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How Well Do Economists Forecast Recessions?

by Zidong An, João Tovar Jalles, and Prakash Loungani

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Prepared by Zidong An, João Tovar Jalles, and Prakash Loungani*

Authorized for distribution by Chris Papageorgiou

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Abstract

We describe the evolution of forecasts in the run-up to recessions. The GDP forecasts cover 63 countries for the years 1992 to 2014. The main finding is that, while forecasters are generally aware that recession years will be different from other years, they miss the magnitude of the recession by a wide margin until the year is almost over. Forecasts during non-recession years are revised slowly; in recession years, the pace of revision picks up but not sufficiently to avoid large forecast errors. Our second finding is that forecasts of the private sector and the official sector are virtually identical; thus, both are equally good at missing recessions. Strong booms are also missed, providing suggestive evidence for Nordhaus' (1987) view that behavioral factors—the reluctance to absorb either good or bad news—play a role in the evolution of forecasts.

JEL Classification Numbers: C52, E27, E37, D8

Keywords: recession, bias, efficiency, information rigidity, forecast comparison

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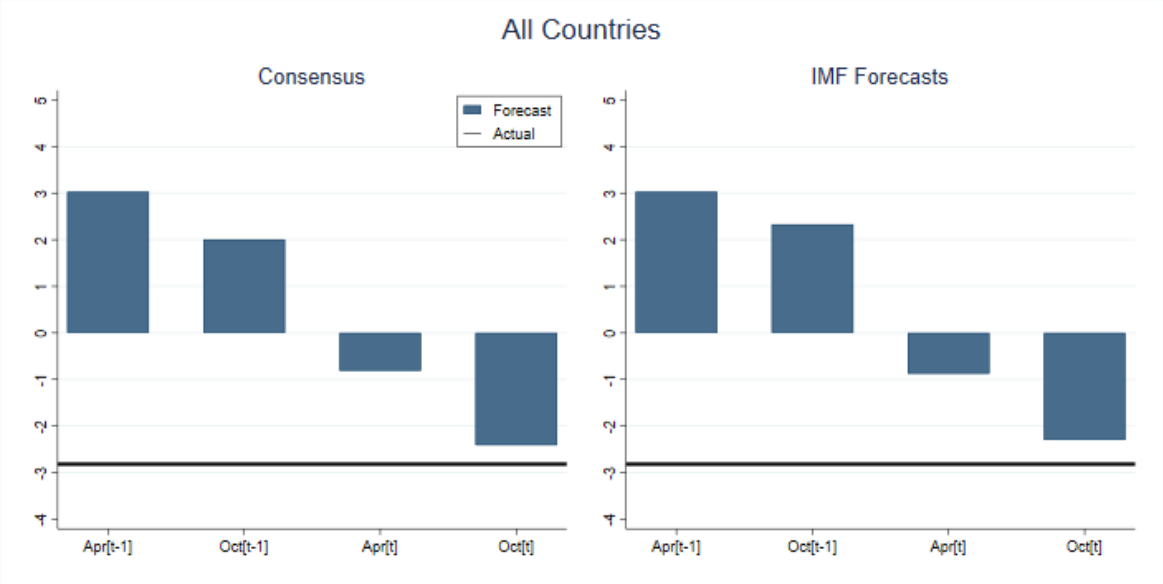
1. Introduction

Recessions are not rare: economies are in a state of recession 10-12 percent of the time. What is rare is a recession that is forecast in advance. This is shown in Figure 1, which is based on data for 63 countries from 1992 to 2014. The bars in the figure show the average forecasts for real GDP growth made in the year before a recession—the first two bars in the figure—and in the year of the recession, the next two bars. In April of the year before the recession, the forecasts—both from the private sector (Consensus Forecasts) and the official sector (IMF) are for 3 percent growth. While the forecast is marked down by October, it remains far from signaling a recession. In the year of the recession, forecasters do call for a recession by April but one that is much milder than what transpires. It is only as the year is ending that forecasts catch up with reality, shown in the figure by the solid black line.

Figure 1: Evolution of Forecasts in the Run-up to Recessions



In this paper, we describe the evolution of forecasts during recessions for advanced and emerging market economies using two sources of forecasts—Consensus Forecasts and the IMF's World Economic Outlook. Our main finding, as illustrated above, is that while forecasters are generally aware that recession years will be different from other years, they miss the magnitude of the recession by a wide margin until the forecast horizon has drawn to a close. We show that forecast revisions during non-recession years are subject to a considerable amount of rigidity. In recession years, forecasts are revised much more rapidly than in non-recession years but not

quickly enough to be able to avoid large forecast errors. Our second finding is that this pattern of behavior is shared by forecasters from the private sector and the official sector.

Other papers have found comparable results. On the first finding that recessions are difficult to forecast, Lewis and Pain (2014) also point to "a common failing to predict downturns and to predict their size" and add that "these difficulties have been found across forecasters, across countries and over longer periods of time (Zarnowitz, 1991; Loungani, 2001; Abreu, 2011; González Cabanillas and Terzi, 2012)." Dovern and Jannsen (2017) also analyze how the systematic growth forecast errors in advanced economies depend on the business cycle, and document the fact that "growth forecasts for recessions are subject to large negative systematic errors, while forecasts for recoveries are subject to small positive systematic errors."[1]

On the second finding, Abreu (2011) studies a sample of nine advanced economies over the period from 1991 to 2009, and finds that "[…] the forecasting performance of the international organisations is broadly similar to that of the surveys of private analysts. By and large, current-year forecasts present desirable features and clearly outperform year-ahead forecasts for which evidence is more mixed both in terms of quantitative and qualitative accuracy."

In the remainder of the paper, we describe the forecast data in Section 2 and the evolution of forecasts in recession and non-recession years in Section 3. The comparison between official sector and private sector forecasts is in Section 4.

2. Data

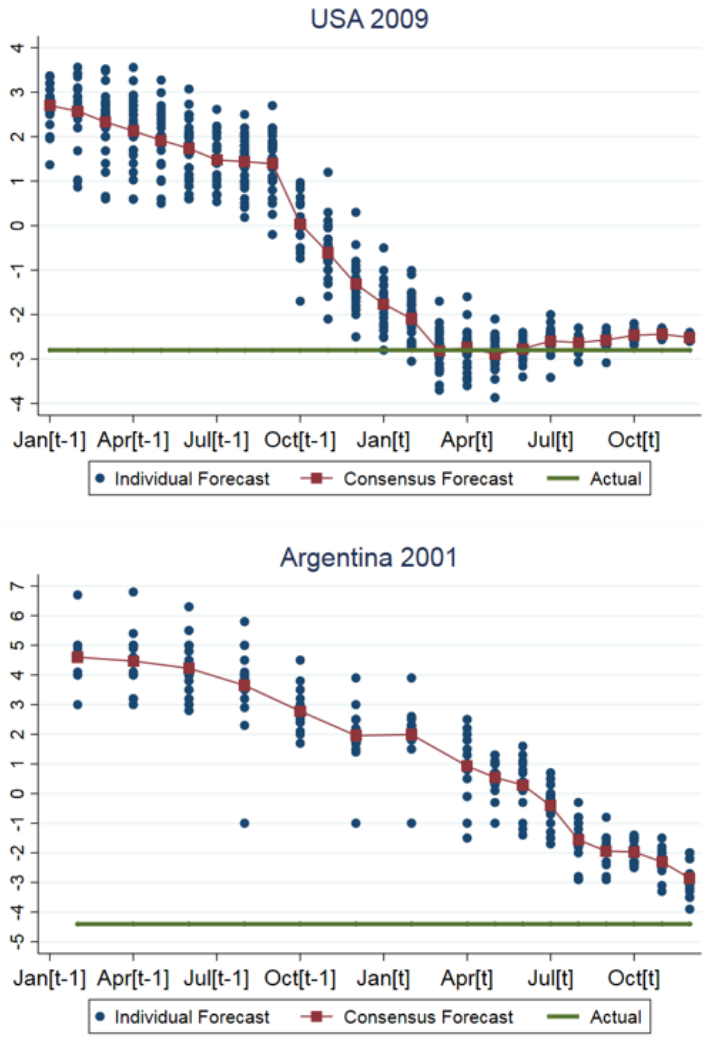
The event being forecast is the annual real GDP growth. We refer to the year for which the forecast is being made as the target year. Forecasts made in the year before the target year are called year-ahead forecasts and those made during the target year are called current-year forecasts.

