

The End of Privilege: a Reexamination of the Net Foreign Asset Position of the United States

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Views expressed herein are of the authors and not necessarily of the Federal Reserve Bank of Minneapolis or the Federal Reserve System.

After GFC big decline in Net Foreign Asset Position of the United States



- NFA = Mkt value of claims of US residents (holds + institutions) on foreigners - Mkt value of claims of foreigners on US residents

Part 1: What drives the decline?

- **Original view emphasized current account**
 - ▶ NFA dynamics reflect national saving
 - ▶ e.g. US savings low in 1980s \Rightarrow current account deficits \Rightarrow deterioration in US NFA

U.S. Current Account show no big deterioration



Part 1: What drives the decline?

- **Newer view recognizes valuations matter**
 - ▶ Gourinchas & Rey (2007) emphasized that changes in relative prices of portfolios of foreign assets/liabilities can induce adjustment in NFA
 - ▶ United States able to run substantial current account in the 1990s without blowing up its NFA (**our notion of privilege**)
 - ▶ But recently modest CA deficits + rapidly deteriorating NFA
- **Post GFC: What Happened?**
- Big boom in value of US Corporations (**relative to foreign**)
- **The End of Privilege** (ex-post)
 - ▶ US NFA position is now worse than cumulated CA deficits
 - ▶ International Income Puzzle and Ex-ante Privilege

Part 2: What does this mean for US residents?

- What drove the boom in value of US corporations?
 - ▶ discount factor and expected growth rate?
 - ▶ unexpected increase in **US** profitability?
 - ▶ taxes? labor share in costs?
 - ▶ unmeasured capital?
- Open economy macro-finance model building on Farhi and Gourio (2018), Greenwald, Lettau and Ludvigson (2019), Eggertsson, Robbins and Wold (2022), Crouzet and Eberly (2021) and others.
 - ▶ Extend model to include implications for U.S. CA and NFA
 - ▶ CKM(2007) style measurement of factors driving:
 - ▶ US Corporate, flows, stocks, valuation and US CA and NFA

Part 2: Results

- “Reduced Form” evidence
 - ▶ huge increase in Free Cash Flow to owners of U.S. Corporations
 - ▶ valuation multiple fairly stable
- Model driven results
 - ▶ Integrating CA in model “identifies” discount rate and expected growth
 - ▶ “Output wedge” key driver of boom in free cash flow and valuation
 - ▶ robust to wide array of alternative “identification” schemes
- Welfare implications for US residents
 - ▶ Nearly zero absent international equity diversification
 - ▶ Very large and negative given observed equity diversification
 - ▶ Int’l diversification dramatically changes welfare impact of “wedge”

Part 1: Data Outline

- NFA dynamics
 - ▶ NFA breakdown into cumulated
 - ▶ Current Account
 - ▶ Valuation Effects
 - ▶ Accounting Residual
 - ▶ Valuation Effects are mostly equity
 - ▶ Big growth in cross border equity positions
 - ▶ Big outperformance of US equity driving NFA revaluations past decade
- U.S. Corporate Sector
 - ▶ Measurement Concepts
 - ▶ Enterprise Value of US resident corporations
 - ▶ Free Cash Flow
 - ▶ Boom in US Enterprise Value
 - ▶ Boom in US Free Cash Flow
 - ▶ No Trend in Valuation Multiple

Part 1: Accounting for NFA Dynamics

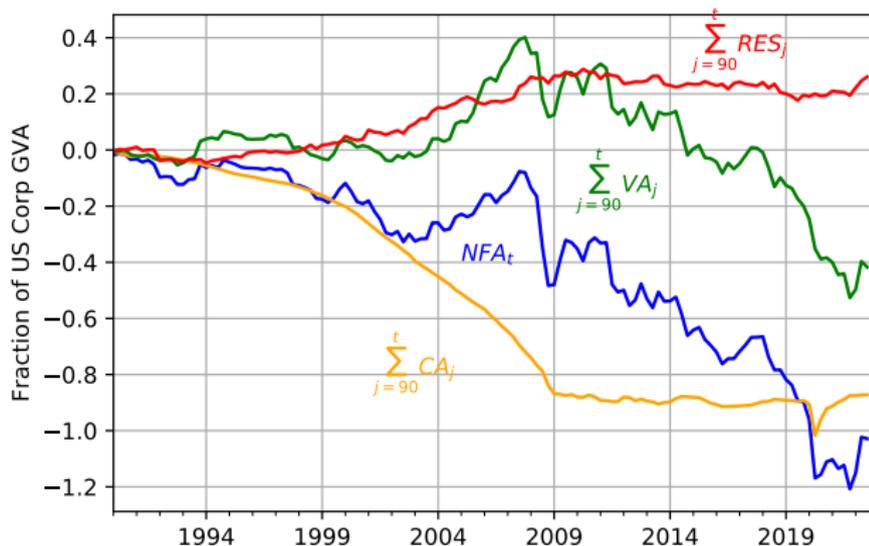
$$NFA_{t+1} - NFA_t = \underbrace{CA_t}_{\text{Net lending abroad}} + \underbrace{VA_t}_{\text{Valuation Effects}}$$

$$VA_t = USFA_t \times g_{P^*}^{t,t+1} - USFL_t \times g_P^{t,t+1}$$

- Iterating yields

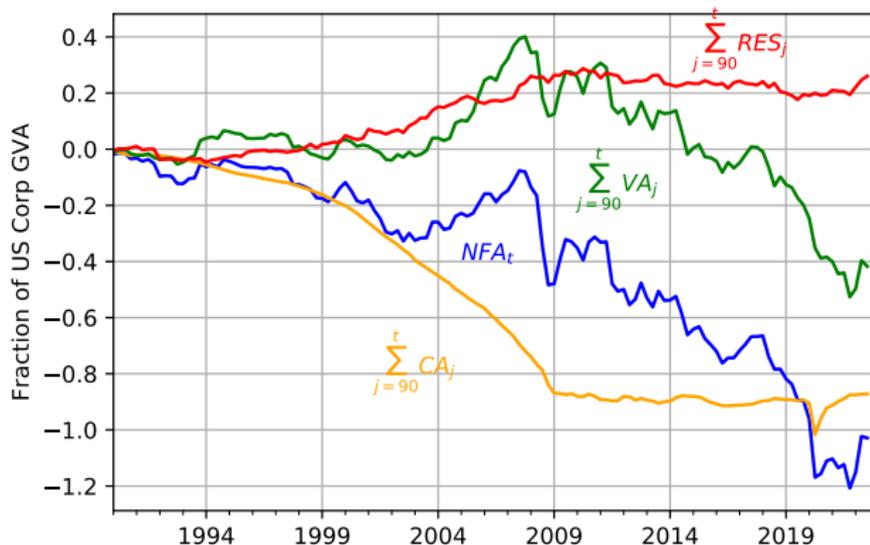
$$NFA_t - NFA_0 = \underbrace{\sum_{j=0}^t CA_j}_{\text{Cumul. net lending}} + \underbrace{\sum_{j=0}^t VA_j}_{\text{Cumul. valuations}}$$

The Privilege



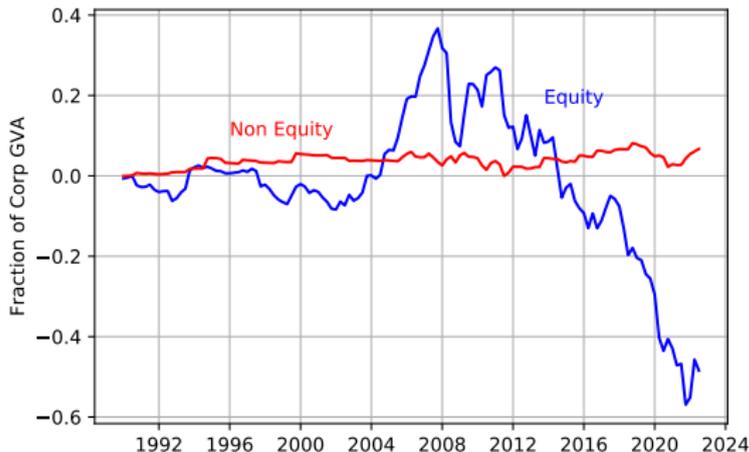
- Pre 2010: US run substantial CA deficits, yet NFA did not decline much due to positive valuation effects (Gourinchas and Rey, 2007)

The Privilege and its end



- Post 2010: US $Cum(CA)/Y$ stabilizes, **negative valuation effects** drive decline in NFA

Net Cumulated Valuations Effects



- Large international variation in values of outstanding equity portfolios, little variation in valuation of non-equity (bonds, currency, etc)

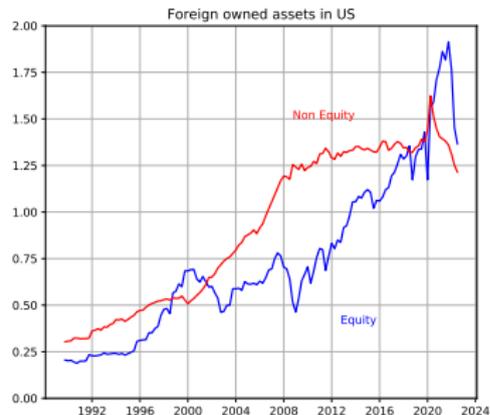
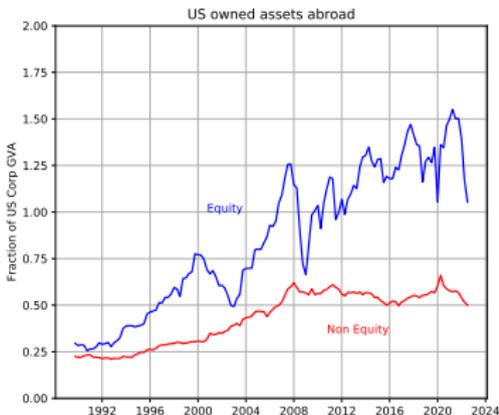
Portfolio and FDI equity

