The Bank of Italy Quarterly Model[1]

1. Introduction

The Bank of Italy Quarterly Model (BIQM) is a new version of the model developed in the mid-eighties by a team of economists of the Research Department headed by Albert Ando (Banca d'Italia, 1986). Since the presentation of the first release, the model has continuously evolved, to take account of new data sources, changed institutional frameworks and a variety of expectations formation mechanisms and policy rules.

The BIQM serves several purposes, the main one being to provide short and medium-term projections. Since monetary policy affects target variables only with substantial lags, policy actions need to be forward-looking and hence must be based on forecasts of target variables at horizons which are consistent with the delayed response of the economy to monetary policy impulses. The model is also used in policy evaluation exercises, for assessing the policy mix which is best suited for enhancing social welfare, and in counterfactual analyses, in which actual developments in the economy or policy programmes are contrasted with fictitious alternatives so as to gain a better understanding of the costs and benefits inherent in economic actions. Finally, the BIQM helps organise and co-ordinate economic research within the Research Department of the Bank of Italy.

As most macroeconometric models, the BIQM is Keynesian in the short-run, with the level of economic activity primarily determined by the behaviour of aggregate demand, and neo-classical in the long-run, akin to Solow's model of exogenous growth. Along a steady-state growth path, the dynamics of the model stem solely from capital accumulation, productivity growth, foreign inflation and demographics; in the short-run, a number of additional features matters, namely the stickiness of prices and wages, the putty-clay nature of the production process and inflation surprises.

The BIQM models separately the public and the private sector and, within the latter, distinguishes among energy, agriculture and the rest. As to the expectations formation mechanism, it makes extensive use of survey data. All equations in the model are estimated by limited-information techniques, mostly ordinary least squares. A limited set of parameters, in particular some related to the user cost of capital, are calibrated. The model contains about 900 equations, some 100 of which are stochastic. The software package used for estimation and simulation is Speakeasy/Modeleasy+.

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[1] This note describes the 2004 version of the Bank of Italy Quarterly Model

2. An outline of the theoretical underpinnings for the model and its purpose

In equilibrium - i.e. once no shocks affect the model, expectations are fulfilled and all adjustment processes have come to an end - the BIQM describes a full employment economy, in which output, employment and the capital stock are consistent with an aggregate production function, relative prices are constant and inflation equals the exogenous rate of growth of foreign prices. Money is neutral, though not super-neutral, and the model is stable.

The theoretical structure underlying the steady-state is a traditional one. The supply sector can be thought of as being composed by producers who are price-setters in output market and price-takers in factor markets. Each producer, being endowed with the same Cobb-Douglas constant-returns-to-scale technology, knows the minimum average cost of his competitors and fixes the level of the mark-up so as to keep potential entrants out of business. Along a steady-state growth path, firms decide in each period the cost-minimising factor mix and the level of domestic activity is then set to generate, given factor demands, a non-accelerating-inflation rate of unemployment. Life-cycle consumers choose the desired addition to the real stock of total wealth, which is then allocated among foreign assets, physical capital and government debt,[2] and the real exchange rate adjusts so as to balance supply and demand and to clear capital markets. As consumers compute their life-time resources without anticipating the need for the government to satisfy a long-run solvency condition, the stock of public debt is perceived to be part of total wealth and Ricardian equivalence does not hold.

A detailed description of the theoretical underpinnings of the BIQM is in Banca d’Italia (1986). Other useful descriptions of the main features of the model are Galli *et al.* (1989), Terlizzese (1994) and Siviero (1995).

2.1 Investment, employment and potential output

The supply-side block of the BIQM hinges on the assumption that, since capital is non-malleable, the choice of productive factors is limited to the additions to previously existing stocks. In each period, given demand expectations, firms set the desired addition to capacity by solving:

$$min \quad w_t l(t,t) + c_t^k i_t \qquad \text{subject to} \qquad \Delta v_{t+1} = A\left[(1+\gamma)^t l(t,t)\right]^{\alpha} i_t^{1-\alpha}$$

where w_t is the wage rate, c_t^k the user cost of capital, v_t desired production, α the labour share, γ the rate of growth of technical progress, i_t and $l(t,t)$ the new machinery[3] and the associated labour requirement.

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[2] Equities and private sector securities are not considered since they cancel out in the consolidation of the balance sheet of households and firms.

[3] We use the simplifying assumption that there exists only one capital good, though actually the model specifies separate behavioural equation for machinery, structures and housing.

Cost minimisation yields the optimal capital/output and labour/output ratios,

$$\frac{i_t}{\Delta v_{t+1}} \equiv k_t^* = \left[\frac{1-\alpha}{\alpha}\frac{w_t(1+\gamma)^{-t}}{c_t^k}\right]^{\alpha} \quad \text{and} \quad \frac{l(t,t)(1+\gamma)^t}{\Delta v_{t+1}} \equiv l_t^* = \left(k_t^*\right)^{\frac{\alpha-1}{\alpha}} = \left[\frac{\alpha}{1-\alpha}\frac{c_t^k}{w_t(1+\gamma)^{-t}}\right]$$

respectively, and the minimum average cost associated with one additional unit of production,

$$\lambda \equiv \left[\frac{w_t(1+\gamma)^{-t}}{\alpha}\right]^{\alpha}\left[\frac{c_t^k}{1-\alpha}\right]^{1-\alpha}.$$

Desired capital accumulation is therefore equal to $i_t = k_t^* \Delta v_{t+1}$. Since it takes time to produce and deliver capital goods, actual and planned investment differ, with the former being a weighted average of the most recent values of the latter. Allowing for expectations[4] and delivery lags, the previous expression becomes

$$i_t = \sum_{i=0}^{q} \beta_{1i} k_{t-i-1}^* v_{t-i} + \sum_{i=1}^{q+1} \beta_{2i} k_{t-i}^* v_{t-i}$$

where in general the first set of coefficients is positive while the remaining ones are negative. As typical with models assuming that capital is putty-clay, investments react to changes in demand and changes in relative factor price differently: while in the first instance the shape of the response conforms to the accelerator principle, in the second it is smooth and monotone.

