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Keywords: rational expectation; forecast; forecast revision.

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This paper investigates the rationality of forecast revisions made by the IMF and the OECD for past three decades. It finds that 60% of real-GDP forecast series and 37% of GDP-deflator forecast series are consistent with rationality. Forecast smoothing is found in real GDP forecasts.

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1. Introduction

Typical economic forecaster closely watches the economic condition, and revises her forecasts periodically. Recent research has shown that these forecast revisions are subject to behavioral biases. Berger and Krane (1985), Nordhaus (1987), Scotese (1994), Loungani (2001), and Harvey et al. (2001) find that forecasters utilize new information too slowly. Abarbanell and Bernard (1992) and Amir and Ganzach (1998) show that security analysts under-react to new information. On the other hand, Clements (1995, 1997), Ehrbeck and Waldmann (1996), and Ashiya (2002, 2003) find that forecasters over-react to new information.

This paper investigates rationality of forecast revisions made by the IMF and the OECD. Using their forecast data of past three decades, it examines how they incorporate new information into revised forecasts of real GDP and GDP deflator for the G7 countries. It finds that 60% of real-GDP forecast series and 37% of GDP-deflator forecast series are consistent with rationality. Moreover, it finds that real GDP forecasts are excessively smooth in the Nordhaus (1987) sense. All these findings are common to both the IMF forecasts and the OECD forecasts.

There are plenty of studies that evaluate the rationality of IMF and OECD forecasts (Holden et al. (1987), Ash et al. (1990, 1998), Artis (1996), Pons (1999, 2000, 2001), Kreinin (2000), Öller and Barot (2000), and Batchelor (2001)). These studies have shown that IMF and OECD forecasts pass most conventional tests for rationality, but none has examined the rationality of their *forecast revisions*. This paper is the first attempt to fill this gap.

The paper is organized as follows. Section 2 explains data, and Section 3 explains the methodology. Section 4 reports the results. Section 5 concludes.

2. Data

2.1 IMF

The International Monetary Fund (IMF) has published real-GDP and GDP-deflator forecasts for the G7 countries in the May and the October issues of "World Economic Outlook" since 1984. The May issue in year t contains the eight-months-ahead forecast for year t ($f_{-8,t}$) and the 20-months-ahead forecast for year $t+1$ ($f_{-20,t+1}$).

The October issue in year t contains the two-months-ahead forecast for year t ($f_{-2,t}$) and the 14-months-ahead forecast for year $t+1$ ($f_{-14,t+1}$). Additional information is obtained from Artis and Zhang (1990) and Artis (1996), which contain the data of $f_{-20,t+1}$ from $t=1980$ and $f_{-8,t}$ and $f_{-14,t+1}$ from $t=1972$. However, we discard $f_{-20,t+1}$ from $t=1980$ to $t=1987$ for both GDP and inflation forecasts because $f_{-20,t+1}=f_{-14,t+1}$ for all countries in this period. We use the data through $t=2003$.

As for the realization g_t, Keane and Runkle (1990) argue that the revised data introduces a systematic bias because the extent of revision is unpredictable for the forecasters (See also Stark and Croushore (2002)). For this reason we use the initial announcements of the real GDP growth rate and the inflation rate (measured by the GDP deflator) published in the May issue of "World Economic Outlook".

2.2 OECD

The Organization for Economic Cooperation and Development (OECD) has published real-GDP and GDP-deflator forecasts for the G7 countries in the June and the December issues of "OECD Economic Outlook" since 1967. The June issue in year t contains the seven-months-ahead forecast for year t ($f_{-7,t}$) since 1967, and the 19-months-ahead forecast for year $t+1$ ($f_{-19,t+1}$) since 1981. The December issue in year t contains the one-month-ahead forecast for year t ($f_{-1,t}$) since 1967, the 13-months-ahead forecast for year $t+1$ ($f_{-13,t+1}$) since 1967, and the 25-months-ahead forecast for year $t+2$ ($f_{-25,t+2}$) since 1987.[1] We use the data through $t=2003$. As for the realization g_t, we use the initial announcement published in the June issue of "OECD Economic Outlook".

3. Methodology

This section illustrates our methods for evaluating forecast rationality. The basic idea is that a rational forecaster should use available information efficiently. Thus its forecast error should not be related to information available when the forecast was made, and its forecast revision should not be related to information available when the earlier forecast was made.

Let us take the IMF forecasts as an example. The IMF releases four forecasts for a given year t: $f_{-20,t}$, $f_{-14,t}$, $f_{-8,t}$, and $f_{-2,t}$. Remember that $f_{-i,t}$ is the forecast for year *t* released *i* months prior to the end of year *t*. Define $FE_{-i,t} \equiv f_{-i,t} - g_t$ as the forecast error of $f_{-i,t}$ and $FR_{-i,t} \equiv f_{-i,t} - f_{-i-6,t}$ as the forecast revision that was made *i* months prior to the end of year *t*.

First we examine the rationality of forecast revisions ($FR_{-i,t}$). Berger and Krane (1985, p.130) argue that " if forecasts are formed in a consistent fashion, then current forecast revisions should not be at all predictable from past revisions." The regressions they consider are

$$FR_{-i,t} = \alpha + \beta \cdot FR_{-i,t-1} + u_{-i,t} \quad (1)$$

and $$FR_{-i,t} = \alpha + \beta \cdot FR_{-i-6,t} + u_{-i,t}. \quad (2)$$

The null hypothesis of rationality is $\beta = 0$. We allow a nonzero intercept because average forecast revision can be positive (negative) when the economy continually experiences positive (negative) shocks. Equation (1) evaluates the serial correlation of forecast revisions for a fixed *forecast horizon*. Rejection of the null indicates that the forecaster fails to utilize the information she previously used to revise her forecast for the same horizon. On the other hand, equation (2) evaluates the serial correlation of forecast revisions for a fixed *future realization*. Rejection of the null indicates that the forecaster fails to utilize the information she previously used to revise her forecast for the same realization (Nordhaus (1987), Clements (1995), and Loungani (2001) also consider equation (2)).

Next we examine the rationality of forecast errors ($FE_{-i,t}$). If a forecast is rational, its forecast error should be independent of its past forecast revisions. Nordhaus (1987), Ehrbeck and Waldmann (1996), and Amir and Ganzach (1998) consider the following regression:

$$FE_{-i,t} = \alpha + \beta \cdot FR_{-i,t} + u_{-i,t}. \quad (3)$$

The null hypothesis is $\alpha = \beta = 0$. $\alpha \neq 0$ indicates the forecast is biased. $\beta \neq 0$ indicates the forecast could be improved by the information on forecast revisions.

