Robust Real Rate Rules

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Can central banks control inflation?

- In a speech on maintaining price stability, President Nagel stated:

“Today, I would like to address the following question: Who is responsible for maintaining price stability in the euro area? In my view, the answer to this question is quite simple and clear: The Eurosystem! That is, the European Central Bank and the 20 national central banks in the euro area.

Does that mean that the actions of other economic agents are irrelevant? Absolutely not. Other economic agents can make the Eurosystem’s life easier, but also more difficult. Ultimately, however, responsibility for price stability lies in the hands of the Eurosystem.”

- But to what extent **can central banks control inflation**? For example:
  - Do **supply shocks** take inflation out of the central bank’s control?
  - Does a **flat Phillips curve** make it harder for the central bank to control inflation?
- We will answer these questions via examining the economy’s behaviour under certain **monetary rules**.

Background on monetary rules

- Agents' beliefs about the future behaviour of the central bank influence outcomes today.
- So: agents need to predict future nominal rates as a function of future economic conditions (inflation etc.).
- This is easiest if the CB commits to a **rule** setting nominal rates as a certain function of conditions.
- Even without an explicit commitment, CB behaviour may be well approximated by a rule. (True for Fed & ECB.)
- Central bankers are often sceptical about monetary rules as they value their discretion.
- This paper introduces rules that combine the benefits of commitment to a rule with CB discretion.

What makes a good monetary rule?

- Good monetary rules ensure that the inflation expectations of rational agents are **uniquely** pinned down.
  - Without this, adverse changes in sentiment can lead to self-fulfilling recessions.

- Good monetary rules also ensure that agents can easily **learn** how the economy behaves.
  - Without this, the beliefs of learning agents may never converge, amplifying business cycles.

- Good monetary rules ensure that inflation is **stable**.
  - Without this, there can be hyperinflationary spirals.

- Good monetary rules ensure that zero lower bound episodes are **transitory**.
  - Without this, the central bank loses its main tool to influence the economy (the nominal interest rate).

Taylor-type rules

- John Taylor (1993) found that US Fed behaviour could be captured well by rules of the form:

$$\boxed{i_t = \bar{\imath} + \phi(\pi_t - \pi^*) + \psi x_t}$$

- Notation: (This is the standard notation in monetary economics and is used throughout these slides.)
  - i_t: The nominal interest rate in period t.
  - π_t: The inflation rate in period t.
  - x_t: The output gap in period t.
  - ϕ, ψ: Constants determining the response to inflation and the output gap.
  - $\bar{\imath}$: The long-run average level of the nominal interest rate.
  - π^*: The inflation target.

The performance of Taylor-type rules

- In very simple New Keynesian models, Taylor-type rules **can** meet all four criteria if ϕ and ψ are large enough.
  - ϕ being large captures CB "aggressiveness" in fighting inflation.
  - $\phi > 1$ is sufficient in simple models. This is known as the **Taylor principle**.

- For more plausible models, Taylor-type rules **do not** meet all criteria.
  - Even making ϕ and/or ψ arbitrarily large is not sufficient in general.

- It is more likely that a model will fail to meet one or more criteria when, for example:
  - There are hand-to-mouth households.
  - Adjusting firm physical capital is costly.
  - Government spending is high.
  - The inflation target is high.
  - The growth rate is high, and wages are sticky.
  - There are financial frictions.
  - Agents are not fully rational.
  - Real primary surpluses do not respond to debt.

Real rate rules (RRRs)

- Holden (2023) introduces a new class of monetary rules, “real rate rules”.
- The basic real rate rule sets:

$$\boxed{i_t = r_t + \pi^* + \phi(\pi_t - \pi^*)}$$

- where $\phi > 1$ (the Taylor principle is satisfied), and where r_t is the **real interest rate**.
- **Crucially:** Markets in inflation protected securities (like **TIPS**) ensure real interest rates are **observable**.
  - Markets in inflation swaps can substitute.

The Fisher equation

- The behaviour of an economy in which the CB follows a real rate rule is determined by the **Fisher equation**.
- The Fisher equation relates the returns on nominal bonds and inflation protected bonds. It states:

$$i_t = r_t + \mathbb{E}_t \pi_{t+1}$$

  - where $\mathbb{E}_t \pi_{t+1}$ is agents' period t expectation of inflation the next period.
  - In other words: **Nominal rates are real rates plus expected inflation.**

- Combining the Fisher equation with the real rate rule implies:

$$\mathbb{E}_t(\pi_{t+1} - \pi^*) = \phi(\pi_t - \pi^*)$$

  - In other words: Inflation's expected deviation from target is ϕ times its current deviation.
  - $\pi_t = \pi^*$ (inflation is always at target) is clearly one equilibrium of this equation.
  - **Under rational expectations it is the unique equilibrium** as long as $\phi > 1$ (the Taylor principle again).
  - Also stable under learning + various models of bounded rationality. Intuition under naïve expectations follows.

How do real rate rules work with naïve expectations?

- We can rearrange the previous equation to see how inflation depends on inflation expectations.

$$\pi_t - \pi^* = \frac{1}{\phi}\left(\mathbb{E}_t \pi_{t+1} - \pi^*\right)$$

- $\phi > 1$ means that inflation's deviation from target responds only weakly to expectations' deviation from target.

- The simplest model of expectations is the naïve one: $\widetilde{\mathbb{E}}_t \pi_{t+1} = \pi_{t-1}$.
    - The naïve expectation of inflation tomorrow is just inflation yesterday.
- With these expectations, we have:

$$\pi_t = \pi^* + \frac{1}{\phi}\left(\pi_{t-1} - \pi^*\right)$$

- This is a stable process if and only if $\phi > 1$. This also provides intuition for the stability under learning of RRRs.

