"Has Monetary Policy Cared too much About a Poor Measure of r^*?" by Ricardo Reis, LSE

Discussion: Annette Vissing-Jorgensen, Federal Reserve Board

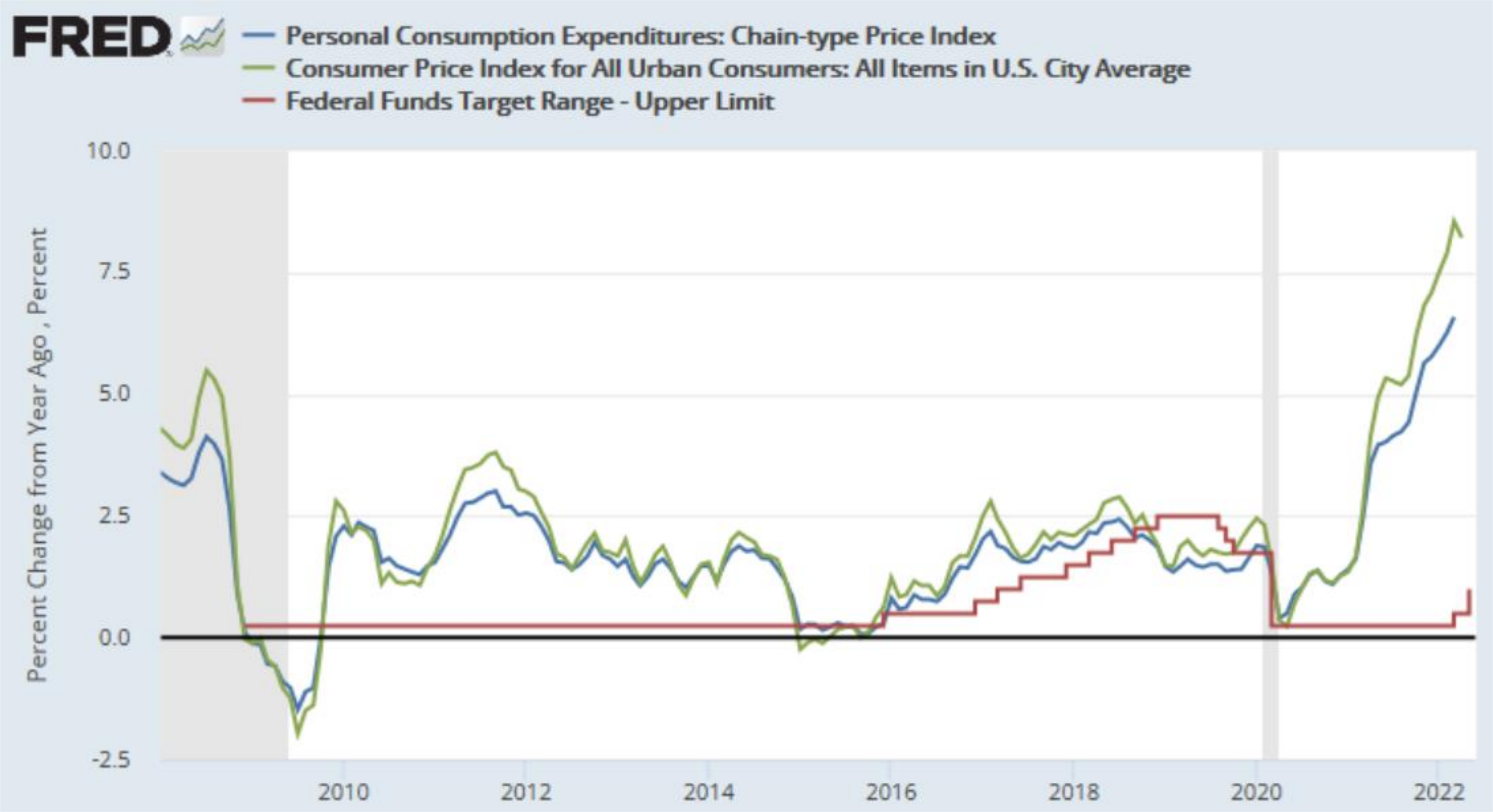
Disclaimer: These are my personal views, not those of the Federal Reserve Board or the Federal Reserve System

Asian Monetary Policy Forum, Singapore, May 2022

Summary:

1. Empirically: m^* (real cost of capital for private capital) is not falling, unlike r^* (real cost of capital for government)
2. Theory: A falling r^* and increasing m^*- r^* can be explained by higher government deficits
3. Theory: Policy should focus on m^* not r^*. Otherwise, we'll get too much inflation

Background



- CPI (PCE) inflation hit 5% (4%) in June 2021 (monthly data, year-over-year)
- The Federal Funds target was increased in March 2022 to 0.25-0.5% and is now 0.75-1%: Appears somewhat late and somewhat modest (so far)

The main claim of the paper

Opening paragraph:

- "Why has inflation risen so much in 2021-22? The increase has been persistent, common across many advanced countries, and accompanied by historically loose monetary policy. This paper explores a hypothesis: central banks allowed inflation to rise because their focus on some estimates of r* made them unduly tolerant of rising inflation."

Concluding slide:

- "Focusing on low r* leads monetary policy to over-focus on ZLB and worry about deflation while welcoming inflation, instead of closing the m-r gap"
- "Was this over-focus on low r* and neglect of high m*-r* the cause of the rise in inflation? Perhaps…"

Since this is the main idea, I'll focus my comments on the monetary policy arguments, not the fiscal policy ones

Why may a falling r* be a problem? Recap of the ZLB issue

$r^{real} = r^{nom} - \pi^e$: Expected real interest rate

- r^{nom} cannot go negative (at least not much) → Lowest possible r^{real} : $r^{real} = 0 - \pi^e$
- Full employment requires a particular value of r^{real}, call it $r^{real,*}$. If $r^{real,*} < 0 - \pi^e$ then monetary policy cannot deliver full employment. The ZLB "binds" and demand is "too low"
- Increasing expected inflation π^e helps: Allows a lower r^{real}
  - After a period of below 2% realized inflation, this may require a period of above 2% realized inflation

What is Reis' take on the ZLB? What does he view as a mistake?