Ashiya (2003) further develops this idea and points out two factors that influence forecast accuracy: optimism/pessimism and over-/under-reaction. If a forecaster is optimistic (pessimistic), her forecast errors tend to be positive (negative). If a forecaster over-reacts to new information, her forecast errors tend to be positive (negative) when she obtains good (bad) news, i.e., when her forecast revisions are positive (negative). Similarly, if a forecaster under-reacts to new information, her forecast errors tend to be negative (positive) when her forecast revisions are positive (negative).

Since the sign of forecast errors are affected by the combination of these two factors, the sign of forecast revision is crucial for the analysis. For example, a positive forecast error does not necessarily indicate optimism, because pessimism plus over-reaction (under-reaction) may cause it when the forecast revision is positive (negative). On this ground, Ashiya (2003) argues that the data should be divided into two sub-samples according to the sign of forecast revisions in order to extract useful information from equation (3). This paper follows his methodology, and estimates

$$FE_{-i,t} = \alpha + \beta \cdot FR_{-i,t} + u_{-i,t} \quad \text{s.t.} \quad t \in T^{+} \equiv \left\{ t \middle| FR_{-i,t} > 0 \right\} \tag{4}$$

and $$FE_{-i,t} = \alpha + \beta \cdot FR_{-i,t} + u_{-i,t} \quad \text{s.t.} \quad t \in T^{-} \equiv \left\{ t \middle| FR_{-i,t} < 0 \right\} \tag{5}$$

in addition to equation (3). The null hypothesis is $\alpha = \beta = 0$. Positive α implies optimism, while negative α implies pessimism. Positive (negative) β implies over-reaction (under-reaction) to new information.

One remaining problem is that the residuals from these regressions might be highly leptokurtic and hence the null might be rejected too frequently. We shall deal with this problem using the square root transformations. [2] First, we check normality of the residual distributions using the *W*-statistic defined by Shapiro and Wilk (1965). Secondly, we pick up regressions in which the null of rationality is rejected and the residual distribution is fat-tailed. We consider the following transformation for them:

$$I\left(FR_{-i,t}\right) \cdot \sqrt{\left|FR_{-i,t}\right|} = \alpha + \beta \cdot I\left(FR_{-i,t-1}\right) \cdot \sqrt{\left|FR_{-i,t-1}\right|} + u_{-i,t}, \tag{1'}$$

$$I\left(FR_{-i,t}\right) \cdot \sqrt{\left|FR_{-i,t}\right|} = \alpha + \beta \cdot I\left(FR_{-i-6,t}\right) \cdot \sqrt{\left|FR_{-i-6,t}\right|} + u_{-i,t}, \tag{2'}$$

and $$I\left(FE_{-i,t}\right) \cdot \sqrt{\left|FE_{-i,t}\right|} = \alpha + \beta \cdot I\left(FR_{-i,t}\right) \cdot \sqrt{\left|FR_{-i,t}\right|} + u_{-i,t}, \tag{3'}$$

where $I(x) \equiv \begin{cases} 1 & \text{if} \quad x \geq 0 \\ -1 & \text{otherwise} \end{cases}$.

Section 4 will find that the residual distributions become normal but the estimation results remain unaffected by these transformations.

4. Results

This section presents the estimation results of equation (1) to (5) for the real GDP forecasts and GDP deflator forecasts made by the IMF and the OECD. Subsection 4-1 shows the results of the IMF forecasts, and subsection 4-2 shows those of the OECD forecasts. Subsection 4-3 discusses the results (See Table 11 for the summary).

4.1 IMF forecast

We consider the rationality of forecast revisions for $f_{-2,t}$ (two-months-ahead forecast) and $f_{-8,t}$ (eight-months-ahead forecast). Table 1 and 2 show the results for the real GDP forecasts, and Table 3 and 4 show the results for the GDP deflator forecasts. Figures in parentheses are standard errors. S&W shows the W-statistic defined by Shapiro and Wilk (1965), which tests normality of the residual.

Table 1 indicates that the null of rationality is not rejected at the 0.05 significance level in any equation for Germany, Italy, and UK. Namely, real GDP forecast series of $f_{-2,t}$ for Germany, Italy, and UK pass all rationality tests. On the other hand, the null is rejected in equation (2) for France and Japan, equation (3) for Canada, and equation (4) for Japan and USA. Therefore forecast series of these countries fail the rationality test. Similarly, Table 2 indicates real GDP forecast series of $f_{-8,t}$ for France,[3] Germany, UK, and USA pass all rationality tests, but those for Canada (equation (2)), Italy (equation (2), (3), and (5)) and Japan (equation (3), (4), and (5)) fail the test.

As for the GDP deflator forecasts, Table 3 shows that $f_{-2,t}$ for Canada, Italy, and UK pass the test, while those for France (equation (5)), Germany (equation (3)), Japan (equation (3) and (4)), and USA (equation (3)) fail. Table 4 shows that $f_{-8,t}$ for Germany, Italy, and UK pass the test, but those for Canada (equation (5)), France (equation (3) and (5)), Japan (equation (5)), and USA (equation (3) and (5)) fail.

4.2 OECD forecast

We consider the rationality of forecast revisions for $f_{-1,t}$, $f_{-7,t}$, and $f_{-13,t}$. Tables 5 to 7 show the results of real GDP forecasts, and Tables 8 to 10 show the results of GDP deflator forecasts.

Table 5 indicates that the real GDP forecast series of $f_{-1,t}$ for Germany, Italy, and USA pass all rationality tests at the 0.05 significance level. However, those for Canada (equation (2)), France (equation (4)), Japan (equation (4)), and UK (equation (3)) fail the test. Table 6 shows that $f_{-7,t}$ for France, Germany, UK, and USA pass the test, while those for Canada (equation (3)), Italy (equation (2)), and Japan (equation (4)) fail. Table 7 indicates that real GDP forecast series of $f_{-13,t}$ pass the rationality test for all countries.

Tables 8 to 10 demonstrate that only seven series of GDP deflator forecast pass the test: they are $f_{-1,t}$ for Germany and Italy (Table 8), $f_{-7,t}$ for Germany and UK (Table 9), and $f_{-13,t}$ for Germany, Italy, and UK (Table 10).

