33rd CIRET Conference, Copenhagen, Denmark, Sept. 2016

Session:
Surveys Amongst Experts

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WISHFUL BIAS IN PREDICTING US RECESSIONS: INDIRECT EVIDENCE[3]

There is evidence in the economic literature that professional forecasters are unsuccessful in predicting recessions, but the reasons for these failures are still not clear. Meanwhile, this phenomenon has been little studied on the basis of quarterly estimates for various target horizons.

We analysed quarterly consensus forecasts of real GDP growth rates and probabilities of recession taken from the Survey of Professional Forecasters (SPF) conducted by PhilFed and established several stylized facts including: "alarm signals" usually appear only after cyclical peaks; consensus forecasts of recessions for distant target horizons (more than two quarters) have never met except several quarters after the second oil shock; as a rule, pre-recession probabilities of recessions are much less than 50%; the expected durations of recession are less than actual ones; the Mincer-Zarnowitz test with a dummy for recessions reveals that SPF give biased forecasts of real GDP growth rates for almost all target horizons; experts regularly overestimate growth rates during recessions; adding a dummy for recessions significantly increases adjusted R^2s; consensus forecasts clearly signal a recession only after a black swan; the majority of experts avoid predicting declines in real GDP before a recession; depth of contraction is even more underestimated for quarters after black swans.

None of these stylized facts proves the unwillingness of professional forecasters to predict recessions (especially prolonged ones) in a direct way. However, in our view, together they constitute indirect evidence for the existence of a wishful bias against predicting recessions. If this bias exists, customers of SPF forecasts should take this into account in their decision-making processes.

JEL Classification: E32, E37.

Keywords: Recession, Forecasting, Wishful Bias, the Survey of Professional Forecasters.

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[3] The support from the Basic Research Program of the National Research University Higher School of Economics is gratefully acknowledged.

1 Introduction

Predicting recessions is an old problem for economists, and they have made significant efforts to solve it. So many different approaches have been proposed and tested that even a simple enumeration of them is quite long: leading cyclical indicators; macroeconomic models; regression and spectral analyses; principle components; dynamic factor models; VAR and its various modifications; various rules of thumb and statistical "diagnostic" rules adopted from engineering, informatics, biology, medicine and other sciences (even from earthquake forecasting); Markov regime-switching models; probit and logit models and others.[4] It cannot be denied that there has been a huge increase of knowledge but the achievements in solving the main problem — obtaining reliable predictions of recessions in real-time — are still disappointingly poor: failures are confirmed time after time (see Fels and Hinshaw, 1968, Hymans, 1973, Koenig and Emery, 1994, Fintzen and Stekler, 1999, Anas and Ferrara, 2004 as well as Sinclair et al., 2010, Dovern and Jannsen, 2015, Messina et al., 2015 for the latest results).

The causes for these failures have not been clearly ascertained. Historically, the first idea was to construct better models and indicators that would be more adequate to the complexity of the process. Indeed, cyclical dynamic is very complicated: the transition from expansion to contraction is not often sharp or distinct (Alexander, 1958, Koening and Emery, 1994), timely preventive measures taken by the monetary authorities may preserve the economy from sliding into recession (Stekler, 1972, Anas and Ferrara, 2004, Stekler and Talwar, 2013), and the role of unpredictable shocks or black swans should not be underestimated (Loungani and Trehan, 2002). Meanwhile, despite significant efforts in modelling, the problem has remained unsolved. Two other explanations have become popular: (a) real-time information, especially on GDP, does not properly reflect the actual economic situation (Nalewaik, 2010, Stekler and Talwar, 2013); (b) the final judgements of forecasters are biased because of asymmetric loss functions (Schnader and Stekler, 1998, Fintzen and Stekler, 1999, Batchelor, 2007, Patton and Timmermann, 2007, Elliott et al., 2008, Ashiya, 2009, Smirnov, 2011b, Stekler and Talwar, 2013, Guler et al., 2014).

Here, we produce an additional empirical ground for answering several interrelated questions: "What do we mean by stating there is a failure to predict recessions? If forecasts of economic dynamic do not predict recessions accurately, then what do they predict instead of

[4] See Smirnov 2011a, p. 8-11 for a survey.

recessions? What are the peculiarities of available forecasts? Are they biased? How may these peculiarities be explained?" We present indirect evidence for the hypothesis that there is a wishful bias in forecasting recessions, that is, experts avoid predicting recessions even having grounds for these predictions.

To deal with the questions mentioned above one needs a long, comparable, and easily available time-series of forecasts. The best choice here is to use consensus forecasts from polls of professional forecasters. As they are not strongly dependent on specific models, methods or individual's qualification and intuition, some generalization becomes possible. Out of the four most well-known polls of macroeconomists in the USA, we chose the Survey of Professional Forecasters (SPF) conducted by PhilFed.[5] The correspondent series of forecasts are longer than those from BlueChips or ConsensusEconomics and cover several additional recessions in the 1970s and 1980s; SPF contains forecasts of quarterly real GDP growth rates that are simple to compare with actuals (the Livingston Survey does not)[6]; SPF contains probability distributions of forecasts; and they are fully available for free on the PhilFed website.

We agree that it is fully justified to use annual forecasts for cross-countries research as, for example, Loungani, 2001, Batchelor, 2007, Ager et al., 2009, Dovern and Weisser, 2011, Dovern and Jannsen, 2015 have done. As cyclical turning points for most countries have never been dated, an identification of a national recession with negative annual GDP growth rate is the only reasonable option. But for the USA, all the cyclical turning points have been dated by the NBER, and this makes it possible to trace when professional forecasters started to signal cyclical peaks and troughs. As the duration of post-war American recessions is measured in months or quarters rather than in years, quarterly information is more suitable for this purpose than annual.

