Evaluating Safe Deficit Targets and Automatic Stabilisers under the SGP

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Abstract.
Rule guided fiscal policy in the UK and the Euro Area puts weight on the automatic stabilisers. We assess the scale of these stabilisers in the UK and the Euro Area countries using a large, New Keynesian estimated macro model, NiGEM. The model is in wide use in finance ministries and central banks through out the Euro Area, and was extensively used in the assessment of UK membership of the Euro Area. Assessing the stabilisers allows us to investigate fiscal policy multipliers and assess model properties. Stabilisers are thought to be stronger than the evidence suggests, and as a result there is a case for more active fiscal policy. We discuss the Treasury proposal for automatic active fiscal responses to strengthen the stabilising properties of government policy.

Introduction

In this paper we discuss fiscal pacts and fiscal targets, and relate the literature to the discussion of discretionary fiscal policy and the operation of automatic stabilisers. Discussions of Monetary Union have made it clear that without independent monetary policy, fiscal policy becomes more important as a stabilisation mechanism so it is important to establish what degree of stabilisation we have. The European Commission's work on minimum benchmarks for fiscal policy and budget targets within the Stability and Growth Pact puts significant weight on automatic stabilisers. There are several ways to construct minimum benchmarks for budget targets. The cyclical sensitivity of the budget is a key question for both setting targets and analysing automatic stabilisers. A rigid interpretation of the Pact would force governments to make a trade-off between size of automatic stabilisers (and indeed operation of fiscal policy generally for stabilisation purposes) and meeting the Pact's requirements. Hence an understanding of the scale of stabilisers and ways of evaluating targets is important when discussing fiscal policy in Europe. The UK Treasury in its discussion document on Fiscal stabilisation and EMU (H.M. Treasury (2003) discuss the evidence on stabilisers, as conclude, as do we that they are likely to be weak, and hence suggest that there is a role for automatic 'discretionary' responses.

We first discuss the reason for pacts. We then evaluate the role of automatic stabilisers in response to demand shocks, as these will be required to do most of the work allocated to fiscal policy within the current framework of pacts. We do this the Commission methodology both for evaluating stabilisers and setting targets. Brunila, Buti and in't Veld (2002) use the Commission's QUEST model to evaluate the scale of the impact on deficits of deviations of output from equilibrium, and look at the impact of such changes in deficits on the level of output by analysing a limited number of shocks to the economy. Our work is a departure from Barrell and Pina, (2003) and Barrell, Hurst and Pina (2003) which use all shocks to the economy and the OECD methods of evaluating stabilisers. We conclude that automatic stabilisers remove around 5 to 11% of the demand shocks that turned up in the in the 1990s. It is not at all clear that they remove supply shocks, and indeed their existence can amplify these shocks, as Blanchard (2000) argues.

We concentrate on the five largest economies in Europe for the sake of clarity. Barrell and Hurst (2003) report related results for 12 European economies, and H.M. Treasury (2003) p 54 reports our estimates of the overall stabilisers for the same 12 European countries.

Fiscal policy

Fiscal policies involve the setting of taxes and expenditures and they are embedded in a political environment that makes decision making over the government deficit difficult. There is a clear connection between the economic cycle and the deficit, in part because taxes and expenditures respond automatically to the cycle, but also because politicians find it difficult not to respond to the state of the economic cycle. To the extent that taxes fall with incomes and spending, and expenditure rises with unemployment, the government budget can be seen as a shock absorber, using automatic stabilisers.

There are always pressures to increase borrowing over the cycle, but this inevitably puts pressure on real interest rates. The real rate of interest in the economy is a price that reflects the balance of saving and investment, and an increase in government borrowing might be expected to put upward pressure on the rate. This in turn might lead to the crowding out of private sector investment and hence the reduction, at least in the long run, of production potential. Higher levels of debt also raise pressure on governments to use inflation as a way of reducing the burden of debt, and this risk may also affect long term prospects for output.

The risks of higher inflation and higher real rates have been important when politicians have considered the design of the Stability Pact in Europe. A government acting alone might still decide to have a Pact with its own citizens, as in the UK. The long term real interest rate that affects private sector investment depends on expected short term real interest rates over the future, and these in turn depend upon expectations of the fiscal stance and government borrowing. A credible pact between the government and its citizens assures them that the risks of it borrowing excessively in future are low, and hence anticipated real interest rates will be lower than they otherwise would have been.

