A simple empirical measure of central banks' conservatism

Levieuge, Grégory and Lucotte, Yannick

Laboratoire d'Economie d'Orléans, Université d'Orléans, CNRS

28 April 2012

A Simple Empirical Measure of Central Banks' Conservatism

Grégory Levieuge* & Yannick Lucotte†

Abstract

In this paper we suggest a simple empirical and model-independent measure of Central Banks' Conservatism, based on the Taylor curve. This new indicator can easily be extended in time and space, whatever the underlying monetary regime of the considered countries. We demonstrate that it evolves in accordance with the monetary experiences of 32 OECD member countries from 1980, and is largely equivalent to the model-based measure provided by Krause & Méndez [*Southern Economic Journal*, 2005]. We finally bring forward the interest of such an indicator for further empirical analysis dealing with the preferences of Central Banks.

Keywords : Central Banks' preferences, Conservatism, Taylor curve, Taylor rule

Code JEL : E43, E47, E52, E58

1 Introduction

For at least three decades, normative academic studies on optimal monetary policy rules have relied on the assumption that the monetary authorities follow a quadratic loss function, which penalizes the deviation of the objective variables from their respective target. Precisely, this loss function includes on the one hand the deviation of inflation with respect to its target and on the other hand the gap between GDP and its potential (i.e. the output gap). As there is an inflation-output variability trade-off, each of these objective variables are weighted according to the relative importance given by the authorities. The more the relative weight on inflation (output gap) stabilization in the loss function, the more vigorous the reaction coefficient on inflation (output) in its policy rule, at the expense of a higher output (inflation) variability. The determination of optimal monetary policies requires a measure of relative preferences. Since they are a priori unknown, economists had to either assign "ad hoc" preferences to Central Banks, or to deal with a large range of

*Corresponding author. Laboratoire d'Économie d'Orléans (LEO), UMR CNRS 7322, Rue de Blois, B.P. 6739, Orléans Cedex 2. Email : gregory.levieuge@univ-orleans.fr

†Laboratoire d'Économie d'Orléans (LEO), Email : yannick.lucotte@univ-orleans.fr

preference parameters to determine an efficient policy frontier, instead of a single optimal policy rule.

This was the case until Woodford (2003) demonstrated that the usual quadratic loss function ascribed to the Central Bank can be derived from the utility function of the representative agent[1]. This approach gives two advantages. First, it justifies the microeconomic foundations of the objective of the Central Bank to fight against inflation. Second, it removes any uncertainty surrounding the value of the preference parameters, as the latter might be determined by a combination of structural parameters of the underlying macroeconomic model.

Nevertheless, the hypothesis - now accepted as an norm - that Central Banks' preferences match those of the society, should be empirically evaluated. There are at least three arguments calling for a reevaluation. First, a large strand of the literature starting with Rogoff (1985) has demonstrated that a central banker more conservative than the society was a desirable solution to solve the inflation bias problem. In this view, the Central Bank and the households do not share the same preferences. Second, while the relative anti-inflationary preferences of the agents have considerably decreased[2] since the 1980s (due to the actual non-inflationary environment), keeping a low inflation remains the top priority of the Central Banks. Moreover, the preferences of the median voter vary over time, therefore explaining political changes. If the Central Bank were to follow these varying preferences, its behavior would change each time a new government or parliament house is installed. However, this is at odds with the main principle of Central Bank independence (hereafter CBI). Third, the Central Bank conservatism (hereafter CBC) is likely to be explained not only by economical structural parameters, but also by institutional and political factors (e.g. legal status of the Central Bank, political check and balances, political stability, wage-setting institutions, parliamentary systems), as it is the case for CBI[3].

So, such a measure of Central Banks' preferences, actually a measure of CBC, is needed in order to evaluate the assumption of an utility-based Central Bank's loss function. Unfortunately, there are very few attempts to reveal it, contrary for instance to the numerous indicators of CBI[4], and even the existing references give very heterogeneous results due to their model-dependence. In order to fill this gap, the objective of this article is to provide a simple and reliable measure of CBC. Based on the Taylor curve, we construct an empirical indicator, labelled $CONS$, which can easily be expanded in time and space, whatever the underlying monetary regime. Moreover, we demonstrate that our indicator is reliable. Not

[1]For details, see Woodford (2003, Chap. 6).

[2]For the European countries see for instance the Eurobarometer Survey Series published by the European Commission.

[3]See e.g. Eijffinger & De Haan (1996), Farvaque (2002), D'amato, Pistoresi & Salsano (2009).

[4]See e.g. Banaian (2008) for a detailed survey of CBI indicators. This can explain why the relation between CBC and CBI is still not well-known. This point will be discussed in section 5.

only does it evolve in accordance with the monetary history of the 32 OECD countries over the 1980-1998 period, but it is also largely equivalent to the model-based measure provided by Krause & Méndez (2005). However, a main difference remains: their measure assumes a monetary policy based on an interest rate rule, what is inappropriate for countries following a currency board, a money growth targeting or an exchange rate pegging. This limits the geographical extension of their indicator, whereas the $CONS$ measure does not require this restrictive (and sometimes fallacious) assumption.

This paper is organized as follows. The first section reviews the literature, focusing on Krause & Méndez (2005), whose results are taken as a reference. The method for determining an alternative CBC indicator and the corresponding results for the OECD countries are presented in section 3. Some comparisons through time and space reveal that the $CONS$ indicator is in compliance with the monetary history and reputation of the countries under study. Moreover, we demonstrate in section 4 that $CONS$ is equivalent to the measure provided by Krause & Méndez (2005) in terms of optimal monetary policy and resulting interest rate paths. In section 5 the advantages of such an indicator are brought forward for further empirical analysis dealing with the preferences of Central Banks. The last section concludes.

2 The existing literature

For at least three decades, academic studies about optimal monetary policy have assumed that the Central Bank optimizes a quadratic loss function following:

$$\mathfrak{L} = E_t \left[\lambda \left(\pi_t - \overline{\pi}_t \right)^2 + (1-\lambda) \left(y_t - \overline{y}_t \right)^2 \right] \quad \text{with} \quad 0 \leqslant \lambda \leqslant 1 \tag{1}$$

where λ represents the preferences of the Central Bank regarding the stabilization of inflation (π_t) around its target $\overline{\pi}_t$, relatively to the weight attached to the stabilization of the output gap ($y_t - \overline{y}$). The higher λ, the more the Centrak Bank is said *conservative* in the sense of Rogoff (1985).

There are very few attempts in the literature to reveal the CBC. The main contributions rely on a similar method, which consists in deducing the λ parameter in (1) by an identification procedure from an estimated small scale (static or dynamic) backward-looking macroeconomic model including a Taylor Rule[5]. These studies have at least three limits. First, they only concern a small sample of countries, what consequently renders impossible a large sample econometrical study of the CBC determinants (as for example the institutional or political ones). Second, the degree of CBC considerably varies from a study to an other. As an example, the table 1 reports the weight on output relative to inflation stabilization, i.e. the value of $(1-\lambda)/\lambda$, found in the literature for the United States. In line with the dual mandate of the FED, Ozlale (2003) finds a nearly equivalent weight for

[5]Dennis (2006) differs slightly from other studies by using likelihood methods to jointly estimate the policy constraints and the policymaker's decision rule.

output and inflation stabilization in the FED's loss function. The importance of output stabilization is confirmed by Cecchetti & Ehrmann (2002) and Krause & Méndez (2005) - hereafter KM. Neverthless, the weight attached to the output stabilization is insignificant according to the remaining studies[6]. As the studying period and the methodological approach are quiet the same, these differences suggest that the results are very model-dependent. Third, these contributions offer a constant value of λ, covering their entire sample. Certainly, the CB preferences are not likely to radically change in the short run. However some evolutions are possible and should be taken into account. Indeed, the degree of conservatism might tipically change when a country turns to an Inflation Targeting framework, when it decides to follow a disinflation policy, when it changes its exchange rate regime, or when the independence of its Central Bank is legally modified.

Reference	$(1-\lambda)/\lambda$	Period
Ozlale (2003)	0.49	$1979:3-1999:1$
Cecchetti & Ehrmann (2002)	0.35	$1981:1-1997:4$
Krause & Méndez (2005)$^{(1)}$	0.17	$1978:1-2000:4$
Dennis (2006)	0.00	$1982:1-2000:2$
Favero & Rovelli (2003)	0.00	$1980:3-1998:3$
Castelnuovo & Surico (2003,2004)	0.00	$1987:3-2001:1$
Tachibana (2004)	0.00	$1980:1-2000:4$

(1) Here is considered the mean value of the quarterly $(1-\lambda)/\lambda$ found over the mentionned period

Table 1: The results found in the literature about the United States

It is worth noting that KM constitutes one of the most advanced contribution, as it is not concerned by the first nor the third limit. In line with the aforementioned references, they consider a usual quadratic loss function as (1), a simple static AD-AS model, and a policy rule which is defined as $i = \beta_y d + \beta_\pi s$, with i the short-term interest rate, and d and s the demand and supply shocks respectively. Minimizing (1) under the constraints imposed by the structure of the underlying AD-AS model leads to analytically determine the optimal reaction coefficients of the policy rule (β_π^* and β_y^*). Obviously, the latter depends on the structural parameters of the model and on the degree of policy maker's conservatism λ. In other words, noting Φ the parameters of the AD-AS model, they analytically find $\beta_\pi^* = f(\Phi, \lambda)$. The parameter λ can then equivalently be formulated in terms of the reaction coefficients and the structural parameters of the model[7], so that: $\lambda = g(\Phi, \beta_\pi^*)$. Following this latter relation, and assuming that policy makers act optimally, they make

[6] Using an alternative method based on inverse-control theory, Salemi (1995) finds a clear decrease in the weight attached to the output stabilization since 1982.

