Forecasts of Asia-Pacific Economic Activity to 1999

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This section of the Journal reports regular forecasts of macroeconomic activity for a selection of Asia-Pacific nations. This issue gives quarterly *ex ante* forecasts for the USA, Japan, Korea, Australia, and New Zealand for the period through to the fourth quarter of 1999 and updates the forecasts for these countries over this horizon that were reported in the previous issue of the Journal. An analysis of past forecasting performance for the US economy is provided.

The forecasts given here are based on time series models that make extensive use of automated model selection procedures[2]. The judgmental elements in making these forecasts are minimal and are confined to the choice of variables, the selection of the model classes to be used, and the setting of certain maximal parameters like maximal lag order in an autoregression or vector autoregression. The choice of variables is similar across all the countries considered and includes real gross domestic product, real private consumption expenditure, real fixed investment, real exports, a short run interest rate, the M1 money stock, and the unemployment rate. This choice leads to comparable small scale time series models of the RUMPY variety for each country. None of the models incorporate policy reaction functions, and in consequence forecasts are generated under the implicit assumption of current policy settings

The in-house models used to generate forecasts are all linear (in variables) time series models. The models are either classical or Bayesian versions of vector autoregressions (VAR's, and BVAR's), reduced rank regressions (RRR's), error correction models (ECM's) or univariate versions of these models. For the USA we also report forecasts obtained from Ray Fair's (1994) structural econometric model of the US economy. In future issues,

coverage of the region will expand and we hope to compare our automated time series forecasts with structural econometric models of other countries in the region. We also plan to include some automated econometric analyses of economic policy.

The approach we are following is to report forecasts from all of the main time series models for each country. Reporting the results this way helps to show the effects of model specification and model uncertainty on ex ante forecasting, something that is seldom done in other published work. As is apparent from the forecasts given here and in earlier issues, there is often considerable variation across models in forecasts, sometimes even for short periods ahead and between models that are in the same general class, like ECM and RRR models. In other cases, forecast profiles are much closer together. This, in itself, is of interest. But, since no econometric model is correctly specified, we hope that the exercise of multi-model forecasting will help to shed light on the importance of econometric model determination in the production of good forecasts. In future issues, we hope to address the problem of combining forecasts and choosing a best overall model. At that point we will also include prediction intervals. At the moment, forecast evaluations are reported only for the USA, where data revisions are slight. We hope to extend this evaluation exercise to some of the other countries in future issues.

Data

The final sample observations that were available at the time these forecasts were generated were as follows: USA, 1996:3; Japan, 1996:3; Korea, 1996:3; Australia, 1996:3; New Zealand, 1996:3. The initializations of the data sets were selected on the basis of the quarterly data that was

available for all of the series to ensure a balanced data set for each country. All variables are transformed to natural logarithms except for the interest rate.

USA Variables and Data:

Real gross domestic product (1987$bil., SA)

Real personal consumption expenditure (1987$bil., SA)

Real fixed investment (1987$bil., SA)

Price deflator of GDP

3-month Treasury Bill rate (percentage points)

M1-Money stock, end of quarter ($bil., SA)

Unemployment rate, all workers 16 and over (percentage points, SA)

Sample Period: 1952:1 – 1996:3

Source: National Income and Product Accounts (chain link data)

Forecast Period: 1996:4 – 1999:4 (13 quarters)

Japan Variables and Data:

Real gross domestic product (1990Ybil., SA)

Real personal consumption expenditure (1990Ybil., SA)

Real fixed investment (1990Ybil., SA)

Price deflator of GDP

M1-Money stock, end of quarter (Ybil., SA)

Unemployment rate (percentage points, SA)

Sample Period: 1971:1 – 1996:3

Source: Nikkei Database

Forecast period: 1996:4 – 1999:4 (13 quarters)

Korea Variables and Data:

Real gross national product (1990Wbil., SA)

Real personal consumption expenditure (1990Wbil., SA)

Real exports (1990 US$mil., SA)

Consumer price index (1990 = 100)

M1-Money stock, end of quarter (Wbil., SA)

Sample Period: 1970:1 – 1996:3

Source: Bank of Korea

Forecast period: 1996:3 – 1999:4 (13 quarters)

Australia Variables and Data:

Real gross domestic product (1989/90$mil., SA)

Real personal consumption exp. (1989/90$mil., SA)

Real fixed investment (1989/90$mil., SA)

Price deflator of GDP

M1-Money stock, end of quarter (currency + demand deposits, $mil., SA)

90-day Money market rate (percentage points)

Sample Period: 1975:1 – 1996:3

Source: Australian Bureau of Statistics

Forecast period: 1996:4 – 1999:4 (13 quarters)

New Zealand Variables and Data:

Real gross domestic product (production based) (1989/90$mil., SA)

Real private consumption exp. (1989/90$mil., SA)

Real fixed investment (1989/90$mil., SA)

Core CPI

M1-Money stock, end of quarter (currency + demand deposits, $mil., SA)

90-day RBNZ Bill yield (percentage points)

Sample Period: 1983:1 – 1996:3

Source: Reserve Bank of New Zealand

Forecast period: 1996:4 – 1999:4 (13 quarters)

Results

Tables 1 – 4 give the forecast results for the main variables included in each model. Four variables are included for each country: two macroeconomic aggregates (output and either investment or exports) and two monetary variables (inflation and either M1 or a 90 day interest rate). Figures 1 – 5 graph the forecasts over the forecast horizon together with recent historical data. In these tables and graphs we show growth rates for output and investment (exports, in the case of Korea), inflation, M1 and, in the case of the USA, level forecasts for interest rates. The growth rates are computed on a quarterly basis for the USA and Japan and on an annual basis for Korea, Australia and New Zealand. As indicated in the introduction, none of the time series models incorporate policy reaction functions, and therefore forecasts from these models implicitly assume current policy settings.

USA

There is high variation in the forecasts of real GDP growth in the final quarter of 1996 and first quarter of 1997. The FAIR, ECM, and RRR models all predict growth to be less than 2% whereas the BVAR model forecasts fourth quarter 1996 growth of 2.5% while the scalar BAR model is considerably more optimistic. in the 3.8 – 4% range. The BVAR model predicts a slow-down in growth in the first quarter 1997. The longer term forecasts of the FAIR model are similar to those of the BVAR and RRR models. The ECM model is more optimistic over the long term keeping growth in the region of 3%. As in earlier forecasts, the scalar BAR model is distinctly more optimistic about real GDP growth than the multivariate models.

