Reconciling Macro and Finance:
The US Corporate Sector, 1929-Present

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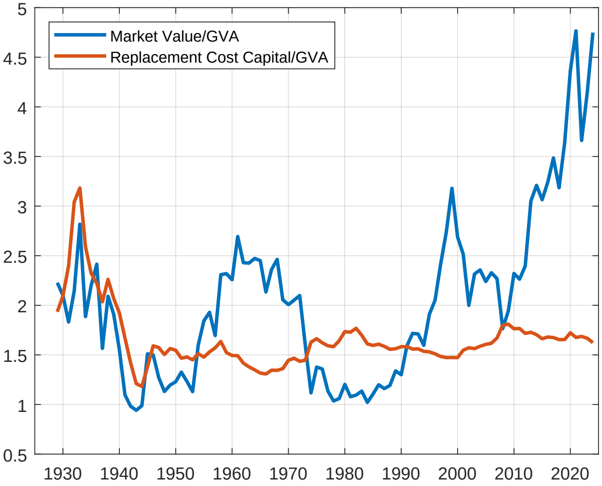
Volatile Valuations

- Market valuation of the US corporate sector is very volatile
- But corporate capital stock famously smooth after WWII



Our Paper

- Revisit question of what drives valuations using new data and using a macro model.

- Data: Integrated Macroeconomic Accounts (IMA)
  - Natural data set for integrating macro and finance

- Model: extended growth model with two components of firm value:
  1. Physical capital
  2. Value of future "factorless income" (pure rents)
     valuation requires a model for dynamics of cash flows and discount rates

- Advantages of using a macro model for valuations
  1. We know how to value capital – a big chunk of firm value!
  2. Capital Euler equation offers new evidence on expected returns

Outline of Talk

1. IMA data:
   - Macro measures of aggregate firm value, cash flow, returns
   - Show that returns look like CRSP returns
   - Show that valuations track cash flows at low frequency
   - Show that cash flows have familiar macro drivers (changing taxes, labor's share, etc.)
2. Introduce the macro model
   - Decompose values and cash flows into capital vs. claims to factorless income
   - Use model Euler equation to compute expected return to capital
   - Show that expected to capital return tracks bond returns closely
   - Show that expected return also tracks expected growth

Outline

3. Valuing capital (macro):
   - Derive simple and familiar valuation expression: $V_t^K = K_{t+1}$! (approximately)
   - Explore drivers of time variation in value of capital
     - time-varying expected returns, taxes, depreciation etc.

Outline

4. Valuing factorless income (finance):

   - Volatile valuations because of volatility in expected future factorless income?
   - Or because of time-variation in how expected future income is discounted
   - Traditional finance consensus: volatile valuations mostly due to volatile expected returns
     - e.g., Shiller, 1981, Campbell and Shiller, 1988, Cochrane 2008, many others
   - But some recent papers argue that volatility is about cash flows:
     - Larrain & Yogo 2008, Greenwald, Lettau & Ludvigson 2025, Knox & Vissing-Jorgensen 2025
   - Theory: Need very persistent movements in expected returns in excess of growth for time-varying returns to drive valuations
   - Application to valuing factorless income : Movements in expected returns are large but not persistent

   $\Rightarrow$ Valuations mostly driven by time-varying expected cashflows

The Integrated Macroeconomic Accounts

- Merge NIPA, Fixed Assets, and Flow of Funds
  - Integrated Income and Cash Flow Statements and Balance Sheets
- Corporate Sector: U.S. Resident Corporations
  - Public and Private
  - Multinational Subsidiaries
- Free Cash Flow from Operations
  - $FCF_t = GVA_t - Taxes_t - WL_t - Invest_t$
  - Cash Flows available to owners of US resident corporations
  - “Dividend” in the basic growth model

IMA Enterprise Value

- Enterprise Value V_t is market value of assets that generate this free cash flow

Assets	Liabilities
Enterprise value = Value of Non Fin. Assets	Market value of Equity
Value of Fin. Assets	Other Liabilities

  - V_t = Mkt. Val of Equity + Other Liabilities - Value of Fin. Assets
  - Mkt. Valuation of Non-Financial Assets of *US Resident Corps*
  - Now reported on lines 14 and 15 of FOF Table B1

- IMA returns

$$1 + r_{t+1}^{V} = \frac{V_{t+1} + FCF_{t+1}}{V_t}$$

IMA vs Usual Finance Data

- Advantage of IMA is that we measure returns and valuations for the same firms for which we measure value-added and investment in the National Accounts

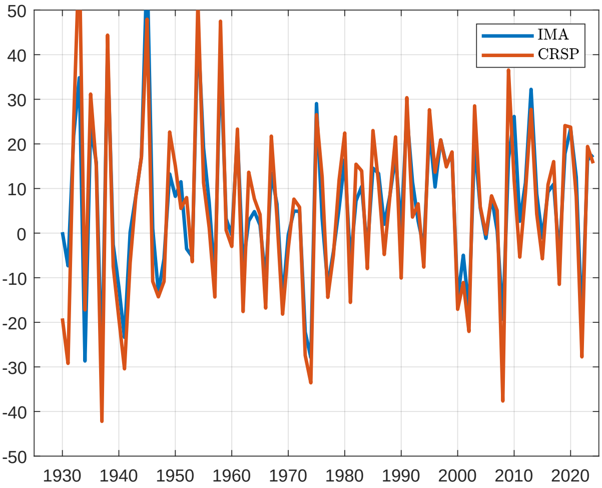
- Three key differences relative to standard finance data:
    1. Our measure is broader: it includes non publicly-traded firms
    2. The IMA measure values U.S. resident firms (including U.S. resident subsidiaries of foreign firms)
    3. We value claims to all free cash flow, not just the portion flowing to equity holders