[7] Note that contrary to Woodford (2003, Chap. 6), the λ coefficient is not derived here from the utility function of a representative household. The degree of conservatism is exogenous. However it is always possible to rewrite the analytical expression of the optimal coefficient β_π, which depends in part on λ, in order to pass the latter on the left side, and so formulating it in terms of β_π.

rolling regressions of dynamic near-VAR models in order to proceed to the identification of all the parameters (Φ, β_π^*). They can finally deduce annualy estimates of λ for 24 countries, from 1978 to 2002.

While perceptive, this way of revealing policy maker's preferences is also obviously model-dependent. In particular, they make the assumption that all the countries of their sample followed an interest rate rule, which was actually not the case, including for the OECD's countries at the early 1980s. On the contrary, in this paper, we propose an alternative measure of CBC, directly based on empirical observations, and easily expendable to a large set of countries, whatever the monetary policy regime.

3 Measuring Central Banks' Conservatism: A simple empirical approach

Our measure of CBC is inspired by the seminal paper of Taylor (1979), which argued for the existence of a "second order Phillips curve", in the sense that a monetary authority faces a permanent trade-off between the volatility of inflation and that of the output gap. This trade-off, leading to the negatively sloped so-called "Taylor curve", is represented in the figure 1, with the variability of the inflation rate (σ_π^2) on the horizontal axis and the variability of the output gap (σ_y^2) on the vertical axis. This curve is found joining all the theoretical $(\sigma_{\pi,i}^2, \sigma_{y,i}^2)$-pairs resulting from optimal monetary policies under given values of λ_i in (1), and given a structural model of the economy.

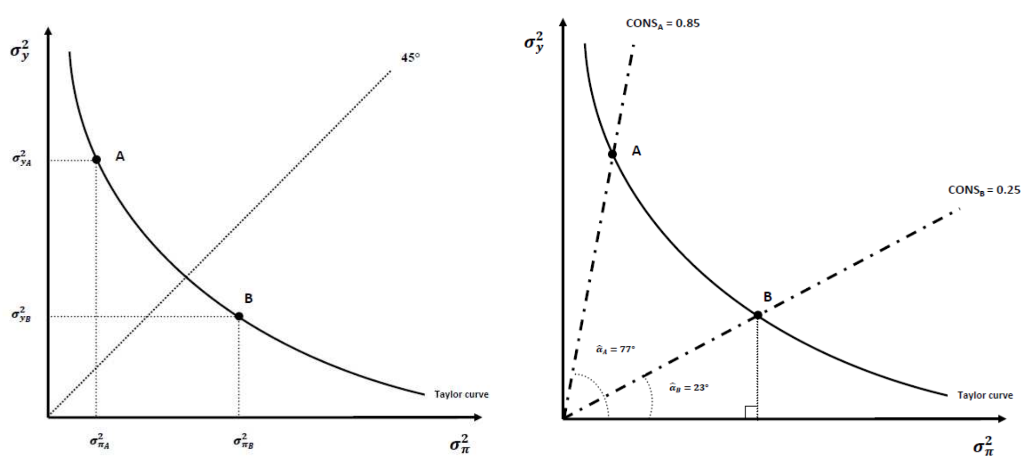

Figure 1: The Taylor Curve and the inflation-output variability trade-off

According to this theoretical standpoint, the observed position of an economy on this curve reveals the preferences of the Central Bank in terms of inflation stabilization (σ_π^2) relatively to the output one (σ_y^2). Indeed, while the first bisector corresponds to the case in which monetary authorities assign an equal weight to inflation and output variability in their loss function (1), a Central Bank is said more and more conservative as its corresponding point grows up along the Taylor curve from the right to the left, i.e. as inflation is more (and more) weighted than output variability in its loss function. For example, the point A in the figure 1 illustrates a case in which the Central Bank is more adverse to inflation variability than for the point B ($\sigma^2_{\pi A} < \sigma^2_{\pi B}$), while tolerating more output variability ($\sigma^2_{yA} > \sigma^2_{yB}$). The point A then reveals a more conservative stance than the point B.

This is the rationale for the method we put forward in this paper in order to reveal a new and easily computable index of CBC. This new index is based on the value of the angle of the straight line joining the origin and a given point on the Taylor Curve. Indeed, knowing empirical volatilities of inflation and output gap, i.e. respectively the adjacent side and opposite side in this case, it is possible to calculate any angle value, following the usual trigonometrical formula: angle(α) = $atan(\sigma^2_y/\sigma^2_\pi) \times 180/pi$. Once rescaled to $[0, 1]$, this angle measure constitutes a fair estimate of the relative degree of CBC, equivalent to the λ parameter of the loss function (1). In this line, we suggest a new method to calculate an indicator of CBC, noted $CONS$, given by:

$$CONS = \frac{1}{90}\left[atan\left(\frac{\sigma^2_y}{\sigma^2_\pi}\right) \times \frac{180}{pi}\right] \tag{2}$$

As σ^2_y and σ^2_π are easily observable whatever the country, over any period, computing this index is direct, simple and consistent with the theoretical literature based on the Taylor Curve[8]. This measure is illustrated in the right chart of the figure 1. Taking the United Kingdom as an example, the point B and A refer to the sub-periods 1980-84 and 1985-89 respectively. In line with Assenmacher-Wesche (2006), a straightening of the conservatism of the Bank of England is observed from the first to the second sub-period, with an increase of the angle from 23° ($\hat{\alpha}_B$) to 77° ($\hat{\alpha}_A$), corresponding to an increase of $CONS$ from 0.25 to 0.85 respectively, according to (2).

As a whole, following the formula (2), we calculate this $CONS$ index for a large sample of OECD countries using quarterly data from 1980 Q1 to 1998 Q4, since many of OECD countries have joined the European Monetary Union in 1999. The data are drawn from the IMF's International Finance Statistics and the OECD database. As the CBC is not likely to be very volatile, we consider four non-overlapping sub-periods: 1980 Q1 - 1984 Q4, 1985 Q1 - 1989 Q4, 1990 Q1 - 1994 Q4, and 1995 Q1 - 1998 Q4. The output gap is calculated as the residuals of a regression of the log of real GDP on a constant and a quadratic trend (see e.g. Clarida, Gali & Gertler (1998)). Inflation and output gap volatilities correspond to their respective variance. Results are reported in the table 2.

[8]Of course, other factors, independent of the monetary policy and beyond central banks' control, such as demand or supply shocks, can in practice affect σ^2_y and σ^2_π. This point will be discussed in detail in section 5, in which we present notably an alternative $CONS$ index that takes shocks into account.

Country	1980-84	1985-89	1990-94	1995-98	Average 80-98
Australia	0.501	0.882	0.497	0.174	0.513
Austria	0.318	0.805	0.978	0.847	0.737
Belgium	0.717	0.630	0.967	0.888	0.801
Canada	0.487	0.993	0.733	0.962	0.794
Chile	0.693	0.655	0.612	0.981	0.735
Czech Republic			0.737	0.918	0.828
Denmark	0.428	0.971	0.972	0.964	0.834
Estonia			0.012	0.196	0.104
Finland	0.504	0.970	0.961	0.989	0.856
France	0.096	0.763	0.944	0.927	0.682
Germany	0.669	0.852	0.917	0.872	0.827
Greece	0.652	0.398	0.424	0.534	0.502
Iceland	0.022	0.571	0.388	0.994	0.494
Ireland	0.034	0.687	0.969	0.946	0.659
Israel	0.004	0.007	0.666	0.819	0.374
Italy	0.285	0.562	0.861	0.201	0.477
Japan	0.829	0.902	0.910	0.665	0.826
Korea Republic	0.038	0.693	0.352	0.953	0.509
Mexico	0.016	0.007	0.145	0.107	0.069
Netherlands	0.655	0.504	0.967	0.952	0.769
New Zealand	0.293	0.388	0.865	0.558	0.526
Norway	0.372	0.881	0.899	0.944	0.774
Poland			0.002	0.150	0.076
Portugal	0.449	0.651	0.78	0.886	0.691
Slovak Republic			0.383	0.564	0.473
Slovenia			0.002	0.399	0.200
Spain	0.678	0.784	0.961	0.833	0.814
Sweden	0.588	0.897	0.626	0.823	0.733
Switzerland	0.715	0.717	0.713	0.920	0.766
Turkey	0.001	0.032	0.113	0.158	0.076
United Kingdom	0.254	0.856	0.544	0.896	0.637
United States	0.572	0.873	0.774	0.911	0.782

Table 2: The $CONS$ index for 32 OECD Countries (4 sub-periods and average)

A preliminary assessment of the factual properties of this index can be made with respect to the monetary history of OECD countries. First, we plot in figure 2 the values of $CONS$ index for different periods in order to assess its evolution. As a whole, the fact that most countries are located above the 45° line indicates a general increase of CBC in OECD economies, between the first and the second sub-periods considered (indicated in horizontal and vertical axis respectively). This is clearly the case between the 1980s and the 1990s (left plot), this latter decade often described as the "Great Moderation". Such an evolution of CBC particularly reflects changes in Central Banks' legislation and in their practices and, more generally the changing face of central banking over the last three decades (see e.g. Siklos (2002), Crowe & Meade (2007)). The right plot of the figure 2 shows furthermore that this increase of CBC obviously starts over the 1980s, decade characterized by active disinflation policies in many OECD countries.

