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Scattered Fiscal Forecasts

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Abstract

The banking debacle of 2007/2008 and the Greek sovereign debt crisis have witnessed that forecasts of government balances play a major role for how participants in financial markets assess the sustainability of government budget deficits. But how do forecasters form their government-balance forecasts? Do forecasters deliver unbiased forecasts? Our results imply that they do not. On the contrary, using more than 100,000 forecasts of government balances for 38 countries we report strong evidence of forecaster anti-herding, i.e. forecaster scatter their projections around the consensus forecast.

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1. Introduction

Forecasts of government balances are of major importance for how market participants' form their expectations of future tax policy and government spending. Moreover, the banking debacle of 2007/2008 and the Greek sovereign debt crisis have witnessed that forecasts of government balances play a major role for how participants in financial markets assess the sustainability of government budget deficits. Assessments of sustainability of government budget deficits, in turn, are likely to be mirrored in the risk premiums on government bonds (Nickel et al., 2011). But how do forecasters form their government-balance forecasts? And, given the major importance of forecasts of government balances for financial and economic developments, do forecasters deliver unbiased forecasts?

We used a new empirical test developed by Bernhard et al. (2006) to analyze these questions. As compared to tests advanced in earlier literature, this new test has the advantage that it is robust to, for example, unexpected common shocks, optimism and pessimism among forecasters and inaccurate measurement of the forecast target. We used more than 100,000 forecasts of government balances for 38 countries to implement the test. Our empirical results indicate that forecasters do not deliver unbiased forecasts of government balances. We document that biased forecasts are likely to reflect anti-herding of forecasters. Anti-herding arises if forecasts are biased away from the consensus forecast, indicating that, for strategic or other reasons, forecasters intentionally scatter their forecasts around the consensus forecast.

To the best of our knowledge, the empirical test developed by Bernhardt et al. (2006) has not yet been used to study forecasts of government balances. Recent applications of their empirical test focus on forecasts of German stock analysts (Naujoks et al., 2009) and oil-price forecasts (Pierdzioch et al., 2010).[1] Because we are the first to apply the test developed by Bernhardt et al. (2006) to the study of forecasts of government balances, we describe the empirical test in detail in Section 2. We introduce the survey data that we used in our empirical research together with our empirical results in Section 3. We offer some concluding remarks in Section 4.

2. A Test of Forecast Scattering

The test developed by Bernhardt et al. (2006) uses the insight that, given an information set available at the time a forecast is made, forecasters should form in period t a median-unbiased private forecast of government balances in period $t+k$.[2] This private forecast is denoted by $\tilde{E}_{i,t}[s_{t+k}]$, where i denotes a forecaster index. Accordingly, the probability that an unbiased private forecast exceeds (is less than) future realized

[1] In earlier literature, regressions of actual values of a variable on forecasts have often been used to test for rationality and unbiasedness of forecasts. See Keane and Runkle (1990), Song et al. (1995), Aggarwal and Mohanty (2000), among others. Elliott et al. (2008) argue that such regressions do not discriminate between irrational forecasts and forecasts derived from an asymmetric loss function. The test developed by Bernhardt et al. (2006) does not depend upon a specific forecaster loss function. As regards fiscal forecasts, Melander et al. (2007) study whether the fiscal and other forecasts of the EU commission are biased.

[2] The index k denotes the forecasting horizon expressed in months (with $k = 12, 11, ..., 1$ for current-year forecasts, and $k = 24, 23, ..., 13$ for next-year forecasts).

government balances, s_{t+k}, should be equal to 0.5. As a result, the probability that future realized government balances overshoot (undershoot) the unbiased private forecast should not be linked to the consensus (average) forecast, $\bar{E}_t[s_{t+k}]$.