- Central banks should focus on *m* (real private cost of capital) *not r* (real government cost of capital):
- The benefits from higher π^e are lower once you focus on *m* because *m* may not move down with π^e as much as *r*:

> "With efficient capital markets, … *m* … falls one-to-one with *r* and therefore one-to-one with π. Instead, with financial frictions, there is no presumption that *m* may fall. In fact, all else equal, it will not change. Therefore, the benefits of higher inflation in stimulating real activity are lower, because capital does not rise as much"

  - A higher π^e lowers $r^{real} = 0 - \pi^e$
  - But a higher π^e may have no effect on $m^{real} = m^{nom} - \pi^e$, because m^{nom} may simply increase with π^e
  - Instead, benefits from reforms that reduce m-r are large

The argument is not that the ZLB is irrelevant because *m*>0, but that allowing high inflation is not helpful for lowering the relevant real interest rate (cost of capital), *m*

My comments

Comment 1. My take on why the Fed moved somewhat late in raising rates

Comment 2. I don't agree with Reis' presumption that *m* is unaffected by expected inflation
m and r are connected and increasing expected inflation does give useful policy space

Comment 3. In general, monetary policy is powerful in lowering risk premia and thus at affecting m

Comment 4. Estimating m is hard. A standard finance approach suggests that *m* may have fallen with r

Comment 5. If m-r is up, I don't think it's due to higher government debt.
I'm not sure Reis' model has the right moving parts to speak to this

Comment 1. My take on why the Fed moved somewhat late in raising the target

Three key factors driving the timing of liftoff relative to inflation:

(1) The dual mandate with a substantial weight on the employment mandate in a situation where the inflation objective was reached first → Willingness to take some risk on inflation getting too high for too long

- September 2020 FOMC statement: Two conditions for liftoff

  "The Committee decided to keep the target range for the federal funds rate at 0 to 1/4 percent and expects it will be appropriate to maintain this target range until labor market conditions have reached levels consistent with the Committee's assessments of maximum employment and inflation has risen to 2 percent and is on track to moderately exceed 2 percent for some time."

- June 2021 press conference: (inflation at 5.3% (CPI), 4.0% (PCE), unemployment at 5.9%)

  CHAIR POWELL. […] Liftoff is, is well into the future. The conditions for liftoff—we're very far from maximum employment, for example. It's, it's a consideration for the future.

Comment 1. My take on why the Fed moved somewhat late in raising the target

- Yes, the Fed's framework called for letting inflation run moderately above 2% for some time, but that was satisfied much before the employment condition was satisfied

  The binding objective in this episode was the maximum employment condition

Comment 1. My take on why the Fed moved somewhat late in raising the target

(2) Difficulty of understanding a new shock in real time:

- Inflation: How persistent was the supply shock?
- Employment: How tight was the labor market? Would labor force part. come back up? What were the effects of stimulus checks, unempl. benefits and COVID (school closings, health fears, long covid, drug use) on labor supply, job search?

In a recent speech, Governor Waller argues that data revisions can create what appears to be policy errors ex-post:

Change in nonfarm payroll employment: Initial Report and Current Estimate (Thousands)

Month	Initial Report	Current Estimate	Revision
August	235	517	282
September	194	424	230
October	531	677	146
November	210	647	437
December	199	588	389
Total	1369	2853	1484

Comment 1. My take on why the Fed moved somewhat late in raising the target

(3) Emphasis on "telegraphing" balance sheet changes ahead of time (perhaps due to scars from the taper tantrum in 2013 plus Treasury market issues in March 2020)

June 2021 press conference:

NANCY MARSHALL-GENZER. […] when you're ready, how will you go about signaling the start of tapering when you do decide to do that?

CHAIR POWELL. So our intention for this process is that it will be orderly, methodical, and transparent. And I can just tell you, we, we, we see real value in communicating well in advance what our thinking is. And we'll try to be clear. And, as I mentioned, we'll, we'll give advance notice before announcing a decision to taper. And so all I can say is that we, we think it's important—we think where the balance sheet's concerned, a lot of notice, as much transparency as we can give, and as far—as far in advance as we can to give people a chance to adjust their expectations. […]

Perhaps the need to taper delayed lift-off for a few months (the unemployment rate was 3.9% in December 2021)

Are markets that fragile in times when tightening is needed? If they are, should central banks:

- pro-actively start the pre-announcing earlier (at the risk of tapering too early) to avoid tapering constraining liftoff?
- just get on with liftoff even if tapering isn't finished?

Comment 2. I don’t agree with Reis’ presumption that *m* is unaffected by expected inflation

Reis’ argument that *m* is disconnected from *r* and that central banks can’t lower *m* with higher π^e is not convincing

- Since *m* and *r* are connected by financial markets, the standard idea of increasing π^e to help address the ZLB makes sense

- Reis does not actually show empirically or theoretically that *m* is immune to expected inflation

- Standard models of m-r: It’s a risk premium
  - If something other than the risk premium lowers *r* (e.g., expected inflation), it will also lower *m* in equilibrium
  - This happens via changes in risky asset prices (including the stock market)

- Reis’ model of m-r: Non-standard. No risk. m≠r is due to some agents holding only debt, combined w/limits on firm leverage
  - Despite this: m and r are connected in the model
  - m/r need to adjust to satisfy assumptions about the wealth share of debtholders and about firms’ assumed leverage policy

A standard simple model where *m-r* is a risk premium: Caballero & Simsek (2020)

Two-period example:

- k=1, no labor, productivity z
- Prices are fully sticky (no inflation, nominal=real)

- Date 1: Assume $y_1 = z_1$. $log z_1 \sim \mathrm{N}\left(g - \frac{\sigma^2}{2}\right)$

  Date 0: $y_0 = c_0 \leq z_0 = 1$. If demand is insufficient, output may be below potential

- Risky asset: Log gross return: $r_m = log\left(\frac{z_1}{Q}\right)$, Q is the price of the market portfolio at t=0

  Riskless asset: Log gross return: r_f, set by the central bank subject to the ZLB

- Utility: Epstein-Zin, EIS= 1, discount factor $e^{-\rho}$, risk aversion γ → $c_0 = \frac{1}{1+e^{-\rho}}(y_0 + Q)$ (endowed w/y_0 and market)

A standard simple model where m-r is a risk premium: Caballero & Simsek (2020)

Goods market clearing (at t=0): $y_0 = c_0 = \frac{1}{1+e^{-\rho}}(y_0 + Q)$ → $y_0 = e^{\rho} Q$ (1)

Risky asset market clearing (at t=0): $\omega_m = \frac{E[r_m] + \frac{\sigma^2}{2} - r_f}{\gamma\sigma^2} = \frac{g - logQ - r_f}{\gamma\sigma^2} = 1$ → $E[r_m] + \frac{\sigma^2}{2} - r_f = \gamma\sigma^2$ (2)

$$logQ = g - \left(r_f + \gamma\sigma^2\right)$$

- $y_0 = 1$ requires $Q = e^{-\rho}$ which requires $r_f = \rho + g - \gamma\sigma^2$: This defines r_f^*
- If $r_f^* < 0$, the ZLB binds. The central bank sets $r_f = 0$ → $Q < e^{-\rho}$ → $y_0 < 1$:

  A lower Q clears the asset market, ensuring a (log) risk premium of $\gamma\sigma^2$, but causes a demand-driven recession

- Asset market clearing would work the same with inflation: If real r_f falls due higher expected inflation, so does m $(\ln(E[R^m]))$, to generate a risk premium of $\gamma\sigma^2$

Comment 3. Monetary policy is powerful in lowering risk premia

In general, thinking about *m* should make you think that monetary policy is *more* powerful, not less:

Evidence that expansionary policy lowers risk premia and thus may be *particularly effective* at lowering *m*