The private sector forecasts are taken from Consensus Economics. Each month, this source provides year-ahead and current-year output forecasts for a large group of countries. The first year-ahead forecast is made in the January before the target year and the last current-year forecast is

[1] McNees (1991), Fintzen and Stekler (1999), Sinclair (2010) and IMF Independent Evaluation Office (2014) also show similar results.

made in the December of the target year. Hence, for any target year, there is a sequence of 24 forecasts. We use 'h' to denote this forecasting horizon, with 'h' taking values from 1 to 24.

Figure 2. Consensus Forecasts for USA (2009) and Argentina (2001)



Source: Consensus Forecasts.

The structure of the data is illustrated with a couple of concrete examples in Figure 2. The top panel shows forecasts made for the United States for the target year 2009. The horizontal axis shows the horizon and the vertical axis shows the forecast (and realization) for output growth. Each dot shows the forecast made by an individual forecaster and the solid line through these dots is the arithmetic average of these forecasts or the 'consensus'. In this paper, we use these consensus

forecasts rather than the individual forecasts.[2] The solid line shows the realization of output growth, which in this case was about -3 percent. As shown, the year-ahead forecast made in January of 2008 (corresponding to h=24) is about 3 percent. Over the remainder of the forecasting horizon, the consensus inches down from 3 percent to -3 percent. The bottom panel shows forecasts for Argentina for the target year 2001. Here the initial forecast is for about 4 percent growth and it moves down slowly towards the outcome of about -4 percent,

The official sector forecasts are taken from the IMF, which provides output year-ahead and current-year forecasts every April and October. Hence, the IMF forecasts are available for 4 of the 24 horizons: (1) April(t-1), corresponding to h=21; (2) Oct(t-1); h=15; (3) Apr(t); h=9; (4) Oct(t); h=3.

Our sample consists of 63 countries (29 advanced economies and 34 emerging economies). The longest period over which we have forecasts is 1992 to 2014; for some countries, the forecasts start later. Table A1 in the Appendix provides the list of countries and time periods.[3]

Data on (actual) real GDP growth are taken from the IMF. A recession is defined as a year when output growth was negative.[4] Tables A2 and A3 in the Appendix list the recessions in our sample. There are 153 recessions (86 in advanced economies and 67 in emerging markets), which are listed in the table by country (Table A2) and by year (Table A3). Of the 1306 country-year observations, economies are in recession in 153 years or 12 percent of the time. A recession is defined here simply as a year in which output fell (i.e. output growth was negative). In April of the year before the recession, forecasters expected output to fall in only 5 of these 153 cases. The performance gets better over time: by October of the year of the recession, forecasts were for a fall in output in 118 of the 153 cases.

[2] While individual private sector forecasts may be subject to various behavioral biases (Batchelor and Dua, 1992), many of these are likely to be eliminated by averaging across several forecasters.
[3] Given that starting dates are varied across countries, most of results in this paper are based on an unbalanced panel (i.e., countries enter the sample at different dates) to make use of all available information.
[4] For a smaller set of countries, Loungani, Stekler and Tamirisa (2013) use a more elaborate way to define recessions based on quarterly data and a business cycle dating methodology. However, forecast assessments are fairly similar to those based on this simpler definition of a recession.

Table 1. Recessions in Actual and Consensus Forecasts

		Consensus Forecasts: Apr [t-1]			Consensus Forecasts: Oct [t]		
		Non-recession	Recession	Total	Non-recession	Recession	Total
Actual	Non-recession	1145	8	1153	1120	33	1153
	Recession	148	5	153	35	118	153
	Total	1293	13	1306	1155	151	1306

Source: IMF World Economic Outlook and Consensus Forecasts

3. The evolution of forecasts

3.1 Type 1 vs. Type 2 error

We begin our description of the evolution of forecasts by providing some evidence on the extent of type 1 error (a recession happened but was not forecast) and type 2 error (a recession did not happen but was falsely forecasted).

The first row of Table 2 shows the type 1 error at various horizons; these are the number of recessions missed in the sense that the forecasts were for positive growth. As already noted in the introduction, 148 of 153 recessions are missed in April(t-1); this declines over the subsequent months but even by Oct(t), 35 recessions are missed. Over the subsequent months, forecasters steadily revised down their forecasts; the number of instances are given in the second row of the table.

Table 2. Performance During Recessions

Number of recessions	Consensus Forecasts				IMF Forecasts			
153 in Total	Apr[t-1]	Oct[t-1]	Apr [t]	Oct [t]	Apr[t-1]	Oct[t-1]	Apr [t]	Oct [t]
Recessions missed (#)	148	139	69	35	147	136	72	40
Downward revisions (#)		134	147	129		125	146	121
MFE during recessions								
All countries	-5.85	-4.82	-2.01	-0.41	-5.85	-5.15	-1.94	-0.52
Advanced	-4.68	-3.75	-1.49	-0.47	-4.53	-3.84	-1.23	-0.53
Emerging	-7.35	-6.20	-2.67	-0.32	-7.53	-6.82	-2.86	-0.51

Sources: IMF World Economic Outlook and Consensus Forecasts.

This indicates that even though forecasters failed to predict recessions in most of the cases, they started to realize the potential trouble ahead. Despite the downward revisions in forecasts,

however, the forecast errors—provided in the remaining rows of the table—remain quite large. Hence, while forecasts are moving in the right direction, the extent to which they are marked down is too small. The Consensus and IMF forecasts are quite similar in this regard, as can be seen by comparing the left and right panels of Table 2.

Table 3 compares the performance pre- and post- Great Recession. The performance was somewhat better over the latter period: a larger proportion of recessions was successfully forecasted and the mean forecast error was smaller (except for the year-ahead forecast for emerging economies).

Table 3. Performance During Recessions, Pre- and Post-Great Recession

Pre-Great Recession	Consensus Forecasts				IMF Forecasts			
70 in Total	Apr[t-1]	Oct[t-1]	Apr [t]	Oct [t]	Apr[t-1]	Oct[t-1]	Apr [t]	Oct [t]
Recessions missed (#)	70	69	45	20	70	69	44	26
Downward revisions (#)		59	67	64		55	66	65
MFE during recessions								
All countries	-6.31	-5.33	-2.81	-0.52	-6.61	-5.96	-3.06	-0.82
Advanced	-4.70	-4.06	-2.28	-0.30	-4.71	-4.31	-2.3	-0.47
Emerging	-7.21	-6.04	-3.10	-0.64	-7.67	-6.88	-3.49	-1.01
Post-Great Recession	Consensus Forecasts				IMF Forecasts			
83 in Total	Apr[t-1]	Oct[t-1]	Apr [t]	Oct [t]	Apr[t-1]	Oct[t-1]	Apr [t]	Oct [t]
Recessions missed (#)	78	73	24	15	77	67	28	14
Downward revisions (#)		77	80	66		70	80	56
MFE during recessions								
All countries	-5.46	-4.39	-1.33	-0.31	-5.2	-4.46	-1	-0.27
Advanced	-4.68	-3.63	-1.17	-0.54	-4.46	-3.65	-0.79	-0.55
Emerging	-7.64	-6.52	-1.78	0.32	-7.25	-6.7	-1.59	0.52

Sources: IMF World Economic Outlook and Consensus Forecasts.

