Reconciling Macro and Finance: The US Corporate Sector, 1929-2022

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What Needs to be Reconciled?

- Macro aggregates are relatively stable over time:
  GDP growth, capital-output ratio, labor's share of income, etc.

- But corporate valuations and returns are extremely volatile
  - Value over GVA
  - Value over Payouts
  - Value over Measured Capital

- How should macro-finance models match both the macro and the finance facts?
  - fluctuations in future expected returns?
  - fluctuations in expected growth of payouts?

Our Results in Three Parts

1. Integrated Macroeconomic Accounts (IMA) as unified data source
    - Macro flows, stocks, valuation and returns all tied together
    - IMA returns and valuation data similar to CRSP
    - Volatile share of cash flows to firm owners
2. Revisit Campbell-Shiller regressions with IMA data
    - Lots of IMA payout growth predictability from payout to value ratio
    - Growth in Payouts/GVA not growth of GVA (Share shocks)
    - Why public firm and IMA data give different results?
3. "Accounting" model
    - Value of capital stock and value of "factorless income"
    - Cash flows to capital and "factorless income"
    - Easy to explain large swings in corporate valuation based on cash flows
    - Puzzling returns to physical capital

Key Literature

- Mainstream view
  - Cochrane (2008, 2011), Campbell's (2018) textbook
- Total Payouts vs CRSP Dividends
  - Larrain and Yogo (2008)
  - Cohen, Polk, Vuolteenaho (2003)
  - Boudoukh, Michaely, Richardson Roberts (2007)
  - Zeng and Luk (2020)
  - Davidiuk, Richard, Shaliastovich, Yaron (2023)
- Share Shocks
  - Lustig and Van Nieuwerburgh (2008)
  - Greenwald, Lettau, Ludvigson (2023)
- Huge literature in macrofinance
  - Cochrane (1991, 2017), Hall (2001), McGrattan and Prescott (2005), Jermann (2010), Farhi & Gourio (2018), Corhay, Kung, & Schmid (2021), Eggertsson, Robbins & Wold (2022), Crouzet & Eberly (2021) and many others

Part 1: The Integrated Macroeconomic Accounts

- Merge NIPA, Fixed Assets, and Flow of Funds
- Corporate Sector: U.S. Resident Corps
  - Public and Private
  - Multinational Subsidiaries
- Cash Flows from Operations
  - GVA_t, $Taxes_t$, WL_t
  - $Invest_t$, broad notion of capital $Q_t K_{t+1}$
- Balance Sheet and Flows
  - Financial and Non-Financial Assets and Liabilities end of $t-1$
  - Transactions in Assets and Liabilities
  - Revaluations of Assets and Liabilities
  - Other (mostly statistical discrepancies)
  - Financial and Non-Financial Assets and Liabilities end of t

IMA Measurement Concepts

- Growth model consistent measures of corporate payouts and valuation

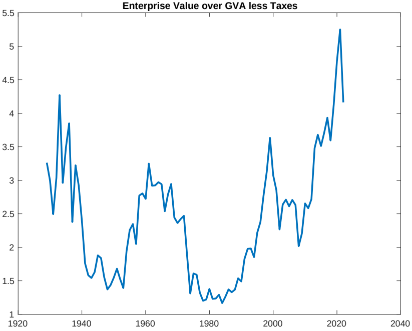
- IMA Payouts: Free Cash Flow from Operations
  - $FCF_t = GVA_t - Taxes_t - WL_t - Invest_t$
  - *Free Cash Flow from Operations*
  - Cash Flows available to owners of US Resident Corps

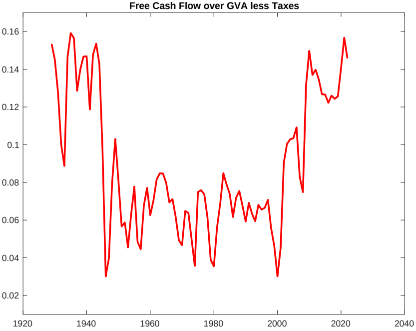
- IMA Value: Enterprise Value
  - $V_t = Mkt\,Val\,Equity_t + Liabilities_t - Fin\,Assets_t$
  - *Enterprise Value*
  - Mkt. Valuation of Non-Financial Assets of US Resident Corps
  - Now reported on lines 14 and 15 of FOF Table B1