Digging into valuation effects

$$VA_t = USFA_t \times g_{P^*}^{t,t+1} - USFL_t \times g_P^{t,t+1}$$

- For valuation effects to matter need:
 1. Large gross positions, $USFA_t$, $USFL_t$
 2. Differences in asset price dynamics $g_P^{t,t+1}$ and $g_{P^*}^{t,t+1}$

Large Gross Positions



- In recent years both equity and non equity positions are large!
- Equity is both portfolio and direct investment equity

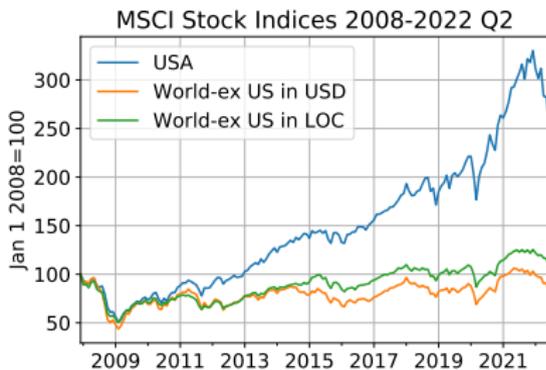
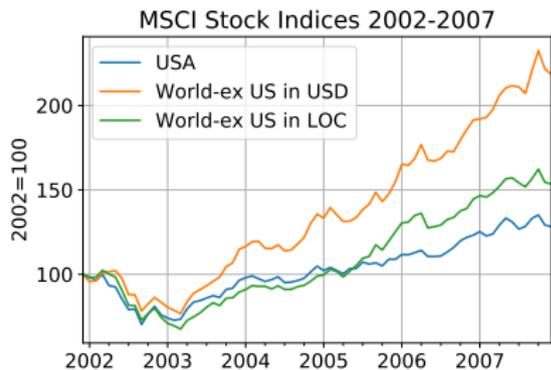
Issue with measuring gross positions

What accounts for equity revaluations?

Two key candidate drivers

- Exchange rates
- Stock prices

Two valuation episodes



- 2002-2007: Equity valuations favor US, USD depreciation important
- 2008-2022Q2: Equity valuations against US, mostly driven by US stocks outperforming foreign stocks

Part 1: Data on US Corporate Sector

- U.S. Corporate Sector
 - ▶ Measurement Concepts
 - ▶ Enterprise Value of US resident corporations
 - ▶ Free Cash Flow
- Boom in US Enterprise Value
- Boom in US Free Cash Flow
- No Trend in Valuation Multiple

Corporate Sector Measurement V, K, D, E

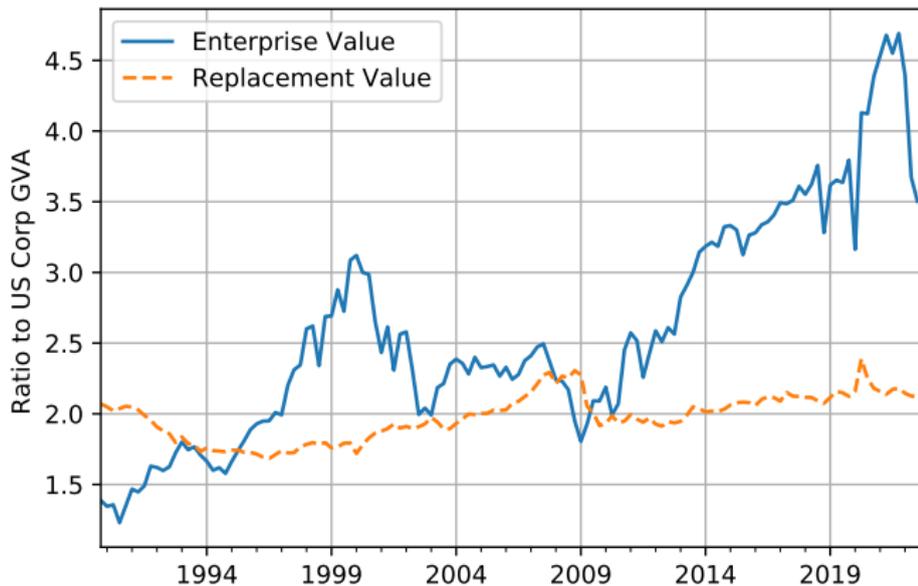
- In our simple model, firms are 100% equity financed
⇒ V is total market value of non-financial assets
- Flow of Funds reports **market value and replacement cost** of non-financial assets in US **resident corporate sector**
- NIPA measures flows for **resident corporate sector**

Corporate Sector Balance Sheet

Assets	Liabilities
Non-financial assets Replacement and Enterprise Value	Market value of equity
Financial assets	Financial liabilities (debt, bank loans etc)

- Model D is **free cash flow** that can be paid to investors:
- $D = \text{Output} - \text{Wages} - \text{Investment} - \text{Corp. Taxes} - \text{IBT}$
- $E = \text{Output} - \text{Wages} - \text{CFC} - \text{Corp. Taxes} - \text{IBT}$

Enterprise Value and Capital US Corporate Sector



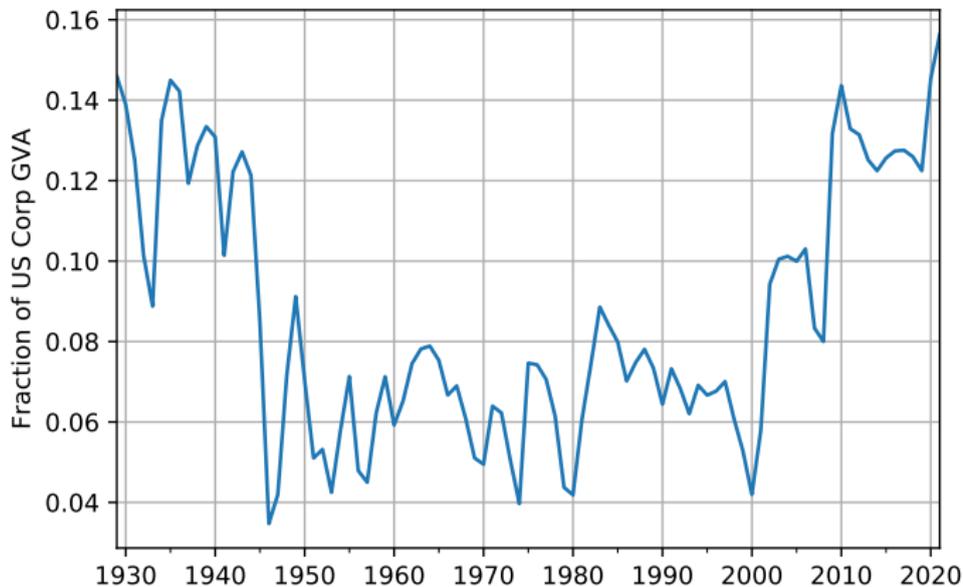
- Big boom in Enterprise Value to GVA. Stable Capital/Output ratio

Free Cash Flow US Corporate Sector



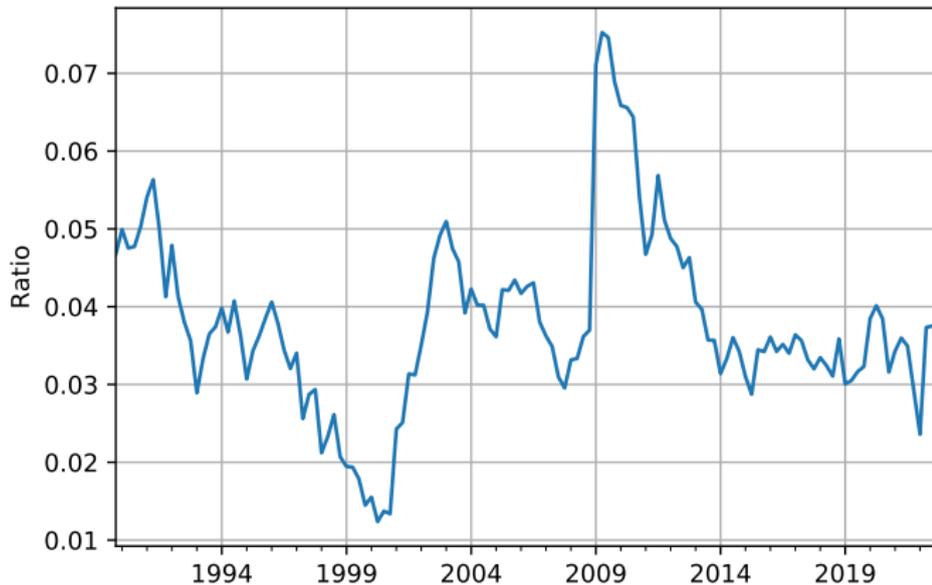
- Free Cash Flow = GVA - Taxes - Labor Compensation - Investment
- Big boom in Free Cash Flow to GVA

Free Cash Flow US Corporate Sector back to 1929



- Boom in Free Cash Flow to GVA not seen in prior post WWII data

Free Cash Flow to Enterprise Value US Corporate Sector



- No trend in valuation ratio D_t/V_t [Blue Angels](#) [ROW Data](#) [D*/V* on US equity in ROW](#)

Part 2: What Drives Rising US Asset Values?

