermined}\\ \text{trend}}} - \underbrace{f(X_{t+1}) - f(X_t)}_{\substack{\text{stationary diff.}\\ \text{for Markov } X}} + \underbrace{\varepsilon_{t+1}}_{\substack{\text{mean 0}\\ \text{martingale diff.}}}$$

- **Implication for r^f_{t+1} and r^*:**

$$r^f_{t+1} = \underbrace{\rho_t}_{\text{time preference}} + \underbrace{\mathbb{E}_t[f(X_{t+1}) - f(X_t)]}_{\text{expected growth}} - \underbrace{L_t(M_{t+1})}_{\text{uncertainty/prec. savings}}$$

More Interpretable Version

- **Goal:** Decomposition of changes in trend real rate r^*
- **Now:** Power utility w/ RRA $\gamma = \frac{1}{\psi}$, time discount factor $\beta_t = e^{-\rho_t}$, log cons. growth $g_{t+1} = c_{t+1} - c_t$
- **Decomposition:**

$$
\begin{aligned}
r^f_{t+1} &= \rho_t + \mathbb{E}_t[f(X_{t+1}) - f(X_t)] - L_t(M_{t+1}) \\
&= \underbrace{\rho_t}_{\text{time preference}} + \underbrace{\gamma \mathbb{E}_t[g_{t+1}]}_{\text{expected growth}} - \underbrace{L_t(M_{t+1})}_{\text{uncertainty/prec. savings}} \\
&\qquad\qquad\qquad\qquad = \sum_{n=2}^{\infty} \frac{(-\gamma)^n \kappa_n(g_{t+1})}{n!}
\end{aligned}
$$

More Interpretable Version

- **Goal:** Decomposition of changes in trend real rate r^*
- **Now:** Power utility w/ RRA $\gamma = \frac{1}{\psi}$, time discount factor $\beta_t = e^{-\rho_t}$, log cons. growth $g_{t+1} = c_{t+1} - c_t$
- **Decomposition:**

$$
\begin{aligned}
r^f_{t+1} &= \rho_t + \mathbb{E}_t[f(X_{t+1}) - f(X_t)] - L_t(M_{t+1}) \\
&= \underbrace{\rho_t}_{\text{time preference}} + \underbrace{\gamma \mathbb{E}_t[g_{t+1}]}_{\text{expected growth}} - \underbrace{L_t(M_{t+1})}_{\text{uncertainty/prec. savings}} \\
r^* &= \rho^* + \gamma g^* - L^*(M)
\end{aligned}
$$

- **Interpretation:** r^* can move due to changes in
  (i) time preference (pure discounting)
  (ii) expected growth
  (iii) risk/uncertainty

Implications for Equity Prices

- **Decomposition for real rate:** $r^* = \rho^* + \gamma g^* - L^*(M)$
- Each of the three structural changes will have **different effects on equity valuations**
- **Equity:** Levered claim to consumption, $d_t = \lambda c_t$
- **Steady state for equity dividend yield** $ey^* \equiv \log(1 + (D/P)^*)$**:**

$$ey^* = r^* + rp^* - \lambda g^*$$

  - $rp^* = \sum_{n=2}^{\infty} \frac{\kappa_n(g_{t+1})}{n!} \left(\lambda^n + (-\gamma)^n - (\lambda - \gamma)^n\right) \overset{\text{lognormal}}{=} \lambda\gamma\sigma^2 = \frac{2\lambda}{\gamma} L^*(M)$ [Martin 2013]
  - For all t, holds to first order if ey_t is (i) a random walk or (ii) stationary [using Campbell-Shiller sums]
- While one could compute $\frac{\partial ey^*}{\partial r^*}$, this object has no structural interpretation
- Instead, compute for each of the three underlying sources of changes in r^*

Implications for Equity Prices

- **Real rate:** $$r^* = \rho^* + \gamma g^* - L^*(M)$$
- **Equity yield:** $$\begin{aligned} ey^* &= r^* + rp^* - \lambda g^* \\ &= \rho^* + (\gamma - \lambda) g^* + \frac{2\lambda - \gamma}{\gamma} L^*(M) \end{aligned}$$
- **Implications for 1% change in r^* due to:**
  1. **Pure discounting**: Bonds & equity **co-move perfectly**, with r^* and ey^* each changing by 1%
  2. **Growth rate**: ey^* changes by $\frac{\gamma-\lambda}{\gamma}$ for 1% change in r^*
     $\Longrightarrow$ equity **unchanged** for $\gamma \approx \lambda$ (e.g., log. util. & cons. claim): offsetting effects on r and g
  3. **Risk**: Bonds & stocks likely **co-move negatively**, with ey^* decreasing by $\frac{2\lambda-\gamma}{\gamma}$ for 1% increase in r^*

  $\Longrightarrow$ **only pure discounting channel generates perfect pass-through**
- Results are analytically more complex outside s.s. or for non-lognormality, but takeaways identical

Implications for Equity Duration

- **Real rate:** $$r^* = \rho^* + \gamma g^* - L^*(M)$$
- **Equity yield:** $$ey^* = r^* + rp^* - \lambda g^*$$ $$= \rho^* + (\gamma - \lambda) g^* + \frac{2\lambda - \gamma}{\gamma} L^*(M)$$
- **Equity price:** $$\left(\frac{P}{D}\right)^* = [\exp(\underbrace{r^* + rp^*}_{\mu^*} - \lambda g^*) - 1]^{-1}$$
- **Equity duration is equivalently:**
  1. Value-weighted time to mat. of cash flows: $Dur = \sum_{n=1}^{\infty} n \frac{e^{-n(\mu^*)} \mathbb{E}_t[D_{t+n}]}{P} = \frac{1}{1 - e^{-(\mu^* - \lambda g^*)}} \approx \frac{1}{\mu^* - \lambda g^*}$
  2. Price sensitivity to **equity discount rate** μ^*: $Dur = -\frac{\partial \log P}{\partial \mu^*} = \frac{1}{1 - e^{-(\mu^* - \lambda g^*)}} \approx \frac{1}{\mu^* - \lambda g^*}$
  3. Price sensitivity to **pure discount rate** ρ^*: $\frac{\partial \mu^*}{\partial \rho^*} = 1$, so $-\frac{\partial \log P}{\partial \rho^*} = -\frac{\partial \log P}{\partial \mu^*} = Dur$
- Equity duration is **not** price sensitivity to arbitrary change in r^*! E.g., sensitivity to $g^* \approx 0$