Surprisingly, GDP quarterly forecasts from SPF have very rarely been used to estimate the quality of predicting recessions. We know of only one (!) paper (Sinclair et al., 2012) that tested quarterly GDP forecasts from SPF for their counting of recessions; and even these estimations were done only for nowcasts and forecasts for one quarter ahead. Seven other papers analysed the hypothesis of the rationality of quarterly GDP forecasts from the SPF. The most recent of them more or less agreed that — with several exceptions for some sub-periods and target horizons — the hypothesis of unbiasedness cannot be rejected at high levels of significance.[7] However, this should not be understood as a confirmation of the unbiasedness of

[5] By the ASA-NBER up to 1990:2.
[6] Up to 1991:4 the SPFs had asked about GNP instead of GDP. For our purposes this doesn't matter, so – just for the simplicity - we use the term "GDP" everywhere.
[7] See section 4.3 for more details and discussion.

predicted peaks and troughs; the failure to predict several US recessions by polls of professional forecasters was well established, yet not for all recessions, and not by uniform method (see McNees, 1987, 1992, Stock and Watson, 2003, Stekler and Talwar, 2013).

We examine more systematically consensus forecasts for their success in predicting US recessions. In the next section we briefly describe the data. In Section 3 some descriptive measures of quarterly consensus forecasts are analysed, especially in the vicinity of cyclical turning points. Section 4 tests for the unbiasedness of quarterly forecasts for different target horizons and cyclical phases (expansions/contractions). Section 5 discusses the main results and offers some concluding remarks.

2 The Data

The main block of our data consists of consensus (median) forecasts of quarter-to-quarter real GDP growth rates (seasonally adjusted at annual rates, SAAR) from SPF. Each SPF (usually conducted by Philfed in the middle of a quarter*)* contains five consensus forecasts for GDP growth rates: one for the current quarter and four for the subsequent four quarters. It also contains the mean probabilities of a decline in the level of real GDP in the current quarter as well as in the following four quarters. Hence, for the current quarter *t*, SPF contains five forecasts of GDP growth rate specified for the current quarter and four following quarters ($f_{t,t}$, $f_{t,t-1}$, $f_{t,t-2}$, $f_{t,t-3}$, and $f_{t,t-4}$) as well as five probabilities of recession ($p_{t,t}$, $p_{t,t-1}$,$p_{t,t-2}$, $p_{t,t-3}$, and $p_{t,t-4}$).[8]

Actual GDP growth rates necessary for comparisons with forecasts were also taken from the PhilFed historical database. In our case, "actual" implies the first (or advance) GDP estimate. The first estimate is preferred to the last available one because in the course of 47 years the difference between the first and the last estimates is heavily dependent on changes in the methodology; understandably, they could not be taken into account while providing regular forecasts.[9]

We use SPF data for the period 1968:4-2015:4. There are 189 quarters in our sample, 27 of them belong to recessions (contractions), all others to economic expansions. Seven corresponding pairs of quarterly cyclical turning points (peaks and troughs) were dated by the NBER.

[8] This is true for all *t* except: four quarters just in the beginning of the surveys (1968:4-1969:4) and five quarters for which the forecasts for one year ahead had not been made at the proper time (1970:1-3, 1971:1, 1975:3).

[9] It is worth noting that the average difference between the first and "most recent" estimates for GDP growth rate is 0.8 percent point for 1968:4-1999:4. With standard deviation 2.2 it is not statistically different from zero. But 83 differences out of 125 are positive; this ratio (0.664) is significantly larger than 0.5. See section 4.3 for more comparisons between first and second estimates of GDP.

As we are interested not in the individual strategies of experts but in a possible bias in consensus forecasts, we do not refer to individual estimates.[10] The only exclusion is a specially constructed index based on individual subjective probabilities of a decline in real GDP described in Section 3.2.

3 Predictions of cyclical turning points and "decoding" warning signals from SPF

3.1 Forecasting cyclical peaks with negative GDP growth rates

To begin, we ask how an expert can denote his belief in an upcoming recession. In our view, no matter what method of forecasting used, a minimum sequence of two quarters with negative GDP growth rates needs to be shown. Though a pair of quarters with declining GDP is not a definition of recession it may be used as a clearly understandable symbol and hence signal of it. An expert may easily use this instrument to warn of an oncoming recession; in the absence of two predicted quarters of declining GDP, there is no reason to think that the expert does predict an upcoming recession.

Therefore, the first thing we do is to identify pairs of negative GDP growth rates in historical consensus forecasts and to check their location relative to cyclical turning points dated by NBER.[11] We consider all the recessions after 1968:4. In Table 1 we summarize the most important facts, they are:

– Usually a pair of negative GDP growth rates appeared several quarters after the corresponding peaks; in other words, during recessions, not before them (negative numbers in line 3);

– In only two cases (the 1973–75 and 1980 recessions) were there pairs or even triples of negative growth rates that led to or coincided with cyclical peaks. These negative rates were obviously caused by black swans that had happened before the cyclical peaks: the Yom Kippur War in October 1973 and the Iranian revolution in January 1979;

– In the three most recent recessions, black swans (the invasion of Kuwait, the terrorist attacks on the WTC, and the Lehman Brothers' bankruptcy) appeared after cyclical peaks and the first pairs of negative growth rates in SPF appeared just after them (only in 1990,

[10] See Schuh (2001), Elliot et al. (2008), Dovern and Weisser (2011) for an investigation of individual experts' biases.
[11] See McNees (1987), Stock and Watson (2003), Stekler and Talwar (2013) for similar analysis.

it took one additional quarter for forecasters to recognize that the war with Iraq was inevitable and it would cause a cyclical recession in the US economy);

– For the 1970 and 1981–82 recessions, negative forecasts of real GDP growth rates appeared in SPF not after a black swan but after two quarters of actual negative rates; experts were persuaded that the observed deterioration in economic activity was not accidental but was due to a recession.

