

Macroeconomic Policy in Europe:
Experiments with monetary responses and fiscal impulses

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Abstract:

In this paper we discuss the main model properties of NiGEM, the National Institute's large-scale macroeconometric model. NiGEM is a 'New-Keynesian' model where agents display forward looking behaviour but there are nominal rigidities slowing adjustment. In a number of policy simulations we find there are strong similarities across countries. Nevertheless, Euro Area responses to monetary and fiscal policy are greatest in Germany in NiGEM, whilst these responses are slower in comparison to the US due to greater wage-price inertia.

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1. Introduction

In this paper we undertake some standard simulations on our model, NiGEM under appropriate policy rules, ensuring that the setup and simulations are comparable to those on other models of the world economy. In the next section we discuss the structure of the model. In the third section of the paper we present monetary and fiscal policy analyses in a standardised way, whilst in the fourth section we discuss specific policy simulations set up for comparability. We argue that an experiment that shifts a money or inflation target by a predefined amount reveals more about the nature of the model than does a traditional interest rate shock. The impact of interest rate shocks sustained for one year, as in section four, depend both on the size of the effect of interest rates and on the speed of response of the model. Hence a model with more inertia may give the impression of being less interest sensitive in this experiment.

2. Modelling the Economy

NiGEM is an estimated model, which uses a ‘New-Keynesian’ framework in that agents are presumed to be forward-looking but nominal rigidities slow the process of adjustment to external events. All countries in the OECD, including South Korea, are modelled separately, as is China and there are six other regional blocks. All economies are linked through the effects of trade and competitiveness and are fully simultaneous. There are also links between countries in their financial markets as we model the structure and composition of wealth, emphasising the role and origin of foreign assets and liabilities. We have forward-looking wages, forward-looking consumption, forward-looking exchange rates and long-term interest rates are the

forward convolution of short-term interest rates. The model has complete demand and supply sides and there is an extensive monetary and financial sector.

NiGEM contains expectations and we therefore need a solution method that allows us to solve for their current and future values. We use the Extended Path Method to obtain values for the future and current expectations and iterate along solution paths. During this process expectations are repeatedly recalculated until convergence is achieved. Consider solving the model for period t . A single shock is applied to the model. We assume that agents have full knowledge of the vector of model parameter estimates, future values of the exogenous values are available and all lagged values are known. Agents know the set of shocks and when solving for the dynamic path of the endogenous variables they set all future shocks equal to their expected value of zero (the certainty equivalence assumption is assumed to hold). The model is solved far enough into the future so that the results are not affected by the terminal date, and terminal conditions are 'standard'.

In a world model we need a description of trade in goods and services, a description of the structure of foreign assets and liabilities, and links between these and the rest of the model. The current account flows onto the asset stock, and cumulated current accounts should affect future income flows. In a world model consistency is ensured when every export is imported by somebody, all liabilities are somebody else's assets, all income flows from assets are matched by flows on liabilities, and current accounts add up across the world (to the normal degree of discrepancy).

Each country that we wish to study needs a description of its domestic economy. This can be broken up into sectors, and the minimum would cover the government, the labour market, consumption behaviour, the supply side of the

economy and financial markets. The model contains a wealth equilibrium for the private sector. Governments are constrained to be solvent, and hence also have an asset equilibrium. These two constraints tie down the net asset holdings of the external sector.

2.1. The Structure of the Model

Trade. Our trade equations depend upon demand and relative competitiveness effects, and the latter are defined in similar ways across countries. There are a variety of competitiveness measures we can construct. For exports we assume that exporters compete against other people who export to the same market (RPX), and demand is given by the imports in the markets to which the country has previously exported (S). The dynamic equation for each country consequently takes the general form:

$$\Delta X_t = \lambda[X_{t-1} - S_{t-1} + b*RPX_{t-1}] + c1*\Delta X_{t-1} + c2*\Delta S_t + \text{error} \quad (1)$$

Imports depend upon import prices relative to domestic prices (RPM) and on demand (TFE)

$$\Delta M_t = \lambda[M_{t-1} - b1*TFE_{t-1} + b2*RPM_{t-1}] + c1*\Delta M_{t-1} + c2*\Delta TFE_t + \text{error} \quad (2)$$

As exports depend on imports, they will rise together in the model. We have a similar pattern for services trade, but relative price elasticities are higher.² In all cases competitiveness depends in part on domestic prices or costs, and a rise in domestic prices not matched either by a change in the exchange rate or foreign prices will mean net exports will fall, and hence output will fall relative to where it would have been.

² Goods and services trade elasticities

	TFE Imports – goods demand	Relative prices imports goods	Export Market demand	Relative prices Exports goods	Demand services rest of world	Relative prices Exports services	TFE Services imports	Relative prices Imports services
France	1.51	-0.59	1.00	-0.63	1.00	-1.0	1.2	0.4
Germany	1.95	-0.37	1.00	-0.66	1.00	-1.0	1.0	1.0
Italy	1.50	-0.73	1.00	-0.49	1.00	-1.0	1.2	0.9
UK	2.06	-0.16	1.00	-0.82	1.00	-1.0	1.3	1.0

Source: NiGEM (2002)

Government. It is important to have sketch models of direct and indirect taxes, and of government spending. We consider the financing of the government deficit (BUD), and we allow either money (M) or bond finance (DEBT).

$$BUD_t = \Delta M_t + \Delta DEBT_t \quad (3)$$

The debt stock affects interest payments and forms part of private sector wealth. Current fiscal revenues are disaggregated into personal taxes (variable TAX, which includes both personal income tax and social security contributions), corporate taxes (CTAX) and miscellaneous taxes (mainly indirect; MTAX). We also have government consumption and investment (GC and GI), interest payments (GIP) and transfers (TRAN). As GC and GI are in constant prices, we convert them to nominal terms using the private consumption deflator CED and the GDP deflator P, respectively. The budget balance thus reads:

$$BUD_t = TAX_t + MTAX_t + CTAX_t - TRAN_t - GIP_t - GC_t * CED_t - GI_t * P_t \quad (4)$$

Government interest payments are modelled as the income on a perpetual inventory, the change in the debt stock each period paying the long interest rate in the issue period until it is replaced.³ Personal taxes and transfers affect disposable income, as do interest payments.⁴ All budget items feed into the economic system through their impact on the budget balance, and thus on the economy's asset stocks.

Consumption and Personal Income. We assume that consumers consider their current income (RPDI income including non-labour income net of taxes) and their real financial wealth (RNW),⁵ and that they adjust toward a long run relationship involving these variables. Adjustment costs are assumed to be quadratic, and

³ The perpetual inventory attempts to take account of countries like Italy and Belgium where there are large proportions of short-term public debt.

⁴ Variable GIP also influences net property income paid abroad, and thus the current account and asset stocks as well.

behaviour is forward looking. The resulting equation is written with all variables in logs below:

$$\Delta \log C_t = \lambda [\log C_{t-1} - a \log \text{RPDI}_{t-1} - (1-a) \log \text{RNW}_{t-1}] + \delta \Delta \log C_{t+1} + \text{error} \quad (5)$$

and the coefficient on the forward change in consumption is the rate of time preference.⁶ We assume that wealth is affected by financial markets through equity and bond prices, and hence if these markets ‘expect’ something in the future then it will be reflected in prices. News that changes expectations will cause wealth to be re-valued, and hence will affect behaviour now.

Personal incomes are generated from compensation received by those in employment, by transfers from the government, and from other income which depends upon net domestic and foreign profits received and on government interest payments. Income recipients also pay direct taxes on their incomes. Consumers are assumed to be the ultimate owners of all assets and hence of all income streams. All assets and liabilities are explicitly modelled, and so are the resulting income streams.

Production and Price Setting. For each country we have an underlying CES production function which constitutes the theoretical background for the specification of the factor demand equations, forms the basis for unit total costs and provides a measure of capacity utilisation which then feeds into the price system. A CES production function that embodies labour augmenting technological progress (denoted λ) with constant returns to scale, can be written as:

⁵ In previous versions of the model short term nominal interest rates had an effect on consumption decisions in countries such as the UK. However, given the degree of financial liberalisation in the economies we study we presume that these effects are now absent as determinants of consumption.
⁶ Coefficients in forward consumption are based on panel estimation in an early version of Barrell, Byrne and Dury (2002), where common parameters were estimated for Europe but not the UK.

	Error correction in Consumption	Weight on income in consumption	Rate of time preference parameter –quarterly (1-rtp)
France	- 0.17322	0.83137	0.97
Germany	- 0.17322	0.83137	0.97
Italy	- 0.17322	0.83137	0.97
UK	- 0.088163	0.86406	0.97

$$Q = \gamma [s(K)^{-\rho} + (1-s)(Le^{\lambda t})^{-\rho}]^{-1/\rho}. \quad (6)$$

γ and s are production function scale parameters, and the elasticity of substitution, σ , is given by $1/(1+\rho)$. Variables K and L denote the net capital stock and labour input measured in terms of employee hours. With long-run constant returns to scale we obtain log-linear factor demand equations of the form:

$$\ln(L) = [\sigma \ln\{\beta(1-s)\} - (1-\sigma) \ln(\gamma)] + \ln(Q) - (1-\sigma)\lambda t - \sigma \ln(w/p) \quad (7)$$

$$\ln(K) = [\sigma \ln(\beta s) - (1-\sigma) \ln(\gamma)] + \ln(Q) - \sigma \ln(c/p). \quad (8)$$

The parameters of the production function vary across countries and w , c and p denote respectively labour costs per head, nominal user costs of capital and the price of value added (at factor cost) and β denotes the mark-up. We estimated a long run labour demand curve to retrieve the elasticity of substitution and the technical progress parameters. We calibrated the remaining parameters and utilised the elasticity of substitution in the capital demand equation. These parameters are also used in the construction of an indicator of capacity utilisation that affects the mark-up of prices over unit total costs. The capital stock adjustment equation depends upon the long run equilibrium, and the user cost of capital is influenced by the forward looking real long rate, as well as by taxes and by depreciation. The speed of adjustment to equilibrium in the investment/capital stock adjustment equations also depends upon the short term real interest rate, with the effects being similar across countries.

Our core price equations relate the producer price to the cost function implied by our production function. Producer prices are driven by import prices and by the total cost of production, where the latter is constructed from the wage per person hour and the nominal user cost of capital per unit of capital. The user cost of capital

depends on the tax adjusted long term real interest rate, and hence this variable also enters the cost function. The producer price is a core variable in the determination of consumer prices and hence of the rate of inflation.⁷ The price equations are all statically homogenous, but in some cases do not display dynamic homogeneity, as this imposes too strong a restriction on the data to be acceptable.⁸ Hence in some countries, but not the UK for instance, the mark-up of prices over costs depends upon the rate of price inflation. However, this is not relevant to the results in this paper as we do not change the trend rate of inflation in any of the simulations. There are marked capacity effects in the price system. If output is above capacity prices rise more rapidly than their determinants (foreign prices, total unit costs, expectations) would suggest, and the reverse is the case if the economy is below capacity. If prices fall relative to baseline because the economy is below capacity then real financial wealth rises, and competitiveness improves, and both help raise capacity utilisation through higher domestic demand and exports.

Labour Markets. We assume that employers have a right to manage, and hence the bargain in the labour market is over the real wage. In the long run wages rise in line with productivity all else equal. Given the determinants of the trajectory for real wages, if unemployment rises then real wages fall relative to trend, and conversely. There is continual structural change in labour markets and sustainable unemployment changes when policies change, and we have to continually update our model so that it

⁷ The long run production and price parameters are given below.

