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ABSTRACT

The focus of this paper is the empirical address of some questions linked with the launch of the European Monetary Union (EMU) and its macroeconomic stability implications for three members (France, Germany and Italy)and one possible future member (United Kingdom). First, it is assessed the degree of symmetry of the shocks that characterized the above European economies in the recent past. Second, for the above mentioned countries, there are measured the likely macroeconomic stability effects, implied by the shift from monetary and exchange rate national policies prior to EMU to the common monetary policy conducted by ECB. Third, for France, Germany, Italy and UK it is assessed the potential stabilization role of the fiscal national policies. Finally, there are measured the effects of the Stability and Growth Pact (SGP) criteria on the fiscal national policy stabilization role.

The investigation is conducted via stochastic simulations using Taylor G7 multi country rational expectations structural model, re-estimated for the period 1980-1996 and including Switzerland instead of Canada. There are compared the macroeconomic stability outcomes under two exchange rate regimes : one is the EMU regime and the other is a hypothetical purely flexible one.

The national fiscal stabilization policy is evidenced to be a useful tool under the EMU for the achievement of similar levels of stability (as compared with the flexible regime), with Germany and United Kingdom being exceptions for opposite reasons. Germany may benefit in consumer prices stability by being an EMU member whereas United Kingdom may loose as far as the GDP deflator stability is concerned.

RESUME

Le lancement de l'Union Monétaire Européenne (UEM) en janvier 1999 et l'adoption de la règle de stabilité des prix comme premier objectif de la Banque Centrale Européenne (BCE) impliquent que les pays membres ne peuvent plus utiliser les politiques monétaires ou de taux de changes pour atténuer leurs différences conjoncturelles ou comme moyen d'ajustement vis-à-vis de chocs asymétriques (c'est-à-dire qui affectent les pays membres avec une intensité différente).

En présence de chocs asymétriques ou dans le cas de conjonctures différentes entre les pays membres, la politique monétaire de la BCE pourrait ne pas permettre d'atteindre un degré de stabilisation macroéconomique équivalent à celui de la période qui a précédé l'UEM. Les politiques fiscales nationales de stabilisation de court terme et les réformes structurelles sont considérées comme des outils possibles pour apporter des réponses à ce problème.

L'objectif de cette étude est de réaliser une investigation empirique des questions liées au lancement de l'UEM et de ses implications concernant la stabilité macroéconomique. On considère trois pays membres de l'UEM, l'Allemagne, la France et l'Italie, ainsi qu'un pays non membre, le Royaume Uni. Dans un premier temps, on évalue le degré de symétrie des chocs en Europe pour une période récente. Ensuite, on envisage les conséquences en termes de stabilité macroéconomique du passage d'un régime de taux de change purement flexible au régime de l'Union Monétaire pour les pays mentionnés. Ensuite, on envisage le rôle potentiellement stabilisateur de la politique fiscale au niveau national pour l'Allemagne, la France, l'Italie et le Royaume Uni. Enfin, on mesure les effets du respect des critères des déficits prescrits dans le Pacte de Stabilité et de la Croissance (PSC) dans le cadre de la politique fiscale stabilisatrice.

Ces évaluations sont réalisées au moyen de simulations stochastiques du modèle multinational à anticipations rationnelles des pays du G7 proposé par Taylor. Ce modèle est ré-estimé pour la période 1980-1996 et inclut la Suisse au lieu du Canada. La comparaison en terme de stabilité macroéconomique a été réalisée pour deux régimes de taux de change en Europe : l'UEM et un régime hypothétique de changes purement flexibles.

Les résultats d'estimation montrent que les chocs structurels en Europe sont aussi bien fortement symétriques qu'asymétriques pour la période 1980-1996. Le passage d'un régime purement flexible au régime de l'UEM pour les pays membres implique plus de stabilité pour le produit et les composantes du PIB pour l'Italie, la France et le Royaume Uni s'il devenait membre de l'UEM, mais des effets de stabilisation mitigés pour l'Allemagne. De plus, le régime de l'UEM est de façon générale plus instable en ce qui concerne les prix à la consommation et les salaires.

On montre également que les politiques fiscales nationales sous le régime de l'UEM constituent un outil efficace pour atteindre des niveaux de stabilisation équivalents à ceux obtenus en régime de changes flexibles, sauf dans le cas de l'Allemagne et du Royaume Uni. L'Allemagne peut disposer de prix à la consommation plus stables sous le régime de l'UEM alors que le Royaume Uni serait perdant en termes de stabilité des prix à la production s'il devenait membre de l'UEM.

Pour des déficits budgétaires structurels représentant moins de 1.5% de PIB, on conclut que le respect du critère de déficits publics du Pacte de Stabilité n'est pas très coûteux en termes de pouvoir stabilisateur de la politique fiscale du pays en question. A l'inverse, pour des déficits structurels proches de 3% du PIB, le pouvoir stabilisateur de la politique fiscale se trouve considérablement réduit.

JEL Classification : E63, C15, C51
Mots clés : EMU, PSC, politique fiscale, simulations stochastiques

SUMMARY

The launch of European Monetary Union (EMU) in January 1999 and the adoption of price stability in the Euro area as the European Central Bank's (ECB) primary objective imply that individual member countries can no longer have at their disposal either monetary policy or exchange rate policy, in order to cushion differences in cyclical positions among them and/or to adjust to asymmetric shocks (i.e. shocks that affect Euro area countries with different intensities).

In the presence of asymmetric shocks and/or different cyclical positions among the EMU member countries, the common policy responses of ECB might not be enough to achieve similar degree of effective stabilization with the period prior to EMU. The fiscal stabilization policy conducted at national level and the structural reforms for EMU members, are thought to represent possible answers to this problem.

The focus of this paper is the empirical address of some questions linked with the launch of EMU and its macroeconomic stability implications for three monetary union members (France, Germany and Italy) and one possible future member (United Kingdom).

First, it is assessed the degree of symmetry of the shocks that characterized the above European economies in the recent past. Second, for the above mentioned countries, there are measured the likely macroeconomic stability effects, implied by the shift from monetary and exchange rate national policies prior to EMU to the common monetary policy conducted by ECB. Third, for France, Germany, Italy and UK it is assessed the potential stabilization role of the fiscal national policies. Finally, there are measured the effects of the Stability and Growth Pact (SGP) criteria on the fiscal national policy stabilization role.

The investigation is conducted via stochastic simulations using Taylor G7 multi country rational expectations structural model, re-estimated for the period 1980-1996 and including Switzerland instead of Canada. There are compared the macroeconomic stability outcomes under two exchange rate regimes : one is the EMU regime and the other is a hypothetical purely flexible one.

The simulations show that the degree of symmetry describing the estimated structural shocks ranges from highly symmetric to asymmetric for the period 1980-1996.

The stability comparisons between the flexible regime and the EMU regime show that the later is likely to imply stability benefits of output and its components for Italy, France and UK, but mixed stability effects for GDP components in Germany. However, EMU implies also that the consumer prices and wages are likely to be less stable under this regime.

The national fiscal stabilization policy is evidenced to be a useful tool under the EMU for the achievement of similar levels of stability (as compared with the flexible regime), with Germany and United Kingdom being exceptions for opposite reasons. Germany may benefit in consumer prices stability by being an EMU member whereas United Kingdom may loose as far as the GDP deflator stability is concerned.

The evidence suggests that the Stability and Growth Pact restrictions under the conditions of budget deficits in the range from 0 to less than 1.5% of GDP are not likely to make any significant harm to the stabilization powers of the fiscal policy, but with deficits at 3% of GDP the price stabilization power of fiscal policy under EMU decreases significantly.

JEL Classification: E63, C15, C51

Key words: EMU, SGP, fiscal policy, stochastic simulations

The Fiscal Stabilization Policy under EMU – An Empirical Assessment

Arjan Kadareja[1 *]

INTRODUCTION

The launch of European Monetary Union (EMU) in January 1999 and the adoption of price stability in the Euro area as the European Central Bank's (ECB) primary objective imply that individual member countries can no longer have at their disposal either monetary policy or exchange rate policy, in order to cushion differences in cyclical positions among them and/or to adjust to asymmetric shocks (i.e. shocks that affect Euro area countries with different intensities).

In the presence of asymmetric shocks and/or different cyclical positions among the EMU member countries, the common policy responses of ECB might not be enough to achieve similar degree of effective stabilisation with the period prior to EMU[2]. The fiscal stabilisation policy conducted at national level and the structural reforms for EMU members, are thought to represent possible answers to this problem.

The past experience with the fiscal policies in Europe reveals, however, that its discretionary use could well put in danger the achievement of the primary objective of ECB's monetary policy . So, in order to reinforce the fiscal discipline, the Stability and Growth Pact introduced the criteria that the general government budget deficit and gross debt should not exceed 3% and 60% of GDP, respectively.

The focus of this paper is the empirical address of some questions linked with the launch of EMU and its macroeconomic stability implications. The questions are as follows;

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[1] Special thanks go to A. Bénassy-Quéré, S. Dées, U. Camen, H. Genberg , J. P. Laffargue, Florence Legros, A. Kabili and C. Wyplosz who helped me enormously with their suggestions, remarks and comments. I am also very grateful to J. B. Taylor who sent me all his computer programs. All the remaining errors are mine.

[*] CEPII.

[2]This is likely to be the case as long as Euro zone does not represent yet an optimum currency area in the Mundell's sense, due to low degree of factors mobility among EMU members states, especially labor's (see Mundell (1961) on the theory of optimum currency areas).

1- What is the degree of symmetry (or asymmetry) of the shocks that characterised the European economies in the recent past?

2- What are the likely macroeconomic stability effects for EMU members, implied by the shift from monetary and exchange rate national policies prior to EMU to the common monetary policy conducted by ECB?

3- Using the fiscal stabilisation policies at national level, can EMU members achieve similar levels of macroeconomic stability as compared with the period prior to monetary union?

4- The reinforcement of the fiscal discipline as implied by the Stability and Growth Pact (SGP), is it likely to limit the national fiscal policies in their stabilisation role?

The investigation is conducted via stochastic simulations using Taylor G7 multi country rational expectations structural model[3], re-estimated for the period 1980-1996[4] and including Switzerland instead of Canada. The paper is divided into seven sections. The first one analyses the degree of symmetry displayed by the estimated shocks for European countries for the period 1980-1996. The second section describes the simulation of two exchange rate regimes. The third one reports and explains the results of the simulations when only monetary policy is used for stabilisation purposes. The fourth section presents the main results when both monetary and fiscal policies are used for stabilisation and the fifth one measures the likely restrictive effects of the SGP on the fiscal policies in the EMU area. In the sixth section are discussed the caveats and the final section concludes. The appendices A1, A2 and A3 show respectively the Taylor model re-estimated parameters for the period 1980-1996, the technique used for the estimation of the shocks and stochastic simulations, and the sensivity analysis of the main results.

I SYMMETRIC AND LESS SYMMETRIC SHOCKS IN EUROPE

The estimation and analysis of the variance covariance matrix of the model structural shocks, for the period 1980-1996, is shown in Kadareja (2000). The technique used is based on the Fair & Taylor extended path algorithm (see the appendix A2 for more on this).

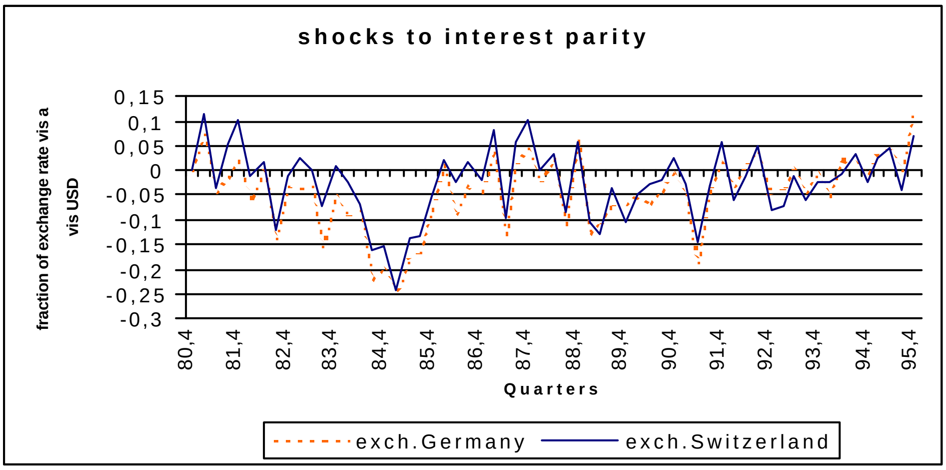
For an illustration of the estimated shocks in graph 1 are represented the shocks to interest parities vis a vis the US dollar for Germany and Switzerland. The origin of these shocks is not known for sure but an assumption that these shocks mostly reflect risk premia is usually made. Under this assumption, from the graph can be seen that for both German Mark and Swiss Franc the negative premia against the dollar dominate for most of the time. There is also clear evidence that the premium shocks vis a vis US dollar for German Mark and Swiss Franc have always the same sign and almost always the same magnitude. Since both currencies are hit by almost the same shocks it seems evident that the German Mark has been considered by the investors as a reference currency for the Swiss Franc. In fact, as we will see later the correlation coefficient between these two shock series is quite high, 0.91. This is as high as the correlation coefficient between interest parity shocks vis a vis US$ of

[3] When the objective of the study is the economic policy analysis, like here, the structural rational expectations approach is to be preferred over the VAR approach (see Canova (1995) for a good comparison).

[4] See Kadareja (2000) for the estimation methods, technique and results.

French Franc and German Mark. This is interesting considering that France and Germany have always been in the Exchange Rate Mechanism of EMS, whereas CH has never been a member of EMS.