Roadmap

Measurement Strategy

For each date & country, want to decompose trend real rate into components:

$$r^* = \underbrace{\rho^*}_{\text{time pref.}} + \gamma \underbrace{g^*}_{\text{exp. growth}} - \underbrace{L^*(M)}_{\text{uncert.}}$$

- **Survey data:** Consensus Economics long-term forecasts [1990–2024, semiannual and then quarterly]
  - 20–30 prof. forecasters per country for adv. econ., annual forecasts out 5 years *(+ long-term)*
  - r^*: 5-year-ahead forecast of 10-year bond yield − forecast of inflation
    [so our r^* is trend long-term rate]
  - g^*: 5-year-ahead forecast of real output growth
- **Options data:** Global panel of index options from OptionMetrics
  - $L^*(M)$: proxy using VIX^2
  - For $\gamma = \lambda = 1$ & log symmetric distribution, entropy satisfies $L^*(M) = L^*(R_{\text{mkt}}) \overbrace{\propto}^{\text{[Martin 2017]}} VIX^2$
  - Calculate 6-month VIX^2 using option prices *(project onto realized vol. to get $\widehat{VIX}^2$ for early int'l samples)*
- ρ^***: Will back out as residual after estimating other terms**

Equity Prices and Cash Flows

Then test whether estimated components of r^* map to equity prices & returns following the theory.

- **Prices:** Value-weighted indices for G7 economies from CRSP/Compustat *(via XpressFeed Global DB)*
  - Same for traded short rates *(when needed for excess returns, and also use ZC yields from central banks)*

- **Equity yields:** Use 5-year earnings yield $ey = \overline{E}_{t-4,t}/P_t$
  - Avoids issue of declining dividend payout ratios
  - But results ±unchanged when using dividend yield D/P $(\mathrm{Corr}(\Delta dp, \Delta ey) > 80\%)$

- **Duration-sorted portfolios:** 5 portfolios of stocks sorted by $\widehat{LTG}$ [via Gormsen & Lazarus 2023]
  - $\widehat{LTG}$: Project IBES long-term growth forecasts on 5 firm characteristics *(for firms w/ analyst coverage)*

Long-Term Trends

1. Estimation in levels for:

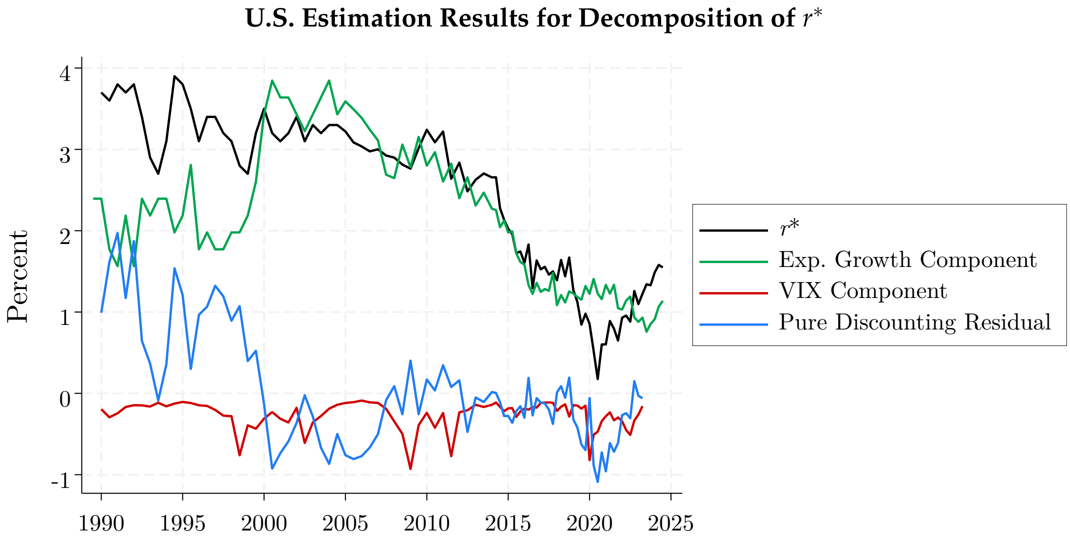
$$r^* = \underbrace{\rho^*}_{\text{time pref.}} + \underbrace{\gamma\, g^*}_{\text{exp. growth}} - \underbrace{L^*(M)}_{\text{uncert.}}$$

- Regression over quarters t & countries j [$N = 932$]:

$$\begin{aligned} r^*_{t,j} &= \text{Constant} + \gamma\, g^*_{t,j} - \beta\, \text{VIX}^2_{t,j} + \text{FE}_j + \varepsilon_{t,j} \\ &= \underset{[\text{s.e. } 0.4]}{-1.9} + \underset{[0.2]}{2.1}\, g^*_{t,j} - \underset{[1.8]}{3.8}\, \text{VIX}^2_{t,j} + \widehat{\text{FE}}_j + \widehat{\varepsilon}_{t,j} \quad [R^2 = 0.65] \end{aligned}$$