All the time series models predict a rise in inflation, but the FAIR model forecasts inflation to be steady for the next two quarters with a very slow increase thereafter. The vector

time series models predict inflation rising to the 3.3% level (ECM) – 3.67% level (RRR) by the end of the century. As in our last set of forecasts, the ECM inflation forecasts are closest to those of the FAIR model. The FAIR, ECM, and BVAR models all give similar long term forecasts for the 90 day T-bill rate, showing a steady rate in the 5 – 5.5% range for most of the period. The RRR model shows a slight dip in the rate in 1996:4 and 1997:1, followed by a slow rise thereafter. As in our last set of forecasts, the models give generally similar forecast profiles for real investment growth. The BVAR and ECM models are the least favourable, showing a small decline in investment growth in 1997 before a rise in investment growth occurs. The BAR model is the most optimistic showing growth in investment falling initially and then stabilising around the 4 – 5% range for the remainder of the period.

Japan

All models predict a rise in real GDP growth in the fourth quarter 1996 followed by a decline in the growth rate in 1997:1. The least optimistic of these is the RRR model, which forecasts a prolonged recession from 1997:1 for the remainder of the period. The ECM and BVAR models are more optimistic and forecast growth in the 1 – 3% range by the end of the decade. The RRR model inflation forecasts are higher than those of the other models through to 1998 and predict inflation reaching 3.5% by mid 1997, but tailing off thereafter till the end of the period. The other models predict inflation staying in the 1 – 2.5% range for most of the period.

Korea

As in our last set of forecasts, there is a big difference between the ECM model forecasts for real GNP growth and the RRR, BVAR and BAR forecasts. The ECM model predicts a general decline in real GNP growth from present levels to around 3.5% by 1998 and a leveling off thereafter. The ECM model prediction of a decline in real GNP growth is accompanied by the model's prediction of a decline in real export growth to around 2% by 1998. The other models have more optimistic projections for real GNP and real exports and also forecast faster growth in M1. The RRR and BVAR models forecast real GNP growth rate to rise in the final quarter of 1996 and again in mid 1997, and thereafter to decline slowly to the 6 – 7% range by the end of the decade. Both these models predict more robust growth in real exports (in the range 3 – 7%) than the ECM model.

Australia

Like our recent forecasting experience for Australia, all models give a broadly similar pattern of projection for real GDP growth for the first three quarters out to mid 1997. Thereafter, all the models except the RRR model give similar forecast profiles for real GDP growth. .The common prediction is for the growth rate to fall to around 2% in 1997:1 and slowly pick up to around 3% by the end of the decade. The RRR model is less optimistic and shows a slow but steady decline from mid 1997 to the end of the period, with growth ending up around 1.5%. Inflation is predicted to remain below 2% by each of the ECM, BVAR and BAR models, while the RRR model forecasts inflation rising to 2.7% during 1997 and staying around that level for the remainder of the period.

New Zealand

All the multivariate models predict a decline in the growth rate of real GDP in the fourth quarter of 1996 through 1997. The RRR model forecasts steady growth around 1.7% for the rest of the decade. The ECM and BVAR models are more pessimistic and predict growth of less than 1% for most of the period. The ECM, BVAR and RRR models all forecast higher inflation, reaching 5% by mid 1997 and slowly tailing off thereafter. These forecasts are outside the new wider RBNZ inflation target zone of 0 – 3%. None of these models, of course, employ policy reaction functions to influence inflation forecasts. The scalar BAR model is more optimistic about real GDP growth giving forecasts of around 3% for 1998 and it also predicts much lower inflation rates for the CORE CPI.

Forecasting Record

Figures 6(a) and 6(b) show the average forecast RMSE's of our in-house models and the FAIR structural econometric model of the US economy over the period 1995:1 – 1996:3. The RMSE's are calculated for forecast horizons up to 7-periods ahead. So far, we have a track record of 5 observations on the 1-period ahead forecasts, 5 observations on the 2-period ahead forecasts, 4 observations on the 3-period ahead forecasts, 3 observations on the 4-period ahead forecasts, 2 observations on the 5-period ahead forecasts and 1 observation each on the 6- and 7-period ahead forecasts. With this number of observations, we can expect to see some variability in the forecast performance as measured by averaging the RMSE's for each forecast horizon.

Figure 6(a) gives the forecasting record for real GDP. As in our last analysis, the forecasting record of the FAIR model is clearly the best for one and two periods out. Thereafter, the performance of the ECM model and the FAIR model is very close. Interestingly, the average forecast RMSE's for the FAIR and ECM models do not seem to increase much with the length of the forecast horizon, although the longer horizon forecast RMSE's are computed with fewer observations. The BVAR model seems generally to have the worst forecast performance for real GDP growth over longer horizons.

In forecasting inflation, there is less variability within models across horizons than for GDP, but there is a much wider band of performance across models. The FAIR model is uniformly the best inflation forecasting instrument over a horizons. The ECM model is again a close second and ha: two period ahead forecast performance very close to the FAIR model. The RRR model is consistently the worst performer in inflation forecasting for the USA.

These results continue to show that the ECM model and the FAIR model have the best overall performance in predicting the course of inflation and real GDP growth in the USA economy. These results seem to confirm the value of imposing structural elements in time series models for forecasting purposes, at least on the basis of the record for the US economy.