Graph 1



The graph 1, under the assumption that the interest parity shocks mostly reflect exchange rate risk premia, helps to shed some light on the change through time in the rankings as "safe heaven" of US Dollar, German Mark and Swiss Franc. So, most of the time the German Mark and Swiss Franc are ranked higher than US Dollar, but in case when US$ is ranked first is the German Mark which is ranked second (the ERM abandoning of UK and Italy in 1992 is an exception). The large premium shock against US$ in early 1985 preceding the Plaza agreement in September 1985, corresponds to the shift in investors confidence away from US$ denominated assets due to the burst of the speculative bubble present at the end of 1984 and which had caused an appreciation of the US$ in clear contradiction with the economic fundamentals[5]. In that case and for about two years after the second quarter of 1992 (when Italy and UK left the ERM) the graph 6 provides evidence that the Swiss Franc is considered safer than the German Mark. So, this gives some support to the claim of the extra reaction of Swiss Franc in the periods of financial turbulence.

In what follows, is done an attempt to classify some of the model estimated structural shocks for the European countries according to their degree of symmetry. To the extent that the characteristics of the recent past shocks can serve as a guide to assess their behaviour in the near future, the symmetry information on them is likely to be important for the monetary policy design by the European Central Bank and for the fiscal stabilisation policies at national levels. The symmetric shocks are more of concern for the ECB monetary policy whereas the reaction to country specific shocks is one of the objectives of fiscal policies under EMU.

[5] See IMF's World Economic Outlook, May 1998.

The systematic classification of the shocks is done using the estimated correlation matrix corresponding to European countries and variables. The focus is on the intra European countries correlations for the same type of shocks (i.e. for the shocks to the same variable). All shock correlations are calculated vis à vis their German counterparts, and this is done because the German economy is the largest in Europe and the German Mark has played the anchor role in the Exchange Rate Mechanism[6].Note, that the centre role for Germany is suggested also by the table 2.1 (appendix A1) where the German shocks variances are the smallest as compared with their EU countries counterparts[7]. Based on the sign and the size of the correlations we classify them into *highly symmetric* shocks indicated by high and positive correlations (above 0.5), *symmetric* shocks indicated by medium size positive correlations (in the interval (0.2:0.5)), *not symmetric* shocks indicated by around zero correlations (in the interval (-0.2:0.2)) and *asymmetric* shocks indicated by negative correlations (in the interval (-0.2:-0.5)). For the European countries in the model and the shocks chosen to focus on, there is no evidence of highly asymmetric shocks since high negative correlations are absent. The graphs 2 to 6 , based on the whole correlation matrix (see Kadareja(2000)), show the correlations between the same type of shocks across Europe with their counterparts corresponding to Germany. The graph 2 shows the correlations corresponding to the financial shocks. So, the shocks to interest parities vis à vis US$ (horizontal axis) were highly symmetric for all EU member countries and for Switzerland, note also from table 2.1 (Appendix A1) that the size of these shocks for European countries is quite similar and very important .

The term structure shocks correlations shown, in the graph 2 (vertical axis), are high and positive, though less than in the case of interest parity shocks and in addition can be detected two groups of countries concerning the degree of symmetry. So, the shocks for Switzerland and France are highly symmetric whereas for Italy and UK the symmetry is of medium size.

Among the aggregate demand shocks, the consumption and investment shocks, as shown in graph 3, are not symmetric for France and Switzerland. For Italy and UK, the investment shocks are not symmetric whereas the consumption shocks are asymmetric. On the other hand, as shown in graph 4, there is symmetry for the exports shocks in France, Italy and UK and for the imports in France and Italy, but there is no symmetry concerning the export and import shocks in Switzerland and indeed asymmetry concerning the import shocks in UK. In the group of supply shocks, there is symmetry for the wage shocks in France, Italy and Switzerland, but not in UK. Concerning the GDP price shocks there is asymmetry in UK, and no symmetry in France, Italy and Switzerland, as graph 5 shows. It must be mentioned that from table 2.1, the wage contract shocks as far as the size is concerned, are the most important in the group of supply shocks. Finally, as graph 6 shows, there is symmetry for import prices shocks in France and Italy but no symmetry in Switzerland and UK, whereas

[6] So, the terms symmetric or less symmetric shocks used later in this section, imply symmetric or less symmetric with respect to German shocks.

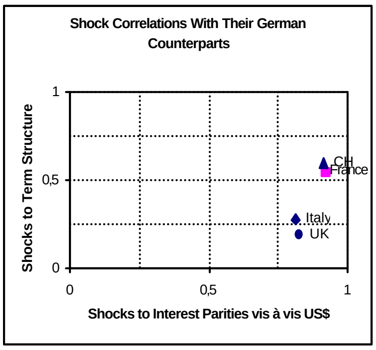
[7] This is true also for the GDP deflator equations shocks, because these shocks are estimated according to an ar (1) scheme for Italy, France and UK but not so for Germany. In table 2.1 is reported the standard deviation of the uncorrelated part of these shocks, and so according to the estimated auto correlation coefficients (see the table 1.3 in the appendix) the size of the shocks shown in table 2.1 for Italy, France and UK should be multiplied respectively by 1.93,
1.83 and 1.54, in order to be compared with the German shocks size.

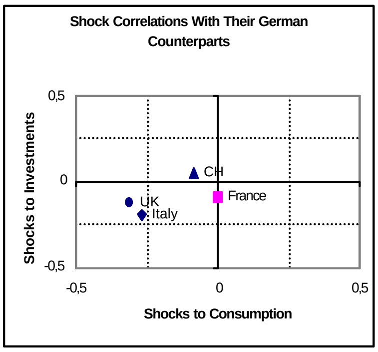
there is symmetry for the export prices shocks in UK and

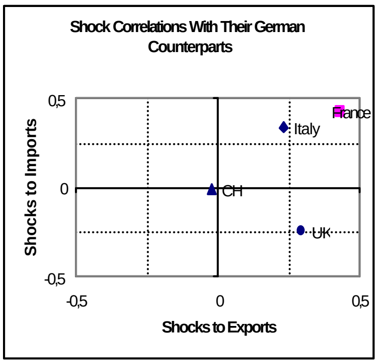
France, but not in Switzerland and Italy.

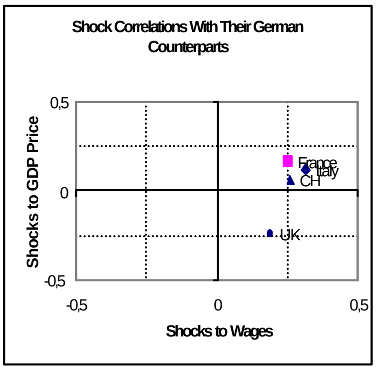
The evidence concerning the same shocks to Italy, France, Germany and UK, for the period 1970-1986, can be found in Taylor (1993a). The correlation matrix for that period shows in general a lower degree of symmetry for European financial shocks, but quite similar symmetry for the other shocks. So, the stochastic structure does not seem to change very much through time and across exchange rate regimes.

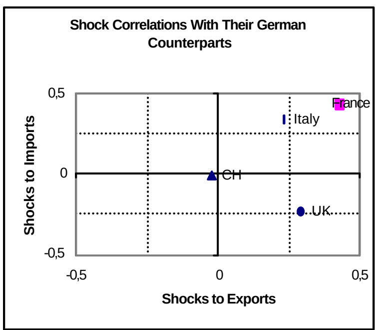
Graphs 2-6











Another evidence for the period 1962-1988 based on the correlation coefficients calculated once the output shocks are decomposed into demand and supply shocks is given by Bayoumi and Eichengreen(1993). Although the correlations calculated by these authors correspond to a broad category of shocks it is interesting to see that the ordering of the countries as far as the shock symmetry vis à vis Germany is concerned is the same as here, i.e. more symmetric shocks for France and Italy and less so for UK.

II STOCHASTIC SIMULATIONS OF TWO EXCHANGE RATE REGIMES

One of the objectives of this paper is the comparison of the monetary and fiscal policy stability performance under two different macroeconomic policy systems. One is the flexible regime where all currencies can freely float vis à vis each other and the monetary and fiscal policy for each country is in the hands of the corresponding national authorities, the other one is the regime with EMU, where Italy, France, Germany and UK have permanently fixed the exchange rate vis à vis each other but their currencies can freely float (jointly) vis à vis the currencies of the other countries. Under the second regime the monetary policy for Italy, France, Germany and UK is in the hands of European Central Bank, whereas the fiscal policy is in the hands of corresponding countries authorities. For the remained countries with regards to the exchange rate, monetary and fiscal policy, there are no changes vis à vis the flexible regime. The choice of these two particular regime scenarios is done because in the near future the second scenario will prevail (after UK joining the EMU) and the natural alternative to that is the first scenario.

First, it is going to be assumed that under both regimes the short term interest rates will be the appropriate instrument of the monetary policy in the hands of each central bank. Taylor (1993a), argues in favour of this by considering the experience of the late 80-s for USA and other developed economies, whereas for Switzerland, evidence that short-term interest rate describes well the monetary policy stance of Swiss National Bank is given by Lambelet (1993).

For the flexible exchange rate regime, it is going to be assumed that each central bank adjusts its short term interest rate target mostly in response to changes in the price level, but also to changes in output. We call this rule of monetary policy the Taylor price rule. For country ‘i ’ algebraically the interest rate for this rule is of the form,

The notation in equation (13) is conform the notation used in the model shown in the appendix A1 and α_1, β_1, RS, LP, LP^B, RS^B , LY, LY^B represent respectively, the reaction coefficient to the GDP deflator fluctuations from the baseline, the reaction coefficient to the GDP fluctuations, the short term interest rate, the log of the GDP deflator, the log of the GDP deflator baseline, the interest rate baseline, the log of the GDP and the log of the GDP baseline. Note that the first term under the square brackets on the right hand side of (13) is the expected annual inflation rate deviation from the baseline. Note, also, that the equation (13) may call for an impossible negative nominal interest rate, if that is the case then the nominal interest rate is fixed to 0.2%. The equation (13) replaces the money demand equation (i.e. the equation (12)) in the basic model shown in appendix A1.

As will be shown later, here are considered the interest rate rules with α_1=2.0 and β_1=0.3. So, what the rule (13) says is that for every 1 percentage point quarterly rise in GDP price above the baseline the real short term interest rate should increase by 2% points, assuming the output on the baseline, whereas assuming the GDP price on the baseline for every 1 percentage point fall of GDP below the baseline the real short term rate should decrease by 30 basis points.

Taylor rules have received considerable attention as a basis for assessing what policies the ECB might follow. So, R. Clarida, J. Gali, and M. Gertler (1997) and (1998); and G. Peersman and F. Smets (1998); show that the Bundesbank monetary policy behaviour since the mid 70s can be described by a Taylor interest rate rule. The estimated characteristics of such a rule imply that for every 1 percentage point rise in expected inflation one year ahead the Bundesbank has pushed up the nominal short term rate such that to imply a real rate increase by about 30 to 60 basis points, holding the output gap constant, and that it has reduced the nominal (and real) short term interest rate by about 25 to 50 basis points for every 1% point fall in GDP below the potential, holding expected inflation constant.

Here have been used similar inflation-regarding real interest rate price rules reacting to actual GDP price deviations, instead of the expected inflation one year ahead. So, to actual GDP price deviations annualized is reacted by changing the real (expected) interest rates by 50 basis points and to GDP gap changes by 30 basis points.

For all the countries under the flexible exchange rate regime and for the non-members of EMU under the regime with EMU, the simulations will be conducted by replacing the inverted money demand equations with equations (13). Hence, the money supply becomes endogenous and it enters the model only via interest rate effects as expressed by equations (13).

Under the regime with EMU, for EMU members there will be a single short term interest rate, so instead of the equations (13) there will be only one equation representing the interest rate policy in the hands of European Central Bank (ECB). It is as if the central banks of EMU members change their old policy rules and follow the same new rule via the ECB. This rule, will also be a price rule of the form,

$$RS_e - RS_e^B = [LP_e(+4) - LP_e - LP_e^B(+4) + LP_e^B] + a_1[LP_e - LP_e^B] + b_1[LY_e - LY_e^B] \text{ if } RS_e > .002$$

$$\text{otherwise } RS_e = .002 \tag{14}$$

In equation (14) the variables with subscript ‘e’ correspond to EMU and have the same meaning as their counterparts in equation (13). In order to calculate the ‘European’ average variables the following GDP based weights were used:

Germany = 0.38, France = 0.24, UK = 0.19, Italy = 0.19.

Since the rule (14) means that the short term interest rate deviations from the US rate will be identical for the EMU member countries then by virtue of the interest parity relations (written vis à vis US$) the expected change in the exchange rate vis à vis US$ of their respective currencies will be equal (in fact as explained below, the EMU implies more than this).

The fiscal stabilisation policy rule is assumed to be characterised by the same form and parameters for both regimes and has the following form for the country 'i ',

where G_i, G_i^B, λ and κ are respectively the government expenditure in the current period, the

$$G_i - G_i^B = \lambda * [LP_i - LP_i^B] * Y_i + \kappa * [LY_i - LY_i^B] * Y_i \text{ ; if } (G_i - G_i^B) < \omega * Y_i$$

$$\text{otherwise} \quad G_i = G_i^B + \omega * Y_i \qquad (15)$$

baseline government expenditure, the response parameter to GDP deflator fluctuations (negative) and the GDP fluctuations response parameter (negative), the other variables are explained in the monetary rules equations. As can be seen the formulation (15) describes a fiscal stabilisation rule which counteracts to the GDP and price percentage deviations from the baseline. For EMU members the terms on the right hand side of (15) can broadly capture the asymmetries in the movements of GDP and price paths vis a vis the EMU average targets[8]. The second part of the rule (15) imposes the upper limit restriction that the stabilisation part of the government expenditure should not exceed (100*ω) % of the current quarter GDP. The targets for both regimes are the forecasts of the model under the regime with EMU, when there are no shocks to any of the equations[9]. This is called a baseline simulation and it corresponds to the real output growth rate of all countries equal to their respective potential output growth rates. The path of the variables in an economy without shocks seems a good basis for comparison.

As mentioned earlier, because the economy is subject to several uncertainties the use of stochastic simulations is much more realistic for the comparison of the monetary and fiscal policies macroeconomic stability performance under two alternative regimes. The stochastic simulations will be conducted over a future seven-year period. The shocks for the stochastic simulations will be drawn from the estimated distribution of the shocks, as described in the appendix A2. Clearly the assumption done here is that the observed shocks in the recent past can serve to project the stochastic environment in the near future.