Table 4 shows the type 2 error. The first row shows the number of episodes where a forecasted recession did not happen. The number is small relative to the type 1 error. Though the number tends to increase over time, many of these are cases where the forecast may be for growth just below zero while the realization ends up just above zero. Hence, despite the increase in the number of falsely forecasted recessions, the mean forecast error decreases with time. Once again, there is not much difference between the behavior of the Consensus and IMF forecasts.

Table 4. Falsely Forecasted Recessions (Out of 1153 Non-Recession Episodes)

	Consensus Forecasts				IMF Forecasts			
	Apr[t-1]	Oct[t-1]	Apr [t]	Oct [t]	Apr[t-1]	Oct[t-1]	Apr [t]	Oct [t]
# of false forecasts	8	18	27	33	14	11	24	27
MFE								
All countries	3.42	4.11	2.57	1.47	3.73	5.71	3.18	1.49
Advanced	1.68	3.67	1.94	1.04	3.94	5.11	2.26	1.05
Emerging	6.34	4.54	3.24	2.13	2.97	6.05	3.83	2.24

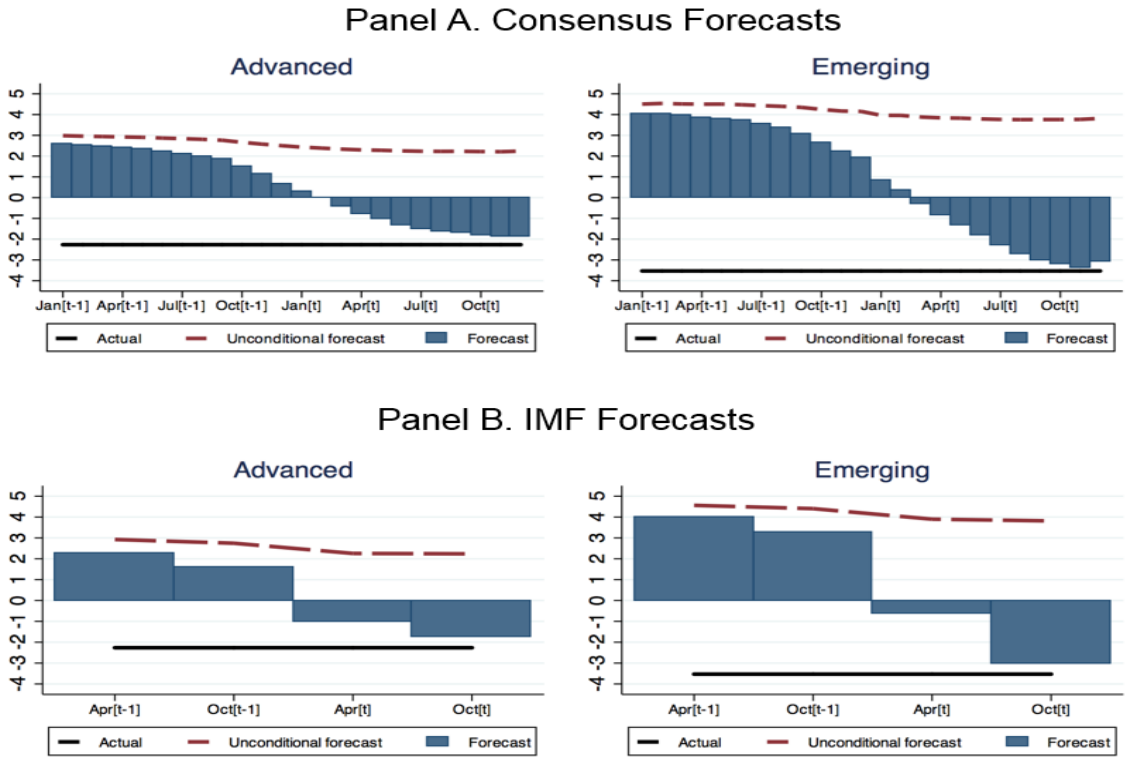
Sources: IMF World Economic Outlook, Consensus Forecasts, and authors' estimates.

To summarize, type 1 error – the failure to forecast a recession – is a much more common error than type 2 error, falsely forecasting a recession.

3.2 Comparing Recessions and Non-Recession Years

Figure 3 shows the evolution of Consensus Forecasts (Panel A) and IMF forecasts (Panel B) in recession years and compares them with the overall or unconditional evolution of forecasts (that is the evolution of forecasts for all years, recession as well as non-recession). Advanced economies and emerging markets are shown separately (left and right panels, respectively).

Figure 3. Evolution of Forecasts during Recessions



Each panel has three pieces of information. First, the solid line is the actual GDP growth, on average, across the recessions; this average is about -2 percent for advanced and -3 percent for emerging economies. Second, the dashed line shows the evolution of unconditional real GDP forecasts on average, that is, including both the recession and non-recessions years. These forecasts start out at about 3 percent for advanced and 4.5 percent for emerging economies and are slowly revised down over the subsequent 24 months. Third, the bars show the evolution of forecasts for recession years on average; hence these bars provide the sort of information provided in figure 1 for the US and Argentina for selected recession years but these bars now show the average across all countries and all recession years.

What does the figure reveal? Forecasts for recession years start out very close to the unconditional average in the year preceding the recession, but they begin to depart from it around the middle of that year. This indicates that forecasters are already becoming aware that the coming year is probably going to be a departure from the norm. This is important as it shows that forecasters are alert to incoming information about potentially negative prospects for the coming

year. However, the magnitudes of the revisions are much smaller than what would be needed to forecast recessions accurately and there is clear indication of forecast smoothing: changes are made in a serially correlated fashion. By December of the year of the recession, forecasts have essentially caught up to both the reality and the magnitude of the recessions. For both Consensus and IMF forecasts, we find similar patterns of smooth downward forecast revisions, and for both advanced and emerging economies.

The evidence thus far suggests that forecasters either do not have the information or the incentives to forecast recessions. Lack of information could arise for various reasons. First, data on the economy may only became available with long lags or be of poor quality. Second, economic models may not be good enough to be able to predict outlier events, Third, recessions may occur because of events which are themselves difficult to predict. Lack of incentives could also arise for various reasons. For instance, the reputational loss from being wrong may be higher than the gain from being right.