4.3 Discussion

This subsection addresses the following three issues. For which country do the IMF and the OECD release rational forecasts? Which of GDP and inflation forecast is more consistent with rationality? What implication can be drawn from the estimation results of equation (1) through (5)?

Table 11 reports the forecast series for which the null of rationality is not rejected in any equation at the 0.05 significance. The first and the third row show that all series of IMF forecast for UK and all series of OECD forecast for Germany pass the rationality test. By contrast, the fifth row shows that no series of IMF forecast for Japan pass the test. On the whole, forecasts for Germany, UK, and Italy fare well in the rationality test, while forecasts for Japan, Canada, and France do not.

The last row of Table 11 indicates the number of G7 countries for which the null of rationality is not rejected in any equation of the corresponding forecast series at the 0.05 significance. The first column shows that three out of seven series of two-months-ahead

GDP forecast made by the IMF pass the rationality test, and so on. Table 11 shows that 21 out of 35 real GDP forecast series pass the rationality test, but only 13 out of 35 GDP deflator forecast series pass the rationality test. [4]

As for the individual equations, the estimation results of equation (2) for real-GDP forecast series are striking. Table 1, 2, 5, 6, and 7 show that β is positive in equation (2) for 32 out of 35 real-GDP forecast series. Calculation of the cumulative binomial distribution shows that the P-value of the sign test is 2.1×10^{-7}. Since $\beta > 0$ indicates that a forecast revision in one direction tends to be followed by further revisions in the same direction, this result demonstrates a strong tendency for forecast smoothing in the real GDP forecast. Our result is consistent with that of Berger and Krane (1985), Nordhaus (1987), and Loungani (2001) (Clements (1997), however, finds a negative correlation among forecast revisions). [5]

5. Conclusions

This paper has analyzed the rationality of forecast revisions made by the IMF and the OECD for past three decades. It has considered five regressions for the rationality test, and has estimated them for real-GDP and GDP-deflator forecast series of various forecast horizons. It finds that 60% of real-GDP forecast series and 37% of GDP-deflator forecast series are consistent with rationality. It also finds evidence of slow adjustment to new information in real GDP forecasts. These results shed new light on the rationality of forecast revisions, and would be helpful in interpreting revised forecasts.

Notes

1. $f_{-13,1972}$ for the GDP forecasts are missing, and we adopt the figures in the Appendix of Pons (1999). As for the forecasts of GDP deflator, $f_{-13,1971}$ and $f_{-13,1972}$ for all countries, $f_{-7,1973}$ for USA, and $f_{-13,1973}$ for UK are missing.
2. Clements and Taylor (2001) introduce a pseudo-maximum likelihood estimator of regression (2) that is robust to the leptokurtic residuals.
3. We allow a nonzero intercept for equation (1) and (2).
4. Zarnowitz (1985) (in ASA/NBER forecasts) and Batchelor and Dua (1991) (in Blue Chip forecasts) also find a relatively poor performance in inflation forecast.
5. As for the inflation forecast, β is positive in equation (2) for 16 out of 35 forecast series: we do not find a tendency for forecast smoothing.

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Table 1: real GDP forecast of IMF, $f_{-2,t}$

Canada	(1)	(2)	(3)	(4)	(5)
α	0.072	0.061	0.007	0.194	0.179
(S.E.)	(0.192)	(0.195)	(0.077)	(0.245)	(0.180)
β	-0.053	0.046	-0.208*	-0.493	0.046
(S.E.)	(0.234)	(0.215)	(0.094)	(0.282)	(0.220)
S&W	0.958	0.947	0.935	0.880	0.925
n	20	21	20	9	10

France	(1)	(2)	(3)	(4)	(5)
α	-0.033	0.156	-0.065	0.160	-0.021
(S.E.)	(0.129)	(0.132)	(0.074)	(0.242)	(0.225)
β	-0.282	0.376*	-0.180	-0.600	0.039
(S.E.)	(0.229)	(0.161)	(0.130)	(0.351)	(0.410)
S&W	0.969	0.910	0.980	0.958	0.962
n	20	21	20	7	10

Germany	(1)	(2)	(3)	(4)	(5)
α	0.044	0.123	0.048	0.215	-0.189
(S.E.)	(0.160)	(0.165)	(0.124)	(0.379)	(0.219)
β	0.178	0.145	-0.215	-0.370	-0.560
(S.E.)	(0.234)	(0.138)	(0.180)	(0.452)	(0.394)
S&W	0.929	0.930	0.756**	0.718**	0.952
n	20	21	20	9	10

Italy	(1)	(2)	(3)	(4)	(5)
α	-0.163	-0.072	0.035	-0.457	0.245
(S.E.)	(0.106)	(0.120)	(0.107)	(0.776)	(0.171)
β	-0.145	0.101	-0.443	0.286	-0.012
(S.E.)	(0.221)	(0.166)	(0.223)	(1.721)	(0.322)
S&W	0.947	0.954	0.988	0.911	0.971
n	20	21	20	6	12

Japan	(1)	(2)	(3)	(4)	(5)
α	0.150	0.480	-0.133	-0.510*	0.179
(S.E.)	(0.271)	(0.261)	(0.106)	(0.224)	(0.269)
β	-0.067	0.552*	-0.045	0.303	0.093
(S.E.)	(0.234)	(0.234)	(0.092)	(0.214)	(0.201)
S&W	0.967	0.933	0.983	0.935	0.965
n	20	21	20	13	7

UK	(1)	(2)	(3)	(4)	(5)
α	0.044	0.020	-0.008	0.135	-0.200
(S.E.)	(0.101)	(0.100)	(0.107)	(0.376)	(0.514)
β	-0.114	-0.035	-0.479	-0.773	-0.813
(S.E.)	(0.233)	(0.092)	(0.245)	(0.736)	(1.212)
S&W	0.951	0.969	0.958	0.948	0.954
n	20	21	20	9	8

USA	(1)	(2)	(3)	(4)	(5)
α	0.102	0.180	0.006	-0.474**	-0.087
(S.E.)	(0.123)	(0.148)	(0.092)	(0.107)	(0.244)
β	-0.130	0.246	-0.006	0.472**	-0.639
(S.E.)	(0.170)	(0.159)	(0.127)	(0.113)	(0.618)
S&W	0.918	0.902*	0.953	0.901	0.927
n	20	21	20	10	10

Notes
S&W: the W-statistic defined by Shapiro and Wilk (1965), which tests normality of the residual.
*/**: Significant at the 0.05/0.01 level respectively.