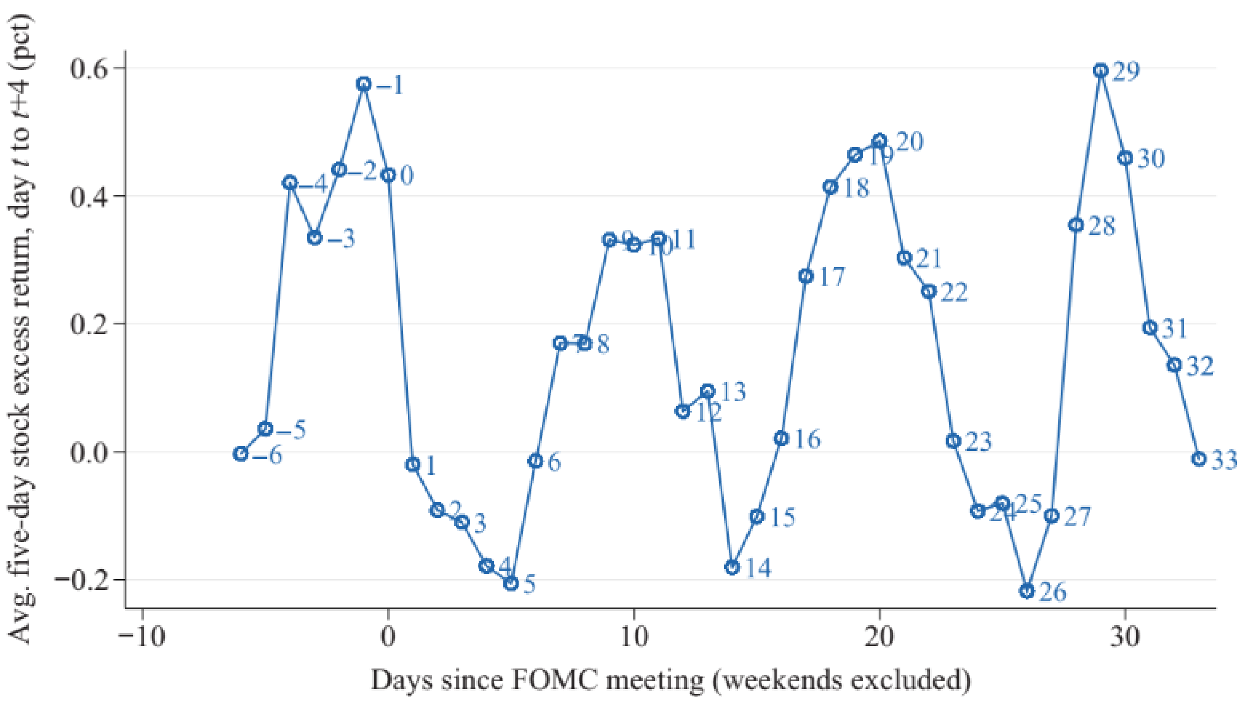
- Effects of QE on pre-payment risk premium (MBS), default risk premium (sovereign, corporate)
- Effect of monetary policy (short rate/FG/QE) on stock prices via the equity premium

Comment 3. Monetary policy is powerful in lowering risk premia

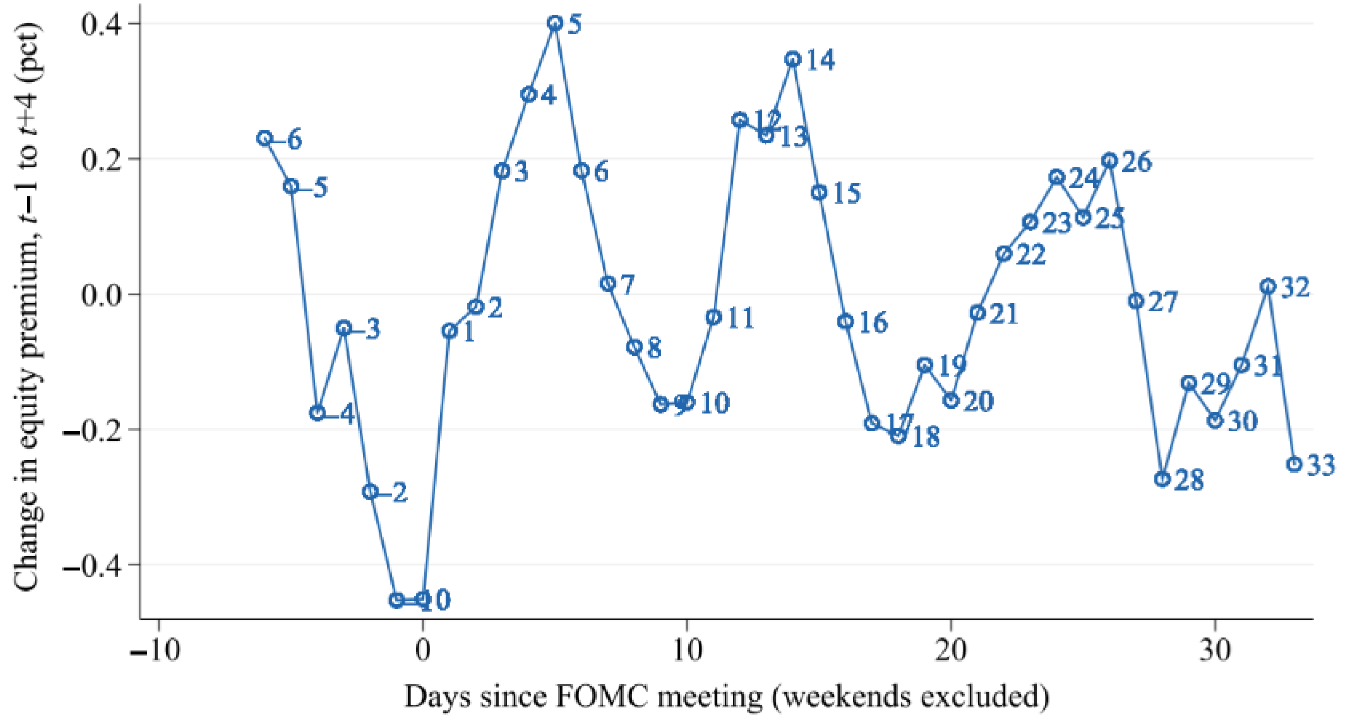
Cieslak, Morse and Vissing-Jorgensen (2019), using data for 1994-2016:

- Stock returns (over T-bills) were on avg. much higher on days that fell in even weeks relative to FOMC announcements
- This was, to a large extent, driven by falling risk premium in even weeks

Stock returns over the FOMC cycle, 1994-2016



Equity premium (1 month) over the FOMC cycle, 1994-2012



Comment 3. Monetary policy is powerful in lowering risk premia

Causal effect of monetary policy news? Yes

- Prior to 1994, intermeeting target changes were common and reveal the timing of Fed decision making/debate and disproportionately took place in even weeks in FOMC cycle time
- 1994-2016 period: Fed funds futures yields on avg. fell in even weeks in FOMC cycle time
  Monetary policy news was systematically positive (and came out via informal communications channels)

How did the Fed affect risk premia? Tail risk forward guidance

- Following market drops, in weeks of Fed decision making, the market rebounded and risk premia fell
- Our interpretation: The Fed gave guidance that it would accommodate if things got worse: "Ready to act as needed"
- This "Fed put" was stronger than markets expected over the 1994-2016 period

Comment 4. Approaches to estimating m. Is m-r really up that much?