The two alternative regimes (flexible vs EMU) will be ranked according to the performance of the stabilisation policies in terms of fluctuations of the key macroeconomic variables around the baseline target path. The performance is going to be measured by the root mean squared percentage deviation (RMSD) of each variable from its baseline path.

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[8] Actually, a better fiscal rule reacting to asymmetries for each EMU member, might be the one which targets exactly the deviations of its inflation rate and output gaps vis a vis their counterparts averages for the EMU zone as a whole (see, the monetary policy reaction function for France under ERM regime in Bénassy-Quéré and Mojon (1998)).

[9] In principle each regime should have its own baseline path, however some partial results we have taken using two baselines show that the regime comparisons do not depend on which baseline is chosen.

At this point we discuss the issue of shocks being exchange rate regime independent or not. The comparison of two estimated variance-covariance matrices of the Taylor model shocks for two different periods and different exchange rate regimes in Europe (see Taylor (1993a) and Kadareja (2000) reveals that with the exception of financial market shocks the estimated second moments of the other shocks are similar. So, this suggests that the stochastic structure of the model does not seem to change very much through time and across exchange rate regimes.

However, the financial shocks (uncovered interest parity and term structure shocks) seem to be regime dependent. These shocks are usually interpreted as reflecting risk premia, speculative bubbles and/or shifts in uncertainty about future inflation. One can argue that the risk premia and /or speculative bubbles to interest parities between EMU member countries for the period prior to EMU should disappear once the EMU credibly takes place. Among the shocks to the term structure one can mention the risk premia but also shifts in uncertainty about future inflation. Under EMU one can argue that differences for both types of these shocks among the EMU members will be reduced but it is not sure that they will disappear.

There are two problems to deal with when the regime with EMU is going to be simulated. The first one is linked with the interest parities and their shocks. To describe this we reproduce the equation (1) of the basic model (see appendix A1)

Ex ante interest rate parity $LE_i = LE_i(+1) + 0.25*(RS_i - RS_0) + U_{ei}$ (1)

$U_{ei} = \rho_{ei}U_{ei}(-1) + V_{ei}$

Under EMU the short term interest rate difference vis à vis US rate on the right hand side of (1) for the EMU member countries will be the same, because their short term interest rate will be unique. So, from (1) the expected exchange rate change vis à vis US$ (in % terms) for the respective currencies of EMU members will be the same. But, in order for our model to fully imply that the currencies of EMU members have all been substituted by the Euro, EMU members interest parity shocks vis à vis US$ (i.e. U_{ei}) should be identical. So, during the stochastic simulations we must hit the interest parities equations for each of EMU members with the same generated time series of shocks corresponding to U_{ei} . In doing so, under this regime, we rule out the shocks to interest parities between EMU members[10] .

For the simulations, the generated shocks corresponding to the interest parity of Germany written vis à vis the US, have been chosen to represent the U_{ei} shocks for the other EMU members. The implied assumption of this choice is that the future shocks to Euro interest parities written vis à vis non EMU member countries will have the same statistical properties as the shocks to German Mark interest parities versus the same non EMU members. This

[10]It should be mentioned that the volatility of the interest parity shocks depends on the assumption about the exchange rate expectations term on the right hand side of equation (1). Here, the expected exchange rate is model-consistent (i.e. is given by the simulation of the model). Bénassy-Quéré and Mojon (1998) fully discuss the alternatives for the exchange rate expectations. They use in their simulations a partial model for the exchange rate expectations.

choice[11] is based on the working experience of EMS where the German Mark was seen as the EMS anchor currency[12].

The second problem has to do with the term structure equation, which is reproduced for convenience from the basic model shown in appendix A1.

Term structure $$RL_i = b_i 0 + [(1-b_i)/(1-b_i^9)] \sum_{s=0}^{8} b_i^s RS_i (+s) \quad (2)$$

Note, that according to the notation used to represent the model, equation (2) contains an omitted normal error term. One question that arises is: Are the term structure equations for EMU member countries going to be the same, once EMU takes place? We know that the expected short term interest rates will be the same, as implied by a credible EMU regime. Also, in this model the long term interest rate adjusted for the expected inflation rate represents the real cost of investments for the firms. It seems plausible that the differences in the investments costs for an European firm in different regions of Euroland will disappear as the integration becomes complete. To support this is the remarkable observed convergence of the long term interest rates for the candidate EMU countries before and after the EMU was launched.

Another question is : Are the error terms in equation 2 going to be the same for EMU members ? It is clear that due to common inflation regarding EMU monetary policy the differences in term structure shocks among EMU members arising from shifts in inflation uncertainty will disappear, but differences arising from the risk of default or government debt rescheduling, for example, may not. In any case, the assumption made here is that once EMU takes place the term structure equations are unified for the EMU members. As in the case of interest parities the German specification is chosen to represent the EMU term structure. The reason for this choice is the same as the one for the interest parity choice and the assumption that the Euroland term structure shocks will have the same statistical properties as the German term structure shocks observed in the recent past, is made.

[11] One way to deal with this (for sensivity analysis purposes) could be to try for the simulations, not only the U_{ei} for Germany but also in turn the U_{ei}-s generated for the other EMU member countries. It is not done here, however, because the differences are expected to be minimal due to similar size (see table 2.1, Appendix A1) and high and positive correlation between the estimated U_{ei}-s for the EMU member countries (see the graph 1)

[12] Burda and Wyplosz (1993), provide nice evidence on this. In a graph against time of short-term interest rates, in periods right before EMS currency realignments there are always shifts for Italian and French rates but not for the German one. Then by virtue of uncovered interest parity relation for Italy and France vis à vis Germany, the German Marc behaves as a reference currency for Italian Lira and French Franc.

III STABILITY PERFORMANCE OF THE MONETARY POLICY UNDER TWO REGIMES FOR EUROPE

Due to asymmetric shocks, the common price regarding monetary policy of ECB may not achieve the same price stability levels for each member country as National Central Banks' monetary policy under the flexible regime.

In this section are shown the likely stability differences of the two regimes via 100 stochastic simulations, using only the monetary policy for stabilization purposes and so keeping the government expenditure exogenous(as it is in the basic model of the appendix A1).

From table 2.3 it can be seen that the EMU regime is beneficial for the stability of output and all its components (consumption, investments, net exports, exports and imports) in Italy; for the stability of investments, net exports and exports in France; for consumption, investments and net exports in UK. However, with the exception of the stability gain in the exports sector, the EMU regime implies stability losses in German consumption, investments and imports, and consequently for output as whole.

In the financial sector and prices, the EMU regime implies more stability for the exchange rate (vis à vis US$) in France and UK, for the short term interest rate and long term real interest rate in Italy and UK, for export and import prices in all EMU members and for the consumer price (CPI[13]) in Germany; but it implies losses for the stability of GDP deflator and wages for all EMU members and stability losses for the short term interest rate and long term real rate in Germany, and for CPI in UK. One explanation for the stability benefits under the EMU regime of exports and imports, net exports, import and export prices, is that the exchange rate vis à vis Euro is permanently fixed for all EMU members, so for them the foreign prices (in domestic currency units) should be much more stable. Other things equal, more stable foreign prices should imply more stability for import and export prices, and for export and import quantities. Note, that the above effect is magnified by the fact that the EMU members already trade mostly with each other than with the rest of the world.

[13] The CPI :s do not appear explicitly in the estimated model. However, assuming that they can be expressed as log-linear functions of the GDP deflator and import prices, it is possible to simulate also the effect on them. To this end we estimated equations of the following form for the European countries in the model: ÄLCPI= b* ΔLP +c* Δ LPIM. Using two-stage-least squares and quarterly data from 1980 to 1997, we obtained the following estimates (b and c were constrained to sum to 1) : France (b=0.83, c=0.17), Germany (b=0.62, c=0.38), Italy (b=0.86,c=0.14), UK (b=0.71, c=0.29), CH (b=0.66, c=0.34).

Table 2.3: Comparisons of EMU versus floating exchange rates for EMU countries and the EMU effects on CH

(Results are averages over 100 stochastic simulations. Shocks are generated from the estimated variance covariance matrix. The parameters of the monetary rules are in all cases α_1=2.0,β_1=0.3)

	EMU COUNTRIES			CH
	FLEXIBLE	EMU	EQUAL	
OUTPUT	G	I	F,UK	EQUAL
CONSUMPTION	G	UK,I	F	EQUAL
INVESTMENT	G	UK,I,F	0	EQUAL
NET EXPORTS (% of GDP)	0	UK,I,F	G	EQUAL
EXPORTS	0	G,F,I	UK	EQUAL
IMPORTS	G	I	F,UK	EQUAL
EXCHANGE RATE (vis à visUS$)	0	UK,F	I,G	EQUAL
INTEREST RATES	G	I,UK	F	EQUAL
REAL INTEREST RATES	G	I,UK	F	EQUAL
CPI	UK	G	F,I	FLEXIBLE
GDP DEFLATOR	UK,F,I,G	0	0	EQUAL
EXPORT PRICES	0	G,I,UK,F	0	FLEXIBLE
IMPORT PRICES	0	I,UK,F, G	0	EQUAL
WAGES	UK,F,I,G	0	0	EQUAL

Note *: In the floating exchange rate case all countries have floating exchange rates and short-term interest rates are set according to identical Taylor rules. In the EMU case, the four EMU countries have a fixed exchange rate and the monetary policy is set by a single Taylor rule, whereas all other countries behave as in the floating case. The entries in the columns 2 and 3 of the table refer to the countries (G = Germany, F = France, UK = United Kingdom, I = Italy) for which the system in the corresponding column and for the corresponding row variable has a <u>lower</u> root mean squared percentage deviation (RMSD) from the baseline, i.e. the countries for which it results in more stability. When there are more than one country in a cell then the list is done in decreasing order from the country which benefits more in stability to the country (or countries) which benefits (benefit) less. The*

RMSD are judged to be equal if they differ by less than 5% and this case is shown in column three. The column under the heading «CH» shows the EMU effects on the Swiss economy.

Another effect (which adds to the first) is that under the EMU regime the shocks to interest parities between EMU members disappear (so the model is hit less for them), however in our case, this effect is likely to be of limited importance because the interest parity shocks are estimated to be small between the EU members (as graph 1 suggests).

An explanation of the deterioration in stability of GDP prices and wages under EMU can be given considering different monetary policy responses to asymmetric shocks, under each regime. If we consider for the sake of argument a very specific UK GDP price shock which leads, say, to 1% quarterly increase in the UK's GDP deflator above the baseline (but to no changes in the GDP prices for the other EMU members), then according to the Taylor rule (13) (under the flexible regime) it would call for a 2% tightening of short term UK's interest rates and virtually to no changes in the short term rates for the other countries; whereas according to the Taylor rule (14) (under EMU regime) it would be translated into a tightening of EMU short term rate of only 0.38% (this would be too little for UK's GDP price best stability on one hand, and completely undesirable for the rest of the EMU on the other). Since, according to the graph 4, the generated price shocks are likely to be not very symmetric for France and Italy and indeed asymmetric for UK, the EMU regime may imply less stability for the GDP prices. For the wage results the same explanation is valid, considering that a GDP price regarding Taylor rule ultimately mostly responds to wage movements as they are translated into GDP price movements via the markup pricing. To see this note from the estimation of the markup pricing equations that the wages are the most important determinant of the GDP prices and from the table 2.1 (Appendix A1) that the wage shocks are the largest in the group of price shocks. So, the stability of wages and consequently GDP deflator[14], can be better served by the monetary policy under the flexible regime.

In a similar exercise Bénassy-Quéré and Mojon (1998) report stability results from the stochastic simulations of a three country model[15] . It is quite interesting to see that the regime ranking concerning the CPI and output stability in Germany, implied by their results, is the same as in the table 2.3 above.

[14] The import prices which are much more stable under EMU have less effect than wages on the GDP deflator (see the estimates of the markup pricing equations in the table 1.3 of appendix A1).

[15] See Bénassy-Quéré and Mojon (1998) table7, page 22.

IV WHAT DOES THE FISCAL STABILISATION POLICY DO?

In the table 2.4 are reported the results of 100 stochastic simulations where both monetary and fiscal policies are used for stabilization purposes. The monetary policy is defined as in the section 3 whereas the fiscal stabilization policy is defined according to the specification (15).

A comparison of the tables 2.3 and 2.4 concerning the stability results on output and its components, import and export prices reveals that the stability gains under EMU for Italy, UK and France and the mixed results for Germany are also present in this case. The intuitive explanations for those results given in the case of monetary policy are also valid here.

Some qualitative changes visible in table 2.4 are that the GDP deflator stability is equally served for Germany under both regimes, CPI stability is slightly better served for UK and France under the EMU regime and contract wages stability is equally served under both regimes for France, Italy and Germany.

In table 2.5 are given the quantitative stability comparisons between the two regimes. It suggests that in the case when both policies are used the regime differences in terms of stability for all EMU members for GDP deflator and wages, represent half or less of the differences of the monetary policy case. There are no changes in the regime differences concerning the stability of import and export prices and the EMU regime performs better in terms of CPI stability. In Taylor model via output, the fiscal policy affects the wage equations where the actual and expected output gaps play an important role in the determination of wage contracts[16]. Then, through markup pricing the effect is transmitted to GDP prices. All these channels are estimated to be very important in our case. The conclusion from table 2.5 is that, with the exception of the GDP deflator stability in UK.

[16] The re-estimation of the wage equations for the period 1980-1996, for USA, Italy, France, Germany and UK reveals that the coefficients on the actual and expected output gaps in the wage equations are higher than their Taylor (1993a) counterparts.

Table 2.4: Comparisons of EMU versus floating exchange rates for EMU countries, and effects on CH

(Results are averages over 100 stochastic simulations. Shocks are generated from the estimated variance covariance matrix. The parameters of the monetary rules are in all cases α_I=2.0,β_I=0.3; the parameters of the fiscal rules are in all cases λ=-0.8 and κ=-0.15; the SGP criterion is imposed and the assumed baseline government deficit is 0).