Table 1: USA Forecasts

(a) Real GDP: growth rate (% annual rate)

	ECM	RRR	BVAR	BAR	Fair Model
1996:4	0.74	1.92	2.53	3.43	1.84
1997:1	1.75	1.69	1.36	3.55	2.49
1997:2	2.48	2.46	1.86	3.68	2.72
1997:3	2.62	2.45	1.79	3.68	2.39
1997:4	2.93	2.39	2.01	3.67	2.33
1998:1	3.06	2.23	2.13	3.64	2.33
1998:2	3.06	2.06	2.14	3.62	2.29
1998:3	3.06	1.90	2.11	3.59	2.30
1998:4	3.02	1.78	2.08	3.57	2.45
1999:1	2.96	1.70	2.02	3.55	2.55
1999:2	2.91	1.66	1.94	3.53	2.59
1999:3	2.86	1.64	1.88	3.51	2.62
1999:4	2.82	1.63	1.82	3.49	2.73

(c) Inflation — GDP deflator (% annual rate)

	ECM	RRR	BVAR	BAR	Fair Model
1996:4	2.00	2.09	2.23	2.37	1.54
1997:1	2.21	2.46	2.43	2.68	1.60
1997:2	2.33	2.95	2.58	2.94	1.66
1997:3	2.46	3.27	2.78	3.27	1.82
1997:4	2.62	3.45	2.92	3.54	1.92
1998:1	2.74	3.56	3.03	3.78	2.01
1998:2	2.83	3.62	3.13	4.01	2.09
1998:3	2.94	3.66	3.22	4.21	2.17
1998:4	3.04	3.68	3.29	4.40	2.25
1999:1	3.12	3.69	3.34	4.57	2.32
1999:2	3.19	3.69	3.39	4.72	2.40
1999:3	3.27	3.68	3.43	4.86	2.47
1999:4	3.33	3.67	3.47	4.98	2.55

(b) Real Investment: growth rate (% annual rate)

	ECM	RRR	BVAR	BAR	Fair Model
1996:4	0.71	4.68	0.41	7.15	1.79
1997:1	−1.68	1.79	−0.17	6.26	2.14
1997:2	−0.48	2.02	−1.30	5.47	2.47
1997:3	−1.66	3.00	−1.51	5.00	1.81
1997:4	−1.08	3.35	−1.07	4.73	1.57
1998:1	−0.06	3.33	−0.31	4.56	1.45
1998:2	0.51	3.08	0.52	4.46	1.26
1998:3	1.13	2.75	1.29	4.39	1.05
1998:4	1.64	2.43	1.87	4.34	1.10
1999:1	1.98	2.17	2.24	4.30	1.24
1999:2	2.24	1.99	2.43	4.28	1.37
1999:3	2.44	1.87	2.49	4.25	1.53
1999:4	2.58	1.80	2.45	4.23	1.77

(d) 3-Month Treasury Bill Rate

	ECM	RRR	BVAR	BAR	Fair Model
1996:4	5.26	4.55	4.87	5.22	4.86
1997:1	5.27	4.51	4.89	5.36	4.94
1997:2	5.22	4.54	5.03	5.51	5.12
1997:3	5.24	4.60	5.02	5.65	5.16
1997:4	5.25	4.68	5.00	5.78	5.11
1998:1	5.26	4.76	5.03	5.91	5.08
1998:2	5.29	4.82	5.07	6.04	5.07
1998:3	5.33	4.86	5.10	6.15	5.05
1998:4	5.38	4.88	5.14	6.26	5.03
1999:1	5.42	4.88	5.19	6.36	5.02
1999:2	5.47	4.88	5.24	6.45	5.01
1999:3	5.52	4.86	5.28	6.54	5.02
1999:4	5.57	4.84	5.33	6.63	5.04

Table 2: Japan Forecasts

(a) Real GDP: growth rate (% annual rate)

	ECM	RRR	BVAR	BAR
1996:4	4.56	2.25	4.44	4.10
1997:1	2.81	−0.77	0.88	3.01
1997:2	2.97	−1.59	1.22	3.52
1997:3	3.68	−1.85	2.32	4.03
1997:4	3.39	−1.99	1.04	3.91
1998:1	3.35	−2.00	1.23	4.00
1998:2	3.40	−1.86	1.62	4.05
1998:3	3.30	−1.64	1.21	4.01
1998:4	3.23	−1.37	1.32	3.99
1999:1	3.17	−1.10	1.44	3.97
1999:2	3.11	−0.83	1.30	3.93
1999:3	3.05	−0.59	1.33	3.90
1999:4	3.01	−0.38	1.34	3.86

(c) Inflation — GDP deflator (% annual rate)

	ECM	RRR	BVAR	BAR
1996:4	0.83	2.60	0.48	0.82
1997:1	1.58	3.19	1.92	1.56
1997:2	1.88	3.54	1.67	1.77
1997:3	2.28	3.53	1.17	1.88
1997:4	2.48	3.34	1.28	1.79
1998:1	2.65	2.99	1.07	1.71
1998:2	2.73	2.58	0.84	1.61
1998:3	2.77	2.15	0.86	1.56
1998:4	2.76	1.73	0.72	1.52
1999:1	2.74	1.34	0.63	1.50
1999:2	2.68	1.00	0.61	1.48
1999:3	2.62	0.71	0.57	1.47
1999:4	2.55	0.48	0.54	1.45

(b) Real Investment: growth rate (% annual rate)

	ECM	RRR	BVAR	BAR
1996:4	4.71	5.01	7.20	5.78
1997:1	5.74	1.02	4.98	4.40
1997:2	3.44	−1.87	3.29	4.50
1997:3	4.28	−2.66	4.05	4.63
1997:4	4.42	−3.28	3.51	4.52
1998:1	3.95	−3.52	2.85	4.50
1998:2	3.99	−3.47	3.24	4.46
1998:3	3.98	−3.19	3.05	4.41
1998:4	3.83	−2.81	2.88	4.37
1999:1	3.80	−2.36	3.04	4.33
1999:2	3.78	−1.89	2.95	4.29
1999:3	3.74	−1.45	2.88	4.26
1999:4	3.73	−1.05	2.89	4.23

(d) M1 growth (% annual rate)

	ECM	RRR	BVAR	BAR
1996:4	7.92	8.61	9.37	3.10
1997:1	6.55	3.74	7.24	3.18
1997:2	6.38	2.69	7.14	3.33
1997:3	5.95	1.81	4.34	3.53
1997:4	5.52	0.57	4.92	3.74
1998:1	5.39	−0.18	5.05	3.93
1998:2	5.04	−0.67	4.84	4.09
1998:3	4.84	−0.93	5.36	4.24
1998:4	4.63	−1.05	5.57	4.38
1999:1	4.46	−1.05	5.55	4.50
1999:2	4.31	−0.96	5.68	4.60
1999:3	4.17	−0.83	5.65	4.70
1999:4	4.05	−0.67	5.54	4.79