What is *m*? The cost of capital (required return) for investing in private capital

Approach 1: The finance approach, m is $E(r^A)$ (A=assets, E=equity, D=debt)

$$E(r^A) = \frac{E}{V}\,E(r^E) + \frac{D}{V}E(r^D) = r + \frac{E}{V}\,(E(r^E) - r), \qquad \text{setting } E(r^D) = r$$

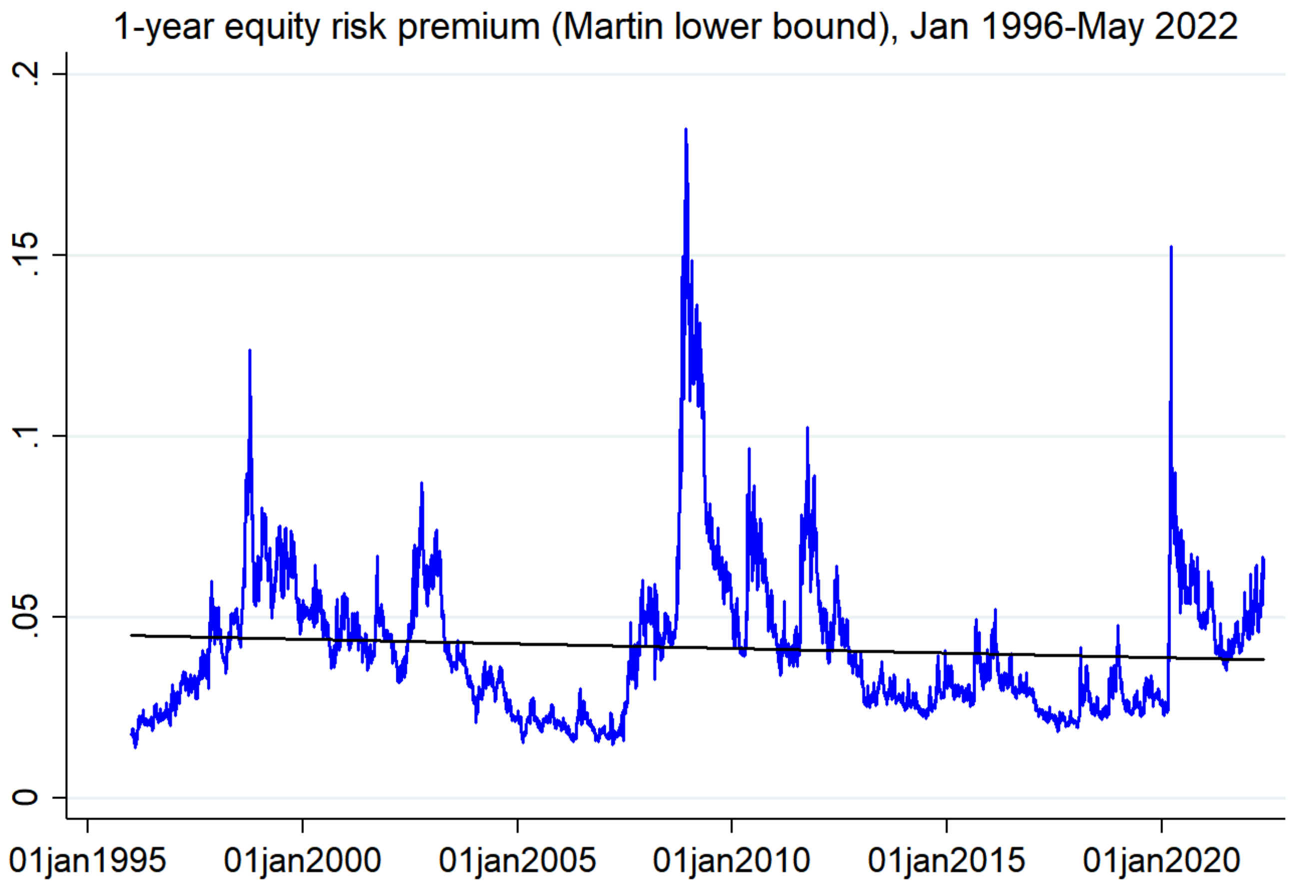
- Use observable D/V, E/V, *r*, and an estimate of $E(r^E) - r$. Calculate $E(r^A)$.
- Market-based. Simple. Few assumptions needed. Drawback: Can only be used for publicly traded capital
- Notice that

$$E(r^A) - r = \frac{E}{V}\,(E(r^E) - r)$$

  - E/V is fairly stable in recent decades (Graham, Leary and Roberts, 2014)
  - Let's look at $E(r^E) - r$: If it's flat, so is $E(r^A) - r$, which would suggest that *m* is falling with *r*

Comment 4. Approaches to estimating m. The finance approach

$E(r^E) - r$: Martin (2017) measure, based on S&P500 index options. *Not* increasing → m-r is not increasing