Associated with each vintage of capital is a fixed amount of labour which is needed to operate the new machinery and an efficient quantity of output which can be produced with it. The equations modelling employment and potential output are accordingly derived from the parameters of the investment function and from the sequence of vintages of new capital.

The demand for labour is determined in a stepwise procedure: first, as shown above, cost minimisation determines the optimal labour-to-output ratio for the planned addition to capacity Δv_{t+1}, then the labour requirement of the last vintage of *installed* rather than desired investment is derived; finally, the demand of labour associated with the overall stock of capital is computed. Frictions and adjustment costs make total employment temporarily differ from the desired value.[5] The labour requirement for unit of output associated with current-period installed capital, $\hat{l}_t^*$, is obtained from the coefficients of the investment equation

[4] The addition to capacity required to meet expected demand, Δv_{t+1}, is proxied by a distributed lag of value added.

[5] The word optimal is somewhat abused in this context and must be interpreted as the quantity of labour associated with installed capital. Since actual and planned investment do not coincide, due to production and delivery lags, such an amount of labour is in fact sub-optimal. Additional frictions, like adjustment costs and labour market rigidities, may cause deviations from this benchmark level. Sub-optimality here refers only to this second source of frictions.

$$\hat{l}_t^* = \psi \sum_{i=0}^{q} \left(\frac{\beta_{1i}}{((1+\gamma)(1+n))^i} + \frac{\beta_{2i}}{((1+\gamma)(1+n))^{i+1}} \right) l_{t-i-1}^*$$

with n being the rate of growth of population and ψ being a scaling factor ensuring that the weights sum to 1. The corresponding measure for the capital stock is computed by averaging $\hat{l}_t^*$ for all vintages of capital: the BIQM uses, as a shortcut, a geometric lag structure

$$\tilde{l}_t^* = \omega \tilde{l}_{t-1}^* + (1-\omega)\hat{l}_t^*$$

The equilibrium relationship between desired investment and capacity, $i_t = k_t^* \Delta v_{t+1}$, represents the building block for modelling potential output as well. As the previous equation shows, the optimal capital-output ratio may be viewed as a conversion factor mapping desired addition to production capacity into capital accumulation. By setting $k_t^* = 1$ in the investment equation, one can therefore obtain a measure of the desired gross addition to capacity which is consistent with capital accumulation; the level of potential output is then obtained by cumulating the net addition to capacity corresponding to each vintage of capital.

2.2 Prices and wages

The pricing strategies of firms are described by the equations modelling the private-sector value added deflators (at factor costs). Prices are set as a mark-up on marginal costs. In equilibrium, marginal and minimum average costs coincide and are proportional to unit labour costs

$$p_t = \mu\lambda = \frac{\mu}{\alpha}\left[\frac{w_t}{(1+\gamma)^t}\right] l_t^* = \frac{\mu}{\alpha} w_t \frac{l(t,t)}{\Delta v_{t+1}}$$

The mark-up is assumed to depend on the prices set by foreign competitors and on cyclical conditions, measured by the real exchange rate and the output gap respectively. Deflators of aggregate demand components are modelled as a function of import and value added deflators.[6]

A standard Phillips curve relation completes the price-wage block: wage inflation depends with unit elasticity on price changes, measured by a convex combination of expected and actual (past) inflation, and on the rate of unemployment. The degree of utilised capacity is also included to proxy for vacancies; a measure of union power is provided by the number of working hours lost due to strikes. Indirect taxes, social contributions and terms of trade impact on wages by affecting consumer prices. In equilibrium, the Phillips curve determines the NAIRU, while the price equation determines the factor shares in income distribution.

[6] The modelling strategy used to map supply and demand prices is derived from Klein (1983), pp. 24-28.

2.3 Consumption and housing investment

The BIQM does not distinguish between households and firms; the explanatory variables in the equations modelling consumption accordingly refer to the private sector as a whole. Consumption of nondurables and durables are treated separately. The former is modelled consistently with the life-cycle theory and is driven by permanent income, proxied by a weighted average of disposable income and wealth. Disposable income is computed by adjusting for the capital gains/losses on financial assets engendered by changes in the inflation rate. Since wealth is not measured at market value, the real interest rate is included among the explanatory variables. The demand for durables is driven by total consumption expenditure: its share depends on the relative price of durable goods and on the long-term interest rate.

The equation for housing investment relies on a variant of Tobin's *q* model: residential capital depends on the present value of the future streams of profits (proxied by the market price) of an additional unit of capital. Financing constraints are accounted for by using the expected real interest rate as an explanatory variable and a time trend is included to capture demographic effects on the total demand for houses; fiscal factors also play a role in the equation. The interaction between supply and demand for houses, the latter modelled as a portfolio allocation problem, determines the market price.

2.4 The trade equations

Several equations are devoted in the BIQM to modelling imports and exports. Services, agricultural goods and energy products are modelled separately from other goods. No distinction is made between trade with the Euro area and trade with the rest of the world.