Herding arises if a published forecast is biased towards the consensus forecast. In this case, the published biased forecast, $E_{i,t}[s_{t+k}]$, is positioned between $\tilde{E}_{i,t}[s_{t+k}]$ and $\bar{E}_t[s_{t+k}]$. It follows that, if the biased published forecast exceeds the consensus forecast, the probability that the biased public forecast also exceeds future realized government balances should be smaller than 0.5. By the same token, the probability that the published biased forecast is less than future realized government balances should be smaller than 0.5 if a biased published forecast is less than the consensus forecast. In contrast, *anti-herding* can be recovered from probabilities that are larger than 0.5 because, in this case, a forecasters' public forecast is biased away from the consensus forecast.

Regardless of the consensus forecast, if published forecasts of government balances are unbiased, the conditional probability, P, that future realized government balances undershoot (overshoot) an unbiased published forecast should be 0.5, implying

$$P(s_{t+k} < E_{i,t}[s_{t+k}] \,|\, E_{i,t}[s_{t+k}] > \bar{E}_t[s_{t+k}], s_{t+k} \neq E_{i,t}[s_{t+k}]) = 0.5, \tag{1}$$

$$P(s_{t+k} > E_{i,t}[s_{t+k}] \,|\, E_{i,t}[s_{t+k}] < \bar{E}_t[s_{t+k}], s_{t+k} \neq E_{i,t}[s_{t+k}]) = 0.5. \tag{2}$$

In the case of herding, a forecaster publishes forecasts that are biased towards the consensus forecast, and the probability of undershooting is less than 0.5, given a published forecast that exceeds the consensus forecast. In a similar vein, if the biased published forecast is less than the consensus forecast, then the probability of overshooting should also be less than 0.5. We get

$$P(s_{t+k} < E_{i,t}[s_{t+k}] \,|\, E_{i,t}[s_{t+k}] > \bar{E}_t[s_{t+k}], s_{t+k} \neq E_{i,t}[s_{t+k}] < 0.5, \tag{3}$$

$$P(s_{t+k} > E_{i,t}[s_{t+k}] \,|\, E_{i,t}[s_{t+k}] < \bar{E}_t[s_{t+k}], s_{t+k} \neq E_{i,t}[s_{t+k}]) < 0.5. \tag{4}$$

If forecasters anti-herd, in contrast, the two conditional probabilities should be larger than 0.5. We have:

$$P(s_{t+k} < E_{i,t}[s_{t+k}] \,|\, E_{i,t}[s_{t+k}] > \bar{E}_t[s_{t+k}], s_{t+k} \neq E_{i,t}[s_{t+k}] > 0.5, \tag{5}$$

$$P(s_{t+k} > E_{i,t}[s_{t+k}] \,|\, E_{i,t}[s_{t+k}] < \bar{E}_t[s_{t+k}], s_{t+k} \neq E_{i,t}[s_{t+k}]) > 0.5. \tag{6}$$

The test statistic, S, is computed as the average of the sample estimates of the two conditional probabilities. The test statistic, S, has an asymptotic normal distribution. The null hypothesis is that forecasters form unbiased forecasts. If forecasters form unbiased forecasts, the test statistic should assume the value $S = 0.5$. If forecasters herd, the test statistic should assume a value $S < 0.5$. If forecasters anti-herd, the test statistic should assume a value $S > 0.5$.

Bernhardt et al. (2006) show that systematic optimism or pessimism of forecasters do not distort the test statistic, S. Systematic pessimism raises (lowers) the conditional probability that future realized government balances exceed (fall short of) forecasts of government balances. The shift in the conditional probabilities, however, does not affect

the test statistic, S, which is defined as the average of the two conditional probabilities. The averaging of the two conditional probabilities further implies that the test statistic does not depend on whether forecasters target the median or the mean of an asymmetric distribution over future realized government balances. The variance of the test statistic, S, attains a maximum under the null hypothesis of unbiased forecasts of government balances, implying that the test statistic, S, is conservative insofar as, under the null hypothesis, one maximizes the difficulty to reject the null hypothesis of unbiased forecasts.

