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THE PREDICTIVE CONTENT OF BUSINESS SURVEY INDICATORS: EVIDENCE FROM SIGE

by Tatiana Cesaroni * and Stefano Iezzi*

Abstract

Business survey indicators represent an important tool in economic analysis and forecasting practices. While there is wide consensus on the coincident properties of such data, there is mixed evidence on their ability to predict macroeconomic developments in the short term. In this study we extend the previous research on the predictive content of business surveys by examining the leading properties of the main business survey indicators of the Italian Survey on Inflation and Growth Expectations (SIGE). To this end, we provide a complete characterization of the business cycle properties of survey data (volatility, stationarity, turning points etc.) and we compare them with the national accounts reference series. We further analyse the ability of SIGE indicators to detect turning points using both discrete and continuous dynamic single equation models as compared with their benchmark (B)ARIMA models. Overall, the results indicate that SIGE business indicators are able to make detect early the turning points of their corresponding national account reference series. These findings are very important from a policy-making point of view.

JEL Classification: C32, E32.
Keywords: business cycle, business survey data, turning points, cyclical analysis, forecast accuracy, macroeconomic forecasts.

Contents

1. Introduction 5
2. The data 7
3. Stationarity properties, volatility and cross correlation 8
4. Turning points analysis 16
5. Forecasting models 21
   5.1 Binary approach 21
   5.2 Continous approach 22
6. Empirical results from forecast exercises 22
7. Conclusions 29
References 30
Appendix: Data description 32

* Bank of Italy, DG Economics, Statistics and Research.

1. Introduction[1]

Business survey data are widely used in short-term policy analysis since they furnish timely information on overall economic activity as well as on the evolution of the key macroeconomic series. Their prompt availability as compared with national accounts data (which are published with a delay of roughly two months) makes it possible to use them to detect potential changes in the business cycle phases and to prevent possible slowdowns. Furthermore, they are used for economic surveillance purposes as early warning indicators of economic crises given their ability to capture business sentiment.

While there is broad consensus on the coincident properties of business survey data, in the last twenty years the literature has provided discordant results concerning their ability to forecast economic activity in the short term.

Bergstrom (1995) analyses the relationship between the industrial production growth rate and the business tendency survey (BTS) for Sweden using autoregressive distributed lag models. He finds that using specifications that include BTS indicators improves the forecasting performance of the models. Bruno and Lupi (2004) detect business cycle turning points by using European commission survey data in VAR models and find a predictive power of such qualitative indicators. Lemmens et al. (2005) analyse the predictive content of production expectations data for 12 European Union countries using both univariate and multivariate Granger Causality tests. In their findings, production expectations display predictive content in only seven EU countries when using univariate Granger test, whereas in a multivariate test context, leading properties are confirmed for all the countries. Abberger (2007) assesses the ability of employment expectations to forecast employment based on national accounts (NA) data using smoothing techniques, Probit models and ECM, and concludes that employment expectations are leading indicators of the current employment dynamics. Analogously, Claveria et al. (2007) analyse the predictive power of a wide set of business and consumer survey variables from European Commission surveys for several European countries and conclude that the forecast performance in terms of the root mean square error (RMSE) is higher with respect to their benchmarks only for a limited number of models using information from surveys. More recently, Cesaroni (2011) analyses the cyclical behaviour of four Italian business survey indicators (i.e. inventories, industrial orders book level, degree of plants utilization and confidence climate index) from the European Commission joint harmonized survey using both time and frequency domain methods, and concludes that business tendency surveys are

[1] We would like to thank Francesco Zollino, Leandro D'Aurizio, Luigi Cannari, Riccardo De Bonis, Giovanni D'Alessio, Nicola Branzoli and all the participants of the Bank of Italy lunch seminar held on 28 May 2015 for their comments and suggestions. Any error or mistake remains the authors' sole responsibility.

able to predict economic activity evolution, especially at the highest business cycle frequencies. Cesaroni et al. (2011) examine the business cycle stylized facts for the three main Euro Area countries (namely Italy, France and Germany) and find that the business cycle characteristics of GDP (such as amplitude, duration and steepness) are very similar to those found in their corresponding qualitative business survey data. Such findings show that business surveys are suitable for capturing developments in the business cycle.