- But we find IMA returns and valuations closely track standard finance measures

IMA and CRSP Value-Weighted Realized Real Returns Similar

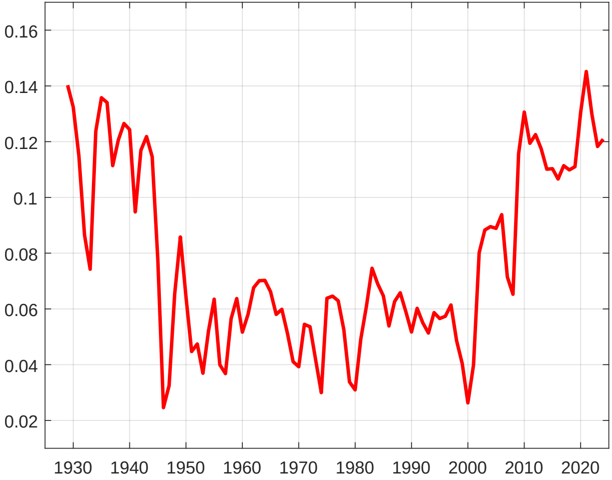
- CRSP returns slightly more volatile

E/P ratios



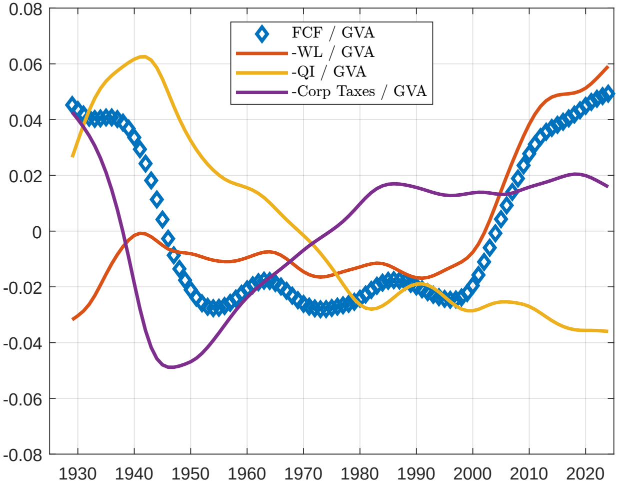
Free Cash Flow over Corporate Sector Gross Value Added

- Now 2 $\times$ level in 1950-2000 period



Free Cash Flow Drivers

- $FCF = GVA - WL - QI - Taxes$
- Decline early in sample mostly rising corporate taxes
- Rise in recent decades mostly falling labor share
- Investment increasingly depressing FCF because of faster depreciation

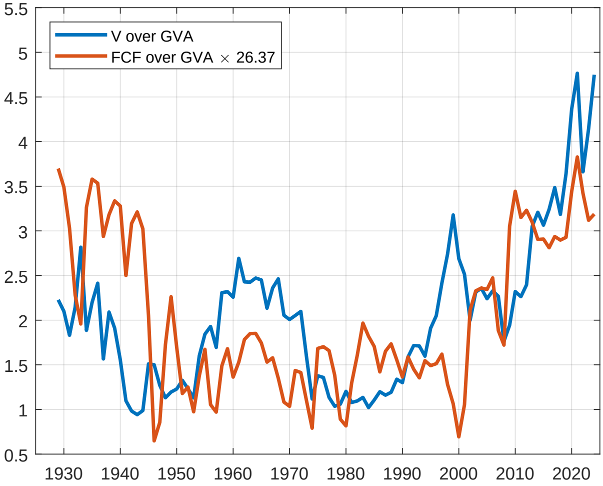


Century of Valuations and Cash Flows

- Gordon Growth Model:

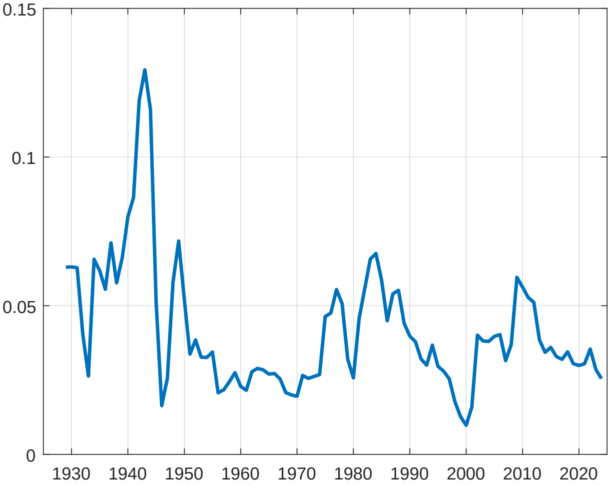
$$V = \frac{(1+g)FCF}{r-g}$$

- Low frequency (V, FCF) co-movement suggests cash flows matter for valuations



Free Cash Flow to Enterprise Value Ratio

- FCF/V stationary post 1950
- Not especially low at end of sample



Macro Model

- Extension of standard stochastic growth model
- Key extension: "factorless income" – time-varying pure rents that help generate fluctuations in firm values

1. Partition output into labor income, taxes, capital income and factorless income
2. Construct series for cash flows to capital & to factorless income and for values of those two flows
3. Construct a macro series for expected returns to capital in excess of GVA growth

Production

- Representative firm value added:

$$GVA_t = K_t^{\alpha}(Z_t L)^{1-\alpha}$$

- Capital law of motion:

$$K_{t+1} = (1 - \delta_t)K_t + I_t$$

(no adjustment costs)

- Replacement value of capital stock:

$$\underbrace{Q_t K_{t+1}}_{ReplacementCost_{t+1}} = \underbrace{Q_{t-1} K_t}_{ReplacementCost_t} + \underbrace{(Q_t - Q_{t-1})K_t}_{Reval_t + Other_t} - \underbrace{\delta_t Q_t K_t}_{CFC_t} + \underbrace{Q_t I_t}_{Investment_t}$$