3. Data and Empirical Results

We analyzed the monthly Consensus Economics survey data of government-balance forecasts for 38 countries. Our sample of countries includes industrialized countries, Asian countries, Eastern European countries, and Latin American countries. The sample period ends in December 2010, but the start of the sample period differs across countries. While the government balance forecasts for the industrialized countries have been published since March 1993, for other countries like Slovakia or Ukraine the survey started in March 2010 only. In total, we used in our empirical analysis more than $100,000$ forecasts made by more than 1,800 forecasters.[3] Survey data are available for two different forecast horizons, that is, for the current year and the next year.[4]

Insert Figures 1 and 2 about here.

Figures 1 and 2 plot the cross-sectional average of forecasts (dashed lines), the actual government balances (solid lines) taken from the IMF International Financial Statistic, and the cross-sectional scattering of forecasts as measured by the cross-sectional range of forecasts (shaded areas). While the variables for the industrialized and Asian countries are forecasted in national currency, the variables for the other countries are forecasted as a percentage of GDP. The cross-sectional average of forecasts (that is, the consensus forecast) moves in tandem with actual government balance. The scattering of forecasts around the consensus forecast, however, is substantial. For example, for the United States (the Euro area) the May 2009 forecasts ranged from bn. \$ -810 to bn. \$ $-2,410$ (bn. € -365 to bn. € -700). The cross-sectional scattering of forecasts is largest during the financial crisis of 2007/2008.

The results given in Table 1 suggest that anti-herding of forecasters may help to explain the cross-sectional scattering of forecasts. The test statistic, S, significantly exceeds 0.5 in the vast majority of countries, irrespective of whether one considers current year or next year forecasts. In other words, our results provide strong evidence of anti-herding of forecasters.[5] Interestingly, the anti-herding behavior is significantly

[3] A short sample period does not lead to statistical problems because the test statistic, S, is computed from the cross-section of forecasts. The forecasters participating in the survey work for institutions such as investment banks, large international corporations, economic research institutes, and at universities located in the respective country. A complete list of participants is available upon request.

[4] For some countries, like, the UK, the U.S., and India, the forecasts are for the fiscal year while for other countries the forecasts are for the calendar year. For the industrialized countries and the Asian countries the forecasts are in national currency. For the Eastern European European countries and the Latin American countries forecasts are expressed relative to GDP.

[5] Because forecasters simultaneously issue forecasts, we used the lagged consensus forecast to compute the test statistic. To this end, we combined forecasts such that the forecasting horizons of current-year forecasts exactly match the forecasting horizon of next-year forecasts. For January forecasts, we used the next-year forecast of the preceding period. The lagged next-year consensus forecast is in the information

stronger for the Asian and Latin American countries while relatively less pronounced for the industrialized countries.

Insert Table 1 about here.

In order to study the link between forecast accuracy and anti-herding, we calculated the forecaster-specific Root Mean Squared Error, $RMSE_i$. We then computed the test statistic, S_i for every forecaster. Finally, we estimated the correlation coefficient between the two variables. For all regions, we find a negative correlation of anti-herding with forecast errors (Table 2). However, this correlation is statistically significant on a 95 % confidence level only for the industrialized countries. Furthermore, the size of the correlation coefficients point into the direction of a very loose relationship. Thus, while fiscal forecasts scatter, anti-herding does not necessarily lead to less accurate forecasts.

Insert Table 2 about here.