The modelling of the demand for imports and exports relies on the assumption of imperfect substitutability between foreign and domestic goods. In accordance with demand theory, imports may be viewed as the solution to the maximisation problem of a representative consumer, who acts taking into account a budget constraint. Separability and homogeneity of the utility function ensure that the saving decision and consumption allocation - in particular the choice between domestic and foreign goods - can be treated separately. Absence of money illusion is imposed by considering relative prices and real income.[7] The scale variable driving imports is a weighted average of aggregate demand components, with exports and investments in machinery having the largest weights; the degree of utilised capacity is included in the specification so as to capture the fact that

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[7] Domestic and foreign prices enter the equation symmetrically, which is somewhat restrictive: factors like reputation, available servicing and retail outlets may induce people to react differently to identical changes in import and domestic prices. In addition, any individual good price is unlikely to have the same weight in the import and domestic price indices, so that some divergence between the two indices may simply result from individual good prices having different rate of inflation. Price homogeneity is however imposed in the equation, since it appears to be supported by statistical evidence.

sudden changes in domestic demand are initially more than proportionally met by foreign production.

Exports are modelled in a similar way: the scale variable is world imports and the degree of utilised capacity is used as a proxy for non-price competitiveness. Both imports and exports have unit elasticity with respect to their respective scale variables.

2.5 The public sector

The model includes a detailed description of the items composing the government budget. No *ad-hoc* policy rule is incorporated, but rather, whenever possible, the equations try and reflect the legal framework shaping the behaviour of the government sector. Those components of the budget balance which are more discretionary, like consumption of goods and services and investment, are linked to GDP: absent fiscal impulses from the government, they are a constant fraction of nominal aggregate demand. Automatic stabilisers turn out to be quite powerful and contribute to make the model borderline stable.

Revenues are modelled both on a cash and on an accrual basis. The main items are direct taxes - disaggregated into taxes on wages, profits and capital income -, indirect taxes – distinguished according to whether they are levied on value added or on quantity sold - and social contributions – split into contributions paid by employers and contributions paid by employees -. On the expenditure side, the main items are transfers – mostly pensions -, wages and interest payments.

The financial behaviour of the public sector is described by the overall supply of government debt, distinguished according to maturity,[8] and by the interest rate set on Treasury bonds. Borrowing requirements, net of changes in the stock of monetary base,[9] determine the total amount of new issues of Treasury securities, while yields-to-maturity determine the structure of government debt. The equation for the long-term interest rate reflects the desired composition of government debt and is consistent with the demand curve of the private sector. It sets the long-term rate as a function of the three-month Treasury bill rate and of a time-varying risk premium, which depends asymmetrically on interest rate volatility: when interest rates are rising, the risk premium which must be paid by the issuer increases; when interest rates are falling, the risk premium remains unchanged.

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[8] The BIQM considers all types of government securities, namely: BOT (Treasury bills), CCT (variable-rate T bills), CTE and BTE (Treasury securities denominated in ECU), CTZ (two-years zero discount bonds), CTO (Treasury bonds with a put option), BTP (longer-term fixed-income Treasury bonds). The objective is to track the path of public sector interest payments as precisely as possible. The demand functions for these debt instruments are however expressed at a more aggregate level, distinguishing only between short-term and long-term securities.

[9] Other minor items relate public sector borrowing requirements and new issues of Treasury securities, namely (changes in the stock of) post office deposits and foreign debt.

2.6 The monetary and financial sector

The monetary and financial block of the BIQM fully tracks the flow of funds within the economy. It provides a detailed description of the portfolio decisions of economic agents: for given financial balances of the private and public sector, the former determined by consumption and investment choices and the latter by the objectives of the fiscal policy, the block generates gross flows of assets and liabilities and specifies how they are allocated among different instruments. Changes in the net foreign position are explicitly considered so that the model satisfies the private and public sector budget constraints with reference to total financial assets and total credit.

The theoretical framework underlying the monetary and financial block is to a large extent the one outlined in Ando-Modigliani (1975) and conforms to the methodology that used to underlie the MPS econometric model. Agents make their financial choices hierarchically: they first choose the amount of money they want to hold in order to finance their transactions and then allocate their wealth among the remaining assets according to their risk-return preferences. Substitutability among assets is not perfect, since lenders and borrowers have their preferred point in maturity along the term-structure, as suggested by the preferred-habitat theory: returns vary from period to period depending on future expectations of the real interest rate and of the inflation rate, with volatility on financial markets and relative asset supply influencing the term premia. In order to ensure that agents satisfy their budget constraint, the demand function for a few assets (specifically those which seem to be more volatile) is derived as a residual, under the implicit assumption that they play the role of shock absorbers.

The monetary and financial section of the BIQM is composed by more than two hundred equations, of which some thirty are stochastic. It describes the financial position of seven categories of economic agents (central bank, banks, government, households, firms, mutual funds and rest-of-the-world)[10] and how their asset and liabilities are allocated among nine groups of instruments (currency, deposits, compulsory reserves, repos, short-term securities, long-term securities, loans, mutual funds shares). Each market is described by a demand function and an inverted supply equation, in which the endogenous variable is the relevant interest rate. The structure of the block is designed so as to provide a detailed account of the channels through which the central bank affects the economy via portfolio adjustment in the monetary and financial markets and therefore focuses on the market for shorter-term maturity instruments and on those "intermediate" variables which are (or were) used as information variables for the conduct of monetary policy. The model therefore includes a detailed description of the working of the money market: the central bank controls liquidity conditions through open market operations and hence

[10] In order to simplify the overall structure of the model, some short-cuts are used, the main being the consolidation of the balance sheet of households and firms, which sidesteps the need to model the equilibrium process in the stock market. This solution is consistent with the limited role that the equity market played until recently both as a source of financing for firms and as an investment opportunity for households.

affects the interbank market and the market for Treasury securities. Term structure equations link the return on fixed-income long-term Treasury bonds to the three-month Treasury bill rate. For policy simulation purposes, the exchange rate responds to changes in the spread between domestic (Euro area) interest rates and foreign rates and adjusts according to an uncovered interest parity relation.