There is a great deal of uncertainty in the economy, and it is very difficult to extract signals about changes in trend output and cyclically adjusted budget deficits from the barrage of data facing economists and politicians. In downturns governments borrow and use fiscal policy to offset slow growth. In upturns the strength of tax revenues is taken to be a sign of a ‘new economy’ and tax rates are cut rather than debt reduced.[1] As a result government debt ratcheted up and the real interest rate facing the private sector rose over the 1970s and 1980s, inducing a noticeable tightening of policy in the 1990s as fiscal pacts began to bite. One way round the problem of government optimism in the upturn is to have clear and independently produced indicators of the fiscal stance and the cyclical position that it does not produce.

[1] Melitz (2002) documents the potential asymmetry in government responses

Random fluctuations in the deficit are probably more common than is often recognised. Receipts or spending may not be 'on plan' and hence the deficit may be at undesired levels. Good housekeeping requires that at some point corrective action is taken if either receipts are too high (or too low) or spending too low (or high). If politicians set themselves targets for debts or deficits they should also be clear that they stand ready to adjust tax rates down (or up) if the deficit turns out better (or worse) than planned without a cyclical or discretionary policy explanation.

Cyclical, Discretionary and Random Components in the Budget

Seemingly random fluctuations in the government budgetary position are common. Tax revenues change for many reasons, and probably the least significant are those associated with the economic cycle. Tax revenues tend to fall with the cycle, whilst expenditure rises with it, and hence when evaluating the budgetary stance it is important to understand the cyclical position. However, it is extremely difficult to assess what the cyclical position of the economy might be, and there are a large number of ways of extracting the information, as Massman, Mitchell and Weale (2003) discuss. Even if we can measure the cycle, it is important to know what has driven a particular cycle before one can asses its implications for the budget position.

There has been considerable debate about the scale of changes in revenues and spending in relation to the cycle, and it is widely thought that a 1% deviation in GDP from its trend might cause a 0.5 percent of GDP change in the budget deficit. This figure is perhaps a little high and it should differ noticeably between countries and will also depend on the causes of the cyclical movement. A slowdown in activity driven by falling export demand is likely to have noticeably less impact on revenues than one driven by weak consumer spending, as the latter is more tax rich than the former. It is clear from this that producing a single gross measure of the sensitivity of the budget to the cycle is a best misleading. Although a single measure is simple and transparent, the trade off with information about the causes of the shift in the budget may be too great.

Discerning discretionary fiscal policy moves is difficult, as it involves the detailed analysis of budgets and their impacts. Changes in tax rates and the definition of tax bases must be seen as discretionary movements in the government position, as must changes in expenditure on goods services and transfers. In general an improvement in the budgetary position made by a conscious discretionary policy might be expected to have a contractionary impact on the economy in the short term, although it might lead to lower long term real interest rates, and these might offset the contractionary impact of the policy. However, it is important not to assume that any non-cyclical movement in the budget represents discretionary policy.

Random variations in tax receipts or in spending may push the budget outturn well away from its predicted level without there being a cyclical explanation or a discretionary policy driving the change. Economic models cannot encompass all of the factors driving the economy, and models explaining tax receipts are bound to be incomplete descriptions. Tax receipts may change even when both the tax base and the tax rate do not move. A change in tax paying behaviour after the introduction of self assessment in the UK in the 1990s could not have been picked up by any model. A shift in the pattern of consumption away from taxed to untaxed goods may not be picked up in our equations for indirect tax receipts unless we have very detailed models. Both of these events will look like random (but explicable) elements in our analysis of taxes. We know such things will happen in the future and we should set our budgetary rules to deal with them. If receipts change permanently in this way, tax rates somewhere have to change in response to keep the government on target.

The Model

The analysis in this paper uses the National Institute Global Model, NiGEM. It is an estimated world 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[2]. 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[3].

Each country has a description of its domestic economy that can be broken up into sectors: the government, the labour market, consumption behaviour, the supply side of the economy and financial markets. We need to ensure that interest rates are set to stabilise the economy. We use a policy of nominal aggregate targeting and inflation rate targeting, or two pillar strategy advocated by the European Central Bank

$$r_t = \gamma_1 (P_t Y_t - P^*_t Y_t^*) + \gamma_2 (\Delta P_t - \Delta P_t^*) \qquad (1)$$

All variables are in logs, PY is (the log of) nominal GDP, P is (the log of) the Consumer Price Index (CPI) inflation rate, and a * denotes a target.