- Then back out: $\widehat{\rho}^*_{t,j} = \widehat{\text{Const.}} + \widehat{\text{FE}}_j + \widehat{\varepsilon}_{t,j}$

Level Decomposition Estimates



Long-Term Trends

1. **Real rate estimation:**

$$r^* = \underbrace{\rho^*}_{\text{time pref.}} + \underbrace{\gamma\, g^*}_{\text{exp. growth}} - \underbrace{L^*(M)}_{\text{uncert.}}$$

$$r^*_{t,j} = \underset{[\text{s.e. } 0.4]}{-1.9} + \underset{[0.2]}{2.1}\, g^*_{t,j} - \underset{[1.8]}{3.8}\, \text{VIX}^2_{t,j} + \widehat{\text{FE}}_j + \widehat{\varepsilon}_{t,j} \quad [R^2 = 0.65]$$

- Then back out: $\widehat{\rho}^*_{t,j} = \widehat{\text{Const.}} + \widehat{\text{FE}}_j + \widehat{\varepsilon}_{t,j}$

2. **Decompose long difference:** $\Delta r^*_{t,j} \equiv r^*_{2024,j} - r^*_{1990,j} = \Delta\widehat{\rho}^*_{t,j} + 2.1\, \Delta g^*_{t,j} - 3.8\, \Delta\text{VIX}^2_{t,j}$

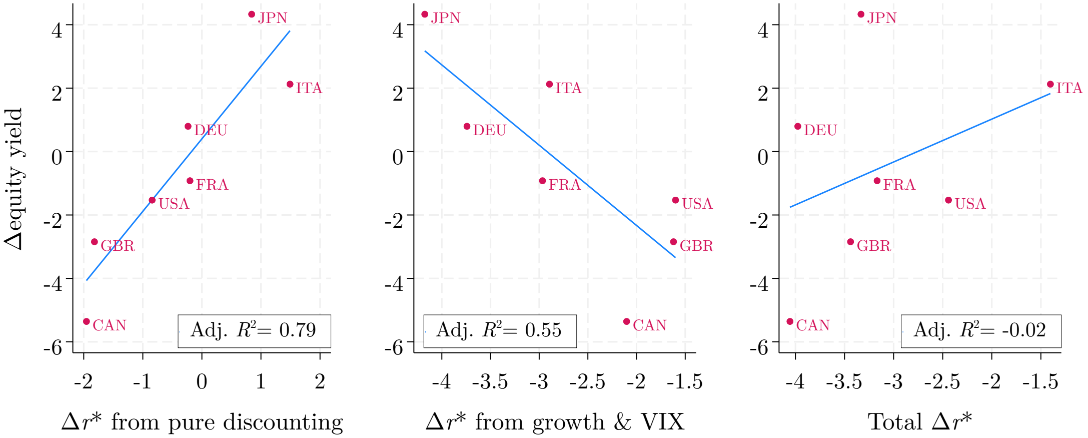
3. **Equity yield (theory):** $\Delta ey^* \equiv ey_{2024,j} - ey_{1990,j} = \Delta\rho^*_{t,j} + (\gamma - \lambda)\Delta g^*_{t,j} + \frac{2\lambda - \gamma}{\gamma}\Delta L^*_{t,j}(M)$

$\Longrightarrow$ Test whether equity valuations move...

(i) **Together** with estimated pure discounting term $\Delta\widehat{\rho}^*_{t,j}$

(ii) **Not at all, or negatively**, with the two other components of r^*: $\widehat{\gamma}\, \Delta g^*_{t,j} - \widehat{\beta}\, \Delta\text{VIX}^2_{t,j}$

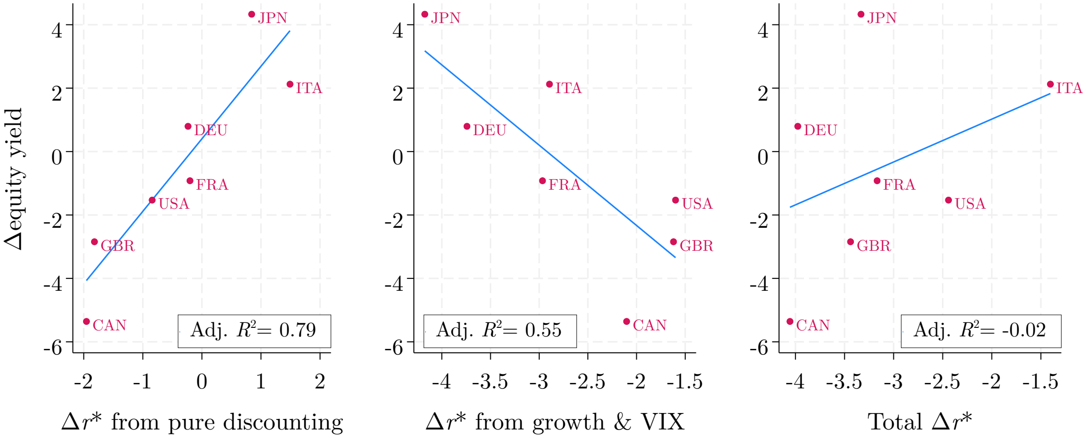
Main Results: Long-Term Decomposition



Excellent fit: equity moves with pure discounting term $\Delta\widehat{\rho}^*_{t,j}$, negatively with remaining predicted yield

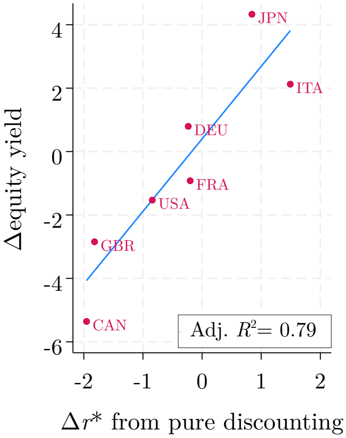
(recall that equity wasn't used at all to estimate r^* terms!)

