# FROM TRENDS IN INTEREST **RATES TO INFLATION, AND BACK**

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## Where is the interest rate converging to?

Figure 2. FOMC participants' assessments of appropriate monetary policy: Midpoint of target range or target level for the federal funds rate



A key question for monetary policy in 2025: when to stop easing? ... for fiscal policy: will debt revenues sustain public debt with persistent deficits? ... for <u>economists</u>: has the savings-investment balance changed?

### **Policy rate path and risk-free** curve

(percentages per annum)



Sources: Bloomberg and ECB calculations. Notes: The cut-off dates for the data used for the €STR forward curves are 17 December 2021, 16 December 2022, 15 September 2023, and 27 August 2024



## Three r<sup>\*</sup> in the measurement literature

There are (at least) three  $r^*$  in the literature

- (1) <u>Steady-state</u> or long-run value component of realized returns. Measured with time series models to separate trends from cycles
- (2) <u>Counterfactual</u> interest rate where investment equals savings Measured using models of capital markets and investment
- (3) If policy rate is above (below) it, the inflation will fall (rise) Measured using expectations and financial conditions, models of inflation

Sources of confusion:

- If the long-run is frictionless, then (1) = (2)
- If monetary policy works through frictions, then (2) = (3).

# Conceptually also hard to get head around

- Every asset gives a different return  $r_i$ . Which of the  $r_i$  is the  $r^*$ ?
- One tempting but flawed strategy:
  - Every  $r_i = r^* + premium_i$
  - The *r*\* is the safest, most liquid, shorter-term one, so its *premium=0*
  - But... that is the policy rate!
  - We wanted to calculate where policy rate will be heading in the future, but end up saying the current policy rate as the answer!
- This talk: home in on a few conceptual  $r^*$ 's that answer different questions
- Distinguish them, measure their trends, interpret the data, guess where they are



## **FACTS FROM 1995-2019**

# The four r-stars... (1) investment, m



## Average return on private capital minus expected inflation US

## The four r-stars... (1) investment, m Longer trend for US and the UK





# The four r-stars... (1) investment, m

## Other countries, namely the G-7 and Chile



# The four r-stars... (2) government bonds, y





10-year yield on Treasuries minus expected inflation

## The four r-stars... (2) government bonds, y

Very uniform across advanced economies





# The four r-stars... (2) government bonds, y

## Considering trends in output and inflation softens trend





Holston-Laubach-Williams

# The four r-stars... (3) realized return $\rho$



Annual realized return on holding bonds, reverts in 2015 US

## The four r-stars... (4) policy rate, i





### Short-term policy rate in real terms US



## Term premium falling with unconventional monetary policy



## Conclusions for 1995-2019 The four r\*

- y: Real yield on government bonds declined throughout The r\* that matches finance models of safe returns
- $\rho$ : Realized return on government bonds mirror yields until 2010-15 The r\* that captures role of unexpected inflation in business cycle
- The r\* that captures role of monetary policy in inflation

• m: Expected return on productive investment was roughly stable throughout. The r\* that matches long-run macro models of savings and investment

• i: Policy rates fell even faster until 2010-15, but then rose as yields kept falling

# Other indicators: (5) output / potential



## Output has been mostly below potential, especially in 2010-15

# Other indicators (6) investment/GDP, k

## Investment subdued throughout



# Other indicators (7) unproductive savings, b/k

## Government debt rising



## Wealth to capital stock mixed





# Other indicators (8) external finance, $\gamma$



interest/income

Non-financial corporate sector interest payments to income

(trend)

## **AN EXTENDED I-S FRAMEWORK**



## Productive savings and investment



- Investment in productive capital is higher the lower the cost paid to the financier
- *m* for marginal product of capital, marked up by markup
- Shifts left / down when:
  - TFP growth and population growth fall
  - Price of capital goods falls
  - Public investment falls
  - Depreciation rises

k

![](_page_20_Figure_11.jpeg)

## Productive savings and investment

![](_page_21_Figure_1.jpeg)