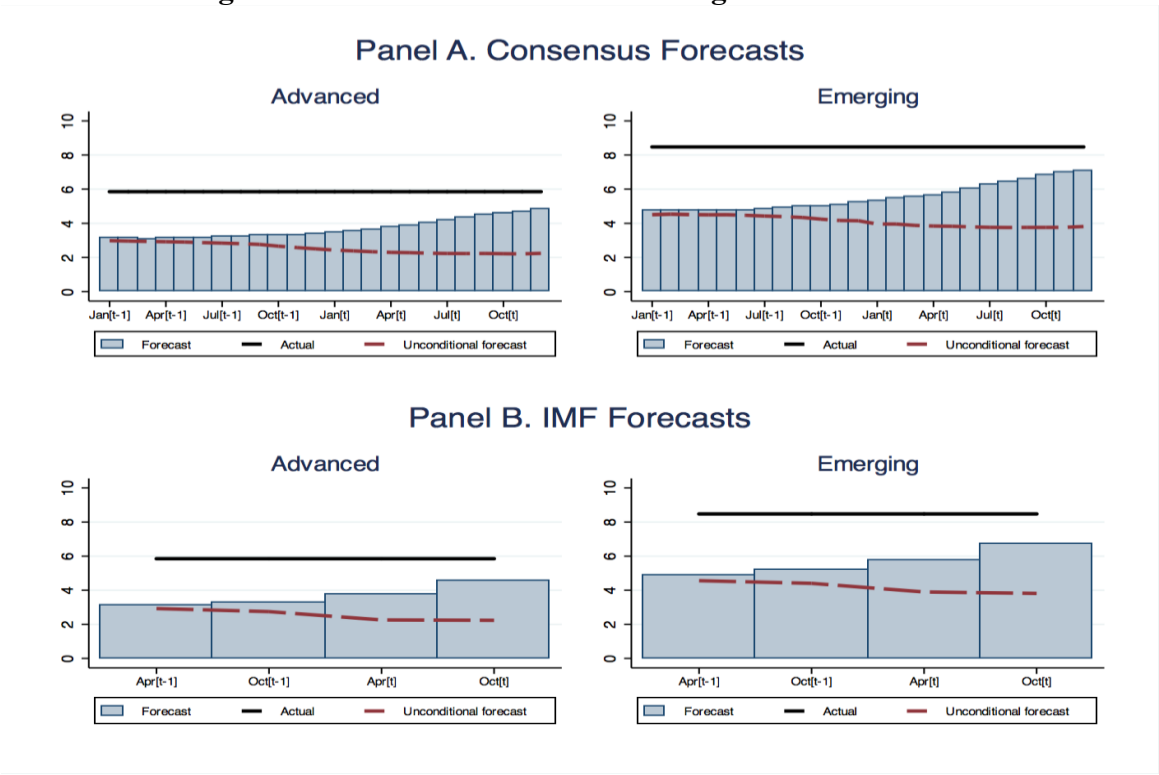
Sorting out why this forecasting failure occurs is beyond the scope of this paper. However, we present some additional results that might provide clues in the search for an answer. As noted, one reason for the failure might be that recessions occur following events, such as economic crises, which are themselves difficult to predict. Figure A1 in the Appendix is like Figure 2 except that we exclude recessions that follow a crisis (either a currency or a debt crisis). The results are very similar to those shown above. Hence, distinguishing between crisis and non-crisis cases does not seem to be useful in finding reasons for the forecasting failure.

Another reason could be that forecasters have trouble with outliers, whether they are recessions or booms. We can shed light on this by seeing how well forecasters are able to predict episodes of economic boom. A boom is defined here as a year in which economic growth is greater than one standard deviation above the country average. Tables A4 and A5 in the Appendix gives the list of booms by country and year, respectively.

Figure 4 shows the evolution of forecasts in economic boom episodes. Forecasts for the boom years start out from the unconditional average in the year preceding the economic boom, but begin to depart from it around the middle of that year. However, even by December of the year of the economic boom, forecasts are still about 1.5 percent lower than actual growth. Hence, we find a similar pattern to the one we found in the case of recessions. This finding is consistent with the

view, sometimes expressed in the aftermath of the Global Financial Crisis, that economic models are not capable of generating big swings in outcomes away from some steady state level; to the extent that some forecasters rely on such models, they too will tend to have difficulty when outcomes depart strongly from normal. To some extent, therefore, our evidence supports the view that it is lack of information rather than lack of incentives that accounts for the forecasting failure during recessions.

Figure 4. Evolution of Forecasts during Economic Booms



Nordhaus (1987) argued that slow forecast revisions could also occur for behavioral reasons. He presented evidence from a variety of sources that "people tend to smooth their forecasts too much. That is, we break the good or bad news to ourselves slowly, taking too long to allow surprises to be incorporated into our forecasts."

3.3 Information rigidity around turning points

The evidence presented in the previous sub-section suggest forecast smoothing, which Nordhaus (1987) noted as a property of an inefficient forecast. Under the null hypothesis of full information rational expectations, a sequence of forecasts for the same target should follow a martingale: forecast revisions should be serially uncorrelated.[5] We can test for efficiency by regressing forecast revisions on past forecast revisions:

$$Rev_{it,h} = \alpha_h + \beta_h Rev_{it,h+k} + \mu_{i,h} + \varepsilon_{it,h} \quad (1)$$

where $Rev_{it,h}$ is the forecast revision for country *i* in target year *t* with forecast horizon *h*; α_h and β_h are the coefficients of constant term and previous forecast revision; $\mu_{i,h}$ and $\varepsilon_{it,h}$ represents the country fixed effect and error term. Under the null hypothesis of full information rational expectations, $\beta_h = 0$. A positive and significant β_h indicates the existence of information rigidity. Since Figure 2 shows that the largest forecast revisions occur after the mid-year of the year-ahead forecasts, we use the revision between October and April of the current-year forecast as the dependent variable, and the revision between April of the current year and October of the previous year as the explanatory variable.

Table 5 presents the results for all countries, advanced economies, and emerging economies based on Consensus Forecasts and IMF forecasts. The coefficient estimates are positive and significantly different from zero for all country groups for both sources of forecasts. The null hypothesis of full information rational expectations can thus be rejected. Comparing the coefficients between advanced and emerging economies, the serial correlation is higher for emerging economies than those for the advanced economies. This indicates that forecasting for emerging economies exhibits a higher level of information rigidity. The serial correlation is also higher for Consensus than for IMF forecasts.

[5] Subsequent work on the 'sticky information model' by Mankiw and Reis (2002) accounts for this inefficiency as due to fixed costs of updating information, whereas in the 'noisy information model' of Sims (2003) and Woodford (2003) the departure from efficiency occurs because people have limited ability to distinguish information from noisy signals.

Table 5. Information Rigidity – Nordhaus (1987)

Dependent Variable:	Consensus			IMF		
Revision	All	Advanced	Emerging	All	Advanced	Emerging
Lagged Revision	0.35***	0.29***	0.38***	0.21***	0.09*	0.27***
	(0.04)	(0.04)	(0.06)	(0.04)	(0.05)	(0.05)
Constant	0.06***	0.03*	0.07***	0.05**	0.02	0.05**
	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)	(0.02)
N. of Obs.	1306	639	667	1306	639	667
R-sq	0.18	0.12	0.21	0.08	0.01	0.13

Source: IMF World Economic Outlook, Consensus Forecasts, and authors' estimates.
Note: The dependent variable is the forecast revision made between Oct[t] and Apr[t]. The independent variables are the forecast revision made between Apr[t] and Oct[t-1], dummy variable for recession, and their interaction. Country fixed effects are included but omitted for reasons of parsimony. Robust standard errors are reported in parentheses. *, **, *** denote statistical significance at the10, 5 and 1 percent levels, respectively.

To test for the extent of information rigidity around the turning point, we include a dummy variable for recessions and a variable that interacts the forecast revision with the dummy variable for recessions:

$$Rev_{it,h} = \alpha_h + \beta_h Rev_{it,h+k} + \gamma_h Rec_{it} + \theta_h Rev_{it,h+k} * Rec_{it} + \mu_{i,h} + \varepsilon_{it,h} \qquad (2)$$

A negative and significant θ_h indicates a relatively lower level of information rigidity during recession years than other years. We also test if $\beta_h + \theta_h = 0$; a positive and significant $\beta_h + \theta_h$ indicates the existence of information rigidity even if recession years.