	Elasticity of substitution	import prices in producer prices	unit total costs in producer prices	unit labour costs in consumer price	Producer prices in consumer price
Germany	0.482	0.55	0.45	0.46	0.54
France	0.653	0.64	0.36	0.51	0.49
Italy	0.484	0.72	0.28	0.43	0.57
UK	0.667	0.35	0.65	0.29	0.71

reflects the economies we are studying, rather than being just a simple description of past data. Both the determinants of equilibrium and the dynamics of adjustment change, and adjustment, especially in Europe is slow.

We assume that labour markets embody rational expectations and we assume that wage bargainers use model consistent expectations, either for the immediate period ahead or over a longer term horizon. We estimate wage equations and hence the natural rate of unemployment within a stylised version of the bargaining framework of Layard et al. (1991, Chap. 2). The dynamics of the wage market depend upon the error correction term in the equation and on the split between lagged inflation and forward inflation as well as on the impact of unemployment on the wage bargain.⁹

There is no explicit equation for sustainable employment in the model, but as the wage and price system is complete the model delivers equilibrium levels of employment and unemployment. An estimate of the NAIRU can be obtained by solving the price equation based on unit total costs for the real wage. Unit total costs depend in turn upon the user cost of capital and the distribution parameters, and hence the real rate of interest will affect the NAIRU, as will the rate of capacity utilisation. Equilibrium output depends on factor inputs into the production function. The

⁸ Dynamic homogeneity is absent from the French and Germany price systems, but is present in the UK.

⁹ The wage equation parameters are summarised below.

	Error Correction in the wage equation	Weight on forward price inflation terms	Weight on backward wage and price inflation	Long run coefficient on unemployment
Germany	-0.1670	0.31	0.69	-0.0386
France	-0.0948	0.36	0.64	-0.0150
Italy	-0.1500	0.60	0.40	-0.0250
UK	-0.1019	1.00	0.00	-0.0206

equilibrium supply of labour is the product of the level of employment given by the NAIRU and trend hours worked, which decline over time.

Financial Markets. For most purposes we assume that exchange rates are forward looking, and ‘jump’ when there is news. The size of jumps depends on the effects on interest rates that are anticipated for the future, and hence policy rules affect financial markets. We assume that bond and equity markets are also forward looking, and long-term interest rates reflect short rates that are expected in the future. The long rate is the forward convolution of expected short rates, whilst the equity price is related to the discounted present value of future expected profits.

Forward looking long rates LR (and long real rates) have to look T periods forward

$$(1+LR_t) = \prod_{j=1, T} (1+SR_{t+j})^{1/T}. \quad (9)$$

Forward looking exchange rates RX have to look one period forward along the arbitrage relation involving domestic and foreign interest rates (SRH and SRF)

$$RX_t = RX_{t+1} (1+SRH_t)/(1+SRF_t). \quad (10)$$

Forward looking equity prices are solved out from the infinite forward recursion and depend only on the expected equity price next period and the discount factor, which in turn depends upon the equity risk premium

$$EQP_t = Profits_t + EQP_{t+1} \text{discounted}. \quad (11)$$

We also adjust for the expected real growth of the capital stock and its implications for profits per unit of equity. The equity risk premium also feeds into the physical investment decision.

2.2. Policy rules

Fiscal and monetary policy rules are important in ‘closing the model’ and our rules are discussed at greater length in Barrell and Dury (2000).

Fiscal Policy Rules. We assume budget deficits are kept within bounds in the longer term, and taxes rise to do this. This simple feedback rule is important in ensuring the long run stability of the model. Without a solvency rule (or a no Ponzi games assumption) there is no necessary solution to a forward-looking model. We can describe the simple fiscal rule as

$$\text{Tax}_t = \text{Tax}_{t-1} + \phi [\text{GBRT}_{t-1} - \text{GBR}_{t-1}] + \delta [\text{GDRT}_{t-1} - \text{GDR}_{t-1}] \quad (12)$$

where Tax is the direct tax rate, GBRT and GBR are the government surplus target and actual surplus as a ratio to GDP, GDR and GDRT are the stock of debt to GDP and the target for the stock, ϕ and δ are the feedback parameters. The former is designed to remove an excess deficit in less than five years, whilst the latter is set to zero in this exercise. Targets have to be set consistently.

Monetary Policy Rules. We assume that the monetary authorities target something that stabilises the price level or the inflation rate in the long term. The speed of response of the authorities affects the properties of the model. A typical policy for a central bank may be to target some nominal aggregate such as nominal GDP or the money stock, which may rise in line with nominal GDP in the long run. A standard monetary policy rule would be to change the interest rate according to some proportion of the deviation of the targeted variable from its desired path. For example a proportionate control rule on the nominal GDP or the money stock would be:

$$r_t = \lambda_1 (P_t Y_t - P_t^* Y_t^*) \quad (13)$$

where P = the log of the price level and Y is the log of real output with a star denoting target variables.

However, a nominal target only stabilises inflation in the long run and policy makers are likely to be concerned with keeping inflation at some desired level in the short term. During the 1990's several moved to a new monetary policy regime of inflation targeting and have announced a formal inflation targeting framework where decisions are guided by the deviation of inflation from some target level. We might write a similar rule with the money stock replaced with the inflation rate. This would give a simple proportional rule on the inflation rate (we may use either the current or the expected inflation rate – in this paper we use expected rates)

$$r_t = \gamma_2 (\Delta P_{t+j} - \Delta P_{t+j}^*) \quad (14)$$

where j indicates the lead or lag in the feedback rule and P is in logs.

The European Central Bank (ECB) uses a combination of these two approaches. A combined policy of nominal aggregate targeting and inflation rate targeting would then give:

$$r_t = \gamma_1 (P_t Y_t - P_t^* Y_t^*) + \gamma_2 (\Delta P_{t+j} - \Delta P_{t+j}^*) . \quad (15)$$

where P and Y are in logs. The policy rules on the model use the Consumer Price Index (CPI) inflation rate. We choose the combined rule as our default monetary policy rule because it represents the mixed framework that is used in Europe by the ECB. In this paper in the following sections we use a Taylor rule, although not the industry standard that we programme up as a default in the model. We may write the rule as

$$r_t = \gamma_1 (Y_t - Y_t^*) + \gamma_2 (\Delta P_{t+j} - \Delta P_{t+j}^*) + \gamma_0 \quad (16)$$

where P and Y are in logs and we have set $\gamma_1=0.25$ (25.0), $\gamma_2=1.00$ and γ_0 is the steady state rate of interest. The core simulations in this paper do not change this parameter, but if we change the saving and investment balance in the economy then the

equilibrium real interest rate changes, and hence so does the intercept in the Taylor rule. We target the expected not the actual inflation rate.

3. Monetary Policy

Standard diagnostic analyses of models can be done in several ways. We would normally operate policy in relation to targets, and we set up two monetary policy experiments in this section that shift targets within the policy environment. They are equivalent in intention to those discussed in the next section. Fiscal policy also operates in a rule guided framework in Europe (see Barrell and Pina, 2003, for a discussion) and can be analysed in a similar way.

We specify a tightening of monetary policy as a shift in the objective or target of the monetary authority, rather than a shift in its instrument setting on its own. The interest rate is clearly the major instrument of monetary policy, but in a forward looking world the same objective can be achieved by a multiplicity of instrument settings over varying periods of time. For instance inflation can be reduced in an inflation targeting regime by changing the target by 1.0 percentage point for 2 years or by 2.0 percentage points for 1 year. The overall result should be essentially the same in the medium term. In order to ensure comparability across models and frameworks we require some degree of commonality. We choose to shift the target for the price level downward by 2.5 percent, and to implement this with a 1.0 percentage point increase in interest rates for one year, with the targeting rule setting rates thereafter. We do this for the Euro Area and for the World in our two experiments, respectively.

The ECB makes it clear that it has a two pillar strategy where one pillar is a nominal aggregate, therefore it is wise to emulate a monetary tightening, as compared

to our baseline, by shifting this nominal target.¹⁰ In order to ensure experimental comparability we assume the same targeting rule for all countries, and we adopt the same feedback parameters. Of course we could implement a Taylor rule for the USA, an inflation target for the UK and Canada, and some strategy for Japan. However, all give essentially the same result as long as our objective remains to reduce the price level as compared to base by 2.5 percent everywhere. Targets are shifted in independent monetary authorities in the Euro Area, the USA, the UK, Sweden, Denmark, Norway, Switzerland, Canada, Japan, and Australia and New Zealand.¹¹

We plot the results for these two experiments. Figure 1 plots the effects on prices and output of the EMU monetary policy tightening. The real and monetary sector in the Euro Area are affected immediately as a consequence of the reduction in monetary target, with a larger fall in output, in the first years after the shock at least. The effect on output peaks after two years and then returns to base. Prices on the other hand are permanently affected by the monetary contraction, of the order of two and a half percent. There are small initial increases in output and price for the UK, due to changes in relative competitiveness, but there are no permanent departures for the UK from baseline. Figure 2 plots short-term and long-term interest rates in the Euro Area and displays the associated increase in interest rates in the first year for the ECB. The increase in UK interest rates is associated with the small increase in UK output mentioned before. In this experiment the euro jumps by just over 3 percent against the dollar in the first quarter, and the nominal appreciation settles around 2.5 percent (as we would expect) after a year or so. This real appreciation is the major factor behind the slowdown in the economy and the reduction in price inflation.

¹⁰ If we believed that the monetary authority operated just an inflation target we could shift that target by an equivalent amount.

¹¹ Henceforth, we will refer to this group of countries as ‘world’ or ‘all countries’.

Figure 3 plots output and prices in the Euro Area and UK when we repeat the exercise and shock the targets and interest rates of all countries. In contrast to Figure 1 we now see a permanent decrease in prices in the Euro Area and in the UK. The temporary decline in output is somewhat larger and longer in the Euro Area due to the downturn in world demand, but returns to base for both areas in the long term.

A worldwide increase in interest rates with a tighter monetary target reduces prices in all countries, albeit to different extents in the short run. This policy simulation is interesting because we are able to isolate the impact of the monetary policy shock from changes in the exchange rate in the transmission mechanism. Consequently the impact here is primarily through demand, although the euro does temporarily appreciate by around 1.0 percent in the first quarter. Figure 5 plots output and prices in the US and the Euro Area when all countries are shocked, and Figure 6 compares the impact on long and short rates in both areas. Greater inertia in the wage-price system in the Euro Area means interest rates stay higher for longer and prices move more slowly than in the US, and these factors explain the temporary euro appreciation. Prices adjust slightly less rapidly in the Euro Area in the worldwide shock, and in the second year they have fallen by 0.4 instead of 0.6 in the Euro Area only experiment. US prices fall by almost 1.0 in the second year as compared to baseline in the worldwide shock. It is clear from a comparison of these two experiments that the exchange rate is not the only channel for the impact of a monetary policy impulse in the model, and that the differences in inertia in the Euro Area and the US influence the apparent interest sensitivity of these economies in the first year after a shock.