Table 3: Korea Forecasts

(a) Real GDP: growth rate (% annual rate)

	ECM	RRR	BVAR	BAR
1996:4	5.59	6.95	7.61	7.27
1997:1	4.37	6.59	7.64	6.91
1997:2	3.83	7.04	8.53	7.60
1997:3	3.35	7.46	9.27	8.26
1997:4	3.81	7.42	8.87	8.21
1998:1	3.56	7.09	8.45	8.23
1998:2	3.60	6.93	8.08	8.20
1998:3	3.57	6.75	7.81	8.18
1998:4	3.57	6.64	7.60	8.16
1999:1	3.54	6.52	7.44	8.14
1999:2	3.52	6.43	7.33	8.12
1999:3	3.50	6.35	7.27	8.10
1999:4	3.48	6.27	7.24	8.08

(c) Inflation — GDP deflator (% annual rate)

	ECM	RRR	BVAR	BAR
1996:4	6.14	5.94	5.89	5.93
1997:1	6.05	5.67	5.69	5.37
1997:2	5.92	5.51	5.31	4.73
1997:3	6.70	6.25	5.64	4.95
1997:4	7.12	6.75	5.84	4.93
1998:1	7.30	6.92	5.60	4.85
1998:2	7.52	6.94	5.53	4.83
1998:3	7.72	6.91	5.62	4.79
1998:4	7.85	6.87	5.63	4.76
1999:1	7.95	6.82	5.60	4.72
1999:2	8.04	6.78	5.54	4.69
1999:3	8.11	6.74	5.44	4.65
1999:4	8.16	6.70	5.32	4.62

Table 3 cont: Korea Forecasts

(b) Real Investment: growth rate (% annual rate)

	ECM	RRR	BVAR	BAR
1996:4	7.56	6.89	7.71	9.00
1997:1	2.13	2.52	2.50	5.41
1997:2	2.92	4.49	3.63	8.06
1997:3	2.50	5.31	3.76	9.71
1997:4	1.88	6.68	3.70	9.83
1998:1	1.99	7.01	4.43	10.27
1998:2	1.91	7.05	5.01	10.54
1998:3	1.87	7.09	5.55	10.66
1998:4	1.94	7.15	6.12	10.78
1999:1	1.95	7.22	6.62	10.87
1999:2	1.98	7.29	7.04	10.93
1999:3	2.02	7.36	7.41	10.98
1999:4	2.05	7.42	7.71	11.02

(d) M1 growth (% annual rate)

	ECM	RRR	BVAR	BAR
1996:4	7.82	10.11	9.62	9.36
1997:1	6.20	10.64	9.89	9.23
1997:2	6.22	13.01	11.84	11.09
1997:3	7.57	16.35	14.92	14.16
1997:4	7.93	16.02	14.95	14.51
1998:1	7.80	15.24	14.32	14.43
1998:2	8.11	14.63	14.01	14.46
1998:3	8.35	14.15	13.69	14.47
1998:4	8.37	13.78	13.37	14.44
1999:1	8.44	13.48	13.13	14.42
1999:2	8.53	13.24	12.97	14.40
1999:3	8.56	13.04	12.85	14.39
1999:4	8.58	12.87	12.77	14.37

Table 4: Australia Forecasts

(a) Real GDP: growth rate (% annual rate)

	ECM	RRR	BVAR	BAR
1996:4	3.70	3.39	3.55	3.55
1997:1	2.33	1.83	2.06	2.02
1997:2	2.99	2.23	2.63	2.51
1997:3	2.95	1.91	2.52	2.33
1997:4	2.86	1.86	2.55	2.27
1998:1	2.91	1.82	2.74	2.40
1998:2	2.89	1.77	2.89	2.50
1998:3	2.88	1.72	3.05	2.60
1998:4	2.88	1.68	3.20	2.70
1999:1	2.88	1.64	3.34	2.78
1999:2	2.87	1.61	3.44	2.85
1999:3	2.87	1.57	3.53	2.90
1999:4	2.86	1.54	3.60	2.94

(c) Inflation — GDP deflator (% annual rate)

	ECM	RRR	BVAR	BAR
1996:4	1.51	1.65	1.56	1.28
1997:1	1.22	1.89	1.40	0.83
1997:2	0.49	1.69	0.85	−0.05
1997:3	1.10	2.74	1.51	0.27
1997:4	0.72	2.76	1.17	−0.14
1998:1	0.75	2.77	1.09	−0.28
1998:2	0.76	2.77	0.93	−0.48
1998:3	0.65	2.76	0.78	−0.68
1998:4	0.66	2.76	0.64	−0.88
1999:1	0.61	2.75	0.52	−1.09
1999:2	0.58	2.74	0.41	−1.29
1999:3	0.55	2.73	0.32	−1.50
1999:4	0.52	2.71	0.23	−1.71

(b) Real Investment: growth rate (% annual rate)

	ECM	RRR	BVAR	BAR
1996:4	7.90	7.82	7.15	7.30
1997:1	1.82	1.98	0.13	0.97
1997:2	2.27	2.52	0.14	1.04
1997:3	2.13	2.50	−0.64	0.61
1997:4	1.82	2.36	−0.57	0.66
1998:1	1.90	2.24	0.11	0.80
1998:2	1.88	2.15	0.31	1.03
1998:3	1.92	2.07	0.86	1.28
1998:4	1.97	1.99	1.21	1.51
1999:1	2.01	1.92	1.59	1.72
1999:2	2.05	1.86	1.90	1.88
1999:3	2.08	1.80	2.16	2.01
1999:4	2.11	1.74	2.38	2.10

(d) M1 growth (% annual rate)

	ECM	RRR	BVAR	BAR
1996:4	9.47	9.80	9.19	10.51
1997:1	7.00	7.84	6.87	9.24
1997:2	6.34	7.79	6.19	9.97
1997:3	5.51	7.58	5.69	10.63
1997:4	5.10	7.43	5.93	10.71
1998:1	4.82	7.23	5.95	10.83
1998:2	4.65	7.03	6.34	10.89
1998:3	4.52	6.83	6.48	10.92
1998:4	4.38	6.64	6.64	10.94
1999:1	4.27	6.46	6.77	10.96
1999:2	4.18	6.29	6.86	10.97
1999:3	4.08	6.14	6.92	10.98
1999:4	3.99	5.99	6.93	10.99