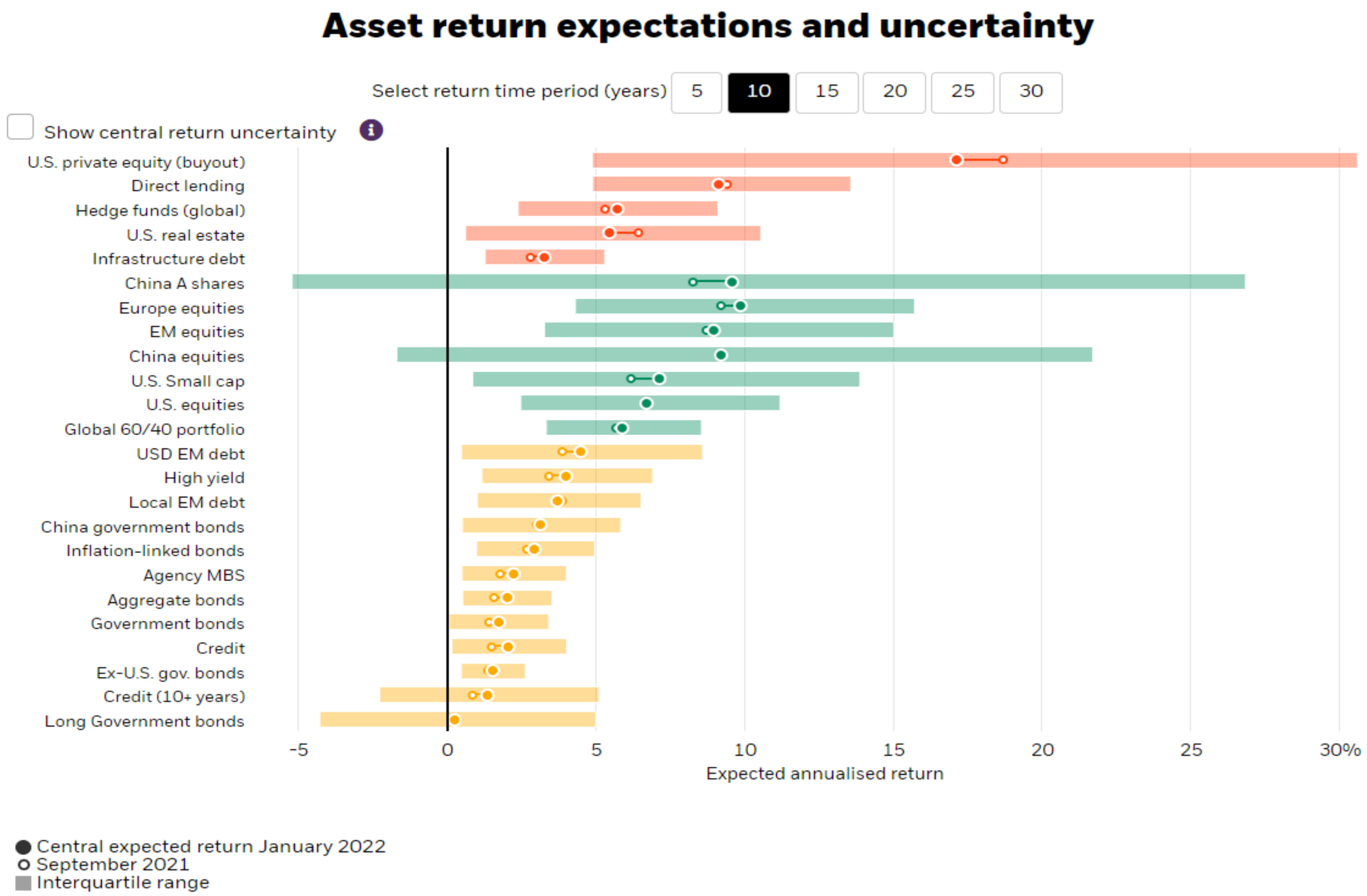


Data from Knox and Vissing-Jorgensen (2022). Linear trend shown by black line

Comment 4. Approaches to estimating m. The finance approach

Validity? Compare Martin equity premium to equity premium estimates of large asset managers

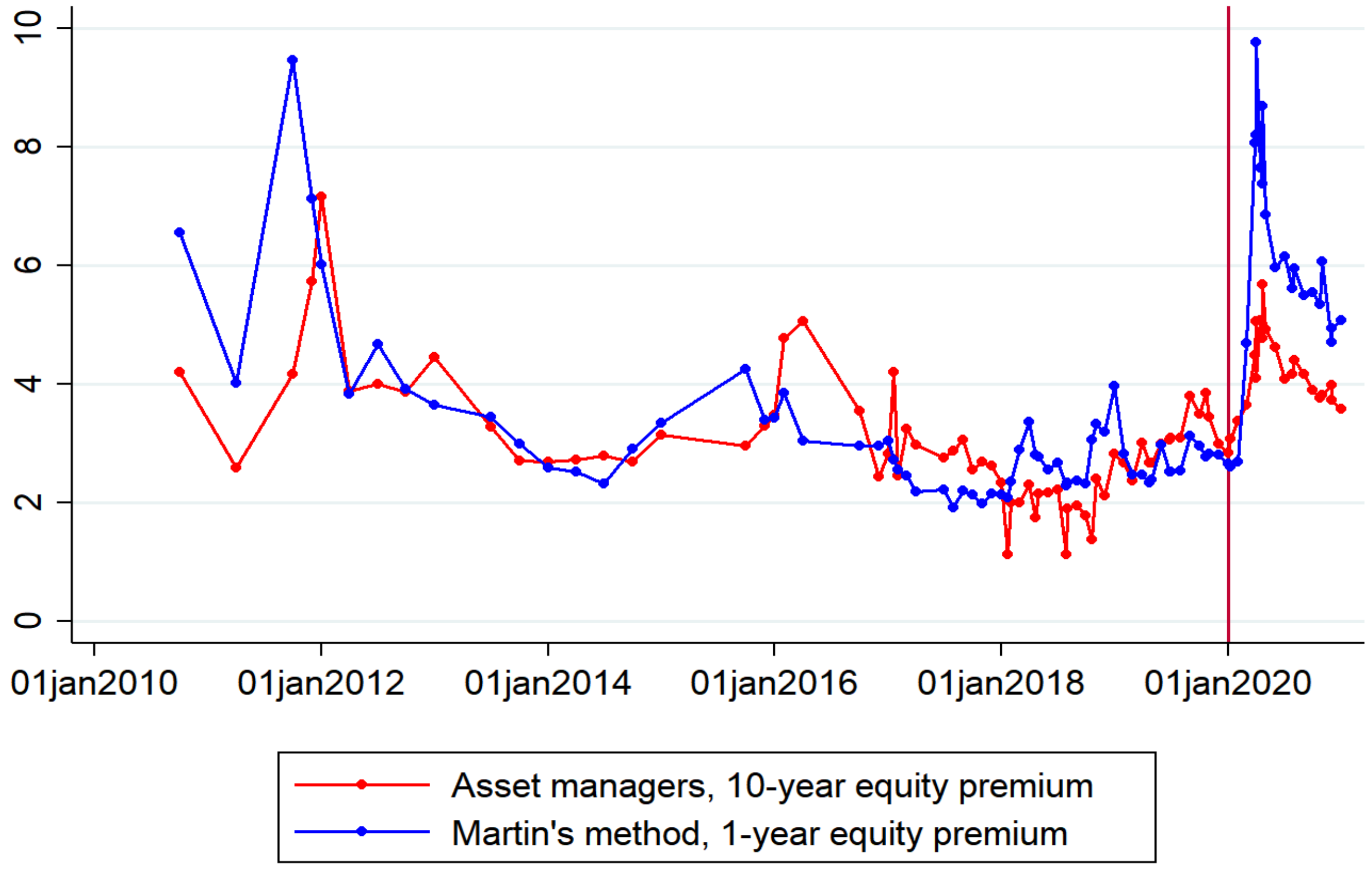
BlackRock capital market assumptions, January 2022:



Comment 4. Approaches to estimating m. The finance approach

- Dahlquist and Ibert (2021): Collect such capital market assumptions of 47 asset managers and investment consultants: BlackRock, StateStreet, AQR etc. Mostly for horizons 5/7/10 years

- Knox and Vissing-Jorgensen (2022): Construct a time series of asset manager risk premia and relate it to the Martin measure