3. Single-equation and system properties

All equations in the BIQM are specified so as to ensure convergence to a steady-state growth path: demand components driven by domestic economic activity have unit elasticity with respect to output; exports increase one-to-one with world demand and are homogenous with respect to domestic and foreign prices; prices and wages show no-money illusion, with the former linked to foreign inflation and the latter growing, in real terms, with trend productivity; capital and labour (in efficiency units) move in line with domestic value added.

3.1 Single-equation properties

The single–equation properties of the main equations of the BIQM are reported in table 1. Given that the BIQM distinguish between consumption of durables and non-durables, between trade in goods and services, between public and private sector and disaggregates the latter into three subsectors, the figures listed in the table are to be interpreted as the referring not to single equations but to block of equations. The table lists the short and long-run responses of a chosen subset of variables to their main explanatory variables. The employment equation and the Phillips curve refer to the non-farm non-energy private sector.

3.2 System properties

In order to evaluate the properties of the BIQM, a few exogenous variables have been shocked and the response of the system analysed. The results for the main endogenous variables are plotted in figures 1-5. The monetary policy experiment is conducted under the assumption that the policy tightening is not co-ordinated with other central banks and that exchange rates move according to an UIP condition.

1. A 100 basis point shock to the short-term interest rate sustained for two years

The monetary policy tightening induces a contraction in economic activity and a decrease in the price level. Output reaches a through in the 2nd year after the shock and gradually recovers thereafter, when the initial policy impulse vanishes. Investments is the component of aggregate demand which is mostly affected by the worsening of financing conditions, while consumption fluctuations are partly dampened by the positive effect on disposable income ensued by the exchange rate appreciation and by the decrease in the price level. Net exports benefit from the contraction engendered by the initial shock and contribute to mitigate the slowdown in economic activity. The decrease in the import deflator is immediately reflected in the HICP, while it takes approximately two years for the slowdown in GDP growth to affect prices. The fall in output translates with some delay into job cuts: the increase in the unemployment rate becomes sizeable only in the 3rd year. This evidence is fully consistent with the price-stickiness observed in oligopolistic markets and with capital being non-malleable: the first feature implies that changes in marginal costs are transmitted to prices slowly, with the mark-up buffering shocks to unit labour costs, while the second one justifies the smooth adjustment of labour demand and the limited response of both wages and productivity to shifts in factor prices.

2. *A five-year increase by 1% of GDP in Government consumption*

In the 1st year of the experiment, the fiscal stimulus results in a rise of GDP roughly in line with the size of the shock itself: while the surge in government consumption boosts, albeit modestly, household consumption and investment, net trade deteriorates sharply, even in the very short run. It takes a few years for the full effect of the initial shock to show up, since initially a sizeable part of the increase in demand is met by foreign production. The Keynesian multiplier reaches its highest value of 1.28 between the 3rd and the 4th year and it takes even longer for domestic demand to reach its maximum. Spurred by the surge in activity, inflation starts rising from the 2nd year onwards and remain higher than in the baseline for all the simulation horizon: under the assumption of fixed nominal short-term interest rates, which corresponds to a lax monetary policy stance, the rise in inflation engendered by the fiscal stimulus results in a decline of real interest rates and contributes to amplify the impact on activity and prices of the initial shock. The reaction of capital accumulation follows the typical accelerator pattern; construction investment is the component whose response is more gradual and delayed. Investment is uniformly higher than in the baseline, fostered by the pick-up in real wages and the fall in real interest rates, both factors engendering a decrease in the relative cost of capital. Consumer spending increases as well, but less markedly, because the capital losses on (non-indexed) financial wealth, stemming from the acceleration of prices, attenuates the effects on disposable income of the policy-induced upturn. Net exports steadily decrease, reflecting first the expansion in imports driven by the delayed adjustment of production to the higher level of aggregate demand and then the deterioration in competitiveness ensued by the increase in domestic prices. Labour dishoarding and the unfavourable change in relative factor prices delay the reaction of private-sector employment to the fiscal stimulus. Excess demand in both labour and goods markets results in significant and persistent inflationary pressures: after five years the HIPC is some 2 percentage points higher than in the baseline. From the 6th year on, the vanishing of the fiscal impulse and the loss in competitiveness trim down the pace of expansion of economic activity. The increasing slackness in the labour market gradually engenders a reversal in the dynamics of unit labour cost; profits margins, which decreased initially, partially recover along with the slowdown in production costs. In the 10th year after the initial shock, inflation is lower than in the baseline, as are real wages; GDP, though still falling, seems to have more or less reached the trough and appears to benefit form the working of fiscal stabilisers and from the gradual recovery of competitiveness conditions.

3. *A five-year increase by 1% of non-euro area imports*

Exports rise in response to stronger foreign demand, but the response in GDP is sizeably attenuated by the leakage due to the surge in imports. The market share of Italian goods shrinks slightly as world demand expands, because of the lag with which exports react to the shock and also as a result of the increase in domestic demand; the latter induces firms to shift their production to first fulfil domestic demand in the short term. As demand pressures build up, prices rise, with a one/two-year lag, and competitiveness deteriorates, attenuating the initial boost provided by the rise in world demand. As the initial stimulus is reverted, output rapidly falls below baseline.