Table 5: New Zealand Forecasts

(a) Real GDP: growth rate (% annual rate)

	ECM	RRR	BVAR	BAR
1996:3	1.60	1.82	1.65	2.22
1996:4	1.18	1.78	1.31	2.40
1997:1	0.50	1.45	0.69	2.38
1997:2	0.41	1.48	0.53	2.82
1997:3	0.79	1.71	0.56	2.86
1997:4	0.99	1.65	0.52	2.89
1998:1	1.28	1.71	0.53	2.93
1998:2	1.43	1.92	0.51	2.97
1998:3	1.18	1.84	0.43	3.00
1998:4	1.10	1.87	0.38	3.04
1999:1	0.95	1.87	0.34	3.07
1999:2	0.77	1.82	0.31	3.11
1999:3	0.73	1.89	0.31	3.14
1999:4	0.71	1.96	0.33	3.18

(c) Inflation — Core CPI (% annual rate)

	ECM	RRR	BVAR	BAR
1996:3	2.66	2.85	2.92	1.51
1996:4	3.50	3.74	3.68	0.84
1997:1	4.40	4.93	4.51	0.26
1997:2	5.15	5.97	5.00	-0.61
1997:3	5.16	5.86	4.71	-0.78
1997:4	5.17	5.38	4.38	-0.95
1998:1	5.03	4.44	4.05	-1.11
1998:2	4.80	3.29	3.78	-1.27
1998:3	4.96	2.80	3.59	-1.42
1998:4	4.81	2.58	3.43	-1.58
1999:1	4.85	2.76	3.26	-1.73
1999:2	4.98	3.15	3.09	-1.88
1999:3	4.99	3.38	2.92	-2.02
1999:4	5.04	3.48	2.74	-2.16

(b) Real Investment: growth rate (% annual rate)

	ECM	RRR	BVAR	BAR
1996:3	6.73	8.23	8.15	7.99
1996:4	-0.87	2.85	3.36	3.39
1997:1	-1.26	3.10	2.98	2.89
1997:2	-2.79	4.01	2.69	2.88
1997:3	-1.74	4.75	2.10	2.92
1997:4	1.50	6.26	1.81	2.96
1998:1	1.01	5.73	1.02	3.00
1998:2	2.32	4.67	0.55	3.05
1998:3	2.08	3.33	0.22	3.09
1998:4	1.10	2.24	-0.09	3.13
1999:1	0.83	2.05	-0.23	3.16
1999:2	0.17	2.41	-0.31	3.20
1999:3	-0.04	3.23	-0.35	3.23
1999:4	0.05	4.28	-0.33	3.26

(d) M1 growth (% annual rate)

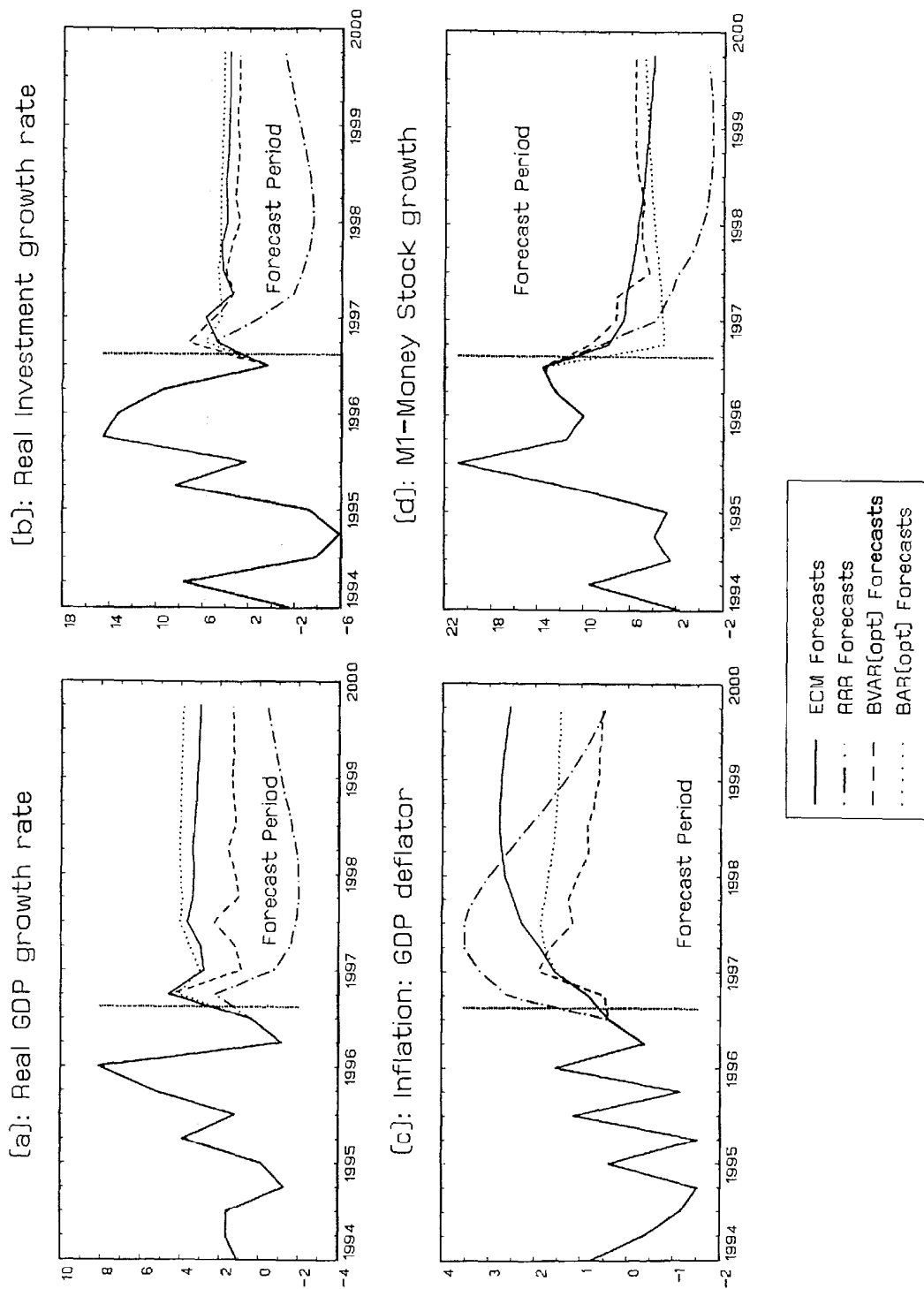|	ECM	RRR	BVAR	BAR
1996:3	2.16	4.16	5.18	4.35
1996:4	2.39	2.31	3.59	1.72
1997:1	0.55	7.49	6.96	3.07
1997:2	1.75	9.80	7.23	1.27
1997:3	1.31	12.91	8.17	0.95
1997:4	5.32	15.58	8.98	0.64
1998:1	6.28	14.22	8.68	0.32
1998:2	7.33	11.25	8.26	0.00
1998:3	7.74	8.91	7.78	-0.31
1998:4	6.74	6.18	7.19	-0.62
1999:1	6.27	4.69	6.73	-0.94
1999:2	5.74	5.05	6.33	-1.25
1999:3	5.32	6.12	5.95	-1.57
1999:4	5.22	7.23	5.61	-1.88