- IMA returns

$$\exp(r^V_{t+1}) = \frac{V_{t+1} + FCF_{t+1}}{V_t}$$

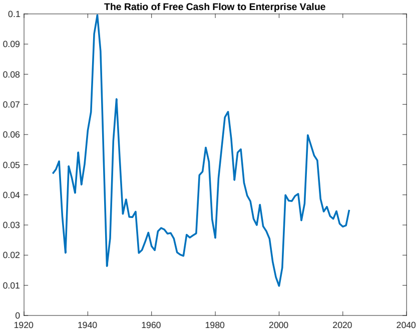
Enterprise Value and FCF over Corp GVA

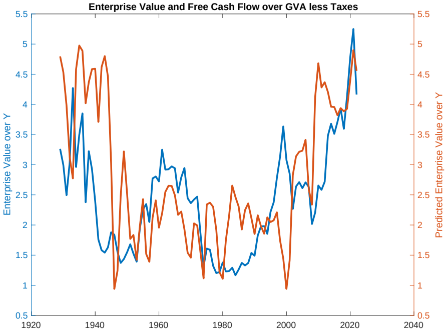




- Both Enterprise Value and Free Cash Flow show huge volatility relative to Corporate Sector Output

Ratio of Free Cash Flow to Enterprise Value



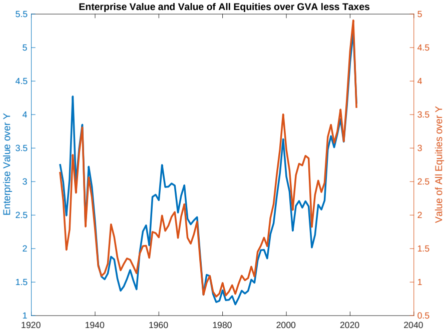


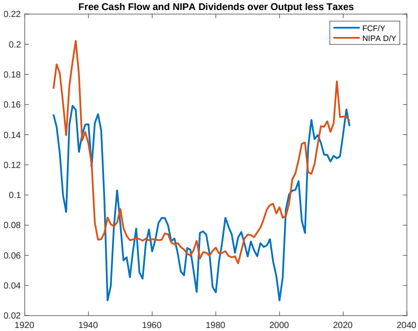
- IMA FCF/V shows no trend over time
- Low frequency Cash Flows and Value roughly line up at multiple of 31.25

Robustness: IMA Dividends and Equity Valuation

- IMA Equity Payouts: Monetary Dividends Paid
  - NIPA Table 7.10
  - Cash dividends of U.S. resident corporations
- IMA Equity Value: Corp. Equity plus FDI Equity in U.S.
- IMA Equity Returns
  - Dividend Yield plus Capital Gain
  - Capital Gain measured from IMA Revaluation of outstanding equity
  - Equivalent to annual holding period return in CRSP.

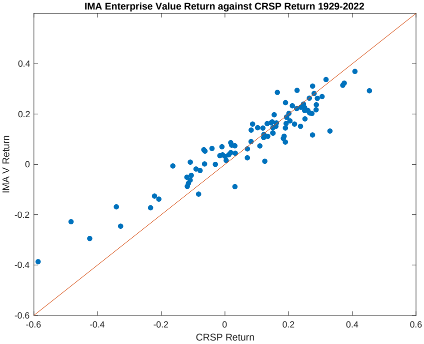
Comparison with Equity Value and Dividends

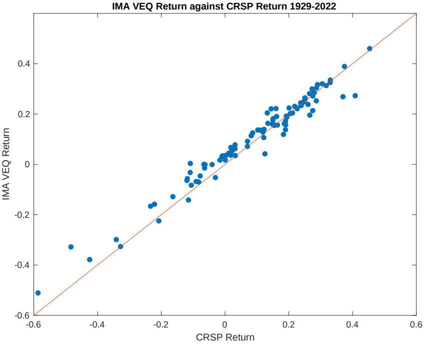




- IMA Equity roughly constant leverage (50% of Corp GVA)
- IMA Dividends smooth business cycle in FCF