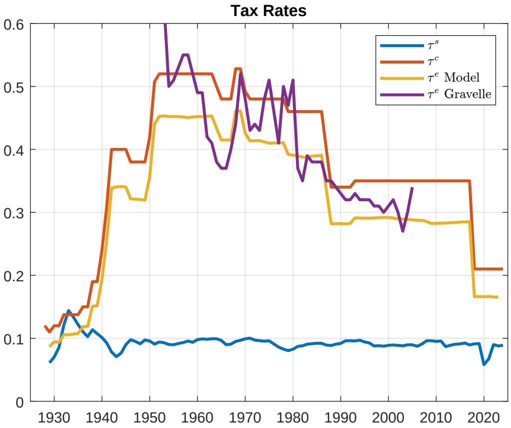
Factor Shares and Factorless Income

- Deviation from standard model: portion Π_t of value-added accrues as a pure rent to firm owners
- Value-added divided as

$$1 = \underbrace{\frac{W_t L}{GVA_t}}_{(1-\tau_t^s)(1-\alpha)\frac{1}{\mu_t}} + \underbrace{\frac{R_t K_t}{GVA_t}}_{(1-\tau_t^s)\alpha\frac{1}{\mu_t}} + \underbrace{\frac{\Pi_t}{GVA_t}}_{(1-\tau_t^s)\left(1-\frac{1}{\mu_t}\right)} + \underbrace{\frac{IBT_t}{GVA_t}}_{\tau_t^s}$$

- τ_t^s measured directly
- Assume α constant $\Rightarrow$ can infer μ_t from $\frac{W_t L}{GVA_t}$
  $\Rightarrow$ can split NOS_t between $R_t K_t$ and Π_t

Also Model Corporate Taxes



$$Taxes_t^c = \underbrace{\tau_t^c}_{corp\ tax} \left[\underbrace{\left(1 - \tau_t^s\right)}_{indirect\ bus.\ tax} GVA_t - W_t L - \underbrace{\delta_t Q_t K_t}_{deduct\ CFC} - \underbrace{\lambda Q_t \left(K_{t+1} - K_t\right)}_{deduct\ fraction\ net\ inv.} \right] - \underbrace{T_t^L}_{LS\ transfer}$$

Valuing Capital

- Assume firm managers invest to maximize

$$FCF_t^K + V_t^K$$

where

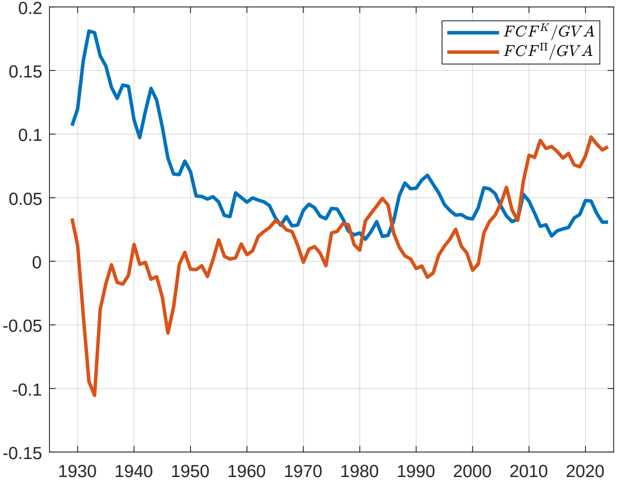
$$FCF_t^K = (R_t K_t - \delta_t Q_t K_t)(1 - \tau_t^c) - (1 - \lambda \tau_c^c) Q_t (K_{t+1} - K_t)$$

- Define earnings to capital

$$E_t^K = FCF_t^K + Q_t(K_{t+1} - K_t)$$

Cash flows to capital and to factorless income

- $FCF_t^{\Pi} = FCF_t - FCF_t^K$
- Cash flow has shifted toward factorless income
- (Plot is for $\alpha = 0.305$)



Valuation

- General valuation formula

$$V_t = \mathbb{E}_t \sum_{k=1}^{\infty} M_{t,t+k} FCF_{t+k}$$

- Value can change due to time-varying discount factor $M_{t,t+k}$ or time-varying expected cash flow
- Contentious debate in asset pricing literature!
- But in standard growth model (constant returns, no adjustment costs) a miraculous result:

$$V_t^K = K_{t+1}$$

- In our model with taxes and time-varying price of capital, we get something similar:

$$V_t^K = (1 - \lambda \tau_t^c) Q_t K_{t+1}$$

Why?

- Start from general valuation formula:

$$
\begin{aligned}
V_t^K &= \mathbb{E}_t\left[M_{t,t+1}\left(FCF_{t+1}^K + V_{t+1}^K\right)\right] \\
&= \mathbb{E}_t\left[M_{t,t+1}\left(R_{t+1}^K K_{t+1} - K_{t+2} + (1-\delta)K_{t+1} + V_{t+1}^K\right)\right]
\end{aligned}
$$

- Guess that $V_{t+1}^K = K_{t+2} \Rightarrow$

$$
\begin{aligned}
V_t^K &= \mathbb{E}_t\left[M_{t,t+1}\left(R_{t+1}^K K_{t+1} + (1-\delta)K_{t+1}\right)\right] \\
&= K_{t+1}\mathbb{E}_t\left[M_{t,t+1}\left(R_{t+1}^K + (1-\delta)\right)\right]
\end{aligned}
$$

- Euler equation for optimal investment

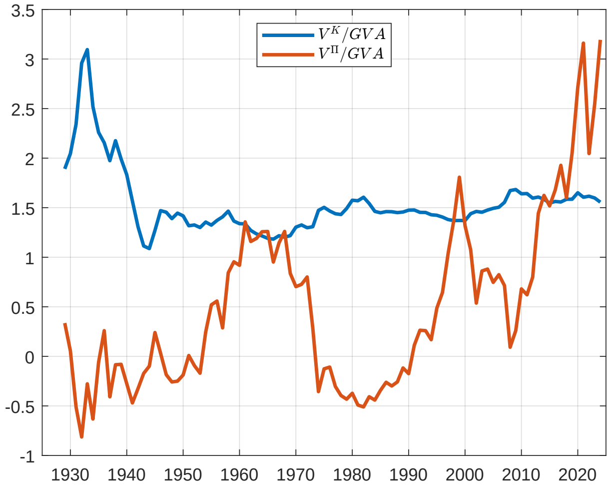
$$
1 = \mathbb{E}_t\left[M_{t,t+1}\left(R_{t+1}^K + 1 - \delta\right)\right]!
$$

$\Rightarrow$

$$
V_t^K = K_{t+1}
$$

Value of capital and factorless income

- $V_t^K = (1 - \lambda\tau_t^c) Q_t K_{t+1}$
- $V_t^\Pi = V_t - V_t^K$
- Value has shifted toward value of factorless income