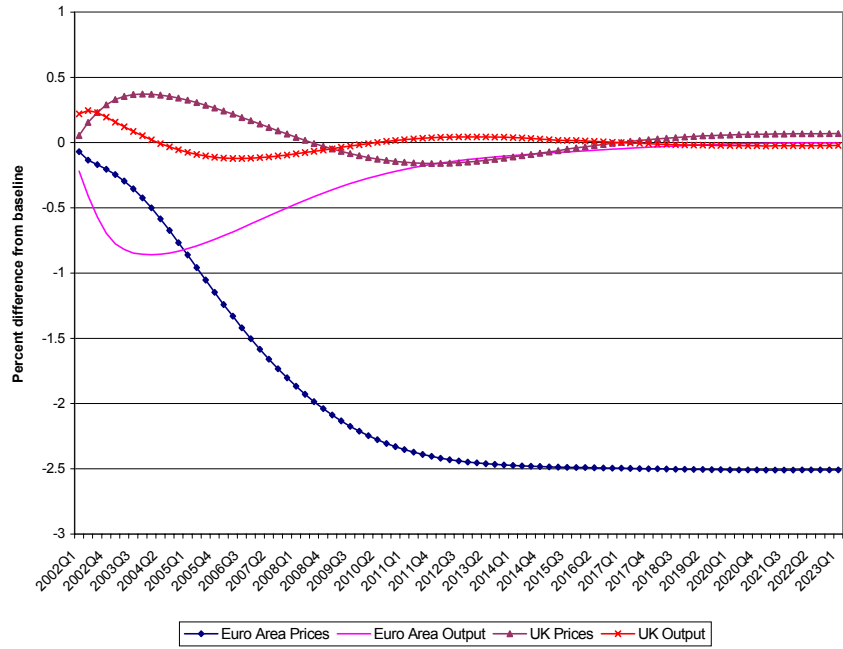


Figure 1. Output and Prices in the Euro Area and the UK when the Euro Area Tightens Monetary Policy

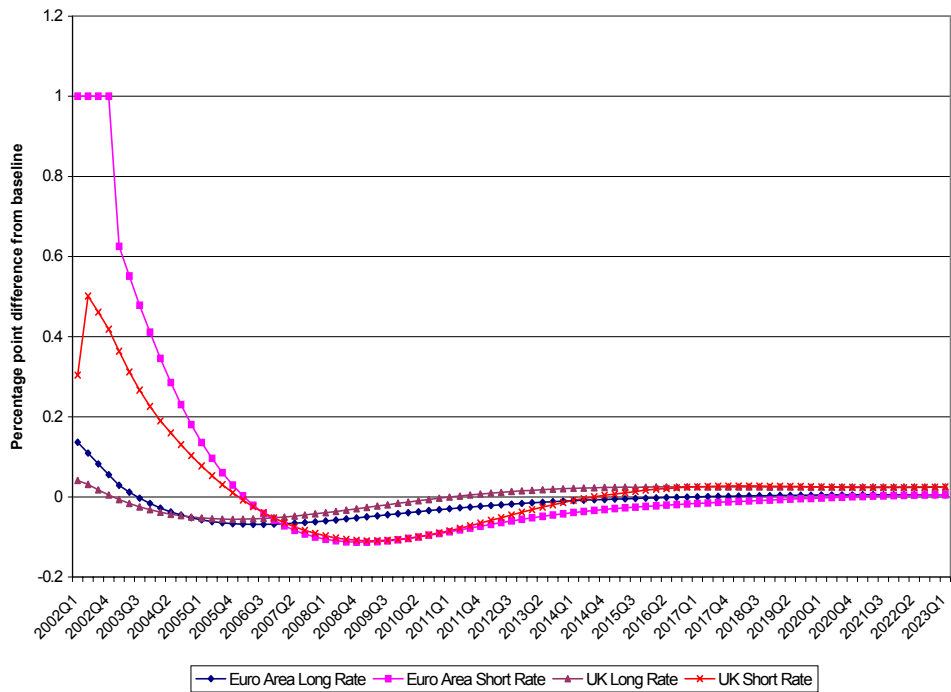


Figure 2. Short and Long Rates in the Euro Area and the UK when the Euro Area Tightens Monetary Policy

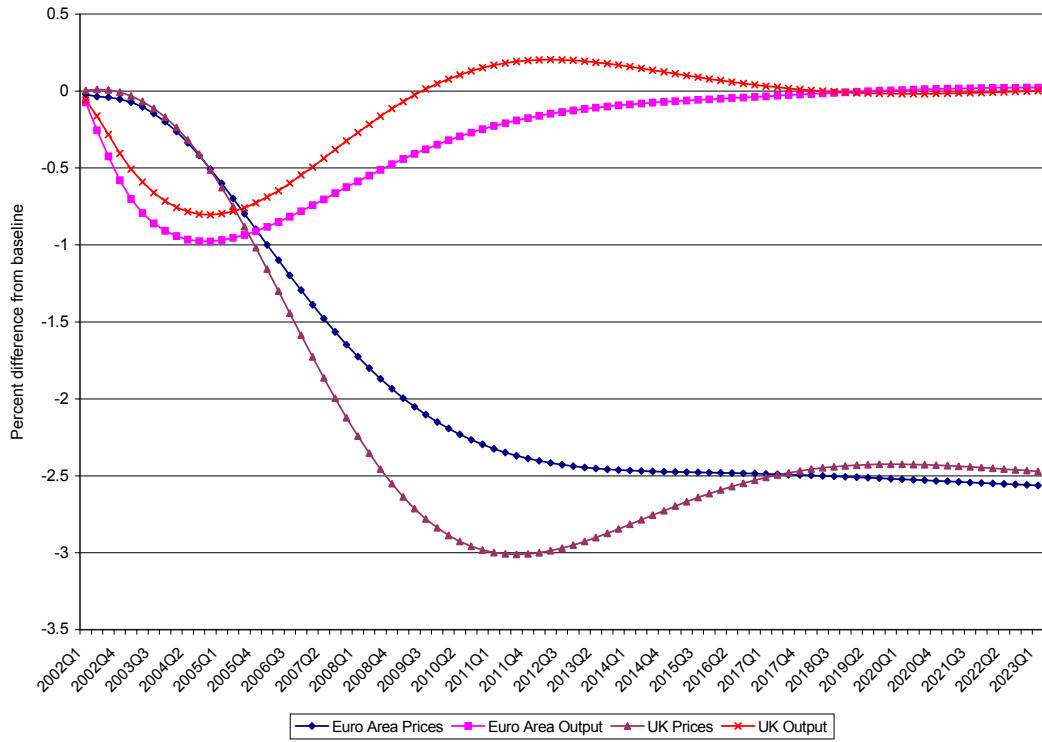


Figure 3. Output and Prices in the Euro Area and the UK when All Countries Tighten Monetary Policy

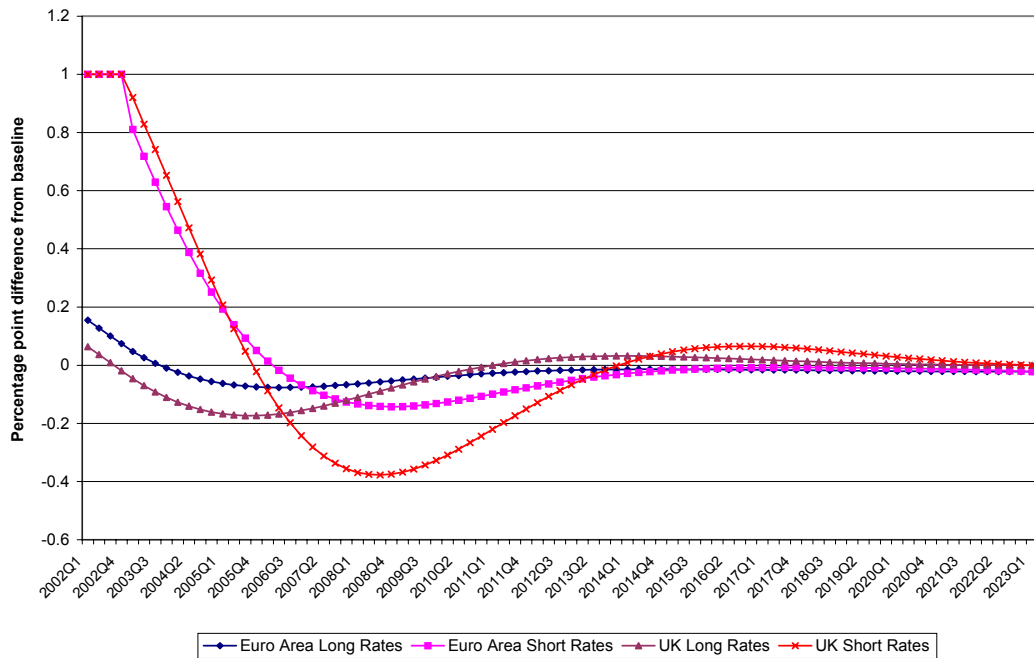


Figure 4. Short and Long Rates in the Euro Area and the UK when the All Countries Tighten Monetary Policy

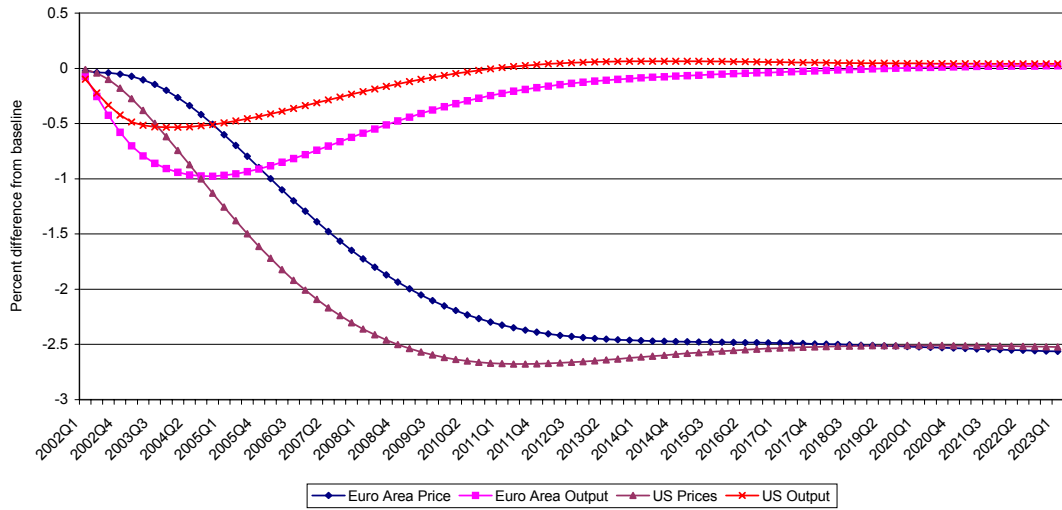


Figure 5. Output and Prices in the Euro Area and the US when All Countries Tighten Monetary Policy

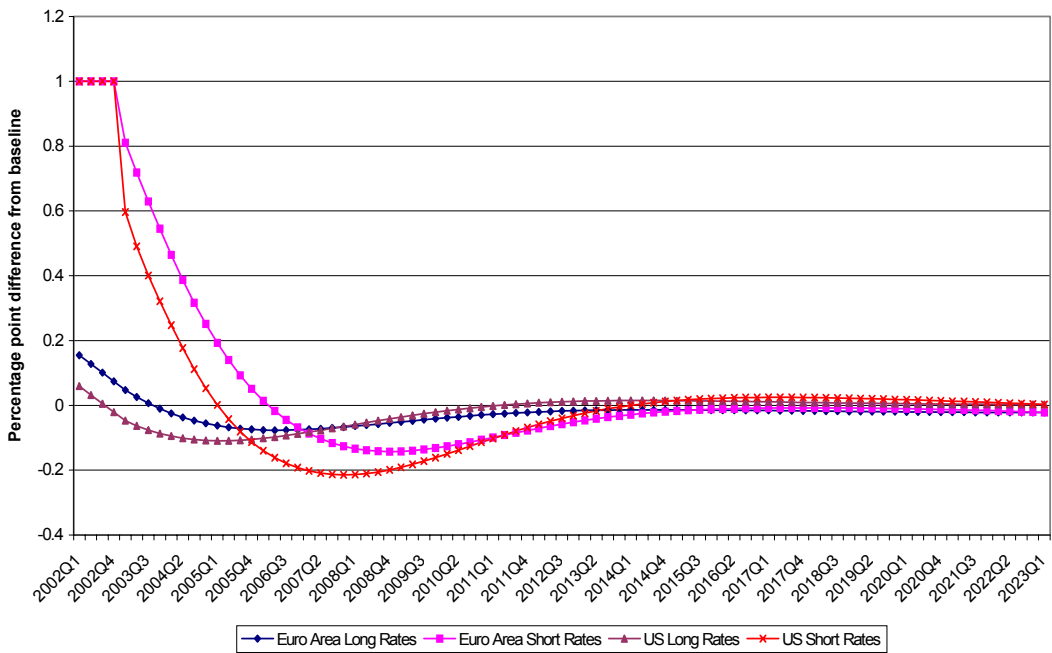


Figure 6. Short and Long Rates in the Euro Area and the US when All Countries Tighten Monetary Policy

4. Experiments with Monetary and Fiscal Policy

In this section we report two simple model comparison based exercises. In both sets we have attempted to standardise on the ‘industry comparison’. The first involves a fiscal impulse in each of four European countries separately. We reduce government spending by one per cent of GDP for one year in Germany, France and Italy with monetary policy being determined by the ECB, and then in the UK with independent monetary policy. The second exercise involves a 1.0 increase in interest rates sustained for one year, first in the Euro Area and then in the world as a whole.