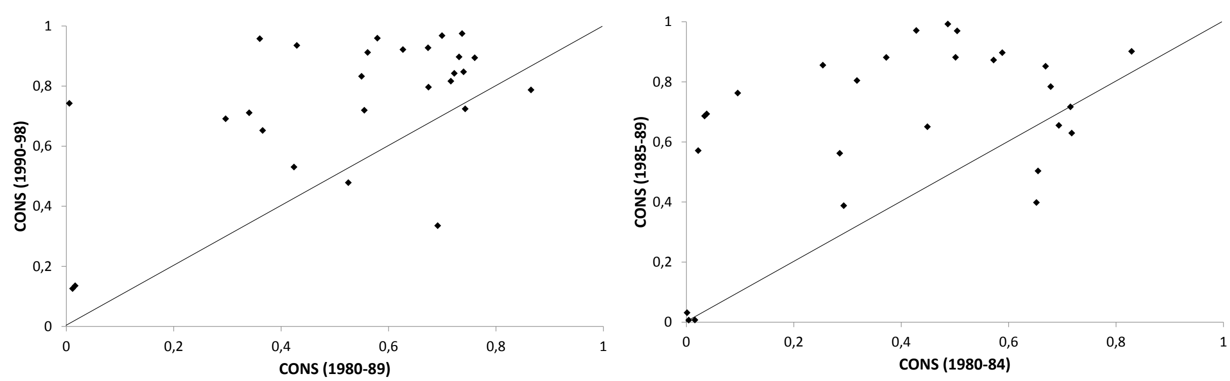

Figure 2: Evolution of Central Banks' Conservatism since 1980

Second, we plot in figure 3 the $CONS$ index with the log of inflation for two periods: 1980-99 and 1995-98. As it can be seen, there exists a negative relationship between the degree of CBC and the inflation level. This means that, on average, conservative Central Banks are associated with lower inflation rates than non-conservative ones. This result is in line with previous empirical findings indicating a positive link between inflation level and inflation variability. It is also consistent with studies reporting a tight relationship between CBI and inflation performance (see e.g. De Haan & Klomp (2010)).

Finally, we study whether the evolution of $CONS$ index is linked to monetary and institutional arrangements. Figure 4 (left plot) shows $CONS$ index for the inflation targeting countries before and after the adoption of this monetary policy framework[9]. We can see that all the countries, excepted Australia and to a lesser extend Sweden, are located above

[9] Over the decade 1990-99, twelve OECD countries have made the choice of adopting inflation targeting. These countries are: New Zealand (1990), Canada (1991), Chile (1991), United Kingdom (1992), Israel (1992), Australia (1993), Finland (1993), Sweden (1993), Spain (1995), Czech Republic (1997), Poland (1998), and Korea (1998).

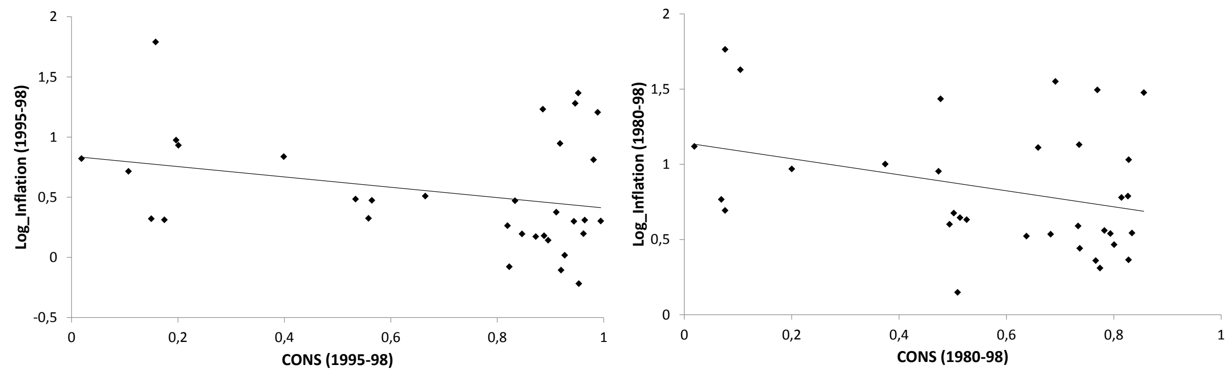

Figure 3: Central banks' conservatism and inflation performance

the 45° line. This may indicate an increase in the weight assigned to the stabilization of inflation in the loss function of inflation targeting Central Banks. Also, it seems to agree with the view of inflation targeting opponents who criticize this monetary policy strategy for excessively focusing on the inflation objective. The right plot in figure 4 shows the evolution of $CONS$ index between the 1980 and 1990 decades for the countries (excepted Luxembourg) that have joined the European Monetary Union in 1999. Results indicate a relatively high increase of CBC in these ten countries. They reflect the institutional and monetary features of the European integration laid down in the Maastricht Treaty (1992), with as reference the Bundesbank, known as one of the most independent and conservative Central Bank in the world. Hence, these plots seem to capture the major evolutions of institutional and monetary history of OECD countries and their central banking practices.

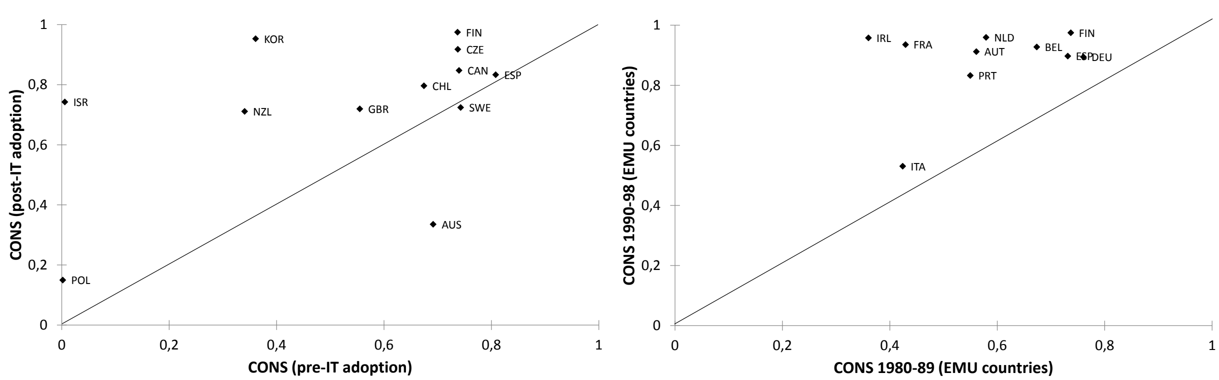

Figure 4: Monetary arrangements and the evolution of Central Banks' conservatism

4 Is $CONS$ a reliable indicator?

In absolute terms, it is impossible to determine whether $CONS$ is a good measure of conservatism. Nevertheless, the previous section demonstrated that the $CONS$ index delivers very intuitive and coherent information about the preferences of Central Banks for the 32 OECD countries considered, given their past experiences (in terms of disinflation policies, adoption of Inflation Targeting framework, transition to EMU, reputation, etc.).

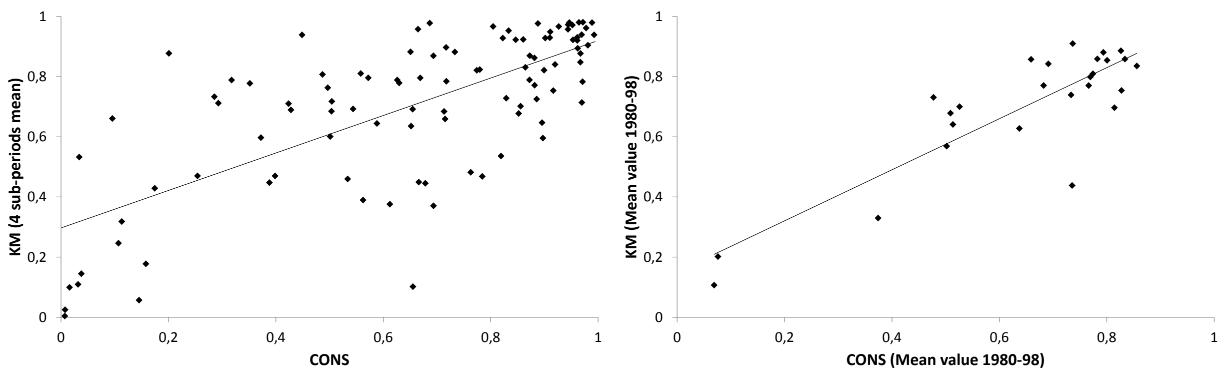

Figure 5: The link between $CONS$ and KM

We now compare in this section the $CONS$ index with the indicator provided by KM, which constitutes a valuable reference in terms of CBC measure. The figure 5 (left plot) displays the correlation between $CONS$ and a 5-year mean value of the indicator computed by Krause & Méndez (noted KM and corresponding to the sub-periods considered in this paper) for a common sample of 25 countries[10]. As indicated in table 3, the two measures are highly correlated, with a Pearson coefficient of 71.6%. The link between the 1980-1998 mean value of KM and $CONS$ is even better (cf. right plot of figure 5); the corresponding Pearson coefficient reaches 85.8% in this case. The Spearman ranking correlation confirms the substantial link between the two indicators, but with a lower correlation for the first sub-period. This difference with KM for the 1980-1984 period is not unfavorable to our indicator. Indeed, contrary to us, KM assume that the countries followed an interest rate policy rule, which was not true for a majority of countries over this first sub-period.