Tab. 1. Dates of cyclical peaks, black swans and first recession predictions

	1970	1973-75	1980	1981-82	1990-91	2001	2008-09
Peak according to NBER	69:4	73:4	80:1	81:3	90:3	01:1	07:4
First recession prediction[a]	70:2	73:4	79:1	81:4	90:4	01:4	08:4
Lead/lag (+/-), quarters	-2	0	+4	-1	-1	-3	-4
Black swan[b]	2Q < 0	Yom Kippur War (1st oil shock)	Iranian revolution (2nd oil shock)	2Q < 0	Invasion of Kuwait	Sep. 11 terrorist attacks	Lehman Brothers' bankruptcy
First SPF after the black swan	70:2	73:4	79:1	81:4	90:3	01:4	08:4
Lead/lag (+/-) with first recession prediction, quarters	0	0	0	0	-1	0	0

Notes: a - first appearance of a pair of negative forecasted rates in SPF (in 1970:2, one negative forecasted rate after two actual negative rates in the previous quarters); b – Unexpected shocks or a pair of quarters with negative actual GDP growth rates (we denote the latter situation as "2Q < 0").

It seems plausible that experts avoid predicting a recession up to the moment when it becomes fully and evidently unavoidable. Even the Great Recession of 2008–09 was forecasted for the first time by SPF consensus only four quarters after the peak, just after the Lehman Brothers' bankruptcy (until this event the forecasted rates were low, but still positive). Of course, a black swan by itself is not a sufficient reason to start a period of low economic activity; it seems that only the oil shocks of the 1970s were *per se* powerful enough to do this. All other

black swans (those which may be related to recessions) happened during periods of economic weakness. They served as last straws, pushing uncertain situations into clear recessionary scenarios, and causing experts to forecast the negative GDP rates that they had been avoiding.

3.2 Forecasting cyclical peaks with high probabilities of recession

If a forecaster wants to denote his belief that a recession is approaching, he may not only give negative forecasts for real GDP growth rates, but also give a high (supposedly 50% or more) probability of a decline in real GDP.[12] For each target horizon, it is not difficult to calculate the average of these probabilities, the so called "anxious index". It is also possible to calculate the proportion of experts that report high probabilities of a recession (100% for this index means that all participants of a survey report a probability of 50% or higher). To distinguish between these two indices, we named them "Average anxious index (AAI)" and "Unanimity anxious index (UAI)". Some of their characteristics are shown in Table 2.

Tab. 2. Anxiety indices for different target horizons, 1968:4-2015:4

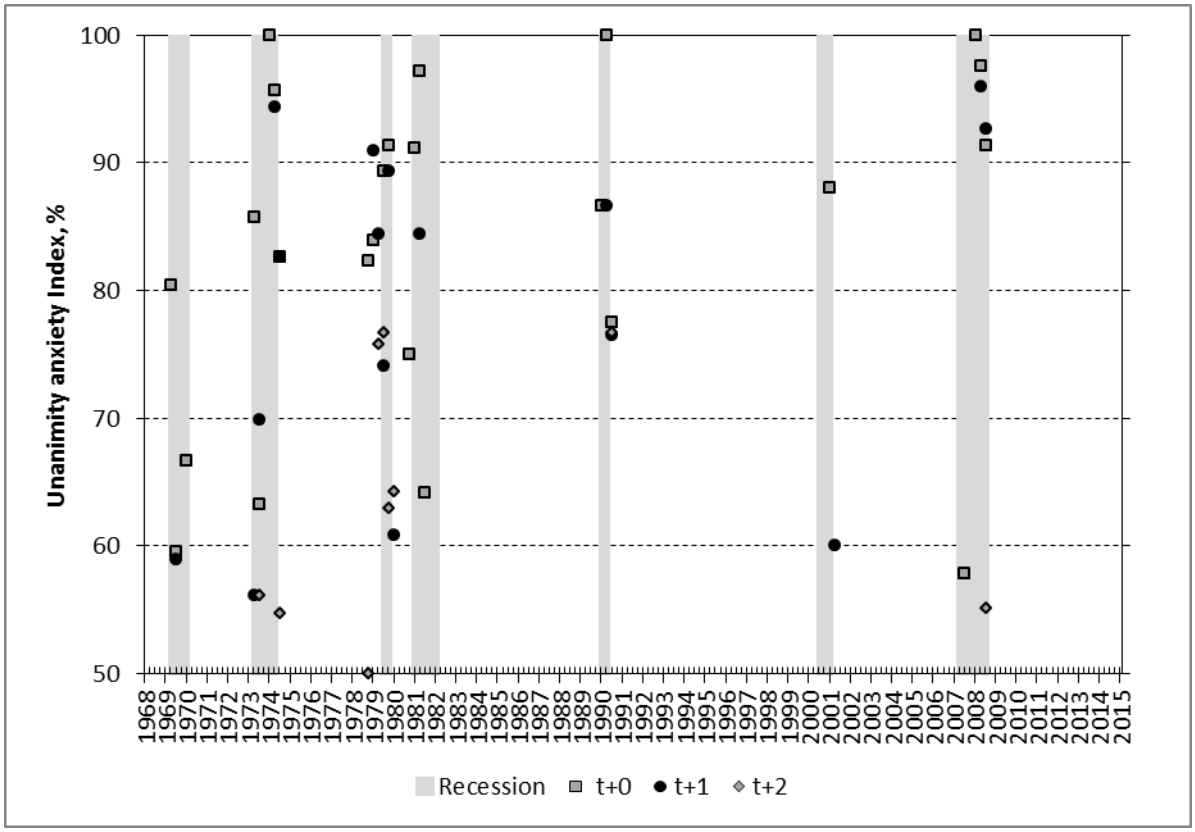
	Target horizons, quarters				
	0	1	2	3	4
Total number of quarters with AAI and UAI ≥ 50% (out of 189)					
Average anxious index (AAI)	22	13	5	0	0
Unanimity anxious index (UAI)	24	16	9	0	0
Average value of AAI and UAI for recession quarters					
Average anxious index (AAI)	62	46	30	21	16
Unanimity anxious index (UAI)	68	50	23	9	6
Average value of AAI and UAI for non-recession quarters					
Average anxious index (AAI)	12	15	16	17	17
Unanimity anxious index (UAI)	6	6	6	5	5

For the most part, the UAI better discriminates between recession and non-recession quarters: its averages for recessions are usually larger and for expansions are smaller for all target horizons. Therefore, we use only this index hereinafter.

