r* in the monetary policy universe: navigational star or dark matter?

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1 Introduction

Ladies and gentlemen, It's a pleasure and an honour for me to speak here before such a distinguished audience.

"Remember to look up at the stars and not down at your feet." This was advice from Stephen Hawking, the famous English physicist and author of numerous books on the cosmos. And who would want to contradict the genius?

So today I invite you to join me on a stargazing tour. If you don't have a telescope with you, no worries. However, I should add a disclaimer here: When a couple look up at the stars, things could get romantic. When astronomers observe the stars, impressive images can come into view. When economists talk about stars, it usually gets complicated. Now you know what you're getting into!

I'm sure you've already guessed what topic I have in mind: the natural rate of interest – also known as r-star. It is a concept that economists have been grappling with for more than 125 years.[1] And it has perhaps never received more attention than in the current era of monetary policy.

From a central banker's perspective, I would like to discuss what role r-star can and should play in the monetary policy universe. I will structure my lecture around four key questions: What is r-star and why is it of interest for monetary policy? How have estimates for r-star evolved over the past decades? What drives uncertainty about current estimates and the future evolution of r-star? What conclusions should monetary policy draw from this?

2 Definition of r-star and use for monetary policy

Let's start with the definition. The natural rate is the real interest rate that would prevail if the economy were operating at its potential and prices were stable. R-star is commonly thought to be driven by real forces that structurally affect the balance between saving and investment. Think of technological progress and demographics, for example. This also means that r-star should, by definition, be independent of monetary policy. The latter follows from the widely held belief that monetary policy can affect real variables only temporarily, but is neutral in the long term.

At first glance, the natural rate could be a guiding star for the conduct of monetary policy. If a central bank sets its policy rates so that the real interest rate is above r-star, monetary policy is restrictive or "tight". Consequently, economic activity slows and the inflation rate should decrease. If the real rate is below r-star, monetary policy is expansionary or "loose". It provides incentives for consumers to purchase more and for enterprises to step up investment and output. Hence, this should result in more economic activity and a higher inflation rate.

However, the idea of the natural rate serving as a guiding star for monetary policy comes with profound challenges. Perhaps the name r-star evokes associations with astronomy and navigation. But these would be misleading. If r-star were like a star in the sky, it would be relatively easy to locate. Stars emit light and are therefore observable.

The natural rate is a theoretical concept. It is based on a hypothetical state of the world. That means the natural rate is, by nature, unobservable. It can only be estimated. For example, models use assumptions about the relationship between measurable variables and r-star. In this respect, the natural rate is not so much like a star shining brightly in the sky. It is more a case of dark matter. As it is invisible, astronomers infer dark matter indirectly by observing its gravitational effects.

If something is hard to find, it only spurs researchers to look even harder – whether they are astronomers or economists. Therefore, we can draw on a variety of estimation methods for the evolution of the natural rate.

3 Estimates for r-star over time

Since around the 1980s various estimates of different types have been pointing to a downward trend for r-star over several decades and across many advanced economies.[2] In the wake of the global financial crisis, the estimates slumped to exceptionally low levels.[3] This development was roughly in line with the observed trajectory of actual real interest rates of short- and long-term government bonds during this period. And no wonder: In the long run, both should be driven by the same fundamental forces affecting the balance between saving and investment.

So the question is this: what has lifted saving and depressed investment? A simple answer would be: in the long term, the most important driver is potential growth. But this finding is not very enlightening. Potential growth is also not observable. It is determined by underlying forces such as demographics and technological progress. This is where we need to look for the causes.

Indeed, according to a number of recent studies, waning productivity growth and population ageing were the key factors in pushing saving up and investment down.[4] Lower productivity reduces the return on investment, so people are less willing to invest. As they expect to live longer, they are more willing to save.