1. Rising profitability of US corporations

- ▶ Farhi and Gourio (2018), Eggertson, Robbins, Wold (2021), Crouzet and Eberly (2021)
- ▶ Greenwald, Lettau, Ludvigson (2020): *“the considerable gains to holding equity over the post-war period can be in large part attributed to an unpredictable sequence of factor share shocks that reallocated rewards to shareholders”*
- ▶ De Loecker, Eeckhout, Unger (2020), Akcigit et al. (2021), Philippon (2019) evidence on rising market power
- ▶ Barkai (2020), Karabarbounis, Neimann (2014, 2019) evidence on decline in labor share, rise in factorless income
- ▶ Gutierrez and Philippon (2017) evidence on weak investment growth, notwithstanding low interest rates

2. Changing Discount Factors and Expected Growth Rates

Simple analytical quantitative macro finance model

- Similar to Farhi and Gourio (2018) in an international setting
- Chari, Kehoe, Mcgrattan (2007) style measurement of factors driving
 - ▶ US Corporate Sector flows, stocks, valuation
 - ▶ Gross Value Added, CFC, Labor Compensation, Investment
 - ▶ \implies Free Cash Flow and Earnings E_t
 - ▶ Replacement Value of Capital
 - ▶ Enterprise Value
 - ▶ \implies all standard accounting and valuation ratios
 - ▶ and US CA and NFA
- Match all these data every quarter 1990 - 2022
- Counterfactuals to quantify implications for US welfare

Key Model Elements

- US and ROW, common expected trend productivity growth \bar{g}_{t+1}
- ROW preferences linear — pins down r_{t+1}^* for world
- Equity portfolios match those in data each period, trade in a risk free bond finances current accounts
- Output wedge μ_t — Bertrand competition between leader and follower firms implies markup is gap in marginal costs
- Share of capital in costs α_t , and growth from t to $t + 1$ g_{t+1}
- Tax rate τ_t , price of capital Q_t , depreciation rate δ_t ,
- At t , parameter values at $t + 1$ are observed and expected to persist

Firms

- Final output is CES composite of intermediate varieties

$$Y = \left(\int_0^1 Y_i^{\frac{\varepsilon-1}{\varepsilon}} di \right)^{\frac{\varepsilon}{\varepsilon-1}}$$

- Each variety i can be produced by
 - ▶ single **leader firm** with productivity z_H
 - ▶ competitive fringe of **followers** with productivity z_L

$$Y_i = zK_i^\alpha (ZL_i)^{1-\alpha}$$

- Firms rent capital at rate R and labor at rate W
- Growth in labor productivity Z_t from t to $t+1$ at rate g_{t+1}
- Expected growth in labor productivity Z_{t+1} from $t+1$ on \bar{g}_{t+1}
- Tax rate τ_t on output

Firms

- Leader firms produce all output in equilibrium
- Gross markups are given by

$$\mu_t = \min \left\{ \frac{\varepsilon}{\varepsilon - 1}, \frac{z_{Ht}}{z_{Lt}} \right\}$$

- Assume $\mu_t = \frac{z_{Ht}}{z_{Lt}}$: followers are close and leaders engage in **limit pricing**:
 - ▶ produce just enough to drive p_i down to followers' unit cost, discourage entry
 - ▶ markups can raise either because leader more productive, or because followers less productive
- Other firms make investment decisions and rent out capital

$$\max_{\{K_{t+1}\}} \mathbb{E}_0 \sum_{t=0}^{\infty} \frac{1}{(1 + r_{t+1}^*)^t} [R_t K_t + (1 - \delta_t) Q_t K_t - Q_t K_{t+1}]$$

Households

- US Preferences

$$E \sum_{t=0}^{\infty} \left(\frac{1}{1+\rho} \right)^t \log(C_t)$$

- ROW prefs: risk neutral, discount factor $\rho_{t+1}^* \Rightarrow r_{t+1}^* = \rho_{t+1}^*$
- US Households hold shares λ_{t-1} and λ_{t-1}^* of domestic and foreign firms
- Trade risk free bonds internationally that pay r_t^*

$$C_t + B_{t+1} + (\lambda_t - \lambda_{t-1})V_t + (\lambda_t^* - \lambda_{t-1}^*)V_t^* = \\ W_t L_t + (1 + r_t^*)B_t + \lambda_{t-1} D_t + \lambda_{t-1}^* D_t^*$$

- Set λ_t and λ_t^* to match observed equity holdings. ROW share of US Equity

Equilibrium Factor Shares, Earnings, and Dividends

- Firm FOCs plus symmetry across varieties gives factor income shares

$$\frac{R_t K_t}{Y_t} = (1 - \tau_t) \frac{\alpha_t}{\mu_t}$$
$$\frac{W_t L_t}{Y_t} = (1 - \tau_t) \frac{1 - \alpha_t}{\mu_t}$$

- Rest of output is monopoly profits (factorless income)

$$\frac{\Pi_t}{Y_t} = (1 - \tau_t) \frac{\mu_t - 1}{\mu_t}$$

- Optimal investment (assume $\mathbb{E}_t Q_{t+1} = Q_t$)

$$R_{t+1} K_{t+1} = (r_{t+1}^* + \delta_{t+1}) Q_t K_{t+1} \quad (1)$$

- Dividends and Earnings

$$D_t = (1 - \tau_t) Y_t - W_t L_t - I_t$$
$$E_t = (1 - \tau_t) Y_t - W_t L_t - \delta_t Q_t K_t$$

- τ_t, δ_t, Q_t directly from data. If you know r_{t+1}^* can solve for μ_{t+1} and α_{t+1}
- Barkai (2020) and Karabarbounis and Neiman (2019)

Asset Values

- Firm value is discounted present value of dividends

$$V_t = \sum_{j=1}^{\infty} \frac{D_{t+j}}{(1 + r_{t+1}^*)^j}$$

- Equals capital stock plus discounted value of monopoly profits

$$V_t = Q_t K_{t+1} + \frac{\Pi_{t+1}}{(r_{t+1}^* - \bar{g}_{t+1})}$$

- Valuation multiple, the earnings yield, and Tobin's Q

$$r_{t+1}^* - \bar{g}_{t+1} = \frac{E_{t+1}}{V_t} - \bar{g}_{t+1} \frac{Q_t K_{t+1}}{V_t}$$

- One equation in two unknowns r_{t+1}^* and \bar{g}_{t+1}
- Use Current Account for our second equation in these two variables

US Current Account

- Corporate Savings equals Investment, Gov't Savings equals zero
- US Households have all US owned financial assets and US labor income
- Log utility over consumption and exogenous labor supply
- Consume fraction $(1 - \beta)$ of their wealth
- \implies Household Savings and Current Account

$$CA_t = Income_t - \frac{\rho}{1 + \rho} Wealth_t$$

$$Income_t = r_t^* B_t + \lambda_{t-1} D_t + \lambda_{t-1}^* D_t^* + W_t L_t$$

$$Wealth_t = Income_t + B_t + \lambda_{t-1} V_t + \lambda_{t-1}^* V_t^* + H_t$$

H_t is discounted present value of labor income from $t + 1$ on

What drives the Current Account?

- Comparison of Income vs. Wealth

$$(1 + \rho)CA_t = Income_t - \rho (B_t + \lambda_{t-1}V_t + \lambda_{t-1}^*V_t^* + H_t)$$

- Weighted Sum of Income Yields vs. Rate of Time Preference

$$(1 + \rho)CA_t = \underbrace{\lambda_{t-1}\left(\frac{D_t}{V_t} - \rho\right)V_t}_{\text{US Equity}} + \underbrace{\lambda_{t-1}^*\left(\frac{D_t^*}{V_t^*} - \rho\right)V_t^*}_{\text{ROW Equity}} +$$

$$\underbrace{(\beta r_t^* - \rho)B_t}_{\text{Net Non-Equity}} + \underbrace{\left(\frac{W_t L_t}{H_t} - \rho\right)H_t}_{\text{Human Wealth}}$$

$$H_t = \frac{W_{t+1}L_{t+1}}{r_{t+1}^* - \bar{g}_{t+1}}$$

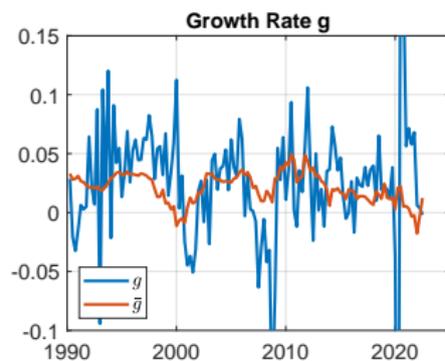
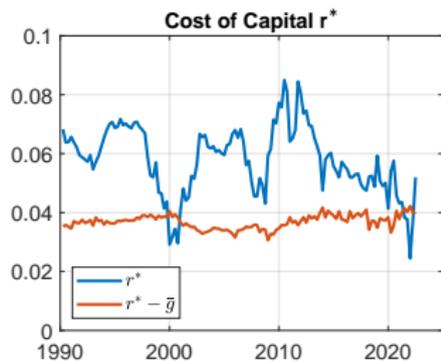
- All terms directly observed except $r_{t+1}^* - \bar{g}_{t+1}$ in definition of H_t

What drives the Current Account?