	EMU COUNTRIES			CH
	FLEXIBLE	EMU	EQUAL	
OUTPUT	G87	UK11,I0	F46	EQUAL 45
CONSUMPTION	G89	UK9,I1	F48	EQUAL66
INVESTMENT	G91	UK0,I2,F32	0	EQUAL68
NET EXPORTS (% of GDP)	0	UK20,I6,F17, G12	0	EQUAL 45
EXPORTS	0	G12	UK46,F39, I39	EQUAL33
IMPORTS	G82	I2, UK19	F28	EQUAL55
EXCHANGERATE (vis àvisUS$)	0	UK31	I44,G14,F39	EQUAL38
INTEREST RATES	G70	I0,UK1	F53	EQUAL79
REAL BOND INTEREST RATES	G93	I0,UK3,F23	0	EQUAL73
CPI	0	G10,UK39,F37	I51	FLEXIBLE
GDP DEFLATOR	UK83,F61,I91	0	G58	EQUAL78
EXPORT PRICES	0	G5,I4,UK16,F19	0	FLEXIBLE82
IMPORT PRICES	0	I3,UK5, G3,F17	0	EQUAL59
WAGES	UK74	0	F73,I100,G81	EQUAL52
GOVERNMENT EXPENDITURE	UK90,I91,F69,G6 7	0	0	EQUAL78

Note *: (see, also, the note to table 2.3). Each number, following table entries (country symbols or EMU effects on CH), equals the number of stochastic simulations (out of 100) for which the RMSD of EMU regime exceeds the flexible regime counterpart (for the symbol country and for the corresponding row variable).*

Table 2.5: Stability comparisons between the two regimes

Variable	Country	Monetary Policy			Monetary and Fiscal Policy		
		Flexible	EMU	Nr. of EMU>Flex	Flexible	EMU	Nr. of EMU>Flex
GDP Deflator	Italy	Best	10 %	86	Best	6 %	91
	France	Best	17 %	78	Best	6 %	61
	Germany	Best	11 %	69	Best	Equal	58
	UK	Best	51 %	91	Best	19 %	83
Wages	Italy	Best	21 %	98	Best	Equal	100
	France	Best	25 %	86	Best	Equal	73
	Germany	Best	17 %	80	Best	Equal	81
	UK	Best	40 %	87	Best	6 %	74
Import Prices	Italy	49 %	Best	2	45 %	Best	3
	France	29 %	Best	14	26 %	Best	17
	Germany	29 %	Best	3	30 %	Best	3
	UK	37 %	Best	7	38 %	Best	5
Export Prices	Italy	37 %	Best	8	35 %	Best	4
	France	20 %	Best	23	20 %	Best	19
	Germany	36 %	Best	8	36 %	Best	5
	UK	23 %	Best	21	25 %	Best	16
CPI	Italy	Best	Equal	64	Best	Equal	51
	France	Best	Equal	50	5%	Best	37
	Germany	19 %	Best	24	22 %	Best	10
	UK	Best	12 %	65	5%	Best	39

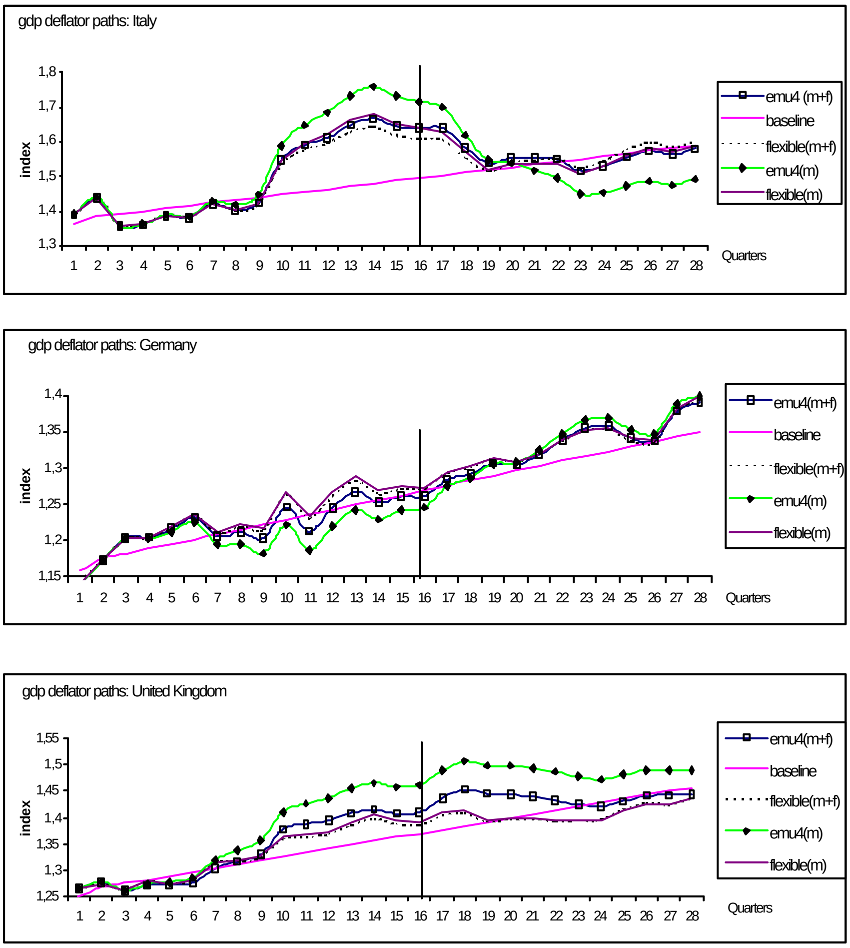
Table 2.5: continuing

	Italy	-	-	-	Best	9 %	91
Government Expenditure	France	-	-	-	Best	10 %	69
	Germany	-	-	-	Best	6 %	67
	UK	-	-	-	Best	25 %	90

Note : *In the columns 3,4,5 and 6,7,8(from the left) are shown the comparisons, in RMSD terms, of the flexible vs. EMU regime; columns 3,4,5 correspond to the case where only monetary policy is used for stabilization purposes whereas columns 6,7,8 correspond to the case where both policies are used. The superior regime, in stability terms, for a given EMU member and for a given variable is indicated by the «Best» entry in the corresponding cell. An «Equal» entry corresponds to the regime which is inferior to the best regime by less than 5%, a percentage entry indicates the stability inferiority in % terms for the corresponding column regime with regards to the best regime. The columns 5 and 8 refer to the number of simulations out of 100, where the EMU regime results less stable for the corresponding variable and country.*

The use of fiscal stabilization policy at national levels for all members of EMU makes it possible to achieve similar levels of stability in GDP deflator, CPI and wages as those prior to monetary union. An explanation on what the fiscal policy does under the EMU regime will be given with the help of graphs derived from one particular stochastic simulation. The GDP deflator paths shown in the graphs 7 to 10 are the model solutions for Italy, France, Germany and UK. The deviations of the paths from the baseline GDP deflator reflect the joint effects of stochastic shocks and stabilization economic policy responses. Asymmetric shocks make it difficult for the unique monetary response of ECB to achieve the same stability results as those achieved by the monetary policies at national level under the flexible regime. For this particular simulation this is the case for Italy and UK. The comparison of the policy responses for a particular quarter of the simulation, say the 16th (shown with a vertical line in the graphs), reveals that the common monetary policy response under EMU (as compared with the monetary responses under the flexible regime) is not restrictive enough for the best level of GDP deflator stability in Italy and UK on one hand, whereas it is not relaxed enough for France and Germany on the other. What the fiscal policy does in this situation is to reduce the GDP deflator path gaps between the flexible and EMU regimes and this effect for the chosen quarter is for all countries more than half of that gap. So, the graphs (and the table 2.5 results) suggest that there is indeed an important stabilization role for the fiscal policy to play under the EMU regime, especially in cases of asymmetric shocks. Apparently, the fiscal policy under the flexible regime plays a minor stabilization role since the GDP deflator paths almost coincide for flexible(m) and flexible (m+f) cases for Germany, UK, France and to some extent Italy.

Graph 7-10



Note: *baseline - corresponds to the GDP deflator path in a model simulated without shocks; emu4(m+f) - corresponds to the GDP deflator path under EMU regime when both monetary and fiscal policies are used for stabilization purposes; flexible (m+f) - the same as above but the regime is flexible; emu4(m) - corresponds to the GDP deflator path under EMU regime when only monetary policy is used for stabilization purposes; flexible(m) - the same as above but the regime is flexible.*

This is also indicated by the results shown in table 2.9

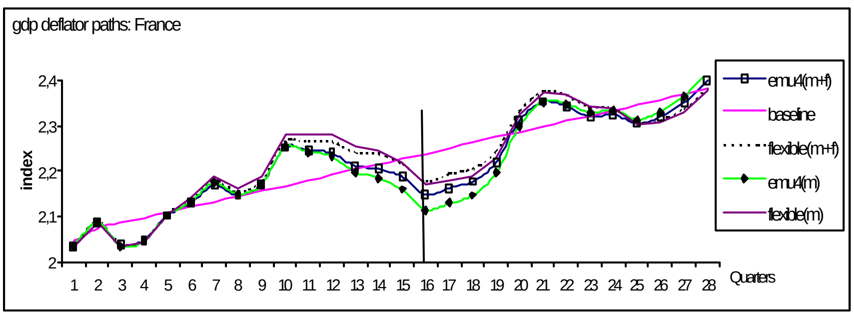


Table 2.9 f: Fiscal policy stabilization role under two exchange rate regimes

The entries are calculated over the average results of 100 stochastic simulations. The shocks are generated from the estimated variance covariance matrix. The monetary and fiscal rules are the same as explained in table 2.4.

Regime	Italy	France	Germany	UK
Flexible	12 %	11.6 %	9.2 %	5.8 %
EMU	15.2 %	19.9 %	15.9 %	25.4 %

Note *: The entries show(in %) the GDP deflator stability improvement for each regime when both monetary and fiscal policy are used for stabilization as compared with the RMSD of the respective regimes when only monetary policy is used for stabilization purposes.*

So, for each country the fiscal policy is more efficient for the GDP deflator stability under the EMU regime. This is in line with the theory, i.e. that the fiscal policy effectiveness is less under the flexible regime than under EMU (since the fiscal policy in a EMU member country affects much more the interest rate in that country under the flexible regime than the Euro area interest rates under EMU and so, ceteris paribus, the crowding out of private investments, consumption, and exports (in case of fiscal expansion for example) is much more felt under the flexible regime). However, the regime differences with respect to the crowding out (or crowding in) can not explain why, for example, the fiscal stabilization efficiency is increased under EMU more than four times for UK and only 26% for Italy.

The explanation of these differences can be given by looking at the shocks degree of symmetry and the operation of monetary and fiscal policies under EMU. The common monetary policy responses of ECB are not always adequate for the best GDP deflator stability for each member of EMU, and so some asymmetric shocks are left without proper reaction, moreover for UK, for example, it is possible[17] that those responses might even represent extra shocks[18] (*albeit*, of small size), hence the enhanced stabilization role for the fiscal policy under EMU, and in particular in the UK case.

V IS THE STABILITY AND GROWTH PACT TOO RESTRICTIVE FOR EUROPEAN FISCAL STABILIZATION POLICIES?

The aim of the Stability and Growth Pact (SGP) under EMU is to reinforce the framework for fiscal discipline in order to avoid the negative spillovers from the fiscal policies of individual states to other members, which might weaken the credibility of the anti inflationary thrust of the common ECB monetary policy. However, an important issue arises as to what extent the

[17] From the graph 4 the GDP deflator shocks for UK are asymmetric with respect to their German counterparts.

[18] Of course, the asymmetric shocks are the primary cause of the extra shocks.

observance of the SGP criteria might constrain the fiscal national policies in their stabilization role.

Eichengreen and Wyplosz (1997) fully address the SGP issue. In the empirical part of their study, using a simple macro model, they assess the consequences of having subjected the European economies to the SGP for the last 30 years. They find, among others, that with the exception of Germany the variability of output increases when the SGP is imposed and that the inflation is not statistically affected by the fiscal stimulus. They argue that SGP is a non-issue if European countries succeed in moving their budgets into balance whereas the pact becomes more of a problem if the deficits remain at their actual levels(about 3% of GDP).

Here, it is carried out an empirical assessment of the SGP issue taking into account that the monetary and fiscal stabilization policies under EMU will be different from the past. So, the ECB's monetary policy main objective to preserve the price stability in the Euro area has not always been shared by all EMU members' Central Banks in the past; what is more under EMU the fiscal policies conducted at national level are likely to be different from the past[19] (one additional objective being the counter action to asymmetric shocks). The following two exercises are conducted:

The first one evaluates the likelihood of the fiscal policies to be limited by the criterion of SGP that the general government budget deficit must not exceed 3% of GDP, assuming first that the baseline government deficit is zero, then 1.5% of GDP and finally 3% of GDP.

The second exercise evaluates the likely effects of SGP criterion on the level of stabilization powers of the fiscal policies and on the stability performance analysis between the two exchange rate regimes, assuming first that the baseline government deficit is zero, then 1.5% of GDP and finally 3% of GDP.

For this purpose the second part of the fiscal rule (15) is intended to impose the SGP criterion [20]. Then for 100 stochastic simulations we calculated the average of the number of quarters (as a % of the total number of simulation periods) in which the restriction in (15) was binding. Not surprisingly, from the results in table 2.5.1, can be seen that the restrictions for the conduct of counter cyclical fiscal policies implied by the above criterion of SGP depend on the country. So for Italy the fiscal policy is likely to be restricted 21.8% of the times, for UK 12.9% and for France and Germany 3.3% and 1.1%, respectively.

The SGP restrictions result binding more often as the baseline government budget deficit moves from 0 to 1.5% of GDP (the simulation results are shown in the rows of table 2.5.1 with the indication bld=1.5%); and finally as one would expect the restrictions result binding around 50% of the time for all countries in case the baseline government deficit is assumed to be 3% of GDP (in the table 2.5.1 row EMU bld=3%).