In our fiscal experiments we assume that there is no fiscal feedback within the year of the shock, and that short term interest rates are fixed at base. However, within this period exchange rates, equity prices, long term interest rates and expectations in the labour market change as these variables have a forward looking component. In our model some of the impact of monetary reactions comes from these markets, and hence we cannot say that we have fully isolated the impact of fiscal policy. In each case we additionally assume that forward inflation is used in the monetary rule, that consumers display forward looking behaviour, and that a Taylor rule with a coefficient of 1.0 on inflation and 0.25 (25.0) on output is used, ($\gamma_1=0.25$, $\gamma_2=1.00$ in equation (16)).

Tables 1-12: Fiscal Shocks, one country at a time, 1% GDP for 1 year, no fiscal feedback, no interest reaction in the first year

Table 1: Germany GDP % difference from baseline

	Consumption	Private sector investment	Government expenditure	Export volumes	Import volumes	GDP
2002	-0.172	-1.463	-4.684	-0.311	-2.141	-0.991
2003	-0.102	0.298	0	-0.023	0.098	0.076
2004	-0.059	0.26	0	0.043	0.118	0.076
2005	-0.015	0.096	0	0.042	0.019	0.029
2006	0.015	0.03	0	0.032	0.01	0.02
2007	0.037	0.016	0	0.021	0.028	0.021
2008	0.053	0.016	0	0.011	0.042	0.022
2009	0.065	0.018	0	0.003	0.051	0.021
2010	0.072	0.02	0	-0.002	0.058	0.021
2011	0.077	0.021	0	-0.004	0.062	0.02

Table 2 Germany Costs, Prices, and Rates differences (B) and % differences (P) from baseline

	Whole economy unit labour cost	Inflation (CED)	Unemployment, %	Private consumption deflator	Dollar exchange rate	Real Effective Exchange Rate	Nominal Effective Exchange Rate	Short term rate	Long term rate
	P	B	B	P	P	P	P	B	B
2002	-0.036	-0.092	0.492	-0.037	-0.069	-0.006	0.016	0	-0.014
2003	-0.786	-0.264	-0.046	-0.265	-0.089	-0.182	0.022	-0.123	-0.008
2004	-0.469	-0.041	-0.165	-0.395	-0.163	-0.258	0.04	-0.036	0.001
2005	-0.322	0.061	-0.072	-0.359	-0.178	-0.2	0.042	-0.002	0.004
2006	-0.252	0.058	-0.028	-0.298	-0.177	-0.126	0.04	0.001	0.005
2007	-0.203	0.043	-0.013	-0.249	-0.176	-0.068	0.039	0	0.006
2008	-0.169	0.031	-0.008	-0.214	-0.176	-0.026	0.038	0.001	0.007
2009	-0.146	0.022	-0.006	-0.189	-0.176	0.003	0.038	0.003	0.008
2010	-0.128	0.017	-0.006	-0.17	-0.175	0.022	0.037	0.004	0.009
2011	-0.114	0.013	-0.006	-0.156	-0.173	0.034	0.036	0.006	0.009

Table 3 Germany Contribution

	Consumption as a % of GDP	Investment and Stocks as a % of GDP	Government Consumption as a % of GDP	Net Exports as a % of GDP	Govt. balance as a % of GDP	Govt. debt as a % of GDP	Trade account as a % of GDP	Current account as a % of GDP
2002	-0.097	-0.483	-1	0.589	0.727	0.24	0.688	0.681
2003	-0.058	0.174	0	-0.041	-0.037	-0.542	-0.055	0.014
2004	-0.033	0.133	0	-0.024	0.084	-0.511	-0.046	-0.013
2005	-0.008	0.028	0	0.01	0.023	-0.527	-0.006	0.017
2006	0.009	0.002	0	0.009	0.003	-0.549	-0.002	0.023
2007	0.021	0.002	0	-0.002	0.001	-0.562	-0.009	0.016
2008	0.03	0.003	0	-0.012	0	-0.563	-0.016	0.008
2009	0.036	0.004	0	-0.019	0	-0.556	-0.022	0.002
2010	0.041	0.004	0	-0.025	0	-0.546	-0.025	-0.003
2011	0.044	0.004	0	-0.028	0	-0.533	-0.028	-0.007

Table 4 France GDP % difference from baseline

	Consumption	Private sector investment	Government expenditure	Export volumes	Import volumes	GDP
2002	-0.076	-1.082	-3.89	-0.258	-2.545	-0.78
2003	-0.084	-0.017	0	0.09	0.741	-0.148
2004	-0.097	0.259	0	0.092	0.228	0.018
2005	-0.094	0.183	0	0.073	-0.015	0.032
2006	-0.08	0.088	0	0.056	-0.08	0.017
2007	-0.056	0.032	0	0.04	-0.068	0.007
2008	-0.027	0.01	0	0.025	-0.038	0.005
2009	-0.002	0.005	0	0.013	-0.01	0.007
2010	0.019	0.006	0	0.004	0.009	0.01
2011	0.036	0.009	0	-0.004	0.023	0.012

Table 5 France Costs, Prices, and Rates differences (B) and % differences (P) from baseline

	Whole economy unit labour cost	Inflation (CED)	Unemployment, %	Private consumption deflator	Dollar exchange rate	Real Effective Exchange Rate	Nominal Effective Exchange Rate	Short term rate
	P	B	B	P	P	P	P	B
2002	0.436	-0.086	0.233	-0.016	-0.004	-0.007	0.001	0
2003	-0.235	-0.034	0.136	-0.103	-0.008	-0.07	0.002	-0.059
2004	-0.394	-0.044	0	-0.174	-0.046	-0.119	0.011	-0.021
2005	-0.355	-0.022	-0.063	-0.216	-0.06	-0.155	0.013	-0.005
2006	-0.273	0.001	-0.062	-0.222	-0.066	-0.158	0.014	-0.002
2007	-0.205	0.014	-0.042	-0.205	-0.07	-0.138	0.014	-0.001
2008	-0.155	0.02	-0.025	-0.181	-0.074	-0.108	0.014	-0.001
2009	-0.118	0.021	-0.016	-0.154	-0.076	-0.077	0.014	0
2010	-0.088	0.02	-0.011	-0.129	-0.078	-0.048	0.015	0.001
2011	-0.062	0.019	-0.009	-0.107	-0.079	-0.023	0.014	0.001

Table 6 France Contribution

	Consumption as a % of GDP	Investment and Stocks as a % of GDP	Government Consumption as a % of GDP	Net Exports as a % of GDP	Govt. balance as a % of GDP	Govt. debt as a % of GDP	Trade account as a % of GDP	Current account as a % of GDP
2002	-0.041	-0.353	-1	0.614	0.843	-0.023	0.647	0.653
2003	-0.046	0.077	0	-0.18	-0.049	-0.625	-0.194	-0.168
2004	-0.053	0.107	0	-0.036	0.016	-0.663	-0.052	-0.041
2005	-0.051	0.055	0	0.027	0.028	-0.644	0.011	0.018
2006	-0.044	0.019	0	0.042	0.022	-0.63	0.026	0.037
2007	-0.03	0.003	0	0.034	0.014	-0.625	0.021	0.035
2008	-0.015	-0.001	0	0.02	0.009	-0.623	0.011	0.026
2009	-0.001	0	0	0.008	0.006	-0.621	0.002	0.017
2010	0.01	0.001	0	-0.002	0.005	-0.617	-0.005	0.01
2011	0.019	0.002	0	-0.009	0.004	-0.61	-0.01	0.005

Table 7 Italy GDP % difference from baseline

	Consumption	Private sector investment	Government expenditure	Export volumes	Import volumes	GDP
2002	-0.021	-0.937	-4.973	-0.171	-2.489	-0.673
2003	-0.023	-0.097	0	0.094	0.695	-0.141
2004	-0.034	0.105	0	0.111	0.208	0.01
2005	-0.039	0.103	0	0.085	-0.004	0.044
2006	-0.037	0.052	0	0.054	-0.071	0.037
2007	-0.029	0.014	0	0.029	-0.07	0.022
2008	-0.019	-0.001	0	0.013	-0.047	0.01
2009	-0.008	-0.002	0	0.004	-0.021	0.004
2010	0.001	0.002	0	-0.001	-0.001	0.002
2011	0.01	0.007	0	-0.003	0.012	0.003

Table 8 Italy Costs, Prices, and Rates differences (B) and % differences (P) from baseline

	Whole economy unit labour cost	Inflation (CED)	Unemployment, %	Private consumption deflator	Dollar exchange rate	Real Effective Exchange Rate	Nominal Effective Exchange Rate	Short term rate	Long term rate
	P	B	B	P	P	P	P	B	B
2002	0.415	-0.095	0.095	-0.037	-0.016	-0.027	0.004	0	-0.004
2003	-0.343	-0.055	0.101	-0.176	-0.015	-0.149	0.004	-0.045	-0.002
2004	-0.575	-0.037	0.044	-0.269	-0.047	-0.222	0.011	-0.018	0.002
2005	-0.489	0.013	-0.004	-0.265	-0.056	-0.211	0.013	0.003	0.003
2006	-0.32	0.034	-0.021	-0.209	-0.052	-0.152	0.012	0.008	0.003
2007	-0.181	0.031	-0.021	-0.15	-0.049	-0.09	0.011	0.005	0.002
2008	-0.095	0.022	-0.015	-0.106	-0.048	-0.044	0.01	0.002	0.002
2009	-0.051	0.012	-0.009	-0.079	-0.048	-0.015	0.01	0.001	0.002
2010	-0.032	0.007	-0.005	-0.064	-0.05	0.001	0.01	0.001	0.002
2011	-0.024	0.004	-0.003	-0.057	-0.052	0.01	0.01	0.001	0.002

Table 9 Italy Contribution

	Consumption as a % of GDP	Investment and Stocks as a % of GDP	Government Consumption as a % of GDP	Net Exports as a % of GDP	Govt. balance as a % of GDP	Govt. debt as a % of GDP	Trade account as a % of GDP	Current account as a % of GDP
2002	-0.013	-0.326	-1	0.666	0.771	0.379	0.631	0.641
2003	-0.014	0.051	0	-0.179	-0.102	-0.281	-0.201	-0.166
2004	-0.02	0.058	0	-0.028	0.015	-0.32	-0.062	-0.045
2005	-0.024	0.038	0	0.03	0.055	-0.403	-0.002	0.007
2006	-0.022	0.018	0	0.041	0.048	-0.496	0.019	0.029
2007	-0.017	0.006	0	0.033	0.028	-0.557	0.019	0.032
2008	-0.011	0.001	0	0.02	0.011	-0.579	0.013	0.028
2009	-0.005	0.001	0	0.008	0.002	-0.574	0.005	0.022
2010	0.001	0.001	0	0	-0.002	-0.555	0	0.016
2011	0.006	0.002	0	-0.005	-0.002	-0.531	-0.004	0.012