There are several points to note. First, high (≥ 50%) UAI is a rare event in SPF; for target horizons 3–4 it never occurs (the majority of experts never forecasts recessions with probability

[12] To be precise, an expert has to answer the following question: "Indicate the probability you would attach to a decline in real GDP (chain-weighted basis, seasonally adjusted) in the next five quarters".

≥ 50% for these horizons). Second, there are only three quarters with a low (< 50%) UAI for the current quarter and a high for the next (only this sequence may be understood as a prediction in the true sense of the word). All of these cases (1973:4, 1979:1, and 1980:1) are clearly connected with the oil shocks of the 1970s that seriously undermined the confidence of all economic agents and experts. In more ordinary situations, experts use high probabilities to express their recognition of a recession which has already begun rather than to forecast it for the future. Third, high UAIs for various target horizons are usually coincident signals of recessions (see Figure 3).[13] Only on the eve of the 1980 recession were there several additional high UAIs; this suggests that serious contractions of GDP were strongly anticipated in 1979.[14] Fourth, none of the three recent recessions (of 1990-91, 2001, and 2008-09) were predicted by the majority of experts; they were only recognized just after the corresponding black swans (the invasion of Kuwait, September 11, and the Lehman Brothers' bankruptcy).



Note: The shaded bars represent recessions as defined by the NBER

Fig. 1. UAI - proportion of respondents that indicated probability of recession ≥ 50 %

[13] As number of quarters with high anxiety index is equal precisely to zero for 3-4 target horizons, these horizons are not shown at Figure 3.

[14] In other words, the 1980 recession was very long-awaited: the resiliency of the US economy to the second oil shock was rather surprising.

All of the above does not mean that it is completely impossible to construct some decision rule for predicting recessions with AAI, UAI or some other indicators based on probabilities. It may be possible to extract a useful alarm signal from this information to predict recessions in advance. For example, Leonhardt (2002) believed that "the magic number for the [average] anxious Index seems to be 30. When forecasters think that there is a 30 percent chance that the economy will shrink in the coming quarter, a downturn usually follows". Lahiri and Wang (2006, 2007, 2013), Clements (2008), Engelberg et al. (2009), Rudebusch and Williams (2009), Chua and Tsiaplias (2011) tested the probability data from the SPF more carefully with sophisticated econometric methods and their results are promising. But in our context, the most important fact is that most recessions started while their forecasted probability was much less than 50%. This means that, at least during pre-recession quarters, experts were overoptimistic.

3.3 Forecasting cyclical troughs on the presumption of short recessions

The dependence of a recession alarm signal on black swans, which are by definition unpredictable, suggests that experts would rarely forecast any decline in GDP for distant quarters. On the other hand, the almost full absence of negative forecasts for 3–4 quarters ahead reflects the fact that the expected duration of US recessions is short.[15] On average, the expected duration of recessions is much shorter than the actual duration.

Out of the 7 US recessions since the end of the 1960s, two lasted for 2 quarters and one for 3 quarters; the remaining four were longer (up to 6 quarters). Meanwhile, out of 24 SPF with at least 1 negative GDP consensus forecast, nine contained only 1 negative rate (they were nowcasts in all cases), 11 SPF contained a pair of negative rates, and 4 SPF triple negative rates in a row (the latter was observed only before and during the 1980 recession, just after the second oil shock).[16] It means that the consensus usually assumes that the end of a recession will be reached in the current or in the next 2 quarters.[17] In other words, a trough is never expected more than 2 quarters later. This approach for predicting troughs evidently continues to be used even if a recession turns out to be longer than 2 quarters. In such cases, experts simply shift forward their estimations for the trough (one may easily conclude this from a comparison of lines 2 and 4 of Table 3).

[15] It was true even for the 1980 recession. Although the first warning for this recession appeared in 1979:1 (a year before the peak) the contraction was supposed to start in 1979:3 and finish in 1979:4 (two quarters of decline only). As the US economy was revealed to be much more stable than it had been expected to be, the forecasts for recession turning points were shifted to the right. At the same time, the duration of the recession was never expected to be more than three quarters.

[16] Ultimately, the 1980 recession was a short one that followed a long period of anticipation.

[17] We consider a quarter as an estimate of the trough if the correspondent GDP growth rate is the last negative rate that precedes the first positive one in a row of expected rates.

Tab. 3. Cyclical troughs and their dating in SPF

	1970	1973-75	1980	1981-82	1990-91	2001	2008-09
Trough according to NBER	70:4	75:1	80:3	82:4	91:1	01:4	09:2
First estimate of the trough in SPF*	70:2	74:2	79:4	82:1	91:1	01:4	09:1
Lead/lag (+/-) to NBER date, quarters	2	3	3	3	0	0	1
Last estimate of the trough in SPF*	70:4	75:2	80:3	82:1	91:2	01:4	09:2
Lead/lag (+/-) to NBER date, quarters	0	-1	0	3	-1	0	0

Note: * Last negative rate that precedes the first positive one.

The result from using this simple rule of thumb ("trough is equal to peak plus 2–3 quarters") for predicting cyclical troughs is paradoxical. The first estimate of a trough usually leads the trough dated by NBER by 1–2 or even 3 quarters but for the 1973–75 and 1990–91 recessions, the final estimate of the trough lagged. In any case, it is difficult to recognize that predictions of cyclical troughs are accurate. As a rule, they are too optimistic, as are the expected durations of recessions.

4 Are forecasted GDP growth rates biased?

4.1 Consensus forecasts for various target horizons: main descriptive statistics

Some important descriptive measures for quarterly consensus forecasts of real GDP growth rates for various target horizons are shown in Table 4. Several items are worth noting. First, negative GDP growth rates are rare for distant target horizons. The ratio of negative forecasts for 4 quarters ahead (for the same quarter of the next year) is zero. For 2–3 quarters ahead, the frequencies of forecasted negative GDP growth rates are significantly lower than for the actual negative rates; only estimates for the current quarter have roughly the same share of negatives.[18] Second, the average forecasted growth rate is not significantly different from the average actual rate for nowcasts only; forecasts for 4 quarters ahead are almost 1 percentage point higher. Third, while average forecasted GDP growth rates increase with longer target

[18] Hereinafter we used Chi-squared-, t-, and F-tests to check the equality of (correspondingly) frequencies, means and standard deviations.

horizons, their standard deviations decrease.[19] The latter is quite unusual: as a rule, the range for possible variations of forecasts grows with time and becomes broader for more distant time horizons.