The last information from the table 2.5.1 concerns the likelihood of the exceptional clause of SGP[21] to be invoked by the member states. So, (in case of regime EMU bld=0) for Italy in 3%

[19] European governments tended to be eager to raise expenditure and cut taxes in a recession, but reluctant to cut spending or raise taxes during a boom, which lead to an inflation bias in fiscal policy (from IMF's World Economic Outlook (1999)).

[20] The second part of the fiscal rule (15) is more restrictive for the fiscal policy than the SGP requires, because it imposes the criterion each quarter instead of each year, and this is done for technical reasons.

[21] According to SGP, the exceptional clause can be invoked by a member country if the general government deficit in excess of 3% of GDP results from an unusual event outside the control of the

of the cases when the SGP results binding the exceptional clause could be invoked, for UK in 0.8% of the cases, for France 4.4%, whereas Germany could never «enjoy» the use of that clause[22]. The exceptional clause could be invoked more often in case of regime EMU bld=3%, however even in this case it is a low probability phenomenon since the highest entry which corresponds to UK (8.9%) implies that the chances are about once in a twenty year period.

Table 2.5.1

Regime	SGP Effects on Fiscal Policy	Italy	France	Germany	UK
Flexible (bld=0)	Binding SGP	20.6	1.6	0.75	5.4
	Exceptional Clause	2.1	0.0	0.0	2.0
Flexible (bld=1.5%)	Binding SGP	33.1	13.6	10.4	20.8
	Exceptional Clause	3.1	1.6	0.0	4.0
EMU (bld=0)	Binding SGP	21.8	3.3	1.1	12.9
	Exceptional Clause	3.0	4.4	0.0	0.8
EMU (bld=1.5%)	Binding SGP	33.6	15.3	10.6	27.0
	Exceptional Clause	3.9	2.3	0.0	3.7
EMU (bld=3%)	Binding SGP	50.7	45.4	47.8	52.8
	Exceptional Clause	5.5	8.3	3.6	8.9

Note: *In the rows «Binding SGP» the table number entries show the total number of quarters when the restriction in the fiscal rule (15) results binding(in % terms of the total number of simulation quarters,across 100 stochastic simulations). In the row «Exceptional Clause» the table entries show the total number of quarters when the exceptional clause of the SGP could be invoked (in % terms of the total number of quarters when the SGP results binding, across 100 stochastic simulations). The EMU and flexible regime entries for CH correspond respectively to the cases of CH being and being not a member of EMU. The regime rows corresponding to baseline government deficit assumptions equal to 0%, 1.5% and 3% of GDP are indicated respectively with bld=0, bld=1.5% and bld=3%.*

To assess the likely effects of SGP criterion on the stability performance comparison between the two exchange rate regimes, we simulated the model under both regimes for 100 stochastic simulations and with the criterion of SGP imposed and not imposed. The stability comparison results with the criterion imposed are already shown in table 2.4, in addition we calculated the entries for a similar table but with the criterion not imposed. That table is not shown here but it is identical with the table 2.4. So, the criterion of SGP does not affect the stability comparison analysis between the two regimes.

country in question or from a severe economic downturn. For the results reported here such a severe downturn is considered a GDP recession more severe than -1%.

[22] For the results reported in all tables concerning the use of fiscal policy for stabilization purposes the exceptional clause is not invoked for technical reasons. However, the gains in realism are not expected to be high, since the exceptional clause is a low probability phenomenon and the differences in regimes with regard to the frequency of invoking it are not substantial.

The last question we address here has to do with the likely effects of the SGP criterion on the level of stabilization powers of the fiscal policies. For this purpose we calculated the stability

differences between the averages of 100 simulations under the same regime (EMU), with the SGP imposed (for three alternative assumptions about the baseline government budget deficit) and not imposed. In table 2.5.2 are shown only those results corresponding to a stability difference between the best and the worst regime of more than 5%. From the table 2.5.2 can be seen that the unrestricted use (column 3) of the counter cyclical fiscal policy gives the best stability effects (directly) for all EMU members concerning contract wages, GDP deflator, CPI, but also (indirectly) for all EMU members concerning short-term interest rates, long-term (bond) real interest rates and interest sensitive components of aggregate demand, notably investments but also consumption (for Italy and France). However, the unrestricted use of the fiscal policy has the cost of higher instability (as compared with the EMU with bld=3% of GDP and SGP imposed) of the government expenditure for stabilization purposes and consequently of GDP, and then of income sensitive net exports (as % of GDP), exports (for France and Germany) and imports (for Italy). It is interesting to see that the fiscal discipline implied by SGP, in cases when EMU member countries have 0 or even 1.5% of GDP government budget deficit (cases corresponding to columns 4 and 5), does not make any significant harm to the stabilization powers of fiscal policy regarding contract wages, GDP deflator, CPI, but also short-term interest rates, long-term (bond) real interest rates and interest sensitive components of aggregate demand, investments and consumption[23]. On the other hand the «side» effect, which has to do with the extra GDP fluctuations induced by the unrestricted use of the fiscal policy for mostly GDP deflator stability purposes, does not significantly increase under the regimes of columns 4 and 5, as compared with the best stability regime for GDP and net exports (shown in column 6).

[23] Since the results of the table 2.5.2 for columns 4 and 5 show equivalence for the stability of the above varibles with the best regime in column 3.

Table 2.5.2 : Stability effects of the SGP restrictions

Comparisons of EMU regime with SGP restrictions imposed and not imposed (Results are taken from 100 stochastic simulations using the estimated variance covariance matrix. The parameters of the monetary rules are in all cases $\alpha_1=2.0, \beta_1=0.3$; the parameters of the fiscal rules are in all cases $\lambda=-0.8$ and $\kappa=-0.15$, the exceptional clause under SGP is not invoked.)

Variable	Country	No SGP	SGP		
			Bld=0	Bld=1.5% of GDP	Bld=3% of GDP
Sh-term Interest rate	EMU members	Best	Equal	10.3%	21.1%
Consumption	Italy	Best	5.6 %	9.8 %	18.2%
	France	Best	Equal	Equal	7%
Investments	Italy	Best	Equal	6.0 %	13.2%
	France	Best	Equal	Equal	5%
	Germany	Best	Equal	Equal	5.6%
	UK	Best	Equal	Equal	6.4%
Exports	France	6.3%	Equal	Equal	Best
	Germany	7.2%	Equal	Equal	Best
Imports	Italy	13%	7%	Equal	Best
GDP	Italy	18.6%	9%	Equal	Best
	France	6.8%	5.8%	Equal	Best
	Germany	7.7%	6.8%	5.1%	Best
	UK	5.2%	Equal	Equal	Best
Contract Wages	Italy	Best	Equal	Equal	9.0%
	France	Best	Equal	Equal	8.8%
	Germany	Best	Equal	Equal	5.5%
	UK	Best	Equal	Equal	12.9%
GDP Deflator	Italy	Best	Equal	5.1%	9.2%
	France	Best	Equal	Equal	10.6%
	Germany	Best	Equal	Equal	6.7%
	UK	Best	Equal	Equal	15.6%

Table 2.5.2 (continuing)

Variable	Country	No SGP	SGP		
			bld=0	**bld=1.5% of GDP**	**bld=3% of GDP**
Real Exports (%of GDP)	Italy	7.6%	Equal	Equal	Best
	UK	20.1%	16.8%	10.0%	Best
Government Expenditure	Italy	62.9%	29.4%	13.7%	Best
	France	39.3%	36.7%	20.7%	Best
	Germany	38.2%	36.4%	24.1%	Best
	UK	62.5%	46.2%	23.0%	Best
CPI	Italy	Best	Equal	Equal	8.5%
	France	Best	Equal	Equal	8.1%
	UK	Best	Equal	Equal	7.6%
Real Bond Interest Rates	Italy	Best	Equal	Equal	9.1%
	France	Best	Equal	Equal	9.2%
	Germany	Best	Equal	Equal	7.6%
	UK	Best	Equal	Equal	6.5%

Note: *In the columns 3,4,5 and 6 (from the left) is shown the comparison, in RMSD terms, of the following four alterations of the EMU regime:*

a)- with no SGP restrictions(column 3), b)- with SGP restrictions and bld=0 (column 4),
c)- with SGP restrictions and bld=1.5% of GDP(column 5), d)- with SGP restrictions and bld=3% of GDP(column 6); The superior regime, in stability terms, for a given EMU member and for a given variable is indicated by the «Best» entry in the corresponding cell. An «Equal» entry corresponds to the regime which is inferior to the best regime by less than 5%, a percentage entry indicates the stability inferiority in % terms for the corresponding column regime with regards to the best regime.

VI CAVEATS

A number of limitations to the analysis done in this paper should be considered when interpreting the results.

First, the EMU is likely to bring substantial structural changes in the economy of the member countries especially in the labour market and trade flows within the EMU. Also, the structural reforms undertaken by the EMU member countries for a smooth operation of EMU point in the same direction. In addition, that part of the stochastic structure which is mostly regime dependent is going to be altered after the EMU. So, the stochastic structure and the correlations may well change with respect to those estimated in the recent past. That this may well be the case (even in the absence of EMU), is indicated by the re-estimation of the Taylor model for a more recent period where can be detected structural changes especially in the wage equations (see Kadareja (2000), chapter I). All these imply that even though the expectations in the model are rational the Lucas' critique applies to other aspects of the model.

Second, it is important to keep in mind that the criterion for deciding between regimes only takes into account macroeconomic stability. The efficiency gains from a single currency are not considered. Related to this is the fact that the model assigns no special importance to the variance of exchange rates in any behavioural equation.

Third, countries are assumed to follow identical monetary policy rules in the floating exchange rate environment. In the floating rate simulations, this eliminates one of the potential sources of instability that proponents of EMU have emphasised, namely policy-induced asymmetric shocks.

Fourth, the design of the fiscal policy as done here, does not take into account the various lags affecting budgetary decision making and policy implementation. This tends to favor the fixed regime since the fiscal policy is more effective under EMU.

Fifth, lags in the availability of data constitute a practical difficulty in the implementation of policy rules of the Taylor type. Lagged values of output and inflation gaps may be more appropriate as conditioning variables for the policy rules. Alternatively, as done partly here and as implemented by several Central Banks, the policy reaction function can be specified in terms of expectations of inflation and output gaps[24]. This raises the question of what information the authorities have when they form their expectations, and what model they use to evaluate the effect of this information on the future inflation rate. The possibility that the model used by the authorities and that used by the private sector are different could lead to potential problems of credibility and conflict.

VII CONCLUSIONS

Considering German economy as the centre of the EU, for the European countries participating in the multi country Taylor model the degree of symmetry describing some estimated structural shocks ranges from highly symmetric to asymmetric for the period 1980-1996. There is no evidence of highly asymmetric shocks hitting EU economies for this period as a whole.

[24] The Central Bank of Sweden explains its strategy as targeting the expected inflation rate.

The stochastic simulations suggest that for the near future period the EMU regime is likely to imply stability benefits of output and its components for Italy, France and UK, but mixed stability effects for GDP components in Germany; it implies also stability benefits for all EMU members with regard to import and export prices.

However, in the presence of asymmetric shocks , EMU implies also that the common monetary policy of the European Central Bank alone is not likely to be enough to achieve stability levels of GDP deflator, consumer prices and wages similar to those that could have been achieved by member countries out of the monetary union.

With this regard, the fiscal stabilization policy conducted at national level is evidenced to be a useful tool under the EMU for the achievement of similar levels of stability, with Germany and United Kingdom being exceptions for opposite reasons. Germany may benefit in consumer prices stability by being an EMU member whereas United Kingdom may loose as far as the GDP deflator stability is concerned.

The results suggest that the Stability and Growth Pact while enforcing the fiscal discipline in Euroland, is likely to imply some limitations in the conduct of fiscal counter cyclical policies in Italy and UK, and to a less extent in France and Germany. The evidence is that the SGP restrictions under the conditions of budget deficits in the range from 0 to less than 1.5% of GDP are not likely to make any significant harm to the stabilization powers of the fiscal policy, but with deficits at 3% of GDP the price stabilization power of fiscal policies under EMU decreases significantly.

APPENDIX A1

Taylor Multi Country (Basic) Model and Its Estimates

The subscripts indicate the country(0=USA, 1=Italy, 2=France, 3=Germany, 4=CH, 5=Japan, 6=UK). Expectations of future variables are indicated by a positive number in parentheses. Lagged variables are indicated by a negative number in parentheses. An «L» indicates a natural logarithm. The shocks to the equations are assumed to be serially uncorrelated unless otherwise indicated. Only when the shocks are serially correlated are they shown explicitly.

Exchange interest rate parity $LE_F = LE_i(+1) + 0.25*(RS_i - RS_{USA}) + U_{ei}$ (1)

$$_{ei} = \rho_{ei} U_{ei}(-1) + V_{ei}$$

Term structure $RL_i = b_i 0 + [(1 - b_i)/(1 - b_i^9)] \sum_{s=0}^{8} b_i^s RS_i(+s)$ (2)

Consumption $CX_i = c_{i0} + c_{i1} CX_i(-1) + c_{i2} YP_i + c_{i3} RRL_i$ (3)

Where (according to data availability) $CX_i = CD_i, CN_i, CS_i, CNSS_i, C_i$.

Fixed Investment $IX_i = d_{i0} + d_{i1} IX_i(-1) + d_{i2} YP_i + d_{i3} RRL_i$ (4)

Where (according to data availability) $IX_i = IR_i, IN_i, IF_i$.