Table 10 UK GDP % difference from baseline

	Consumption	Private sector investment	Government expenditure	Export volumes	Import volumes	GDP
2002	-0.069	-0.702	-4.757	-0.134	-1.552	-0.644
2003	-0.069	-0.44	0	0.015	-0.091	-0.147
2004	-0.072	0.216	0	0.027	0.026	-0.027
2005	-0.055	0.498	0	0.03	0.077	0.027
2006	-0.034	0.482	0	0.03	0.081	0.043
2007	-0.013	0.332	0	0.029	0.053	0.046
2008	0.006	0.161	0	0.028	0.029	0.04
2009	0.021	0.021	0	0.027	0.014	0.031
2010	0.033	-0.072	0	0.024	0.007	0.024
2011	0.042	-0.127	0	0.021	0.007	0.019

Table 11 UK Costs, Prices, and Rates differences (B) and % differences (P) from baseline

	Whole economy unit labour cost	Inflation (CED)	Unemployment, %	Private consumption deflator	Dollar exchange rate	Real Effective Exchange Rate	Nominal Effective Exchange Rate	Short term rate	Long term rate
	P	B	B	P	P	P	P	B	B
2002	0.252	-0.122	0.152	-0.062	-0.079	0.011	0.066	0	-0.027
2003	-0.401	-0.092	0.223	-0.242	-0.142	-0.091	0.126	-0.237	-0.014
2004	-0.59	-0.126	0.093	-0.456	-0.36	-0.08	0.338	-0.216	0.014
2005	-0.642	-0.075	0.016	-0.604	-0.527	-0.058	0.503	-0.098	0.035
2006	-0.639	-0.013	-0.013	-0.646	-0.584	-0.043	0.559	0.001	0.044
2007	-0.608	0.019	-0.024	-0.625	-0.571	-0.037	0.544	0.048	0.046
2008	-0.56	0.031	-0.028	-0.579	-0.529	-0.035	0.499	0.061	0.046
2009	-0.509	0.033	-0.028	-0.529	-0.482	-0.034	0.45	0.058	0.044
2010	-0.463	0.03	-0.026	-0.483	-0.441	-0.031	0.406	0.05	0.042
2011	-0.423	0.027	-0.023	-0.443	-0.406	-0.028	0.369	0.044	0.041

Table 12 UK Contribution

	Consumption as a % of GDP	Investment and Stocks as a % of GDP	Government Consumption as a % of GDP	Net Exports as a % of GDP	Govt. balance as a % of GDP	Govt. debt as a % of GDP	Trade account as a % of GDP	Current account as a % of GDP
2002	-0.048	-0.175	-1	0.58	0.815	-0.154	0.46	0.484
2003	-0.048	-0.142	0	0.043	-0.063	-0.525	0.007	0.095
2004	-0.05	0.024	0	-0.002	0.019	-0.456	-0.016	0.056
2005	-0.039	0.088	0	-0.023	0.034	-0.426	-0.025	0.01
2006	-0.023	0.092	0	-0.025	0.021	-0.42	-0.024	-0.014
2007	-0.009	0.069	0	-0.014	0.011	-0.425	-0.014	-0.013
2008	0.004	0.039	0	-0.003	0.004	-0.429	-0.005	-0.006
2009	0.014	0.013	0	0.004	0.001	-0.428	0	0.002
2010	0.023	-0.005	0	0.006	0	-0.426	0.002	0.006
2011	0.03	-0.016	0	0.005	0.001	-0.422	0.001	0.007

Fiscal Experiments. Tables 1 to 12 report on our fiscal experiments one at a time. In general, we may say that multipliers (the impact of fiscal policy on output) are low, and that they are largest in Germany. In all countries they are below one, suggesting that exchange rate and financial sector crowding out outweigh the impact effect of the increase in government spending.¹² At -0.99 percent, the multiplier is largest in Germany, compared to -0.78 percent and -0.67 percent in France and Italy, respectively. The relative size of multipliers reflects the smaller immediate impact of Total Final Expenditure on imports in Germany than elsewhere that is reflected in the model and is discussed in Barrell and te Velde (2002). They argue that the German economy is more focussed on manufacturing and has a wider variety of manufacturing sectors than other European countries. Hence it has less need to adjust its imports in response to an increase in demand. The UK multiplier, -0.64 percent, is kept smaller by the decision to operate the experiment with an independent monetary policy and leave exchange rates floating. The increase in imports due to the rise in demand results in a positive contribution of net trade. Whilst it is of similar size in the

four countries, it is highest in Italy with 0.67 percent of GDP. As we are applying a fiscal shock in this experiment, investment is mainly affected through the demand channel. Due to the higher ratio of investment to GDP,¹³ the negative contribution of investment is largest in Germany, 0.48 percent as compared to 0.35 percent in France and 0.33 percent in Italy. At 0.18 percent it is significantly smaller in the UK. As long rates fall more in the country with independent monetary policy, the effect on investment is less pronounced than in the Euro Area economies. There is only a subdued effect on forward looking consumers, which incorporate the temporary nature of the shock in their decision making. The contribution of consumption is just -0.1 percent in Germany, -0.04 percent in France and -0.05 percent in the UK. It is smallest in Italy, at -0.01 percent.

There are various adjustments we can make to our policy simulations, helping us decompose the effects of the assumptions we make. Figure 7 plots the output response for Germany for our base case with forward inflation, a Taylor rule and forward looking consumers. If we switch to our standard two pillar feedback the initial output response is slightly larger, and this is reduced if we do not have forward looking inflation in the feedback rule. If we also do not have forward looking consumers, the multiplier does not change substantially, as this is a temporary shock. Backward looking consumers do not react to the temporary nature of the rise in demand, and hence reduce their consumption more than they would if they looked forward.

¹² Alesina et al. (2002) present evidence for OECD countries that a contractionary fiscal policy has a positive effect on profits and investment both in the long run and short run, consistent with a crowding out argument.

¹³ The ratio of total investment to GDP was 22.48 percent in Germany, 20.60 percent in France, 20.68 percent in Italy and 18.32 percent in the UK in the year 2000.

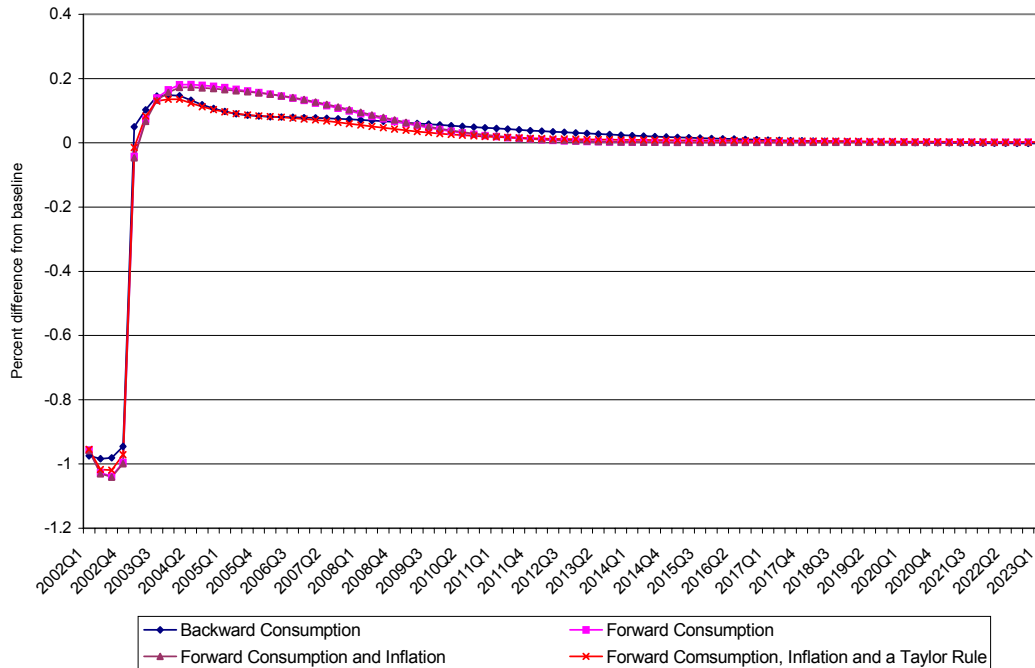


Figure 7. The Response to Fiscal Policy in Germany under Different Assumptions

Monetary Experiments. Interest rates were raised by 1.0 percentage point for one year in either the Euro Area or in the whole world. During this period monetary feedback (but not feedbacks from financial markets) was excluded by assumption. As we wish to emulate a monetary tightening we need to ensure that the experiment allows the price level to shift permanently during the experiment. A strategy with a nominal target would reverse the monetary impulse. However, the degree of price level drift and the changes in nominal exchange rates will depend upon the relative speeds of response of the wage price systems (in particular, but not exclusively) in the US and in the Euro Area. After the first year we assume that all relevant monetary authorities operated a Taylor rule with a feedback of 1.0 on inflation and 0.25 (25.0) on output. As this shock should not change the steady state interest rate no other changes to the rule were needed.

Tables 13-26: European Interest Rate Changes

Table 13 Euro Area GDP % difference from baseline

	Consumption	Private sector investment	Government expenditure	Export volumes	Import volumes	GDP
2002	-0.054	-0.673	0	-0.224	-0.287	-0.164
2003	-0.164	-0.931	0	-0.246	-0.446	-0.223
2004	-0.158	-0.315	0	-0.141	-0.223	-0.114
2005	-0.129	-0.068	0	-0.102	-0.145	-0.064
2006	-0.094	0.012	0	-0.07	-0.101	-0.037
2007	-0.064	0.024	0	-0.041	-0.067	-0.02
2008	-0.043	0.013	0	-0.016	-0.04	-0.012
2009	-0.028	-0.004	0	0	-0.022	-0.007
2010	-0.019	-0.019	0	0.009	-0.012	-0.005
2011	-0.014	-0.03	0	0.012	-0.007	-0.005

Table 14 Euro Area Costs, Prices, and Rates differences (B) and % differences (P) from baseline

	Unemployment, %	Private consumption deflator	Dollar exchange rate	Real Effective Exchange Rate	Nominal Effective Exchange Rate	Short term rate	Long term rate	Equity Prices	Govt. balance as % of GDP
	B	P	P	P	P	B	B	P	B
2002	0.057	-0.025	-0.436	0.287	0.322	1	0.032	-0.558	-0.149
2003	0.117	-0.049	0.077	-0.083	-0.03	-0.101	-0.027	0.075	-0.008
2004	0.047	-0.123	-0.041	-0.058	0.037	-0.108	-0.015	0.062	0.039
2005	-0.001	-0.189	-0.122	-0.045	0.088	-0.072	-0.005	-0.009	0.033
2006	-0.019	-0.227	-0.162	-0.037	0.116	-0.038	0.001	-0.066	0.024
2007	-0.021	-0.244	-0.18	-0.031	0.128	-0.016	0.005	-0.101	0.016
2008	-0.015	-0.248	-0.186	-0.028	0.131	-0.003	0.007	-0.119	0.011
2009	-0.008	-0.244	-0.185	-0.026	0.13	0.004	0.008	-0.127	0.006
2010	-0.001	-0.236	-0.181	-0.024	0.127	0.008	0.008	-0.128	0.003
2011	0.004	-0.225	-0.176	-0.023	0.122	0.01	0.009	-0.124	0.002