	Mean 1980-98	1980-84	1985-89	1990-94	1995-98	4 sub-periods
Pearson Coef.	0,8581	0,4521	0,7637	0,7985	0,7536	0.716
Spearman Coef.	0,6991	0,2609	0,5726	0,8366	0,6568	-

Table 3: Correlation Coefficients between λ_{CONS} and λ_{KM}

[10]Precisely, we refer to the extended sample of countries considered in Krause & Méndez (2008). These data are available for download at http://userwww.service.emory.edu/ skrause/pdf/Lambdas.xls

In order to compare further our measure with KM, we demonstrate that both indexes yield comparable optimal policy rules. The method we propose to this end relies on the model used by KM to identify the parameters defining λ in their paper, based on Mojon & Peersman (2001) and given by:

$$\begin{cases} \tilde{y}_t = \beta_{1r}\left(\tilde{i}_{t-1} - \tilde{\pi}_{t-1}\right) + \beta_{1f}\tilde{f}_{t-1} + \sum_{j=1}^{2}\beta_{1j}\tilde{y}_{t-j} + \sum_{j=1}^{2}\beta_{1(j+2)}\tilde{\pi}_{t-j} + \varepsilon_{yt} \\ \tilde{\pi}_t = \beta_{2r}\left(\tilde{i}_{t-1} - \tilde{\pi}_{t-1}\right) + \beta_{2f}\tilde{f}_{t-1} + \sum_{j=1}^{2}\beta_{2j}\tilde{y}_{t-j} + \sum_{j=1}^{2}\beta_{2(j+2)}\tilde{\pi}_{t-j} + \varepsilon_{\pi t} \\ \tilde{f}_t = \alpha_1\tilde{f}_{t-1} + \alpha_2\tilde{f}_{t-2} + \varepsilon_{ft} \\ \tilde{i}_t = \beta_y\tilde{y}_t + \beta_\pi\tilde{\pi}_t + \varepsilon_{it} \end{cases} \tag{3}$$

Exactly as in KM, $\tilde{y}_t = y_t - \bar{y}_t$ represents the output gap, with y_t the log of GDP and $\bar{y}_t$ its potential, obtained by applying a HP filter. $\tilde{\pi}_t$ is the difference between the annualized change in Consumer Price Index and its target given by the linear trend of inflation. f is a variable whose aim is to capture the foreign disturbances. It is defined as the "*external price inflation*" by KM, and computed as the sum of the nominal exchange rate devaluation and the foreign inflation[11]. $\tilde{f}_t$ is f_t minus its mean value. $\tilde{i}_t$ is the demeaned 3-month monetary interest rate. The two first relations represent the AD and AS equations respectively. While $\tilde{f}$ is purely exogenous in KM, we defined it here as a fully-fledge equation in order to close the model. As usual for shocks process, it is assumed that $\tilde{f}_t$ only depends on its past values, following an AR(2) specification. The last equation is the monetary policy rule.

This system is estimated with the GMM over the 1990 Q1 - 1998 Q4 period, excepted for Turkey and Israel for which the estimations start in 1986 Q2 and 1989 Q4 respectively[12]. Then, for each country, we proceed to the minimization of the loss function (1) with respect to $\{\beta_y, \beta_\pi\}$, subject to the constraints imposed by the estimated structure of the system (3), and successively considering λ_{KM} and λ_{CONS}, the 1980-1998 mean value of KM and $CONS$ respectively. Details about the method can be found in appendix 1. We then obtain two alternative optimal policy rules[13], with reaction coefficients noted $(\beta^*_{y,KM}, \beta^*_{\pi,KM})$ and $(\beta^*_{y,CONS}, \beta^*_{\pi,CONS})$, associated to λ_{KM} and λ_{CONS} respectively. Finally, the estimated policy rule is successively replaced by this two optimal rules in the system (3), which is then submitted to dynamic historical simulations. Two series of simulated interest rates

[11]Concretely, $f_t = e_t + \pi^f_t$. e_t is the annualized percentage change of the exchange rate to the U.S. dollar, except of the U.S. (U.S.$ / U.K.£ exchange rate). π^f_t, the external inflation, is given by the annualized U.S. CPI inflation, except for the United States (annualized U.K. CPI inflation).

[12]The set of instruments is $\{\tilde{y}_{t-1}, \tilde{y}_{t-2}, \tilde{\pi}_{t-1}, \tilde{\pi}_{t-2}, \tilde{f}_{t-1}, \tilde{f}_{t-2}\}$. Given the few number of degrees of freedom for Israel, we use the 3SLS method for this country. Chile is excluded from this exercise because of lack of interest rate data.

[13]Given the underlying model, this exercise is likely to be subject to the Lucas criticism. But comparing the implications of λ_{CONS} in terms of optimal policy rule with respect to those delivered by λ_{KM} in another model would be less convincing than choosing exactly the same model as KM used.

are generated. The first is noted $\hat{i}_{KM,t}$ ($= \beta^*_{y,KM}\tilde{y}_t + \beta^*_{\pi,KM}\tilde{\pi}_t$). The second is $\hat{i}_{CONS,t}$ ($= \beta^*_{y,CONS}\tilde{y}_t + \beta^*_{\pi,CONS}\tilde{\pi}_t$). The two interest rates will be compared, in order to answer the following question: do the differences between λ_{CONS} and λ_{KM} imply very different reaction coefficients, and therefore really different Taylor rates?

The figures 7 to 9 in appendix 2 represent on the one hand the paths of simulated and actual[14] interest rates (left-side scale), and on the other hand the difference (in grey bars) between the two simulated series (right-side scale). Combined with the results reported in table 4 (cf. appendix 1), it appears that the countries can be divided into three categories:

1) Countries for which λ_{CONS} and λ_{KM} are approximately the same: Belgium, Denmark, Finland, France, Israel, Japan, Mexico, Netherlands, Norway, Sweden, Switzerland and United Kingdom. For these countries, the two series of simulated rates are inherently equivalent.

2) Countries for which the λ are different, but for which the elasticities of $\beta^*_{\pi,k}$ and $\beta^*_{y,k}$ to λ are weak ($k = \{CONS, KM\}$). Despite the a priori differences in terms of λ, the optimal reaction coefficients are very similar, and then the simulated interest rates are comparable: Canada, Germany, New Zealand, Portugal, Spain and the United States.

3) Countries for which the coefficients of conservatism are rather different, and so are the coefficients β^*_y and β^*_π. This is the case for: Australia, Austria, Greece, Ireland, Italy, Korea Republic and Turkey. But does this mean that the simulated interest rates are necessarily different? In order to compare them, we proceed to the following regression: $\hat{i}_{CONS,t} = \delta\hat{\hat{i}}_{KM,t} + u_t$ and test H0 : $\delta = 1$. According to the results reported in table 5 (appendix 1), the null hypothesis of equivalence between the two simulated series is accepted (at the 1% level) for Australia, Austria, Ireland, Korea Republic and Turkey[15].

As a general result, the equivalence between $\hat{i}_{CONS,t}$ and $\hat{i}_{KM,t}$ is only doubtful for two countries: Italy and Greece. Nevertheless, for Greece, the difference concerning the

[14]Note that the actual and simulated interest rates are demeaned. Moreover, some significant gaps with the paths of actual interest rates can sometimes be observed. This can be explained by the fact that the gradual adjustment of interest rate is neglected, in order again to match the model and policy rule considered by KM. Anyway, finding the set of parameters allowing to fit well the actual rate goes beyond the scope of this paper.

[15]Note that for a large majority of countries, the variance of the difference between the two simulated series is very weak (tending easily to 0.0001 for instance). It is logical: the two policy rules only differ (very often weakly) by the way they react more or less strongly to inflation and output gap. If the latter does not move very much, $\hat{i}_{KM,t}$ can stay a long time above or below $\hat{i}_{CONS,t}$, with a constant gap (corresponding to the differences in reaction coefficients). But if the error variance tends to zero, so does the variance of the estimator of δ. As a result, testing (H0) the equivalence between $\hat{i}_{CONS}$ and $\hat{i}_{KM}$ yields an overwhelmingly high statistic, leading to a doubtful rejection of H0, even if the two series are obviously equivalent. Last, this means that, for Italy and Greece, the simulated interest rates series might not be as different as what is obtained according to the statistical test.

1980-1998 sample mean value of λ is mainly due to the sole difference observed for the 1989-1994 sub-period. For the three other sub-periods, $CONS$ and KM are roughly the same. For the 23 remaining countries, the measure of conservatism provided by KM is certainly equivalent to ours.

5 Using CONS index: some research perspectives and guidelines

In this section, we briefly discuss the relevance of our measure of CBC and outline several practical suggestions for further empirical research. As emphasized above, the $CONS$ index is not model-dependent. This index is therefore easily expandable in time and space to a large sample of countries, whatever the monetary regime in place. Moreover, it is easy to calculate, as only data on inflation and GDP are required. These are considerable advantages in comparison with CBC measures previously developed in the literature.

In practical terms, $CONS$ index can find many empirical applications, both as dependent and explanatory variable. In the first case, it could typically be employed to test whether the changes in Central Banks' preferences can explain the "Great Moderation", characterized by a widespread decline of inflation rates. Indeed, as shown in figure 3, it seems that there exists a relatively tight relationship between the degree of CBC and inflation performance. Consequently, it would be interesting to test econometrically if the evolution of CBC has effectively contributed, with other factors such as structural changes and globalization, to the generalized disinflation observed during this period.

Concerning the use of $CONS$ index as a dependent variable, we think that two research areas merit further investigation. First, such an index can be useful to fill the gap in the literature about the linkage between CBI and CBC. Although both contribute to the effective degree of inflation aversion of monetary policy, they are two different concepts. While CBC deals with the degree of inflation aversion of the monetary authorities, CBI refers to the economic and political freedom that are given to the Central Bank for conducting policy in order to achieve its objectives (Lippi (1999)). Nevertheless, in accordance with Rogoff (1985), most theoretical papers usually abstracted from the distinction between CBI and CBC, assuming a monotonic relationship between the degree of independence and the degree of conservatism. The first notable exception is the paper by Eijffinger & Hoeberichts (1998), who show that conservatism and independence are strategic substitutes and that there exists a trade-off between them, in the sense that a society can make the choice of appointing a more conservative central banker to compensate a lack of CBI. Similar results are more recently obtained by Hughes Hallett & Weymark (2005), Weymark (2007), and Eijffinger & Hoeberichts (2008). Despite these theoretical developments, empirical studies still do not distinguish between CBI and CBC, by using *de jure* and *de facto* indicators as a proxy for CBC (see, e.g. Berger, De Haan & Eijffinger (2001), Hayo & Hefecker (2002)). This gap between theoretical and empirical research is certainly due to the lack of easily computable CBC index. Hence, extending the $CONS$ index to a larger sample of countries would allow to empirically contribute to this debate, and to assess whether independent Central Banks are really as conservative as their status suggest.