Table 6 shows the results of the estimation of equation (2). The coefficients on the interaction variable are all negative, indicating a lower level of information rigidity during recession episodes relative to the other years.[6] The p-values reported in each column are associated with the hypothesis test of $\beta_h + \theta_h = 0$. For all the six tests, we fail to reject the hypothesis and conclude that there is no information rigidity during recessions.[7]

[6] Coibion and Gorodnichenko (2012, 2015) find that the degree of information rigidity declines significantly during US' recessions. Using a large international panel, Dovern (2013) also finds that the degree of information rigidity is significantly lower during economic downturns.
[7] The signs of the coefficients on the recession dummy are all negative and significant: forecast revisions are relatively larger for the recession years than those for normal years. Dovern et al. (2012) find that disagreement in growth forecasts significantly increases in recession years.

Table 6. Information Rigidity during Recession Episodes – Nordhaus (1987)

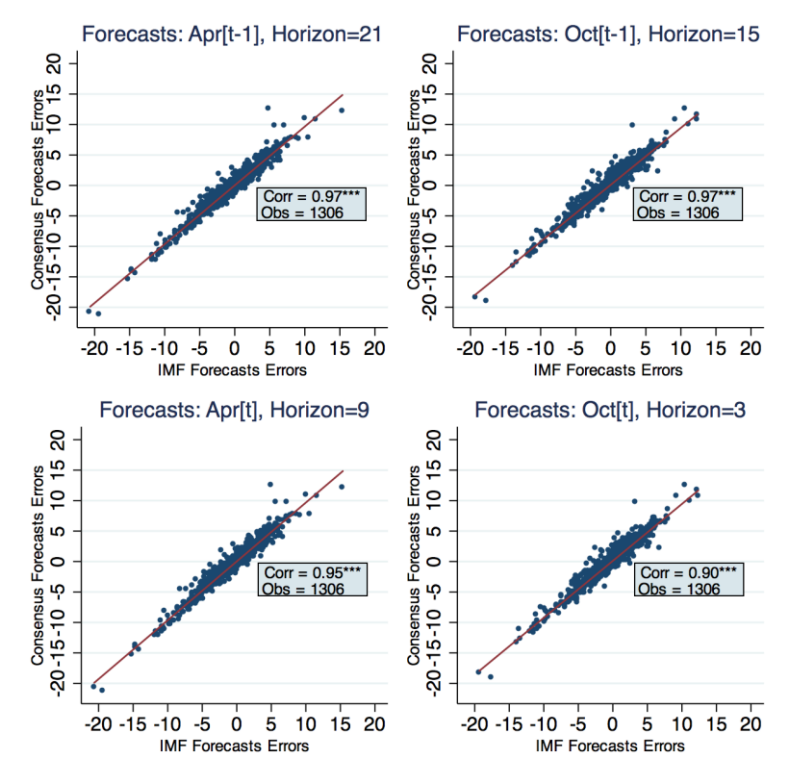
Dependent Variable:	Consensus			IMF		
Revision	All	Advanced	Emerging	All	Advanced	Emerging
Lagged Revision	0.35***	0.36***	0.33***	0.13**	0.22**	0.07
	(0.06)	(0.12)	(0.06)	(0.05)	(0.09)	(0.06)
Lagged Rev.*Rec.	-0.26*	-0.34	-0.29*	-0.11	-0.45**	0.00
	(0.14)	(0.25)	(0.16)	(0.12)	(0.21)	(0.12)
Recession	-1.59***	-1.10**	-2.61***	-1.60***	-1.46***	-2.44***
	(0.32)	(0.42)	(0.34)	(0.34)	(0.46)	(0.38)
Constant	0.15***	0.10***	0.21***	0.16***	0.12***	0.20***
	(0.02)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
N. of Obs.	1306	639	667	1306	639	667
R-sq	0.25	0.17	0.35	0.15	0.12	0.27
P-Value	0.40	0.90	0.76	0.82	0.11	0.34

Source: IMF World Economic Outlook, Consensus Forecasts, and authors' estimates.
Note: The dependent variable is the forecast revision made between Oct[t] and Apr[t]. The independent variables are the forecast revision made between Apr[t] and Oct[t-1], dummy variable for recession, and their interaction. Country fixed effects are included but omitted for reasons of parsimony. Robust standard errors are reported in parentheses. *, **, *** denote statistical significance at the10, 5 and 1 percent levels, respectively.

4. Comparing Consensus and IMF Forecasts

The analysis in the previous sections shows that Consensus Forecasts and the IMF forecasts are similar in their inability to predict recessions. Figure 5 compares forecast errors of Consensus and IMF forecasts for all years, recession as well as non-recession. The correlations between the forecast errors of two sources exceed 0.9.

Figure 5. Consensus Forecast Errors and IMF Forecast Errors



To do a more stringent test of the relative predictive accuracy of the two sources of forecasts, we use the test proposed by Diebold and Mariano (1995). The comparison statistic, DM, is defined as:

$$DM = H^{-1/2}\frac{\sum_{j=1}^{H} d_j}{\sigma_d} \rightarrow N(0,1)$$

where

$$d_j = g(e_{1j}) - g(e_{2j})$$

g is the loss function of interest, e.g. the quadratic loss $g(e) = e^2$ (DMS) or absolute loss $g(e) = |e|$ (DMA), e_{1j} and e_{2j} are the errors from the two competing forecasts, and σ_d is the standard deviation of d. If the DM statistic is positive, the loss associated with the first model (Consensus Forecasts) is larger than that associated with the second one (IMF Forecasts). Diebold and Mariano (1995) suggest estimating σ_d with spectral-based techniques but, given the small sample available and the non-correlation of d_j for almost all cases, we use the standard formula:

$$\hat{\sigma}_d = \frac{1}{H-1}\sum_{j=1}^{H}\left(d_j^{-1}H\sum_{i=1}^{H}d_i\right)^2$$

The test is conducted for each country. Figure 6 shows the summary of test results based on quadratic loss function for the total number of 63 countries. For each horizon, the left bar shows the number of countries for which Consensus Forecasts are more accurate; the right bar shows the number of countries for which IMF forecasts are more accurate. In each bar, the lower part shows the proportion that is better but statistically insignificant; the upper part shows the proportion that is better and statistically significant.

Consensus Forecasts tend to be more accurate than IMF forecasts in a larger proportion of countries in our sample group. For instance, by October of the year before the recession (forecast horizon = 15 months), Consensus Forecasts are more accurate for 47 countries, and 14 of them are significant; in contrast, IMF forecasts are more accurate for 16 countries, and significant for only 3 countries. For current-year forecasts, Consensus forecasts are again more accurate for a larger proportion of countries.

Figure 6. Summary of Accuracy Test Results - Diebold and Mariano (1995)