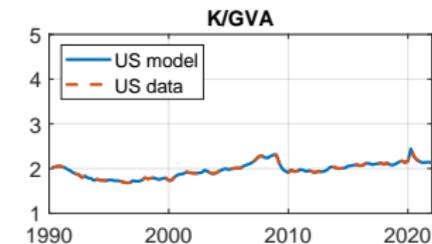
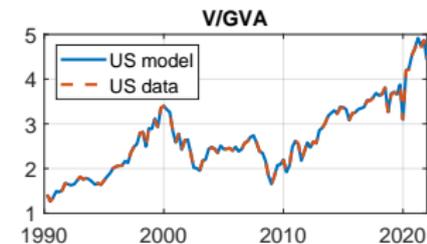
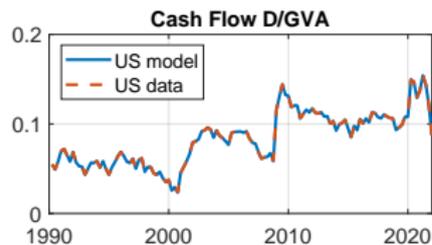
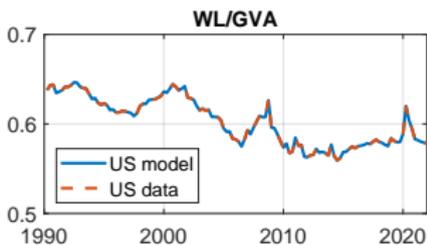
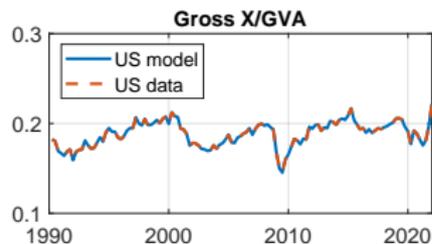
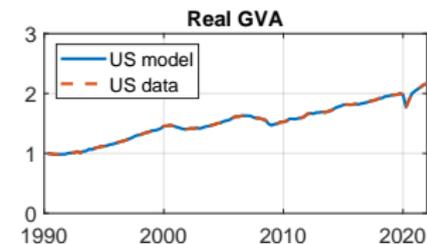
$$(1 + \rho)CA_t = \underbrace{\lambda_{t-1}\left(\frac{D_t}{V_t} - \rho\right)V_t}_{\text{US Equity}} + \underbrace{\lambda_{t-1}^*\left(\frac{D_t^*}{V_t^*} - \rho\right)V_t^*}_{\text{ROW Equity}} + \underbrace{(\beta r_t^* - \rho)B_t}_{\text{Net Non-Equity}} + \underbrace{\left(\frac{W_t L_t}{H_t} - \rho\right)H_t}_{\text{Human Wealth}}$$

- On BGP $CA_{t+1} = \bar{g}_{t+1}B_t$
- Business Cycle fluctuations in $\frac{D_t}{V_t}$, $\frac{D_t^*}{V_t^*}$, $\frac{W_t L_t}{H_t}$ due to fluctuations in current output and investment relative to trend
- These effects dominant in standard international business cycle models
- Changes in these current dividend yields due to changes in r_{t+1}^* and \bar{g}_{t+1}
- These effects very small in standard international business cycle models
- Aggregate Human Wealth is very big so must have $r_{t+1}^* - \bar{g}_{t+1}$ close to constant to avoid massive fluctuations in CA_t .

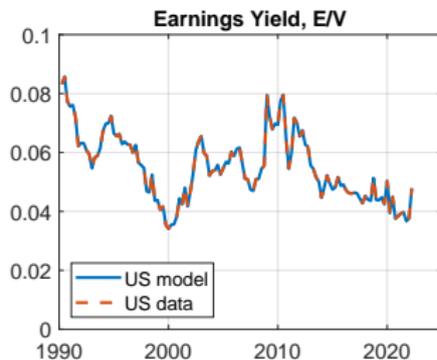
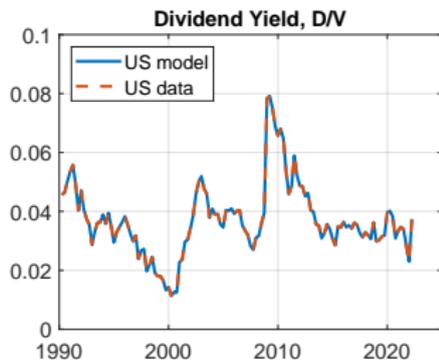
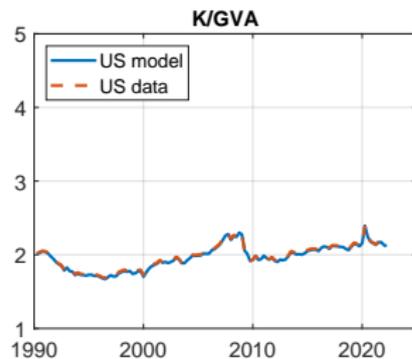
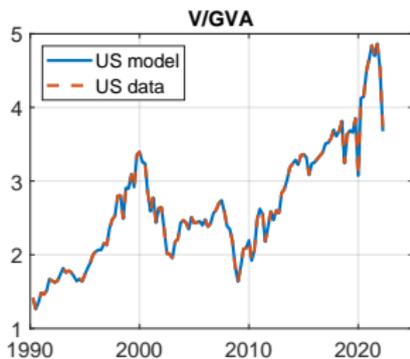
Baseline Results



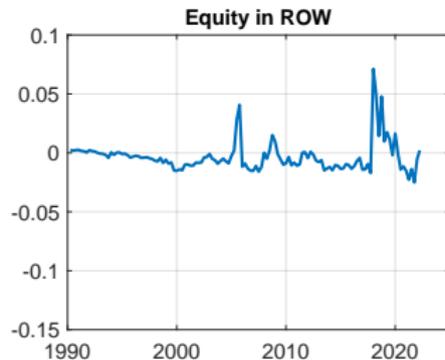
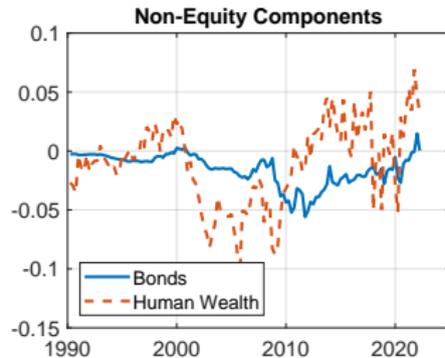
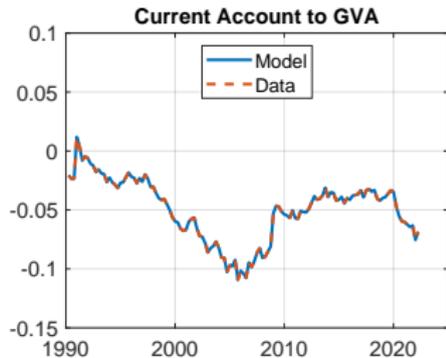
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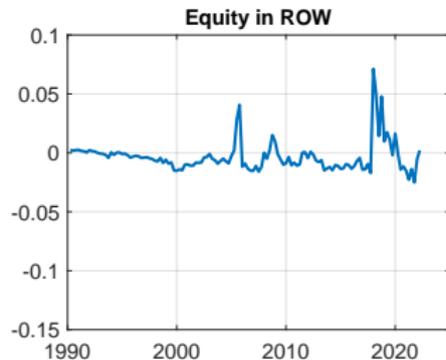
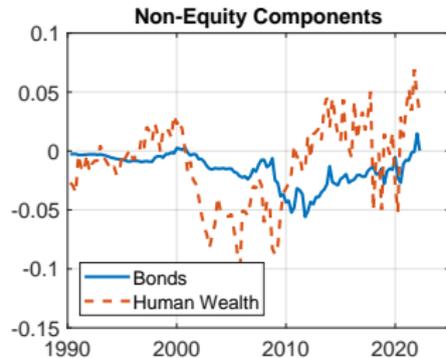
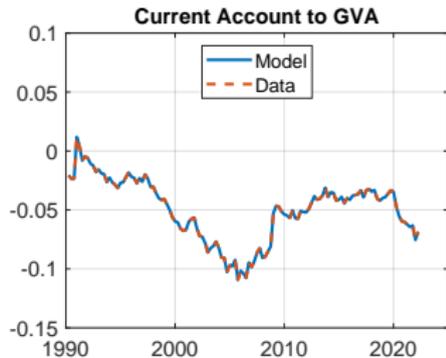
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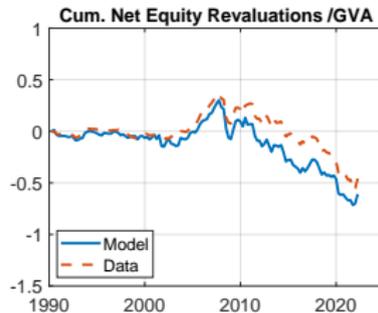
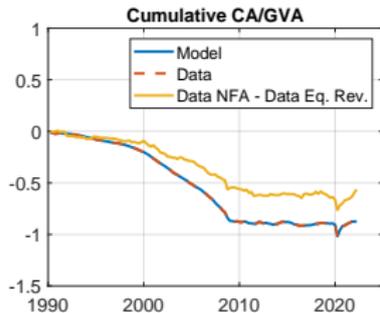
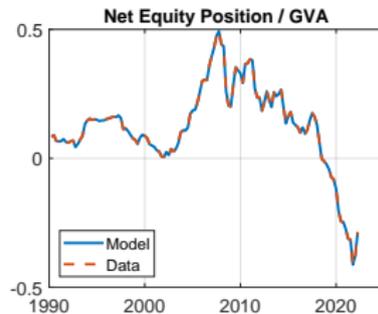
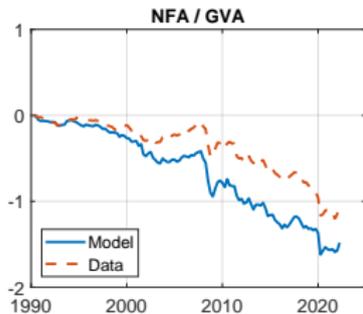
Baseline Results



