



Banc Ceannais na hÉireann
Central Bank of Ireland

Eurosystem



Box C:

QB 2 – June 2023

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Modelling the macroeconomic impact of the ECB's monetary policy tightening on the Irish economy

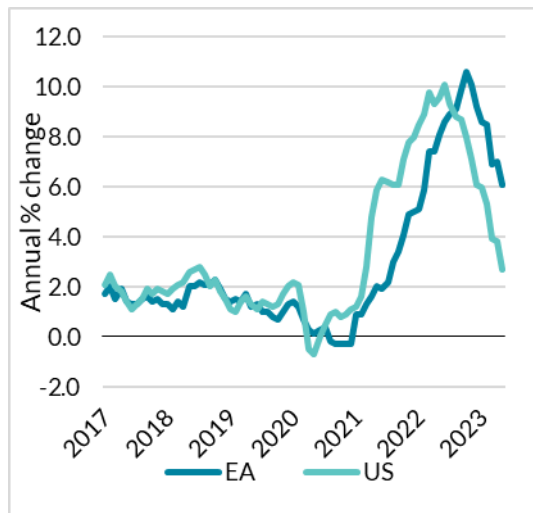
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In response to higher inflation in the euro area, the ECB began to raise interest rates in July 2022, and since then has raised them by 400 basis points (Figures 1 and 2). The purpose of this tighter monetary policy is to help bring inflation in the euro area back down to the ECB's target inflation rate of 2 per cent over the medium-term. Many other central banks have also tightened monetary policy. For example, the Federal Reserve began to raise rates in March 2022 and has increased the Federal Funds Rate by 475 basis points (Figure 2).



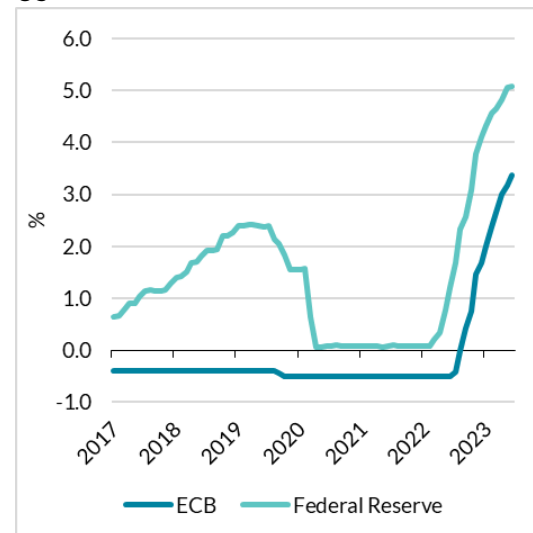
Interest rates have responded to a rise in inflation

Figure 1: Inflation in the euro area and US



Source: Eurostat, ECB, Fed.

Figure 2: Interest rates in the euro area and US



Source: Eurostat, ECB, Fed.

In this *Box*, we report the results of a simulation exercise to gauge the quantitative impact of an exogenous increase in interest rates in the euro area on economic activity and inflation in the Irish economy. We use a suite of macroeconomic models approach to quantify the impact of tighter monetary using both a DSGE model and a large-scale semi-structural model. Our methodology is similar to [Darracq-Parles et al. \(2023\)](#) and [Aurissergues \(2022\)](#).

Given monetary policy is set for the euro area as a whole and Ireland is a small open economy, our model simulations necessitate modelling the effects of any such policy change on the rest of the world and any feedback effects to the domestic economy. This requires that we use a global model as well as a model of the domestic economy. In terms of a semi-structural model, we use NIESR's NIGEM model along with the Central Bank's domestic model while the DSGE model is based on the EAGLE global model and an explicit modelling of the domestic economy.¹

Simulation Exercise

For the simulation exercise, we implement an exogenous euro area monetary policy shock that raises the interest rate by around 360 basis points over four quarters and then follows the forward curve path, which has priced in interest rates falling back to 2.5 percentage points above baseline after 4 years (Figure 3). The future path of interest rates is uncertain and we use this particular path

¹ For the Ireland specific EAGLE model, see [Clancy, Jacquinot, and Lozej \(2016\)](#). For NiGEM, see <https://www.niesr.ac.uk/nigem-macroeconomic-model>.