Moreover, $CONS$ index can be used as a dependent variable to investigate the impact of inflation targeting on the effective degree of conservativeness, and contribute to the debate between the opponents and the proponents of this monetary policy strategy. On the one hand, opponents consider inflation targeting Central Banks as “inflation nutters” (King (1997)), with in their opinion an excessive focus on inflation objective to the detriment of output stabilization. On the other hand, the proponents of inflation targeting claim that, in practice, inflation targeting Central Banks pay attention to more than just inflation objective. For them, inflation targeting is not a rule, but a framework of “constrained discretion” (Bernanke & Mishkin (1997)) which allows for the stabilization of output. Consequently, as suggested by the figure 4 (left plot), the $CONS$ index could be used to assess whether the adoption of inflation targeting has increased the degree of conservatism of inflation targeter Central Banks.

Nevertheless, some precautions should be taken using the $CONS$ index. Indeed, output gap and inflation variabilities are not the prerogatives of the sole Central Bank. The movement from point B to A in figure 1 for instance might not necessarily reflect the conscious willingness of the Central Bank to give more priority to the inflation stabilization. It can partially result from the decision of the government to adopt a more conservative stance in terms of fiscal policy, or from the combination of supply and demand shocks.

Concerning the influence of shocks, two cases can be identified. On the one hand, when the CBC index is used as an explanatory variable, these disturbances can directly be taken into account in an index like $CONS$, by weighting the ratio σ_y^2/σ_π^2 by $\sigma_{\varepsilon y}^2/\sigma_{\varepsilon\pi}^2$ in the formula (2), with $\sigma_{\varepsilon\pi}^2$ the variance of the supply shocks and $\sigma_{\varepsilon y}^2$ the variance of the demand shocks. We have calculated such a weighted $CONS$ indicator (labelled $CONS\_W$), with shocks identified from structural vector autoregressive (SVAR) models[16]. The values of $CONS\_W$ for the sample of 32 countries are represented in table 6 in appendix 3. In comparison with $CONS$, the CBC appears to be higher for Israel, Portugal, Iceland, Estonia, and to a lesser extend for Ireland. On the contrary, the CBC appears to be lower for Slovakia, the Czech Republic, Germany, Denmark and to a lesser extend for Australia. No radical changes are observed for the 22 remaining countries. The figure 6 (left plot) confirms that the correlation between $CONS$ and $CONS\_W$ is high over the 4 sub-periods (the Pearson coefficient reaches 0.89).

[16]The estimated reduced-form VAR models include the output gap, the inflation rate and the short term nominal interest rate. The restrictions on the structural model, required to proceed to its identification, are imposed in reference to the standard small-scale DGSE models widely used in monetary macroeconomics (See e.g. Woodford (2003)). They concern in particular a contemporaneous link between the short interest rate and both inflation and output gap (such as in a Taylor Rule). All details, including the implied optimal interest rate paths, are available from the authors upon request.

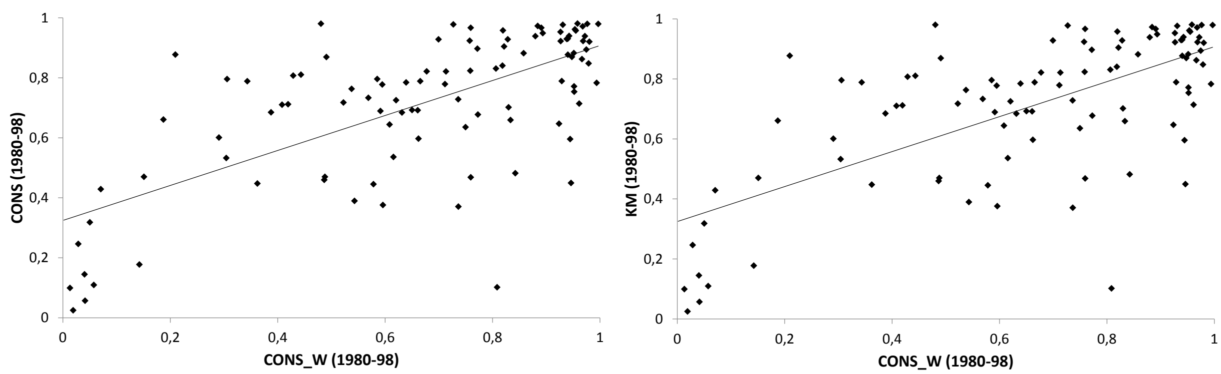

Figure 6: Correlation of $CONS\_W$ with $CONS$ and KM

Moreover, it is worth noting that for Germany, Ireland and Portugal $CONS\_W$ is closer than $CONS$ to KM. As a whole, considering the sample of 25 countries depicted both in the KM sample and in ours, and with respect to the analysis already developed in the previous section, changes are likely to concern only Israel and Denmark[17] (and to a lesser extend Australia). The test of equivalence between the optimal interest rate paths implied by λ_{KM} and λ_{CONS_W} (i.e. the mean value of $CONS\_W$ over the all period) leads to accept $H0$ for Israel (Statistics = 0.99 with P-Value = 0.381) but to reject $H0$ for Denmark (Statistics = 5.61 with P-Value = 0.005). The figure 10 in appendix 3 illustrates this gap for Denmark and Israel[18]. More, since $CONS\_W$ is not different from $CONS$ for Italy and Greece, we can conclude that $CONS\_W$ is significantly different from KM for Italy, Greece and Denmark. For the remaining 29 countries, the equivalence holds. The fact that taking the shocks into account does not disrupt the results obtained with $CONS$ implies that the latter is *per se* a good measure of CBC. One possible reason is that Central Banks readjust their stance following major shocks, in order to maintain their initial degree of conservatism. As a consequence, the impact of shocks would be diluted when using relatively low frequency data such as a 5-year sub-period. The figure 6 (right plot) illustrates the high correlation between $CONS\_W$ and KM (Pearson coefficient = 0.68). On the other hand, when the $CONS$ index has to be used as a dependent variable, it is also possible to use $CONS\_W$. But an alternative method for controlling shocks would consist in simply adding $\sigma^2_{\varepsilon y}$ and $\sigma^2_{\varepsilon\pi}$ as right-hand side variables.

In the same way, it is important to neutralize the influence of government preferences with control variables such as the structural deficit (i.e. a measure which denotes the actual leanings of the government, once the effects of the automatic stabilizers are neutralized), which are likely to explain the position of a country in the $(\sigma^2_\pi, \sigma^2_y)$-plan.

[17]In terms of average values of CBC indexes, λ_{KM}, λ_{CONS} and λ_{CONS_W} are equal to 0.330, 0.374 and 0.781 for Israel, and respectively to 0.858, 0.834 and 0.756 for Denmark. Note that Estonia, Slovakia, the Czech Republic and Iceland do not belong to the KM sample.

[18]Note that the equivalence between $\widehat{i}_{CONS\_W,t}$ and $\widehat{i}_{KM,t}$ is accepted for Australia, with statistics = 2.81 and P-Value = 0.07.

Finally, the position and the potential movements of the Taylor curve in this plan are worth pointing out. The Phillips Curve and the efficiency of the monetary policy are likely to explain them. For example, a more efficient monetary policy would trigger a leftward movement of the Taylor Curve, what makes σ_y^2 and σ_π^2 jointly decrease. Nevertheless, whatever this position, a given economy at a given date does have a $(\sigma_\pi^2, \sigma_y^2)$-pair which can be interpreted in terms of CBC (cf. figure 1). In other words, any movement of the Taylor Curve does not annihilate the inflation/output trade-off. Note that this point in itself casts some doubts on the assumption that the preferences of the CB are entirely structural-dependent. Indeed, while structural parameters (such as the NAIRU or the sacrifice ratio in this case) are likely to explain the position of the Taylor Curve, they are insufficient for explaining the position of the economy on this curve. The latter should depend on other factors, in particular on institutional and political ones. We consider the $CONS$ index to be adequate to test in depth these theoretical insights[19], and as a whole to conduct a large empirical study on the CBC determinants.

6 Concluding remarks

Given the few attempts to reveal the Central Banks' preferences and their limited reliability, the aim of this paper was to provide a simple and intuitive measure of Central Banks' Conservatism (CBC). To this end, we suggest an empirical measure, based on the Taylor Curve, labeled $CONS$. Contrary to the previous measures developed in the literature, this indicator is model-independent, and can easily be expanded in time and space, whatever the underlying monetary regime in place. We demonstrate that the $CONS$ indicator has evolved in accordance with the monetary experiences of 32 OECD countries from 1980. Moreover, this index is largely equivalent to the model-based measure provided by Krause & Méndez (2005), including in terms of implied optimal monetary policy. We finally bring forward the interest of and the precautions to take with such an indicator for further empirical analysis dealing with the preferences of Central Banks. A lot of fields of research could benefit from such an indicator, like studying the relation between CBC and Central Banks' Independence, assessing the influence of CBC on macroeconomic performance, or examining the impact of Inflation Targeting adoption on CBC. Besides, the $CONS$ index will allow to study in depth and understand all the factors that determine the actual degree of Central Banks' conservatism.

