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! …

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 sudden **oil price shocks** or other **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?
  - Is an **aggressive** enough response to inflation always enough to keep inflation near target?
- I will answer these questions via examining the economy’s behaviour under a particular **interest rate rule**.

Background on interest rate 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 easy if the CB commits to an **interest rate rule** setting nominal rates as a certain function of conditions.
  - Even without explicit commitment, CB behaviour may be well approximated by a rule. (True for Fed & ECB.)
- Central bankers are often sceptical about interest rate rules as they value **flexibility** and fear misspecification.
  - This paper introduces rules that combine the benefits of commitment to a rule with CB flexibility.

What makes a good interest rate rule?

- Good interest rate rules ensure that inflation is **stable**.
  - Without this, there can be hyperinflation.

- Good interest rate 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 interest rate rules also ensure that agents can easily **learn** how macro aggregates behave.
  - Without this, the beliefs of learning agents may never converge, amplifying business cycles.

Taylor-type rules

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

$$\text{nominal\_rate}_t = \text{intercept} + A \times (\text{inflation}_t - \text{target}) + B \times \text{output\_gap}_t$$

- In simple New Keynesian models, Taylor-type rules **meet** the criteria for a good rule if A and B are large enough.
  - A being large captures CB "aggressiveness" in fighting inflation.
  - $A > 1$ is sufficient in simple models. This is known as the **Taylor principle**.

- For more plausible models, Taylor-type rules **do not** meet all these criteria for a good rule.
  - Even making A and/or B 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:
  - Some households face a limit on borrowing, or:
  - Agents are not fully rational.

Real rate rules (RRRs)

- Holden (2024) introduces a new class of interest rate rules, “real rate rules”.
  - These include a response to the **real interest rate**.

- The **basic real rate rule** sets:

$$\text{nominal\_rate}_t = \text{real\_rate}_t + \text{target} + A \times (\text{inflation}_t - \text{target})$$

- where $A > 1$, so the Taylor principle is satisfied. Can also include a time varying inflation target.

- **Crucially:** Markets in inflation protected securities (like **TIPS**) ensure real interest rates are **observable**.
  - Markets in inflation swaps can substitute.

The Fisher equation and real rate rules

- If the CB follows a RRR, the behaviour of inflation is determined by the **Fisher equation & RRR (only!)**.
- The **Fisher equation** relates the returns on nominal bonds and inflation protected bonds. It states:

$$\text{nominal\_rate}_t = \text{real\_rate}_t + \text{expectation\_of}_t\ \text{inflation}_{t+1}$$

- Recall the **basic real rate rule**:

$$\text{nominal\_rate}_t = \text{real\_rate}_t + \text{target} + A \times (\text{inflation}_t - \text{target})$$

- **Combining** the two implies:

$$\text{expectation\_of}_t(\text{inflation}_{t+1} - \text{target}) = A \times (\text{inflation}_t - \text{target})$$

- $\text{inflation}_t = \text{target}$ (inflation is always at target) is always one equilibrium of this equation.

The economy under a real rate rule

- Real rate rules **satisfy** all three of the criteria I gave for a **good interest rate rule**.
  - If agents have rational expectations, RRRs ensure **inflation is always at target**, as long as $A > 1$.
  - RRRs also ensure inflation remains near target if agents are learning or only boundedly rational.

- **Intuition**: From rearranging the previous equation, we have:

$$\text{inflation}_t = \text{target} + \frac{1}{A}\text{expectation\_of}_t(\text{inflation}_{t+1} - \text{target})$$

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

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 borrowing and savings 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.
  - Firm expectations do not matter for inflation determination.
  - The Phillips curve pins down the output gap, given inflation and firm inflation expectations.

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 **unavoidably** 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 & risk premia shocks.)
  - So: **Under a RRR supply shocks** (energy price etc.) **have no 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**. Inflation following supply shocks is a CB choice.

How does monetary policy work?

- The standard (**demand** / real rate) 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 would still work if prices were **flexible**! (Increasing rates 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 (demand / real rate) story is at best a **secondary** channel.
  - Monetary policy primarily works through the Fisher equation, as under flexible prices or a real rate rule.
  - A CB commitment to aggressively counteract inflation ensures inflation expectations remain anchored.

More flexible real rate rules

- The basic real rate rule gets inflation to target every period. This is not always a good idea.
  - For example, following a supply shock, it is 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 $\text{target}_{t+1|t}$, then the rule becomes:

$$\text{nominal\_rate}_t = \text{real\_rate}_t + \text{target}_{t+1|t} + A \times (\text{inflation}_t - \text{target}_{t|t-1})$$

- **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.
  - Trading desk mechanically sets nominal rates via the rule to hit this level. Ensures target achieved.

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.

- Fed policymakers **already announce** 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 liquidity/risk/etc. premia in the Fisher equation. 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.
- 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 97.8% of variance of 5-year treasury yields.

Conclusions on Real Rate Rules (RRRs)

- RRRs **ensure price stability** no matter the rest of the economy & give CB almost perfect **control** of inflation.

- Under a real rate rule:
  - Inflation is determined just by the real rate rule and the Fisher equation.
  - The Phillips curve determines the output gap, not inflation. 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.

- More generally: Monetary policy primarily works via the Fisher equation, not via demand and the real rate.

Appendix

How do real rate rules with naïve expectations?

- The simplest model of expectations is the "naïve" one, in which: $\text{expectation\_of}_t\ \text{inflation}_{t+1} := \text{inflation}_{t-1}$.
    - The naïve expectation of tomorrow's inflation is just yesterday's inflation.

- With these expectations, we have:

$$\text{inflation}_t = \text{target} + \frac{1}{A}(\text{inflation}_{t-1} - \text{target})$$

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

How can firms not determine inflation?

- That inflation should be determined by the Fisher equation and the interest rate 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.
- But: Firms only care about their relative price! So, in general 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.

References

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