In this paper we evaluate the predictive content of all the relevant information from the Italian Survey on Inflation and Growth Expectations (SIGE), conducted by the Bank of Italy since 1999, on a sample of roughly 1,000 firms in the industrial and services sectors. The survey has been designed to provide information on a wide range of business cycle indicators and is aimed at furnishing a timely outlook on the development of the Italian economy. The analysed data set includes eight business survey indicators on a quarterly frequency, available from 1999 or 2004, and a number of reference series from NA data (i.e. GDP, inflation, gross fixed investments and the number of employees). To test the predictive content of the survey indicators, we use the following approach:

- First, we evaluate the leading properties of the SIGE indicators by analysing their co-movements with respect to their reference national accounts series through cross-correlation analysis.
- Second, we analyse their business cycle characteristics (i.e., duration, turning points) and we compare them with the business cycle chronology of the Italian national accounts reference series (synchronization analysis).
- Third, we assess the predictive content of the survey indicators as compared with their national account reference series in terms of RMS(F)E using discrete and continuous univariate dynamic models.

We expand the previous research on the predictive content of survey data by providing further evidence from SIGE business indicators. As a by-product, we provide a full characterization of the cyclical chronology of the SIGE indicators with respect to the reference Italian national accounts.

The paper is structured as follows. Section 2 introduces the SIGE business survey data. Section 3 provides a description of their main econometric and statistical properties (i.e., stationarity, volatility) and their co-movements with the corresponding NA time series. Section 4 analyses the business cycle properties of the survey data in terms of turning point detection and phase characteristics (i.e., average duration, synchronicity) by comparing them with their national accounts reference series. Section 5 introduces the forecasting models. Section 6 reports on a forecast performance exercise. Our conclusions follow.

2. The data

Business Survey data are taken from the quarterly Bank on Italy Survey of Inflation and Growth Expectations. The survey is conducted in January, April, July and September on a sample of roughly 1,000 firms in the manufacturing and services sectors with more than 50 employees. Data are available starting from 1999 Q4. Respondents are asked to state their opinions on the short-term evolution of certain macroeconomic variables, such as inflation and the business cycle, and more specific questions concerning their own business activity. The indicators from the survey are represented in the form of balances that are the weighted[2] difference between the percentages of positive and negative answers reported by the firms.

In our analysis, we focus on eight business survey indicators, namely, expectations on inflation, firm' selling prices, the number of employees, the conditions for investment, the three month and three year business condition of the firms, the general economic situation in Italy and the probability of improvement in Italy's general economic situation. These indicators are chosen on the basis of their economic relevance, time series length availability and the possibility of comparing them with macroeconomic data.[3] More specifically, we consider:

- Inflation expectations (INFL_EXP). This indicator captures firms' 12 month expectations of the harmonized index of consumer price. The indicator is quantitative because the respondents provide a numerical value of inflation over the next 12 months.
- Expectations about the firms' own selling prices (D_PREZ). This question asks firms about their expectations about the future prices of it their own products over the next 12 months. The variable is qualitative in the form of a balance and could potentially furnish information on future inflation. [4]
- Expectations on number of employees (OCC_TOT_EXP). This indicator captures firms' three-month expectations about changes in its own workforce over the next three months. The indicator is a balance because takes into account the difference between positive and negative answers.
- Expectations on investment conditions (SIT_INV). Firms are asked about their current investments conditions with respect to the last three months.
- Three-month expectations about the firms' business conditions (SIT_IMP_3M). This question asks firms to assess their business operating conditions over the next three months.

[2] The weights are the inverse of sample probability of inclusion.

[3] Survey indicators usually refer to industry and services sectors.

[4] While most survey microdata are weighted with the inverse of sample inclusion probability, this variable is weighted by also considering the number of employees.

The indicator is a balance since it is obtained by subtracting the number of negative answers from the number of positive answers.

- Three-year expectations about firms' business conditions (SIT_IMP_3Y). In this question, firms are asked to assess their business operating conditions over the next three years. The indicator is a balance since it is obtained by subtracting the number of negative answers from the number of positive answers.
- Expectations about the general economic situation in Italy (SIT_GEN). This is a qualitative question which asks firms about their expectations about the state of economy in Italy over the next three months. The indicator is expected to be leading with respect to the business cycle.
- Probability of improvement in the economy over the next three months (PROMIG). This question asks firms to indicate the likelihood that the economy will improve over the next three months. The indicator has values between 0 and 100.