Expected return to capital

- Use model to estimate expected return to capital

$$
\begin{aligned}
\mathbb{E}_t\left[1+r^K_{t+1}\right] &= \frac{\mathbb{E}_t\left[FCF^K_{t+1}+V^K_{t+1}\right]}{V^K_t} \\
&= \frac{\mathbb{E}_t\left[\frac{R_{t+1}K_{t+1}}{GVA_{t+1}}\frac{GVA_{t+1}}{GVA_t}(1-\tau^c_{t+1})\right]}{(1-\lambda\tau^c_t)\frac{Q_tK_{t+1}}{GVA_t}} + \mathbb{E}_t\left[\frac{(1-\lambda\tau^c_{t+1}-\delta_{t+1}(1-\tau^c_{t+1}))Q_{t+1}}{(1-\lambda\tau^c_t)Q_t}\right]
\end{aligned}
$$

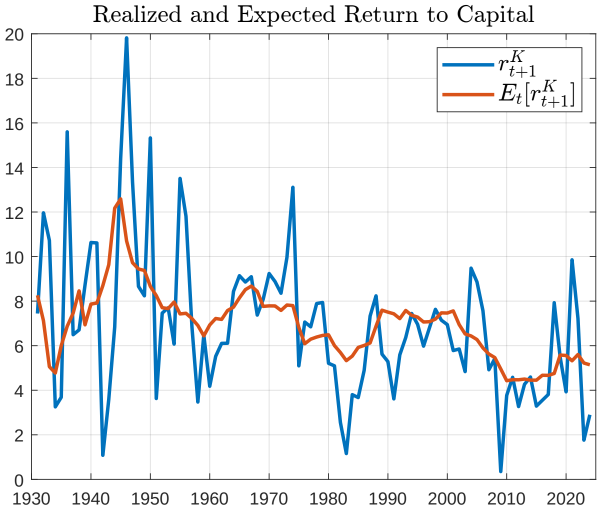
- Assume everything is unit root: $\mathbb{E}_t\left[\frac{R_{t+1}K_{t+1}}{GVA_{t+1}}\right]=\frac{R_tK_t}{GVA_t}$, $\mathbb{E}_t\left[\tau^c_{t+1}\right]=\tau^c_t$, $\mathbb{E}_t\left[\delta_{t+1}\right]=\delta_t$, $\mathbb{E}_t\left[\frac{Q_{t+1}}{Q_t}\right]=(1+\bar{g}^Q)$, $\mathbb{E}_t\left[\frac{GVA_{t+1}}{GVA_t}\right]=1+\bar{g}$

$\Rightarrow$

$$
\mathbb{E}_t\left[r^K_{t+1}\right] = \frac{\frac{1-\alpha}{\alpha}\frac{W_tL_t}{GVA_t}(1+\bar{g})}{\frac{Q_tK_{t+1}}{GVA_t}}\left(\frac{1-\tau^c_t}{1-\lambda\tau^c_t}\right)+\bar{g}^Q-(1+\bar{g}^Q)\delta_t\left(\frac{1-\tau^c_t}{1-\lambda\tau^c_t}\right)
$$

Returns vs Expected Returns to Capital

- Regression suggests this is a good model for expected returns:
  - r_{t+1}^K on $\mathbb{E}_t r_{t+1}^K$ gives intcept ≈ 0, slope ≈ 1

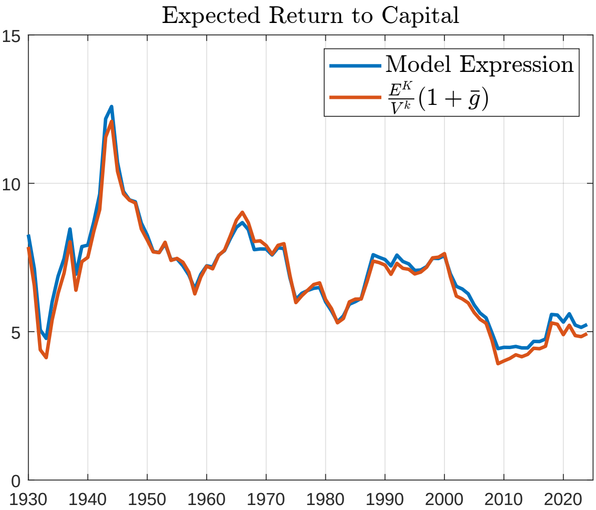


Earnings to Capital Yield vs. Expected Real Return to Capital

- Earnings yield on capital an excellent proxy for expected returns

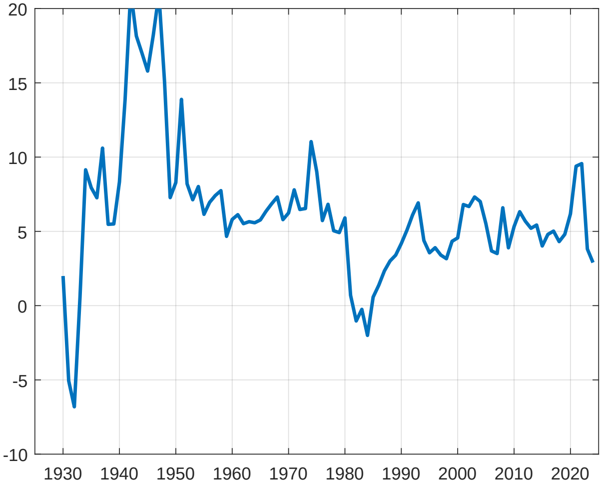
$$\mathbb{E}_t\left[r^K_{t+1}\right] \approx \frac{E^K_t}{V^K_t}\mathbb{E}\left[1+g_{t+1}\right]$$

- Important: expected returns proxied by **earnings to capital** (not total earnings) relative to capital value