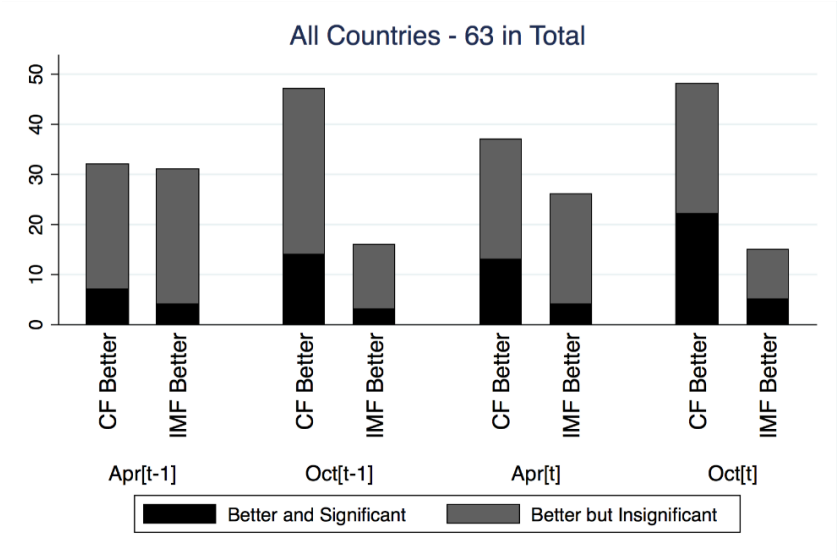
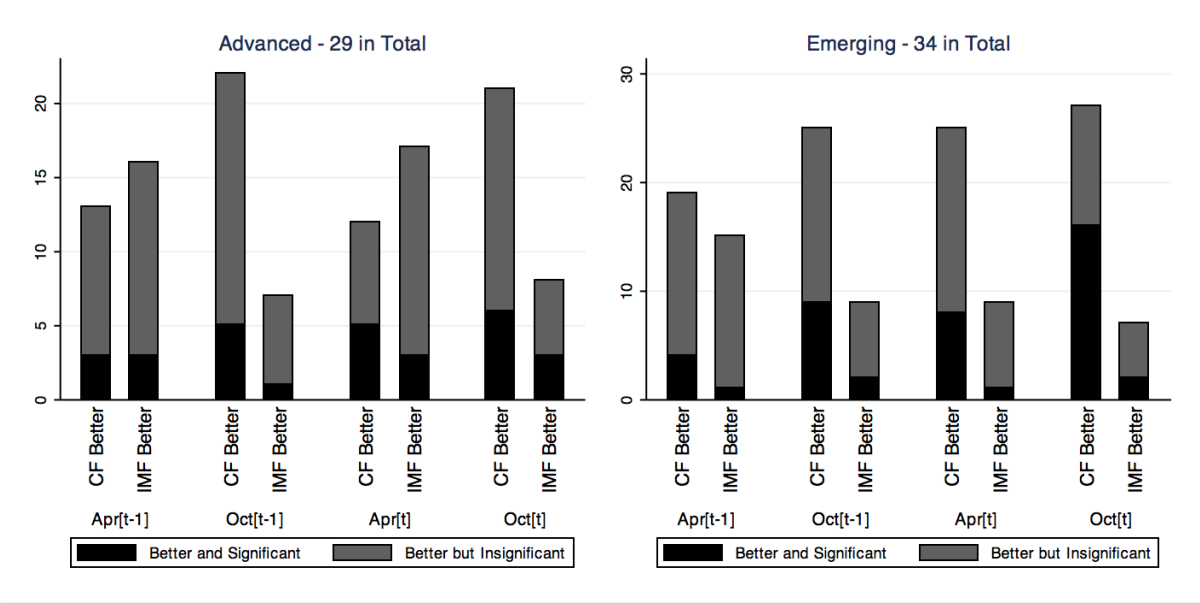


Figure 7 shows similar results for advanced and emerging economies. For the advanced economies, IMF forecasts made in April in the year-ahead and current-year are more accurate for

more countries. For the emerging economies, Consensus Forecasts are more accurate for more countries.

Figure 7. Summary of Accuracy Test – By Country Group



5. Conclusion

This paper describes the evolution of private and public sector forecasts in the run up to recessions. We find that the ability to predict turning points is limited. While forecasts in recession years are revised each month, they do not capture the onset of recessions in a timely way and the extent of output decline during recessions is missed by a wide margin. This holds true for both private sector and official sector forecasts.

Our work does not provide an explanation for why recessions are not forecasted ahead of time. We suggest three classes of theories, which are not mutually exclusive, which could explain our findings.[8] One class says that forecasters do not have enough information to reliably call a recession. Economic models are not reliable enough to predict recessions, or recessions occur

[8] Another explanation could be that forecasters simply do not update their forecasts often enough to be alert to the onset of recessions? However, as shown in Figure 2, the consensus forecasts in recession years are revised every month; they just are not revised down enough to capture the onset of recessions. Related work by one of us, which looks at the behavior of individual forecasters rather than just the consensus, also finds that forecasts are updated quite often (Dovern, Fritsche, Loungani, Tamirisa, 2015).

because of shocks (e.g. political crises) that are difficult to anticipate. A second class of theories says that forecasters do not have the incentive to predict a recession. Included in this class are explanations that rely on asymmetric loss functions: there may be greater loss – reputational and other kinds – for incorrectly calling a recession than benefits from correctly calling one. The third class stresses behavioral reasons for why forecasters hold on to their priors and only revise them slowly and insufficiently in response to incoming information (Nordhaus, 1987). Regardless of the explanation for why recessions fail to be forecasted, we think that users of these forecasts need to be aware of this feature.

APPENDIX

Table A1. Data Coverage of Consensus Forecasts

Country	Start Date of Bi-monthly Forecast	Start Data of Monthly Forecast	Monthly Forecast if Frequency Was Changed from Monthly to Bi-Monthly
		Advanced Economies	
Australia		1990M11	
Austria		1989M11	
Belgium		1989M11	
Canada		1989M10	
Czech	1998M6	1995M1	2007M5
Denmark		1989M11	
Finland		1989M11	
France		1989M10	
Germany		1989M10	
Greece		1993M6	
Hong Kong, China		1990M11	
Ireland		1989M11	
Israel		1995M1	
Italy		1989M10	
Japan		1989M10	
Korea	1998M6	1995M1	2007M5
Netherlands		1989M11	
New Zealand		1989M11	
Norway		1989M11	
Portugal		1989M11	
Singapore	1998M6	1995M1	2007M5
Slovakia	1998M6	1995M1	2007M5
Slovenia		1993M6	
Spain		1989M11	
Sweden		1989M11	
Switzerland		1989M11	
Taiwan POC		1989M11	
United Kingdom		1989M10	
United States		1989M10	

Table A1 (continued): Data Coverage of Consensus Forecasts

Country	Start Date of Bi-monthly Forecast	Start Data of Monthly Forecast	Monthly Forecast if Frequency Was Changed from Monthly to Bi-Monthly
		Emerging Economies	
Argentina	1993M3	2001M8	
Bangladesh		1994M12	
Bolivia	1993M3	2001M8	
Brazil	1993M6	1989M11	2001M8
Bulgaria	1998M6	1995M1	2007M5
Chile	1993M3	2001M8	
China		1994M12	
Colombia	1993M3	2001M8	
Costa Rica	1993M3	2001M8	
Dominica	1993M3	2001M8	
Ecuador	1993M3	2001M8	
Egypt		1995M1	
Hungary	1998M6	1990M11	2007M5
India		1994M12	
Indonesia		1990M11	
Malaysia		1990M11	
Mexico	1993M6	1989M11	2001M8
Pakistan		1994M12	
Panama	1993M3	2001M8	
Paraguay	1993M3	2001M8	
Peru	1993M3	2001M8	
Philippines		1994M12	
Poland	1998M6	1990M11	2007M5
Romania	1998M6	1990M11	2007M5
Russia		1995M11	
Saudi Arabia		1990M11	
South Africa		1995M11	
Sri Lanka		1994M12	
Thailand		1990M11	
Turkey	1998M6	1995M1	2007M5
Ukraine	1998M6	1995M1	2007M5
Uruguay	1993M3	2001M8	
Venezuela	1993M3	2001M8	
Viet Nam		1994M12	

Table A2. List of Recessions: Advanced Economies (86 Recession Episodes)