Baseline Results



Baseline Results



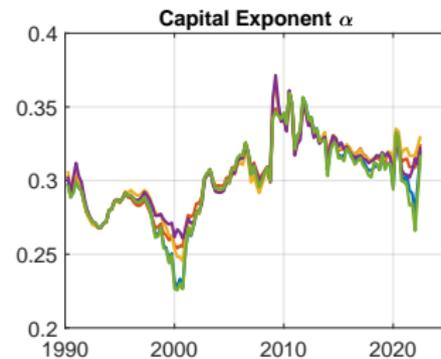
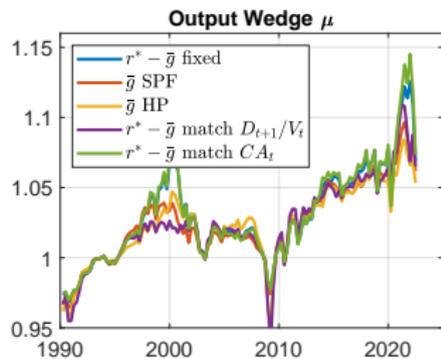
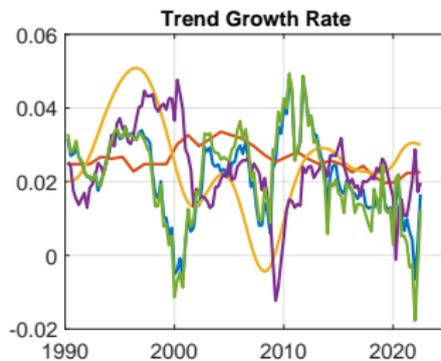
Sensitivity Analysis

- Closed Economy macro finance models do not use current account data
- Valuation multiple, the earnings yield, and Tobin's Q

$$r_{t+1}^* - \bar{g}_{t+1} = \frac{E_{t+1}}{V_t} - \bar{g}_{t+1} \frac{Q_t K_{t+1}}{V_t}$$

- Farhi and Gourio (2018), Crouzet and Eberly (2021) etc. make assumptions about \bar{g}_{t+1} or $r_{t+1}^* - \bar{g}_{t+1}$ to “identify” r_{t+1}^*
- We try four alternative “identifying” assumptions
 - ▶ $r_{t+1}^* - \bar{g}_{t+1}$ constant
 - ▶ \bar{g}_{t+1} given by HP trend
 - ▶ \bar{g}_{t+1} given by SPF 10 year growth forecast
 - ▶ $r_{t+1}^* - \bar{g}_{t+1}$ equal realized D_{t+1}/V_t
- Similar r_{t+1}^* and μ_{t+1} across all five assumptions

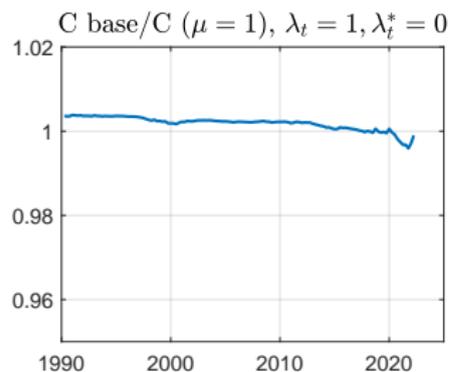
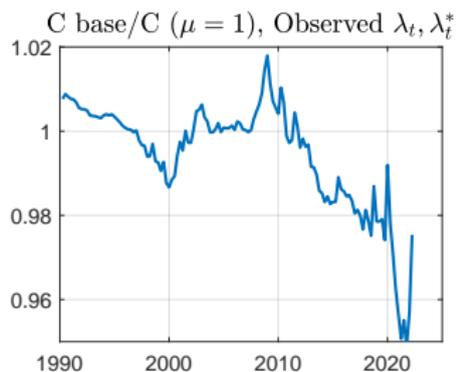
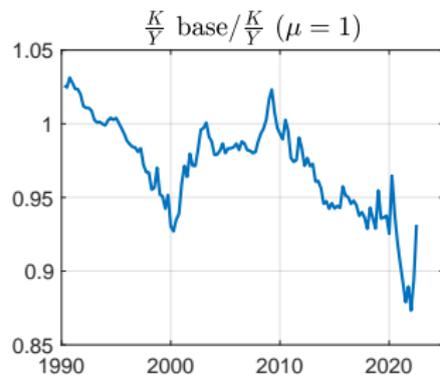
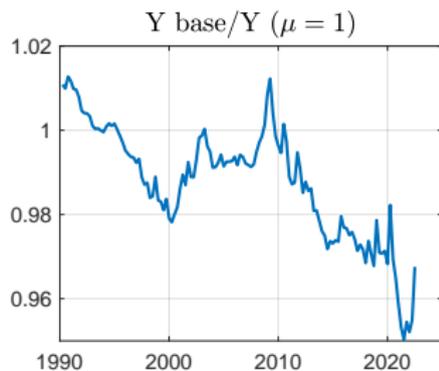
Sensitivity Analysis



Counterfactuals for Welfare

- How did the rise in μ_t impact U.S. welfare?
- How does the welfare impact depend on equity diversification?
- Model with all the same parameters except $z_{Lt} \equiv z_{Ht}$ so $\mu_t \equiv 1$
 - ▶ Solve with λ_t and λ_t^* as in the data
 - ▶ Solve with $\lambda_t \equiv 1$ and $\lambda_t^* \equiv 0$ (no diversification)
- Solution for flows, stocks, and valuation of U.S. Corporate Sector independent of diversification
- Solution for U.S. consumption depends on diversification

Counterfactuals



Mark-ups, diversification and ex-ante welfare (risk sharing)

- Baxter and Jermann (1997), Heathcote and Perri (2013), Coeurdacier, Kollman, Martin (2007)
- Whether the transfer from US to ROW is good for risk sharing (desirable ex-ante) depends on why wedge μ_{t+1} moves
 - ▶ If followers become less productive, shock bad for U.S. as a whole, diversification worsens risk sharing
 - ▶ If initial $\mu_t = 1$, then optimal portfolio has no equity diversification
 - ▶ Consistent with counterfactual has very small welfare cost with $\lambda_t = 1$.
- If μ_{t+1} increases because z_{Ht+1} rises, then diversification improves risk sharing.

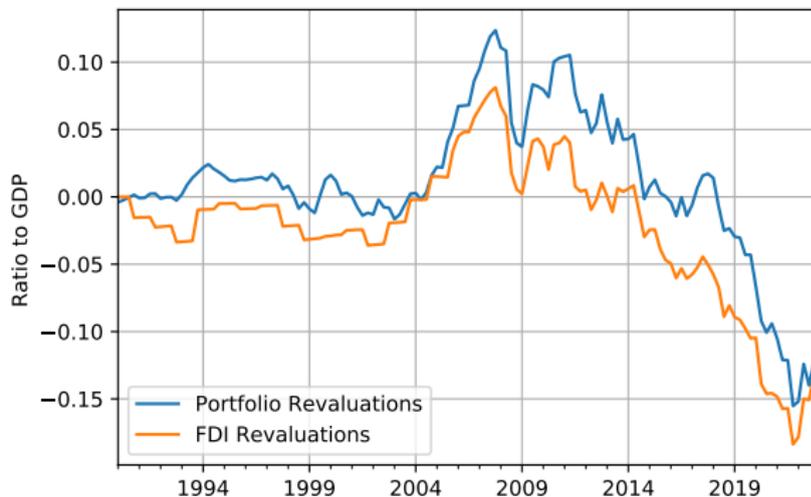
Conclusions

- Large cross border equity positions imply *relative* stock market performance big driver of NFA through direct valuation effects
- Integrated Model of Corporate Sector, CA, and NFA positions
- Quantitative model of flows and asset values in international economy
 - ▶ points to big increase in “output wedge” as key driver of asset boom
 - ▶ no big increase in combined value of corporations and human wealth
 - ▶ absent international diversification, small impact on U.S. welfare
 - ▶ with observed diversification, big impact on U.S. welfare
- Model of links between asset valuations and NFA