Table 2: real GDP forecast of IMF, $f_{-8,t}$

Canada	(1)	(2)	(3)	(4)	(5)
α	-0.519*	-0.234	0.107	-0.344	0.337
(S.E.)	(0.210)	(0.190)	(0.240)	(0.538)	(0.507)
β	-0.169	0.759*	-0.161	0.230	-0.027
(S.E.)	(0.176)	(0.346)	(0.201)	(0.669)	(0.356)
S&W	0.948	0.973	0.947	0.886	0.868*
n	31	17	31	12	18

France	(1)	(2)	(3)	(4)	(5)
α	-0.487*	-0.423	0.078	-0.107	-0.200
(S.E.)	(0.183)	(0.207)	(0.197)	(0.243)	(0.446)
β	-0.157	0.219	-0.234	0.232	-0.489
(S.E.)	(0.183)	(0.443)	(0.197)	(0.328)	(0.384)
S&W	0.952	0.878*	0.840**	0.927	0.854**
n	31	17	31	10	19

Germany	(1)	(2)	(3)	(4)	(5)
α	-0.582*	-0.500	0.308	-0.114	0.408
(S.E.)	(0.247)	(0.293)	(0.242)	(0.457)	(0.494)
β	-0.119	0.837	-0.023	0.374	-0.019
(S.E.)	(0.182)	(0.682)	(0.178)	(0.379)	(0.332)
S&W	0.932*	0.800**	0.969	0.941	0.967
n	31	17	31	9	20

Italy	(1)	(2)	(3)	(4)	(5)
α	-0.374	-0.201	-0.012	0.102	-0.096
(S.E.)	(0.210)	(0.171)	(0.208)	(0.581)	(0.303)
β	0.082	1.130*	-0.394*	-0.391	-0.464*
(S.E.)	(0.185)	(0.453)	(0.183)	(0.812)	(0.216)
S&W	0.948	0.985	0.957	0.946	0.971
n	31	17	31	13	17

Japan	(1)	(2)	(3)	(4)	(5)
α	-0.747*	-0.434	-0.267	-1.249*	-0.745*
(S.E.)	(0.307)	(0.269)	(0.236)	(0.415)	(0.315)
β	-0.091	0.591	-0.459**	1.410*	-0.701**
(S.E.)	(0.187)	(0.355)	(0.144)	(0.479)	(0.168)
S&W	0.839**	0.958	0.990	0.889	0.990
n	31	17	31	8	22

UK	(1)	(2)	(3)	(4)	(5)
α	-0.449	-0.421	0.067	-0.311	0.182
(S.E.)	(0.260)	(0.269)	(0.188)	(0.490)	(0.377)
β	0.098	0.685	0.078	0.554	0.117
(S.E.)	(0.182)	(0.581)	(0.132)	(0.624)	(0.214)
S&W	0.892**	0.919	0.968	0.912	0.963
n	31	17	31	12	18

USA	(1)	(2)	(3)	(4)	(5)
α	-0.127	0.123	-0.052	-0.419	0.060
(S.E.)	(0.240)	(0.254)	(0.171)	(0.338)	(0.412)
β	-0.090	0.311	-0.085	0.160	-0.063
(S.E.)	(0.185)	(0.677)	(0.132)	(0.256)	(0.314)
S&W	0.953	0.946	0.974	0.935	0.963
n	31	17	31	14	16

Notes
S&W: the W-statistic defined by Shapiro and Wilk (1965), which tests normality of the residual.
*/**: Significant at the 0.05/0.01 level respectively.

Table 3: inflation forecast of IMF, $f_{-2,t}$

Canada	(1)	(2)	(3)	(4)	(5)
α	0.122	0.050	0.254	0.708	0.208
(S.E.)	(0.193)	(0.217)	(0.123)	(0.733)	(0.347)
β	0.326	-0.072	-0.136	-0.650	-0.173
(S.E.)	(0.236)	(0.285)	(0.151)	(0.840)	(0.449)
S&W	0.921	0.902*	0.897*	0.731**	0.966
n	20	21	20	9	11

France	(1)	(2)	(3)	(4)	(5)
α	0.039	0.039	0.097	0.022	0.258*
(S.E.)	(0.096)	(0.090)	(0.077)	(0.183)	(0.081)
β	0.138	-0.235	0.073	-0.005	0.586*
(S.E.)	(0.236)	(0.191)	(0.188)	(0.430)	(0.175)
S&W	0.909	0.914	0.951	0.906	0.931
n	20	21	20	10	7

Germany	(1)	(2)	(3)	(4)	(5)
α	-0.083	-0.095	0.043	-0.052	0.048
(S.E.)	(0.064)	(0.066)	(0.090)	(0.313)	(0.179)
β	-0.170	-0.003	-0.686*	0.217	-0.825
(S.E.)	(0.207)	(0.132)	(0.292)	(1.135)	(0.457)
S&W	0.963	0.953	0.947	0.885	0.954
n	20	21	20	5	10

Italy	(1)	(2)	(3)	(4)	(5)
α	0.134	0.083	-0.185	-0.094	0.348
(S.E.)	(0.094)	(0.093)	(0.145)	(0.425)	(0.615)
β	-0.292	0.037	0.402	0.241	1.105
(S.E.)	(0.223)	(0.094)	(0.344)	(1.014)	(1.078)
S&W	0.927	0.925	0.961	0.980	0.857
n	20	21	20	11	5

Japan	(1)	(2)	(3)	(4)	(5)
α	-0.154	-0.117	0.240*	0.600*	0.432
(S.E.)	(0.115)	(0.115)	(0.093)	(0.207)	(0.262)
β	-0.070	0.070	0.221	-0.750	0.616
(S.E.)	(0.234)	(0.194)	(0.190)	(0.470)	(0.487)
S&W	0.955	0.977	0.928	0.910	0.903
n	20	21	20	7	12

UK	(1)	(2)	(3)	(4)	(5)
α	-0.126	-0.145	-0.171	-0.845	0.069
(S.E.)	(0.150)	(0.141)	(0.136)	(0.472)	(0.329)
β	0.162	-0.032	0.262	1.398	0.490
(S.E.)	(0.233)	(0.190)	(0.211)	(0.877)	(0.415)
S&W	0.946	0.962	0.960	0.858	0.928
n	20	21	20	7	10

USA	(1)	(2)	(3)	(4)	(5)
α	0.014	-0.016	0.113*	0.159	0.437
(S.E.)	(0.075)	(0.095)	(0.048)	(0.094)	(0.298)
β	-0.114	-0.052	0.261	0.029	1.058
(S.E.)	(0.237)	(0.154)	(0.151)	(0.314)	(0.723)
S&W	0.908	0.939	0.954	0.924	0.932
n	20	21	20	9	7

Notes
S&W: the W-statistic defined by Shapiro and Wilk (1965), which tests normality of the residual.
*/**: Significant at the 0.05/0.01 level respectively.