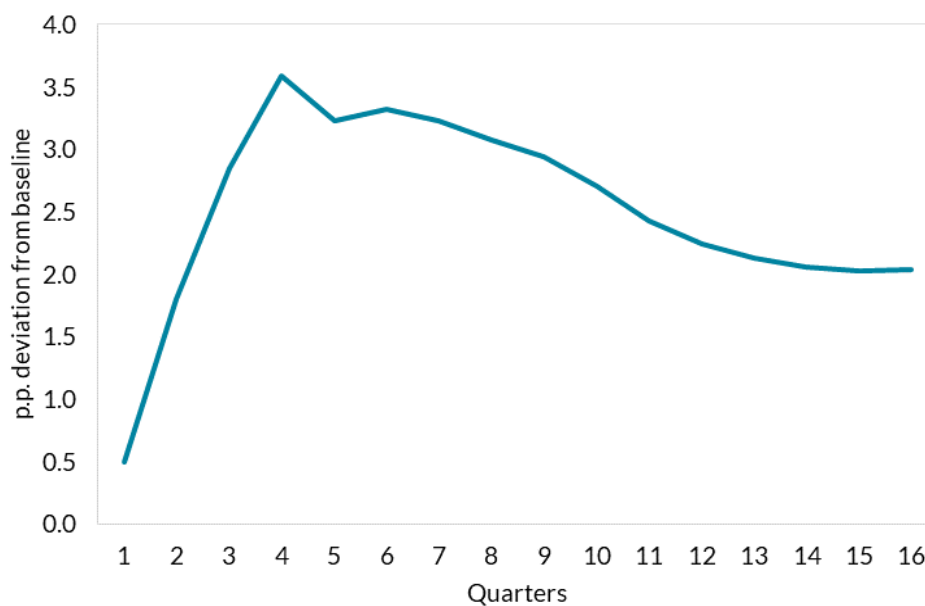


as it is consistent with the currently available market information. The interest rate path that we use in this exercise is not intended as a forecast, but as one possible scenario.² We then compare the outcomes from this scenario with a baseline where no interest rate increase takes place.

To isolate the effects of higher interest rates in the euro area, the shock is implemented on a stand-alone basis with no exogenous increase occurring in interest rates outside the euro area. It is important to state up front that we are not modelling the path or source of the increase in inflation which central banks' are responding to. There is much debate in the literature as to its source and whether it is primarily driven by demand or supply side factors and to what extent the pace of reaction of monetary policy contributed to the persistent inflation that has occurred, see for example, [Bernanke and Blanchard \(2023\)](#), [Gagliardone & Gertler \(2023\)](#), [Koch and Noureldin \(2023\)](#) amongst others.

The simulation exercise considers a higher euro area interest rate path based on market information

Figure 3: Path of euro area policy interest rate in the scenario exercise



Source: authors' calculations and Bloomberg.

² The path ahead for monetary policy is conditional on the economic outlook and we are likely to be closer to 'the top of the ladder' of the current interest rate cycle. See: <https://www.centralbank.ie/news/article/blog-inflation-and-monetary-policy-what-to-expect> and <https://www.centralbank.ie/news/article/speech-monetary-and-fiscal-policy-in-times-of-inflation---remarks-by-governor-gabriel-makhlouf-at-the-dubrovnik-economic-conference-27-may-2023>



Transmission Channels³

Ireland is a small open economy in a monetary union so it is useful initially to discuss the transmission of tighter monetary policy in the euro area beginning with its impact on the international economic environment. The tradable sector is exposed to international developments making it a key channel through which external shocks propagate to the broader Irish economy. The tradable sector is directly affected by foreign demand and relative prices (or costs).