Among the national accounts data we consider inflation (INFL), employment (EMPL), Investments (INV) and Gross Domestic Product (GDP). All the series are produced by the Italian National Institute of Statistics (Istat) and span from 1996Q1 to 2014Q4. The data are available on a quarterly basis, are seasonally adjusted and are used in comparison with the business cycle property SIGE indicators. For GDP and investments, we use chained values with base year 2010.

The dynamic of most of the variables measuring economic activity, such as production or employment, includes a trend component which needs to be excluded in order to extract the business cycle. This should not be the case with business survey indicators, since the questionnaire is designed to elicit answers concerning short run increases and decreases of a given indicator. Nonetheless, seasonal factors and irregular variability could also affect responses.[5]

See Appendix for a detailed description of all the variables and the form of the survey questions.

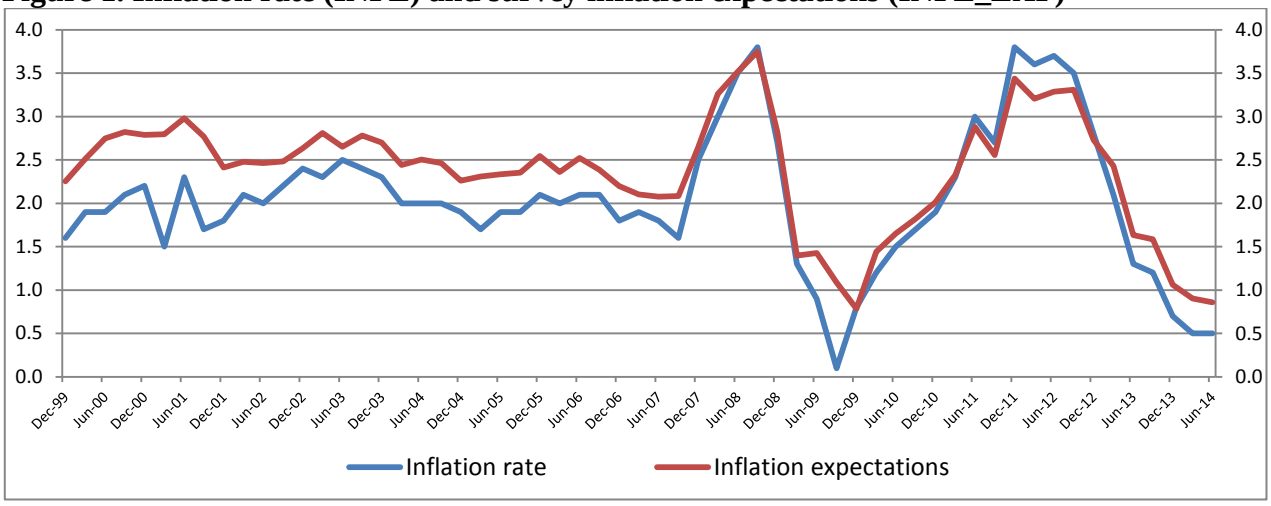
3. Stationary properties, volatility and cross correlation

As a preliminary analysis of the data, we compare, in graph form, the survey indicators with their corresponding reference economic series. The cyclical component of NA data is extracted using quarterly growth rates. Figures 1 and 2 compare the growth rate of the harmonized index of consumer prices with the expected inflation (12 months ahead) and the expectations on firm' own prices over the next 12 months. The inflation expectations indicator (INFL_EXP) appears to be contemporaneous with respect to the reference series. This is probably due to the fact that the

[5] Currently the business survey data published in the Bank of Italy Statistical Bulletin are not seasonally adjusted.

question is formulated by anchoring it to current inflation.[6] The graphical analysis seems to suggest that the expectations formulated by operators follow adaptive rather than rational schemes. Indeed, the agents do not seem to be forward looking when answering about expectations on future inflation dynamics. The firms' own prices (D_PREZ) indicator instead seems to display a leading profile with respect to inflation, although in some subsamples it seems to be out-of-phase. More specifically, the D_PREZ series seems to be counter-cyclical before 2008 and becomes quite pro-cyclical afterwards. This change in pattern might be explained by the fact that, after the financial crisis agents became more aware of ECB inflation target policy and started to formulate their expectations on own prices by looking at monetary policy announcements.