4. *A five-year 1% appreciation of the euro exchange rate*

The temporary euro appreciation engenders a contraction in exports, which persistently depresses GDP. Investment is, among the component of domestic demand, the one most sharply affected by the initial shock, being hit also by the increase in the real rental cost of capital associated with the reduction in inflation ensued by the appreciation (nominal short term interest rates are assumed to remain unchanged at their baseline levels); consumer spending, by contrast, does not react at all in the first half of the simulation horizon and then starts rising, benefiting from the increase in disposable income induced by the slowdown in price dynamics. Employment adjusts slowly to the lower level of economic activity, thanks also to the favourable change in the relative cost of labour. The current account initially improves, owing to the J-curve effect, but then deteriorates, reflecting the competitiveness loss ensued by the appreciation of the domestic currency. Prices fall on impact as the exchange rate appreciates; the initial movement is subsequently amplified by the contraction in aggregate demand. As the initial shock vanishes, they start reverting to the baseline values.

5. *A five-year increase by 10% in oil prices*

The increase in oil prices is rapidly transmitted to the import deflator and hence to domestic prices. The surge in energy prices heavily affects real disposable income and consumption; the latter remains below baseline for nearly the whole simulation horizon. The deterioration in competitiveness depresses exports (it should be emphasised, however, that this effect would be lower than estimated here if one took into account the impact of the oil price hike on the price of competitors). Output decelerates, and so does investment, due to the accelerator mechanism. The current account deteriorates, reflecting the worsening of the terms of trade. The slackness engendered by the economic slowdown gradually offset the inflationary impulses associated with the increase in oil prices: four years after the initial shock, the GDP deflator is below the baseline value, which helps restoring competitiveness conditions and sustaining disposable income. Prices rebound as soon as the initial rise in oil prices vanishes. Due to the persistent contraction in consumer spending and investment, it takes the whole simulation horizon for output to come back to its baseline values.

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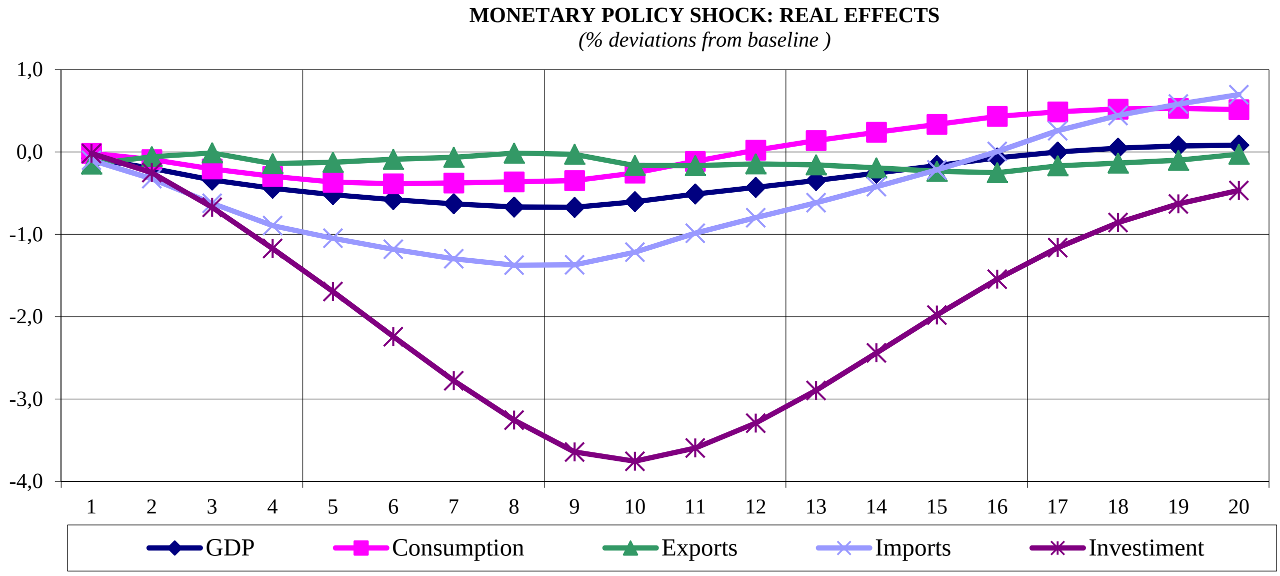
Table 1. Response of main equations to 10% shock to key determinants[‡]

	Multipliers			
	Year 1	Year 2	Year 5	Year 10
Investment				
Output	8.2	19.9	16.2	10.2
Real User Cost	-1.1	-2.9	-5.5	-5.9
Employment				
Output	2.1	4.6	8.3	9.8
Real Wages	0	-0.1	-0.6	-1.8
Output Deflator				
Nominal Wages	2.4	5.6	8.0	8.1
Import Prices	1.3	1.8	1.9	1.8
Wages				
Consumption Deflator	7.2	10.6	10.4	10.0
Unemployment rate [*]	-0.1	-0.1	-0.1	-0.1
Consumption Deflator				
GDP Deflator	6.7	9.8	9.3	9.2
Import Prices	0.4	0.7	0.7	0.8
Export Prices				
External Prices	3.6	4.3	4.4	4.7
Domestic Prices	5.8	5.6	5.6	5.2
Import Prices				
External Prices	9.1	9.1	9.1	9.1
Energy Prices	0.9	0.9	0.9	0.9
Private Consumption				
Disposable Income	1.6	4.6	7.6	6.9
Wealth	0.2	1.1	2.7	3.0
Real Interest Rate	-0.2	-0.4	-0.6	-0.3
Export Volume				
World Demand	8.8	9.2	9.7	9.9
Competitiveness	4.9	9.8	17.5	21.6
Import Volume				
Domestic Demand	13.7	11.7	10.1	10.0
Competitiveness	-4.1	-8.0	-10.7	-10.8

(‡) Employment refers only to the private non-farm non-energy sector

(*) Temporary shock for one quarter.