[19]Krause & Méndez (2005, 2008) precisely examine the effects of institutional and political factors on their CBC measure, but without controlling for the shocks, for the governments' preferences, nor for the potential effects of structural breaks.

References

Assenmacher-Wesche, K. (2006), 'Estimating central banks' preferences from a time-varying empirical reaction function', *European Economic Review* **50**(8), 1951–1974.

Ball, L. (1997), 'Efficient rules for monetary policy', *NBER Working Paper* (5952).

Banaian, K. (2008), Measuring central bank independence: Ordering, ranking, or scoring?, *in* K. Banaian & B. Roberts, eds, 'The Design and Use of Political Economy Indicators', Palgrave Macmillan, pp. 33–55.

Berger, H., De Haan, J. & Eijffinger, S. (2001), 'Central bank independence: an update of theory and evidence', *Journal of Economic Surveys* **15**(1), 3–40.

Bernanke, B. & Mishkin, F. (1997), 'Inflation targeting: a new framework for monetary policy?', *Journal of Economic Perspectives* **11**(2), 97–116.

Castelnuovo, E. & Surico, P. (2003), 'What does monetary policy reveal about a central bank's preferences?', *Economic Notes* **32**, 335–359.

Castelnuovo, E. & Surico, P. (2004), 'Model uncertainty, optimal monetary policy and the preferences of the Fed', *Scottish Journal of Political Economy* **51**(1), 105–126.

Cecchetti, S. G. & Ehrmann, M. (2002), Does inflation targeting increase output volatility?: An international comparison of policymakers' preferences and outcomes, *in* N. Loayza, K. Schmidt-Hebbel & N. Loayza, eds, 'Monetary Policy: Rules and Transmission Mechanisms', Vol. 4, Central Bank of Chile, chapter 9, pp. 247–274.

Clarida, R., Gali, J. & Gertler, M. (1998), 'Monetary policy rules in practice some international evidence', *European Economic Review* **42**(6), 1033–1067.

Crowe, C. & Meade, E. (2007), 'The evolution of central bank governance around the world', *Journal of Economic Perspectives* **69-90.**(4), 69–90.

D'amato, M., Pistoresi, B. & Salsano, F. (2009), 'On the determinants of central bank independence in open economies', *International Journal of Finance and Economics* **14**(2), 107–119.

De Haan, J. & Klomp, J. (2010), 'Inflation and central bank independence: a meta-regression analysis', *Journal of Economic Surveys* **24**(4), 593–621.

Dennis, R. (2006), 'The policy preferences of the us federal reserve', *Journal of Applied Econometrics* **21**(1), 55–77.

Eijffinger, S. & De Haan, J. (1996), 'The political economy of central bank independence', *Special Papers in International Economics* (19), Department of Economics, Princeton University.

Eijffinger, S. & Hoeberichts, M. (1998), 'The trade-off between central bank independence and conservativeness', *Oxford Economic Papers* (50), 397–411.

Eijffinger, S. & Hoeberichts, M. (2008), 'The trade-off between central bank independence and conservativeness in a new keynesian framework', *European Journal of Political Economy* **24**(4), 742–747.

Farvaque, E. (2002), 'Political determinants of central bank independence', *Economics Letters* **77**(1), 131–135.

Favero, C. A. & Rovelli, R. (2003), 'Macroeconomic stability and the preferences of the fed: A formal analysis, 1961-98', *Journal of Money, Credit and Banking* **35**(4), 545–556.

Hayo, B. & Hefecker, C. (2002), 'Reconsidering central bank independence', *European Journal of Political Economy* **18**(4), 653–674.

Hughes Hallett, A. & Weymark, D. (2005), 'Independence before conservatism: Transparency, politics, and central bank design', *German Economic Review* (6), 1–21.

Jondeau, E. & Le Bihan, H. (2002), 'Evaluating monetary policy rules in estimated forward-looking models: A comparison of us and german monetary policies', *Annales d'Économie et de Statistiques* **67-68**, 357–388.

King, M. (1997), 'Changes in uk monetary policy: Rules and discretion in practice', *Journal of Monetary Economics* **39**(1), 81–97.

Krause, S. & Méndez, F. (2005), 'Policy makers' preferences, party ideology and the political business cycle', *Southern Economic Journal* **71**(4), 752–767.

Krause, S. & Méndez, F. (2008), 'Institutions, arrangements and preferences for inflation stability: Evidence and lessons from a panel data analysis', *Journal of Macroeconomics* **30**(1), 282–307.

Lippi, F. (1999), *Central Bank Independence, Targets and Credibility: Political and Economic Aspects of Delegation Arrangements for Monetary Policy*, Edward Elgar Publishing Ltd.

Mojon, B. & Peersman, G. (2001), 'A var description of the effects of monetary policy in the individual countries of the euro area', *ECB Working Paper* (92).

Ozlale, U. (2003), 'Price stability vs. output stability: tales of federal reserve administrations', *Journal of Economic Dynamics & Control* **27**(3), 1595–1610.

Rogoff, K. (1985), 'The optimal degree of commitment to an intermediate monetary target', *Quarterly Journal of Economics* **100**(4), 1169–1190.

Salemi, M. (1995), 'Revealed preference of the federal reserve: Using inverse-control theory to interpret the policy equation of a vector autoregression', *Journal of Business & Economic Statistics* **13**(4), 419–433.

Siklos, P. L. (2002), *The Changing Face of Central Banking, Evolutionary Trends Since World War II*, Cambridge University Press.

Svensson, L. E. (2000), 'Open-economy inflation targeting', *Journal of International Economics* **50**(1), 155–183.

Tachibana, M. (2004), 'Central banks' preferences in Japan, the U.K., and the U.S.', *Japan and the World Economy* (16), 81–93.

Taylor, J. (1979), 'Estimation and control of a macroeconomic model with rational expectations', *Econometrica* **47**(5), 1267–1286.

Weymark, D. (2007), 'Inflation, government transfers, and optimal central bank independence', *European Economic Review* **51**(2), 297–315.

Woodford, M. (2003), *Interest and Prices, Foundations of a theory of Monetary Policy*, Princeton University Press.

Appendix 1: Method and results of policy rules optimization

The system (3) can be written in matrix form as: $A_1 X_t = A_2 X_{t-1} + W_t$, with the vector of all model variables $X_t = \left[\tilde{y}_t \ \tilde{y}_{t-1} \ \tilde{\pi}_t \ \tilde{\pi}_{t-1} \ \tilde{i}_t \ \tilde{f}_t \ \tilde{f}_{t-1}\right]'$, with the vector of (zero mean) serially uncorrelated disturbances $W_t = [\varepsilon_{yt} \ \varepsilon_{\pi t} \ \varepsilon_{it} \ \varepsilon_{ft}]'$, whose covariance matrix is given by $\Omega = E\left(WW'\right)$. The model can equivalently be written $X_t = BX_{t-1} + S_t$, with $B \equiv A_1^{-1} A_2$, $S_t \equiv A_1^{-1} W_t$ and $\Sigma = E\left(SS'\right) = A_1^{-1} \Omega \left(A_1^{-1}\right)'$ the associated covariance matrix. Note that estimating the system (3) comes to estimate B, S and W. We assume, as in KM, that $cov\left(\varepsilon_y, \varepsilon_\pi\right) = 0$.

Next, the optimization program consists in solving:

$$\begin{cases} \underset{\{\theta\}}{Min} & \mathfrak{L} = \lambda_j Var\left(\tilde{\pi}\right) + \left(1 - \lambda_j\right) Var\left(\tilde{y}\right) \\ s.t. & X_t = B(\theta) X_{t-1} + S_t \\ \text{with} & \theta = \left\{\beta^*_{\pi,j}, \beta^*_{y,j}\right\} \text{ and } j = \{CONS, KM\} \end{cases}$$

Following Svensson (2000)[20], the unconditional contemporaneous covariance matrix of X, noted V, is given in vector form by:

$$Vec(V) = \left[I - B \otimes B\right]^{-1} Vec(\Sigma) \tag{4}$$

Unconditional variances for the inflation rate and for the output gap are obtained by selecting the appropriate component in $Vec(V)$. Precisely, the unconditional variance of $\tilde{y}_t$ and $\tilde{\pi}_t$ are the first and 17$^{\text{th}}$ element of $Vec(V)$ respectively. So the optimization program consists in selecting the couple $\left(\beta^*_{\pi,j}, \beta^*_{y,j}\right)$ which gives the lowest value of the loss function defined as the sum of the first and 17$^{\text{th}}$ elements of $Vec(V)$, respectively weighted by $(1 - \lambda_j)$ and λ_j (the BFGS algorithm is used to this end).

Finally, substituting $\left(\hat{\beta}_\pi, \hat{\beta}_y\right)$, the estimated reaction coefficients, by the solution $\left(\beta^*_{\pi,j}, \beta^*_{y,j}\right)$, and launching dynamic historical simulations for the system allows to generate sequences of simulated interest rates (under the respective degree of conservatism λ_{KM} and λ_{CONS}).

[20] See also Ball (1997) and Jondeau & Le Bihan (2002) for instance.