Tab. 4. Actuals and consensus forecasts of GDP growth rates for various target horizons, 1968:4-2015:4

	Actual, 1-st release	Target horizons, quarters				
		0	1	2	3	4
The whole period (189 quarters)+						
Total number of negative GDP growth rates	25	21	14	7	1	0
Frequency of negative GDP growth rates, %	13.2	11.1	7.4	3.7*	0.5*	0.0*
Average GDP growth rate	2.4	2.3	2.7	2.9*	3.1*	3.2*
Standard deviation	3.1	2.2*	1.8*	1.4*	1.1*	1.0*
Periods of expansion (162 quarters)+						
Average GDP growth rate	3.2	2.9*	3.0	3.0	3.1	3.2
Standard deviation	2.2	1.6*	1.6*	1.3*	1.1*	1.0*
Periods of contraction (27 quarters)+						
Average GDP growth rate	-2.3	-1.2*	0.7*	2.1*	3.1*	3.2*
Standard deviation	3.4	2.3*	1.8*	1.6*	0.9*	0.8*

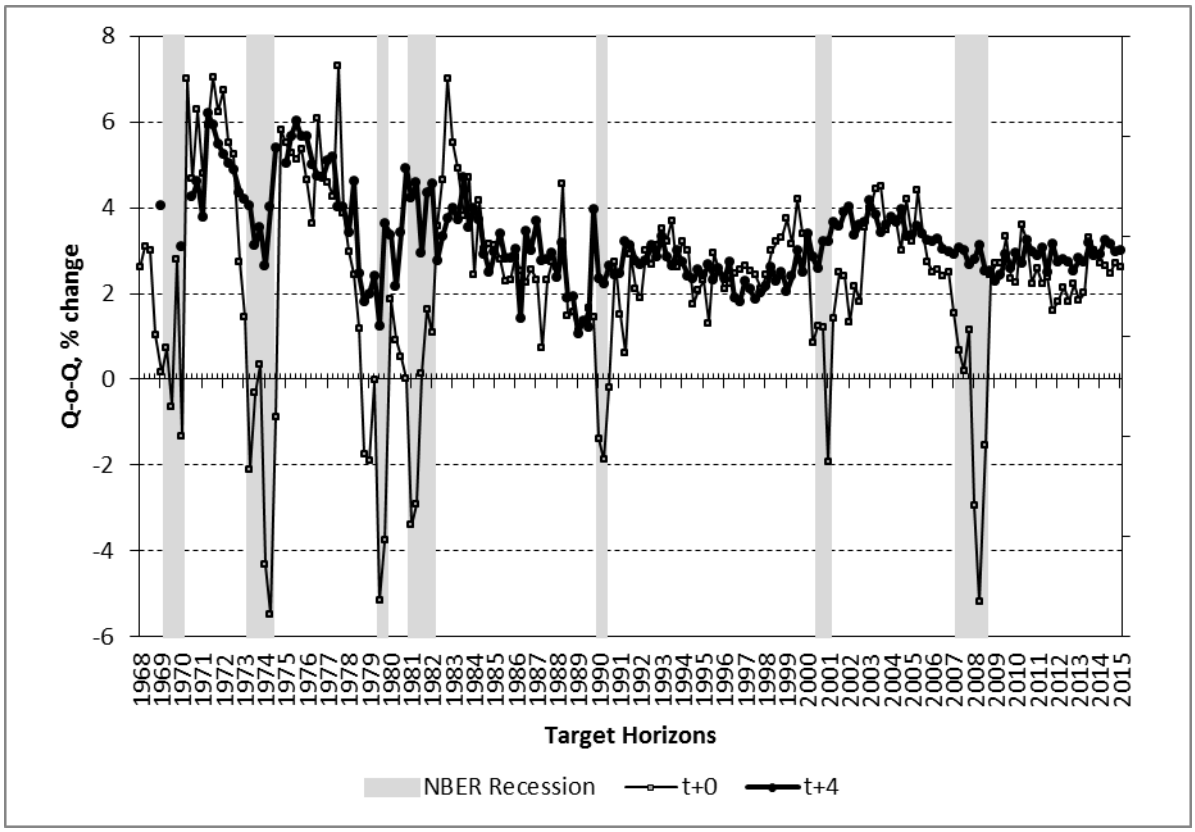
Notes: + for target horizon t+4 the number of quarters is 5 less (2 quarters of contractions, 3 quarters of expansions); * significantly different from actuals at 5% level and higher.

This paradox may be resolved by studying periods of expansions and contractions separately. Table 4 shows that the average consensus forecasts for non-recession quarters are roughly equal to actuals for all target horizons, except nowcasts (the differences between them are not statistically significant even at 5% level). In other words, in the "normal state" the expected GDP growth rates for any time horizon are roughly equal to each other and to the average rate for periods of expansion; low standard deviations mean that there is a focus on trends, not on cyclical fluctuations. For recession quarters, the initial forecasts (made 3–4 quarters before) are the same as for non-recession quarters. Experts begin to adjust their

[19] Standard deviations for forecasts are less than for actuals beginning with nowcasts.

estimates two quarters before contractions; negative growth rates usually appear only after recessions start.[20] For periods of contraction, negative average GDP growth rates may be observed only for nowcasts, for all other target horizons average forecasted rates are positive; and even for nowcasts the average is only half of the actual average rate. Actual rates evidently include some additional (negative) components not captured by professional forecasters even for the current quarters.[21] The fact that for periods of contraction the differences between forecasted and actual growth rates are significantly positive for all target horizons means that consensus forecasts for recession quarters may be biased and overoptimistic.