Figure 1. Inflation rate (INFL) and survey inflation expectations (INFL_EXP)

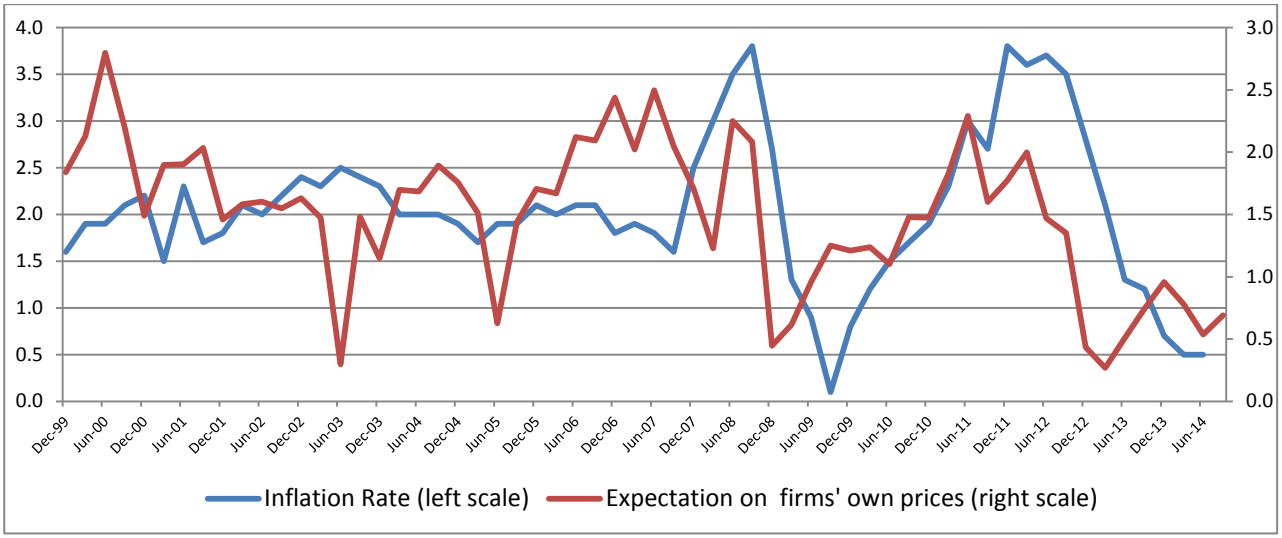


Source: Bank of Italy Survey on Inflation and Growth Expectations and Istat.

A first inspection to the inflation' dynamics seems to indicate that a volatility break occurred in 2007 corresponding to the beginnings of the crisis. The volatility of inflation, together with the amplitude and length of its cycle, significantly increased after that date. Inflation expectations experiment a similar change in pattern, while D_PREZ appears to display similar characteristics both before and after 2007.

[6] With respect to SIGE data, it has been shown that anchoring has the benefit of reducing uncertainty in formulating expectations (expanding the set of knowledge on which they are based), with the consequent reduction in the standard error of the estimates of the average value, without generating a significant bias in the estimate of expectations (Banca d'Italia, 2013).

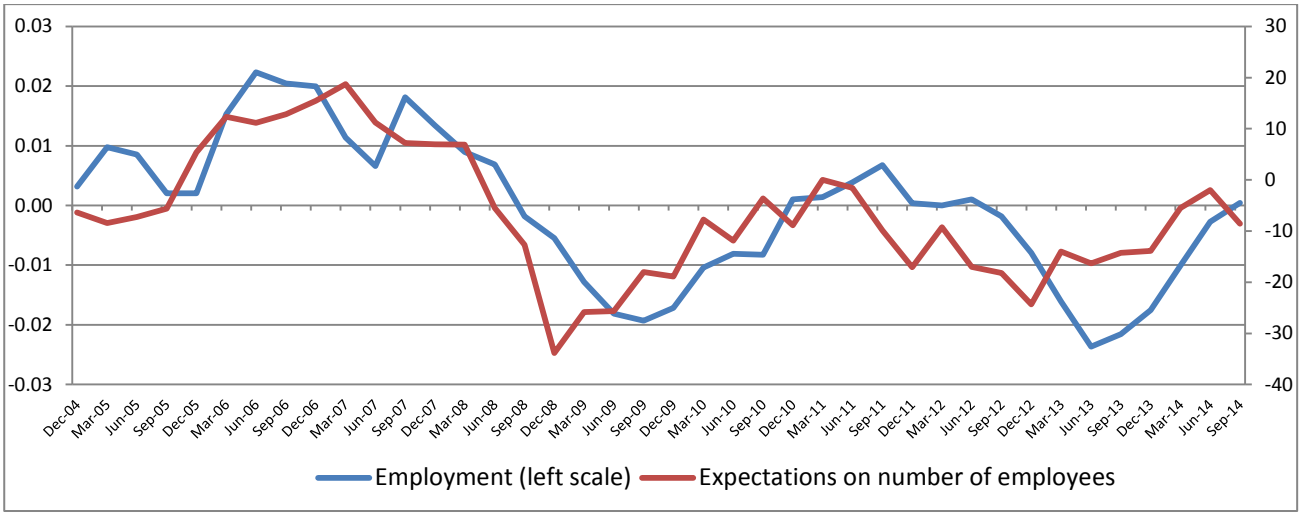
Figure 2. Inflation rate (INFL) and expectations on firms' own prices (D_PREZ)