IMA and CRSP VW Realized Real Returns





Return	Time Period	Mean Return	Std Return	Std D growth
Enterprise Value	1929-2022	0.072	0.146	0.28
IMA Equity	1929-2022	0.076	0.173	0.073
CRSP VW	1929-2022	0.061	0.194	0.138

Part 2: Revisiting Campbell-Shiller Regressions

- Regression to uncover what drives changes in the valuation ratios
- Does high FCF_t/V_t signal high future returns or low dividend growth?
- CRSP data
  - high dividend-price ratio weak signal about future dividend growth.
  - may signal high future returns
- IMA data, different results
  - high dividend price ratio predicts low free cash flow growth
- IMA data, dp ratio predicts FCF/GVA not aggregate growth

explain CS regressions

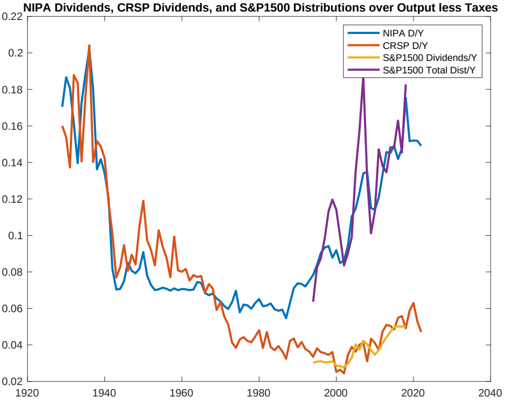
CS regressions in CRSP and IMA data

Table: 15-year Horizon Regression Coefficients on $\widehat{dp}_t$

	$\sum_{j=1}^{15} \rho^{j-1} \hat{r}_{t+j}$	$\sum_{j=1}^{15} \rho^{j-1} \hat{g}_{Dt+j}$	$\rho^{15} \widehat{dp}_{t+k}$
CRSP Data 1929-2022	0.57	-0.23	0.20
IMA FCF and V 1929-2022	0.46	-0.71	-0.17

- Similar finding in Larrain and Yogo (2008)
- Is FCF growth predictable because growth of after-tax GVA is predictable, or because FCF share of GVA is predictable?
- Answer: It's the latter $\Rightarrow$ motivation for share shocks

Why the Difference Between CRSP and IMA Data?



- Dividends smooth FCF over the business cyle
- Zeng and Luk (2020) S&P 1500 payouts
- Public firms are also generating large amounts of cash for equity owners
- Finite sample regression may not pick up low frequency growth in dividends per share Campbell (2018) page 141

Part 3: A baseline "Accounting" Model

- Stochastic growth model with factorless income
- Purpose of Accounting Model:
  - Divide Enterprise Value
    - Value of Physical Capital
    - Value of Factorless Income
  - Divide Free Cash Flow
    - Free Cash Flow to Physical Capital ($R_{Kt}K_t - Invest_t$)
    - Factorless Income
- Different factors drive Enterprise Value at different times
- Use model for Campbell-Shiller Excess Volatility exercise
- Implications for returns to physical capital

Minimal extension of standard stochastic growth model

$$GVA_t = K_t^\alpha (Z_t L)^{1-\alpha}$$
$$K_{t+1} = (1-\delta_t) K_t + I_t$$

- Firms pay taxes
$$Y_t = (1-\tau_t) GVA_t$$
- Wedge between total revenue and cost of labor and physical capital
$$Y_t = \mu_t \left(R_{Kt} K_t + W_t L \right)$$
- Factorless income (profit) share of after-tax value added
$$\frac{\Pi_t}{Y_t} = \left(1 - \frac{1}{\mu_t}\right) \equiv \kappa_t$$
- Factor Shares:
$$\begin{aligned} \frac{W_t L}{Y_t} &= (1-\alpha)(1-\kappa_t) \\ \frac{R_{Kt} K_t}{Y_t} &= \alpha(1-\kappa_t) \end{aligned}$$

Interpretation of Factorless Income

- Karabarbounis and Neiman (2018)
- Managers run firms that own installed non-financial assets
- Opportunity cost of those installed assets $R_{Kt}K_t$
  - not a cash flow for firm that owns its own capital
- Is total revenue below or above total cost $R_{Kt}K_t + W_tL$?
  - below ($\kappa_t < 0$). Inefficient management, etc.
  - above ($\kappa_t > 0$). Monopoly power, etc.
  - equal ($\kappa = 0$).
  - Competitive benchmark in product markets and market for control
- Either way, Free Cash Flow still positive, so firm can survive with $\kappa_t < 0$