Other Issues

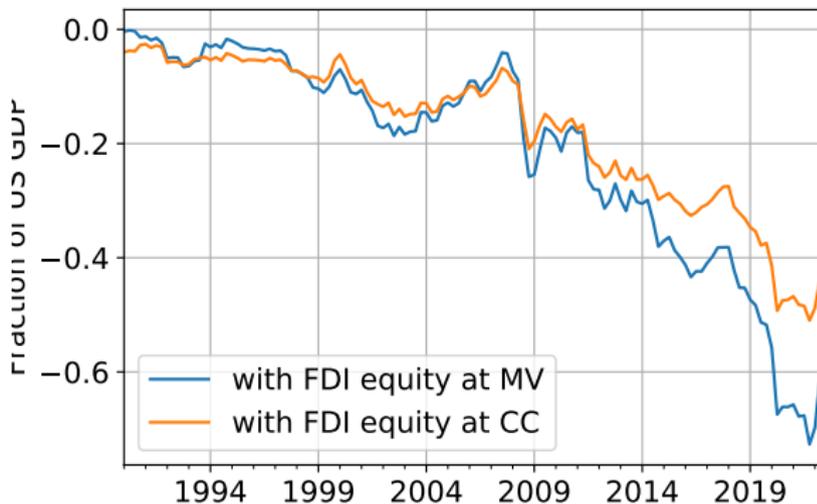
- Income Puzzle and Ex-Ante Privilege [go](#)
 - ▶ Curcuru, Thomas, and Warnock (2013) express skepticism on this point
 - ▶ Income puzzle mainly due to FDI accounting profits not actual payments
- Unmeasured Capital [Corrado et. al. estimates](#)
 - ▶ Corrado, Haskell, Jona-Lassino and Iommni 2022 JEP and linked data
 - ▶ Intangible investment and capital are large
 - ▶ But they show no trend from 1997 to 2021
 - ▶ So hard to account for the rise in free cash flow and valuations
 - ▶ Also hard to account for smooth growth in measured output if there were a big burst of investment in unmeasured intangibles

Cumulated Net Valuations in FDI and Portfolio Equity



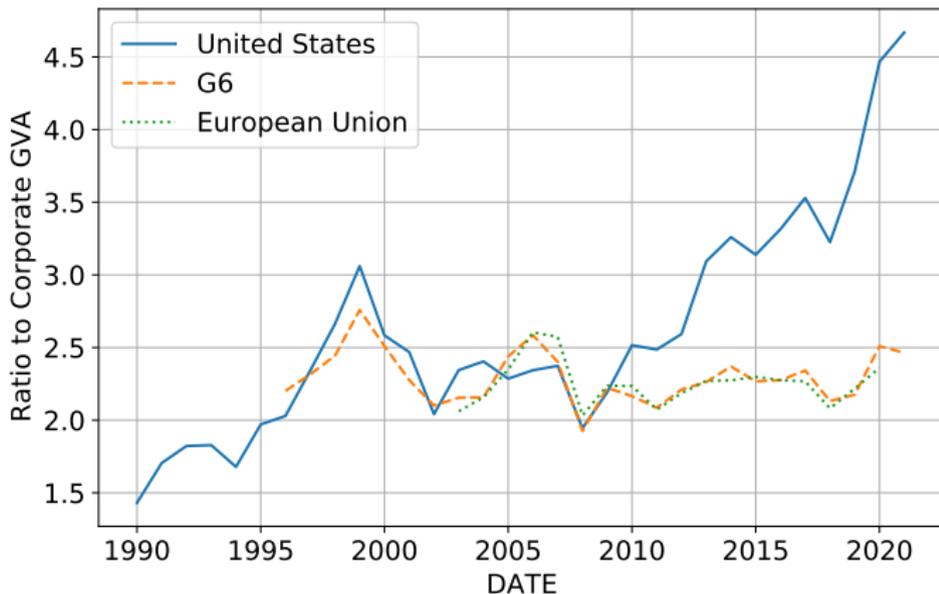
- Large valuations changes both in FDI and portfolio investments [back](#)

Impact of FDI equity valuations on NFA position

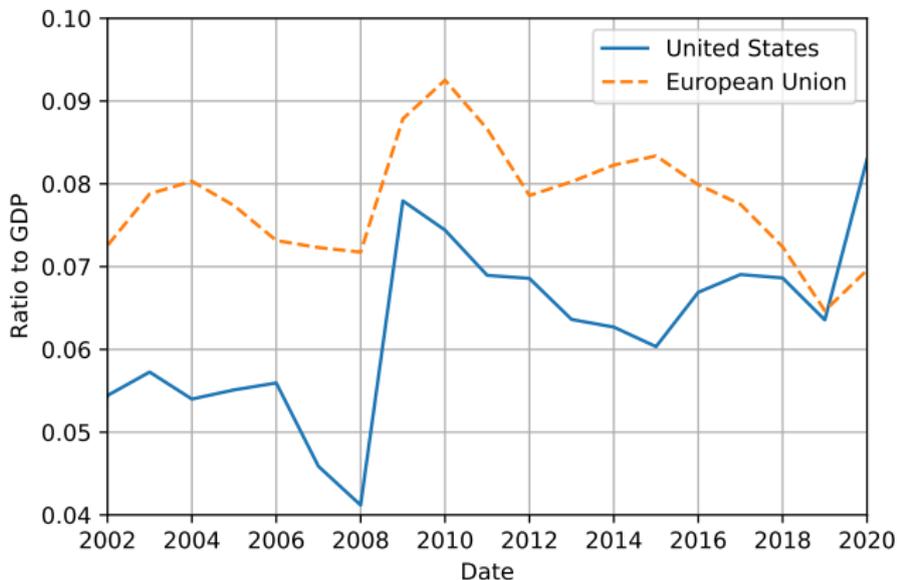


- FDI equity valuations add -20% to NFA position [back](#)

Enterprise Value in ROW has not Risen

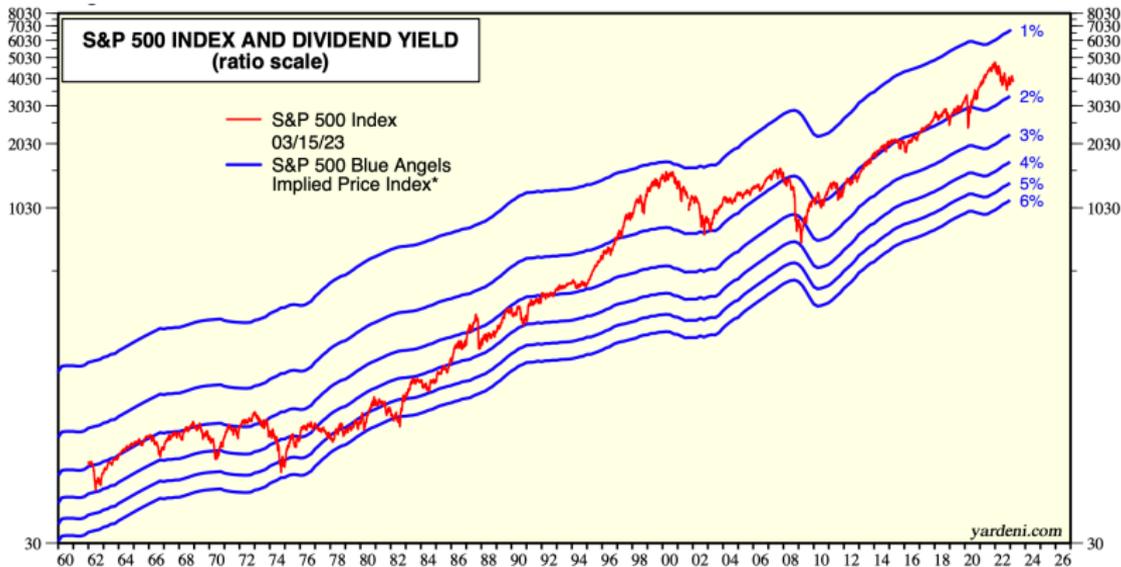


Free Cash Flow in ROW has not Risen



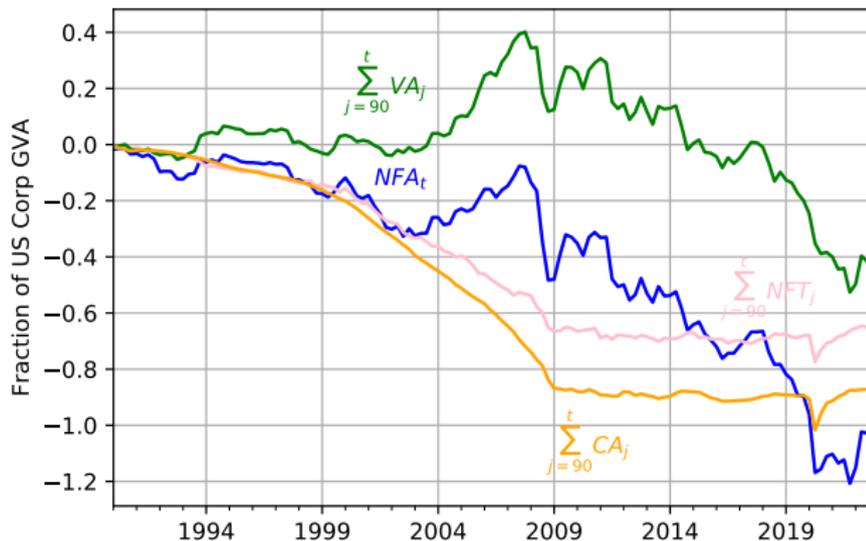
[back](#)

S&P500 Dividends and Yields



* Blue lines show hypothetical values of S&P 500 stock price index using actual S&P 500 dividend (4-quarter trailing sum) divided by dividend yields from 1% to 6%
Source: Standard & Poor's.