Table 4: inflation forecast of IMF, $f_{-8,t}$

Canada	(1)	(2)	(3)	(4)	(5)
α	0.043	-0.290	-0.067	0.114	0.775*
(S.E.)	(0.184)	(0.174)	(0.245)	(0.703)	(0.321)
β	0.227	0.376	-0.330	-0.605	0.709
(S.E.)	(0.181)	(0.533)	(0.242)	(0.555)	(0.376)
S & W	0.931*	0.900	0.985	0.963	0.973
n	31	17	31	13	15

France	(1)	(2)	(3)	(4)	(5)
α	-0.040	-0.007	-0.120	-0.095	0.271
(S.E.)	(0.192)	(0.106)	(0.158)	(0.309)	(0.407)
β	-0.066	-0.394	0.464**	0.291	0.895*
(S.E.)	(0.183)	(0.310)	(0.151)	(0.278)	(0.372)
S&W	0.921*	0.927	0.954	0.937	0.942
n	31	17	31	14	14

Germany	(1)	(2)	(3)	(4)	(5)
α	0.004	0.014	0.191	-0.068	0.690
(S.E.)	(0.093)	(0.118)	(0.126)	(0.291)	(0.336)
β	0.211	0.799	0.300	0.469	1.430
(S.E.)	(0.171)	(0.473)	(0.231)	(0.431)	(0.699)
S&W	0.972	0.898	0.973	0.956	0.938
n	31	17	31	13	14

Italy	(1)	(2)	(3)	(4)	(5)
α	0.286	0.256	-0.440	-0.861	-0.353
(S.E.)	(0.305)	(0.149)	(0.265)	(0.600)	(0.288)
β	0.350	0.721	-0.054	0.192	-0.292
(S.E.)	(0.174)	(0.427)	(0.151)	(0.293)	(0.203)
S&W	0.971	0.852*	0.801**	0.742**	0.958
n	31	17	31	17	12

Japan	(1)	(2)	(3)	(4)	(5)
α	-0.074	-0.108	0.437	0.099	0.041
(S.E.)	(0.305)	(0.149)	(0.310)	(0.894)	(0.312)
β	-0.244	0.379	-0.295	-0.085	-0.937**
(S.E.)	(0.180)	(0.298)	(0.183)	(0.366)	(0.282)
S&W	0.601**	0.933	0.812**	0.845*	0.977
n	31	17	31	11	19

UK	(1)	(2)	(3)	(4)	(5)
α	0.420	0.114	-0.363	-0.405	-0.318
(S.E.)	(0.373)	(0.184)	(0.270)	(0.607)	(0.569)
β	0.050	-0.337	0.203	0.234	0.076
(S.E.)	(0.185)	(0.359)	(0.134)	(0.216)	(0.548)
S&W	0.767**	0.931	0.886**	0.855*	0.867*
n	31	17	31	14	14

USA	(1)	(2)	(3)	(4)	(5)
α	-0.124	-0.399**	-0.012	0.118	0.307*
(S.E.)	(0.156)	(0.132)	(0.096)	(0.578)	(0.126)
β	0.214	0.153	-0.279*	-0.458	0.292
(S.E.)	(0.181)	(0.401)	(0.112)	(0.417)	(0.201)
S&W	0.878**	0.899	0.976	0.878	0.919
n	31	17	31	7	24

Notes

S&W: the W-statistic defined by Shapiro and Wilk (1965), which tests normality of the residual.

*/**: Significant at the 0.05/0.01 level respectively.

Table 5: real GDP forecast of OECD, $f_{-1,t}$

Canada	(1)	(2)	(3)	(4)	(5)
α	-0.297*	-0.178	-0.092	-0.105	-0.038
(S.E.)	(0.138)	(0.115)	(0.082)	(0.154)	(0.196)
β	-0.284	0.410**	-0.023	-0.073	0.038
(S.E.)	(0.163)	(0.102)	(0.096)	(0.233)	(0.200)
S&W	0.919	0.976	0.844**	0.948	0.858**
n	37	37	37	13	22

France	(1)	(2)	(3)	(4)	(5)
α	-0.083	-0.090	-0.057	-0.273*	-0.093
(S.E.)	(0.122)	(0.123)	(0.064)	(0.117)	(0.145)
β	0.161	0.069	-0.019	0.272	-0.050
(S.E.)	(0.166)	(0.119)	(0.088)	(0.192)	(0.158)
S&W	0.868**	0.885**	0.970	0.984	0.917
n	37	37	37	15	17

Germany	(1)	(2)	(3)	(4)	(5)
α	0.012	0.046	-0.028	-0.265	0.013
(S.E.)	(0.149)	(0.142)	(0.061)	(0.134)	(0.156)
β	-0.001	0.221	-0.013	0.193	0.031
(S.E.)	(0.168)	(0.113)	(0.069)	(0.152)	(0.153)
S&W	0.979	0.977	0.974	0.942	0.988
n	37	37	37	17	15

Italy	(1)	(2)	(3)	(4)	(5)
α	-0.190	-0.145	-0.010	0.342	0.157
(S.E.)	(0.158)	(0.156)	(0.098)	(0.254)	(0.210)
β	-0.143	0.122	-0.016	-0.322	0.194
(S.E.)	(0.168)	(0.125)	(0.105)	(0.221)	(0.232)
S&W	0.962	0.937*	0.944	0.813*	0.915
n	37	37	37	11	22

Japan	(1)	(2)	(3)	(4)	(5)
α	0.099	0.136	-0.137	0.654*	-0.061
(S.E.)	(0.241)	(0.237)	(0.133)	(0.252)	(0.318)
β	-0.051	0.162	-0.039	-0.617**	0.177
(S.E.)	(0.166)	(0.127)	(0.092)	(0.174)	(0.198)
S&W	0.978	0.980	0.916**	0.945	0.974
n	37	37	37	20	14

UK	(1)	(2)	(3)	(4)	(5)
α	-0.021	-0.055	-0.076	0.196	-0.107
(S.E.)	(0.135)	(0.136)	(0.077)	(0.237)	(0.155)
β	0.045	-0.120	0.253*	-0.134	0.261
(S.E.)	(0.168)	(0.105)	(0.095)	(0.343)	(0.156)
S&W	0.939*	0.902**	0.979	0.957	0.941
n	37	37	37	19	15

USA	(1)	(2)	(3)	(4)	(5)
α	-0.105	-0.109	-0.061	0.183	-0.119
(S.E.)	(0.099)	(0.098)	(0.056)	(0.211)	(0.088)
β	-0.023	0.044	-0.173	-0.672	-0.202
(S.E.)	(0.169)	(0.091)	(0.096)	(0.421)	(0.127)
S&W	0.976	0.980	0.847**	0.914	0.954
n	37	37	37	16	18

Notes
S&W: the W-statistic defined by Shapiro and Wilk (1965), which tests normality of the residual.
*/**: Significant at the 0.05/0.01 level respectively.