Using model to interpret valuations

- Minimal model structure already quite useful
- Can decompose valuations into portions reflecting:
  1. value of physical capital and income from that capital
  2. value of claims to factorless income and flow of factorless income
- No adjustment costs ⇒

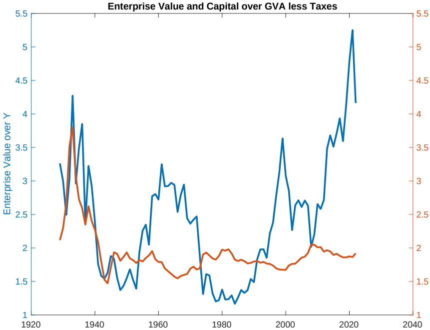
$$V_t^K = Q_t K_{t+1}$$

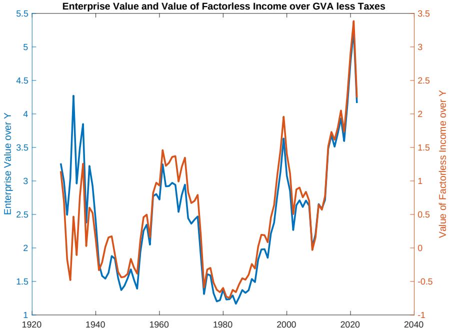
and thus

$$V_t^\Pi = V_t - Q_t K_{t+1}$$

- Observe Enterprise Value V_t and replacement cost of capital $Q_t K_{t+1}$
- So no parameters needed to measure V_t^Π

Enterprise Value, Capital, and Value of Factorless Income





- "Standard" Story: Capital-Output drives Enterprise Value 1929 - WWII
- Value of Factorless Income drives Enterprise Value since WWII
- Corresponds to Tobin's Q

Factorless Income and Free Cash Flow to Capital

- Fix $\alpha = 0.2646$ (return to this)
- κ_t to match IMA labor share of after-tax value added, $\frac{W_t L}{Y_t}$

$$\kappa_t = 1 - \frac{\frac{W_t L}{Y_t}}{1 - \alpha}$$

- Implies division of Free Cash Flow

$$\frac{FCF_t}{Y_t} = \underbrace{\frac{Y_t - W_t L}{Y_t}}_{\text{after-tax GOS}} - \underbrace{\frac{Q_t I_t}{Y_t}}_{\text{Investment}}$$

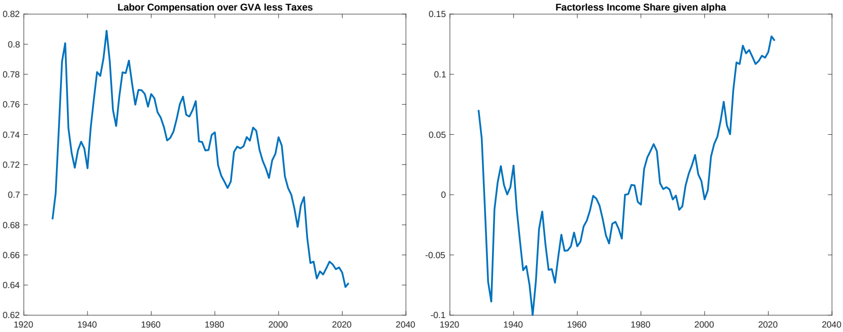
- into Factorless Income

$$\frac{\Pi_t}{Y_t} = \kappa_t$$

- and Free Cash Flow to Capital

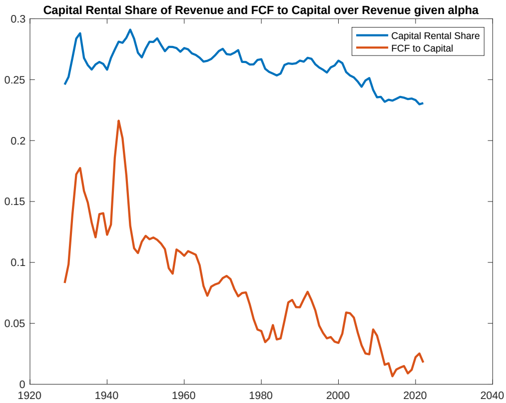
$$\frac{FCF_t^K}{Y_t} = \frac{R_{Kt} K_t}{Y_t} - \frac{Q_t I_t}{Y_t} = \alpha(1 - \kappa_t) - \frac{Q_t I_t}{Y_t}$$