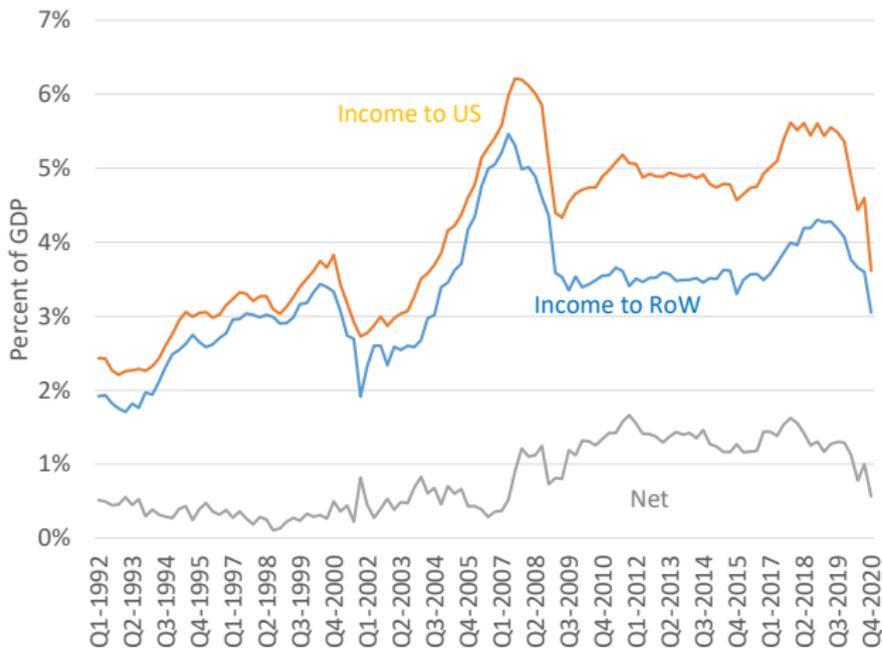
Alternative measures of net lending abroad



- Statistical discrepancy between two ways of measuring net lending abroad: current or financial account
- Similar conclusions regarding end of privilege

International Income Puzzle and Ex-Ante Privilege

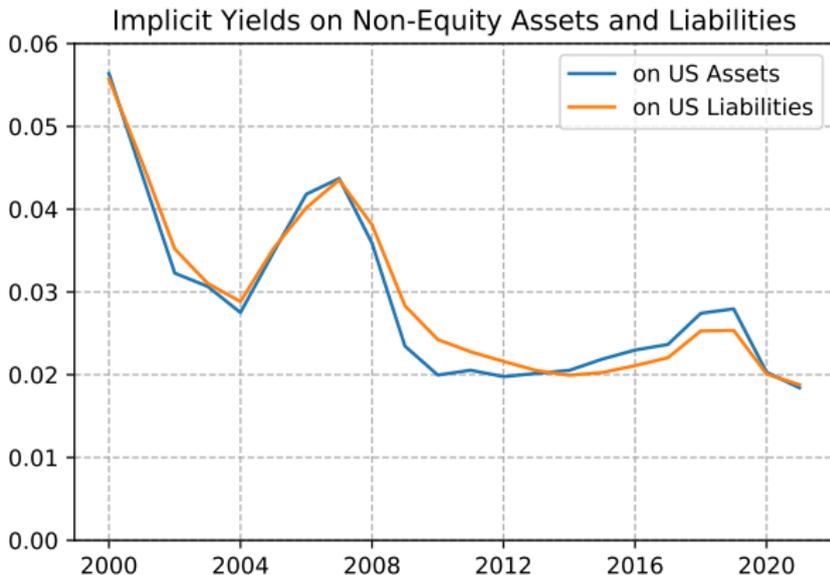
- NFA evolution contrasts with Net Factor Income from abroad: negative declining NFA, positive stable NFI



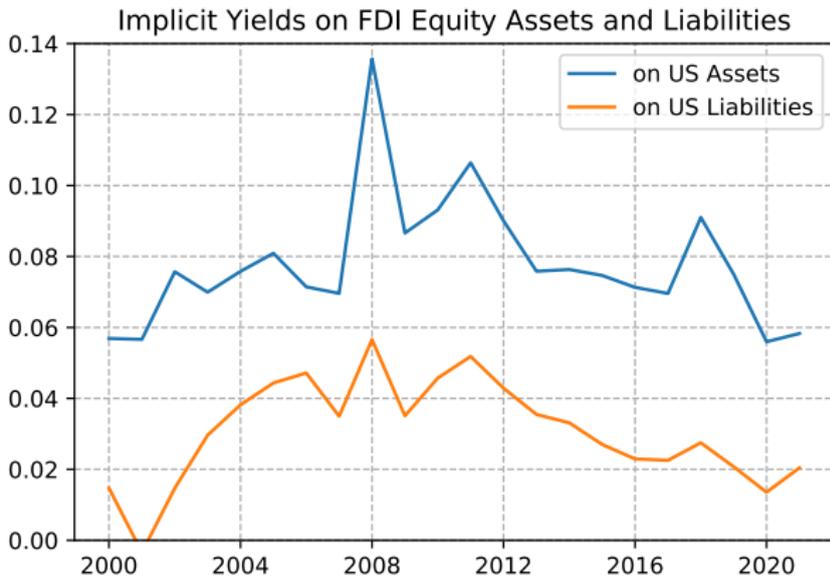
International Income Puzzle and Ex-Ante Privilege

- Are “Safe Assets” special?
 - ▶ Currency, Bank deposits, US Treasuries
 - ▶ average income yields on US non-equity external assets and liabilities are similar implicit interest rates
- Extraordinary “income yield” on US Direct Investment Equity Assets in ROW implicit DI yields
 - ▶ *Dark Matter?* (is value of DI equity in ROW understated)
 - ▶ *Profit Shifting?* (about 1/3 of DI equity income is in tax havens)
- Positive US Net Income despite negative Net Assets almost entirely due to DI equity asset income yield and small gap in dividend yields on portfolio equity assets and liabilities implicit PI yields back to other issues

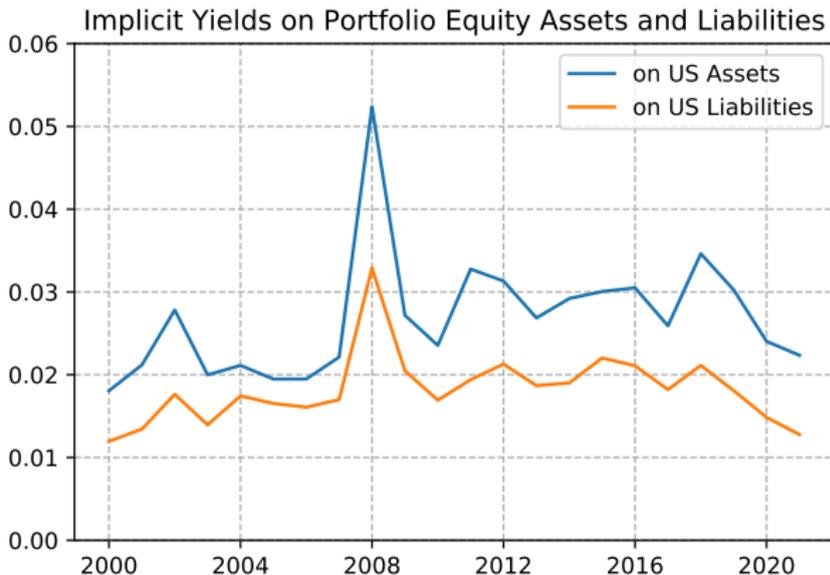
Implicit Income Yields on Non-Equity External Assets and Liabilities



Implicit Income Yields on DI Equity External Assets and Liabilities



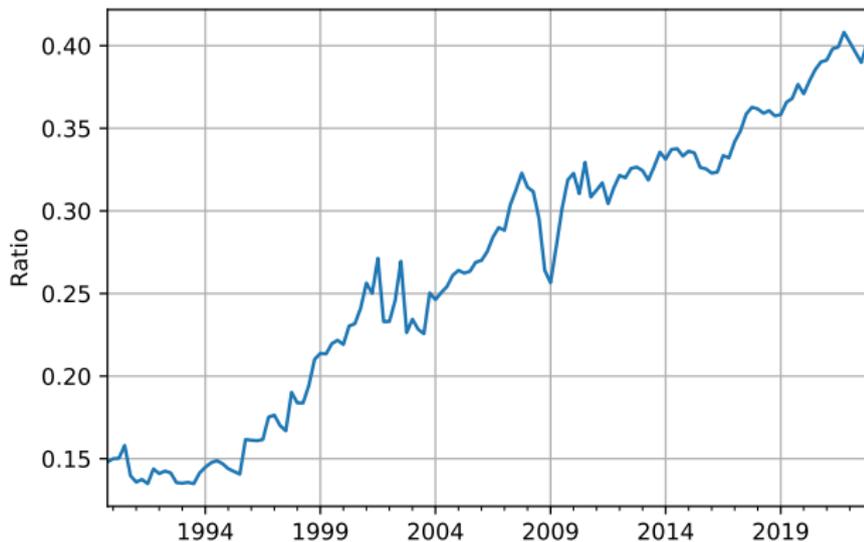
Implicit Income Yields on Portfolio Equity External Assets and Liabilities