- a. *Foreign demand channel.* A higher interest rate in the euro area reduces economic activity in euro area countries, which leads to lower demand for intra-euro area trade, including Irish exports and tradable sector output.
- b. *Exchange rate (price competitiveness).* An increase in the euro area interest rate leads to an appreciation of the euro and a reduction in the demand for euro area exports and tradable sector output in Ireland. Conversely, a stronger euro leads euro area countries to increase their demand for imports from outside the euro area.
- c. *Exchange rate (imported inflation).* A euro appreciation makes imports from outside the euro area less expensive and reduces the import and consumption deflators. The strength of this channel on inflation depends on the degree of pass-through to consumer prices.

Tighter monetary policy in the euro area also has a direct impact on the non-tradable sector and domestic economy in Ireland. Higher interest rates affect financial markets and, subsequently, the real economy. There are a number of financial channels, including pass-through to market interest rates, and an impact on asset prices and expectations.

- a. *Market rates.* An increase in the policy interest rate passes through to market interest rates and raises the cost of borrowing for firms and households. The higher interest rate on loans to firms leads to an increase in the user cost of capital and lower investment. Similarly, loans to households become more expensive resulting in lower consumption. Households may also increase their savings, but the strength of this channel depends on the degree of pass-through to deposit rates and the expected duration of the shock. The combined impact of lower consumption and investment leads to a reduction in domestic demand and non-tradable sector activity.
- b. *Asset prices.* Higher interest rates on mortgage loans reduces the demand for housing. This leads to lower house prices and lower consumption through the housing wealth channel.

³ The ECB describes the transmission mechanism of monetary policy here: <https://www.ecb.europa.eu/mopo/intro/transmission/html/index.en.html> Also see: <https://www.centralbank.ie/news/article/blog-inflation-and-monetary-policy-what-to-expect>



Higher interest rates also reduce the value of financial assets, such as equities and bonds, leading to lower consumption through the financial wealth channel.

- c. *Expectations.* Expectations of future inflation and policy actions can have an important bearing on the impact of tighter monetary policy. DSGE models contain forward-looking expectations while semi-structural models typically have backward-looking expectations. As a result, semi-structural models tend to be slower to react to shocks whereas DSGE models respond more quickly.

Simulation Results

Figures 4 and 5 show the impact of the monetary policy shock on inflation and output in Ireland, respectively. Due to estimation and model uncertainty, we present the average and range of the models' results. Figure 4 shows that the euro area monetary policy shock reduces inflation in Ireland by around 2 and 2.5 per cent relative to what would otherwise be the case without higher interest rates over the first two years, before returning to the baseline. In terms of the range shown in the chart, the semi-structural model suggests that inflation would be 1.5 percentage points lower compared to the baseline case in the absence of higher euro area interest rates while the DSGE model gives a larger estimate of around 3.5 percentage points.

Figure 5 shows the shock leads to a reduction in the level of output in Ireland by 2.5 and 4 per cent in the first two years and 3 per cent in year 3, relative to the case where interest rates remained unchanged. The semi-structural model suggests a gradual reduction of 3 per cent over the 3 year period while the DSGE model falls by 5 per cent before falling back to 3.5 per cent in year 3. The different dynamics shown in Figures 4 and 5 reflect the variable lags associated with the transmission of monetary policy as well as the different treatment of expectations in both models.

The relatively larger effect of the shock on inflation and output using the DSGE model reflects, in part, the role of forward-looking expectations, which bring the effects of the shock in the model forward, before returning back to the steady-state more quickly than the semi-structural model that has backward-looking expectations and slower dynamics.

In the DSGE model, forward-looking households anticipate a longer time period of tightened financing conditions, which is why they reduce their consumption by more and tend to do so earlier, as higher interest rates for a longer period of time make more saving earlier relatively more attractive. However, a stronger reduction in consumption and aggregate demand also imply a stronger reduction in household incomes, which magnifies the feedback effect on aggregate demand and leads to stronger amplification of the shock.