Main Results: Long-Term Decomposition



Excellent fit: equity moves with pure discounting term $\Delta\widehat{\rho}^*_{t,j}$, negatively with remaining predicted yield $\Longrightarrow$ overall weak relationship. **Yield changes do not in general transmit to risky assets!**

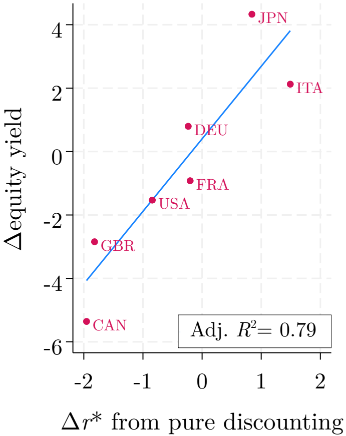
Main Results: Long-Term Decomposition



Interpretation:

- ***x*-axis:** U.S. expected growth ↘ by 0.7pp, VIX ↗ slightly
  $\Longrightarrow$ would have expected r^* decline of 1.6pp
- But r^* fell by 2.5pp $\Longleftrightarrow$ *as if* pure discount rate ↘ 0.9pp
- ***y*-axis:** This ρ shock predicts equity valuations ↗
  ...and this is exactly what we see, with ey^* ↘ 1:1
  (in fact ∼2:1 here given use of earnings yield & $D/E \approx 0.5$)
- Japan: $\Delta r^* = -3.3 \ll$ predicted by huge g^* drop
  $\Longrightarrow$ positive ρ^* shock, precisely matching equity decline
- Is the ρ^* shock really a discount rate/patience shock?
- **Probably not:** stand-in for *any shock* that increases demand
  + prices for both bonds *(in sample)* & stocks *(out of sample)*
- Demographics, global imbalances (Japan → U.S.), ...
  have nothing concrete to say about excess yield drivers (yet!)

Main Results: Long-Term Decomposition



Interpretation:

- ***x*-axis:** U.S. expected growth ↘ by 0.7pp, VIX ↗ slightly
  $\Longrightarrow$ would have expected r^* decline of 1.6pp
- But r^* fell by 2.5pp $\Longleftrightarrow$ *as if* pure discount rate ↘ 0.9pp
- ***y*-axis:** This ρ shock predicts equity valuations ↗
  …and this is exactly what we see, with ey^* ↘ 1:1

Transmission of Δr^* to equity has only been 0.9/2.5 ≈ 35%!
The rest is a result of g^* declines & uncertainty.

Higher-Frequency Changes

Now, instead of estimation in levels, consider 3-year changes:

$$\text{Bonds:} \quad \Delta r^*_{t,j} = \text{Constant} + \gamma\, \Delta g^*_{t,j} - \beta_j\, \Delta \text{VIX}^2_{t,j} + \text{FE}_j + \overbrace{\varepsilon_{t,j}}^{\Delta\rho^*_{t,j}}$$

$$\text{Stock returns:} \quad r^{\text{mkt}}_{t,j} = \text{Constant} + \pi_g\, \Delta g^*_{t,j} + \pi_V\, \Delta \text{VIX}^2_{t,j} + \pi_\rho\, \widehat{\Delta\rho^*_{t,j}} + \text{FE}_j + \nu_{t,j}$$

Useful for 2 purposes:

1. Equity return accounting: Size & contribution of growth vs. risk vs. pure discount shocks *(in real time)*
2. Duration estimation: Recall equity duration is equivalently (i) time to mat. of cash flows, (ii) price sensitivity to equity discount rate μ^*, and **(iii) price sensitivity to pure discounting term ρ^***
   - Both (i) & (ii) very difficult to measure, but our framework provides a way to measure **(iii)**
   - Will also regress $r^{\text{mkt}}_{t,j}$ on raw 10-year nom. yield change to see necessity of decomposition

Higher-Frequency Equity Return Accounting

Regressions for Three-Year Stock Returns

	(1) U.S.	**(2)** U.S.	**(3)** All	**(4)** All
Δ10y yield	4.19		-3.39	
	(3.51)		(2.20)	
Δpure discount ($\widehat{\Delta\rho_t^*}$)		-19.1**		-9.61**
		(7.64)		(3.26)
Δexp. growth		-1.49		16.9*
		(14.0)		(8.82)
$\Delta \text{VIX}^2 \times 100$		-3.08**		-5.44***
		(1.33)		(0.90)
Country FEs	✗	✗	✓	✓
Obs.	74	74	781	781
R^2	0.04	0.20	0.05	0.27
Within R^2	—	—	0.02	0.24

(1)–(2): block bootstrapped SEs. (3)–(4): SEs clustered by country and date.