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Phillips, Peter C. B. (1995), 'Automated forecasts of Asia-Pacific
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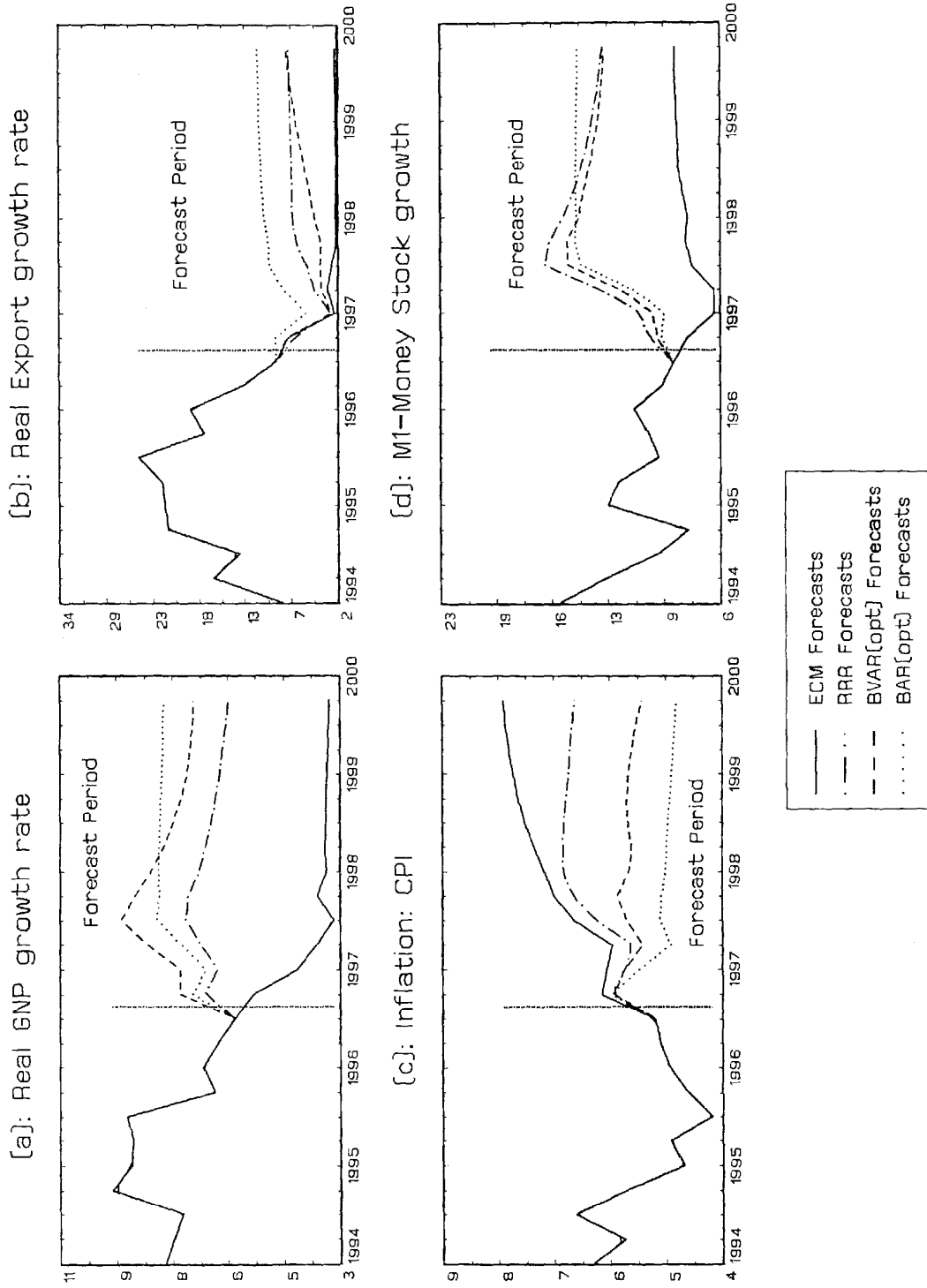Econometrica, Vol. 64, No. 4, July 1996, pp. 763–812.