We have 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).

[2] The theoretical structure and the relevant simulation properties of NiGEM are described in, NIESR (2002) and Barrell, Dury, Hurst and Pain (2001)
[3] We use the Extended Path Method to obtain model consistent expectations.

$$BUD = \Delta M + \Delta DEBT \qquad (2)$$

Current fiscal revenues can be disaggregated. Personal taxes (TAX, which includes both personal income tax and social security contributions) depend on personal incomes. Corporate taxes (CTAX) depend on longer term profitability. Miscellaneous taxes (mainly indirect; MTAX) depend on consumer expenditure. Transfers to individuals (TRAN) depend upon prices and on unemployment, and hence these vary with the economic cycle. Government consumption and investment (GC and GI) which are assumed to be on plan except for random fluctuations, and they are not influenced by the cycle. 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. Government interest payments (GIP) 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[4]. The budget balance thus reads:

$$BUD = TAX + MTAX + CTAX - TRAN - GIP - GC*CED - GI*P \qquad (3)$$

We normally assume budget deficits are kept within bounds in the longer term, and taxes rise to do this. We can describe the simple fiscal rule as

$$Tax_t = Tax_{t-1} + \phi\,[GBRT - GBR] \qquad (4)$$

Where Tax is the direct tax rate, GBR is the government surplus target and actual surplus. The feedback parameter ϕ is designed to remove an excess deficit in less than five years. If fiscal solvency is 'off', it is turned back on again after our experiment.

Shocks in NiGEM

Economies are subject to many shocks, and they are the source of uncertainty in the economy. We define a shock as the part of the level or change in an economic variable, such as consumption, that we cannot explain using other economic variables. Take the equation for employment, for instance, where the number of people employed (EE) depends on the level of output (Y), the rate of technical progress (TP) and the real wage (W/P). Suppressing dynamics for simplicity we may write this as

$$Log(EE) = a + b*Log(Y) + c*\,Log\,(W/P) + d*TP + residual \qquad (5)$$

The residual, or shock, is the part of the evolution of employment that cannot be explained by economic factors. As such it is exogenous to the economic process we are considering. We describe it here as the residual on an estimated structural equation for investment, consumption, equity prices or employment, for instance and we

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

discuss the nature of these residuals below. Where we assume rational expectations and the next period's outcome is taken as the expected value in the current period[5].

We can decompose shocks into demand shocks, supply shocks and fiscal shocks as in Barrell and Hurst (2003). Demand shocks are those that affect the level of spending in the economy, and we include consumption, investment, equity prices and exports. Supply shocks are those affecting the labour market, such as employment, self employment, hours and real wage (compensation equation) shocks. Tax shocks are those that directly affect the budget deficit independently of economic events elsewhere and we include transfers to individuals as well as direct, indirect and corporate taxes.

Barrell and Hurst (2003) take the weighted average of these shocks by country to see who has the largest shocks and which countries faced more supply shocks, demand and fiscal shocks. The table below gives these indicators for the five largest European economies using France as a base. They weight together demand shocks using shares in GDP multiplied by the standard deviation of the individual shock over the period 1991q1 to 1999q4. Hence if exports are twice as important in GDP as investment but the shocks have half the standard deviation then export shocks take the same weight as investment shocks. They weight tax shocks by the importance of the item facing shocked in the overall budget adjusted for the standard deviation of the shocks faced by each item. Supply shocks are the standard deviation weighted average of shocks to employment (labour demand) and the wage equation (labour supply).

Table 2 The Relative Importance of Shocks

	demand shock	Tax shocks	Supply shocks
France	1	1	1
Germany	1.26	1.38	2.17
Italy	1.28	1.2	2.37
Spain	1.26	1.13	1.91
UK	0.93	2.45	1.39

Source, Barrell and Hurst (2003) and NiGEM model residuals

Evaluating Automatic Stabilisers

If fiscal pacts operate and prevent discretionary policy then governments are left with fiscal stabilisers to help them in mild upturns and downturns. Buti, Brunila and in't Veld (2002) use the Commission model QUEST to quantify automatic stabilisers, and we can evaluate the properties of our model to do the same. In general automatic

[5] This is the 'industry standard' and is discussed at length in Barrell, Dury and Hurst (2003). Expectations in these equations could come from a variety of sources. We could use a learning rule, or we could assume that risk premia vary from tome period to time period to remove the unexplained component in our equation. We do not regard either as satisfactory, and we use the residuals from our estimated equations under the assumption of rational expectations.

stabilisers increase with the size of the government sector and the share of cyclically sensitive components of taxation and spending, and hence we would expect them to vary across countries. Country specific factors such as the degree of openness and the flexibility of the labour market will affect the size of stabilisers, and in general more open economies will have lower multipliers and hence stabilisers.