Source: Bank of Italy Survey on Inflation and Growth Expectations and Istat.

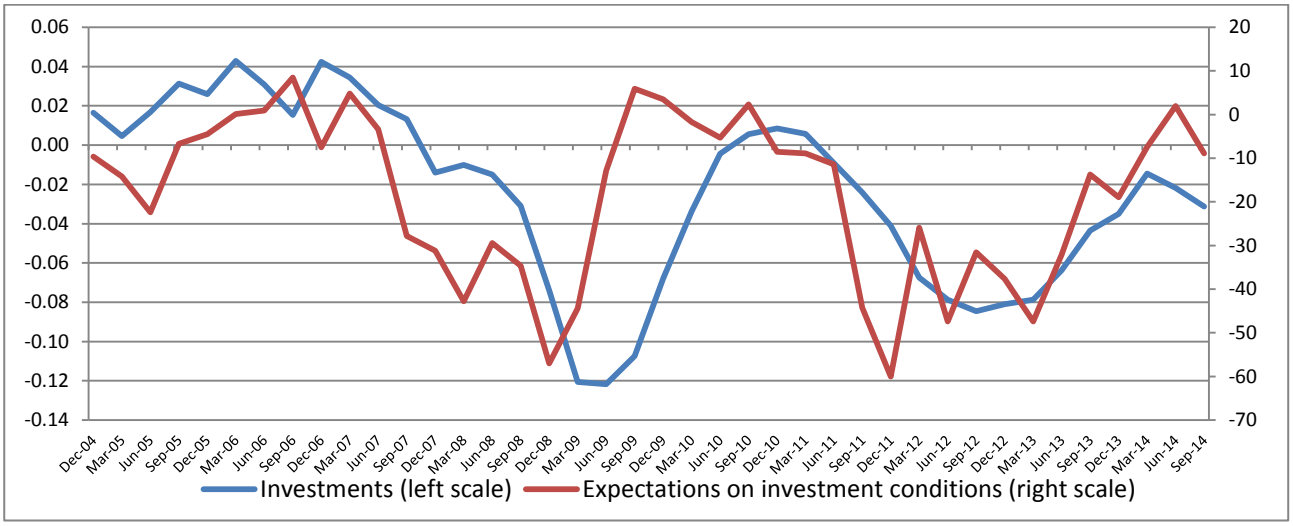
Figures 3 and 4 compare firms' current investment conditions (SIT_INV) and firms' expectations about their own employment over the next three months (OCC_TOT_EXP) with their reference national accounts series (namely, gross fixed investments growth and employment growth).

Figure 3. Employment (annual growth rate) (EMPL) and expectations on number of employees (balance) (OCC_TOT_EXP)



Source: Bank of Italy Survey on Inflation and Growth Expectations and Istat.