Inventory Investment $II_i = e_{i0} + e_{i1} II_i(-1) + e_{i2} Y_i + e_{i3} Y_i(-1) + e_{i4} RRL_i$ (5)

Real exports $LEX_i = f_{i0} + f_{i1} LEX_i(-1) + f_{i2}(LPEX_i - LPIM_i) + f_{i3} LYW_i$ (6)

Real imports $LIM_i = g_{i0} + g_{i1} LIM_i(-1) + g_{i2}(LPIM_i - LP_i) + g_{i3} LY_i$ (7)

Wage determination $LX_i = p_{i0}LW_i + p_{i1}LW_i(+1) + p_{i2}LW_i(+2) + p_{i3}LW_i(+3) +$

$+\alpha_i(p_{i0}YG_i + p_{i1}YG_i(+1) + p_{i2}YG_i(+2) + p_{i3}YG_i(+3))$ (8)

Where $LW_i = p_{i0}LX_i + p_{i1}LX_i(-1) + p_{i2}LX_i(-2) + p_{i3}LX_i(-3)$

Aggregate price $LP_i = h_{i0} + h_{i1}LP_i(-1) + h_{i2}LW_i + h_{i3}LPIM_i(-1) + h_{i5}T + U_{pi}$ (9)

$$U_{pi} = \rho_{pi}U_{pi}(-1) + V_{pi} \quad \text{and} \quad h_{i1} + h_{i2} + h_{i3} = 1$$

Import price $LPIM_i = k_{i0} + k_{i1} LPIM_i(-1) + k_{i2} LFP_i + U_{mi}$ (10)

$$U_{mi} = \rho_{mi}U_{mi}(-1) + V_{mi} \quad \text{and} \quad k_{i1} + k_{i2} = 1$$

Export price $LPEX_i = \beta_{i0} + \beta_{i1} LPEX_i(-1) + \beta_{i2} LP_i + \beta_{i3} LFP_i + \beta_{i4} T + U_{xi}$ (11)

$U_{xi} = \rho_{xi} U_{xi}(-1) + V_{xi}$ and $\beta_{i1} + \beta_{i2} + \beta_{i3} = 1$

Money demand $L(M_i / P_i) = \varphi_{i0} + \varphi_{i1} L(M_i(-1) / P_i(-1)) + \varphi_{i2} RS_i + \varphi_{i3} LY_i$ (12)

The variables are the following:

Financial variables, RS_i - short term interest rate; RL_i - long term interest rate; RRL_i - real long term interest rate (defined as RL_i less the expected percentage change in the GDP deflator over the next four quarters); E_i - exchange rate (US$ per unit of country i's currency); M_i - money supply.

Real gdp and spending components, Y_i-real gdp; C_i-total consumption; CD_i-durable consumption CS_i - services consumption; CN_i - nondurables consumption; $CNSS_i$ - nondurables and services consumption; IR_i - residential investment; II_i - inventory investment; IF_i - fixed investment(total); IN_i - nonresidential investment (total); EX_i - exports in income-expenditure identity(see later); IM_i - imports in income-expenditure identity; G_i - government purchases of goods and services. Variables relating to GDP, YP_i - permanent income, a weighted sum of Y_i over eight future quarters; YW_i - weighted foreign output (of the other six countries); YT_i - trend or potential output; T - time trend; YG_i - percentage gap between real GDP and trend GDP.

Wages and prices, W_i - average wage rate; X_i - «contract» wage rate (constructed from average wage index); P_i - gdp deflator; PIM_i - import-price deflator; PEX_i - export-price deflator, PW_i - trade-weighted foreign price (foreign currency units); EW_i - trade-weighted exchange rate (foreign currency/domestic currency); FP_i - trade-weighted foreign price (domestic currency units).

Table 1.1

The wage equations

	USA	Italy	France	Germany	CH	Japan	UK
alpha	0,146	0,167	0,338	0,129	0,079	0,296	0,069
	0,025	*0,007*	*0,013*	*0,013*	*0,003*		*0,009*
p_0	0,445	0,401	0,405	0,556	0,532		0,501
p_1	0,283	0,220	0,257	0,148	0,255		0,181
	0,007	*0,009*	*0,015*	*0,009*	*0,008*		*0,022*
p_2	0,136	0,190	0,169	0,148	0,107		0,159
	0,004	*0,010*	*0,005*		*0,007*		*0,015*
p_3	0,136	0,190	0,169	0,148	0,107		0,159
% annual	54,3%	75,8%	67,7%	59,2%	42,6%	87,5%	63,6%
% semi-annual	29,5%	6,1%	17,4%	0,0%	29,7%	0,7%	4,4%
% quarter	16,1%	18,1%	14,8%	40,8%	27,7%	11,8%	32,0%
Sample	77.1- 97.2	77.1- 97.1	77.1- 96.4	77.1- 97.1	80.1- 96.4	71.4- 86.3	80.1- 97.1
Initial Conditions							
LX(-1)	-0,632	-1,349	-1,028	-0,541	-0,188		-0,780
	0,011	*0,010*	*0,008*	*0,013*	*0,019*		*0,014*
LX(-2)	-0,586	-1,482	-1,093	-0,555	-0,685		-0,891
	0,010	*0,009*	*0,017*	*0,011*	*0,009*		*0,012*
LX(-3)	-0,568	-1,491	-1,011	-0,508	-0,457		-0,874
	0,020	*0,011*	*0,010*	*0,016*	*0,036*		*0,014*

Standard errors are shown in italics below the estimated coefficients
The estimation of the wage equations is done jointly with an autoregressive equation representing "aggregate demand", the estimation method is maximum likelihood.
For Japan the Taylor estimates are used (see Taylor 1993, chapter 3)
For Germany starting at 1990.Q3 shift and trend dummies are used in GDP gap calculations in order to take account for German unification.
For Switzerland the quarterly average wage data are generated using the Ginsburgh's method(1973) using the annual average wage data and CPI index as a related series.
The program is done in Shazam combining D-F-P and Dagli &Taylor algorithms.

Table 1.2 (Taylor 1993a, chapter 3, Table3-2)

Estimated wage coefficients for Japan

Quarter			
I	II	III	IV
0,1533	0,5414	0,3857	0,2815
0,1633	0,0351	0,4232	0,2675
0,2638	0,1597	0,0314	0,4196
0,4196	0,2638	0,1597	0,0314
rs changing wages in quarter (a_{4i})			
3	42	26	16

Table 1.3 **Aggregate Price Equations**

The dependent variable is the log of the aggregate price, LP.
The method used is 2SLS with first order autoregressive errors.
Correcting for ar(1) implies Nonlinear 2SLS and the starting coefficient values are chosen to coincide with Taylor estimates.
Standard errors are in italics below the estimated coefficients.
Instrument list: T LP(-1) LP(-2) LW(-1) LW(-2) LY(-1) LY(-2) LPIM(-1) LPIM(-2)

Country	Constant	LP(-1)	LW	LPIM(-1)	T	RHO	Sample
U.S.	-0,0845	0,3182	0,6407	0,0411	0,0007	0,9502	80.1- 97.2
	0,0308		*0,1843*	*0,0186*	*0,0004*	*0,0526*	
CH	0,0067	0,7425	0,2053	0,0522	0,0000	0,4481	80.3 - 96.4
	0,0010		*0,1258*	*0,0187*		*0,1334*	
France	0,3351	0,4537	0,4929	0,0534	-0,0006	0,8377	80.1- 96.4
	0,1306		*0,1948*	*0,0388*	*0,0005*	*0,0516*	
Germany	0,0423	0,4728	0,4690	0,0582	-0,0014	0,0000	80.1- 97.1
	0,0106		*0,0940*	*0,0241*	*0,0003*		
Italy	-0,0058	0,5284	0,4441	0,0275	0,00020	0,8565	80.1- 97.1
	0,0268		*0,2965*	*0,0215*	*0,0005*	*0,0790*	
Japan	0,0209	0,9164	0,0804	0,0032	-0,0004	0,1425	80.3 - 96.1
	0,0107		*0,0486*	*0,0057*	*0,0002*	*0,1317*	
U.K.	0,0856	0,5949	0,3169	0,0882	-0,0018	0,7626	80.1- 97.1
	0,0460		*0,1683*	*0,0370*	*0,0010*	*0,1168*	

The estimation is done with E-Views

Table 1.4 Import Price Equations

The dependent variable is the log of the import price, LPIM.
The method used is 2SLS with first order autoregressive errors
Correcting for ar(1) implies Nonlinear 2SLS and the starting coefficient values are chosen to coincide with Taylor (1993) estimates.
Standard errors are in italics below the estimated coefficients
Instrument list: T LP(-1) LP(-2) LW(-1) LW(-2) LY(-1) LY(-2) LPIM(-1) LPIM(-2)

Country	Constant	LPIM(-1)	LFP	T	RHO	Sample
U.S.	-0,0651	0,9279	0,0721	-0,0011	0,0000	80.3 - 97.1
	0,0155		*0,0162*	*0,0003*		
CH	1,4299	0,3274	0,6726	-0,0035	0,7080	80.4 - 97.1
	0,3243		*0,1530*	*0,00082*	*0,0936*	
France	0,7088	0,5260	0,4740	-0,0037	0,8371	80.3 - 97.1
	0,1950		*0,1355*	*0,0010*	*0,1022*	
Germany	1,2930	0,4825	0,5175	-0,00216	0,8006	80.3 - 97.1
	0,3538		*0,1429*	*0,0007*	*0,0806*	
Italy	-3,2327	0,4136	0,5864	-0,0054	0,8185	80.3 - 97.1
	1,0627		*0,1919*	*0,0018*	*0,1132*	
Japan	-0,8629	0,1814	0,8186	-0,0050	0,8624	80.2 - 97.1
	0,1380		*0,1381*	*0,0017*	*0,0640*	
U.K.	2,7409	0,2505	0,7495	-0,0048	0,8893	80.2 - 97.1
	1,0132		*0,2735*	*0,0025*	*0,0796*	

Estimation is done with Eviews

Table 1.5

Export Price Equations

The dependent variable is the log of the price for exports, LPEX.
The method used is 2SLS with first order autoregressive errors.
Correcting for ar(1) implies Nonlinear 2SLS and the starting coefficient values are chosen to coincide with Taylor estimates
Standard errors are in italics below the estimated coefficients
Instrument list: T LP(-1) LP(-2) LW(-1) LW(-2) LY(-1) LY(-2) LPIM(-1) LPIM(-2)

Country	Constant	LPEX(-1)	LP	LFP	T	RHO	Sample
U.S.	-0,0144	0,8501	0,0984	0,0515	-0,0014	0,3740	81.1- 97.1
	0,0161		*0,0463*	*0,0056*	*0,0003*	*0,1174*	
CH	0,5120	0,1749	0,6110	0,2141	-0,0022	0,8575	80.4- 97.1
	0,1671		*0,1356*	*0,0779*	*0,0006*	*0,0656*	
France	0,2820	0,5457	0,2886	0,1657	-0,0025	0,6999	81.1- 96.4
	0,1870		*0,1787*	*0,1328*	*0,0010*	*0,2025*	
Germany	0,3990	0,7128	0,1317	0,1555	-0,0009	0,6952	80.3 - 97.1
	0,1093		*0,0553*	*0,0460*	*0,0003*	*0,0830*	
Italy	-1,3113	0,6129	0,1463	0,2408	-0,0025	0,6304	80.3- 97.1
	0,5816		*0,0949*	*0,1043*	*0,0010*	*0,1909*	
Japan	-0,2428	-0,1259	0,6968	0,4291	-0,0081	0,9039	80.3- 96.1
	0,1555		*0,1185*	*0,1087*	*0,0010*	*0,1634*	
U.K.	1,0753	0,5187	0,1987	0,2826	-0,00266	0,8396	80.3- 97.1
	0,3313		*0,1567*	*0,0966*	*0,0007*	*0,0952*	

Estimation is done with Eviews

Term structure of interest rates

The dependent variable is the long-term interest rate RL.
The method used is NL2SLS with instruments, RL(-1), RL(-2), RS(-1), RS(-2), LY(-1), LY(-2), LFP(-1), LFP(-2), G.
Standard errors are in italics below the estimated coefficients

Sample(adjusted): 1980:3 1995:1

Country	Constant	b	Sample
U.S.	0,018356	0,887477	80.3- 95.1
	0,0025	*0,0915*	
CH	0,008438	0,890644	80.3- 95.1
	0,0023	*0,1116*	
France	0,005816	0,529181	80.3- 95.1
	0,0016	*0,1003*	
Germany	0,011083	0,885198	80.3- 95.1
	0,0018	*0,0797*	
Italy	-0,004917	0,442448	80.3- 95.1
	0,0021	*0,1704*	
Japan	0,007092	0,644419	80.3- 95.1
	0,0011	*0,0698*	
U.K.	0,002960	0,518872	80.3- 95.1
	0,0027	*0,1546*	

The estimation is done with Eviews

Table 1.6

Table 1.7

Table 1.8

Durables Consumption

The dependent variable is CD. The estimation method is GMM
The instruments are CD(-1), Y(-1), Y(-2), RL(-1), LP(-1), LP(-2), T, G.
Standard errors are in italics below the estimated coefficients

Country	Constant	CD(-1)	YP	RRL	RHO	Sample
U.S.	-53.82	0.78	0.0277	-62.40		80.1- 95.2
	24.154	*0.053*	*0.007*	*100.834*		
France	-14.00	0.74	0.0201	-49.48		80.1- 94.4
	6.048	*0.064*	*0.003*	*67.884*		
Italy	-20797.16	0.84	0.0289	-17022.98	0.697967	80.1- 95.1
	8531.480	*0.068*	*0.011*	*13698.930*	0.129864	
Japan	-11044.71	0.37	0.0714	-102592.40		80.1- 94.1
	4374.444	*0.102*	*0.011*	*38364.530*		
U.K.	-8.14	0.61	0.0406	-17.96		80.1- 95.1
	1.377	*0.054*	*0.006*	*6.485*		

Nondurables Consumption

The dependent variable is CN. The estimation method is GMM
The instruments are CN(-1), Y(-1), Y(-2), RL(-1), LP(-1), LP(-2), T, G.
Standard errors are in italics below the estimated coefficients