Higher-Frequency Equity Return Accounting

Regressions for Three-Year Stock Returns

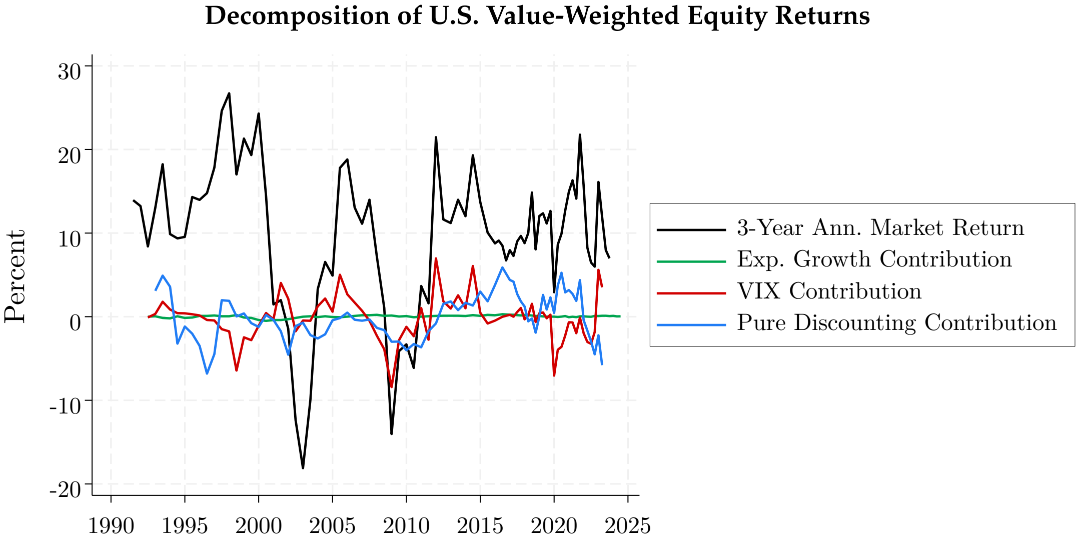
	(1) U.S.	**(2)** U.S.	**(3)** All	**(4)** All
Δ10y yield	4.19		-3.39	
	(3.51)		(2.20)	
Δpure discount $(\widehat{\Delta\rho^*_t})$		-19.1**		-9.61**
		(7.64)		(3.26)
Δexp. growth		-1.49		16.9*
		(14.0)		(8.82)
$\Delta VIX^2 \times 100$		-3.08**		-5.44***
		(1.33)		(0.90)
Country FEs	✗	✗	✓	✓
Obs.	74	74	781	781
R^2	0.04	0.20	0.05	0.27
Within R^2	—	—	0.02	0.24

(1)–(2): block bootstrapped SEs. (3)–(4): SEs clustered by country and date.

Exactly in line with theory:

- Very weak stock-bond correlation
- But isolated pure discount shocks generate strong comovement
- Growth rate shocks ~zero effect, uncertainty shocks strong neg.
- **Duration:** $-\frac{\partial \log P}{\partial \rho^*} \approx$ 19y for U.S.
- ...but likely underestimate given meas. uncertainty in $\widehat{\Delta\rho^*_t}$

Higher-Frequency Equity Return Accounting



Equity Return Forecasting

Regressions for Future Returns $r^{\text{mkt}}_{t,t+3}$

	(1)	(2)	(3)
10y yield	0.08		
	(0.38)		
Survey-based r^*_t		0.50	
		(0.68)	
Pure discounting term $\widehat{\rho}^*_t$			2.08***
			(0.61)
Country FEs	✓	✓	✓
Obs.	1,050	842	842
R^2	0.06	0.03	0.06
Within R^2	0.00	0.00	0.03

SEs clustered by country and date.

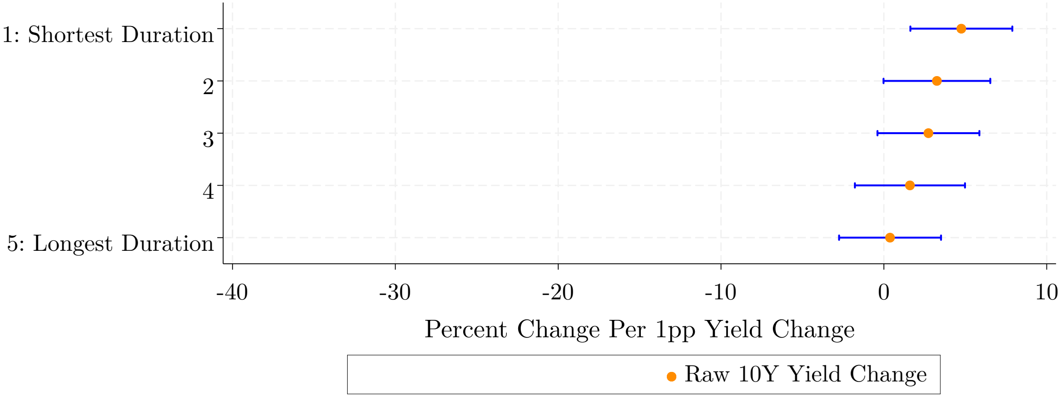
- Neither (1) nom. yields nor (2) expected real yields help predict returns
- Suggests risk premia comove negatively with yields [Farhi & Gourio 2018]
- But the pure discounting term **strongly** predicts returns
- Further evidence that it strips out confounding shocks to r^*_t
- Separate results: After stripping out pure discounting & expected growth, what's left strongly predicts **excess** returns

Cross-Sectional Evidence: Duration-Sorted Portfolios

- **Gormsen & Lazarus (2023)** construct equity portfolios sorted by firm's predicted cash-flow duration
  - Start from IBES long-term growth (LTG) forecasts for firms covered by analysts
  - Project LTG on 5 firm characteristics to obtain $\widehat{LTG}$ for all publicly traded firms
  - Take quintile portfolios of firms sorted by $\widehat{LTG}$ for U.S. & int'l
- **Old findings:**
  1. Short-duration portfolios earn significant alpha relative to long-duration
  2. This explains major risk factors (value, profit, inv, BAB, payout), plus causal evidence from div. strips
- **Now ask:** Are long-duration firms more exposed to (i) yields, (ii) isolated pure discounting shock?
  - Regress 3-year return on Δr_t and $\widehat{\Delta\rho_t^*}$ by portfolio
  - Provides out-of-sample test for both duration sort and construction of pure discounting term
  - And sets the stage for relevant cross-sectional decompositions
    (e.g., how much of value's poor performance is from interest rates?)