In addition, inequality, risk aversion and fiscal policy could be other factors. For example, growing inequality raises saving, as richer households save a larger share of their income. Similarly, higher risk aversion leads to higher saving, especially in safe assets, while lowering investment.[5]

Many of the estimates for r-star reached their lowest point in the pandemic years 2020 and 2021. After that, there were signs of a partial reversal. A recent analysis by Eurosystem economists across a suite of models and data up to the end of 2024 suggests that estimates of r-star range from –½ % to ½ % in real terms. In nominal terms, they find that it ranges between 1¾ % and 2¼ %.[6]

It is clear that these ranges depend on the estimating approaches considered. Taking into account an even wider array of measures, Bundesbank staff calculations using data up to the end of 2024 reveal a range of 1.8 % to 2.5 %.[7] And the ECB (European Central Bank) found for the third quarter of 2024: When three estimates derived from versions of the Holston-Laubach-Williams model are factored in, the range of real r-star is –½ % to 1 % and the nominal range is 1¾ % to 3 %.

All in all, the results suggest that the range of r-star estimates most likely increased by about one percentage point from their lows. The latest estimates by economists from the Bank for International Settlements come to similar findings.[8]

The reasons for the increase after the pandemic are not yet fully clear. For example, high fiscal spending with rising public debt levels could play a role. Or higher needs for capital, as companies make their value chains more resilient by duplicating structures and increasing stock levels.

4 Uncertainties around r-star estimates

Stargazing tours in economics are a journey into the uncertain. This is also and especially true for r-star. Estimates of the natural rate of interest are subject to major uncertainties, shaped by three M's: megatrends, methodology and monetary policy.

First, we are facing a number of megatrends. Think of climate change, ageing societies, digitalisation, and the risks of de-globalisation and increasing geopolitical divisions. The effects of these megatrends on natural rates are difficult to gauge and may change over time.

On the one hand, they could contribute to a higher natural rate. Here are some examples: The widespread uptake of artificial intelligence could boost productivity growth. The green transition could lead to higher investment. Fiscal deficits could persist at an elevated level due to higher defence spending given geopolitical tensions. The entry of the baby boomer generation into retirement could reduce savings.

On the other hand, life expectancy is predicted to keep rising; the high hopes for the productivity-enhancing effect of AI (artificial intelligence) could turn out to be too optimistic; and given high public debt levels, fiscal space for additional spending is limited in many countries. Overall, it is virtually impossible to predict which developments will prevail in affecting r-star.

The second factor of uncertainty is methodology. The methods used to define and estimate r-star differ in important ways, especially in terms of time and risk.

Ricardo Reis demonstrates this impressively in a recent paper.[9] He presents four different "r-stars". They are based on four different conceptual approaches. And they developed quite differently between 1995 and 2019.

One major difference is the risk dimension. Knut Wicksell's original definition of the natural rate was the rate of return on physical capital in equilibrium.[10] The rate of return on physical capital is the return on investment in the real economy. And this rate is very much associated with risks.

However, this perspective has been lost in virtually all of the model approaches. Generally, they use rather secure government bond yields as a starting point. Again, with regard to the real economy, a risky return on capital would be a more appropriate yardstick. When we look at measures for the return on private capital, we see a strong contrast with risk-free rates. Returns on private capital have remained broadly stable over the last decades in the US (United States),[11] Germany[12] and the euro area as a whole.[13]

From these observations, Ricardo Reis draws the following conclusion: "focusing exclusively on the return on government bonds as the measure of r-star, while neglecting the return on private capital, leads to the wrong policy advice."[14]

Another case in point is the time horizon that is considered. Commonly cited estimates seek to assess the real rate that prevails in the longer run, when all shocks have dissipated. Most of these estimates are highly imprecise. Many methods simply project the current or the historical level of real rates into the future. This may confound permanent trends with cyclical factors, which may not be representative for the future. As a result, such methods could miss important turning points in real rate trends.

Other approaches characterise a short-run real rate in a hypothetical world without frictions. While interesting, this concept is of limited value for actual policymaking in the real world. Methods based on a short-term equilibrium tend to produce more volatile estimates of r-star.

There is a third reason for caution: monetary policy itself may play a role in shaping the natural rate or its estimates. A number of studies challenge the view that money is neutral in the long run.[15]

There are different channels through which monetary policy could have lasting effects on real interest rates. Prolonged tight monetary policy, for example, may lower investment, innovation and productivity growth.[16] By contrast, persistent monetary easing could fuel financial imbalances and contribute to zombification.[17]

Moreover, recent research suggests that central bank announcements provide guidance about the trend in real rates. For instance, a narrow window around Fed (Federal Reserve System) meetings captures most of the trend decline in US (United States) real long-term yields since 1980.[18] This could mean: when central banks look for r-star in financial market prices, they might actually be looking in a mirror.[19] Feedback loops between monetary policy and markets could unduly reinforce their perceptions about r-star. And shifts in perceived r-star could affect actual r-star as it influences saving and investment decisions.