4. Conclusions

Anti-herding of fiscal forecasters leads to a scattering of forecasts around the consensus forecast. The negative correlation between anti-herding and forecast errors shows that anti-herding forecasters are not less "successful" in statistical terms than forecasters who track the consensus forecast. In economic terms, the success of a forecaster depends on a forecaster's loss function, and forecast accuracy may be only one of several arguments in the loss function. For example, Laster et al. (1999) construct a model in which forecasters are endowed with the same information set, the same believes about the "correct" forecasting model, and the same loss function. Forecasts are made for two types of customers. The first group of customers regularly consumes forecasts and is interested in an accurate forecast. The second group of customers only occasionally use forecasts. They take into consideration only the performance of a forecaster in the last forecasting cycle. The larger the influence of the occasional users, the stronger the incentive to deviate from the consensus forecast because if *'...forecasters are paid according to relative ability, they might scatter, since it is hard to win when making a forecast similar to others"* (Lamont 2002, p.268).

set of forecasters when making current-year forecasts, and the forecasting horizon is identical for the lagged forecasts and the contemporaneous forecasts.

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Table 1: Results for the Test Statistic, S

Panel A: Industrialized countries

Country	Canada		France		Germany		Italy		Japan		Netherlands
Year	Current	Next	Current	Next	Current	Next	Current	Next	Current	Next	Current
S-Statistic	0.526	0.548	0.565	0.519	0.547	0.503	0.560	0.540	0.648	0.573	0.665
Stand. Dev.	0.011	0.011	0.009	0.009	0.007	0.007	0.010	0.011	0.016	0.018	0.063
Lower 99 %	0.500	0.519	0.543	0.495	0.528	0.483	0.533	0.511	0.606	0.526	0.500
Upper 99 %	0.554	0.577	0.588	0.543	0.565	0.522	0.587	0.568	0.689	0.620	0.830
Obs.	2,279	2,162	3,407	2,920	4,929	4,505	2,349	2,161	1,005	794	64

Panel A (cont.): Industrialized countries

Country	Norway	Spain	Sweden	Switzerland	UK		U.S.		Euro Area		Industrialized Countries	
Year	Current	Current	Current	Current	Current	Next	Current	Next	Current	Next	Current	Next
S-Statistic	0.688	0.837	0.793	0.843	0.561	0.551	0.529	0.482	0.714	0.515	0.543	0.524
Stand. Dev.	0.071	0.043	0.057	0.058	0.007	0.007	0.008	0.008	0.014	0.012	0.003	0.003
Lower 99 %	0.500	0.725	0.645	0.691	0.543	0.532	0.508	0.461	0.678	0.484	0.533	0.515
Upper 99 %	0.875	0.948	0.942	0.996	0.580	0.570	0.549	0.503	0.749	0.546	0.551	0.533
Obs.	52	138	80	75	4,930	4,743	4,253	4,094	1,494	1,820	25,673	23,199

Panel B: Eastern European countries

Country	Bulgaria		Croatia		Czech Republic		Estonia		Hungary		Latvia		Lithuania	
Year	Current	Next	Current	Next	Current	Next	Current	Next	Current	Next	Current	Next	Current	Next
S-Statistic	0.710	0.513	0.702	0.532	0.608	0.571	0.554	0.460	0.446	0.548	0.569	0.559	0.594	0.512
Stand. Dev.	0.023	0.027	0.025	0.029	0.014	0.015	0.025	0.030	0.013	0.014	0.026	0.031	0.028	0.033
Lower 99 %	0.650	0.442	0.637	0.455	0.573	0.532	0.487	0.380	0.411	0.511	0.501	0.478	0.521	0.426
Upper 99 %	0.771	0.583	0.767	0.609	0.644	0.609	0.620	0.540	0.480	0.585	0.637	0.639	0.667	0.598
Obs.	478	345	408	289	1,380	1,197	385	279	1,443	1,281	374	276	345	255

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Panel B (cont.): Eastern European countries