- In neoclassical growth model, horizontal at the discount rate
- Incomplete markets are classic reason for upward-sloping
- Shift right / down when:
  - More savings in total (demography, inequality, TFP)
  - More competition, less regulation, lower taxes.
  - Productive means attractive

k

![](_page_21_Figure_10.jpeg)

![](_page_21_Picture_11.jpeg)

![](_page_21_Picture_12.jpeg)

## Productive versus storage savings

![](_page_22_Figure_1.jpeg)

- Instead of productive capital stock can use storage (government debt + housing + financial monopoly rents)
- Not 45 degree line because differ in their non-return features
- Shifts right / down when:
  - Productive investments are perceived as riskier or less liquid, higher premium
  - Global imbalances and asymmetric information

m

## Productive versus storage savings

![](_page_23_Figure_1.jpeg)

- Ramsey-Euler equation: total return on savings equals discount rate plus growth times inverse IES.
- Total savings are a weighted average of returns on the two forms of savings
- Shifts right / up:
  - Growth rises, demography
  - Financial frictions rise (m>y)

m

![](_page_23_Picture_9.jpeg)

## Side note

- so that *m* rises, and so savings slopes up.
- Conversely, more supply of non-productive assets shifts savings left / up

![](_page_24_Figure_3.jpeg)

# • More investment in productive assets (k) means PA shifts left (and maybe RE),

![](_page_24_Figure_7.jpeg)

![](_page_24_Figure_10.jpeg)

## Realized returns and output

![](_page_25_Figure_1.jpeg)

- Given productive capital, get output **x** equals potential **x**<sup>p</sup>
- Potential output shifts left:
  - Productivity falls
  - Markups rise
  - Higher norm remuneration of variable factors
  - When capital payment *m* is higher and there is less *k*

![](_page_25_Picture_10.jpeg)

## Realized returns and output

![](_page_26_Figure_1.jpeg)

- Variable inputs as well. Require a ex post return, through a norm.
- Say inflation is lower than norm. Then realized returns  $\rho$  are high.
- Variable inputs still get paid their norm. Are less used, output is below potential
- Leading example: wages. But other downward nominal rigidities leading to too little use of variable inputs.

![](_page_26_Figure_8.jpeg)

![](_page_26_Picture_9.jpeg)

## Realized returns and output

![](_page_27_Figure_1.jpeg)

- Policy targets: trade-off costs of inflation versus costs of underemployment.
- Ideal: when target inflation equals inflation norm, and target output equals potential output, then intersect at kink.
- Shift right / down when
  - underestimate potential
  - overestimate inflation norm
  - |970s?

![](_page_27_Picture_9.jpeg)

![](_page_27_Figure_10.jpeg)

![](_page_27_Figure_11.jpeg)

![](_page_27_Picture_12.jpeg)

## Policy rate and unexpected inflation

![](_page_28_Figure_1.jpeg)

- Easier, standard
- Lower policy interest rate (*i*) means higher demand, which pushes inflation above its expected value by pricesetting firms
- Shifts right / up if:
  - Expected inflation  $(\pi^e)$  rises
  - Term premia (*tp*) falls
  - Wicksellian rate (y) is higher

 $\pi$ 

![](_page_28_Figure_10.jpeg)

## Policy rate and inflation

![](_page_29_Figure_1.jpeg)

- Taylor rule for policy rate: higher inflation, then higher policy rate, as usual.
- Shifts right /down when higher target inflation rate  $(\pi^T)$
- When target  $(\pi^{T})$  equals expected equals actual inflation: policy rate (i) is equal to Wicksellian rate (y) times expected inflation  $(\pi^e)$  divided by the term premium (tp).