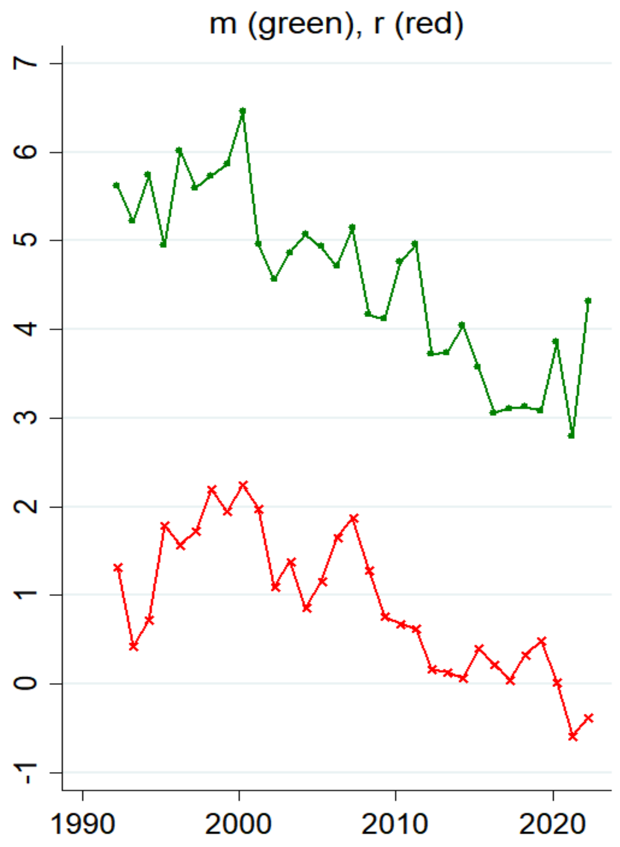


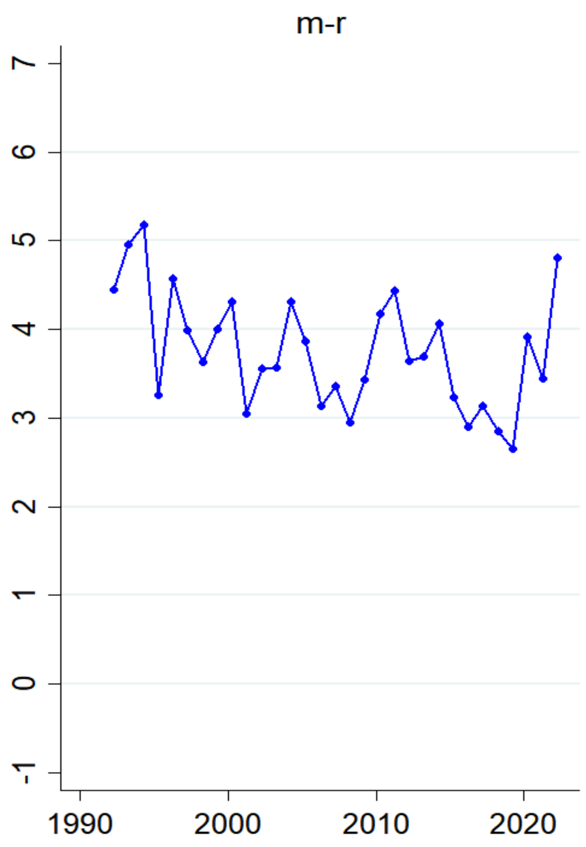
Vertical line is at 1/1/2020

Comment 4. Approaches to estimating m. The finance approach

Survey of Professional Forecasters: Also suggest that both m and r are falling, with m-r stable

1992-2022, mean forecasts, 10-year real returns, m=stocks, r=T-bills

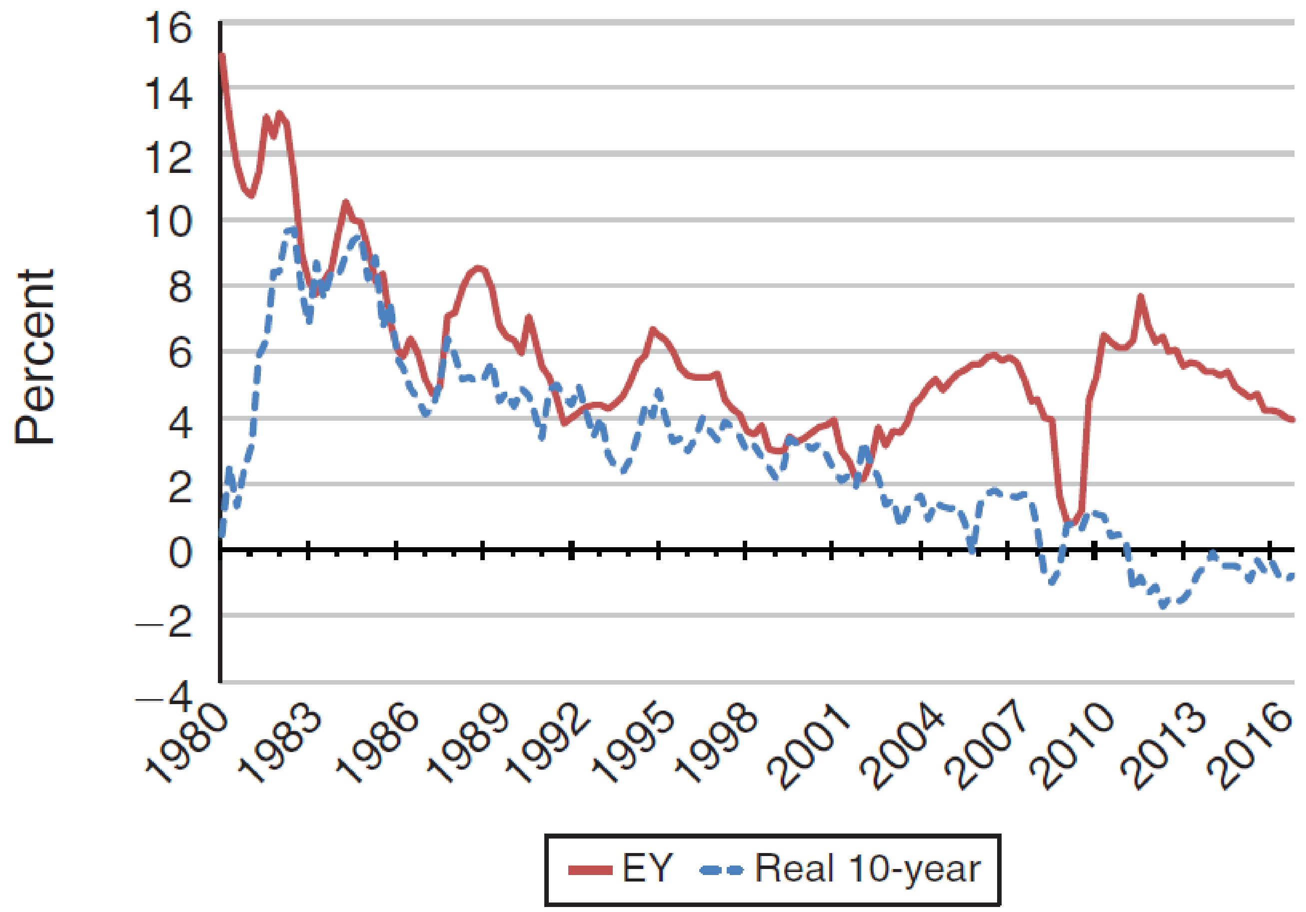




Comment 4. Approaches to estimating m. The finance approach

If $E(r^E) - r$ is not up, then how do we reconcile the divergence between E/P ratios and long real yields since around 2000?

