



The value of hard and soft data for short-term forecasting of GDP

Mary Keeney, Bernard Kennedy and Joëlle Liebermann

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Abstract

When monitoring and assessing the state of the economy in real time, policymakers face the problem that Gross Domestic Product (GDP) is released with a lag. For the euro area, the first estimate of GDP for a reference quarter is only released six weeks after the close of the quarter. In the interim period, one can use monthly conjunctural indicators to obtain a more timely estimate of GDP. These indicators include hard data, such as industrial production, and soft data such as PMI surveys. However, the hard data for a reference month are only released with a one or two month lag, whereas the soft data are released at the end of the reference month. Hence, one faces a potential trade-off between reliability and timeliness of information. This letter illustrates the value of soft and hard data for computing an early GDP estimate by running a pseudo real-time forecasting exercise.

1 Introduction

When monitoring and assessing the state of the economy in real time, policymakers face the problem that Gross Domestic Product (GDP), which is the most comprehensive measure of the state of the economy, is released with a lag. For the euro area, the first (flash) estimate of GDP for a reference quarter is released six weeks after the close of the quarter.

In the interim period, monthly conjunctural indicators become available which provide within-quarter information that can be used to give a more timely assessment of the current state of the economy, i.e., to construct an early estimate of GDP ahead of its official release by Eurostat. These monthly indicators consist of both quantitative and

qualitative data or so-called hard and soft data. The former refer to direct measures of economic activity such as industrial production, retail sales and the unemployment rate. Soft data such as surveys provide qualitative assessments reflecting sentiment and/or expectations, hence have a looser link than the hard data with the state of the economy. Examples of such surveys include Markit's Purchasing Managers Index (PMI) and the European Commission's Economic Sentiment Indicator (ESI). Box A provides more details on the nature of these two surveys.

In practice, both types of data are utilised to construct an early estimate of GDP as one faces a trade-off between reliability and timeliness of the information. Indeed the hard data for a reference month are only released with a one or two month publication lag, whereas the surveys are released

⁰Corresponding author: joelle.liebermann@centralbank.ie. We thank Lars Frisell, Stefan Gerlach and Gerard O'Reilly for comments on an earlier draft. The views expressed in this letter are those of the authors and do not necessarily reflect those of the Central Bank of Ireland

at the end of the month they cover or the beginning of the next month. A frequent question that confronts policymakers is how much weight should one put on this more timely soft data relative to the more comprehensive and reliable hard data? How does this evolve as more information becomes available during the quarter?

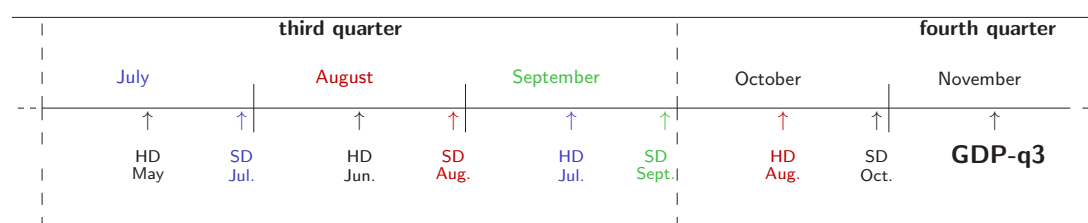
To illustrate this issue of publication lags and non-synchronous releases, Figure 1 below provides a stylised schematic representation of the timing of the information releases for the third quarter of 2012. The upper part of the figure displays the dates while the lower part shows the flow of information released during the third and fourth quarter of 2012, up to the first release of third quarter GDP. Furthermore, a colour is associated with each release to indicate which month of the quarter the release refers to. For example, the releases pertaining to July are all in the same colour (blue) as the one in which July is displayed in the upper part of the figure.

The first piece of information for the third quarter comes from survey (soft data) releases at the end of July and August for those respective months. In mid September, hard data¹ for the first month of the reference quarter are released. At any given point in time, prior to the official release of

GDP for the third quarter, one can construct an early estimate of GDP using the available monthly information. Note that the early estimate of GDP for the third quarter constructed in that quarter is called a *nowcast*, whereas the one constructed in the fourth quarter is called a *backcast*.² In this letter, we follow Bańbura, Giannone and Reichlin (2011) and name all these successive estimates for a reference quarter as *nowcasts* with these authors defining nowcasting as the “prediction of the present, the very near future and the very recent past”.

In this letter, we illustrate the value of soft and hard data for computing an early GDP estimate by running a pseudo real-time forecasting exercise. We limit ourselves to one example each of hard and soft data. However this simplification does not materially affect the qualitative nature of the results regarding the relative merits of soft versus hard data. In practice numerous monthly variables are available, and it is standard to use them all to construct an early estimate of GDP. For an extensive survey of this literature see Bańbura, Giannone and Reichlin (2011) and Bańbura, Giannone, Modugno and Reichlin (2012), while D’Agostino, McQuinn and O’Brien (2011) and Liebermann (2012) apply nowcasting techniques to Irish GDP.