Table 6: real GDP forecast of OECD, $f_{-7,t}$

Canada	(1)	(2)	(3)	(4)	(5)
α	-0.149	0.056	0.123	-0.216	0.408
(S.E.)	(0.185)	(0.262)	(0.157)	(0.332)	(0.367)
β	-0.321	0.298	-0.283*	-0.058	-0.094
(S.E.)	(0.162)	(0.341)	(0.138)	(0.335)	(0.282)
S&W	0.910**	0.972	0.980	0.950	0.967
n	36	23	36	15	19

France	(1)	(2)	(3)	(4)	(5)
α	-0.129	-0.099	0.057	-0.745	-0.021
(S.E.)	(0.171)	(0.166)	(0.142)	(0.456)	(0.353)
β	-0.241	0.386	-0.064	0.477	-0.251
(S.E.)	(0.165)	(0.218)	(0.137)	(0.289)	(0.362)
S&W	0.940*	0.979	0.895**	0.921	0.899*
n	36	23	36	8	20

Germany	(1)	(2)	(3)	(4)	(5)
α	-0.197	-0.174	-0.043	0.579	0.064
(S.E.)	(0.214)	(0.230)	(0.166)	(0.510)	(0.317)
β	-0.038	0.126	-0.157	-0.832	-0.061
(S.E.)	(0.168)	(0.248)	(0.130)	(0.515)	(0.206)
S&W	0.903**	0.913*	0.977	0.928	0.947
n	36	23	36	16	18

Italy	(1)	(2)	(3)	(4)	(5)
α	-0.139	-0.067	0.165	-0.053	0.206
(S.E.)	(0.212)	(0.104)	(0.189)	(0.410)	(0.242)
β	0.200	0.287*	-0.131	0.325	-0.245
(S.E.)	(0.168)	(0.122)	(0.151)	(0.382)	(0.159)
S&W	0.910**	0.972	0.897**	0.930	0.972
n	36	23	36	15	17

Japan	(1)	(2)	(3)	(4)	(5)
α	-0.299	-0.166	-0.188	-0.855*	-0.299
(S.E.)	(0.317)	(0.180)	(0.291)	(0.390)	(0.607)
β	-0.225	0.260	0.030	0.799*	-0.083
(S.E.)	(0.168)	(0.168)	(0.154)	(0.335)	(0.252)
S&W	0.799**	0.942	0.887**	0.963	0.797**
n	36	23	36	18	18

UK	(1)	(2)	(3)	(4)	(5)
α	-0.270	-0.040	-0.010	-0.331	0.015
(S.E.)	(0.225)	(0.172)	(0.129)	(0.295)	(0.228)
β	0.053	0.137	0.162	0.470	0.167
(S.E.)	(0.172)	(0.256)	(0.099)	(0.332)	(0.146)
S&W	0.824**	0.860**	0.950	0.847*	0.935
n	36	23	36	13	21

USA	(1)	(2)	(3)	(4)	(5)
α	0.170	0.303	0.064	0.216	-0.459
(S.E.)	(0.186)	(0.212)	(0.131)	(0.306)	(0.333)
β	-0.111	0.075	-0.057	-0.103	-0.477
(S.E.)	(0.171)	(0.242)	(0.120)	(0.277)	(0.273)
S&W	0.975	0.966	0.981	0.979	0.735**
n	36	23	36	19	13

Notes
S&W: the W-statistic defined by Shapiro and Wilk (1965), which tests normality of the residual.
*/**: Significant at the 0.05/0.01 level respectively.

Table 7: real GDP forecast of OECD, $f_{-13,t}$

Canada	(1)	(2)	(3)	(4)	(5)
α	-0.417*	-0.457*	0.022	-3.544	-0.089
(S.E.)	(0.157)	(0.168)	(0.495)	(2.162)	(0.847)
β	-0.108	-0.171	-0.640	13.056	-0.761
(S.E.)	(0.204)	(0.373)	(0.639)	(8.003)	(0.915)
S&W	0.904*	0.933	0.968	0.980	0.969
n	23	17	22	5	15

France	(1)	(2)	(3)	(4)	(5)
α	-0.358*	-0.305	0.121	0.452	-0.605
(S.E.)	(0.158)	(0.158)	(0.243)	(0.320)	(0.758)
β	0.011	0.462	-0.196	-0.565	-0.900
(S.E.)	(0.207)	(0.424)	(0.321)	(0.568)	(0.829)
S&W	0.971	0.938	0.946	0.913	0.925
n	23	17	22	8	12

Germany	(1)	(2)	(3)	(4)	(5)
α	-0.363	-0.272	0.208	0.827	0.737
(S.E.)	(0.202)	(0.138)	(0.326)	(0.874)	(0.633)
β	0.076	0.393	-0.014	-2.729	0.393
(S.E.)	(0.217)	(0.258)	(0.344)	(1.990)	(0.529)
S&W	0.824**	0.958	0.967	0.931	0.948
n	23	17	22	6	13

Italy	(1)	(2)	(3)	(4)	(5)
α	-0.296	-0.422*	0.274	-0.110	0.667
(S.E.)	(0.183)	(0.160)	(0.204)	(0.250)	(0.517)
β	0.179	0.913	-0.470	0.281	-0.194
(S.E.)	(0.214)	(0.575)	(0.237)	(0.427)	(0.501)
S&W	0.985	0.927	0.940	0.938	0.787**
n	23	17	22	7	13

Japan	(1)	(2)	(3)	(4)	(5)
α	-0.243	-0.412	-0.027	0.112	0.484
(S.E.)	(0.233)	(0.263)	(0.362)	(1.079)	(0.725)
β	0.104	0.339	-0.465	-0.880	-0.018
(S.E.)	(0.218)	(0.396)	(0.333)	(1.161)	(0.622)
S&W	0.972	0.969	0.935	0.908	0.928
n	23	17	22	8	14