Figure 1. Macroeconomic effects of a shock to the short term interest rate (100 basis points)



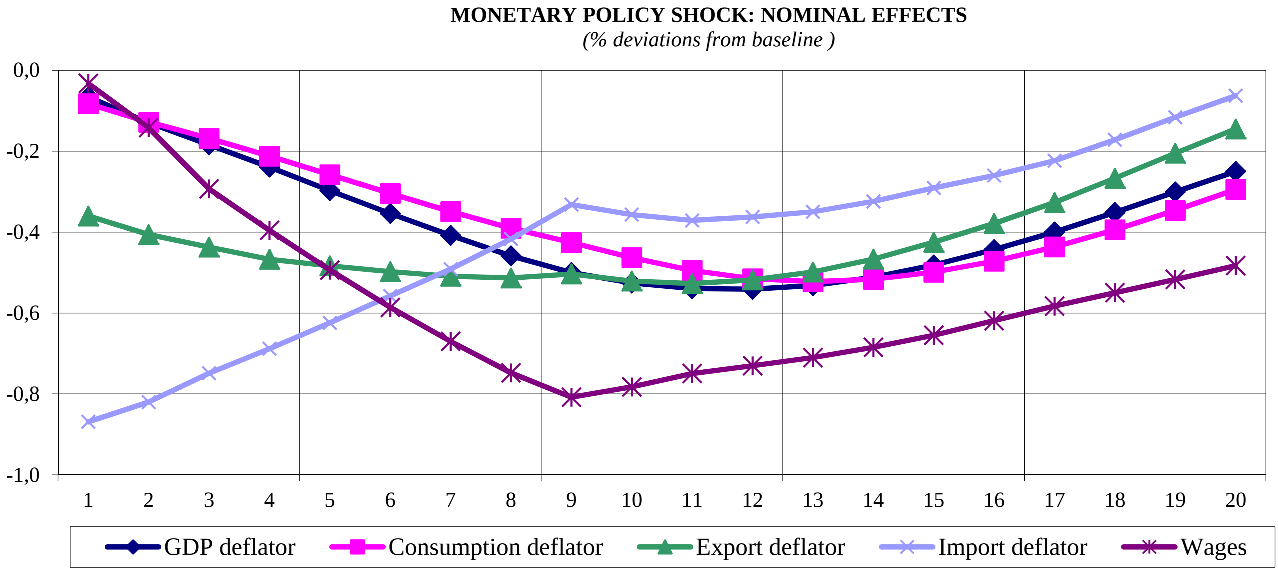
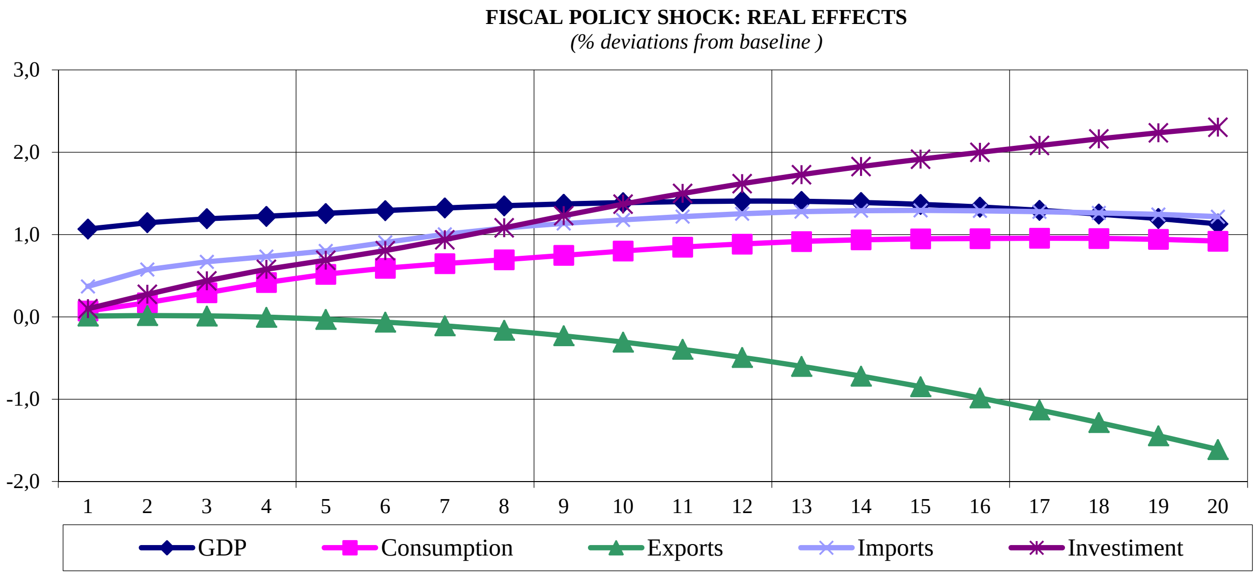


Figure 2. Macroeconomic effects of a shock to Government consumption (1% of GDP)