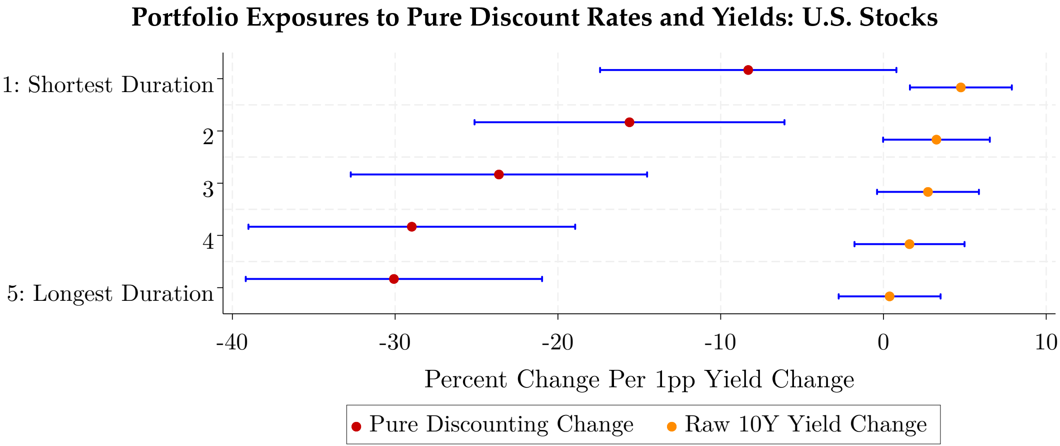
Cross-Sectional Evidence: Duration-Sorted Portfolios

Portfolio Exposures to Unadjusted Yield Changes: U.S. Stocks



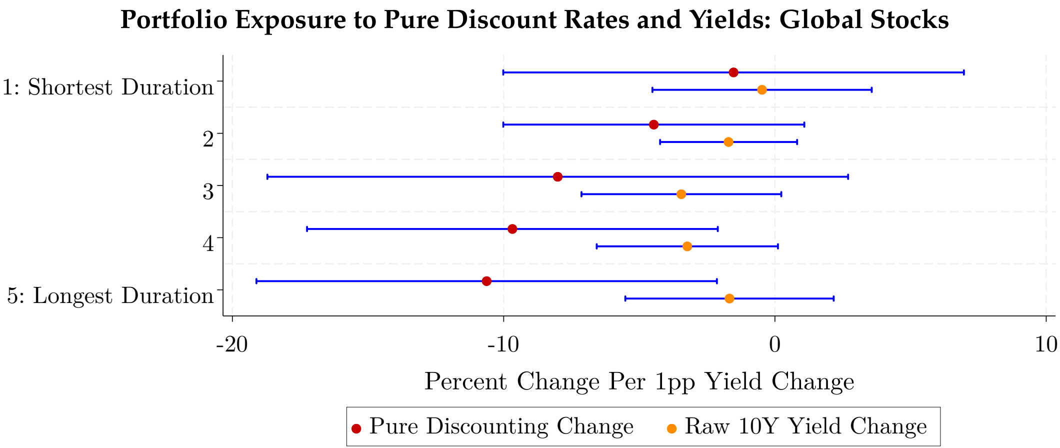
- Long-duration portfolios are not substantially more exposed to raw interest-rate changes...

Cross-Sectional Evidence: Duration-Sorted Portfolios



- Long-duration portfolios are not substantially more exposed to raw interest-rate changes…
- …**but they're substantially more exposed to ρ^* shocks** *(despite their negative CAPM alphas)*
- Implies a significant spread between lowest- and highest-duration stocks

Cross-Sectional Evidence: Duration-Sorted Portfolios

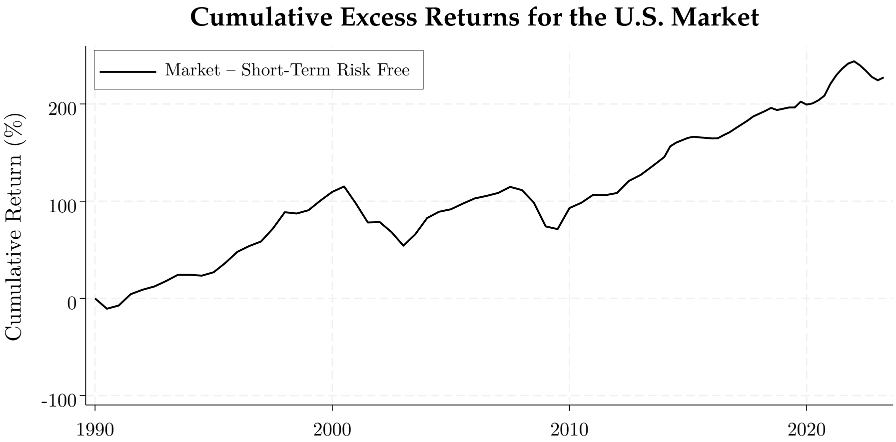


- Long-dur. portfolios are **substantially more exposed** to ρ^* shocks *(despite their negative CAPM alphas)*
- Implies a significant spread between lowest- and highest-duration stocks
- **Also apparent for global stocks** (and similarly for raw yield exposures)