Country	Poland		Romania	Russia		Slovakia	Slovenia		Turkey		Ukraine	Eastern European Countries	
Year	Current	Next	Current	Current	Next	Current	Current	Next	Current	Next	Current	Current	Next
S-Statistic	0.637	0.594	0.534	0.636	0.521	0.703	0.564	0.597	0.577	0.649	0.617	0.594	0.544
Stand. Dev.	0.013	0.014	0.066	0.013	0.014	0.061	0.024	0.028	0.013	0.015	0.048	0.005	0.006
Lower 99 %	0.603	0.558	0.362	0.602	0.484	0.544	0.502	0.525	0.542	0.610	0.490	0.581	0.529
Upper 99 %	0.670	0.630	0.706	0.671	0.558	0.863	0.626	0.670	0.611	0.688	0.744	0.608	0.560
Obs.	1,563	1,382	65	1,445	1,293	87	450	331	1,456	1,160	108	9,015	7,293

Panel C: Latin American countries

Country	Argentina		Brazil		Chile		Mexico		Venezuela		Latin American Countries	
Year	Current	Next	Current	Next	Current	Next	Current	Next	Current	Next	Current	Next
S-Statistic	0.688	0.608	0.687	0.653	0.545	0.520	0.661	0.659	0.695	0.661	0.653	0.618
Stand. Dev.	0.009	0.011	0.010	0.011	0.010	0.011	0.009	0.009	0.011	0.012	0.004	0.005
Lower 99 %	0.663	0.580	0.660	0.625	0.518	0.491	0.637	0.634	0.666	0.630	0.641	0.605
Upper 99 %	0.713	0.636	0.714	0.681	0.572	0.549	0.686	0.684	0.723	0.691	0.664	0.630
Obs.	2,776	2,160	2,452	2,186	2,341	2,048	3,063	2,824	2,138	1,847	12,770	11,065

Panel D: Asian countries

Country	Australia		China		Hong Kong		India		New Zealand		Taiwan		Asian Countries	
Year	Current	Next	Current	Next	Current	Next	Current	Next	Current	Next	Current	Next	Current	Next
S-Statistic	0.572	0.597	0.646	0.736	0.666	0.576	0.603	0.562	0.623	0.577	0.559	0.617	0.609	0.605
Stand. Dev.	0.011	0.011	0.017	0.018	0.018	0.019	0.015	0.017	0.011	0.011	0.030	0.032	0.006	0.006
Lower 99 %	0.544	0.568	0.602	0.688	0.619	0.526	0.563	0.516	0.594	0.548	0.479	0.532	0.593	0.589
Upper 99 %	0.600	0.625	0.689	0.784	0.712	0.627	0.642	0.607	0.651	0.606	0.638	0.702	0.624	0.621
Obs.	2,222	2,138	899	760	796	695	1,114	850	2,191	2,095	271	248	7,493	6,786