Country	Recession: Year (Size)					
Austria	2009 (-3.8)					
Belgium	1993 (-1.0)	2009 (-2.6)				
Canada	2009 (-2.7)					
Czech	1997 (-0.7)	1998 (-0.3)	2009 (-4.8)	2012 (-0.9)	2013 (-0.5)	
Denmark	**2008 (-0.7)**	2009 (-5.1)	2012 (-0.7)	2013 (-0.5)		
Finland	1992 (-3.3)	**1993 (-0.7)**	2009 (-8.3)	2012 (-1.4)	2013 (-1.1)	2014 (-0.4)
France	1993 (-0.6)	2009 (-2.9)				
Germany	1993 (-1.0)	2003 (-0.7)	2009 (-5.6)			
Greece	**2008 (-0.4)**	2009 (-4.4)	2010 (-5.4)	2011 (-8.9)	**2012 (-6.6)**	2013 (-3.9)
Hong Kong	1998 (-5.9)	2009 (-2.5)				
Ireland	**2008 (-2.2)**	2009 (-5.6)				
Israel	2002 (-0.1)					
Italy	1993 (-0.9)	**2008 (-1.0)**	2009 (-5.5)	2012 (-2.8)	2013 (-1.7)	2014 (-0.4)
Japan	1998 (-2.0)	1999 (-0.2)	2008 (-1.0)	2009 (-5.5)	2011 (-0.5)	2014 (-0.1)
Korea	**1998 (-5.5)**					
Netherlands	2009 (-3.8)	2013 (-0.5)	2012 (-1.1)			
New Zealand	2008 (-0.8)					
Norway	2009 (-1.6)					
Portugal	1993 (-0.7)	2003 (-0.9)	2009 (-3.0)	2011 (-1.8)	2012 (-4.0)	2013 (-1.6)
Singapore	1998 (-2.2)	2001 (-1.0)	2009 (-0.6)			
Slovakia	1999 (-0.2)		2009 (-5.3)			
Slovenia	2009 (-7.8)	2012 (-2.7)	2013 (-1.1)			
Spain	1993 (-1.3)	2009 (-3.6)	2011 (-0.6)	2012 (-2.1)	2013 (-1.2)	
Sweden	1992 (-1.0)	**1993 (-2.0)**	**2008 (-0.6)**	2009 (-5.2)	2012 (-0.3)	
Switzerland	1992 (-0.1)	1993 (-0.2)	2009 (-2.1)			
Taiwan POC	2001 (-1.3)	2009 (-1.6)				
UK	2008 (-0.3)	2009 (-4.3)				
USA	2008 (-0.3)	2009 (-2.8)				

Note: Bold year indicates a crisis associated recession. Crisis data based on Laeven and Valencia (2008).

Table A2 (continued). List of Recessions: Emerging Economies (67 Recession Episodes)

Country	Recession: Year (Size)					
Argentina	**1995 (-2.8)**	1999 (-3.4)	2000 (-0.8)	**2001 (-4.4)**	**2002 (-11)**	
Brazil	**1992 (-0.5)**	2009 (-0.2)				
Bulgaria	1997 (-1.1)	1999 (-5.6)	2009 (-5.0)			
Chile	1999 (-0.7)	2009 (-1.0)				
Colombia	1999 (-4.2)					
Costa Rica	2009 (-1.0)					
Dominican R.	**2003 (-0.3)**					
Ecuador	**1999 (-4.7)**					
Hungary	1993 (-0.6)	2009 (-6.6)	2012 (-1.5)			
Indonesia	**1998 (-13)**					
Malaysia	**1998 (-7.4)**	2009 (-1.5)				
Mexico	**1995 (-5.8)**	2001 (-0.6)	2009 (-4.7)			
Paraguay	1999 (-1.4)	2000 (-2.3)	2001 (-0.8)	**2002 (-0.0)**	2009 (-4.0)	2012 (-1.2)
Peru	1998 (-0.4)					
Philippines	**1998 (-0.6)**					
Romania	1997 (-6.1)	1998 (-4.8)	1999 (-1.2)	2009 (-7.1)	2010 (-0.8)	
Russia	**1998 (-5.3)**	2009 (-7.8)				
Saudi Arabia	1999 (-0.7)					
South Africa	2009 (-1.5)					
Sri Lanka	2001 (-1.5)					
Thailand	**1997 (-2.8)**	**1998 (-7.6)**	2009 (-0.7)			
Turkey	1999 (-3.4)	**2001 (-5.7)**	2009 (-4.8)			
Ukraine	1997 (-3.2)	**1998 (-1.8)**	1999 (-0.2)	**2009 (-15)**	2013 (-0.0)	2014 (-6.8)
Uruguay	1995 (-1.4)	1999 (-3.0)	2000 (-1.8)	2001 (-3.5)	**2002 (-7.1)**	
Venezuela	1996 (-0.2)	1999 (-6.0)	**2002 (-8.9)**	2003 (-7.8)	2009 (-3.2)	**2010 (-1.5)**
	2014 (-4.0)					

Note: Bold year indicates a crisis associated recession. Crisis data based on Laeven and Valencia (2008).

Table A3. List of Recessions: By Year

	Advanced			Emerging		
1992	Finland	Sweden	Switzerland	Brazil	Hungary	
1993	Belgium	Finland	France			
	Germany	Italy	Portugal			
	Spain	Sweden	Switzerland			
1995				Argentina	Mexico	Uruguay
1996				Venezuela		
1997	Czech			Bulgaria	Romania	Thailand
				Ukraine		
1998	Czech	HK SAR	Japan	Indonesia	Malaysia	Peru
	Korea	Singapore		Philippines	Romania	Russia
				Thailand	Ukraine	
1999	Japan	Slovakia		Argentina	Bulgaria	Chile
				Colombia	Ecuador	Paraguay
				Romania	Saudi A.	Turkey
				Ukraine	Uruguay	Venezuela
2000				Argentina	Paraguay	Uruguay
2001	Singapore	Taiwan POC		Argentina	Mexico	Paraguay
				Sri Lanka	Turkey	Uruguay
2002	Israel			Argentina	Paraguay	Uruguay
2003	Germany	Portugal		Dom. Rep.	Venezuela	
2008	Denmark	Greece	Ireland			
	Italy	Japan	New Zealand			
	Sweden	UK	US			
2009	Austria	Belgium	Canada	Brazil	Bulgaria	Chile
	Czech	Denmark	Finland	Costa Rica	Hungary	Malaysia
	France	Germany	Greece	Mexico	Paraguay	Romania
	Hong Kong	Ireland	Italy	Russia	S. Africa	Thailand
	Japan	Netherlands	Norway	Turkey	Ukraine	Venezuela
	Portugal	Singapore	Slovakia			
	Slovenia	Spain	Sweden			
	Switzerland	Taiwan POC	UK			
	US					
2010	Greece			Romania	Venezuela	
2011	Greece	Japan	Portugal			
	Spain					
2012	Denmark	Finland	Greece	Hungary	Paraguay	Czech
	Italy	Netherlands	Portugal			
	Slovenia	Spain	Sweden			
2013	Czech	Denmark	Finland	Ukraine		
	Greece	Italy	Netherlands			
	Portugal	Slovenia	Spain			
2014	Finland	Italy	Japan	Ukraine	Venezuela	

Table A4. List of Booms: Advanced Economies (82 Boom Episodes)

Country	Boom Year				
Australia	1994	1996	1998	2007	
Austria	1998	1999	2007		
Belgium	1997	1999	2000	2004	
Canada	1994	1997	1999	2000	
Czech	2005	2006	2007		
Denmark	1994	2000	2006		
Finland	1997	1998	2000		
France	1998	1999	2000		
Germany	2006	2007	2010	2011	
Greece	2003	2006			
Hong Kong	2000	2004	2005		
Ireland	1995	1996	1997	1999	2000
Israel	2000	2007			
Italy	2000				
Japan	2010				
Korea	1994	1995	1999	2000	
Netherlands	1997	1998	1999	2000	
New Zealand	1994	2002			
Norway	1994	1995	1996	1997	
Portugal	1997	1998	1999	2000	
Singapore	1993	1994	2010		
Slovakia	2006	2007			
Slovenia	2007				
Spain	1999	2000			
Sweden	2010				
Switzerland	2000	2006	2007		
Taiwan POC	1992	2010			
UK	1994	2003			
USA	1997	1998	1999		