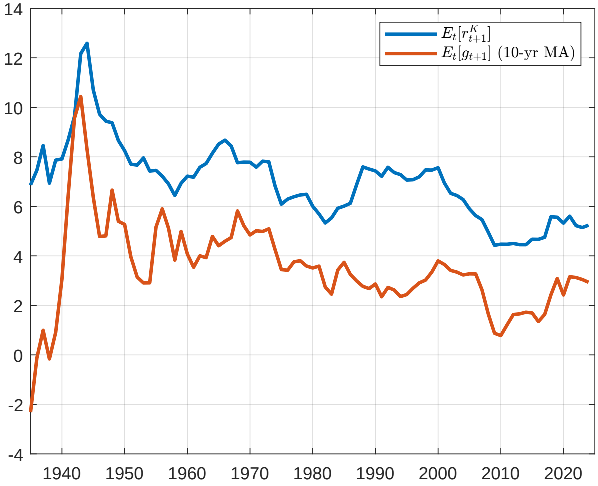
Expected Return Tracks Safe Rate

- Approx. 5 – 6% risk premium except:
- Great Depression (low output), WW2 (low K, high output), Volcker (high short rates)



Expected returns to capital and expected growth

- Expected growth modeled as 10 year lagged moving average
- Remarkably close co-movement with expected returns



Drivers of capital stock

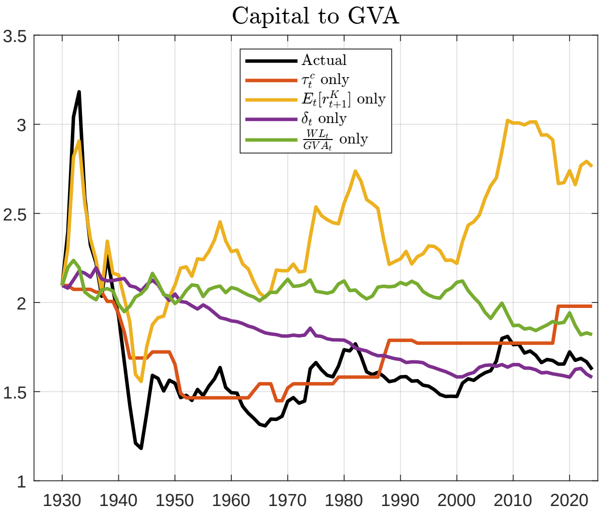
- Recall

$$\mathbb{E}_t\left[r^K_{t+1}\right] = \frac{\frac{1-\alpha}{\alpha}\frac{W_t L_t}{GVA_t}(1+\bar{g})}{\frac{Q_t K_{t+1}}{GVA_t}}\left(\frac{1-\tau^c_t}{1-\lambda\tau^c_t}\right) + \bar{g}^Q - (1+\bar{g}^Q)\delta_t\left(\frac{1-\tau^c_t}{1-\lambda\tau^c_t}\right)$$

- Can invert this to ask when drives changes in capital stock
- Note: Case Shiller ask whether fluctuations in FCF^K_t / V^K_t reflect changes to future cash flow growth or changes in future returns:
- But: Only news at t about returns / taxes / depreciation / growth / labor's share at $t+1$ matter for FCF^K_t / V^K_t!

Drivers of capital stock

- Countervailing forces in recent decades:
- Rising depr., rising factorless income share pushing capital down
- Falling expected returns, falling taxes pushing capital up



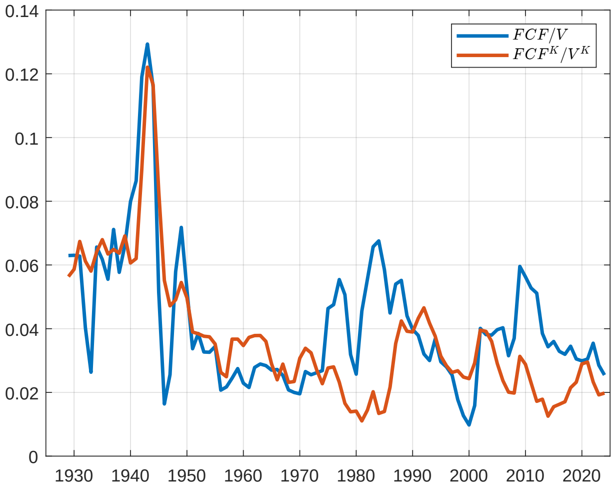
Alternative model for expected growth

- Suppose $\mathbb{E}_t\left[g_{t+1}\right] = \frac{NetI_t}{V_t^K}$

$\Rightarrow$

$$\begin{aligned}\mathbb{E}_t\left[r_{t+1} - g_{t+1}\right] &\approx \frac{E_t^K}{V_t^K} - \frac{NetI_t}{V_t^K} \\ &= \frac{FCF_t^K}{V_t^K}\end{aligned}$$

- Tracks overall FCF / V closely



Shiller 1981 Decomposition

- Normalize valuations and free cash flow by corporate value-added:

$$v_t = \frac{V_t}{GVA_t}, \; f_t = \frac{FCF_t}{GVAt}$$

- Define fundamental price:

$$v_t^* = \sum_{k=1}^{\infty} \left(\frac{1}{1+\rho} \right)^k \mathbb{E}_t \left[f_{t+k} \right]$$

  - Changes in fundamental price reflect changes in DPV of free cash flow as share of value-added
- Shiller style decomposition:

$$v_t = \underbrace{v_t^*}_{fundamental\ price} + \underbrace{z_t}_{residual}$$

- Do fluctuations in v_t reflect fluctuations in v_t^* or in z_t?