Table 15 Germany GDP % difference from baseline

	Consumption	Private sector investment	Government expenditure	Export volumes	Import volumes	GDP
2002	-0.119	-0.778	0	-0.197	-0.394	-0.201
2003	-0.19	-1.095	0	-0.225	-0.566	-0.25
2004	-0.157	-0.36	0	-0.127	-0.246	-0.1
2005	-0.131	-0.089	0	-0.098	-0.148	-0.057
2006	-0.106	-0.011	0	-0.076	-0.112	-0.043
2007	-0.085	0.002	0	-0.053	-0.085	-0.034
2008	-0.066	-0.002	0	-0.03	-0.061	-0.024
2009	-0.049	-0.009	0	-0.01	-0.039	-0.016
2010	-0.034	-0.015	0	0.003	-0.023	-0.01
2011	-0.021	-0.019	0	0.01	-0.012	-0.004

Table 16 Germany Costs, Prices, and Rates differences (B) and % differences (P) from baseline

	Whole economy unit labour cost	Inflation (CED)	Unemployment, %	Private consumption deflator	Dollar exchange rate	Real Effective Exchange Rate	Nominal Effective Exchange Rate	Short term rate	Long term rate
	P	B	B	P	P	P	P	B	B
2002	0.027	-0.018	0.088	-0.021	-0.436	0.111	0.117	1	0.032
2003	-0.2	-0.074	0.142	-0.054	0.077	-0.039	-0.013	-0.101	-0.027
2004	-0.324	-0.102	0.017	-0.158	-0.041	-0.075	0.012	-0.108	-0.015
2005	-0.317	-0.048	-0.02	-0.227	-0.122	-0.082	0.032	-0.072	-0.005
2006	-0.298	-0.013	-0.015	-0.251	-0.162	-0.065	0.043	-0.038	0.001
2007	-0.283	0.001	-0.008	-0.254	-0.18	-0.045	0.047	-0.016	0.005
2008	-0.27	0.005	-0.004	-0.25	-0.186	-0.03	0.049	-0.003	0.007
2009	-0.258	0.007	-0.003	-0.244	-0.185	-0.022	0.048	0.004	0.008
2010	-0.247	0.008	-0.003	-0.237	-0.181	-0.018	0.047	0.008	0.008
2011	-0.236	0.009	-0.003	-0.228	-0.176	-0.016	0.046	0.01	0.009

Table 17 Germany Contribution

	Consumption as a % of GDP	Investment and Stocks as a % of GDP	Government Consumption as a % of GDP	Net Exports as a % of GDP	Govt. balance as a % of GDP	Govt. debt as a % of GDP	Trade account as a % of GDP	Current account as a % of GDP
2002	-0.067	-0.191	0	0.058	-0.118	0.192	0.107	-0.283
2003	-0.107	-0.249	0	0.106	-0.061	0.388	0.12	0.186
2004	-0.089	-0.047	0	0.035	0.052	0.309	0.043	0.093
2005	-0.073	0.003	0	0.013	0.045	0.261	0.02	0.047
2006	-0.059	0.006	0	0.01	0.025	0.226	0.017	0.027
2007	-0.048	0.004	0	0.01	0.013	0.198	0.016	0.018
2008	-0.037	0.002	0	0.011	0.01	0.172	0.015	0.015
2009	-0.028	0.001	0	0.011	0.006	0.151	0.014	0.013
2010	-0.019	-0.001	0	0.011	0.005	0.133	0.012	0.011
2011	-0.012	-0.002	0	0.01	0.005	0.117	0.009	0.008

Table 18 France GDP % difference from baseline

	Consumption	Private sector investment	Government expenditure	Export volumes	Import volumes	GDP
	P	P	P	P	P	P
2002	-0.05	-0.56	0	-0.244	-0.383	-0.12
2003	-0.15	-0.947	0	-0.262	-0.466	-0.222
2004	-0.105	-0.354	0	-0.162	-0.101	-0.131
2005	-0.09	-0.084	0	-0.133	-0.042	-0.08
2006	-0.078	0.011	0	-0.09	-0.03	-0.05
2007	-0.071	0.028	0	-0.043	-0.03	-0.032
2008	-0.066	0.016	0	-0.005	-0.03	-0.021
2009	-0.057	-0.001	0	0.02	-0.027	-0.014
2010	-0.046	-0.017	0	0.031	-0.024	-0.008
2011	-0.035	-0.03	0	0.033	-0.022	-0.004

Table 19 France Costs, Prices, and Rates differences (B) and % differences (P) from baseline

	Whole economy unit labour cost	Inflation (CED)	Unemployment, %	Private consumption deflator	Dollar exchange rate	Real Effective Exchange Rate	Nominal Effective Exchange Rate	Short term rate
	P	B	B	P	P	P	P	B
2002	0.048	-0.036	0.032	-0.026	-0.436	0.104	0.118	1
2003	0.045	-0.002	0.087	-0.035	0.077	-0.014	-0.009	-0.101
2004	-0.102	-0.03	0.07	-0.073	-0.041	0.035	0.015	-0.108
2005	-0.202	-0.038	0.033	-0.129	-0.122	0.051	0.033	-0.072
2006	-0.257	-0.033	0.005	-0.181	-0.162	0.039	0.042	-0.038
2007	-0.283	-0.023	-0.007	-0.218	-0.18	0.017	0.046	-0.016
2008	-0.292	-0.014	-0.011	-0.241	-0.186	-0.004	0.048	-0.003
2009	-0.29	-0.006	-0.01	-0.252	-0.185	-0.021	0.047	0.004
2010	-0.282	0	-0.009	-0.254	-0.181	-0.033	0.046	0.008
2011	-0.27	0.005	-0.007	-0.25	-0.176	-0.04	0.044	0.01

Table 20 France Contribution

	Consumption as a % of GDP	Investment and Stocks as a % of GDP	Government Consumption as a % of GDP	Net Exports as a % of GDP	Govt. balance as % of GDP	Govt. debt as % of GDP	Trade account as % of GDP	Current account as % of GDP
2002	-0.027	-0.125	0	0.032	-0.124	0.164	0.05	-0.223
2003	-0.081	-0.191	0	0.051	0.009	0.293	0.052	0.144
2004	-0.057	-0.052	0	-0.022	0.033	0.207	-0.015	0.043
2005	-0.049	-0.001	0	-0.03	0.016	0.179	-0.022	0.001
2006	-0.042	0.013	0	-0.02	0.011	0.172	-0.014	-0.011
2007	-0.039	0.012	0	-0.005	0.009	0.168	-0.002	-0.007
2008	-0.036	0.007	0	0.008	0.008	0.16	0.008	0
2009	-0.031	0.002	0	0.015	0.006	0.148	0.013	0.006
2010	-0.025	-0.002	0	0.019	0.005	0.135	0.016	0.01
2011	-0.019	-0.004	0	0.019	0.005	0.12	0.016	0.011

Table 21 Italy GDP % difference from baseline

	Consumption	Private sector investment	Government expenditure	Export volumes	Import volumes	GDP
2002	-0.01	-0.48	0	-0.233	-0.329	-0.096
2003	-0.066	-0.781	0	-0.261	-0.392	-0.172
2004	-0.067	-0.307	0	-0.132	-0.098	-0.108
2005	-0.067	-0.089	0	-0.106	-0.048	-0.073
2006	-0.067	-0.014	0	-0.082	-0.036	-0.056
2007	-0.067	-0.001	0	-0.053	-0.029	-0.046
2008	-0.066	-0.007	0	-0.026	-0.025	-0.039
2009	-0.063	-0.017	0	-0.005	-0.023	-0.033
2010	-0.061	-0.025	0	0.007	-0.024	-0.028
2011	-0.057	-0.03	0	0.013	-0.028	-0.023

Table 22 Italy Costs, Prices, and Rates Differences (B) and % differences (P) from baseline

	Whole economy unit labour cost	Inflation (CED)	Unemployment, %	Private consumption deflator	Dollar exchange rate	Real Effective Exchange Rate	Nominal Effective Exchange Rate	Short term rate	Long term rate
	P	B	B	P	P	P	P	B	B
2002	0.067	-0.033	0.012	-0.031	-0.436	0.09	0.108	1	0.032
2003	0.032	-0.015	0.041	-0.047	0.077	-0.027	-0.011	-0.101	-0.027
2004	-0.135	-0.031	0.043	-0.101	-0.041	0.002	0.012	-0.108	-0.015
2005	-0.231	-0.028	0.031	-0.156	-0.122	0.017	0.03	-0.072	-0.005
2006	-0.264	-0.017	0.02	-0.191	-0.162	0.024	0.039	-0.038	0.001
2007	-0.268	-0.008	0.014	-0.208	-0.18	0.025	0.043	-0.016	0.005
2008	-0.264	-0.004	0.011	-0.216	-0.186	0.023	0.044	-0.003	0.007
2009	-0.259	-0.001	0.009	-0.219	-0.185	0.017	0.044	0.004	0.008
2010	-0.253	0	0.007	-0.219	-0.181	0.009	0.043	0.008	0.008
2011	-0.247	0.002	0.006	-0.217	-0.176	0.001	0.042	0.01	0.009

Table 23 Italy Contribution

	Consumption as a % of GDP	Investment and Stocks as a % of GDP	Government Consumption as a % of GDP	Net Exports as a % of GDP	Govt. balance as % of GDP	Govt. debt as % of GDP	Trade account as % of GDP	Current account as % of GDP
2002	-0.006	-0.113	0	0.023	-0.296	0.304	0.049	-0.267
2003	-0.04	-0.168	0	0.035	0.1	0.499	0.021	0.092
2004	-0.04	-0.055	0	-0.013	0.068	0.365	-0.015	0.035
2005	-0.04	-0.013	0	-0.021	0.028	0.323	-0.016	0.007
2006	-0.04	0	0	-0.017	0.014	0.304	-0.01	-0.006
2007	-0.04	0.002	0	-0.009	0.008	0.287	-0.003	-0.007
2008	-0.039	0.001	0	-0.001	0.007	0.267	0.004	-0.004
2009	-0.038	-0.001	0	0.006	0.004	0.247	0.009	-0.002
2010	-0.036	-0.003	0	0.011	0.003	0.228	0.012	0.001
2011	-0.034	-0.004	0	0.015	0.004	0.208	0.014	0.002

Table 24 UK GDP % difference from baseline

	Consumption	Private sector investment	Government expenditure	Export volumes	Import volumes	GDP
2002	-0.056	-0.009	0	0.014	-0.157	0.032
2003	-0.073	-0.11	0	-0.097	-0.154	-0.042
2004	-0.025	-0.019	0	-0.091	-0.072	-0.028
2005	-0.003	0.058	0	-0.082	-0.033	-0.01
2006	0.005	0.105	0	-0.064	-0.013	0.003
2007	0.006	0.123	0	-0.044	-0.001	0.011
2008	0.005	0.12	0	-0.025	0.005	0.014
2009	0.004	0.102	0	-0.011	0.009	0.014
2010	0.003	0.075	0	-0.002	0.01	0.011
2011	0.001	0.045	0	0.002	0.008	0.007

Table 25 UK Costs, Prices, and Rates differences (B) and % differences (P) from baseline