Robustness

- Real rate rules work as long as the Fisher equation (roughly) holds.
  - A very weak assumption. Risk/liquidity/etc. premia do not substantially change the performance of RRRs.

- Under a real rate rule, the intertemporal substitution decisions of households are **unimportant** for inflation.
  - Household expectations do not matter for inflation determination. Those of financial market participants do.

- Likewise, the Phillips curve **does not matter** for inflation determination under a real rate rule.
  - It can be forward or backward looking, pretty flat or very steep. Still the CB can **control inflation** just as well.
  - The Phillips curve pins down the output gap, given inflation. Causation only runs in one direction.
  - Firm expectations do not matter for inflation determination, but they can influence output gap movements.

How can price setters not determine inflation?

- That inflation should be determined by the Fisher equation and the monetary rule can seem magical.

- Inflation is the change in the price of goods, so it is surprising how unimportant price setters are under a RRR.

- This is a consequence of general equilibrium. In equilibrium:

  - Firms' marginal costs will move so that they wish to choose prices consistent with the RRR & Fisher Equation.

  - Their price choices feed into other firms' marginal costs, producing the marginal costs we started with.

  - If this did not happen, goods markets would not clear, which would produce the needed price adjustment.

Which shocks cause inflation?

- It is unlikely any CB has followed a RRR before now, so RRRs tell us nothing about what caused **past** inflation.

- But: RRRs do tell us something about which shocks **necessarily** cause inflation.

- Under a RRR, only two equations matter. The rule, and the Fisher equation.

  - Only shocks to these two equations can cause inflation under a RRR. (Monetary shocks, and Fisher shocks.)

  - So: Under a RRR supply shocks have no **necessary** impact on inflation.

  - Since a CB can always adopt a RRR, in general supply shocks have no necessary impact on inflation.

- Central banks **have ultimate responsibility for inflation** and cannot use supply shocks as an excuse.

How does monetary policy work?

- The standard story of monetary transmission is the following:
  - Because of sticky prices, increasing nominal rates also increases real rates, reducing consumption.
  - Via the Phillips curve, the drop in consumption implies a drop in inflation.
- Yet, in our models, monetary policy still works when prices are flexible! (Increasing rates still reduces inflation.)
  - And, under a RRR, movements in real rates cannot be relevant, as real rates cancel out.
  - In fact, even with Taylor-type rules, the real rate channel appears unimportant (Rupert & Šustek 2019).
- So: The standard story is at best a secondary channel.
  - Monetary policy primarily works through the Fisher equation, as under flexible prices or a real rate rule.

More flexible real rate rules

- The basic real rate rule gets inflation to target every period. This is not always desirable.
  - For example, following a mark-up shock, its desirable to tolerate higher inflation, to reduce the fall in output.
- A solution is to introduce a time-varying short-term inflation target to the rule (keeping the long-run target fixed):
  - If the target for period $t+1$ inflation is set in period t to $\pi^*_{t+1|t}$, then the rule becomes:

$$\boxed{i_t = r_t + \pi^*_{t+1|t} + \phi\left(\pi_t - \pi^*_{t|t-1}\right)}$$

- **Splits** monetary policy decision in two. Combines benefits of **flexibility** and rigid **commitment**.
  - President and board announce target level of inflation for the next month(s). Full benefits of flexibility.
  - Staff mechanically sets nominal rates via the rule to hit this level. Ensures target achieved: $\pi_t = \pi^*_{t|t-1}$.

Communication

- CB needs to be clear that any change in targeted inflation is **temporary**. Long run target remains at 2% (say).
    - Not so different to current practice. Not raising rates when inflation is high also needs careful communication.

- The Fed **already announces** a target path for inflation through the **Summary of Economic Projections**.
    - Summary of Economic Projections (SEP) gives monetary policy makers' forecasts for inflation…
    - …conditional on their beliefs about "appropriate monetary policy".
    - *"Each participant's projections [are] based on … her or his assessment of appropriate monetary policy … defined as the future path of policy that each participant deems most likely to foster outcomes for economic activity and inflation that best satisfy his or her individual interpretation of the statutory mandate to promote maximum employment and price stability."*

Practical implementation of real rate rules

- The paper addresses many real-world complications in order to produce a practical real rate rule.

- Major changes:

  - Allowing for endogenous wedges in the Fisher equation (liquidity/risk premia). CB aggression counteracts.

  - Introducing smoothing to the rule. Improves ZLB performance and lowers communication challenges.

  - Modifying the short-term inflation target to respect the ZLB. Cannot target inflation below minus the real rate.

  - Using longer maturity (multi-period) bonds. Longer bonds are less likely to hit the ZLB and are more liquid.

Conclusions

- Real rate rules **ensure stability** no matter the rest of the economy & give CB almost perfect **control** of inflation.
- Under a real rate rule (RRR):
  - Causation runs exclusively from inflation to the output gap. Supply shocks need not move inflation.
  - Household and firm decisions, constraints and inflation expectations are irrelevant for inflation dynamics.
- With a time-varying short-term target, RRRs can implement the CB president/board's desired monetary policy.
- In an empirical exercise I show that Current Fed behaviour is surprisingly close to following a RRR.
  - With the time-varying inflation target from SEP, a RRR explains 97.5% of variance of 5-year treasury yields.
- In general: Monetary policy primarily works via the Fisher equation, not via "demand" and the real rate.

References

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