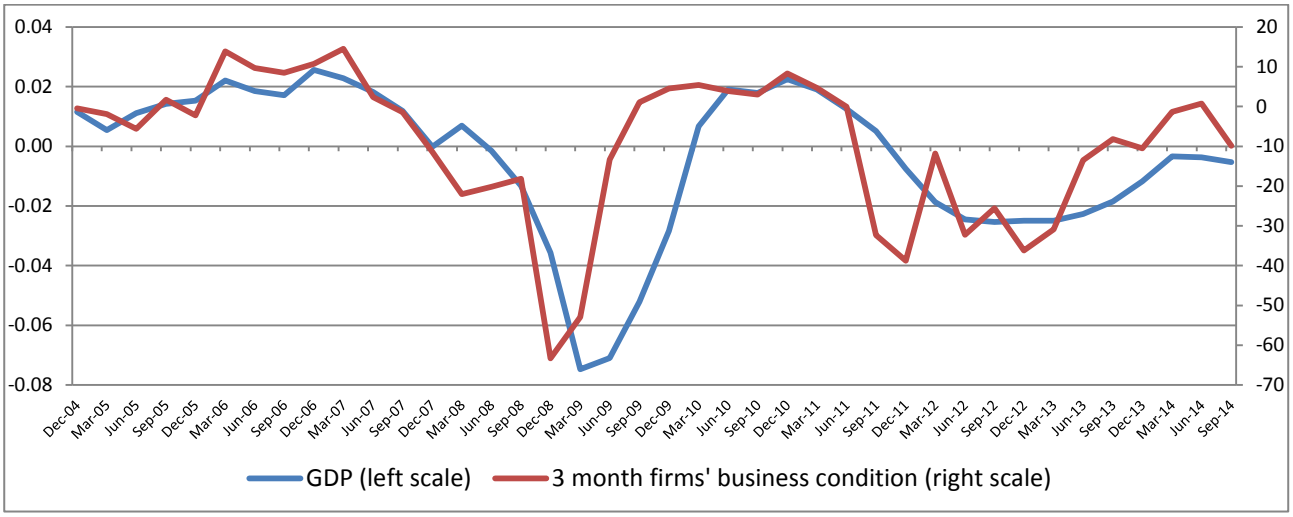
Figure 4. Investments (annual growth rate) (INV) and expectations on investment conditions (balance) (SIT_INV)



Source: Bank of Italy Survey on Inflation and Growth Expectations and Istat.

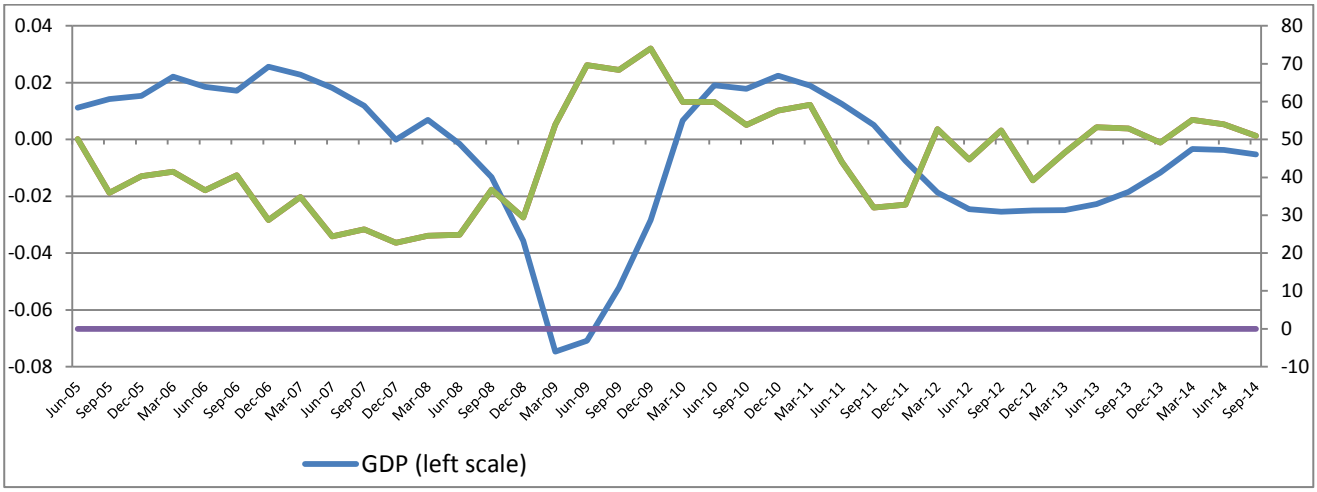
Looking at investment conditions, we note that the series, although more volatile with respect to investments, are able to depict the investments business cycle with a certain lead. The employment expectations are also able to describe the dynamics of employment for the whole sample.

Figure 5. GDP (annual growth rate) and 3 month firms' business condition expectations (balance) (SIT_IMP_3M)



Source: Bank of Italy Survey on Inflation and Growth Expectations and Istat.