Shiller's decomposition and time variation in expected returns

$$v_t = v_t^* + z_t$$

- Assume that z_t is AR1 with persistence ϕ, mean zero.
- Expected returns in excess of growth given by:

$$\mathbb{E}_t\left[\frac{v_{t+1}+f_{t+1}}{v_t}-1\right] = \frac{v_t^*}{v_t}\underbrace{\mathbb{E}_t\left[\frac{v_{t+1}^*+f_{t+1}}{v_t^*}-1\right]}_{\rho} + \frac{z_t}{v_t}\underbrace{\mathbb{E}_t\left[\frac{z_{t+1}}{z_t}-1\right]}_{\phi-1}$$

Rearranging,

$$\frac{v_t^*}{v_t} = 1 - \frac{z_t}{v_t} = 1 + \frac{\mathbb{E}_t\left[\frac{v_{t+1}+f_{t+1}}{v_t}-1\right]-\rho}{1+\rho-\phi}$$

- Big movements in v_t^*/v_t only if $\mathbb{E}_t\left[\frac{v_{t+1}+f_{t+1}}{v_t}-1\right]$ both volatile and persistent (high ϕ)
- Note that fluctuations in $\frac{z_t}{v_t}$ map to fluctuations in expected returns
- But neither directly observed

A macro predictor for expected returns

- Assume

$$z_t = \psi \left(v_t - \frac{f_t}{\rho} \right)$$

- Implies

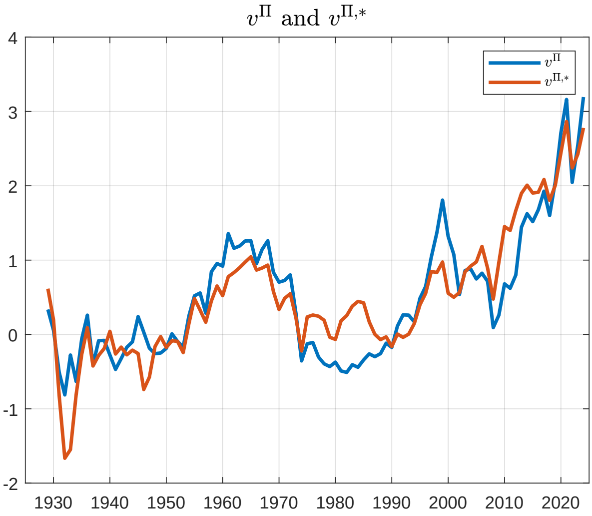
$$\mathbb{E}_t \left[v_{t+1} + f_{t+1} \right] - (1+\rho) v_t = -(1+\rho-\phi)\psi \left(v_t - \frac{f_t}{\rho} \right)$$

$$v_t^* = v_t - \psi \left(v_t - \frac{f_t}{\rho} \right)$$

  - $\psi = 0 \Rightarrow v_t^* = v_t$, $z_t = 0$
  - $\psi = 1 \Rightarrow v_t^* = f_t/\rho$, $z_t = v_t - f_t/\rho$
- Set $\rho = \frac{\mathbb{E}[f_t]}{\mathbb{E}[v_t]} = 0.038$
- Set $\phi = 0.83$ to persistence of f_t/v_t
- Set $\psi = 0.32$ to match slope from regression of $v_{t+1} + f_{t+1} - (1+\rho)v_t$ on $v_t - f_t/\rho$ ($R^2 = 0.066$)

Valuation of Factorless Income Mostly Driven by Fundamentals

- $V_t^\Pi - \frac{FCF_t^\Pi}{\rho}$ is volatile and a good return predictor
- But it is not persistent enough to generate large movements in valuations



What about predicting free cash flow?

- Assume process for cash flow admits Beveridge Nelson (1981) decomposition:

$$f_t = \underbrace{x_t}_{random\ walk} + \underbrace{y_t}_{AR1\ persistence\ \phi}$$

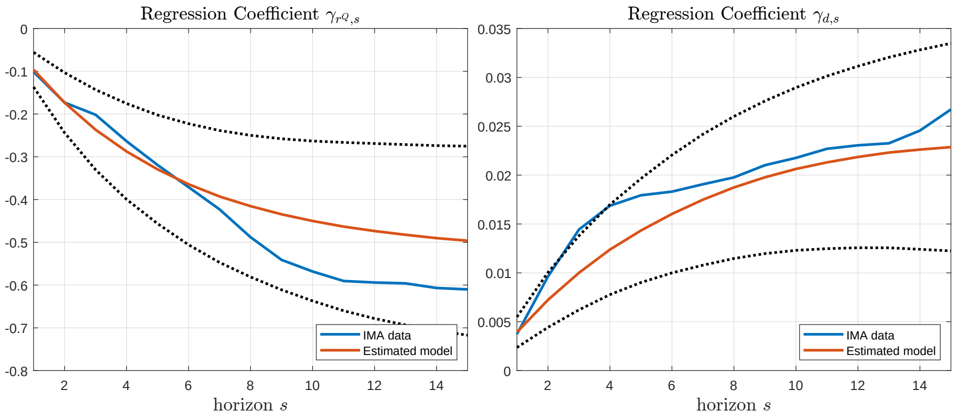
$\Rightarrow$ Simple valuation expression

$$v_t = \frac{1}{\rho} x_t + \frac{\phi}{1 + \rho - \phi} y_t + z_t$$

$\Rightarrow$ Simple expressions for expected returns / cash flow growth

- Estimate model via SMM to replicate large set of moments, including forecasting regression coeffients for returns and free cash flow growth at different horizons
- Get estimates similar to the naive exercise above

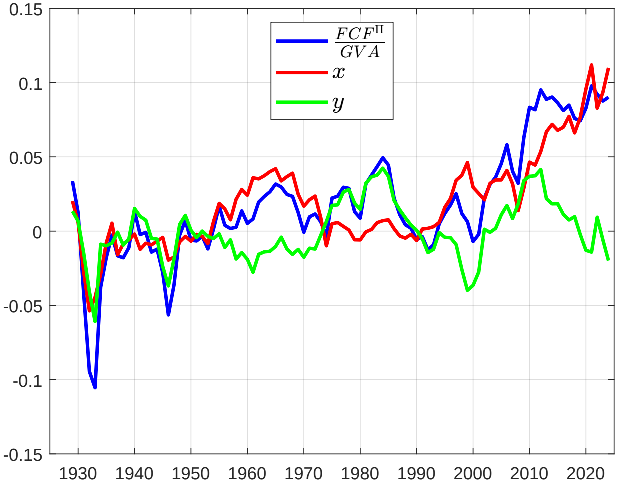
Forecasting Returns and Cash Flow Growth