	Whole economy unit labour cost	Inflation (CED)	Unemployment, %	Private consumption deflator	Dollar exchange rate	Real Effective Exchange Rate	Nominal Effective Exchange Rate	Short term rate	Long term rate
	P	B	B	P	P	P	P	B	B
2002	-0.032	0.047	0.001	0.041	0.127	-0.4	-0.456	0.078	-0.011
2003	0.041	-0.021	-0.002	0.03	0.107	0.002	-0.054	-0.037	-0.014
2004	0.01	-0.017	0.008	-0.005	0.058	-0.022	-0.092	-0.037	-0.009
2005	-0.029	-0.01	0.012	-0.024	0.037	-0.032	-0.13	-0.029	-0.006
2006	-0.049	-0.005	0.006	-0.035	0.029	-0.032	-0.151	-0.022	-0.003
2007	-0.051	-0.001	-0.001	-0.039	0.023	-0.025	-0.157	-0.015	-0.001
2008	-0.044	0.002	-0.006	-0.037	0.018	-0.016	-0.155	-0.009	0
2009	-0.033	0.004	-0.008	-0.032	0.014	-0.005	-0.151	-0.004	0
2010	-0.021	0.005	-0.008	-0.024	0.012	0.004	-0.146	0	0.001
2011	-0.01	0.006	-0.007	-0.016	0.012	0.01	-0.141	0.002	0

Table 26 UK Contribution

	Consumption as a % GDP	Investment and Stocks as a % GDP	Government Consumption as a % GDP	Net Exports as a % GDP	Govt. balance as % of GDP	Govt. debt as % of GDP	Trade account as % of GDP	Current account as % of GDP
2002	-0.039	0.003	0	0.068	-0.041	0.027	-0.02	-0.273
2003	-0.051	-0.022	0	0.031	0.013	0.032	0.032	0.125
2004	-0.018	-0.009	0	-0.001	0.025	0.02	-0.005	0.073
2005	-0.002	0.006	0	-0.015	0.008	0.011	-0.021	0.025
2006	0.003	0.017	0	-0.018	0.002	0.008	-0.024	-0.004
2007	0.004	0.023	0	-0.016	0	0.004	-0.021	-0.015
2008	0.003	0.023	0	-0.012	0	0	-0.015	-0.017
2009	0.003	0.02	0	-0.009	0	-0.004	-0.009	-0.016
2010	0.002	0.016	0	-0.006	-0.001	-0.006	-0.005	-0.013
2011	0.001	0.01	0	-0.003	-0.001	-0.007	-0.001	-0.01

Tables 27-40: All Interest Rates change for a Year

Table 27 Euro Area GDP % difference from baseline

	Consumption	Private sector investment	Government expenditure	Export volumes	Import volumes	GDP
2002	-0.036	-0.642	0	-0.203	-0.29	-0.136
2003	-0.155	-0.993	0	-0.489	-0.585	-0.284
2004	-0.139	-0.33	0	-0.365	-0.315	-0.166
2005	-0.11	-0.053	0	-0.28	-0.205	-0.1
2006	-0.077	0.044	0	-0.194	-0.134	-0.058
2007	-0.05	0.06	0	-0.121	-0.081	-0.032
2008	-0.029	0.046	0	-0.068	-0.043	-0.018
2009	-0.015	0.025	0	-0.032	-0.017	-0.01
2010	-0.006	0.004	0	-0.011	-0.002	-0.007
2011	0	-0.011	0	-0.001	0.006	-0.005

Table 28 Euro Area Costs, Prices, and Rates differences (B) and % differences (P) from baseline

	Unemployment, %	Private consumption deflator	Dollar exchange rate	Real Effective Exchange Rate	Nominal Effective Exchange Rate	Short term rate	Long term rate	Equity Prices	Govt. balance as % of GDP
	B	P	P	P	P	B	B	P	B
2002	0.048	0.003	0.076	0.016	0.002	1	0.015	-0.522	-0.137
2003	0.137	-0.035	0.126	0.043	-0.008	-0.14	-0.043	0.1	-0.009
2004	0.07	-0.126	0.201	0.039	-0.027	-0.138	-0.028	0.079	0.032
2005	0.012	-0.211	0.22	0.036	-0.045	-0.101	-0.015	-0.006	0.027
2006	-0.014	-0.268	0.221	0.034	-0.066	-0.061	-0.006	-0.084	0.022
2007	-0.02	-0.3	0.214	0.034	-0.082	-0.034	0	-0.14	0.017
2008	-0.016	-0.317	0.202	0.035	-0.09	-0.016	0.003	-0.174	0.013
2009	-0.009	-0.322	0.185	0.036	-0.089	-0.004	0.005	-0.193	0.007
2010	-0.002	-0.32	0.164	0.036	-0.083	0.002	0.006	-0.2	0.004
2011	0.003	-0.314	0.141	0.034	-0.074	0.005	0.006	-0.199	0.003

Table 29 Germany GDP % difference from baseline

	Consumption	Private sector investment	Government expenditure	Export volumes	Import volumes	GDP
2002	-0.109	-0.749	0	-0.174	-0.387	-0.179
2003	-0.158	-1.155	0	-0.439	-0.671	-0.3
2004	-0.128	-0.371	0	-0.346	-0.333	-0.143
2005	-0.104	-0.071	0	-0.283	-0.208	-0.088
2006	-0.078	0.022	0	-0.213	-0.142	-0.061
2007	-0.053	0.04	0	-0.148	-0.092	-0.042
2008	-0.03	0.033	0	-0.097	-0.052	-0.026
2009	-0.009	0.022	0	-0.059	-0.02	-0.014
2010	0.009	0.011	0	-0.034	0.003	-0.006
2011	0.024	0.004	0	-0.018	0.018	0.001

Table 30 Germany Costs, Prices, and Rates Differences (B) and % differences (P) from baseline

	Whole economy unit labour cost	Inflation (CED)	Unemployment, %	Private consumption deflator	Dollar exchange rate	Real Effective Exchange Rate	Nominal Effective Exchange Rate	Short term rate	Long term rate
	P	B	B	P	P	P	P	B	B
2002	0.033	0.003	0.078	0.004	0.076	0.005	-0.002	1	0.015
2003	-0.18	-0.087	0.167	-0.044	0.126	0.002	-0.005	-0.14	-0.043
2004	-0.346	-0.118	0.039	-0.16	0.201	-0.04	-0.011	-0.138	-0.028
2005	-0.367	-0.069	-0.009	-0.249	0.22	-0.056	-0.016	-0.101	-0.015
2006	-0.361	-0.03	-0.015	-0.291	0.221	-0.044	-0.022	-0.061	-0.006
2007	-0.348	-0.011	-0.012	-0.308	0.214	-0.023	-0.027	-0.034	0
2008	-0.334	-0.001	-0.009	-0.312	0.202	-0.003	-0.029	-0.016	0.003
2009	-0.322	0.003	-0.007	-0.311	0.185	0.012	-0.029	-0.004	0.005
2010	-0.31	0.005	-0.006	-0.306	0.164	0.021	-0.027	0.002	0.006
2011	-0.3	0.007	-0.005	-0.3	0.141	0.026	-0.024	0.005	0.006

Table 31 Germany Contribution

	Consumption as a % GDP	Investment and Stocks as a % GDP	Government Consumption as a % GDP	Net Exports as a % GDP	Govt. balance as % of GDP	Govt. debt as % of GDP	Trade account as % of GDP	Current account as % of GDP
2002	-0.062	-0.181	0	0.064	-0.109	0.176	0.082	-0.273
2003	-0.089	-0.274	0	0.062	-0.055	0.394	0.093	0.235
2004	-0.072	-0.054	0	-0.018	0.044	0.328	-0.001	0.074
2005	-0.058	0.008	0	-0.038	0.04	0.293	-0.024	0.01
2006	-0.044	0.016	0	-0.034	0.026	0.261	-0.021	-0.007
2007	-0.03	0.015	0	-0.027	0.018	0.228	-0.014	-0.006
2008	-0.017	0.012	0	-0.021	0.014	0.198	-0.008	-0.001
2009	-0.005	0.008	0	-0.017	0.009	0.172	-0.006	0.003
2010	0.005	0.005	0	-0.016	0.007	0.152	-0.007	0.005
2011	0.014	0.003	0	-0.016	0.006	0.135	-0.009	0.005

Table 32 France GDP % difference from baseline

	Consumption	Private sector investment	Government expenditure	Export volumes	Import volumes	GDP
2002	-0.067	-0.54	0	-0.22	-0.423	-0.107
2003	-0.15	-1.027	0	-0.558	-0.662	-0.285
2004	-0.064	-0.379	0	-0.436	-0.158	-0.185
2005	-0.042	-0.057	0	-0.34	-0.041	-0.111
2006	-0.036	0.066	0	-0.226	-0.01	-0.062
2007	-0.043	0.084	0	-0.123	-0.011	-0.036
2008	-0.048	0.064	0	-0.049	-0.015	-0.022
2009	-0.047	0.035	0	-0.003	-0.016	-0.013
2010	-0.042	0.01	0	0.022	-0.015	-0.007
2011	-0.033	-0.008	0	0.031	-0.013	-0.003

Table 33 France Costs, Prices, and Rates differences (B) and % differences (P) from baseline

	Whole economy unit labour cost	Inflation (CED)	Unemployment, %	Private consumption deflator	Dollar exchange rate	Real Effective Exchange Rate	Nominal Effective Exchange Rate	Short term rate	Long term rate
	P	B	B	P	P	P	P	B	B
2002	0.071	-0.004	0.029	0.005	0.076	0.01	0.003	1	0.015
2003	0.106	-0.024	0.106	-0.011	0.126	0.043	-0.002	-0.14	-0.043
2004	-0.087	-0.042	0.094	-0.072	0.201	0.074	-0.01	-0.138	-0.028
2005	-0.228	-0.048	0.049	-0.143	0.22	0.089	-0.018	-0.101	-0.015
2006	-0.313	-0.044	0.009	-0.212	0.221	0.075	-0.027	-0.061	-0.006
2007	-0.356	-0.035	-0.011	-0.266	0.214	0.05	-0.034	-0.034	0
2008	-0.374	-0.025	-0.016	-0.305	0.202	0.024	-0.037	-0.016	0.003
2009	-0.379	-0.015	-0.015	-0.328	0.185	0.003	-0.037	-0.004	0.005
2010	-0.376	-0.007	-0.012	-0.34	0.164	-0.013	-0.034	0.002	0.006
2011	-0.37	-0.001	-0.009	-0.343	0.141	-0.024	-0.031	0.005	0.006

Table 34 France Contribution

	Consumption as a % GDP	Investment and Stocks as a % GDP	Government Consumption as a % GDP	Net Exports as a % GDP	Govt. balance as % of GDP	Govt. debt as % of GDP	Trade account as % of GDP	Current account as % of GDP
2002	-0.036	-0.119	0	0.05	-0.139	0.145	0.057	-0.304
2003	-0.082	-0.219	0	0.016	0.034	0.321	0.027	0.271
2004	-0.035	-0.06	0	-0.091	0.042	0.222	-0.077	0.036
2005	-0.023	0.008	0	-0.096	0.01	0.191	-0.082	-0.044
2006	-0.02	0.028	0	-0.07	0.005	0.189	-0.059	-0.059
2007	-0.023	0.025	0	-0.038	0.006	0.193	-0.032	-0.044
2008	-0.026	0.017	0	-0.012	0.006	0.194	-0.01	-0.026
2009	-0.026	0.009	0	0.004	0.005	0.189	0.003	-0.011
2010	-0.023	0.003	0	0.012	0.004	0.181	0.01	-0.001
2011	-0.018	-0.001	0	0.016	0.005	0.169	0.012	0.004

Table 35 Italy GDP % difference from baseline

	Consumption	Private sector investment	Government expenditure	Export volumes	Import volumes	GDP
2002	-0.009	-0.455	0	-0.228	-0.358	-0.077
2003	-0.054	-0.822	0	-0.517	-0.577	-0.21
2004	-0.047	-0.332	0	-0.365	-0.18	-0.157
2005	-0.045	-0.091	0	-0.285	-0.074	-0.114
2006	-0.047	0.002	0	-0.202	-0.03	-0.082
2007	-0.049	0.025	0	-0.127	-0.009	-0.061
2008	-0.049	0.02	0	-0.07	-0.001	-0.046
2009	-0.048	0.007	0	-0.031	0.003	-0.036
2010	-0.046	-0.005	0	-0.008	0.002	-0.028
2011	-0.042	-0.014	0	0.005	-0.002	-0.023