Roadmap

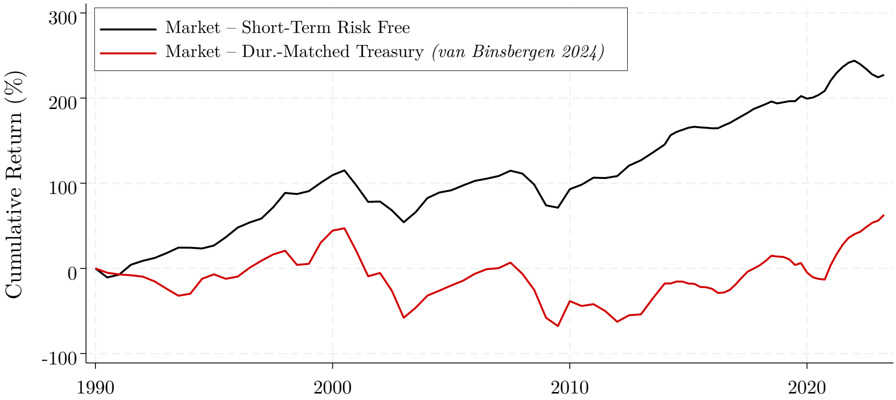
1. Introduction
2. Theoretical Decomposition
3. Empirical Implementation
4. Additional Implications
    - The Equity Premium Lives to See Another Day
    - The Value Premium and Interest Rates
    - What Is a Monetary Policy Surprise?
5. Final Notes

A Significant Duration-Matched Equity Premium



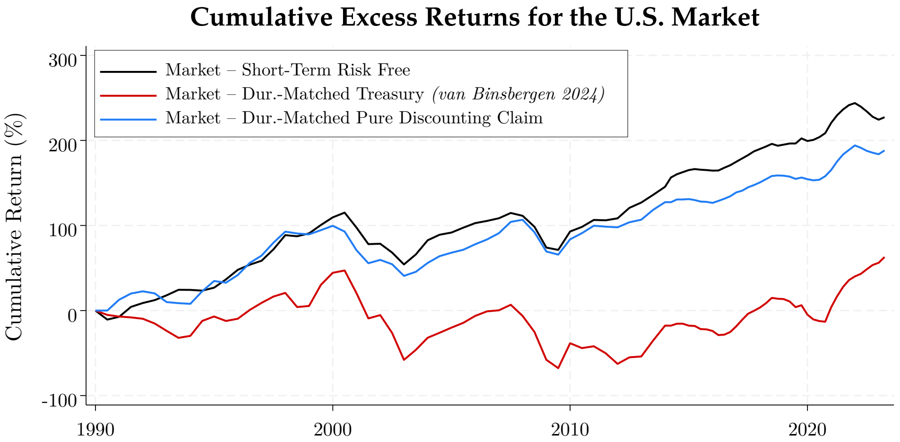
A Significant Duration-Matched Equity Premium

Cumulative Excess Returns for the U.S. Market



- Long-term nominal Treasuries have had high returns, low apparent "duration-matched" premium
- **This isn't a great counterfactual:** long-term bonds differentially exposed to growth & uncert.
- Instead, construct **maturity-matched pure discounting claim** that appreciates when $\rho^* \searrow$

A Significant Duration-Matched Equity Premium



- Long-term nominal Treasuries have had high returns, low apparent "duration-matched" premium
- Instead, construct **maturity-matched pure discounting claim** that appreciates when $\rho^* \searrow$
- Market has **6.1%** ann. excess return relative to this claim

Discount-Rate Shocks and Value Returns

- Declining value premium? Value stocks have underperformed growth stocks since ∼2006
- How much is due to interest rates?

AQR

Cliff’s Perspective

—

Is Value Just an Interest Rate Bet?

Spoiler Alert: Not Even Close

August 11, 2022

Discount-Rate Shocks and Value Returns

- Declining value premium? Value stocks have underperformed growth stocks since ∼2006
- How much is due to interest rates? We'll partially agree

AQR

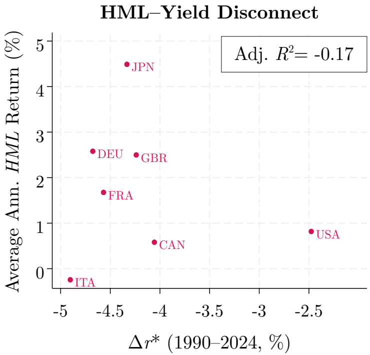
Cliff's Perspective

—

Is Value Just an Interest Rate Bet?