30

 $\pi$ 

![](_page_29_Picture_9.jpeg)

![](_page_29_Figure_10.jpeg)

![](_page_29_Picture_11.jpeg)

## All together: four r\*'s

![](_page_30_Figure_1.jpeg)

### <u>Three exogenous forces</u>

- Structural determinants: Growth, Demographics, Productivity, Competition, Inequality, Global imbalances, Price of inv. goods
- Perceptions: Taste for safety/liquidity, Norm on compensation, Term premia, Expected inflation
- Policy goals / targets Estimates of potential output, inflation target, hawkishness

![](_page_30_Figure_6.jpeg)

# USING THE FRAMEWORK TO ACCOUNT FOR THE 1995-2019 TRENDS

## Fundamentals from literature on investment

![](_page_32_Figure_1.jpeg)

- Rachel Smith (17), Rachel (23). (1) Fall in relative price of capital (2) Lower economy and population growth rate. (3) Decline in public investment
- I would add: (4) Higher depreciation (5) Higher markups

k

![](_page_32_Figure_5.jpeg)

## But data says m constant or barely fell

![](_page_33_Figure_1.jpeg)

- Therefore Savings curve either very flat (consistent)...
- Or it shifted left
- Consistent with data on depressed investment
- To see why **S** may have shifted left and what about **y** turn to the next plot...

k

![](_page_33_Picture_7.jpeg)

![](_page_33_Picture_8.jpeg)

## Fundamentals from the literature on savings

![](_page_34_Figure_1.jpeg)

- Rachel Smith (17), Rachel (23).
- (1) Demographics: ageing RE left
- (2) Productivity and population RE left
- (3) Rising inequality RE left, PB left

Global imbalances RE left

But would lead to *m* falling as much (or more) than y.

![](_page_34_Figure_11.jpeg)

![](_page_34_Figure_12.jpeg)

## Fundamentals from the literature on savings Why PB shifted right

## Why RE shifted left by less

(1) Demographics: ageing Goodhart: cost of providing for the old

(2) Decline in leverage Lowered overall return

(3) Tighter financial frictions Reshuffling of total

(I) Global imbalances

State-controlled foreign investors prefer storage: more exposed to information asymmetry lemons and desire liquidity.

(2) Global financial crisis Risk aversion and regulation rise

(3) Increase in supply of storage Government bonds

![](_page_35_Picture_10.jpeg)

## The following is consistent with the m-r facts

![](_page_36_Figure_1.jpeg)

- Also consistent with the Savings curve shifting left
- More speculative (harder to model) factor: increase in use of asset markets for pursuit of rents from monopoly power
  - Evidence from syndicated loans that associated with his market power
  - Evidence on rise of markups

m

![](_page_36_Figure_8.jpeg)

## Policy challenge of low r, high m world

![](_page_37_Figure_1.jpeg)

- AS vertical segment shifts left (1) less investment means less productive capacity (2) higher markups (3) higher depreciation rate
- Vertical kink is lower (1) as y is lower
- Underemployment with unchanged policy, maybe 2010-15

![](_page_37_Figure_6.jpeg)

## Policy challenge of low r, high m world

![](_page_38_Figure_1.jpeg)

- Eventually **PT** shifts right as:
  - Persistently lower returns lower inflation norm (also loss of union power, Chinese 'deflation'' forces)
  - Fiscal policy pushing up aggregate demand
  - Monetary policy pushing for higher inflation (maybe also steeper if more doveish)
  - 2015-20?

![](_page_38_Figure_8.jpeg)

## Inflation and the ZLB problem

![](_page_39_Figure_1.jpeg)

 $\pi^e$ 

- With a lower **y**, had to adjust policy to a lower interest rate
- If ZLB binds, find yourself at deflation trap.
- The low inflation delivered the realized returns that led to the under-employment in the previous graph. So, lack of PT curve shift may well have been because policy was constrained by the ZLB

![](_page_39_Figure_8.jpeg)

![](_page_39_Figure_9.jpeg)

## The term premium to the rescue

![](_page_40_Figure_1.jpeg)

- Unconventional monetary policy (QE and others) lowered term premium to get out of it and raise inflation.
- Fiscal policy can help raise expected inflation to leave trap as well.