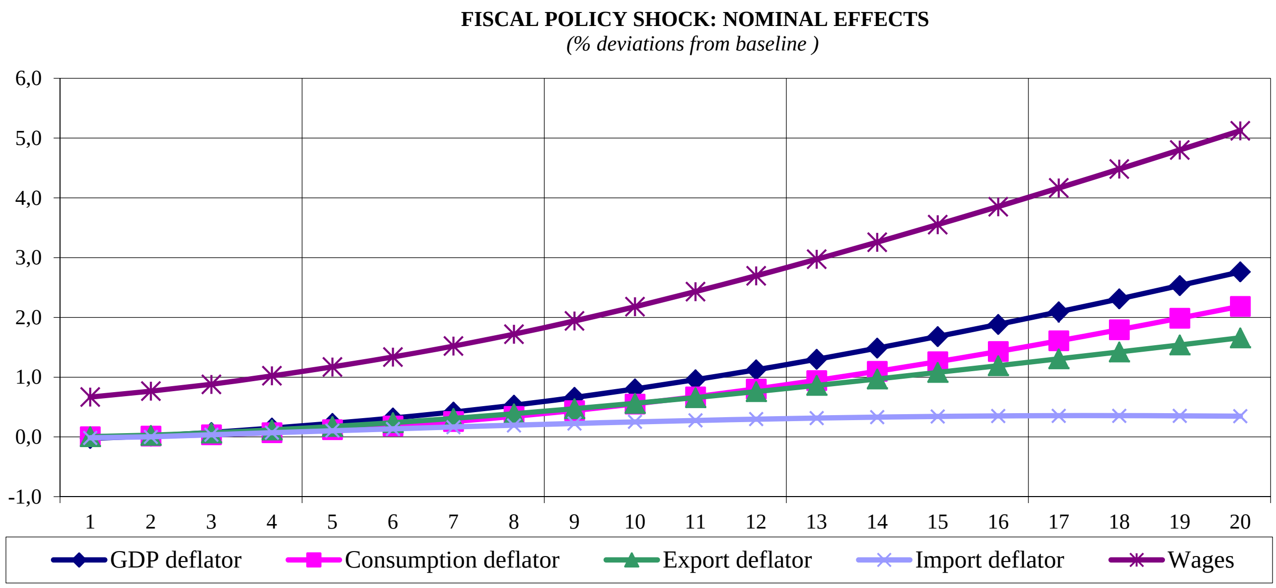
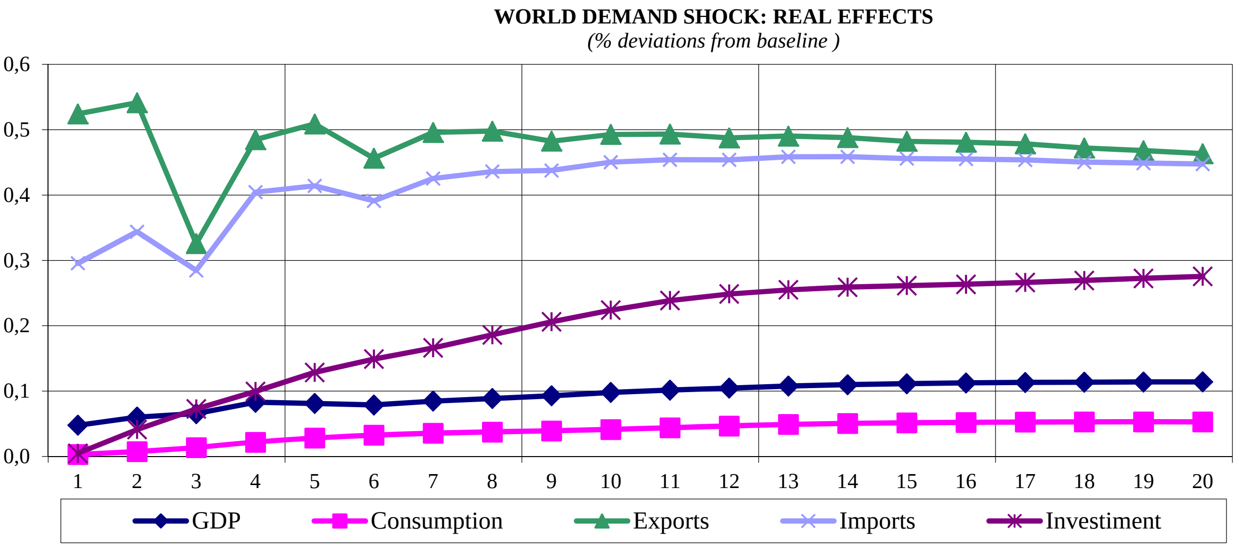