Blanchard (2000) and Barrell and Hurst (2003) suggest that offsetting fiscal automatic stabilisers in the face of supply shocks could stabilise the volatility of output, and hence we only analyse the effectiveness of stabilisers in response to shocks to demand. In order to do this we evaluate the impact of demand changes on the economy and on tax revenues, and then look at the effects of tax changes on output. We may write this as (where tax is direct taxes, itax is indirect taxes, ctax is corporation, tran is transfers, C is consumption, I is investment, X is exports and Y is GDP):

$$Dy/DS = dy/dtax * dtax/dS + dy/ditax * ditax/dS + dy/dctax * dctax/S$$
$$+ dy/dtran * dtran/dS \qquad (6)$$
$$+ dy/dC * dC/dS + dy/dI * dI/dS + dy/dX * dX/dS$$

The left hand side of this expression is the shock multiplier, which we evaluate for consumption, investment and exports, The last three terms represent the shock multipliers if there were no automatic stabilisers. If we have a consumption shock then dI/dS and dX/dS are set to zero by definition, and similarly for investment and export shocks. In order to evaluate the degree of automatic stabilisation we need to evaluate the first four terms of the right hand side of this expression. This requires that we calculate the impact of each shock on tax revenues and on transfer spending, and that we calibrate the effect of an unanticipated change in tax revenues on output.

Evaluating shock multipliers

We first look a the impact of 1% of GDP changes in consumption, investment and export volumes sustained for 1 year, when they return to baseline for one quarter and subsequently the dynamics of the model are allowed to work. We assume that there is no interest rate response in this year, but after the year the monetary authorities respond. The fiscal authorities are assumed to leave tax rates unchanged for the year and then adjust direct taxes to achieve their budget target. The model is run with forward looking financial markets, and exchange rates and long rates jump in the first period.[6] These multipliers are generally below those for discretionary changes in government spending on goods and services, but these multipliers are also likely to be

[6] Multipliers are always less than one in these models, and are generally less than those given in unstructured VAR analyses such as that of Blanchard and Perotti (2002).

below 1.0. Barrell et al (2003) discuss standard fiscal simulations on NiGEM and suggest reasons why Germany has the largest multipliers on this table.

Table 1: Multiplier Effects of a 1% of GDP impulse for one year

	Consumption	Investment	Exports	Average
France	0.697	0.615	0.667	0.682
Germany	0.885	0.765	0.89	0.886
Italy	0.599	0.529	0.582	0.586
UK	0.635	0.6	0.642	0.639
Spain	0.796	0.732	0.852	0.825
Euro Area	0.723	0.647	0.725	0.724

UK in EMU. Interest rates fixed for the first year, No fiscal feedbacks for the first year' The ECB uses a two pillar strategy, The exchange rate and the long rate are forward looking

Budget impacts of shocks

The impact of the shocks on the public finances will depend upon the importance of the three types of tax we model (direct, indirect and corporate) as well as the significance of transfers in the economy. We would expect shocks to consumption to have a much more significant impact on the budget as consumers expenditure is a significant part of the indirect tax base. However, the significance of indirect taxes varies between countries, and hence the impacts of the consumption shock also varies. Investment and export shocks are likely to be less tax rich.

The impact of the shock on the economy also affects the Government budget. If the output effect of the shock is small then the impact on income and corporate tax revenues will be smaller, as will the impact on transfer payments. In addition the generosity of transfer payments differs significantly between countries, and is probably least important in Italy for instance. Hence small open economies with low multipliers will have lesser effects on the budget, and large countries with generous social security systems will have large effects. We can see that the impacts of consumption shocks on the budget is markedly higher than investment or export shocks, and in general export shocks have slightly more budgetary impacts than do investment shocks

Table 2: Effects on Budget as a % of GDP of a 1% of GDP impulse for one year

	Consumption	Investment	Exports	Average
France	0.46	0.14	0.15	0.31
Germany	0.58	0.27	0.31	0.45
Italy	0.47	0.18	0.20	0.28
UK	0.36	0.18	0.20	0.27
Spain	0.59	0.24	0.28	0.42
Euro Area	0.51	0.19	0.22	0.34

UK in EMU. Interest rates fixed for the first year, No fiscal feedbacks for the first year' The ECB uses a two pillar strategy, The exchange rate and the long rate are forward looking

Table 3 records the rescaled impact of the shocks, so that we can seethe tax richness of each shock when GDP changes by 1% as a result.