Country	Constant	CN(-1)	YP	RRL	RHO	Sample
U.S.	129.67	0.57	0.0694	-14.39		80.1- 95.2
	20.220	*0.060*	*0.009*	*22.797*		
France	102.56	0.61	0.0907	-38.44		80.1- 94.4
	21.083	*0.081*	*0.019*	*51.728*		
Japan	51137.67	0.28	0.1584	0.0000		80.1- 94.1
	8106.587	*0.125*	*0.022*			
U.K.	7.04	0.76	0.0569	-13.55		80.1- 95.1
	1.168	*0.028*	*0.007*	*5.150*		

Estimation is done with Eviews

Nondurables and Services Consumption

The dependent variable is CNSS. The estimation method is GMM
The instruments are CNSS(-1), Y(-1), Y(-2), RL(-1), LP(-1), LP(-2), T, G.
Standard errors are in italics below the estimated coefficients

Country	Constant	CNSS(-1)	YP	RRL	RHO	Sample
Italy	-5794,87	0,89	0,0660	-8749,79	0,395278	80.1- 95.1
	3539,964	*0,035*	*0,018*	*15853,200*	0,128607	

Services Consumption

The dependent variable is CS. The estimation method is GMM
The instruments are CS(-1), Y(-1), Y(-2), RL(-1), LP(-1), LP(-2), T, G.
Standard errors are in italics below the estimated coefficients

Country	Constant	CS(-1)	YP	RRL	RHO	Sample
U.S.	-42,90	0,81	0,0817	-91,83		80.3- 95.2
	8,370	*0,023*	*0,009*	*31,901*		
France	-24,37	0,92	0,0286	-80,34		80.1- 94.4
	16,397	*0,045*	*0,015*	*64,276*		
Japan	-1479,94	0,35	0,2072	-50703,17		81.1- 94.1
	3552,416	*0,094*	*0,031*	*31883,100*		
U.K.	-9,60	0,88	0,0560	-24,79		80.1- 95.1
	2,145	*0,022*	*0,010*	*5,967*		

Aggregate Consumption

The dependent variable is C. The estimation method is GMM
The instruments are C(-1), C(-2), C(-3),Y(-1), Y(-2), Y(-3), RL(-1), RL(-2), LP(-1), LP(-2), LP(-3), T, G.
Standard errors are in italics below the estimated coefficients

Country	Constant	C(-1)	YP	RRL	GDUMMY	RHO	Sample
CH	2,20	0,79	0,1213	-20,45		0,6197	81.1- 95.1
	4,298	*0,092*	*0,043*	*14,737*		*0,104*	
Germany	227,15	0,403	0,2292	-553,111	127,02		80.1- 95.1
	33,083	*0,053*	*0,023*	*269,589*	*14,176*		

Estimation is done with Eviews

Table 1.9

Table 1.10

Nonresidential Investment

The dependent variable is IN. The estimation method is the GMM
The instruments are IN(-1), IN(-2), IN(-3), Y(-1), Y(-2), Y(-3), RL(-1), RL(-2),LP(-1), LP(-2), LP(-3), T, G.
Standard errors are in italics below the estimated coefficients

Country	Constant	IN(-1)	YP	RRL	RHO	Sample
U.S.	-22,80	0,79	0,0318	0,0000		80.1- 95.2
	18,859	*0,083*	*0,011*			
France	-23,91	0,54	0,0948	-585,73	0,95	80.1- 94.4
	303,744	*0,273*	*0,106*	*492,515*	*0,078*	
Japan	-78,30	0,917	0,0214	-44236,10		80.1- 94.1
	3534,352	*0,054*	*0,016*	*16031,050*		
U.K.	-9,84	0,73	0,0583	-19,18		80.1- 95.1
	2,299	*0,053*	*0,011*	*12,143*		

Residential Investment

The dependent variable is IR. The estimation method is the GMM
The instruments are IR(-1), IR(-2), Y(-1), Y(-2), RL(-1), LP(-1), LP(-2), T, G.
Standard errors are in italics below the estimated coefficients

Country	Constant	IR(-1)	YP	RRL	RHO	Sample
U.S.	-538,25	0,69	0,0744	-254,97	0,983512	80.1- 95.2
	335,922	*0,113*	*0,038*	*167,794*	0,01563	
France	20,80	0,83	0,0058	-105,03		80.1- 94.4
	8,680	*0,034*	*0,002*	*39,767*		
Japan	1911,98	0,848	0,0063	-23073,85		80.1- 94.1
	972,073	*0,048*	*0,003*	*11652,100*		
U.K.	5,44	0,07	0,0349	-69,88		80.1- 95.1
	3,106	*0,143*	*0,006*	*21,226*		

Total Fixed Investment

The dependent variable is IF. The estimation method is the GMM
The instruments are IF(-1), IF(-2), IF(-3), Y(-1), Y(-2), Y(-3), RL(-1), RL(-2), LP(-1), LP(-2), LP(-3), T, G.
Standard errors are in italics below the estimated coefficients

Country	Constant	IF(-1)	YP	RRL	RHO	GDUMMY	Sample
CH	-19,87	0,67	0,1553	-30,09	0,58		80.3- 95.1
	6,070	*0,106*	*0,046*	*14,178*	*0,131*		
Germany	67,68	0,72	0,0317	-248,73		43,987	80.1- 95.1
	25,177	*0,051*	*0,011*	*177,312*		*8,417*	
Italy	-11087,68	0,803	0,0490	-25976,22	0,69		80.1- 95.1
	8974,439	*0,140*	*0,029*	*27023,940*	*0,202*		

Estimation is done with Eviews

Export Demand

The dependent variable is LEX. The estimation method is OLSQ
Standard errors are in italics below the estimated coefficients

Country	Constant	LEX(-1)	LPEX-LPIM	LYW	RHO	GDUMMY	Sample
U.S.	-1,94	0,92	-0,0873	0,2336			80.1- 97.1
	0,665	*0,033*	*0,096*	*0,083*			
CH	1,61	0,59	-0,4017	0,0668	0,986		80.3- 97.1
	1,127	*0,084*	*0,085*	*0,104*	*0,01*		
France	-4,44	0,60	-0,3524	0,7923			80.1- 96.4
	0,862	*0,080*	*0,092*	*0,153*			
Germany	-6,12	0,54	-0,4624	0,9880		-0,0279	80.1- 97.1
	0,898	*0,071*	*0,084*	*0,143*		*0,007*	
Italy	-2,88	0,66	-0,3502	0,8958			80.1- 97.1
	0,808	*0,082*	*0,123*	*0,216*			
Japan	-2,20	0,718	-0,1865	0,6158			80.1- 96.1
	0,499	*0,052*	*0,044*	*0,118*			
U.K.	-1,27	0,90	-0,2375	0,1935			80.1- 97.1
	0,526	*0,054*	*0,130*	*0,085*			

Estimation is done with Eviews

Table 1.11

Import Demand

The dependent variable is LIM. The estimation method is OLSQ
Standard errors are in italics below the estimated coefficients

Country	Constant	LIM(-1)	LPIM-LP	LY	RHO	GDUMMY	Sample
U.S.	-1,66	0,77	-0,2559	0,3680			80.1- 97.2
	1,044	*0,066*	*0,060*	*0,163*			
CH	-1,02	0,73	-0,1117	0,3986	0,80		80.3- 97.1
	0,933	*0,186*	*0,107*	*0,286*	*0,14*		
France	-3,36	0,55	-0,1135	0,7868			80.1- 96.4
	0,729	*0,076*	*0,044*	*0,144*			
Germany	-4,36	0,42	0,0000	1,0335		-0,0727	80.1- 97.1
	0,579	*0,079*		*0,134*		*0,014*	
Italy	-4,18	0,68	-0,0724	0,5813			80.1- 97.1
	1,546	*0,072*	*0,037*	*0,164*			
Japan	-1,10	0,946	0,0000	0,1305			80.1- 96.1
	0,476	*0,039*		*0,065*			
U.K.	-2,77	0,68	0,0000	0,6929			80.1- 97.1
	0,693	*0,081*		*0,173*			

Estimation is done with Eviews

Table 1.12

Import Demand

The dependent variable is LIM. The estimation method is OLSQ
Standard errors are in italics below the estimated coefficients

Country	Constant	LIM(-1)	LPIM-LP	LY	RHO	GDUMMY	Sample
U.S.	-1,66	0,77	-0,2559	0,3680			80.1- 97.2
	1,044	*0,066*	*0,060*	*0,163*			
CH	-1,02	0,73	-0,1117	0,3986	0,80		80.3- 97.1
	0,933	*0,186*	*0,107*	*0,286*	*0,14*		
France	-3,36	0,55	-0,1135	0,7868			80.1- 96.4
	0,729	*0,076*	*0,044*	*0,144*			
Germany	-4,36	0,42	0,0000	1,0335		-0,0727	80.1- 97.1
	0,579	*0,079*		*0,134*		*0,014*	
Italy	-4,18	0,68	-0,0724	0,5813			80.1- 97.1
	1,546	*0,072*	*0,037*	*0,164*			
Japan	-1,10	0,946	0,0000	0,1305			80.1- 96.1
	0,476	*0,039*		*0,065*			
U.K.	-2,77	0,68	0,0000	0,6929			80.1- 97.1
	0,693	*0,081*		*0,173*			

Estimation is done with Eviews

Table 1.13

Money Demand

The dependent variable is L(M/P). The estimation method is 2SLS
Instrument list: LM(-1) LM(-2) LP(-1) LP(-2) LY(-1) LY(-2) RS(-1) G LT
Standard errors are in italics below the estimated coefficients

Country	Constant	L(M/P)(-1)	RS	LY	LT	Sample
U.S.	-0,07	0,85	-0,6039	0,1346	-0,00064	80.2- 97.1
	0,725	*0,044*	*0,106*	*0,100*	*0,00059*	
Switzerland	-0,59	0,91	-1,0300	0,1843		80.3- 97.1
	0,394	*0,057*	*0,226*	*0,054*		
France	-0,29	0,87	-0,3255	0,1545	-0,0011	81.1- 96.4
	0,729	*0,067*	*0,112*	*0,139*	*0,00078*	
Germany	-1,64	0,77	-0,4524	0,3949		80.1- 97.1
	0,560	*0,084*	*0,133*	*0,137*		
Italy	2,44	0,75	-0,5026	0,0655	-0,00063	80.2- 97.1
	1,084	*0,055*	*0,110*	*0,089*	*0,00044*	
Japan	0,05	0,851	-0,6370	0,1341		80.2- 96.1
	0,296	*0,065*	*0,162*	*0,069*		
U.K.	-6,30	0,81	-0,1081	1,1983	-0,00209	80.1- 96.1
	2,105	*0,062*	*0,419*	*0,381*	*0,00205*	

For UK LT starts at 1982:1, for the others at 1980:1
For UK M4 is used as money
Estimation is done with Eviews

APPENDIX A2

A2.1 - The Extended Path Method for Solving Non linear Rational Expectations Models

The Basic Method

The Taylor rational expectations model is dynamic and non linear in variables and parameters. In order to solve it for the estimation of the structural shocks and for the deterministic and stochastic simulations, is used the Fair &Taylor extended path algorithm (EP)[25]. The description of the basic EP method is as follows;

Let represent the model in the following form :

$$f_i\,[y_t, y_{t-1}, \ldots, y_{t-p}, E_t(y_{t+1}), \ldots, E_t(y_{t+h}), x_t, \alpha_i\,] = u_{i\,t}\ ; \quad (i=1,...,n) \qquad \text{(A2.1)}$$

where y_t is an n-dimensional vector of endogenous variables at time t, x_t is a vector of exogenous variables at time t, E_t is the conditional expectations operator based on the model and on information through period t, α_i is a vector of parameters, and $u_{i\,t}$ is a stationary scalar random variable.

The basic method corresponds to the case when the disturbances are serially uncorrelated and their future values are set equal to their conditional means (i.e. the model is simulated deterministically).

If the expectations variables were known in the model (A2.1) then it could be solved by some conventional method for solving non linear models such as Gauss-Seidel iterative technique. Fair &Taylor (1983) augmented the above technique with the EP method which implements extra iterations to evaluate the rationally expected variables in a way consistent with the model and with the Rational Expectations Hypothesis.

Let the initial set of values for the expected endogenous variables, $E_t\,(y_{t+r})$, be represented as g_r, r =1,2,... Since in general the model will have no natural termination data, an infinite number of these values need to be specified in principle. In practice, however, only a finite number of these will be used in obtaining a solution with a given finite tolerance range. It is required that the initial values be bounded: $|g_r|<M$ for every r , where M is not a function of r . Then the solution of the model (A2.1) is found in five steps : 1- Choose an integer k, which is an initial guess at the number of periods beyond the horizon h for which expectations need to be computed in order to obtain a solution within a prescribed tolerance level δ. Set $E_t\,(y_{t+r}) = g_r$, r = 1,2,...,k+2h. For the purpose of describing the iterations, call these initial values $e_r\,(1,k)$, r = 1,. . ., k+2h; the values at later iterations will be called $e_r\,(i,k)$, i > 1.

[25] The material for the appendix A2.1 is adopted from Fair & Taylor (1983)

2- Obtain a new set of values for $E_t(y_{s+r})$, r = 1,2,...,k+h, by solving the model dynamically for y_{t+r} , r = 1,2,...,k+h. This is done by setting the disturbances to their expected values (zero), using the values $E_t(x_{t+1})$, $E_t(x_{t+h+k})$ instead of actual x's, and using the values e_r (i,k) in place of

$E_t(y_{t+r})$. Call these new guesses e_r (i+1,k), r = 1,2,...,k+h. Since the model is non linear, then the solution for each period requires a series of Gauss-Seidel iterations. Call each of these a Type I iteration.

3- Compute for each expectation variable and each period the absolute value of the difference between the new guess and the previous guess, i.e., compute the absolute value of the difference between each element of the e_r (i+1,k) vector and the corresponding element of the e_r (i,k) vector for r = 1,2,...,k+h. If any of these differences are not less than a prescribed tolerance level (i.e., if convergence has not been achieved), increase i by 1 and return to step 2. If convergence has been achieved, go to step 4. Call this iteration (performing steps 2 and 3) a Type II iteration. Let e_r (k) be the vector of the convergent values of a series of Type II iterations (r = 1,2,...,k+h).