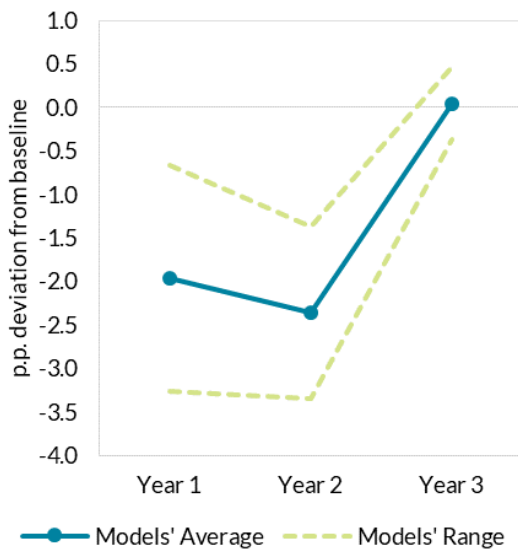
In terms of labour market effects, the shock gradually reduces the level of employment by around 3 per cent and raises the unemployment rate by 1.6 percentage point, relative to the baseline, using



the semi-structural model. This is in line with the around 3 percent reduction in employment in the DSGE model.

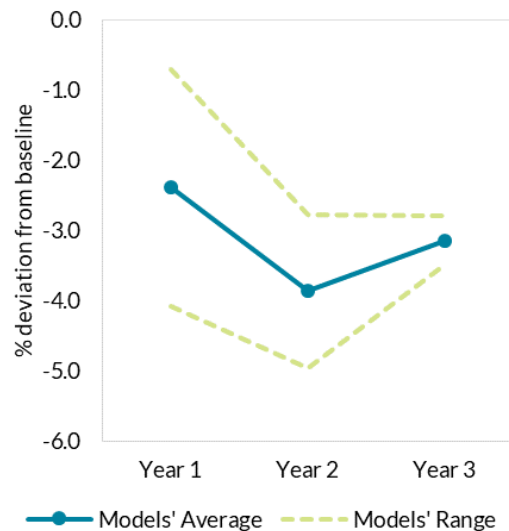
Interest rates have responded to a rise in inflation

Figure 4: Impact of shock on inflation
(p.p. deviation from baseline)



Source: authors' calculations.

Figure 5: Impact of shock on output
(% deviation from baseline)



Source: authors' calculations.

Some caveats

There are a number of caveats to our analysis that relate to what happens to exchange rates, policy responses abroad, source of the shock, and pass-through to market interest rates.

- i. Regarding exchange rates, our simulations take into account the policy actions of the ECB only and excludes interest rate hikes by other monetary authorities.

In a case in which other central banks concomitantly tighten monetary policy to fight inflation, the exchange rate appreciation of the euro previously witnessed would be more muted and dependent on the relative size of policy rates across countries through an uncovered interest parity condition. However, higher interest rates in our trading partners will reduce demand in these economies through lower consumption and investment and ultimately reduced demand for imports from the euro area. We find the overall response of the domestic economy is quite similar whether or not one models a tightening by other countries.

- ii. The simulation considers a monetary policy shock on a stand-alone basis. In reality, the tightening of the interest rates currently observed is in part the result of an endogenous



response to demand and supply shocks that have brought the economy to the current state with high inflation.

- iii. In the current tightening cycle, we have to date witnessed less pass through of the ECB policy rate to some retail rates such as standard variable mortgage rates and some deposit rates.⁴ It is still early in the tightening to determine what the ultimate pass-through to retail rates will be. If the pass-through was to remain below that observed historically, then it would suggest our model results represent a somewhat upper bound of the effect of the tightening cycle.

Conclusion

The simulation results in this box show that the ECB's monetary policy tightening can be expected to continue to influence both economic activity and inflation in Ireland over the forecast horizon. The simulation exercise in this *Box* implies that in the absence of euro area monetary policy tightening, and assuming interest rate pass-through follows historical patterns, inflation would be in the region of 2 to 2.5 percentage points higher over the course of this year and next than what is currently expected. There is significant uncertainty around model-based estimates of the impact of monetary policy, as reflected in the quantitative differences shown by the semi-structural and DSGE models. As such, this type of model-based exercise provides a cross-check on the potential impact, and transmission, of euro area monetary policy on the Irish economy over time.

⁴ See Byrne, McCann, and Gaffney (2023): https://www.centralbank.ie/docs/default-source/publications/financial-stability-notes/the-interest-rate-exposure-of-mortgaged-irish-households.pdf?sfvrsn=cab7991d_8