Figure 1: Timing of releases



Notes: SD refers to soft data and HD refers to hard data.

¹Note that the timing of the hard data releases shown here corresponds to that for the real variables which are generally found to be the most informative for GDP.

²When such an estimate is constructed in the first quarter it is a *forecast*.

Box A: Soft Indicators: Purchasing Managers Index and the Economic Sentiment Indicator

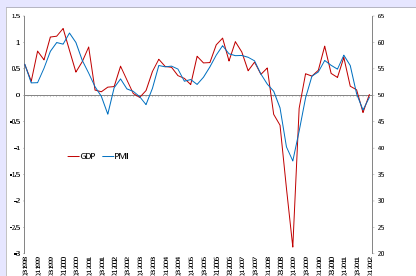
Markit's euro area Purchasing Managers Indices (PMIs) are based on a qualitative survey of purchasing managers' assessments of recent developments and near term prospects with regard to sales, employment, inventories and prices for a sample of around 4,500 companies based on the manufacturing and services sectors.

The European Commission publishes the Economic Sentiment Indicator (ESI), and its subcomponents, on a monthly basis. About 72,000 firms and 27,000 consumers are surveyed every month. The European Commission calculates the euro area aggregates on the basis of national results. The indicator is composed of four components: industrial confidence (40%), consumer confidence (20%), construction sector confidence (20%) and retail trade confidences (20%), which are based on different surveys.

These surveys have been shown to have forecasting power for GDP in the euro area, see for example, Godbout and Jacob (2010) and Lombardi and Maier (2011) among others. They are both widely commented on in the financial press as a harbinger of developments in the economy. They are released at the end of the month they are germane to or the beginning of the subsequent month. One advantage of the ESI is that it is freely available whereas the PMI is propriety.

Figure A: GDP growth and the surveys

(a) GDP growth and the PMI



(b) GDP growth and the ESI

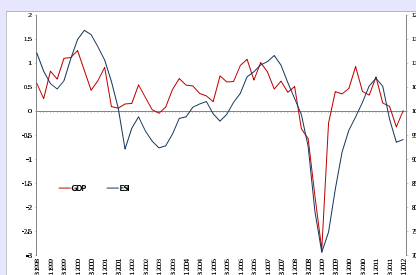


Figure A shows a plot of both of these surveys (quarterly aggregated) relative to GDP, the upper panel displays GDP and the PMI whereas the lower panel displays GDP and the ESI. Table A below further shows the cross-correlation of the PMI and ESI with GDP; for both surveys, the highest correlation is for the contemporaneous correlation.

However, as discussed in this letter, extrapolating the behaviour of quarterly GDP in real-time from monthly values of the PMI is not straight forward due to the mixed frequency nature of the data, i.e., if one observes a PMI value for the first month of the reference quarter, one needs to forecast what its value will be in the next two months of the quarter before forecasting the corresponding quarter's GDP. Comparing the ex post realisation of the PMI for the quarter with that of GDP ignores this important issue.

Table A: Cross-correlations

	PMI quarter q	ESI quarter q
GDP quarter q	0.86	0.74
GDP quarter q+1	0.63	0.48
GDP quarter q+2	0.33	0.20

2 Nowcasting GDP

2.1 The model

The model used to produce an early estimate of GDP is based on a statistical model known as a vector autoregression (VAR) model that can deal with (i) the problem that some variables are available at quarterly frequency while others are available at monthly frequency (the mixed frequency problem) and (ii) takes into account that variables are released non-synchronously and with publication lags (the so-called "jagged edge" structure of the dataset).

Let X_t^1 denote the unobserved monthly growth rate of GDP and X_t^2 is a set of monthly predictors, then the VAR model for $X_t = (X_t^1, X_t^2)'$ is defined as follows:

$$X_t = \sum_{j=1}^p A_j X_{t-j} + \varepsilon_t \quad (1)$$

Using the convention that a quarter is assigned to the last month of the quarter, the unobserved monthly growth rate of GDP, X_t^1 , is related to the observed quarterly growth rate of GDP, Y_t^q , by the following aggregation relationship:

$$Y_t^q = X_t^1 + 2X_{t-1}^1 + 3X_{t-2}^1 + 2X_{t-3}^1 + X_{t-4}^1 \quad (2)$$

which holds in the third month of the quarter.³

2.2 Empirical results

This section presents the out-of-sample performance for nowcasting euro area real quarterly GDP growth. The evaluation sample runs from Q1:2003 to Q1:2012 and the model is estimated recursively with observations starting in Q3:1998.

The variables included in the VAR are quarterly GDP, while the two monthly predictors are industrial production (IP) and the Purchasing Managers Index (PMI) respectively. Industrial production is released a month and a half after the reference month, while the PMI survey is released at the end of the month it pertains to. Most analysts pay quite a bit of attention to both monthly series.