Figure 6. GDP (annual growth rate) and 3 year firms' business condition expectations (balance) (SIT_IMP_3Y)



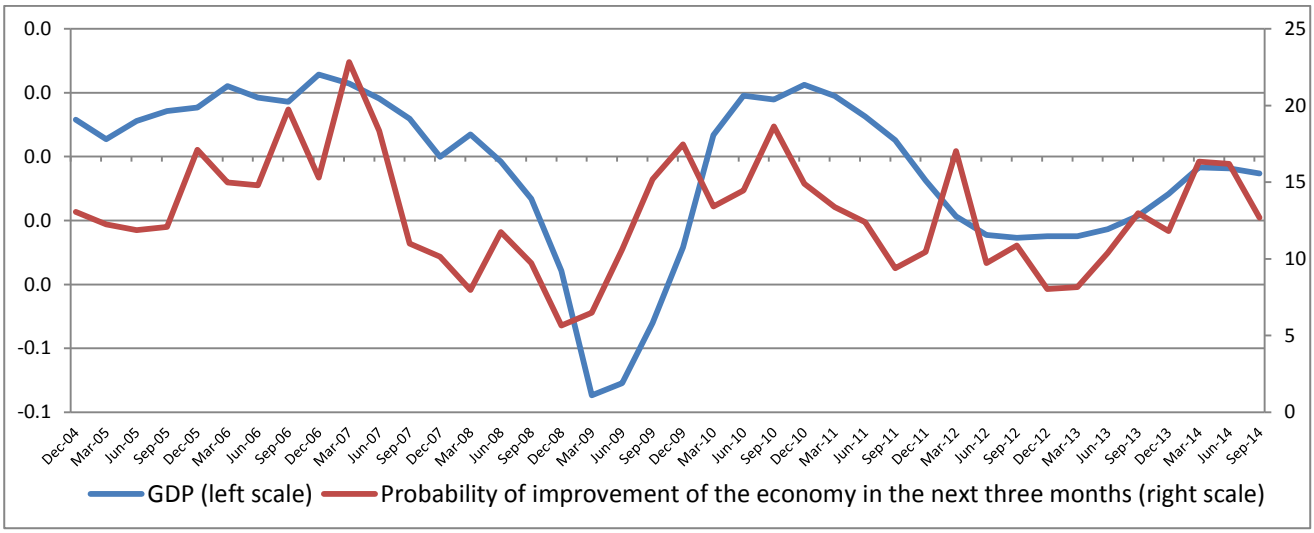
Source: Bank of Italy Survey on Inflation and Growth Expectations and Istat.

Figure 7. GDP ((annual growth rate) and expectations on Italy's general economic situation (balance) (SIT_GEN)

Source: Bank of Italy Survey on Inflation and Growth Expectations and Istat.

Figures 5, 6, 7 and 8 compare SIT_IMP_3M, SIT_IMP_3Y, SIT_GEN and PROMIG with the GDP annual growth rate. At first glance, it appears that all the indicators are able to predict the 2009 downturn in the business cycle as a result of the economic crisis at least two quarters in advance. The three-month expectations on the firms' business conditions (SIT_IMP_3M) seem to show higher volatility with respect to the GDP growth rate, while the three-year expectations (SIT_IMP_3Y) seems to show a greater leading behaviour as compared with SIT_IMP_3M.

Figure 8. GDP (annual growth rate) and Probability of improvement of the economy in the next three months (mean) (PROMIG)



Source: Bank of Italy Survey on Inflation and Growth Expectations and Istat.

Since business cycle analysis and measurement require low frequency removal from the data, we analyse the stationarity properties of the SIGE indicators. Although business survey data, constructed as balances[7], are expected to be stationary, in specific subsamples they might display local stochastic trends. In order to detect the presence of possible unit roots Table 1 reports the results of the Augmented Dickey Fuller (ADF), GLS and Phillips Perron (PP) tests. In the case of ADF the number of lags is chosen on the basis of the Schwartz information criterion, while PP does not requires lag structure investigation of the data as it is non parametric. Since the ADF and Phillips-Perron (PP) tests display low small-sample power[8], given a more powerful GLS test developed by Elliot, Rotemberg and Stock (1996) is also performed.

Table 1. Unit root tests of SIGE indicators. Period: 2004Q4-2014Q4

	ADF	*GLS*	*PHILLIPS PERRON*
INFL_EXP	-4.54***	-4.36***	-2.61*
D_PREZ	-3.41*	-3.30***	-3.37*
OCC_TOT_EXP	-2.98**	-3.03***	-1.70
SIT_INV	-2.43	-2.40**	-2.49
SIT_IMP_3M	-2.58	-2.54**	-2.58
SIT_IMP_3Y♦	-2.13	-2.13**	-2.09
SIT_GEN	-2.27*	-2.75***	-2.79*
PROMIG	-3.32***	-3.37***	-3.34**

Source: Bank of Italy Survey on Inflation and Growth Expectations.
Rejection of the Unit Root hypothesis at ***1 % level, ** 5% level, * 10% level.
♦available from 2005q2

[7] Given the existence of upper and lower bound values for survey indicators constructed as balances we expect bounded stationary behavior in the long run.