Labor Share and Share of Factorless Income



- Factorless Income Share mirror image of Labor Share
- $\alpha = 0.2646$ implies average factorless income share of 1%

Implications for FCF to Capital



- Startling decline in implied FCF to Capital
- Abel, Mankiw, Summers, Zeckhauser 1989 Dynamic Efficiency?

A Campbell-Shiller (1987) Style Excess Volatility Exercise

- Take value of factorless income $\frac{V_{\Pi t}}{Y_t}$ directly from the balance sheet
- Given α, take quantity of factorless income $\frac{\Pi_t}{Y_t} = \kappa_t$ from flows
- Model $\mathbb{E}_t \kappa_{t+k}$
- Is $\mathbb{E}_t \kappa_{t+k}$ volatile enough to account for $\frac{V_{\Pi t}}{Y_t}$ at constant discount rates?
- Yes, if
  - $r - g$ for a claim to all of aggregate output is low
- Key point: discount rate for a claim to aggregate output is the relevant r not equity

Valuing Factorless Income

- General Formula with pricing kernel k steps ahead $M_{t,t+k}$
- Value of a claim to aggregate output at horizon k

$$\frac{P^{Y}_{t,t+k}}{Y_t} = \mathbb{E}_t M_{t,t+k} \frac{Y_{t+k}}{Y_t}$$

- Value of a Claim to Factorless Income at horizon k

$$\frac{P^{\Pi}_{t,t+k}}{Y_t} = \mathbb{E}_t M_{t,t+k} \frac{Y_{t+k}}{Y_t} \kappa_{t+k}$$

$$\frac{P^{\Pi}_{t,t+k}}{Y_t} = \frac{P^{Y}_{t,t+k}}{Y_t} \mathbb{E}_t \kappa_{t+k} + \mathbb{C}ov_t \left(M_{t,t+k} \frac{Y_{t+k}}{Y_t}, \kappa_{t+k} \right)$$

- Value of a claim to output and value of a claim to factorless income

$$\frac{V^{Y}_t}{Y_t} = \sum_{k=1}^{\infty} \frac{P^{Y}_{t,t+k}}{Y_t} \qquad \frac{V^{\Pi}_t}{Y_t} = \sum_{k=1}^{\infty} \frac{P^{\Pi}_{t,t+k}}{Y_t}$$

- Analytical formulas using Essentially Affine Pricing Kernel and conditionally normal κ_{t+1} in appendix Key Formula

Valuing Factorless Income with Constant Discount Rates

- Assume constant prices for claims to output

$$\frac{P^Y_{t,t+k}}{Y_t} = \left(\frac{P^Y_1}{Y}\right)^k$$

- Implies constant price-dividend ratio for a claim to output

$$\frac{V^Y}{Y} = \frac{\frac{P^Y_1}{Y}}{1 - \frac{P^Y_1}{Y}}$$

- Assume constant risk adjustment for κ_{t+k}

$$\mathbb{C}ov_t\left(M_{t,t+k}\frac{Y_{t+k}}{Y_t}, \kappa_{t+k}\right) = D_k$$

- Implies

$$\frac{V^\Pi_t}{Y_t} = \sum_{k=1}^{\infty}\left(\frac{P^Y_1}{Y}\right)^k \mathbb{E}_t\kappa_{t+k} + constant$$

- Next, a process of $\mathbb{E}_t\kappa_{t+k}$

Process for factorless income

- Assume factorless income follows AR(1) with shifting endpoint

$$\begin{aligned} \kappa_{t+1} - x_{t+1} &= \rho(\kappa_t - x_t) + \varepsilon_{\kappa,t+1} \\ x_{t+1} &= x_t + \varepsilon_{x,t+1} \end{aligned}$$