UK	(1)	(2)	(3)	(4)	(5)
α	-0.142	-0.247	-0.036	0.406	-0.695
(S.E.)	(0.145)	(0.164)	(0.270)	(1.058)	(1.184)
β	-0.170	0.928	0.024	-0.391	-0.820
(S.E.)	(0.215)	(0.543)	(0.392)	(1.718)	(1.412)
S&W	0.965	0.956	0.920	0.937	0.953
n	23	17	22	9	10

USA	(1)	(2)	(3)	(4)	(5)
α	-0.160	-0.275	-0.319	1.035	-1.167
(S.E.)	(0.179)	(0.233)	(0.307)	(0.809)	(0.817)
β	0.145	0.234	-0.063	-2.407	-0.615
(S.E.)	(0.205)	(0.492)	(0.343)	(1.498)	(0.674)
S&W	0.921	0.941	0.968	0.957	0.938
n	23	17	22	10	10

Notes
S&W: the W-statistic defined by Shapiro and Wilk (1965), which tests normality of the residual.
*/**: Significant at the 0.05/0.01 level respectively.

Table 8: inflation forecast of OECD, $f_{-1,t}$

Canada	(1)	(2)	(3)	(4)	(5)	(2’)
α	0.115	0.144	0.025	0.242	-0.135	0.102
(S.E.)	(0.149)	(0.144)	(0.092)	(0.186)	(0.383)	(0.132)
β	0.140	0.376*	-0.094	-0.230	-0.317	0.299[a]
(S.E.)	(0.175)	(0.149)	(0.108)	(0.167)	(0.550)	(0.152)
S&W	0.879**	0.924*	0.955	0.896	0.913	0.945
n	37	35	37	16	14	35

France	(1)	(2)	(3)	(4)	(5)
α	-0.023	0.006	0.035	0.345*	0.219
(S.E.)	(0.097)	(0.090)	(0.061)	(0.160)	(0.141)
β	-0.008	-0.312**	0.173	-0.496	0.480*
(S.E.)	(0.169)	(0.102)	(0.107)	(0.304)	(0.198)
S&W	0.944	0.981	0.986	0.919	0.966
n	37	35	37	16	15

Germany	(1)	(2)	(3)	(4)	(5)
α	0.038	0.013	-0.004	-0.052	-0.132
(S.E.)	(0.080)	(0.082)	(0.049)	(0.106)	(0.220)
β	0.037	0.111	0.055	0.170	-0.161
(S.E.)	(0.159)	(0.139)	(0.097)	(0.224)	(0.366)
S&W	0.977	0.969	0.958	0.952	0.926
n	37	35	37	19	14

Italy	(1)	(2)	(3)	(4)	(5)
α	0.102	0.138	-0.204	-0.255	-0.393
(S.E.)	(0.130)	(0.135)	(0.105)	(0.208)	(0.383)
β	-0.066	-0.132	-0.034	0.053	-0.264
(S.E.)	(0.169)	(0.078)	(0.137)	(0.247)	(0.437)
S&W	0.959	0.984	0.959	0.928	0.800**
n	37	35	37	18	12

Japan	(1)	(2)	(3)	(4)	(5)	(1’)	(2’)	(3’)
α	-0.116	-0.222	0.197	0.215	-0.099	-0.184	-0.246*	0.124
(S.E.)	(0.156)	(0.138)	(0.155)	(0.535)	(0.182)	(0.135)	(0.120)	(0.125)
β	0.392*	0.220**	0.425**	0.507	0.083	0.334*	0.383**	0.389**
(S.E.)	(0.148)	(0.051)	(0.147)	(0.420)	(0.196)	(0.155)	(0.111)	(0.143)
S&W	0.935*	0.928*	0.819**	0.802**	0.972	0.923**[b]	0.972	0.973
n	37	35	37	12	25	37	35	37

UK	(1)	(2)	(3)	(4)	(5)
α	-0.094	-0.110	-0.374**	-0.241	-0.438
(S.E.)	(0.130)	(0.139)	(0.131)	(0.322)	(0.402)
β	-0.007	0.093	0.077	-0.101	0.041
(S.E.)	(0.168)	(0.079)	(0.169)	(0.410)	(0.499)
S&W	0.987	0.984	0.937	0.970	0.891*
n	37	34	37	16	19

USA	(1)	(2)	(3)	(4)	(5)
α	-0.075	-0.019	0.030	0.209	-0.069
(S.E.)	(0.060)	(0.060)	(0.036)	(0.106)	(0.117)
β	0.047	0.179*	0.039	-0.316	-0.079
(S.E.)	(0.164)	(0.068)	(0.096)	(0.194)	(0.268)
S&W	0.928*	0.960	0.867**	0.936	0.653**
n	35	34	36	8	15

Notes
S&W: the W-statistic defined by Shapiro and Wilk (1965), which tests normality of the residual.
*/**: Significant at the 0.05/0.01 level respectively.
a: P-value = 0.057, b: kurtosis = 3.072.

Table 9: inflation forecast of OECD, $f_{-7,t}$

Canada	(1)	(2)	(3)	(4)	(5)
α	-0.089	-0.275	-0.097	1.209	0.983**
(S.E.)	(0.175)	(0.136)	(0.174)	(0.607)	(0.275)
β	0.031	0.343	-0.500**	-1.709**	1.014**
(S.E.)	(0.176)	(0.176)	(0.178)	(0.448)	(0.333)
S&W	0.948	0.970	0.979	0.956	0.949
n	33	23	34	10	21

France	(1)	(2)	(3)	(4)	(5)
α	0.115	-0.027	0.056	0.370	0.323
(S.E.)	(0.145)	(0.072)	(0.108)	(0.240)	(0.218)
β	-0.168	-0.192**	0.123	-0.072	0.877
(S.E.)	(0.160)	(0.064)	(0.120)	(0.177)	(0.496)
S&W	0.660**	0.964	0.967	0.964	0.944
n	33	23	34	13	18

Germany	(1)	(2)	(3)	(4)	(5)
α	0.080	-0.018	0.022	-0.061	-0.400
(S.E.)	(0.097)	(0.079)	(0.091)	(0.235)	(0.363)
β	0.153	-0.044	-0.290	-0.205	-1.321
(S.E.)	(0.209)	(0.177)	(0.153)	(0.264)	(0.879)
S&W	0.861**	0.982	0.970	0.824*	0.953
n	33	23	34	13	11