- From Caballero, Farhi and Gourinchas (2017), for S&P500



Comment 4. Approaches to estimating m. The finance approach

Gao and Martin (2021):

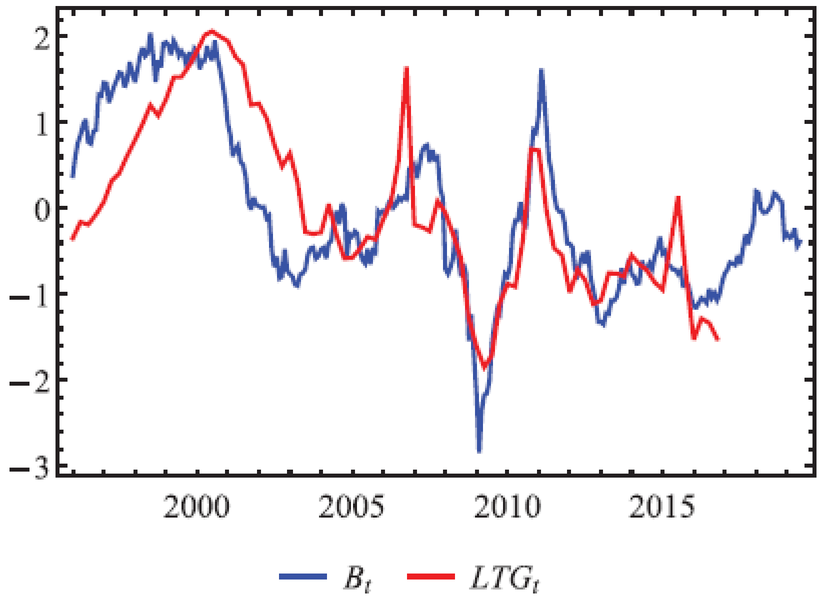
- What growth expectations would be needed to reconcile D/P ratio, given the Martin measure for the equity premium

$$\mathbb{E}_t g_{t+1} = r_{f,t+1} - \mathbb{E}_t(r_{t+1} - g_{t+1}) + \mathbb{E}_t(r_{t+1} - r_{f,t+1})$$

$$\mathbb{E}_t g_{t+1} \geq r_{f,t+1} - (a_0 + a_1 y_t) + \frac{1}{P_t}\left\{\int_0^{F_t} \frac{\text{put}_t(K)}{K}\, dK + \int_{F_t}^{\infty} \frac{\text{call}_t(K)}{K}\, dK\right\}$$

where $y_t = log(1 + D_t/P_t)$

- It lines up well with analysts' long-term growth expectations



Comment 4. Approaches to estimating m. The accounting approach

Approach 2: The accounting approach. This is Reis' first approach

- Estimate $E(r^A)$ as net operating profits/book capital
- This estimates the *cost of capital*, $E(r^A)$ (investors' required return) with the IRR (a measure of profitability)!

Invest book capital, get a perpetuity of net operating profits
→ IRR solves: Book capital=Net operating profit/IRR → IRR=Net operating profit/book capital

This works if investors got exactly what they required

Comment 4. Approaches to estimating m. The accounting approach

Concerns with the accounting approach:

- Averages vs. marginals, adjustment speeds:
  - Suppose the true cost of capital m $(E(r^A))$ falls: More projects have IRR> $E(r^A)$. The capital stock expands
  - But, if the initial capital stock remains equally profitable, and accounts for the majority of the capital stock, then the overall net operating profits/book capital would not change much
  - You'd wrongly think m was almost flat when, in fact, it fell

- Capital mismeasurement:
  - Over time, an increasing fraction of capital may be organizational capital, intellectual capital etc. which is not fully included in measured book values. This could make measured m be flat, even if the true m is declining (Farhi & Gourio, 2018)

Fiscal policy comment: For assessing benefits of private versus public investments, IRR is the right measure, but use it for both m & r

Comment 4. Approaches to estimating m. The Euler equation approach

Approach 3: The Euler equation approach. This is Reis' second approach

- Assume households set their consumption profile over time as a function of their personal impatience (β<1) and the expected real (gross) return available from delaying consumption (call it "Return")

$g(c) = [\beta * \ Return\,]^{\,v} \longrightarrow (1/\beta)g(c)^{1/v} = Return$: You can learn Return from g(c)

- r* literature:
    - Make assumption about preference parameters β and ν
    - Focus on low frequencies: r* goes into a Taylor rule as the intercept. The high frequency moves are dealt with in the other Taylor rule terms
    - Substitute y for c: Should grow at same rate at low frequencies, in equilibrium

- Reis:
    - Uses this at higher frequency, so keeps consumption
    - Different investors invest in different assets. Some households simply consume their labor income

Comment 4. Approaches to estimating m. The Euler equation approach

Savers, $1-\chi$: Stockholders, α: $g(c^s)) = \beta^\nu * R^\nu$

Bondholders, $1-\alpha$: $g(c^b)) = \beta^\nu * r^\nu$

Non-savers, χ: $g(c^{ns}) = g(w*l)$

Aggregate consumption growth:

$$g(c) = (1-\chi)\,\beta^\nu * [\alpha R^\nu + (1-\alpha) r^\nu] + \chi\, g(wl)$$

With $c=(1-s)*y$, and $w*l=(1-\theta)*y$:

$$\left(\frac{1}{\beta}\right) * exp\left(\frac{x}{\nu}\right) = \alpha R + (1-\alpha) r :$$

If you measure **x**, you can learn $\alpha R + (1-\alpha) r$

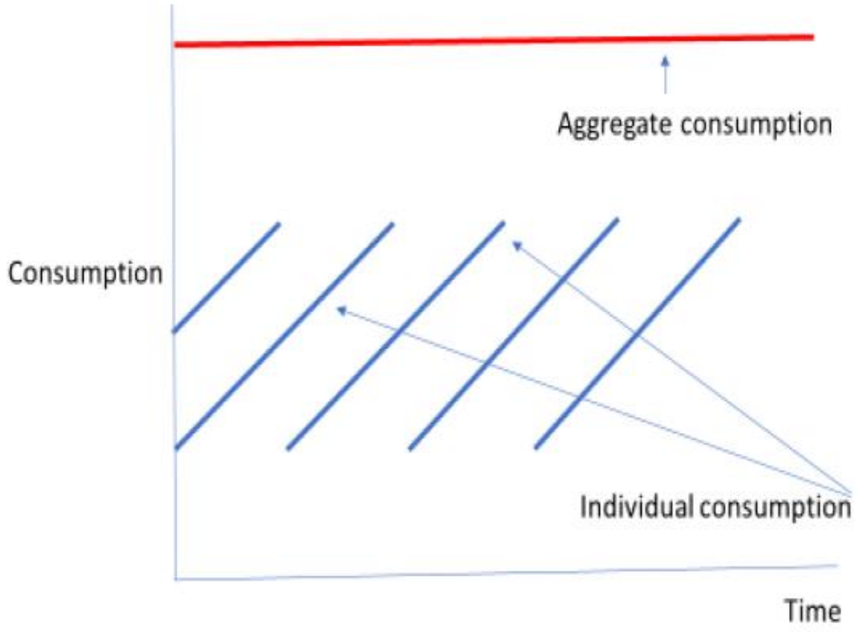
where

$$x = \ln(g(y)) + \ln\left(\frac{g(1-s) - \chi * g(1-\theta)}{1-\chi}\right)$$

Comment 4. Approaches to estimating m. The Euler equation approach

Concerns with the Euler equation approach to estimating *m*:

1. The Euler equation should hold for individuals, not aggregates, nor for aggregates for a particular group of people
    - This is well-known, and reiterated by Blanchard in his new book with a nice example where aggregate growth is zero even if everyone's growth rate is positive over their lifetime



Comment 4. Approaches to estimating m. The Euler equation approach

2. The fit is poor
    - The Euler equation holds for expected consumption and expected returns. Plugging in realizations adds noise
    - Even if you estimate it using individual growth rates, it's hard to get a tight link between consumption growth and returns

3. You need an assumption about β and ν. Especially ν is hard – no consensus.

4. In Reis' version, you need an assumption on α:

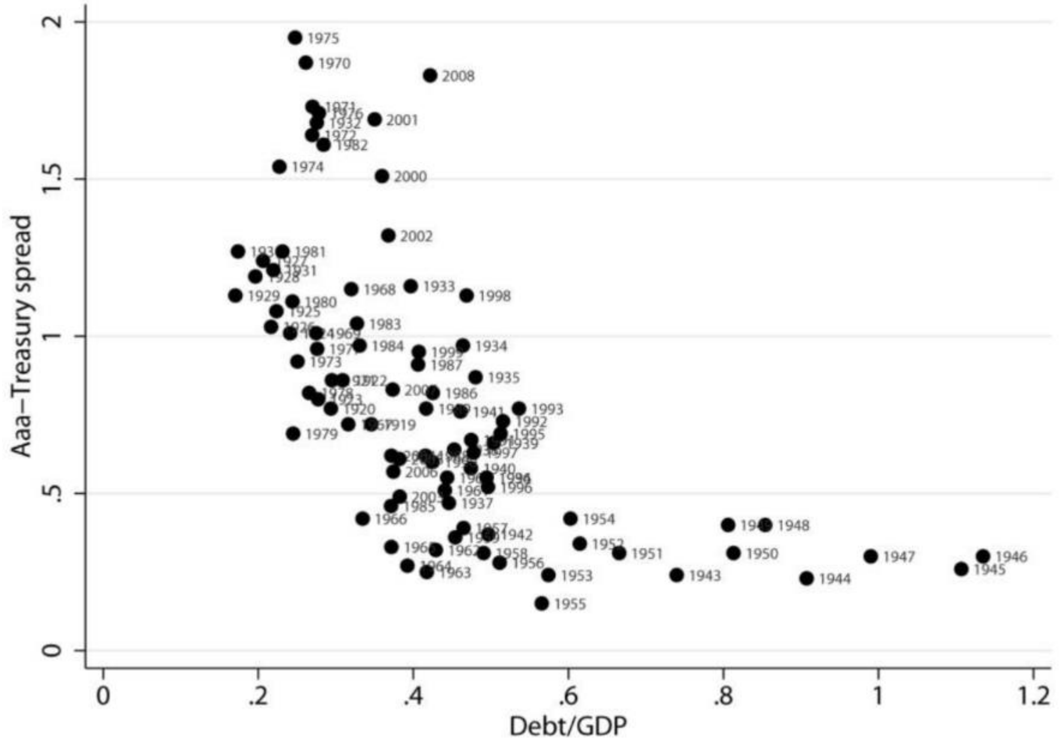
$$\left(\frac{1}{\beta}\right) * exp\left(\frac{x}{\nu}\right) = \alpha R + (1-\alpha)r = r + \alpha(R-r)$$

- If x is flat and r down, then $\alpha(R-r)$ is up
- Reis: α is down because government debt is going up. Therefore, R-r is up a lot (and m-r up a lot)
- But: If α is up, R-r could be flat. The stock market has done well, and wealth inequality has gone up… maybe α is up?

Comment 5. If *m-r* is up, I don't think it's due to higher government deficits or debt

- Risk premium framework: More government debt, *lower* m-r
  - More govt. debt → Investors need to put a smaller fraction in the risky asset → Lower risk premium

- Convenience yield framework: More government debt, *lower* m-r
  - Government debt (if very safe) has lower yield partly due to a yield discount for extremely low risk and high liquidity
  - More government debt *decreases* convenience yields: Krishnamurthy and Vissing-Jorgensen (2012)



Why is m>r in Reis' model and why does it go up with deficits?

- Steady state: x=0 (all g's are gross and =1)

$$\left(\frac{1}{\beta}\right) = \alpha R + (1-\alpha) r \quad \rightarrow \quad R = r + \frac{1}{\alpha} * \left(\left(\frac{1}{\beta}\right) - r\right) \quad \text{with} \quad 1-\alpha = \frac{b}{k} + \frac{z}{k}$$

- Government budget constraint: b/k=g/(1-r*), g is deficit/capital
- And allow for firm leverage. Impose that a constant fraction γ of mk goes to pay debt: $\gamma = \frac{rz}{mk}$

$$\frac{1-\gamma}{1-\frac{\gamma m}{r}} m = r + \frac{1}{\alpha}\left(\frac{1}{\beta} - r\right) \quad \text{with} \quad 1-\alpha = \frac{g}{1-r} + \frac{\gamma m}{r} \quad \rightarrow \quad m = \frac{r}{\gamma}\left(1-\alpha-\frac{g}{1-r}\right)$$

Endogenous: m, r. Exogenous: α, β, γ, g. Solution:

$$\frac{1-\gamma}{1-\left(1-\alpha-\frac{g}{1-r}\right)} * \frac{r}{\gamma}\left(1-\alpha-\frac{g}{1-r}\right) = r + \frac{1}{\alpha}\left(\frac{1}{\beta} - r\right)$$ which gives r. m follows from r

Why is m>r in Reis' model?

To get the intuition for m>r, set g=0:

$$1-\alpha = \frac{z}{k} = \frac{\gamma m}{r} \rightarrow \frac{m}{r} = \frac{1}{\gamma}(1-\alpha)$$

- $1-\alpha$ is exogenous, so z/k is exogenous
  $\gamma = \frac{rz}{mk}$ is exogenous
- m/r needs to adjust to make this possible: If z/k is low, m/r must be low to make firms pick this z/k given their leverage policy
  $m > r$ if $\frac{1}{\gamma}(1-\alpha) > 1 \leftrightarrow \alpha + \gamma < 1$: Low stock market participation and low debt service
  Nothing ensures the values for m/r are "sensible" – it's possible that r>>m or r<<m

I'm not sure Reis' framework is a good model of what drives m-r

- No risk premium. No convenience yield
- No investor is allowed to hold both equity and debt, making *m-r* not subject to standard finance
- *m-r* is driven by a somewhat arbitrary assumption on firms' leverage policy

A higher deficit increases m-r in Reis' model, but with counterfactual Debt/GDP implication

Allow g back in:

$$1-\alpha \ =\frac{b}{k}+\frac{z}{k}=\frac{g}{1-r}+\frac{\gamma m}{r}$$

Increase g (larger deficit)

- This can increase m/r, which increases z/k, if it *decreases* government debt/capital, b/k
- This is possible, because r (gross real rate) falls a lot further below 1 (the real rate gets more negative)

Problem: In the data, Debt/GDP is up a lot over the past few decades (whether debt is book or market value).

Summing up:

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