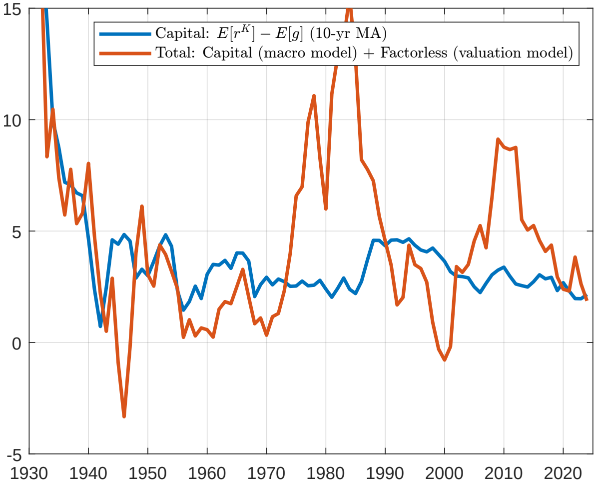
- Estimate $\psi = 0.49 \Rightarrow$ 51% of movements in $V^\Pi - FCF^\Pi/\rho$ reflect varying expected cash flow growth (y_t)
- Estimate $\phi = 0.87$

Cash Flow Decomposition

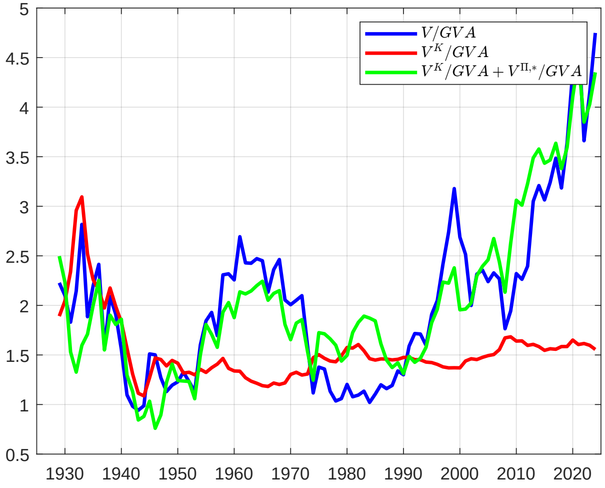
- Long-run expected cash flow roughly tracks current cash flow
- 2000 boom-bust interpreted as temporary boost to expected long-run cash flow
- A replay in 2025?



Expected Total Returns



Final Value Decomposition



A possible source of confusion

- We have focused on explaining $\frac{V_t}{GVA_t}$ – big rise over past 30 years
- One could instead focus on fluctuations in $\frac{V_t}{FCF_t}$ – flat on net over same period!
  - x_t shocks dominant for the former, irrelevant for the latter

Alternative valuation metrics

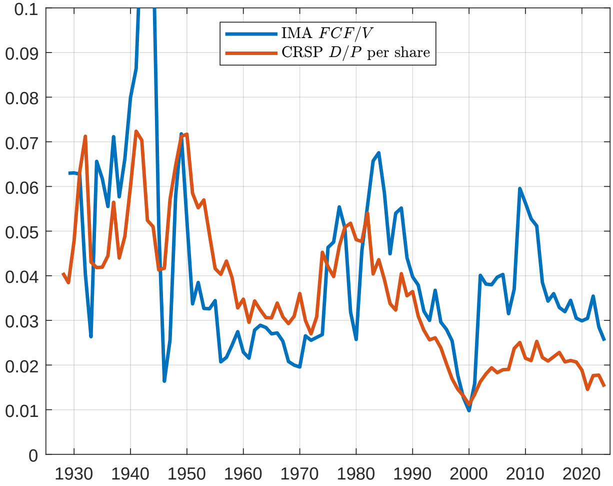
- Neither macro and finance models suggest persistent movements in expected returns net of growth $\Rightarrow$ Cashflows drive valuations
- But there are other valuation metrics
- Some of them are more persistent $\Rightarrow$ larger role for expected returns in explaining valuations?

Dividends / Price per share

- Persistent fall in D/P ratio

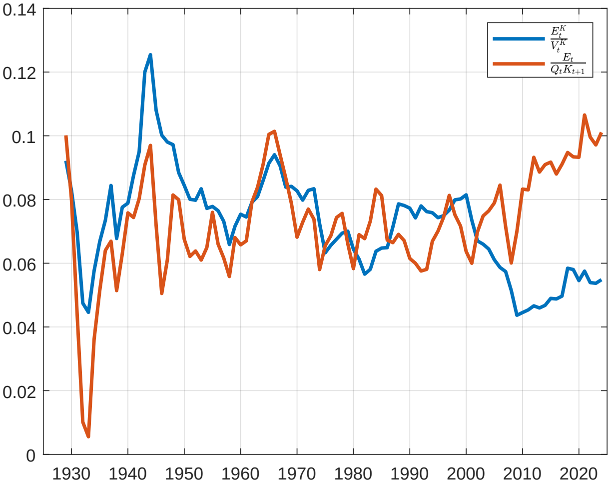
$\Rightarrow$ persistent fall in expected returns?

- But trend in D/P reflects switch from dividend payments to repurchases
- (V/FCF insensitive to payout policy)



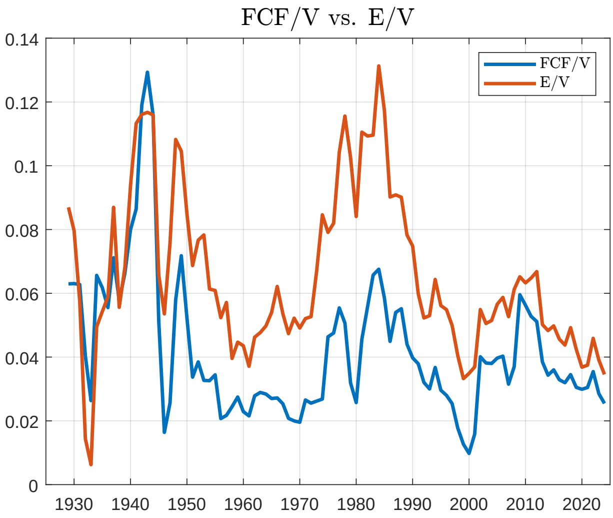
Earnings to Capital / Capital vs. Total Earnings / Capital

- Total earnings yield (e.g., BEA) gives misleading picture of expected returns
- comparing capital income *plus* factorless income to value of capital only
- (see also Farhi and Gourio 18, Eggertsson, Robbins and Wold 21)