Figure 2 demonstrates that for non-recession quarters forecasts for current quarter made 1 year before and nowcasts are close to each other. Several quarters before recessions nowcasts drop but stay positive, then reach their minimums (negative) during recessions, and then (several quarters after recessions) return to the usual level of forecasts for one year ahead. In fact, the same (with a smaller amplitude) is true for target horizons 1–3.[22]



Note: The shaded bars represent recessions as defined by the NBER
Fig. 2. Forecasted GDP growth rates (SAAR) for the current quarter and one year ahead

[20] Except several pre-1980 recession quarters that were mentioned above.
[21] We hypothesize that the main reason for this is trouble with predicting changes in private inventories, but this is a theme for a separate research project.
[22] A figure with a full range of target horizons is overwrought with similar lines that are difficult to distinguish. It may be sent on request.

4.2 Mincer-Zarnowitz test for various target horizons: recessions matter

From descriptive statistics which show the idea of expert over-optimism when forecasting recessions, we turn now to classic econometric tests for unbiasedness. We start with the Mincer-Zarnowitz equation in its simplest form (see Mincer and Zarnowitz (1969)):

$$a_t = \alpha + \beta f_{t,t-\Delta} + u_t, \quad (1)$$

where $f_{t,t-\Delta}$ and a_t are forecasted (*f*) and actual (*a)* GDP growth rates in quarter *t; t-Δ* is a quarter when forecasts were made; *Δ* is a target horizon; *α,* β are constants and u_t is a random error. If forecasts are unbiased then $\alpha = 0$ and $\beta = 1$ simultaneously: $\{H_0: \alpha = 0, \beta = 1\}$.

Table 5 suggests that this unbiasedness hypothesis may be rejected at significance levels less than 5% for target horizons 2 and longer. As α's are not significantly different from zero and β's are significantly lower than one for target horizons 3 and 4, the correspondent consensus forecasts are overoptimistic.

Our next hypothesis is that the state of economy (expansion/contraction) matters (the results from section 3 give grounds for this idea). Accordingly, the second equation is:

$$a_t = \alpha + \beta f_{t,t-\Delta} + \rho D_t + u_t \quad (2)$$

where D_t is a dummy equal to one if *t* is a recession quarter (according to the NBER) and zero otherwise.[23] The null hypothesis is: H_0: $\{\alpha = 0, \beta = 1, \rho = 0\}$. This time H_0 may be rejected at a higher (much less than 1%) level of significance for *all* target horizons including nowcasts. Moreover, the inclusion of the dummy significantly increases R^2s for all target horizons. It means that specification (2) is much better than (1) and the reason for the biasedness may be connected with a failure to understand the current state of economy, not with difficulties in predicting for distant quarters.

Finally, to test the importance of black swans, we estimated the following equation:

$$a_t = \alpha + \beta f_{t,t-\Delta} + \lambda_1 BS_t^- + \lambda_2 BS_t^+ + u_t, \quad (3)$$

where BS_t^- is a dummy equal to 1 if the recession quarter *t* precedes the quarter when the black swan appeared; and BS_t^+ is a dummy equal to 1 if the recession quarter *t* coincides or follows the quarter when the black swan appeared (the latter is defined according the penultimate line of

[23] See Sinclair et al. (2010) and Sinclair et al. (2012) for similar specifications.

Table 1). Both dummies are equal to zero for all non-recession quarters; their sum is equal precisely to D_t from equation (2).

The results of splitting periods of contractions into two parts (before and after the black swans) shows that over-optimism is usually larger for quarters *after* the black swans ($\lambda_1 < \lambda_2$).[24] In other words, experts underestimate the deepness of a recession most significantly when the drop becomes most evident and inevitable. They are over-optimistic at the beginning of recessions but they are even more over-optimistic up to their end.

Tab. 5. Mincer-Zarnowitz tests (1)-(3) for the whole period, 1968:4-2015:4

Specifications and null hypothesis		Coeff.	Target horizons, quarters				
			0	1	2	3	4
(1)	H_0: $\alpha = 0, \beta = 1$	α	-0.177	-0.243	-0.057	0.543	0.451
			(0.358)	(0.459)	(0.904)	(0.426)	(0.559)
		β	1.106	0.996	0.854	0.590	0.591
			(0.077)	(0.967)	(0.322)	(0.046)	(0.075)
		Adj. R^2	0.647	0.334	0.150	0.038	0.031
	H_0: $\{\alpha = 0, \beta = 1\}$	Wald test	(0.182)	(0.384)	(0.047)	(0.001)	(0.000)
(2)	H_0: $\alpha = 0, \beta = 1, \rho = 0$	α	0.439	1.276	1.478	1.392	1.340
			(0.098)	(0.000)	(0.000)	(0.009)	(0.025)
		β	0.941	0.644	0.571	0.574	0.553
			(0.440)	(0.000)	(0.001)	(0.007)	(0.011)
		ρ	-1.617	-4.068	-4.997	-5.514	-5.731
			(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
		Adj. R^2	0.665	0.505	0.457	0.433	0.442
	H_0: $\{\alpha = 0, \beta = 1, \rho = 0\}$	Wald test	(0.003)	(0.000)	(0.000)	(0.000)	(0.000)
(3)	H_0: $\alpha = 0, \beta = 1, \lambda_1 = 0, \lambda_2 = 0$	α	0.510	1.379	1.570	1.279	1.245
			(0.060)	(0.000)	(0.000)	(0.014)	(0.030)
		β	0.923	0.615	0.547	0.616	0.588
			(0.326)	(0.000)	(0.000)	(0.013)	(0.014)
		λ_1	-1.139	-2.192	-2.828	-2.759	-2.429
			(0.134)	(0.015)	(0.003)	(0.004)	(0.016)
		λ_2	-1.873	-4.710	-5.670	-6.323	-6.621
			(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
		Adj. R^2	0.668	0.523	0.479	0.467	0.485
	H_0: $\{\alpha = 0, \beta = 1, \lambda_1 = 0, \lambda_2 = 0\}$	Wald test	(0.004)	(0.000)	(0.000)	(0.000)	(0.000)

Note: probabilities for rejection corresponding H_0 hypothesis by chance are in parenthesis.