Table 3: Effects on Budget as a % of GDP when GDP changes by 1% as a result of shocks

	Consumption	Investment	Exports	Average
France	0.67	0.23	0.22	0.45
Germany	0.66	0.35	0.35	0.51
Italy	0.79	0.35	0.34	0.48
UK	0.57	0.30	0.30	0.42
Spain	0.74	0.33	0.32	0.52
Euro Area	0.73	0.29	0.29	0.46

UK in EMU. Interest rates fixed for the first year, No fiscal feedbacks for the first year' The ECB uses a two pillar strategy, The exchange rate and the long rate are forward looking

Scaling the impact of tax multipliers

Tax multipliers are generally small, as we see from Table 4. We have assumed that the change in tax revenue is unanticipated because we wish to assess the ex-post impact of lower tax receipts rather than the multiplier impact of an announcement of temporarily lower tax rates[7]. A cut in the corporate or indirect tax rate now, with the announcement that the cut will be reversed in a year will lower the real interest rate facing consumers and firms that do not face liquidity constraints. This reduction will bring investment and consumption forward into this year and hence increase the impact of the change on GDP. A fiscal change of this nature is effective in stabilising the economy. However, these assumptions are not appropriate for analysing automatic stabilisers.

Table 4 Tax Multipliers: The GDP impact of a 1% of GDP increase in taxes

	Corporate	Indirect	Income
France	-0.02	-0.35	-0.17
Germany	-0.03	-0.20	-0.23
Italy	-0.01	-0.10	-0.20
UK	-0.02	-0.27	-0.20
Spain	-0.04	-0.13	-0.23

UK in EMU. Interest rates fixed for the first year, No fiscal feedbacks for the first year' The ECB uses a two pillar strategy, The exchange rate and the long rate are forward looking. Tax changes are unanticipated, and do not bring consumption or investment forward.

We should note that the impacts of a change in corporate taxation are limited in the first year, although they do feed into the user cost of capital. A change in user cost feeds only slowly into the investment decision, and hence the impact on output is not great. Cyclically induced changes in corporate tax payments will take some time to

[7] Brunila, Buti and in't Veld (2002) assume that the tax changes are anticipated.

influence firms, even when they are liquidity constrained. Direct taxes immediately reduce incomes, and hence output declines through the impact on consumption. The impact depends on the importance of direct taxes as a percent of personal incomes, and on the speed of response of consumption to changes in income, and hence we have impact multipliers that vary between 0.17 and 0.23.

Automatic Stabilisers

Automatic stabilisers in response to a shock are the proportion of the change in GDP that is removed by the existence of the tax system. Using equation 6 above the stabilising effect of taxes for a given shock can be described as

$$AS = dy/dtax * dtax/dS + dy/ditax * ditax/dS + dy/dctax * dctax/S + dy/dtran * dtran/dS \quad (7)$$

The proportion of the shock (PS) removed can be described as

$$PS = AS/(dy/dS + AS) \quad (8)$$

Tables 1, 3 and 4 above contain the parameters we need for equations 7 and 8. The smoothing properties of the stabilisers for each shock are reported in Table 5 below.

Table 5 The Smoothing Properties of Stabilisers
Smoothing by shock – the proportionate reduction of
The impact of a shock on GDP

	Consumption	Investment	Exports
France	-0.183	-0.029	-0.028
Germany	-0.131	-0.070	-0.070
Italy	-0.092	-0.047	-0.047
UK	-0.110	-0.040	-0.040
Spain	-0.115	-0.060	-0.059
Euro Area	-0.165	-0.078	-0.077

UK in EMU. Interest rates fixed for the first year, No fiscal feedbacks for the first year' The ECB uses a two pillar strategy, The exchange rate and the long rate are forward looking. Tax changes are unanticipated, and do not bring consumption or investment forward.