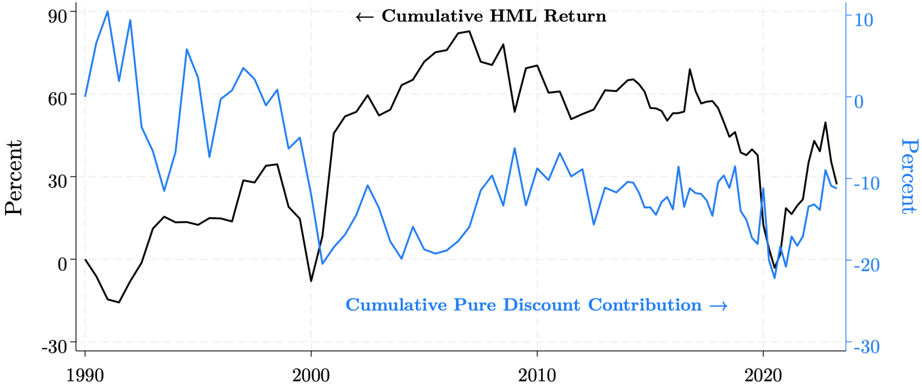
Spoiler Alert: Not Even Close

August 11, 2022

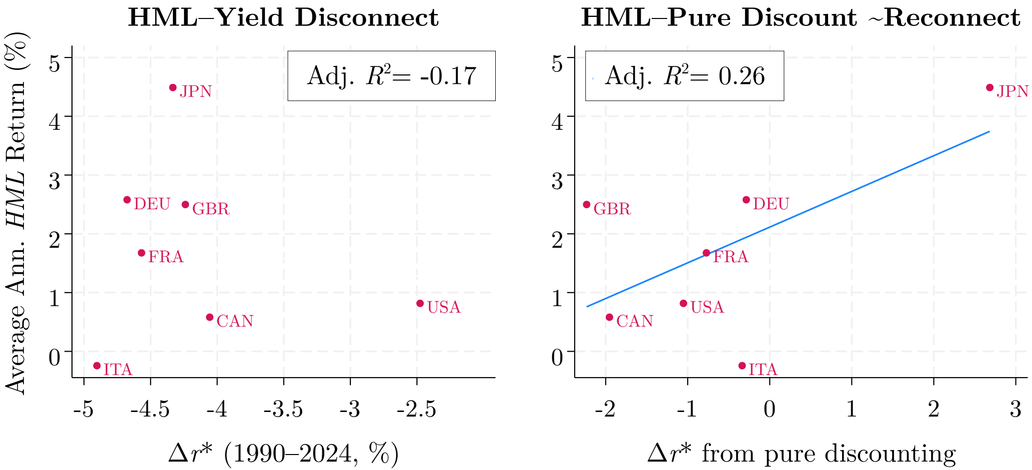


Discount-Rate Shocks and Value Returns

- Declining value premium? Value stocks have underperformed growth stocks since ~2006
- How much is due to interest rates? We'll partially agree. . .but not fully.
  HML is short-duration, exposed to recent discounting shocks.
- While pure discount contribution is often important, clearly not the full story *(note scale)*



Discount-Rate Shocks and Value Returns: Global Evidence



- Pure discounting changes important, but not the full story *(& other long-duration portfolios have done well)*

What Is a Monetary Policy Surprise?

Papers often treat MP surprise as if it were a pure discount-rate shock

- One recent example: "Falling Rates and Rising Superstars" [Kroen, Liu, Mian, Sufi 2024]

  "We empirically analyze the impact of falling rates on firms using high frequency interest rate shocks at FOMC announcements as **exogenous shifters to the interest rate**. . .The high frequency analysis shows that **industry leaders have significantly higher duration than industry followers in a low rate environment.**"

- The surprise ΔFF_t may be exogenous, but yield change $\Delta y_{\text{long-term},t}$ depends on Δ pure discount rate, expected growth rate, & uncertainty *given* surprise. . . and stock return does **not** identify duration
- If pos. MP shocks are contractionary & increase VIX, $\Delta\rho_{t,j} > \Delta y_{t,j}$. With an info. effect, ambiguous.
- Our estimates, along with Δy_t, r_t^{mkt}, and ΔVIX_t^2 given identified MP surprises, allow us to invert two equations for two unknowns, Δg_t and $\Delta\rho_t$:

What Is a Monetary Policy Surprise?

Papers often treat MP surprise as if it were a pure discount-rate shock

- The surprise ΔFF_t may be exogenous, but yield change $\Delta y_{\text{long-term},t}$ depends on Δ pure discount rate, expected growth rate, & uncertainty *given* surprise. . . and stock return does **not** identify duration
- If pos. MP shocks are contractionary & increase VIX, $\Delta\rho_{t,j} > \Delta y_{t,j}$. With an info. effect, ambiguous.
- Our estimates, along with Δy_t, r_t^{mkt}, and ΔVIX_t^2 given identified MP surprises, allow us to invert two equations for two unknowns, Δg_t and $\Delta\rho_t$:

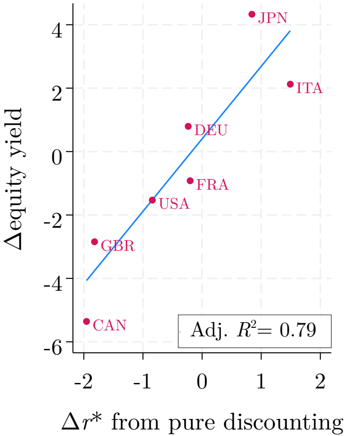
$$\text{Bonds:} \quad \Delta y_t = \Delta\rho_t + \widehat{\gamma}\,\Delta g_t - \widehat{\beta}_j\,\Delta\text{VIX}_t^2$$

$$\text{Stock returns:} \quad r_t^{\text{mkt}} = \widehat{\pi}_\rho\,\Delta\rho_t + \widehat{\pi}_g\,\Delta g_t + \widehat{\pi}_V\,\Delta\text{VIX}_t^2$$

- We back out $\Delta\rho_t$ and Δg_t for each MP announcement and regress each on Bauer & Swanson (2023) orthogonalized MP shock: (1) $\beta_\rho = 0.29^{***}$ $[R^2 = 0.30]$, (2) $\beta_g = 0.07^{*}$ $[R^2 = 0.04]$
  $\Longrightarrow$ 75% of MPS is pure discounting shock, but some info. effect on average *(can also do t-specific plots)*
- Small firms are higher-duration than large firms on average. . .but in low-rate environment, exposure to $\Delta\rho_t$ is indeed higher for large firms

Roadmap

Macro-AP Works Better at Long Horizons



- Bond-stock relationship is chaotic, both at high frequency and (when unadjusted) over longer run
- But simple measurement based on standard cons.-based macro-AP framework provides needed adjustments to explain long-horizon relationship *and* medium-term changes
- Long horizon, fall in interest rates can be fully accounted for by (i) growth rates + (ii) a pure discount-rate component that perfectly fits the stock-price change. . .
- . . .and does so *without* the need for any additional convenience yield specific to Treasuries

Final Notes

Summary:

- **New framework & measurement tools** to decompose any change in rates into underlying causes
- Only pure discounting shocks pass through to equity one-for-one, both in theory and data
- These are important but only about 35% of the story for the decline in rates in the U.S.

Range of implications:

1. Stocks haven't performed poorly against long-term counterfactual
2. Passthrough of r^* declines to risky assets & household wealth has only been partial
3. Big dispersion in duration in cross-section

Lots of work left to do, including unpacking ρ^* changes.

Thank you!