![](_page_40_Picture_8.jpeg)

## THE FUTURE

## What are the data indicating?

10-year yield on Treasuries minus expected inflation US

![](_page_42_Figure_2.jpeg)

![](_page_42_Picture_3.jpeg)

### Return on private capital

![](_page_42_Picture_6.jpeg)

![](_page_43_Figure_1.jpeg)

• Why rise **y** and slight fall **m**?

- Possibilities for shift right in PB:
  (1) Government bonds no
  - longer perceived as being as safe and liquid (Truss event)
- (2) Global imbalances reversal
- (3) Elections and fiscal/monetary mix going forward
- **RE** could shift slightly right or left, it depends.

m

![](_page_43_Figure_10.jpeg)

![](_page_44_Figure_1.jpeg)

- Shift right of **S**avings line from previous slide
- Shift right in Investment as a result of: (i) Al optimism (ii) rise in public investment
- These are small for now, but if keep on picking up, rise in investment and gradual drive down of *m*

![](_page_44_Figure_6.jpeg)

![](_page_45_Figure_1.jpeg)

- With persistently higher y, then vertical kink becomes higher.
- Say policy happy with higher inflation: (i) to avoid any under-employment (ii) pressure to inflate debt (iii) other temporary supply shocks: tariffs, immigration, re-shoring
- **PT** stays in same place, low returns.
- Eventually norms adjust to higher inflation, or policy returns to inflation target, **PT** shifts left

![](_page_46_Figure_1.jpeg)

- One scenario: point A
- Effectively having higher inflation target
- Allows higher inflation by, setting interest rates too low for a while.
- Then inflation expectations will adjust up, and eventually policy settles for persistently higher inflation rate.

 $\pi$ 

![](_page_46_Picture_7.jpeg)

## Alternative scenario

- Scenario above: inflation high, full use of resources and as for the r\*'s
  - *m*: lower as investment picks up

  - y: higher, and in nominal terms much higher •  $\rho$ : low as for a little while inflate the debt, then back to normal • *i*: at first too low, then settle too high
- Alternative:
  - Policy revises its y up, keep policy rates i high, bring inflation  $\pi$  to target. • Challenges along the way: investment picking up, potential rising, policy creating some temporary under-employment, maybe even some temporary undershoot of inflation relative to target.

![](_page_47_Picture_11.jpeg)

## Alternative scenario: the double trap

![](_page_48_Figure_1.jpeg)

- But, say term premium (*tp*) rises: (i) unwinding QE, (ii) higher inflation risk premia after recent inflation disaster, (iii) financial repression coming
- Point **B**: end up at ZLB again. The higher term premium offsets the higher long-term interest rate to leave policy rate close to zero.
- No longer QE tool to fight it

 $\pi$ 

![](_page_48_Picture_6.jpeg)

![](_page_48_Picture_7.jpeg)

## Alternative scenario: the double trap

![](_page_49_Figure_1.jpeg)

- Monetary policy cannot move PT to the right because of ZLB, so the economy is stuck to left of kink, with underemployment of resources
- Fiscal policy cannot help, as high  $\rho$ means large losses in fiscal budgets, ruling out stimulus on account of fear of sovereign default
- A double trap:
  - ZLB and
  - no fiscal space

![](_page_49_Figure_8.jpeg)

![](_page_49_Figure_9.jpeg)

![](_page_50_Picture_0.jpeg)

## CONCLUSION

## Where is r\* going?

- Forecasting may be hard, but ignoring the question is foolish
- trends, looked into the future.
- investment, AI optimism, (demography and inequality?)
- Two scenarios for  $\rho$  and i via  $\pi$ 

  - Persistent low inflation, stagnation with under-employment, high returns

• This talk: distinguished four  $r^*$ 's, proposed a framework, calibrated it with past

• Scenario where y rises a lot, m falls some: loss of safety, global imbalances, public

• Persistent higher inflation, low-then-high policy rates, low-then-normal returns

![](_page_51_Picture_12.jpeg)