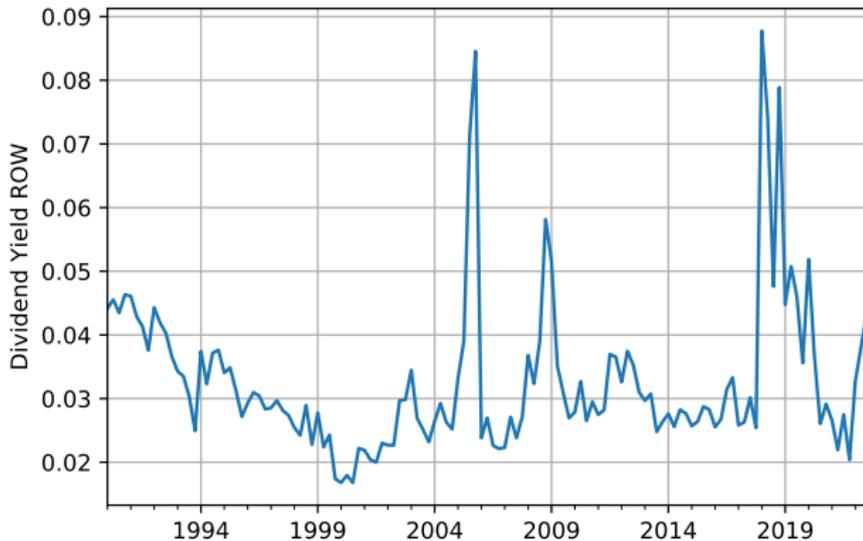
Potential Overstatement of Gross Equity Positions

- Bertaut, Bressler, Curcuru 2020
- Corporate Inversions, e.g. Medtronics
 - ▶ *BEA*, Foreign equity
 - ▶ *MSCI*, US equity
 - ▶ Medtronics owning assets (i.e. plants) in US adds to gross foreign holdings of US equity
 - ▶ US residents holdings of Medtronics adds to US gross holdings of foreign equity
- Offshore funds
 - ▶ *Funds holdings of US equity* add to gross foreign holding of US equity
 - ▶ *Fund Shares held by US residents* add to US gross holdings of foreign equity
- In both cases economically it is US holdings of US equity
- Overstates the gross but, if equity values measured correctly, not the net

ROW Equity Share of US Corporate Enterprise Value



Dividend Yield (paid) on US Equity in ROW



Expected and Unexpected Drivers of NFA

$$NFA_t - NFA_{t-1} = CA_{t-1} + \lambda_{t-1}^* (V_t^* - V_{t-1}^*) - (1 - \lambda_{t-1}) (V_t - V_{t-1})$$

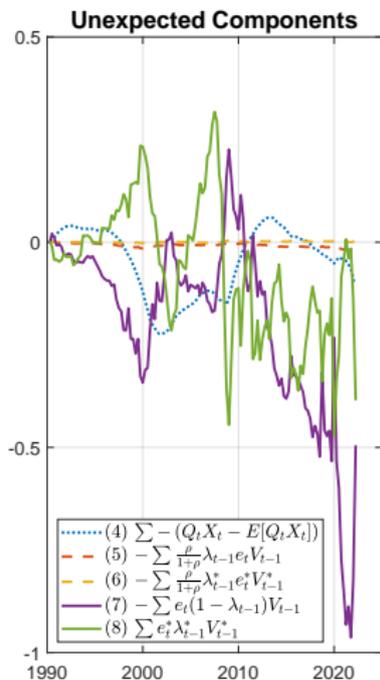
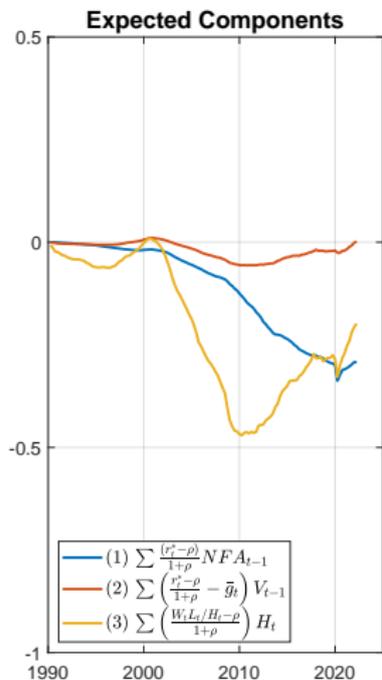
- What movements occur when parameters turn out as expected vs. deviations due to unexpected shocks?
- Excess Returns

$$e_t = \frac{D_t + V_t}{V_{t-1}} - (1 + r_t^*), \quad e_t^* = \frac{D_t^* + V_t^*}{V_{t-1}^*} - (1 + r_t^*)$$

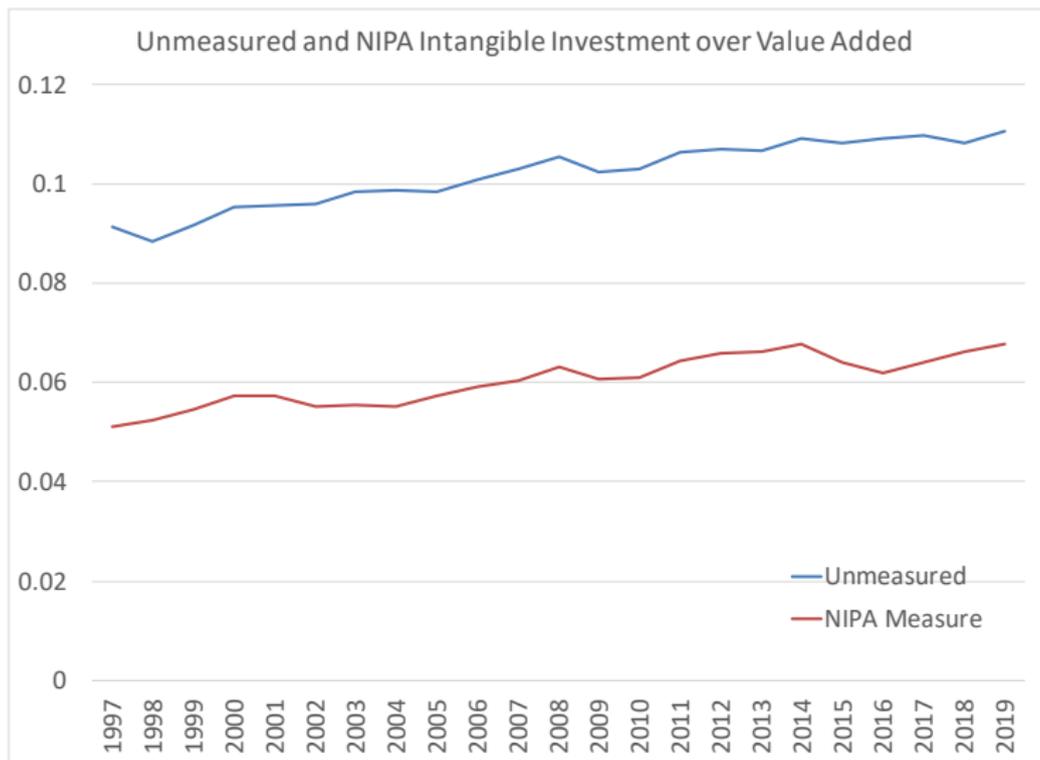
Expected and Unexpected Drivers of NFA

$$\begin{aligned}
 NFA_t - NFA_{t-1} &= \underbrace{\frac{r_t^* - \rho}{1 + \rho} NFA_{t-1}}_{(1)} \\
 &+ \underbrace{\left(\frac{r_t^* - \rho}{1 + \rho} - \bar{g}_t \right) V_{t-1}}_{(2)} + \underbrace{\left(\frac{\frac{W_t L_t}{H_t} - \rho}{1 + \rho} \right) H_t}_{(3)} \\
 &- \underbrace{(Q_t X_t - \mathbb{E}_{t-1}[Q_t X_t])}_{(4)} \\
 &- \underbrace{\frac{\rho}{1 + \rho} \lambda_{t-1} e_t V_{t-1}}_{(5)} - \underbrace{\frac{\rho}{1 + \rho} \lambda_{t-1}^* e_t^* V_{t-1}^*}_{(6)} \\
 &- \underbrace{e_t (1 - \lambda_{t-1}) V_{t-1}}_{(7)} + \underbrace{e_t^* \lambda_{t-1}^* V_{t-1}^*}_{(8)}
 \end{aligned}$$

Expected and Unexpected Drivers of NFA



Corrado et. al. 2021 Unmeasured Investment



Corrado et. al. 2021 Unmeasured Capital