As we would expect, automatic stabilisers are most effective in response to consumption shocks where they take out between 10 and 20 percent of the shocks. Our estimates are below those of the Commission, in part because of the treatment of corporate and indirect taxes in their study, and also because we assume that cyclical variations in non-transfer spending are discretionary and not automatic. Their estimates are highest at 38% for France and lowest at 14% for Ireland.

Assessing the overall smoothing power of automatic stabilisers requires that we take a view on the importance of shocks and their probability. We apply GDP shares

weighted by the relative volatility of the residuals reported in the Appendix to produce a weighted average smoothing capacity, and we include it in the final column of Table 6 below. The individual columns are the contribution to this total from each of the shocks. Both consumption and exports are more important in GDP than is investment, and the ability to smooth shocks here matters. It appears that automatic stabilisers have smoothed between 5 and 11 percent of the shocks that arrived between 1991 and 1999, and they have been most effective in Germany and France.

Table 6: Contribution to Overall Average using GDP weighted standard deviations of shocks

	Consumption	Investment	Exports	Overall Stabilising Effect
France	-0.094	0.000	-0.014	-0.108
Germany	-0.068	-0.001	-0.033	-0.102
Italy	-0.028	0.000	-0.032	-0.061
UK	-0.050	0.000	-0.022	-0.072
Spain	-0.054	0.000	-0.031	-0.085
Euro Area	-0.059	-0.001	-0.028	-0.088

UK in EMU. Interest rates fixed for the first year, No fiscal feedbacks for the first year' The ECB uses a two pillar strategy, The exchange rate and the long rate are forward looking. Tax changes are unanticipated, and do not bring consumption or investment forward.

Conclusion

We have used our model, NiGEM to evaluate automatic stabilisers in Europe. We conclude that stabilisers are relatively weak, removing 6 to 11 per cent of the potential variation in output. We do not assume that the change in tax revenues is anticipated and affects forward looking behaviour, and we do not assume that non-transfers expenditures vary automatically with the cycle. Other studies, such as Brunila, Buti and in't Veld (2002) do make these assumptions, and they noticeably increase the size and variability of their estimates of the stabilising role of automatic responses.

We show that the impact of the cycle on the budget induced by shocks to demand is between 0.4 and 0.5, lower than the commonly quoted 0.5[8]. Cyclical variations in Europe are relatively damped, and output gaps as large as 5 per cent of GDP are hardly ever observed, as Massman, Mitchell and Weale (2003) show. This allows us to conclude that we would be almost certain to avoid deficits of more than 3 per cent of GDP if we allow budget deficit targets in excess of one per cent of GDP in Europe. Our results are consistent with those in Barrell and Hurst (2003).

Scope for discretionary policy must remain in the face of large demand shocks, and there is a case for building automatic tax rate responses to increases in the output gap,

[8] The percent of GDP change in the deficit for a one per cent change in the output gap.

as suggested in H.M. Treasury (2003). There are a number of automatic responses that could be triggered by stabilising fiscal rules. Announced and temporary changes in indirect taxes change the real rate of interest facing consumers, and this will induce those who are not liquidity constrained to pull their consumption forward. However, it is difficult to be sure about the size of the output gap, and any estimate must attach an indicator of its reliability. Both discretionary policy and automatic responses can be counter productive in the face of supply shocks.

Appendix Standard deviations of structural shocks in Europe, 1991q1 to 1999q4

	France	Germany	Italy	Spain	UK
Consumption	0.00926	0.01349	0.00672	0.01059	0.00766
Compensation	0.00392	0.00914	0.01108	0.00693	0.00603
Corporate Tax	0.10852	0.05335	0.02064	0.03462	0.14810
Employment	0.00032	0.00134	0.00344	0.00151	0.00112
Employees	0.00255	0.00472	0.00379	0.00612	0.00292
Equity Prices	0.05183	0.05949	0.07272	0.06522	0.04526
Hours	0.00169	0.00563	0.00132	0.00146	0.00362
Investment	0.00017	0.00112	0.00071	0.00049	0.00045
Indirect taxes	0.01509	0.02198	0.02160	0.02230	0.03788
Direct Taxes	0.00642	0.00965	0.00700	0.00758	0.01651
Transfers	0.00462	0.01516	0.01709	0.01194	0.00910
Exports of goods	0.01542	0.01983	0.02985	0.03179	0.01944
Exports of Services	0.03796	0.04740	0.05206	0.02977	0.02648

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