Country	Value of $\lambda^{(1)}$		β_y^*	β_π^*	Country	Value of $\lambda^{(1)}$		β_y^*	β_π^*
Australia	$\lambda_{KM}=$	0.641	1.28	1.26	Korea. Rep.	$\lambda_{KM}=$	0.679	1.21	1.24
	$\lambda_{CONS}=$	0.513	1.41	0.95		$\lambda_{CONS}=$	0.509	1.33	0.55
Austria	$\lambda_{KM}=$	0.909	0.23	0.71	Mexico	$\lambda_{KM}=$	0.107	2.44	1.53
	$\lambda_{CONS}=$	0.736	0.33	0.63		$\lambda_{CONS}=$	0.069	2.46	1.49
Belgium	$\lambda_{KM}=$	0.854	1.30	3.03	Netherlands	$\lambda_{KM}=$	0.799	0.22	4.30
	$\lambda_{CONS}=$	0.800	1.59	2.89		$\lambda_{CONS}=$	0.769	0.21	4.29
Canada	$\lambda_{KM}=$	0.880	0.35	1.62	New Zealand	$\lambda_{KM}=$	0.700	0.77	1.61
	$\lambda_{CONS}=$	0.793	0.41	1.58		$\lambda_{CONS}=$	0.526	0.74	1.41
Denmark	$\lambda_{KM}=$	0.858	2.08	1.75	Norway	$\lambda_{KM}=$	0.809	0.56	0.21
	$\lambda_{CONS}=$	0.834	2.04	1.40		$\lambda_{CONS}=$	0.774	0.53	0.13
Finland	$\lambda_{KM}=$	0.835	0.41	1.77	Portugal	$\lambda_{KM}=$	0.843	0.26	2.05
	$\lambda_{CONS}=$	0.856	0.39	1.83		$\lambda_{CONS}=$	0.691	0.33	2.05
France	$\lambda_{KM}=$	0.628	1.43	1.36	Spain	$\lambda_{KM}=$	0.697	0.45	0.64
	$\lambda_{CONS}=$	0.637	1.42	1.39		$\lambda_{CONS}=$	0.814	0.40	0.68
Germany	$\lambda_{KM}=$	0.754	0.13	2.22	Sweden	$\lambda_{KM}=$	0.739	0.51	1.90
	$\lambda_{CONS}=$	0.827	0.13	2.23		$\lambda_{CONS}=$	0.733	0.51	1.89
Greece	$\lambda_{KM}=$	0.569	0.97	2.11	Switzerland	$\lambda_{KM}=$	0.770	1.73	1.85
	$\lambda_{CONS}=$	0.502	0.85	1.78		$\lambda_{CONS}=$	0.766	1.73	1.82
Ireland	$\lambda_{KM}=$	0.857	2.27	3.84	Turkey	$\lambda_{KM}=$	0.202	0.93	0.93
	$\lambda_{CONS}=$	0.659	4.08	2.64		$\lambda_{CONS}=$	0.076	0.90	0.78
Israel	$\lambda_{KM}=$	0.330	4.11	2.23	United Kingdom	$\lambda_{KM}=$	0.628	2.20	1.90
	$\lambda_{CONS}=$	0.374	3.91	2.56		$\lambda_{CONS}=$	0.637	2.19	1.96
Italy	$\lambda_{KM}=$	0.731	0.47	2.47	United States	$\lambda_{KM}=$	0.860	0.30	2.49
	$\lambda_{CONS}=$	0.477	0.86	2.01		$\lambda_{CONS}=$	0.782	0.34	2.48
Japan	$\lambda_{KM}=$	0.886	0.53	1.20					
	$\lambda_{CONS}=$	0.826	0.57	1.11					

(1): λ correspond to the mean value of λ_{KM} and λ_{CONS} over the period 1980-1998.

Table 4: Optimal Coefficients of Reaction (β_π^* and β_y^*) induced by λ_{KM} and λ_{CONS}

Country	Stat.	P-Value
Australia	2.79	0.067
Austria	3.10	0.052
Greece	85.2	0.000
Italy	40.6	0.000
Korea Republic	3.70	0.030
Turkey	0.13	0.881

Table 5: Tests of equivalence between $\hat{i}_{CONS,t}$ and $\hat{i}_{KM,t}$

Appendix 2: Figures of simulated interest rates

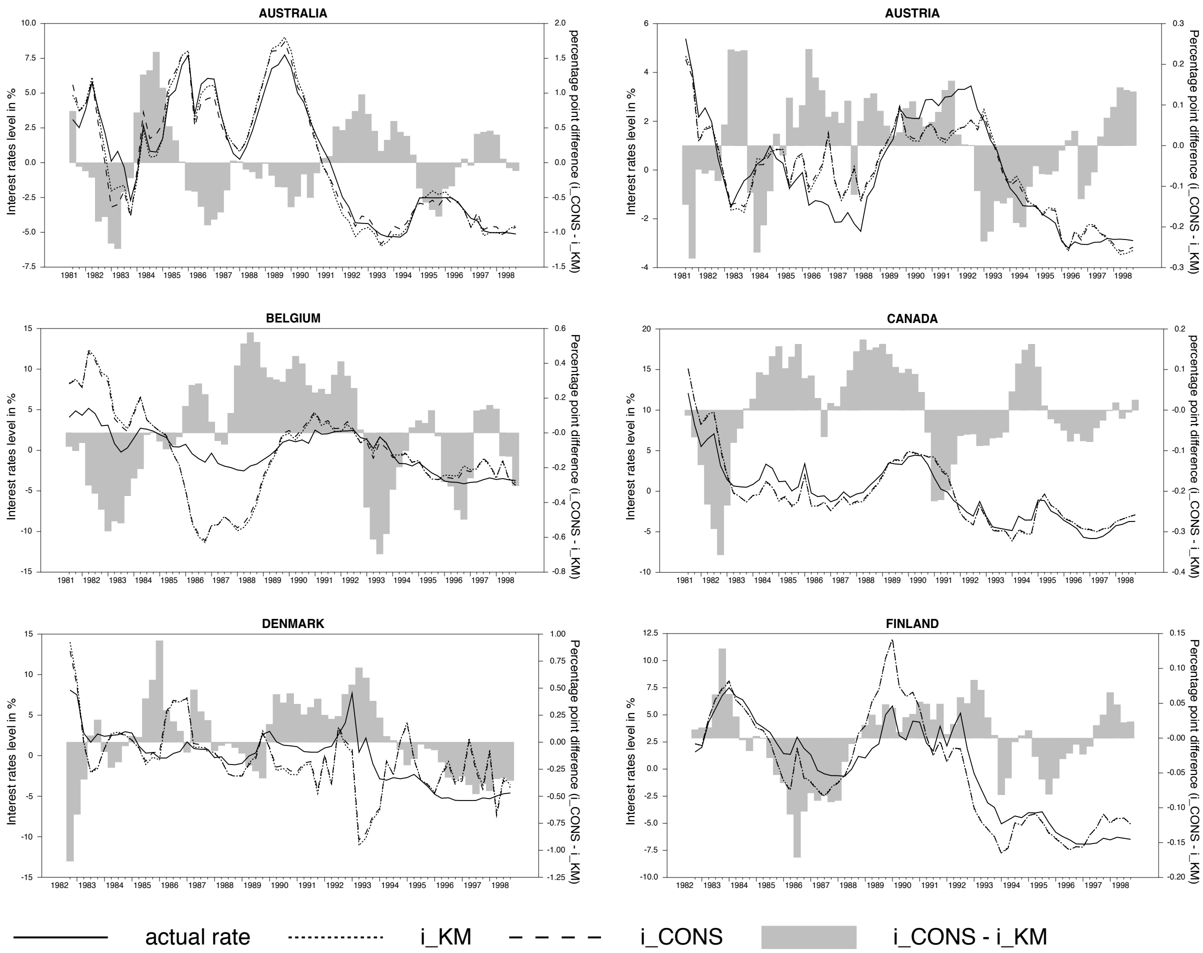

Figure 7: Actual interest rates, simulated interest rates, and difference between simulated interest rates (cont'd)