[24] According to the Wald test, H_0: $\lambda_1 = \lambda_2$ may be rejected at 1% level for all target horizons, except nowcasts.

4.3 Robustness of our results

Our main finding is the biasedness of GDP consensus forecasts for all target horizons. For predictions for 1 quarter ahead and for nowcasts it becomes evident after the inclusion of a dummy for recession quarters; for more distant target horizons the hypothesis H_0: $\{\alpha = 0, \beta = 1\}$ may be rejected at high levels of significance even without this dummy. These findings differ from some previous ones (see Table 6), especially those obtained by Rudebusch and Williams (2009) and El-Shagi et al. (2016).[25]

Tab. 6. Unbiasedness of quarterly GDP forecasts from SPFs: some previous results

Paper	Period	GDP variable	Results, by target horizons*				
			0	1	2	3	4
Zarnowitz (1985)	1968:4-1979:1	Real, growth rate	F	F	P	P	F
Fair and Shiller (1989)	1976:3-1986:2	Log real, growth	-	P	-	-	P
Lahiri and Chun (1989)	NA	Nominal (?), volume	-	F	P	P	F
Baghestani and Kianian (1993)	1981:3-1991:2	Real, volume	P	P	P	P	P
Rudebusch and Williams (2009)	1968:4-2007:1	Real, growth rate	P	P	P	P	P
	1988:1-2007:1	Real, growth rate	P	P	P	P	P
Sinclair et al. (2012)	1968:4-2011:1	Real, growth rate	F	P	-	-	-
Wieland and Wolters (2013)	40-quarters rolling window	Real, growth rate	P, ex. in the 1990s				
El-Shagi et al. (2016)	1968:4-2006:4	Real, growth rate	P	P	P	P	F

Notes: * "P" means "passed the test on unbiasedness", "F" means "failed to pass the test at 5% level".

Our calculations differ from previous ones in 4 parameters: the indicator for GDP (real or nominal, volume or growth rate, etc.), the indicator for consensus (mean or median), the indicator for actual GDP growth rates (advance or second estimate), and the time periods considered. For better comparisons, we recalculated equation (1) for different periods as well as

[25] All others (Zarnowitz (1985), Sinclair et al. (2012), Wieland and Wolters (2013)) revealed some periods and/or target horizons when the hypothesis of unbiasedness was rejected at high levels of significance.

for different indicators of consensuses and actuals (in all cases, real GDP growth rates were the only focus). The main results are (see Table 7):[26]

– For the shortened period 1968:4–2006:4 (it coincides with the period from El-Shagi et al. (2016) and differs by only 1 quarter from the period from Rudebusch and Williams (2009)), the level of significance is slightly lower for means and second estimates of GDP. This may be the reason for the differences between Rudebusch and Williams (2009), El-Shagi et al. (2016), and our results. While using means and second estimates simultaneously, there are no statistical reasons at all to reject unbiasedness of forecasts for all target horizons, except for nowcasts;[27,28]

– For the full period 1968:4–2015:4, the rejection of unbiasedness for 3–4 quarter target horizons is definite and robust. We propose that this is connected not only with the larger size of the sample but with inclusion of the Great Recession with its biased quarterly forecasts.

Tab. 7. Wald test for equation (1) with different measures of "consensus" and "actual" GDP growth rates for different periods[+]

Period	Consensus	Actual	Target horizons, quarters				
			0	1	2	3	4
1968:4-2015:4	Median	Advance estimate	0.18	0.38	0.05	0.00	0.00
	Mean		0.18	0.70	0.17	0.01	0.00
	Median	Second estimate*	0.09	0.78	0.24	0.01	0.00
	Mean		0.04	0.74	0.34	0.06	0.02
1968:4-2006:4	Median	Advance estimate	0.18	0.70	0.17	0.01	0.00
	Mean		0.10	0.83	0.36	0.06	0.04
	Median	Second estimate*	0.08	1.00	0.48	0.04	0.02
	Mean		0.03	0.91	0.77	0.20	0.16

Notes: + Wald test, probabilities for rejection the hypothesis H_0: $\{\alpha = 0, \beta = 1\}$ the by chance; * Rudebusch and Williams (2009) referred to them as "first final".

Another test for robustness is an estimation of equation (1) separately for periods of expansion and contraction. The results were partly surprising for us. Initially, we assumed that

[26] Full regression parameters are available upon request.

[27] Until the end of the 1980s averages were usually less than medians. It means that there were some respondents at that time who forecasted much lower GDP growth rates than the majority of the expert society. As it was long ago we did not analyze this phenomenon in greater detail (since the beginning of the 1990s averages and medians are much closer to each other).

[28] For a discussion of different concepts for "actual" GDP growth in the context of forecasting quality, see Fildes and Stekler (2002), Croushore (2012). Note that according to Mincer-Zarnowitz test, for 1968:4-2015:4 advance estimates of GDP are slightly biased (underestimated) forecasts for the second estimates.

forecasts would be biased only for recession quarters, because for non-recession quarters the average actual GDP growth rate is close to average forecasts for all target horizons, except nowcasts (see Table 4). But in reality, forecasts for non-recession quarters are also mostly biased (see Table 8). Furthermore, β's from equation (1) for non-recession quarters are not significantly different from β's from equation (2) for the whole period.

This confirms that consensuses are biased forecasts of actual GDP growth rates. Not taking the factor of recessions into account only disguises this fact.