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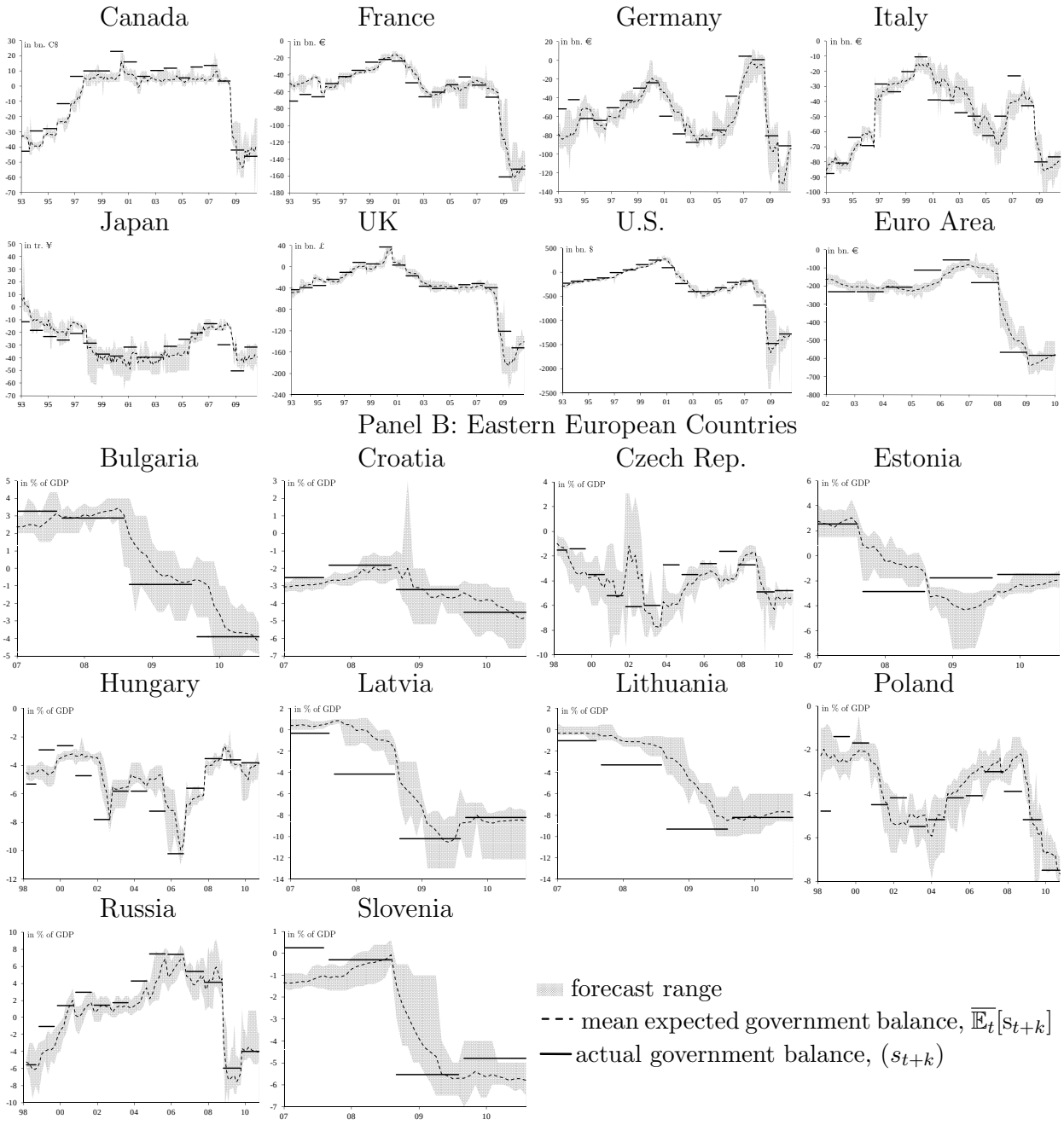
Table 2: Forecast Accuracy and Scattering

	Industrialized Countries		Asian Countries		Eastern European Countries		Latin American Countries	
Country	Current	Next	Current	Next	Current	Next	Current	Next
ρ	-.1330***	-.1497***	-.1617*	-.1515*	-.1207*	-.0339	-.1080*	-.1185*
	(.05)	(.06)	(.09)	(.09)	(.07)	(.07)	(.07)	(.07)
p-value	.01	.01	.07	.09	.09	.63	.09	.08
Forecaster	349	312	126	126	240	207	233	216

Note: This table shows correlation coefficients between the forecaster specific S-statistic and the forecasting success. Standard errors are given in parentheses. *** (**) and * indicate significance at a 1 (5) and 10 percent significance level.