Italy	(1)	(2)	(3)	(4)	(5)
α	0.333	0.074	-0.274	-0.320	-0.071
(S.E.)	(0.264)	(0.175)	(0.192)	(0.445)	(0.372)
β	0.375*	-0.357	0.051	0.063	0.289
(S.E.)	(0.150)	(0.280)	(0.109)	(0.192)	(0.474)
S&W	0.943	0.969	0.961	0.952	0.977
n	33	23	34	18	14

Japan	(1)	(2)	(3)	(4)	(5)
α	0.003	-0.305*	0.317	-0.062	0.466*
(S.E.)	(0.474)	(0.127)	(0.189)	(0.440)	(0.183)
β	-0.311	-0.334	0.055	0.106	0.073
(S.E.)	(0.170)	(0.196)	(0.069)	(0.117)	(0.099)
S&W	0.424**	0.956	0.746**	0.669**	0.920
n	33	23	34	14	18

UK	(1)	(2)	(3)	(4)	(5)
α	0.189	-0.214	-0.195	0.106	-0.094
(S.E.)	(0.285)	(0.157)	(0.181)	(0.343)	(0.500)
β	0.266	-0.220	-0.182	-0.293	0.103
(S.E.)	(0.160)	(0.209)	(0.101)	(0.135)	(0.477)
S&W	0.869**	0.939	0.960	0.940	0.961
n	32	23	33	14	14

USA	(1)	(2)	(3)	(4)	(5)
α	-0.125	-0.267	0.052	0.374	0.061
(S.E.)	(0.141)	(0.137)	(0.071)	(0.172)	(0.123)
β	0.232	-0.319	-0.173*	0.590*	-0.065
(S.E.)	(0.159)	(0.275)	(0.080)	(0.198)	(0.132)
S&W	0.969	0.954	0.961	0.958	0.937
n	32	23	33	15	17

Notes
S&W: the W-statistic defined by Shapiro and Wilk (1965), which tests normality of the residual.
*/**: Significant at the 0.05/0.01 level respectively.

Table 10: inflation forecast of OECD, $f_{-13,t}$

Canada	(1)	(2)	(3)	(4)	(5)
α	-0.052	0.074	0.590*	0.202	0.745
(S.E.)	(0.172)	(0.122)	(0.227)	(0.934)	(0.389)
β	0.305	-0.135	-0.378	-0.017	-0.215
(S.E.)	(0.222)	(0.285)	(0.289)	(2.064)	(0.324)
S&W	0.871**	0.978	0.967	0.943	0.954
n	23	17	22	10	8

France	(1)	(2)	(3)	(4)	(5)
α	-0.164	0.076	0.274*	0.044	0.327
(S.E.)	(0.203)	(0.070)	(0.113)	(0.195)	(0.220)
β	-0.285	0.363	0.218*	0.561*	0.165
(S.E.)	(0.181)	(0.236)	(0.099)	(0.220)	(0.144)
S&W	0.606**	0.821**	0.885**[a]	0.909	0.750**
n	23	17	22	10	9

Germany	(1)	(2)	(3)	(4)	(5)
α	0.097	0.169	0.030	-0.010	0.631
(S.E.)	(0.094)	(0.095)	(0.169)	(0.435)	(0.645)
β	0.244	0.302	0.014	-0.050	1.615
(S.E.)	(0.212)	(0.270)	(0.387)	(0.793)	(1.555)
S&W	0.960	0.948	0.979	0.949	0.953
n	23	17	22	10	7

Italy	(1)	(2)	(3)	(4)	(5)
α	0.198	0.106	-0.423	-0.652	0.205
(S.E.)	(0.108)	(0.129)	(0.225)	(0.454)	(0.542)
β	-0.318	-0.028	0.397	0.606	1.220
(S.E.)	(0.171)	(0.231)	(0.360)	(0.586)	(1.003)
S&W	0.926	0.877*	0.975	0.947	0.899
n	23	17	22	10	9

Japan	(1)	(2)	(3)	(4)	(5)
α	-0.367*	-0.229	0.738**	0.541	1.168*
(S.E.)	(0.137)	(0.132)	(0.192)	(0.288)	(0.464)
β	-0.230	-0.247	0.424	0.617	0.921
(S.E.)	(0.212)	(0.311)	(0.295)	(0.855)	(0.594)
S&W	0.949	0.941	0.911	0.970	0.904
n	23	17	22	7	14

UK	(1)	(2)	(3)	(4)	(5)
α	0.067	0.220	0.082	0.064	-0.365
(S.E.)	(0.150)	(0.181)	(0.189)	(0.418)	(0.483)
β	0.270	-0.015	-0.080	0.126	-0.804
(S.E.)	(0.200)	(0.460)	(0.246)	(0.461)	(0.648)
S&W	0.954	0.912	0.975	0.926	0.942
n	23	17	22	9	10

USA	(1)	(2)	(3)	(4)	(5)
α	-0.252*	-0.231*	0.534**	3.010*	0.103
(S.E.)	(0.103)	(0.103)	(0.141)	(0.754)	(0.211)
β	-0.306	0.431	0.629*	-5.745*	0.028
(S.E.)	(0.207)	(0.273)	(0.276)	(1.986)	(0.350)
S&W	0.979	0.956	0.957	0.955	0.939
n	23	17	22	7	13

Notes

S&W: the W-statistic defined by Shapiro and Wilk (1965), which tests normality of the residual.

*/**: Significant at the 0.05/0.01 level respectively.

a: kurtosis=3.192.

Table 11: Summary

	IMF				OECD					
	GDP		inflation		GDP			inflation		
	$f_{-2,t}$	$f_{-8,t}$	$f_{-2,t}$	$f_{-8,t}$	$f_{-1,t}$	$f_{-7,t}$	$f_{-13,t}$	$f_{-1,t}$	$f_{-7,t}$	$f_{-13,t}$
Canada			○				○			
France		○				○	○			
Germany	○	○		○	○	○	○	○	○	○
Italy	○		○	○	○		○	○		○
Japan							○			
UK	○	○	○	○		○	○		○	○
USA		○			○	○	○			
Total [a]	3	4	3	3	3	4	7	2	2	3

Notes
○ indicates the forecast series for which the null of rationality is not rejected in any equation at the 0.05 significance.
a: The number of G7 countries for which the null of rationality is not rejected in any equation of the corresponding forecast series at the 0.05 significance.