$\Rightarrow$

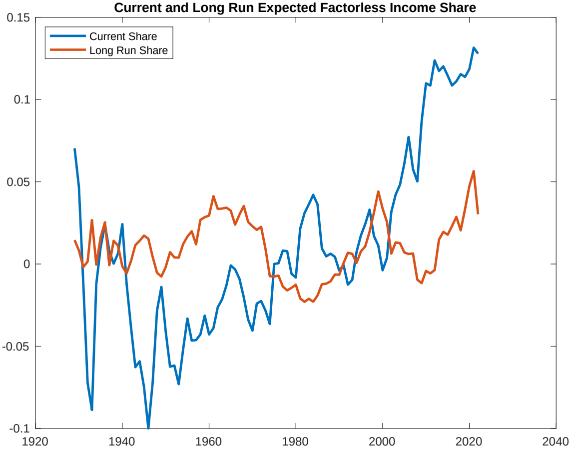
$$\begin{aligned} \mathbb{E}_t[\kappa_{t+k}] &= \rho^k \kappa_t + (1-\rho^k) x_t \\ \mathbb{E}_t[\kappa_{t+\infty}] &= x_t \end{aligned}$$

- Implies

$$\frac{V_t^{\Pi}}{Y_t} = \frac{\rho \frac{V^Y}{Y}}{1 + (1-\rho)\frac{V^Y}{Y}} (\kappa_t - x_t) + \frac{V^Y}{Y} x_t + F$$

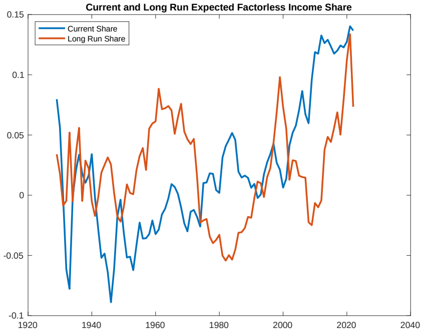
- Given data on $\frac{V_t^{\Pi}}{Y_t}, \kappa_t$ and assumed $\frac{V_Y}{Y}, \rho, F$, what x_t sequence do we need to match the data? Is it reasonable?

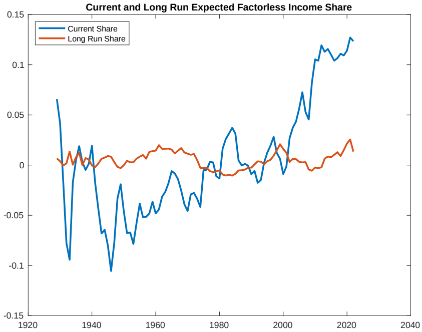
Baseline Results



- Baseline $\frac{V^Y}{Y} = 50$ and $\rho = 0.9$ $F = 0$
- Red line $\mathbb{E}_t \kappa_{t+\infty} = x_t$ needed to account for V_t^{Π}/Y_t
- Is that too volatile?
- This x_t does forecast future κ_{t+k}

Alternative Values of V^Y/Y





- Left: $V^Y/Y = 25$, volatile $\mathbb{E}_t \kappa_{t+\infty} = x_t$
- Right: $V^Y/Y = 100$, smooth $\mathbb{E}_t \kappa_{t+\infty} = x_t$
- Some argue $V^Y/Y \to \infty$

Is V_t^{Π}/Y_t too Volatile?

- What is $\frac{V^Y}{Y} = \frac{(1+g^Y)}{r^Y - g^Y}$?
- Growth in output is not that volatile, so should be less risky than equities
- Lustig, Nieuwerburgh, Verdelhan (2013) $V^C/C \approx 80$
- Blanchard (2019) $V^Y/Y \to \infty$
  - How big a fiscal adjustment is needed?