Total Earnings / Total Value

- Earnings to value ratio shows larger decline since 1980s
- But caution also required here:
- On BGP $\frac{E^K}{V^K} = \frac{r}{1+g}$ while $\frac{E^\Pi}{V^\Pi} = \frac{r-g}{1+g}$
- $\frac{E}{V} = \frac{V^K}{V}\frac{r}{1+g} + \frac{V-V^K}{V}\frac{r-g}{1+g}$
- $\Rightarrow$ expect E/V to decline as value shifts toward factorless income

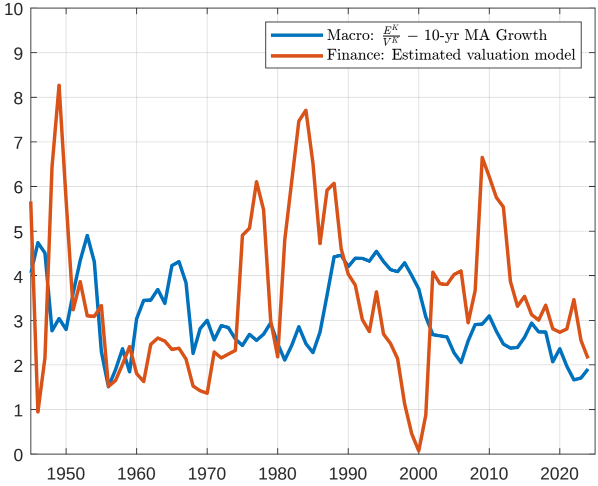


Conclusions

- IMA data: can measure asset values, income and returns using macro data
- Model: think of valuations as part reflecting value of physical capital, part reflecting claims to future rents
- Value of capital stable, thanks to offsetting drivers (returns vs taxes vs depreciation)
- Returns to capital track safe rates and expected growth
- Finance valuation model for future rents: fluctuations in valuations driven primarily by time-varying expected cash flow ...
- ... because movements in expected returns in excess of growth are not very persistent

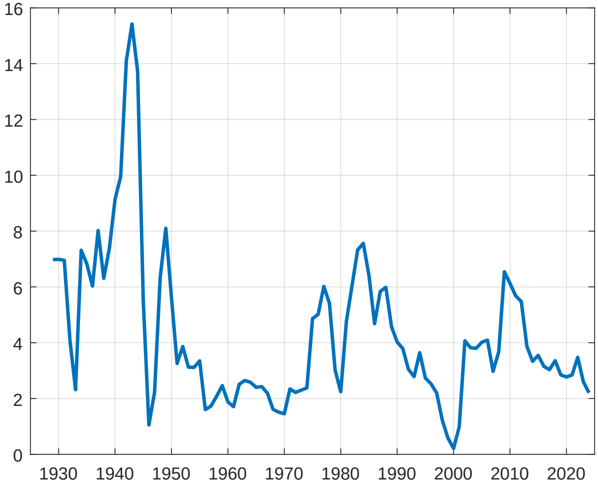
Expected returns in excess of growth (Post WWII)

- No clear trend in either macro or finance measure of expected returns in excess of growth
- Macro measure suggests less time-variation in expected returns

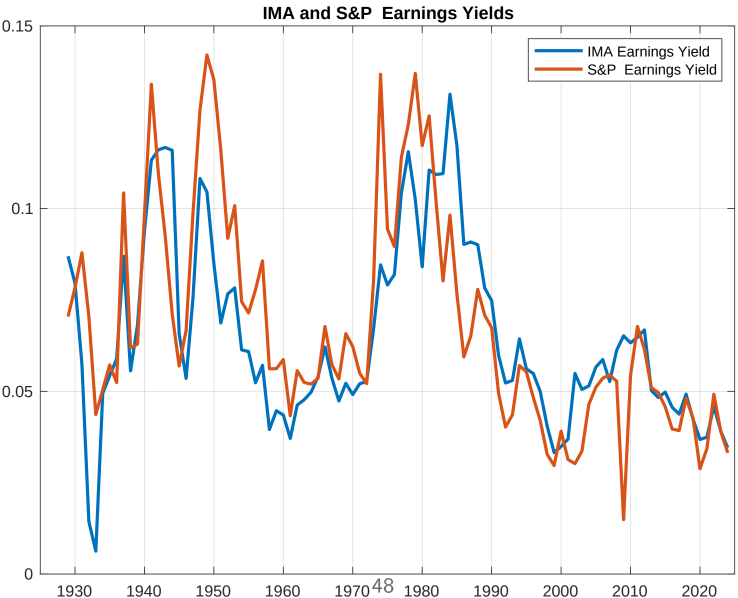


Expected Returns Net of GVA Growth

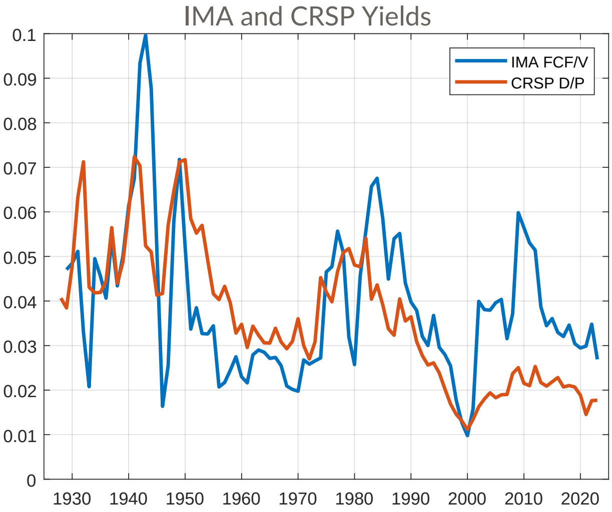
- One year ahead expected returns
- Reminder: just rescaled FCF_t / V_t
- Appears stationary post WWII
- Not super persistent
- Not super low at end of sample
- Average expected return in excess of growth 1.9pp below average realized return



IMA and S&P Earnings Yields Similar



Different Ratios of Cash Flow to Value



back

Simple macro model of valuations