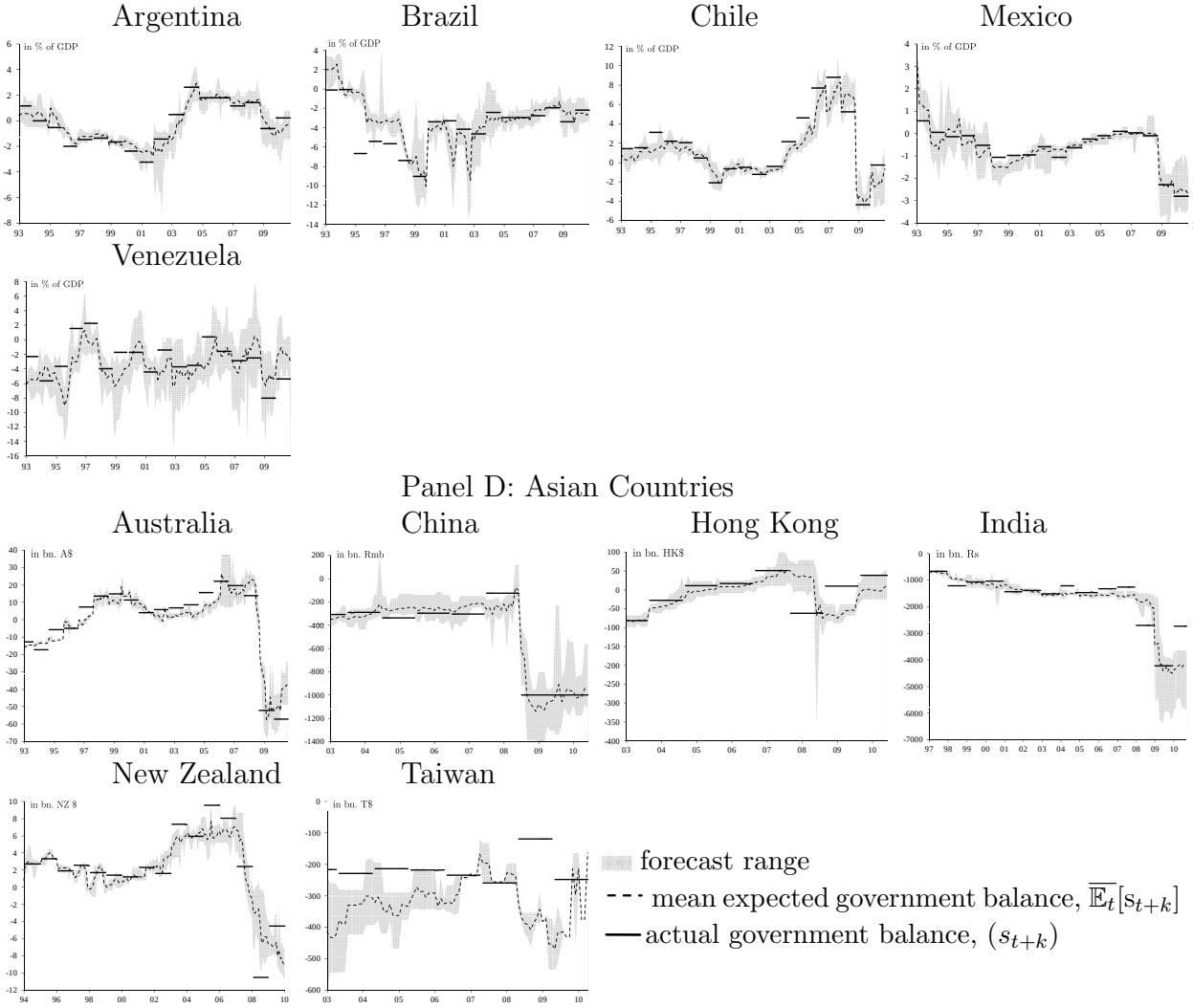
Figure 1: Expected and Actual Government Balance



This figure shows the mean of the short-term forecasts of the government balance (dashed line), the actual government balance (solid line), and the forecast range (shaded area) in national currency (Industrialized Countries) or as % of GDP (Eastern European Countries). The vertical distance between the mean forecast and the actual government balance captures the forecast error.

Figure 2: Expected and Actual Government Balance

Panel C: Latin American Countries



This figure shows the mean of the short-term forecasts of the government balance (dashed line), the actual government balance (solid line), and the forecast range (shaded area) in national currency (Asian countries) or as % of GDP (Latin American Countries). The vertical distance between the mean forecast and the actual government balance captures the forecast error.