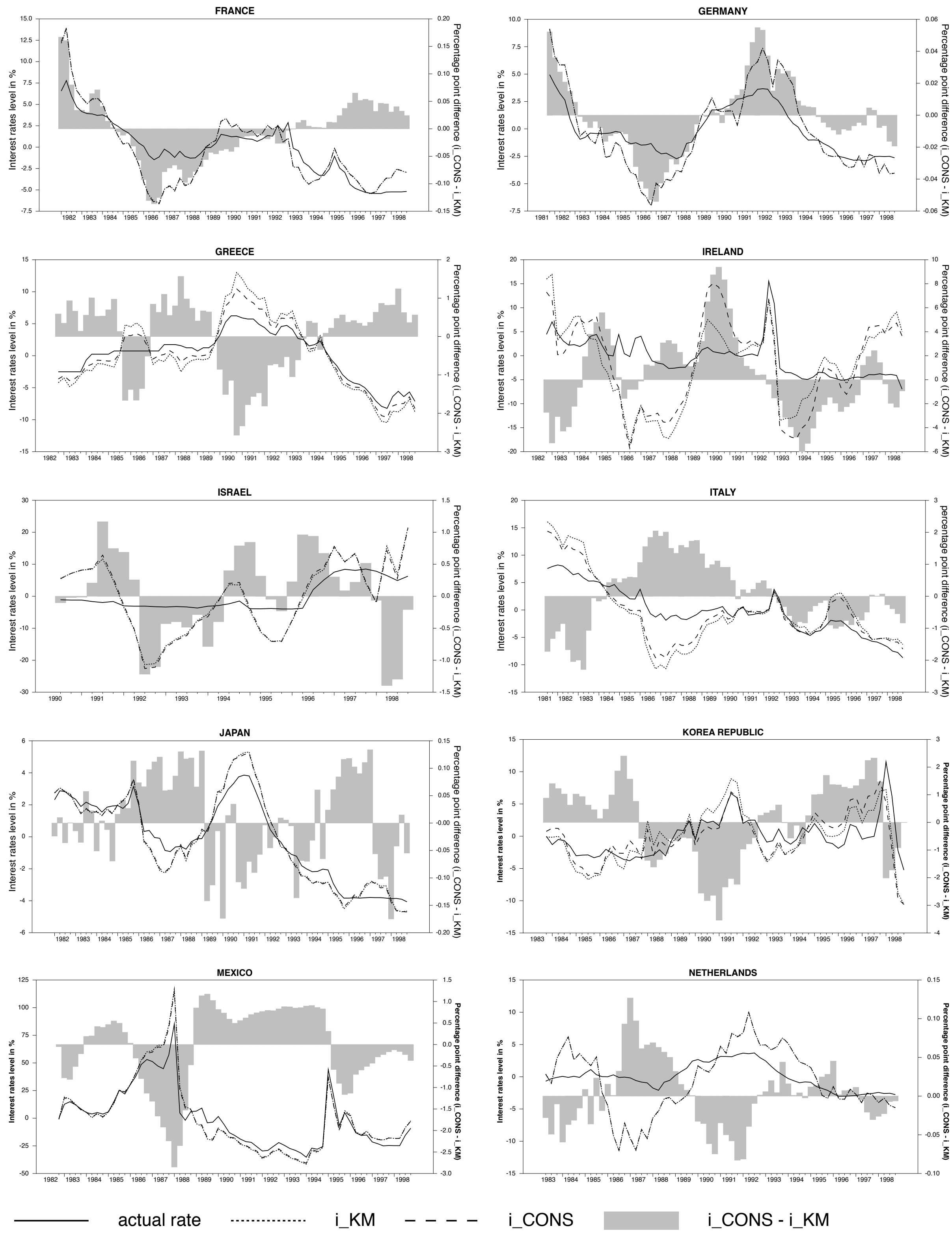

Figure 8: Actual interest rates, simulated interest rates, and difference between simulated interest rates (cont'd)

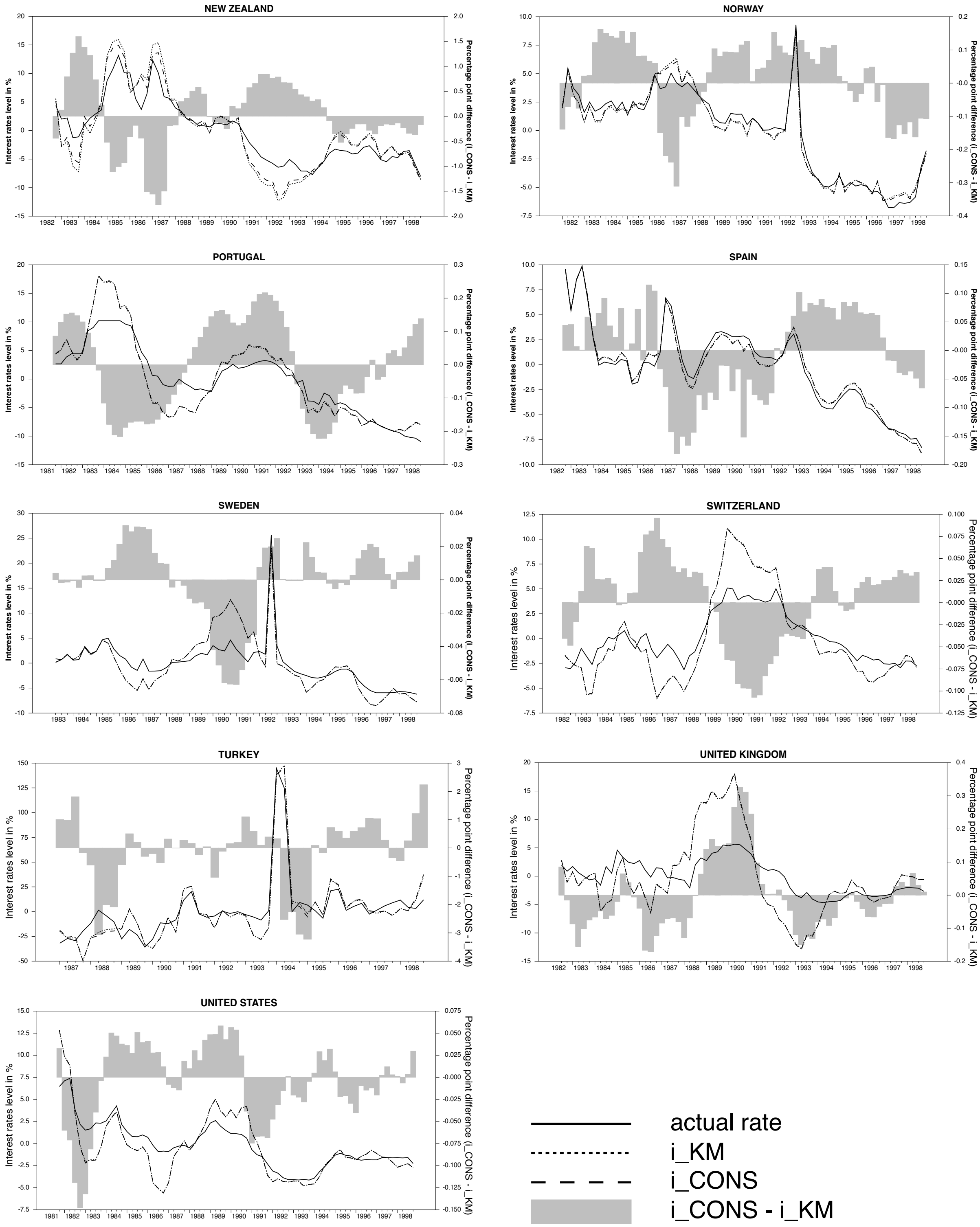

Figure 9: Actual interest rates, simulated interest rates, and difference between simulated interest rates

Appendix 3: The $CONS\_W$ index

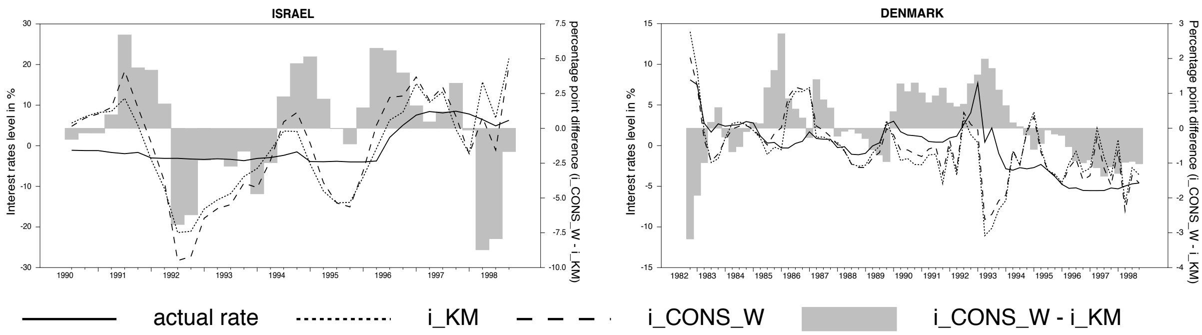

Figure 10: Actual interest rates, simulated interest rates, and difference between simulated interest rates ($CONS\_W$)

Country	1980-84	1985-89	1990-94	1995-98	Average 80-98
Australia	0.291	0.952	0.538	0.071	0.463
Austria	0.343	0.759	0.953	0.969	0.756
Belgium	0.639	0.711	0.940	0.931	0.805
Canada	0.429	0.972	0.858	0.975	0.808
Chile	0.736	0.808	0.596	0.821	0.741
Czech Republic			0.381	0.944	0.662
Denmark	0.591	0.994	0.958	0.480	0.756
Estonia				0.353	0.353
Finland	0.522	0.961	0.940	0.997	0.855
France	0.187	0.842	0.884	0.891	0.701
Germany	0.306	0.773	0.952	0.929	0.740
Greece	0.750	0.488	0.408	0.487	0.533
Iceland			0.774	0.986	0.880
Ireland	0.304	0.727	0.943	0.976	0.737
Israel			0.946	0.615	0.781
Italy	0.569	0.543	0.757	0.209	0.520
Japan	0.736	0.828	0.938	0.819	0.830
Korea Republic	0.040	0.491	0.595	0.927	0.513
Mexico	0.013	0.019	0.041	0.029	0.025
Netherlands	0.661	0.388	0.979	0.968	0.749
New Zealand	0.419	0.362	0.806	0.443	0.508
Norway	0.662	0.966	0.677	0.955	0.815
Poland			0.002	0.199	0.100
Portugal	0.880	0.951	0.759	0.620	0.802
Slovak Republic				0.062	0.062
Slovenia			0.001	0.498	0.250
Spain	0.578	0.759	0.980	0.927	0.811
Sweden	0.608	0.944	0.665	0.699	0.729
Switzerland	0.833	0.772	0.631	0.818	0.764
Turkey		0.057	0.050	0.142	0.083
United Kingdom	0.151	0.830	0.650	0.924	0.639
United States	0.585	0.948	0.713	0.893	0.785

Note: The $CONS\_W$ index is calculated following the formula: $(1/90) \times \left[atan\left(\frac{\sigma_y^2/\sigma_\pi^2}{\sigma_{\varepsilon y}^2/\sigma_{\varepsilon\pi}^2} \right) \times \frac{180}{pi} \right]$

The estimation covers the period 1980-1998 excepted for Iceland (beginning at 1988 Q1), Israel (1990 Q2), the Czech Rep. (1982 Q3), Turkey (1987 Q1), Poland (1991 Q1), Slovenia (1992 Q4), Estonia (1993 Q4) and the Slovak Rep. (1992 Q1), because interest rate data are unavailable (i.e. SVAR model can not be estimated) before.

Table 6: The $CONS\_W$ index for 32 OECD Countries (4 sub-periods and average)