Figures 1[a]-[d]: USA Forecasts
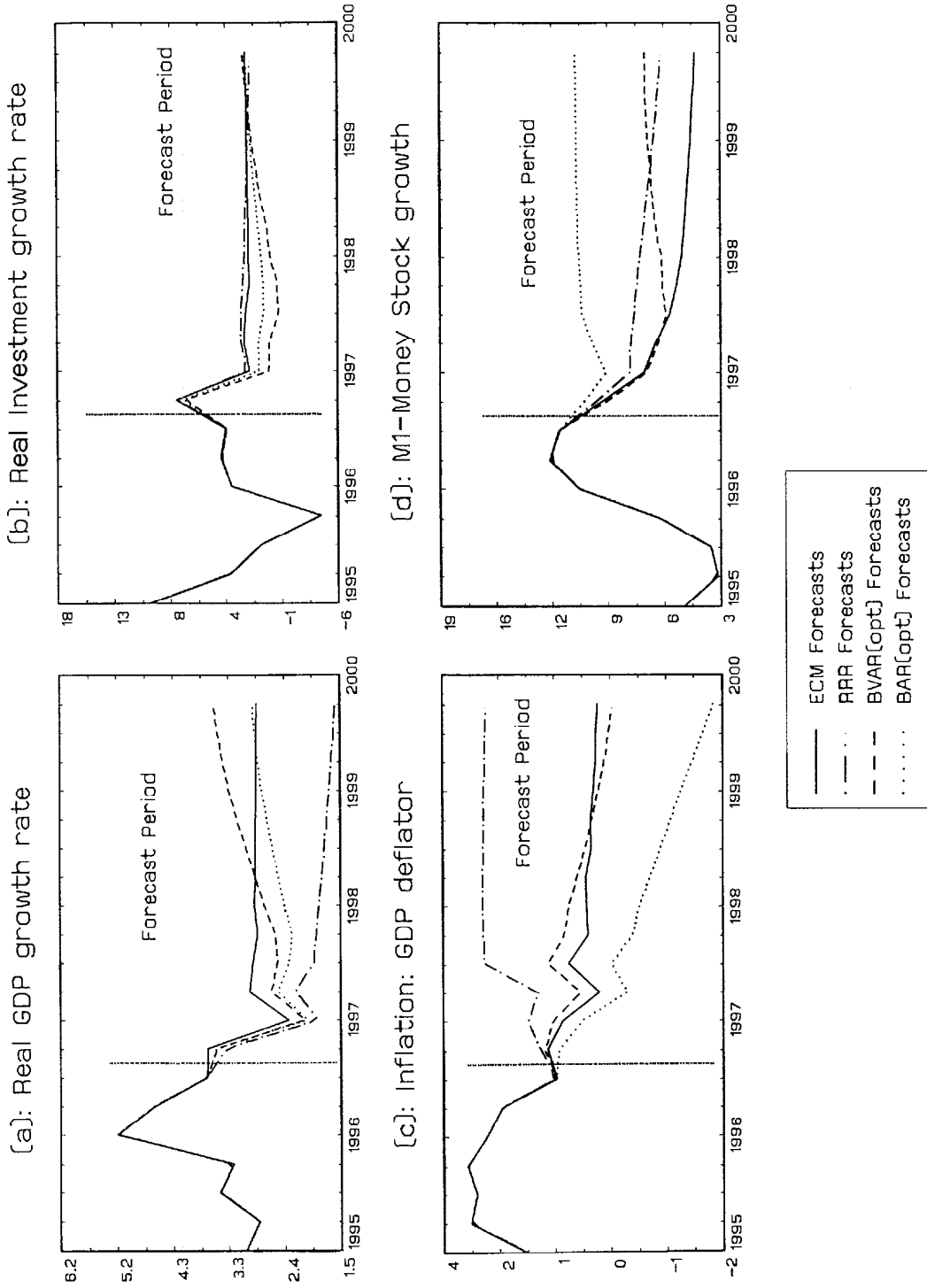
[a]: Real GDP growth rate [%]

[b]: Real Investment growth rate [%]

[c]: Inflation: GDP deflator [%]

[d]: 3-Month Treasury Bill rate [%]

Legend:
- ECM Forecasts
- RRR Forecasts
- BVAR(opt) Forecasts
- BAR(opt) Forecasts
- Fair Model Forecasts
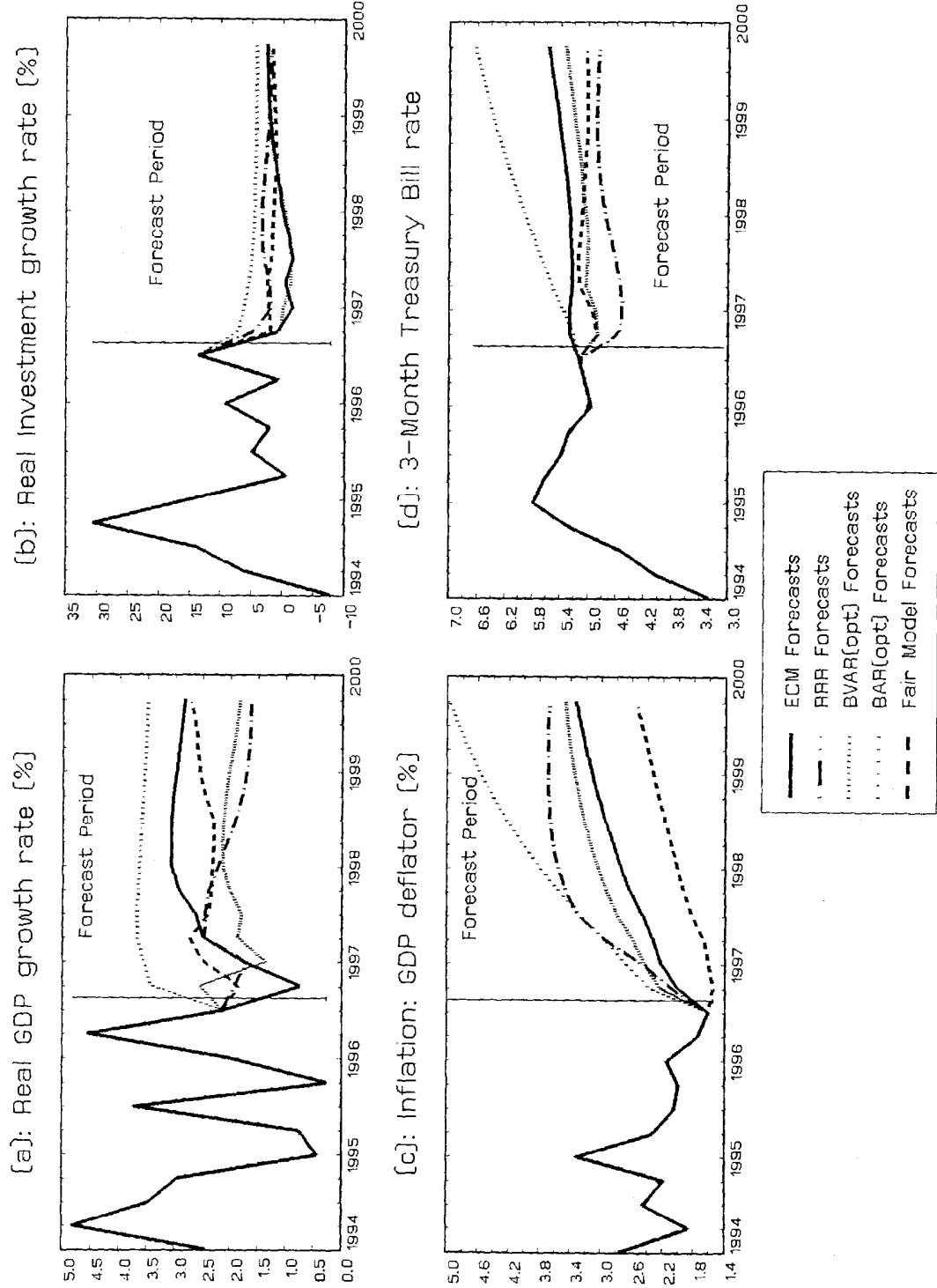
Figures 2(a)-(d): JAPAN Forecasts