5 Conclusions for monetary policy

Against the backdrop of these major uncertainties, the final key question of my speech is this: what role can and should r-star play for monetary policy in practice?

Let's approach the answer with a thought experiment: Put yourself in the shoes of a monetary policymaker who only looks at r-star. The relevant interest rate with which you steer the monetary policy stance is currently 2.75 %. After a previous series of interest rate cuts, you consider whether a further cut would be appropriate.

Your staff inform you that various point estimates of r-star range from around 1.8 % to 2.5 % in nominal terms. If r-star were at the upper end of the estimates, the policy rate would become neutral with the next rate cut. Things would be different if r-star were at the lower end of the estimates: Monetary policy would continue to be restrictive, even after several further rate cuts.

So how would you proceed, given a certain stance you want to achieve? Beware: If you rely on a wrong estimate, your decision may have a different effect on inflation than you intended. Simply choosing the middle of the range might not be a happy medium. Around the point estimates, there are often uncertainty bands of different sizes and with asymmetries.

As you have probably guessed: It is no coincidence that I have described this particular decision-making situation. It looks similar in the euro area ahead of the next monetary policy meeting of the ECB (European Central Bank) Governing Council at the beginning of March. After several rate cuts, the neutral rate could already be near – or there may still be some way to go.

The President of the New York Fed (Federal Reserve System), John Williams, put the problem in a nutshell when he said: "as we have gotten closer to the range of estimates of neutral, what appeared to be a bright point of light is really a fuzzy blur."[20]

The bottom line here is this: The closer we get to the neutral rate, the more appropriate it becomes to take a gradual approach. For this purpose, r-star is a helpful concept: it indicates when we need to be more cautious with policy rate moves so that we don't take a wrong step.

At the same time, the limits of the concept are also clear: it would be risky to base decisions mainly on r-star estimates. Much more is needed to assess the current monetary policy stance and the optimal policy path for the near future.

That is why the Eurosystem uses a variety of financial, real economic and other indicators along the monetary policy transmission mechanism. We want the fullest picture possible. And, of course, r-star also has a place in this picture. For instance, r-star is included in model-based optimal policy projections that we use in the decision-making process.

In my opinion, proceeding in a data-driven and gradual manner has served the ECB (European Central Bank) Governing Council well. There is no reason to act hastily in the present uncertain environment. The data will tell us where we need to go.

Away from day-to-day monetary policymaking, the concept of the natural rate of interest provides a useful framework. This is also exemplified in the policy scenarios that Ricardo Reis presented last week in Brussels.[21]

He works with the assumption that government bond rates remain around current levels. I would add the assumption that inflation stays on target – actually, that is what I am in office for and committed to. Assuming output is at capacity, policy rates would be persistently higher than in the past. But the recommendations on actual monetary policy depend on the driving forces: is the new setting caused by less demand for safe and liquid assets or by an increase in productivity? And he has two more scenarios in his paper!

That provides a good example of why we should take a close look at the factors behind r-star estimates. Here it is important to even better understand the forces that are shifting real interest rate trends. We need to find out how these forces and trends affect our work to ensure price stability.

Reviewing our monetary policy strategy from time to time is therefore vital. That is precisely what we are doing right now in the Eurosystem. And, of course, in this process, we look at all the questions I mentioned about r-star.

Our stargazing tour is drawing to a close. It turns out we were dealing more with dark matter than with a shining star. Just as dark matter is an exciting field for astronomers, r-star is a rewarding topic for economists.

Using r-star alone to navigate the monetary policy universe could be like flying almost blind. But having it as one of many instruments in your cockpit is highly useful.

I would like to end by quoting Stephen Hawking again: "Mankind's greatest achievements have come about by talking, and its greatest failures by not talking."

Footnotes:

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