Table 36 Italy Costs, Prices, and Rates differences (B) and % differences (P) from baseline

	Whole economy unit labour cost	Inflation (CED)	Unemployment, %	Private consumption deflator	Dollar exchange rate	Real Effective Exchange Rate	Nominal Effective Exchange Rate	Short term rate	Long term rate
	P	B	B	P	P	P	P	B	B
2002	0.057	-0.01	0.009	0.001	0.076	0.002	-0.001	1	0.015
2003	0.078	-0.031	0.04	-0.031	0.126	0.018	-0.005	-0.14	-0.043
2004	-0.106	-0.04	0.052	-0.101	0.201	0.038	-0.011	-0.138	-0.028
2005	-0.249	-0.039	0.044	-0.174	0.22	0.048	-0.017	-0.101	-0.015
2006	-0.322	-0.028	0.031	-0.229	0.221	0.048	-0.023	-0.061	-0.006
2007	-0.35	-0.018	0.021	-0.265	0.214	0.045	-0.027	-0.034	0
2008	-0.355	-0.01	0.014	-0.287	0.202	0.04	-0.029	-0.016	0.003
2009	-0.351	-0.005	0.01	-0.298	0.185	0.034	-0.029	-0.004	0.005
2010	-0.345	-0.002	0.008	-0.304	0.164	0.027	-0.027	0.002	0.006
2011	-0.339	-0.001	0.007	-0.306	0.141	0.019	-0.024	0.005	0.006

Table 37 Italy Contribution

	Consumption as a % GDP	Investment and Stocks as a % GDP	Government Consumption as a % GDP	Net Exports as a % GDP	Govt. balance as % of GDP	Govt. debt as % of GDP	Trade account as % of GDP	Current account as % of GDP
2002	-0.006	-0.104	0	0.033	-0.289	0.274	0.033	-0.257
2003	-0.032	-0.187	0	0.01	0.122	0.485	0.01	0.171
2004	-0.028	-0.066	0	-0.064	0.057	0.398	-0.059	0.026
2005	-0.027	-0.014	0	-0.073	0.012	0.383	-0.063	-0.03
2006	-0.028	0.005	0	-0.059	0.005	0.378	-0.048	-0.042
2007	-0.029	0.01	0	-0.041	0.008	0.364	-0.029	-0.035
2008	-0.029	0.008	0	-0.025	0.009	0.343	-0.013	-0.023
2009	-0.029	0.005	0	-0.012	0.007	0.32	-0.003	-0.014
2010	-0.027	0.002	0	-0.004	0.005	0.299	0.003	-0.008
2011	-0.025	0	0	0.002	0.005	0.278	0.006	-0.004

Table 38 UK GDP % difference from baseline

	Consumption	Private sector investment	Government expenditure	Export volumes	Import volumes	GDP
2002	-0.247	-0.771	0	-0.079	-0.459	-0.151
2003	-0.277	-1.701	0	-0.229	-0.725	-0.299
2004	-0.141	-0.953	0	-0.203	-0.409	-0.193
2005	-0.097	-0.299	0	-0.181	-0.226	-0.106
2006	-0.075	0.148	0	-0.142	-0.106	-0.04
2007	-0.062	0.366	0	-0.097	-0.037	0.001
2008	-0.051	0.414	0	-0.057	-0.005	0.023
2009	-0.042	0.366	0	-0.023	0.006	0.032
2010	-0.034	0.276	0	0.002	0.004	0.033
2011	-0.027	0.181	0	0.019	-0.002	0.031

Table 39 UK Costs, Prices, and Rates differences (B) and % differences (P) from baseline

	Whole economy unit labour cost	Inflation (CED)	Unemployment, %	Private consumption deflator	Dollar exchange rate	Real Effective Exchange Rate	Nominal Effective Exchange Rate	Short term rate	Long term rate
	P	B	B	P	P	P	P	B	B
2002	0.064	-0.007	0.03	0.003	0.186	-0.118	-0.127	1	-0.008
2003	-0.003	-0.046	0.129	-0.057	0.218	-0.107	-0.115	-0.171	-0.062
2004	-0.263	-0.088	0.145	-0.193	0.25	-0.116	-0.075	-0.206	-0.04
2005	-0.455	-0.104	0.103	-0.361	0.185	-0.12	0.011	-0.194	-0.017
2006	-0.575	-0.08	0.057	-0.503	0.093	-0.113	0.108	-0.135	0.003
2007	-0.64	-0.048	0.023	-0.594	0.017	-0.099	0.179	-0.071	0.017
2008	-0.662	-0.02	0.001	-0.636	-0.03	-0.087	0.215	-0.021	0.025
2009	-0.658	0	-0.011	-0.642	-0.054	-0.078	0.224	0.012	0.028
2010	-0.639	0.012	-0.016	-0.628	-0.065	-0.073	0.217	0.028	0.028
2011	-0.614	0.016	-0.018	-0.605	-0.072	-0.071	0.204	0.033	0.028

Table 40 UK Contribution

	Consumption as a % GDP	Investment and Stocks as a % GDP	Government Consumption as a % GDP	Net Exports as a % GDP	Govt. balance as % of GDP	Govt. debt as % of GDP	Trade account as % of GDP	Current account as % of GDP
2002	-0.171	-0.137	0	0.158	-0.181	0.185	0.098	-0.928
2003	-0.193	-0.329	0	0.224	0.005	0.384	0.146	0.577
2004	-0.099	-0.199	0	0.104	0.069	0.307	0.046	0.309
2005	-0.068	-0.073	0	0.035	0.031	0.29	-0.007	0.141
2006	-0.052	0.016	0	-0.004	0.02	0.286	-0.032	0.035
2007	-0.043	0.064	0	-0.019	0.015	0.275	-0.037	-0.016
2008	-0.036	0.078	0	-0.019	0.01	0.257	-0.032	-0.038
2009	-0.029	0.073	0	-0.012	0.004	0.237	-0.023	-0.043
2010	-0.024	0.058	0	-0.001	0.001	0.217	-0.013	-0.037
2011	-0.019	0.041	0	0.009	0.001	0.197	-0.004	-0.028

We report results for the UK, Germany, France and Italy in tabular form as well as summary tables for the Euro Area. Tables 13 to 26 report the effects of a Euro Area shift in interest rates, and tables 27 to 40 report the effects of a world-wide increase in short rates of 1.0 percentage point for 1 year. In the Euro Area experiment on its own monetary policy is clearly deflationary. As we argue above, in the experiment involving all countries the monetary tightening is greater in the US than in Europe, and hence the dollar appreciates, giving an offsetting impulse to Euro Area

prices in the first year of the experiment. We should not read into this the implication that monetary policy in the Euro Area is not effective in the short term.

The relative scaling of interest rate responses in this analysis is of some interest. Within the Euro Area Germany responds more in this experiment, reflecting the higher proportion of investment in its output than in France or Italy. In the year of the shock, GDP declines by 0.18 percent relative to base in Germany, compared to a fall of 0.1 percent in France and a slightly smaller contraction in Italy. The United Kingdom shows median interest rate sensitivity, resulting in a 0.15 percent decline of GDP relative to base. Germany's greater interest rate sensitivity is a reflection of the relative scaling of the economies' investment contribution, which at -0.18 percent of GDP is largest in Germany, followed by -0.14 percent in the UK, -0.12 percent in France and -0.10 percent in Italy. Due to stronger demand effects, the impact on consumers is most pronounced in the United Kingdom, with consumption contributing 0.17 percent to the decline in GDP. In Germany, the contribution of consumption amounts to -0.06 per cent, whilst it is essentially neutral in Italy. Net trade is offsetting some of the negative contribution from consumption and investment in all economies, with its impact being most pronounced in the UK due to stronger demand effects. It is notable that in Germany net trade essentially compensates for that part of the contraction in GDP that is resulting from the effect on consumption. A slightly more aggregated approach reported by the IMF (2002) comes up with similar conclusions. That study uses a three equation Structural Vector Auto Regression (SVAR) approach to modelling the UK, the USA and Germany and finds that in the long run the UK and the US have similar scale impacts from real interest rates onto aggregate demand, although the short run effect is more marked in the UK. The long

run sensitivity of demand to real interest rates in Germany is twice as high as that in the UK, although the impact effects are 25 percent higher in the latter country.

Roeger and in't Veld (2002) conclude that amongst the four large European economies the GDP effect of a temporary interest rate change would be largest in Germany. This can be broken down into an 'average' effect on consumption (as a contribution to GDP) but a much stronger contribution to GDP from investment. Part of this is due to the larger share of investment in GDP in Germany than in the other large countries. In contrast in their results after a temporary interest rate shock consumption in the UK was effected to a greater extent than elsewhere, but the impact in investment was much smaller. Our results are similar to theirs. However, in none of the cases was the impact of a rise in interest rates of 1.0 percentage point for one year at all large. A change of this magnitude in the European Commission's Quest model used by Roeger and in't Veld might reduce growth by 1/6th to a quarter of a percentage point for up to two years, with little difference in the impacts across countries.

There are a number of other studies using macro models, albeit of a more disparate nature, as well as a raft of studies using the SVAR approach. The structural studies are surveyed in Guiso et al. (1999) and in Angeloni et al. (2002), and both also survey the work to date on SVARs. Most SVAR studies conclude that differences between countries are not large, but Guiso et al. (1999) suggest that the differences are not particularly robust. The main regularities that seem to emerge suggest that monetary policy is at its most powerful in Germany, and in 4 out of 5 studies discussed in detail the UK displays a weaker output response to monetary policy, although it is generally stronger than that seen in France. The BIS (1995) and Angeloni et al. (2002) both survey the results from large macro models, in the latter

case only for the Euro Area. In general the impact of monetary policy in the models exceeds that displayed in estimated VARs, and Germany shows a slightly stronger impact (and generally long run) effect on output from monetary policy than does the average of the other Euro Area countries. Angeloni et al. (2002) also show that recent SVAR based evidence suggests a marked impact of monetary policy on Germany, and also on the Euro Area as a whole. We can conclude from these studies that the UK does not appear particularly different from, and in particular not more sensitive than, its neighbours.

5. Conclusion

In this paper we describe the theoretical underpinnings and simulation properties of the National Institute's large-scale macroeconomic model NiGEM. The model is constructed within a 'New Keynesian' framework with short run nominal rigidities and forward looking expectations. We have conducted a number of monetary and fiscal policy shocks using NiGEM. Our contention is that the implementation of policy shocks can be achieved by either changing the instruments of policy, for example the short term interest rate, or the targets of policy, in the case of the UK the inflation target, or both. Nevertheless, this requires a careful analysis of policy rules in place.

In terms of NiGEM's policy simulations, monetary shocks have temporary impacts on the real sector but permanent effects on the price index. Equivalent monetary shocks have a greater impact on prices in the US than in the Euro Area. This is due to greater wage-price inertia in the Euro Area. There are small impacts from fiscal policy on output for the larger European countries, with Germany having the strongest multiplier from government spending. The responses to temporary changes in government spending are typically not dependent upon whether consumers

exhibit forward looking behaviour. Amongst the three large countries of the Euro Area considered the responses to monetary policy are strongest in Germany. Additionally we present simulation results where the UK displays weaker responses to monetary policy shocks than Germany, but stronger responses than in the other Euro Area countries, France and Italy.

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