Implications for the Returns to Capital

- How does the return on Physical Capital compare to the return on Enterprise Value?
- Choice of α determines κ_t
- Returns to Enterprise Value and Capital are linked

$$\underbrace{\frac{FCF_{t+1} + V_{t+1}}{V_t}}_{\text{Return to Enterprise Value}} = \underbrace{\left(\frac{FCF_{t+1} - \kappa_{t+1} Y_{t+1} + Q_{t+1} K_{t+2}}{Q_t K_{t+1}}\right)}_{\text{Return to Capital}} \frac{Q_t K_{t+1}}{V_t} +$$

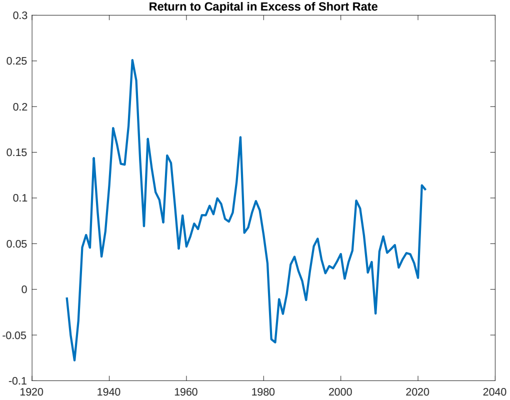
$$\underbrace{\left(\frac{\kappa_{t+1} Y_{t+1} + V_{\Pi t+1}}{V_t}\right)}_{\text{share weighted return to factorless income}}$$

Arithmetic Excess Returns to Capital

Return	Time Period	Mean Excess Return	Std Excess Return
Enterprise Value	1929-2022	0.080	0.158
Capital $\alpha = 0.2646$	1929-2022	0.069	0.065
Capital $\alpha = 0.1800$	1929-2022	0.011	0.061

- Realized Excess Returns on Capital not very volatile
- so does capital have a high excess return?
- What about the dynamics of the returns to capital over decades?

Dynamics of Return to Capital



- Baseline α
- Capital Returns WWII to late 1970's implausibly high
- Since 1980's Capital Returns track riskless rate with moderate premium
- WWII to late 1970's are a puzzle

Conclusions

- IMA a useful dataset for macrofinance
- Plenty of volatility in cash flows to owners of US Corporations
- Returns to physical capital WWII - early 1980's seem too high.
  - A puzzle

A Popular Log-Linearization of Returns

- Return on any asset

$$\exp(r_{t+1}) = \frac{P_{t+1} + D_{t+1}}{P_t} = \left[\frac{\frac{P_{t+1}}{D_{t+1}} + 1}{\frac{P_t}{D_t}} \right] \frac{D_{t+1}}{D_t}$$

- Loglinear approximation

$$\hat{r}_{t+1} \approx -\rho \widehat{dp}_{t+1} + \widehat{dp}_t + \hat{g}_{Dt+1} \qquad \rho \equiv \frac{\overline{P/D}}{\overline{P/D} + 1}$$

- Implies

$$\widehat{dp}_t \approx \hat{r}_{t+1} - \hat{g}_{Dt+1} + \rho \widehat{dp}_{t+1}$$

- iterate k times

$$\widehat{dp}_t \approx \sum_{j=1}^{k} \rho^{j-1} \hat{r}_{t+j} - \sum_{j=1}^{k} \rho^{j-1} \hat{g}_{Dt+j} + \rho^k \widehat{dp}_{t+k}$$

Implies a common set of regressions

- Does $\widehat{dp}_t$ forecast future returns or dividend growth?

- Three regressions (given horizon k)

$$\sum_{j=1}^{k} \rho^{j-1} \hat{r}_{t+j} = \alpha_r^k + \beta_r^k \widehat{dp}_t + \epsilon_{rt+k}$$

$$\sum_{j=1}^{k} \rho^{j-1} \hat{g}_{Dt+j} = \alpha_{gD}^k + \beta_{gD}^k \widehat{dp}_t + \epsilon_{gDt+k}$$

$$\rho^k \widehat{dp}_{t+k} = \alpha_{dp}^k + \beta_{dp}^k \widehat{dp}_t + \epsilon_{dpt+k}$$

$$\beta_r^k - \beta_{gD}^k + \beta_{dp}^k = 1$$

- fraction of variation in dividend yield attributable to each source
- Which coefficient is big?

Back

Useful Formula

Back

- If x and y and z are independent standard normal random variables
- and a, b, c, d are scalar constants, then

$$\mathbb{E}\exp(ax + by)(cx + dz) = ca\exp((a^2 + b^2)/2)$$

- One can derive this formula using the moment generating function for normal random variables.