For each quarter, a sequence of eight nowcasts are produced. Starting in the first month of the reference quarter up to the first month of the subsequent quarter, a nowcast is computed in the middle and end of the month following the release of either IP or the PMI. At each point in time, a nowcast is computed replicating the data availability faced by a forecaster in real-time incorporating the pattern of missing information due to publication lags. However, since revised data for GDP and the monthly predictors are used instead of data available at the time, the forecasting exercise is called a pseudo real-time exercise.

As the objective is to assess the (marginal) predictive value of soft data vis-à-vis hard data for GDP, nowcasts are computed with two bi-variate VARs namely GDP and IP (model A) and GDP and the PMI survey (model B) and with a tri-variate VAR which includes GDP, IP and the PMI survey (model C). In addition, nowcasts are also computed based on a standard benchmark used in the forecasting literature where nowcasts of GDP growth are the average of past GDP growth. This is called the naive model and does not incorporate any timely monthly information.

The Root Mean Square Forecast Errors (RMSFE) statistic is used as a metric for evaluating the nowcasts, and is defined as follows:

$$RMSFE^j = \sqrt{\frac{1}{Q} \sum_{q=1}^Q (\widehat{GDP}_q^j - GDP_q)^2},$$

where q indexes the quarter, $\widehat{GDP}_q^j$ is the model j early estimate (nowcast) for the quarter and GDP_q is the actual GDP. The closer the model is to actual GDP, the lower its root mean square forecast error will be.

The forecasting performance of the alternative models based on their respective RMSFEs are presented in Table 1. The naive model and the VARs are displayed in columns and the nowcast dates are displayed in rows. In brackets, beside the nowcast dates, we include the additional information that becomes available at that date, from the perspective of nowcasting the third quarter as in Figure 1. For each nowcasting date, the entry corresponding to the best forecasting model is coloured in red and the second best is coloured in green.

³See Mariano and Murasawa (2003) for details on the estimation.

Table 1: RMSFEs

Nowcast dates (releases):	naive	model A	model B	model C
<u>current quarter:</u>				
mid mth 1 (<i>IP_{May}</i>)	0.78	0.73	0.59	0.58
end mth 1 (<i>PMI_{Jul.}</i>)	0.78	0.73	0.55	0.53
mid mth 2 (<i>IP_{Jun.}</i> , <i>GDP_{q2}</i>)	0.76	0.51	0.62	0.44
end mth 2 (<i>PMI_{Aug.}</i>)	0.76	0.51	0.48	0.36
mid mth 3 (<i>IP_{Jul.}</i>)	0.76	0.41	0.48	0.33
end mth 3 (<i>PMI_{Sept.}</i>)	0.76	0.41	0.50	0.36
<u>next quarter:</u>				
mid mth 1 (<i>IP_{Aug.}</i>)	0.76	0.32	0.50	0.34
end mth 1 (<i>PMI_{Oct.}</i>)	0.76	0.32	0.43	0.36

As is evident from Table 1, all of the VAR models provide a more precise early estimate of GDP than the naive benchmark. This indicates that exploiting conjunctural monthly indicators is helpful to nowcast GDP. Furthermore, as more information on the reference quarter becomes available, i.e., moving downwards in the table, the precision of the GDP estimate of the VAR models increases (although not always monotonically).

In terms of model ranking, for nowcasting in the current quarter, the best model includes both hard and soft data (model C). But as hard data for the reference quarter is released (from the middle of the third month onwards) the relative usefulness of the PMI survey in terms of improving the accuracy of the nowcast vanishes. In particular, from that point onwards, the accuracy of the GDP estimate deteriorates with the soft data releases. Once two months of hard data for the reference quarter are released (by the middle of the first month of the next quarter), the best performing model only includes hard data (Model A).

It is also worth noting that the model including

only the soft data as timely information (VAR with GDP and PMI) never provides the most precise estimate of GDP and only beats the model including hard data solely (VAR with GDP and IP) during the first month of the reference quarter. After that point it is the worst performer of the three VARs.

This suggests that the value of soft data (surveys) for predicting GDP in real-time derives from their timeliness, as they are mostly helpful at the beginning of the nowcasting cycle. Furthermore, soft data should be used in conjunction with the hard data and not on their own.

These results echo the findings in the nowcasting literature, see for instance Bańbura and Rünstler (2011), Lombardi and Maier (2011) and Giannone, Reichlin, and Simonelli (2009). It is important to bear in mind that most of this literature uses many monthly conjunctural indicators to obtain an early estimate of GDP within a high-dimensional model rather than the highly stylised nature of example shown here.

2.3 Conclusion

This letter assesses the value of soft and hard data for obtaining an early estimate of GDP, ahead of its official release. In line with findings in the nowcasting literature, we find that the soft data are mostly useful at the beginning of the forecasting cycle, when no hard data for the reference quarter is available. As such their usefulness in real-time derives from their timeliness. By the end of the reference quarter, once hard data (industrial production) for the quarter are released less weight should be put on the soft data.

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