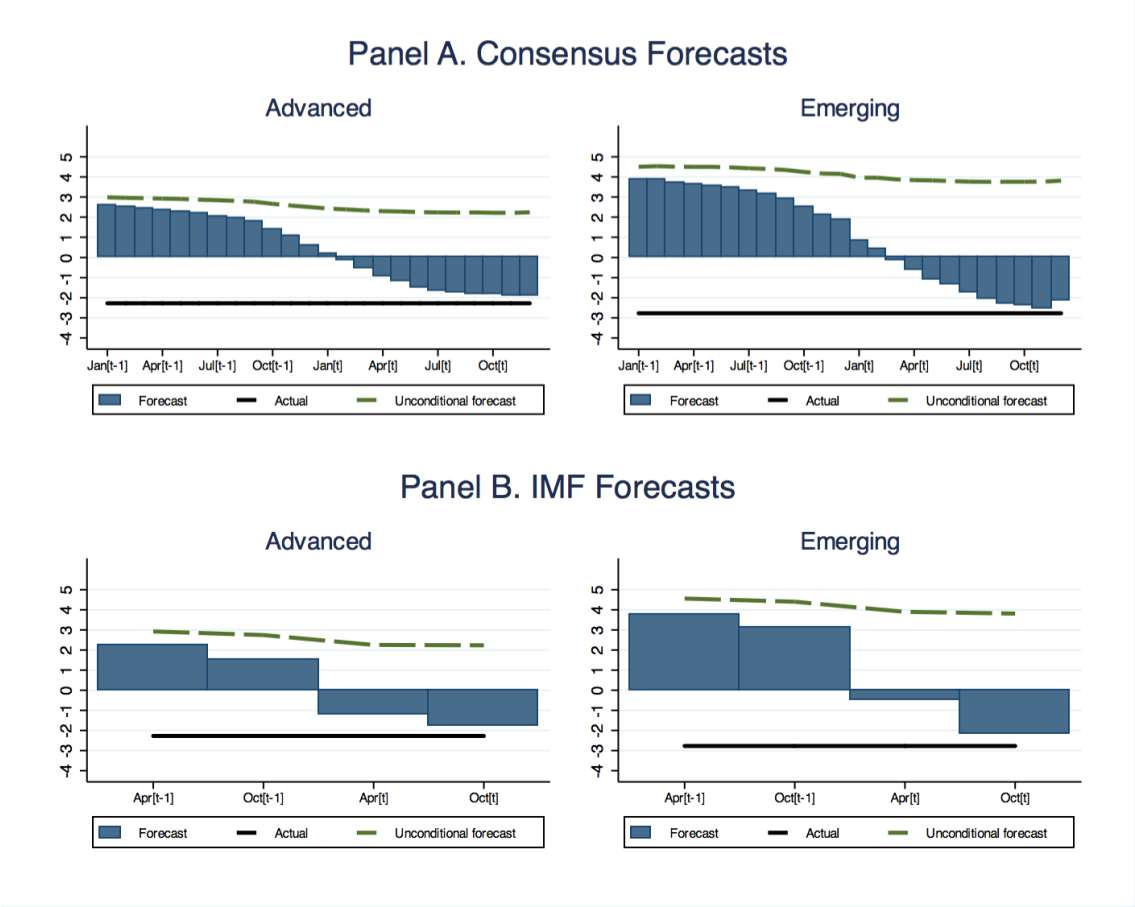
Table A4 (continued). List of Booms: Emerging Economies (93 Boom Episodes)

Country	Boom Year				
Argentina	2004	2005	2010		
Bangladesh	2006	2007	2011		
Bolivia	2008	2013			
Brazil	1994	2004	2007	**2010**	
Bulgaria	2004	2007			
Chile	1995	1996			
China	2005	2006	2007		
Colombia	2006	2007	2011		
Costa Rica	1998	1999	2006	2007	
Dominican R.	2005	2006	2007		
Ecuador	2004	2008	2011		
Egypt	1998	2006	2007	2008	
Hungary	2004				
India	2005	2006	2007	2010	
Malaysia	1993	1995	1996		
Mexico	**1996**	1997			
Pakistan	2004	2005			
Panama	2007	2008	2011	2012	
Paraguay	**2010**	**2013**			
Peru	2007	2008	2010		
Philippines	2010	2013			
Poland	1995	1996	1997	2006	2007
Romania	2004	2006	2008		
Russia	2000				
Saudi Arabia	2003	2004	2008	2011	
South Africa	2005	2006	2007		
Sri Lanka	2011				
Thailand	1993	1994	1995		
Turkey	2004	**2010**	2011		
Ukraine	2001	2003	2004		
Uruguay	2008	2010			
Venezuela	**2004**	2005	2006		
Viet Nam	1997	2004	2005		

Table A5. List of Boom: By Year

	Advanced			Emerging			
1992	Taiwan POC						
1993	Singapore			Malaysia	Thailand		
1994	Australia	Canada	Denmark	Brazil	Thailand		
	Korea	New Zealand	Norway				
	Singapore	UK					
1995	Ireland	Korea	Norway	Chile	Malaysia	Poland	Thailand
1996	Australia	Ireland	Norway	Chile	Malaysia	Mexico	Poland
1997	Belgium	Canada	Finland	Mexico	Poland	Viet Nam	
	Ireland	Netherlands	Norway				
	Portugal	USA					
1998	Australia	Austria	Finland	Costa Rica	Egypt		
	France	Netherlands	Portugal				
	USA						
1999	Austria	Belgium	Canada	Costa Rica			
	France	Ireland	Korea				
	Netherlands	Portugal	Spain				
	USA						
2000	Belgium	Canada	Denmark	Russia			
	Finland	France	Hong Kong				
	Ireland	Israel	Italy				
	Korea	Netherlands	Portugal				
	Spain	Switzerland					
2001				Ukraine			
2002	New Zealand						
2003	Greece	UK		Saudi Arabia	Ukraine		
2004	Belgium	HK SAR		Argentina	Brazil	Bulgaria	Ecuador
				Hungary	Pakistan	Romania	Saudi Arabia
				Turkey	Ukraine	Venezuela	Vietnam
2005	Czech	HK SAR		Argentina	China	Dominican R.	India
				Pakistan	South Africa	Venezuela	Vietnam
2006	Czech	Denmark	Germany	Bangladesh	China	Colombia	Costa Rica
	Greece	Slovakia	Switzerland	Dominican R.	Egypt	India	Poland
				Romania	South Africa	Venezuela	Bangladesh
2007	Australia	Austria	Czech	Brazil	Bulgaria	China	Colombia
	Germany	Israel	Slovakia	Costa Rica	Dominican R.	Egypt	India
	Slovenia	Switzerland		Panama	Peru	Poland	South Africa
2008				Bolivia	Ecuador	Egypt	Panama
				Peru	Romania	Saudi Arabia	Uruguay
2010	Germany	Japan	Singapore	Argentina	Brazil	India	Paraguay
	Sweden	Taiwan POC		Peru	Philippines	Turkey	Uruguay
2011	Germany			Bangladesh	Colombia	Ecuador	Panama
				Saudi Arabia	Sri Lanka	Turkey	
2012				Panama			
2013				Bolivia	Paraguay	Philippines	

Figure A1. Evolution of Forecasts for Recession Episodes without Crisis



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