[a]: Real GDP growth rate

[b]: Real Investment growth rate

[c]: Inflation: GDP deflator

[d]: M1-Money Stock growth

ECM Forecasts
RRR Forecasts
BVAR[opt] Forecasts
BAR[opt] Forecasts

Figures 3(a)–(d): Korea Forecasts

[a]: Real GNP growth rate

[b]: Real Export growth rate

[c]: Inflation: CPI

[d]: M1–Money Stock growth

ECM Forecasts
RRR Forecasts
BVAR[opt] Forecasts
BAR[opt] Forecasts

Figures 4(a)-(d): AUSTRALIA Forecasts

[a]: Real GDP growth rate

[b]: Real Investment growth rate

[c]: Inflation: GDP deflator

[d]: M1-Money Stock growth

Forecast Period

ECM Forecasts
AAA Forecasts
BVAR[opt] Forecasts
BAR[opt] Forecasts

Figures 5[a]-[d]: New Zealand Forecasts

[a]: Real GDP growth rate

[b]: Real Investment growth rate

[c]: Inflation: Core CPI

[d]: M1-Money Stock growth

Legend:
- ECM Forecasts
- RRR Forecasts
- BVAR(opt) Forecasts
- BAR(opt) Forecasts
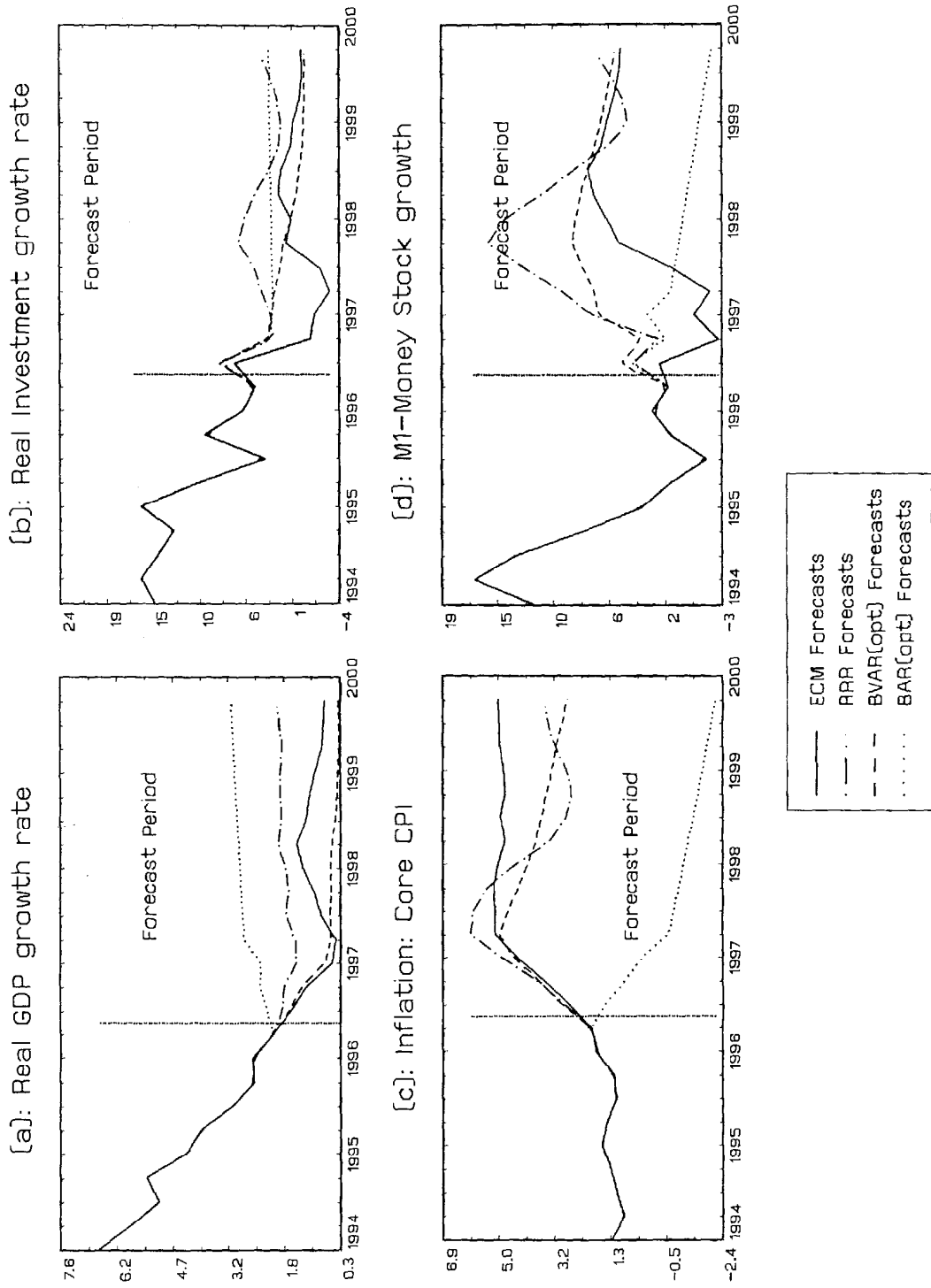
Figures 6: Forecast RMSE Comparisons
[a] USA: GDP Growth Rate

[b] USA: Inflation Rate