Tab. 8. Mincer-Zarnowitz test for periods of expansion and contraction, 1968:4-2015:4

Specification and null hypothesis		Coefficients	Target horizons, quarters				
			0	1	2	3	4
Periods of expansion (162 quarters)							
(1)	H_0: α = 0, β = 1	α	0.660	1.374	1.255	0.988	1.206
			(0.020)	(0.000)	(0.002)	(0.044)	(0.029)
		β	0.866	0.611	0.645	0.703	0.594
			(0.113)	(0.000)	(0.003)	(0.043)	(0.013)
		Adj. R^2	0.393	0.189	0.153	0.124	0.076
	H_0: {α = 0, β = 1}	Wild test	(0.041)	(0.000)	(0.007)	(0.122)	(0.035)
Periods of contraction (27 quarters)							
(1)	H_0: α = 0, β = 1	α	-0.911	-2.898	-2.853	-0.623	-2.997
			(0.070)	(0.000)	(0.017)	(0.795)	(0.338)
		β	1.159	0.791	0.252	-0.546	0.116
			(0.402)	(0.542)	(0.091)	(0.044)	(0.353)
		Adj. R^2	0.592	0.147	-0.026	-0.017	-0.045
	H_0: {α = 0, β = 1}	Wild test	(0.037)	(0.000)	(0.000)	(0.000)	(0.000)

Note: probabilities for rejection corresponding H0 hypothesis by chance are in parenthesis.

4.4 Biased and overestimated?

Equation (4) is a simplified analogue of equation (2) averaged for all target horizons, except nowcasts:

$$a_t = 1.4 + 0.6 f_{t,t-\Delta} - 5.0\, D_t \quad (4)$$

For non-recession quarters with $D_t = 0$, equation (4) takes the form (5):

$$a_t = 1.4 + 0.6 f_{t,t-\Delta} \quad (5)$$

and for recession quarters with $D_t = 1$, it takes the form (6):

$$a_t = -3.6 + 0.6 f_{t,t-\Delta} \quad (6)$$

Because of the constants (α = 1.4 and α = -3.6) these equations add to or subtract from the forecast; because the β-coefficient is less than one (β = 0.6) it adjusts the forecast down. On the whole, for non-recession quarters, consensus forecasts are underestimated if they are less than 3.5 and overestimated otherwise (1.4 + 0.6 * 3.5 = 3.5); this may be understood as a "a return to the trend". On the other hand, as 75% of all consensuses are less than 3.5, they are rather slightly underestimated for non-recession quarters with $D_t = 0$.

For recession quarters, consensus forecasts $f_{t,t-\Delta}$ > -9.0 (always, in other words) are overestimated (-3.6 + 0.6 *(-9.0) = -9.0). Moreover, GDP growth rates estimated according to (6) would be negative ($a_t < 0$) for $f_{t,t-\Delta} < 6.0$ (always too, in other words); for example, it is enough to predict $f_{t,t-\Delta} = 2.1$ (average forecast for a recession quarter made two quarters before) and equation (6) will transform it into $a_t = -2.3$ (average actual growth rate for recession quarters). This relationship exists because for some reason experts would rather predict small but positive growth rates instead of negative ones that definitely point to a recession.

The trouble is that the value of D_t is unknown in real time; in other words, experts cannot choose between equations (5) and (6) in advance. Statistically significant coefficient for D_t in equation (2) means precisely that consensus forecasts from SPFs are unsuccessful in predicting recessions in real time.

5 Discussion and conclusions

The stylized facts established in our paper are:

- Pairs of negative forecasted GDP growth rates and the probabilities of a recession greater than 50% (they may be easily understood as "alarm signals") usually appear after cyclical peaks;
- Consensus forecasts of recessions for distant target horizons (more than 2 quarters) were never met, except several moments after the second oil shock;
- As a rule, pre-recession probabilities of recessions are much less than 50%;
- The expected durations of recessions are less than the actual average durations. In reality a consensus forecast may foretell the beginning of an expansion before a cyclical trough but this is rather a sign of naïve methods of forecasting;
- Applying the Mincer-Zarnowitz test with a dummy for recessions reveals that SPFs give biased forecasts of real GDP growth rates for almost all target horizons;
- For periods of expansion, consensus forecasts are slightly underestimated. However experts regularly overestimate growth rates during recessions. Adding a dummy for recessions significantly increases adjusted R^2s;
- Consensus forecasts clearly signal a recession only after a black swan; the majority of experts avoid predicting declines in real GDP before one. The depth of contraction is even more underestimated for quarters after black swans.

Each of these facts begs the question: "Why?" Our answer is: "Because expert over-optimism concerning recessions, especially their imminence, duration and depth." None of thesestylized facts proves this in a direct way but, in our view, together they constitute indirect evidence for a wishful bias in predicting recessions.

Two more facts established by other researchers lend more support to this idea. First, it was shown that forecasters successfully discriminate between high and low GDP growth rates, but not between positive and negative rates. They obviously prefer to predict low growth instead of decline in economic activity (see Stekler (1972, 1994), Schnader and Stekler (1990, 1998)). Second, Rudebusch and Williams (2009) found that the predictive power of the yield curve outperforms that of the SPF; in other words, experts do not incorporate the information available

about possible recessions—contained in the yield curve—in their GDP forecasts. This indicates that experts have the information to predict recessions better but for some reasons do not do this.

Two additional questions arise immediately. First, what are the reasons for such a bias (if any)? Second, what conclusions should a customer of the SPF consensus forecasts do?

For the first, we suppose that: (a) a lot of forecasters do not have a special aim to predict recessions and simply do not focus on this; some of them use relatively primitive models and rely too heavily on extrapolations (hence, negative fluctuations would not be caught in real time); (b) forecasters do not want to spook investors and provoke self-fulfilling negative predictions; (c) there are no tangible rewards for professional forecasters to predict recessions properly; (d) and as human beings, most experts hope for the best and suppose that threats will dissipate and risks will not be realized.

From a practical point of view, the existence of such a bias is not disastrous insofar as its existence is recognized. SPF customers may: (a) make their own corrective adjustments for this bias; (b) use estimates made by those individual forecasters who are more successful in predicting recessions than the consensus; (c) make policy or business decisions gradually, instead of relying entirely on negative point forecasts of real GDP growth rates or their high probabilities.

These hypothetical answers should be tested further. Additional research specially focused on predicting recessions using quarterly forecasts for all target horizons is needed.

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