Figure 3. Macroeconomic effects of a 1% shock to world demand



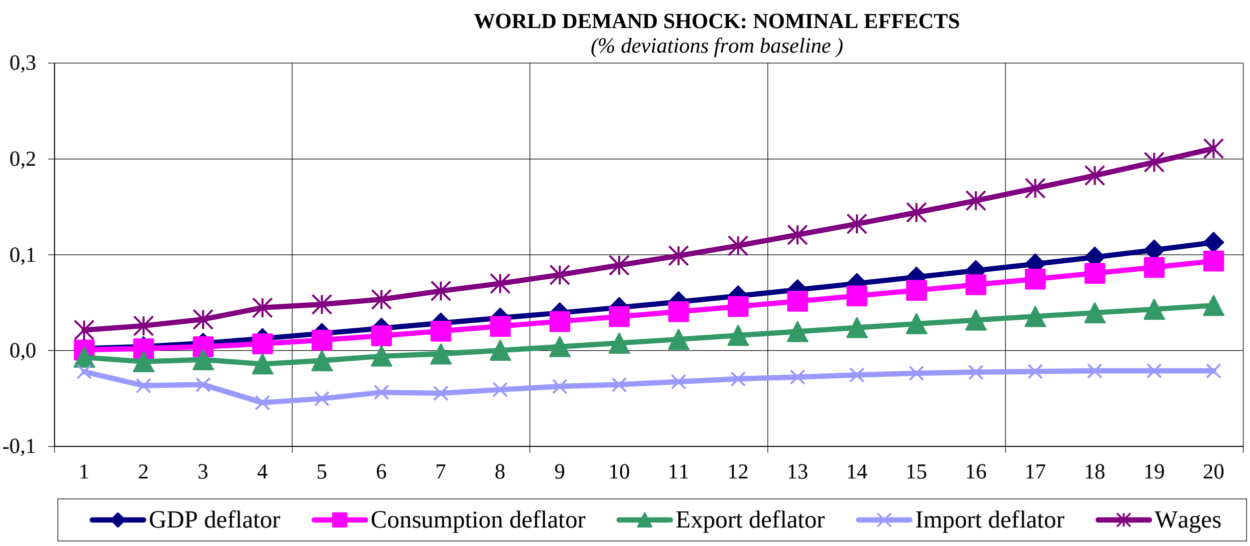
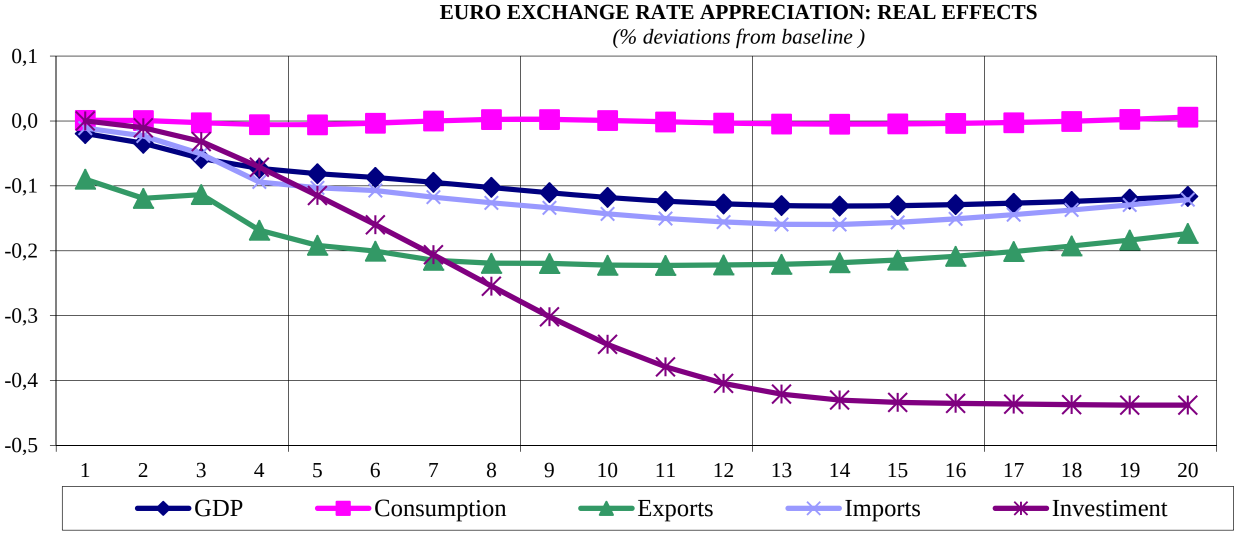


Figure 4. Macroeconomic effects of a 1% shock to the euro exchange rate



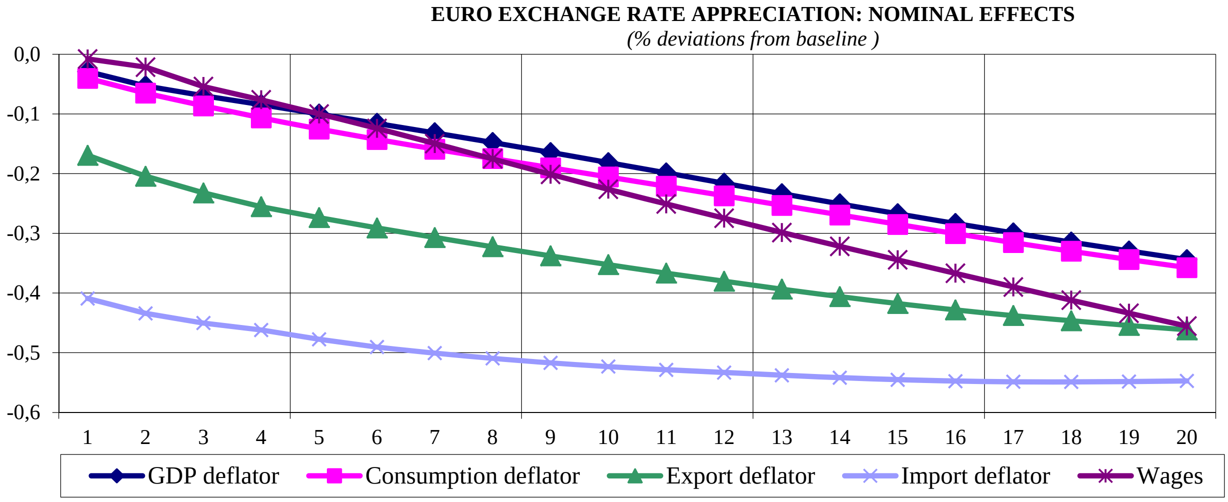


Figure 5. Macroeconomic effects of a 10% shock to oil prices