4- Repeat steps 1 through 3, replacing k by k+1. Compute the absolute value of the difference between each element of the e_r (k+1) vector and the corresponding element of the e_r(k) vector, r = 1,2,...,h. If any of these differences are not less than ä, increase k by 1 and repeat steps 1 through 4. If convergence has been achieved, go to step 5. Call this iteration performing steps 1 through 4 a Type III iteration. Let e_r be the vector of the convergent values of a series of Type III iterations (r = 1,2,...,h).

5- Use e_r for $E_t(y_{t+r})$, r = 1,2,...,h, and the actual values for x_t to solve the model for period t. This gives the desired solution, y_t^s, and concludes the basic solution method.

The Serial Correlation Case

The basic EP method corresponds to the case of no serial correlation for the disturbances, but a look at the model in Appendix A1 reveals that there are some equations where the errors behave according to an ar (1) scheme, so for those equations the right hand side of (A2.1) has the following form,

$u_{it} = \rho_i * u_{i,t-1} + \varepsilon_{it}$ (A2.2)

To solve the model in this case, for each equation with the errors of the form (A2.2), it can be adopted an iterative procedure which picks up the pre sample value for $u_{i,t-2}$ (suppose that the sample starts at 't') such that the last pre sample uncorrelated error is equal to its unconditional mean, i.e. $\varepsilon_{i,t-1} = 0$[26]. This procedure is described in Fair &Taylor (1983). The steps, for the typical i- th equation with auto correlated errors, are the following :

1- Set a starting value for $u_{i,t-2}$.

2- Solve the model (A2.1) for the period 't-1' using EP basic method and substituting $E_{t-1}(u_{t+r})$ by $\rho_i^{(r+2)} u_{i,t-2}$.

[26] The reason for this choice is that the value of $\varepsilon_{i,t-1}$ is likely to be close to its unconditional mean, i.e. zero.

3- Calculate the difference $\varepsilon^{h}_{i,t-1} = y_{i,t-1} - y^{h}_{i,t-1}$ and $u^{h}_{i,t-1} = \rho_i * u_{i,t-2} + \varepsilon^{h}_{i,t-1}$, where the $y^{h}_{i,t-1}$ is the solution for $y_{i,t-1}$ obtained using EP method. If the absolute value of $\varepsilon^{h}_{i,t-1}$ is less than a chosen tolerance level (i.e. if the convergence has been achieved)go to step 4, otherwise set $u_{i,t-2} = u^{h}_{i,t-1} / \rho_i$ and go to step 2.

4- Using the value of $u_{i,t-2}$ after the convergence, calculate $u_{i,t-1} = \rho_i * u_{i,t-2}$, and using the EP basic method solve the model (A2.1) for the period 't'.

To solve the model for periods 't+1' and beyond, we need to use only the EP basic method because the calculations of the expectation variables with respect to 't' information set, are available since the model is already solved for the period 't' . So, for example, to solve the model for the period 't+1' we can use the EP basic method and substitute the $u_{i,t}$ –terms which appear in the equations (with auto correlated errors) by

$$u_{i,t} = \rho_i * u_{i,t-1} + y_{i,t} - y^{h}_{i,t} \qquad \text{(A2.3)}$$

A2.2 The Estimation of the Shocks For the Period 1981-1996 and The Stochastic Simulations

In order to estimate the structural shocks for the period 1981-1996 the model is solved for each quarter using the EP method for the serial correlation case as explained above. However, when solving for each quarter 't' the values of the variables with subscripts less than 't' have been put equal to their actual values, so that the solutions of the model correspond to one step ahead forecasts(within the sample) with the expectations of two exogenous variables (money supply and government expenditure) put equal to their actual values. Finally the shocks have been calculated for each sample point as the difference between the data and the model solutions.

In order to conduct stochastic simulations the above described extended path method which corresponds to deterministic simulations is modified so that the disturbances are not set to their expected values (i.e. zero) but rather generated from the estimated N(0, Σ) distribution. The model has been solved for 100 different draws corresponding to 100 different seed numbers of the random number generator.

The Factorisation of the Variance Covariance Matrix of the Structural Shocks

The main reason for the estimation of the structural shocks is to use their estimated variance covariance matrix in the stochastic simulations of the model. Let's call S, the estimated 96 by 96 variance covariance matrix of the structural shocks (see Kadareja (2000) for more on the estimation of the variance-covariance matrix of the structural shocks). We assume that the structural shocks are distributed as N(0, S).

In order to generate normal random shocks with the same variance covariance matrix as the estimated ones the factorisation of S is necessary. This task is somewhat problematic because in our case the S matrix is singular due to its size (equal to the number of shocks, i.e. 96) exceeding the data sample size used in the estimation of the shocks (61) and so the Choleski factorization method can not be used. However, a modified Choleski numerical method that does this job exists and is programmed as a TSP procedure, called YLDFAC[27]. So, given that the matrix S, though singular, is symmetric and positive semidefinite, the modified Choleski method can be used to factor it as the following,

$$S = A * D * A' \qquad (2.1)$$

where A is a lower triangular matrix and D is a diagonal matrix. The diagonal elements of A are normalised to 1 and the elements of D, being non-negative, are functions of the eigenvalues of S. Once the factorisation is implemented, from the matrixes A, D and the randomly generated column vector SN containing 96 independent standard normal variables, the column vector VN of size 96 can be constructed as follows

$$VN = A * D^{1/2} * SN \qquad (2.2)$$

[27] See TSP reference manual, 1988.

So, by construction it is clear that the vector of generated shocks VN comes from the estimated distribution of the structural shocks, i.e. ~ N(0,S). It is the vector VN, generated for each period 't'(according to 2.2) , which will be used to hit the respective equations of the model for the stochastic simulations. Note, that using a random number generator we can generate a large enough number of vectors $SN_i \sim N(0,I_{96})$, and according to (2.2) $VN_i \sim N(0,S)$; in order for the stochastic simulations results to be fairly robust with respect to the seed number. Similar to Monte Carlo experiments, by choosing a reasonably large number of the realisations of the shocks (in our case 100), the reliability of the simulations results could increase.

On the other hand the sample estimated shocks themselves can be used for stochastic simulations. This is done for European Monetary Union simulations as a robustness check for non-normalities visually present in the graphs of some shocks.

One problem with the stochastic simulations is the implicit assumption that the properties of the disturbances in the future will be like those in the past, but as Taylor (1993) says this is a problem for any empirical analysis based on actual data.

APPENDIX A3

Sensivity Analysis

The inspection of some graphs of the shocks (in Kadareja (2000), chapter II) reveals that in contrast to the generated shocks which are normal by construction, the estimated series of the shocks contain non-normalities. So, it is of interest to see to what degree the results taken from 100 stochastic simulations using the shocks generated by the estimated variance covariance matrix (i.e. table 2.4 results) are supported by the results taken from only one stochastic simulation using the estimated shocks themselves to hit the model.

For this purpose the flexible regime and the flexible regime with EMU have been simulated using only the estimated series of shocks and the results are shown in table 2.6. In tables 2.4 and 2.6 a country symbol position within the first two columns implies that for that country and for the corresponding row variable the corresponding column regime results in more stability, whereas a country symbol position in the third column implies stability equivalence of the two regimes (for that country and for the corresponding row variable).

The sensivity analysis for non normalities is done by the comparison of the entries in tables 2.4 and 2.6. This comparison is compactly shown in table 2.7. In table 2.7 the entry ‘10', for example, corresponding to row ‘Italy’ and column ‘Robust’, implies that 10 positions for Italy (indicated by the symbol ‘I’) in tables 2.4 and 2.6 coincide, i.e. 10 results for Italy are robust to non-normalities. In the column ‘Rejected’ are included the contradictory cases when for a given country and a given variable the same regime results more stable say in table 2.4 and less stable in table 2.6. All the remained cases are included in the column ‘Weakly Rejected’.

As can be seen from the table 2.7 ‘Total’ row, from the results reported in table 2.4, there are more ‘Robust’ than ‘Rejected’ and ‘Weakly Rejected’ results, taken together. There are no big differences across EMU members with this regard, so there is no rejection for the results concerning Italy, and two rejections concerning France (real long term interest rate and CPI more stable under EMU), Germany (more stability under the flexible regime for short term interest rates and government expenditure) and UK(more stability under flexible regime for GDP deflator and wages). As a conclusion the normality check does not call into question any of the gains in stability under EMU regime concerning all members (with the exception of French long term real interest rates and CPI), but it suggests that the losses in Germany and UK under EMU should be taken with caution.

Table 2.6

Comparisons of EMU versus floating exchange rates for EMU countries and EMU effects on CH (Results are taken from one stochastic simulation using the estimated shocks. The parameters of the monetary rules are in all cases á$_1$=2.0, â$_1$=0.3; the parameters of the fiscal rules are ë=-0.8 and ê=-0.15, the restrictions of SGP are imposed, the exceptional clause of SGP is not invoked)

	EMU COUNTRIES			CH
	FLEXIBLE	EMU	EQUAL	
OUTPUT	0	I	UK,G,F	EQUAL
CONSUMPTION	G	I	F,UK	EMU
INVESTMENT	G	I,UK,F	0	EMU
NET EXPORTS (% of GDP)	0	G,UK,I,F	0	EMU
EXPORTS	0	G,I,F,UK	0	EMU
IMPORTS	0	I,F,UK	G	EMU
EXCHANGE RATE	0	I,F,UK	G	EQUAL
INTEREST RATES	0	I,G,UK,F	0	EMU
REAL INTEREST RATES	F	I	UK,G	EQUAL
CPI	F	G,UK,I	0	EMU
GDP DEFLATOR	F	G,UK	I	EMU
EXPORT PRICES	0	G,I,F,UK	0	EMU
IMPORT PRICES	0	G,I,F,UK	0	EQUAL
WAGES	F	UK	G,I	EQUAL
GOVERNMENT EXPENDITURE	F,UK	G	I	EMU

Note: *see the note to table 2.3.*

Table 2.7: Check of robustness to non-normalities

EMU Countries	Robust	Weakly Rejected	Rejected
Italy	10	5	0
France	8	5	2
Germany	9	4	2
United Kingdom	9	4	2
Total	36	18	6

Table 2.4 shows the results taken from 100 stochastic simulations, i.e. we have simulated the model using the random number generator for 100 different seed numbers. To discriminate between regimes the metric used is the average across 100 simulations of the root mean squared percentage deviation from the baseline path. To see whether the RMSD average is independent of the seed numbers used in generating the shocks we have constructed a test linked with the number of simulations. The results are shown in table 2.8. The principle of the test considering two possible cases is described as follows ;

a- The case when RMSD averages indicate one regime as stability superior versus the other (i.e. for the results reported in the columns «FLEXIBLE» and «EMU» of table 2.4). If for a given country, a given economic variable results more stable under the regime 'x' using the averages, then this result is considered «not rejected at 20% level of significance» if 80 or more out of 100 stochastic simulations produce more stable results for that variable under the regime 'x', but «rejected at 20% level» if the opposite is the case. So, for example, the entry «UK11" corresponding to the row 'Output' and column 'EMU' in table 2.4, means that under EMU regime the output in UK results to be more stable than under flexible regime in 89 out of 100 stochastic simulations. According to the principle of the test the result 'UK11' in table 2.4, is translated into a Table 2.8 entry +1 in the row 'United Kingdom' and column 'Not Rejected at 20% level', whereas corresponds to a Table 2.8 entry +1 in the row 'United Kingdom' and column 'Rejected at 20% level' the entry 'UK31' in the row 'Exchange rates' and the column 'EMU' of the table 2.4.

b- The case when RMSD averages indicate that both regimes are equally stable (i.e. for the results reported in the column 'EQUAL' of table 2.4). If for a given country, a given economic variable results equally stable under both regimes using the averages, then this result is considered «not rejected at 20% level of significance» if out of 100 stochastic simulations, the number of simulations which indicate as more stable the flexible regime falls in the interval (30, 60), but «rejected at 20% level» if the opposite is the case. So, the table 2.4 almost ideal «CPI» row entry 'I51' corresponds, of course, to a table 2.8 entry +1 in the row 'Italy' and column 'Not rejected at 20% level'.

The 'Total' row of the table 2.8 suggests that 44 results of the table 2.4 are robust to seed numbers and 16 are not. So, on one hand should be taken with caution the stability gains under EMU of investments, real long term interest rates and CPI in France, and CPI and exchange rates (vis à vis US$) in UK; and on the other the stability losses under EMU of short term interest rates and government expenditure in Germany, GDP deflator and government expenditure in France, and wages in UK.

Table 2.8

Check of robustness with respect to the seed number of simulations (at 20% level)

EMU Countries	Not Rejected at 20% level	Rejected at 20% level
Italy	14	1
France	8	7
Germany	9	6
United Kingdom	13	2
Total	44	16

Data and Computer Programs

Data

The data series were obtained from the following sources :

1. OECD's Main Economic Indicators (compact disc)
2. OECD's Quarterly National Accounts (compact disc)
3. International Financial Statistics (compact disc)
4. The Swiss annual wage data series was obtained from Swiss Statistics Yearbook 1999.

For a full description of the data conversion and other data sources see Taylor (1993a)

Computer programs

The estimation of all equations of the model, excluding the wage equations, was done using

E-Views 3.1. The estimation methods are Generalized Methods of Moments, Two Stage Least Squares, Non-linear Two Stage Least Squares and Least Squares.

A program, which implements Dagli&Taylor and D-F-P algorithms for the maximum likelihood estimation of the wage equations, was written in Shazam 7.0.

The program for the estimation of the structural shocks for the period 1981-1996 is written in Fortran 90 (included in Microsoft Developer Studio). This program has been built upon the Taylor’s original Fortran 77 file « extpath.f ».

The factorization of the estimated variance covariance matrix of the shocks, is done using the TSP routine YLDFAC.

The programs for stochastic and deterministic simulations are written in Fortran 90, based on Taylor’s original Fortran 77 file « extpath.f ».

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