[8] The ADF and PP tests are asymptotically equivalent but may also give different results in finite samples due to the different ways in which they correct for serial correlation in the test regression.

Looking at the results reported in Table 1, we notice that the ADF, PP and GLS tests provide discordant conclusions for OCC_TOT_EXP, SIT_INV, SIT_IMP_3M and SIT_IMP_3Y. Inflation expectations (INFL_EXP) and firms' expectations on their future prices (D_PREZ) are found to be stationary in all cases, although at different significance levels. Overall, for some survey indicators the tests seems to indicate mixed evidence on the stationarity of the sample considered.

To further analyse the stylized facts of the SIGE indicators and to compare them with NA data, Table 2 reports the cyclical volatility of the NA series and the business survey volatility for the whole sample (1999-2014) and two different subsamples (1999-2007 and 2008-2014). The break point date (2008) should account for possible changes in the series volatility due to the economic and financial crisis.

Table 2. Volatility of NA and SIGE indicators

	1999-2014	***1999-2007***	***2008-2014***
	NA indicators		
INFL	0.805	0.346	1.183
Δ^4EMPL	0.013	0.006	0.009
Δ^4INV	0.047	0.023	0.038
Δ^4GDP	0.023	0.012	0.025
	Business Survey indicators		
INFL_EXP	0.64	0.236	0.928
D_PREZ	0.589	0.479	0.585
OCC_TOT_EXP	NA	NA	9.100
SIT_INV	NA	NA	20.125
SIT_IMP_3M	NA	NA	18.887
SIT_IMP_3Y	NA	NA	13.839
SIT_GEN	NA	NA	31.558
PROMIG	NA	NA	3.442

Source: Bank of Italy Survey on Inflation and Growth Expectations and Istat.

Looking at the results, we notice that, as expected, the volatility increases for all national accounts series starting from the 2007 crisis. For inflation in the seven-year sample following the crisis, volatility increases roughly three to four times as compared with the volatility in the first subsample. Analogous evidence can be found in the inflation expectation behaviour (INFL_EXP), while the indicator of firms' expectations on their future prices (D_PREZ) shows a quite stable variability in the two subsamples, thereby confirming the graphical analysis evidence. Inflation expectation displays a similar volatility pattern with respect to the inflation rate. GDP, investments and employment growth also show increased volatility in the second subsample. In the case of GDP, the volatility doubles, shifting from 0.012 to 0.025 in the 2007-2014 sample. Looking at investments, we notice that their relative volatility with respect to GDP increases after the 2007 crisis. For the remaining business survey indicators, it was not possible to compare the two

subsamples due to the shorter data availability period.

Overall the evidence from the four national accounts reference series seems to suggest that the Great Moderation hypothesis has been superseded. Such preliminary evidence also seems to indicate that the changes that occurred in the series after the crisis could be structural rather than due to transitory shocks. However such intuition should be investigated in further detail. [9]

To inspect the leading and lagging general properties of the SIGE indicators Table 3 reports the cross-correlations between each survey indicator and the reference NA series for all leads and lags from t-4 to t+4 over the period 2004-2014.

Table 3. Cross correlations between SIGE indicators and NA reference series. Period 2004-2014.

	Lag								
	K=-4	**K=-3**	**K=-2**	**K=-1**	**K=0**	**K=1**	**K=2**	**K=3**	**K=4**
Cross correlations WRT inflation									
INFL_EXP*	-0.24	0.09	0.44	0.71	0.91	0.74	0.45	0.15	-0.18
D_PREZ*	0.38	0.43	0.43	0.40	0.29	0.07	-0.14	-0.26	-0.35
Cross correlations WRT total employment growth									
OCC_TOT_EXP	0.56	0.72	0.83	0.84	0.76	0.64	0.50	0.34	0.20
Cross correlations WRT investments growth									
SIT_INV	0.58	0.69	0.72	0.65	0.48	0.26	0.03	-0.11	-0.19
Cross correlations WRT GDP									
SIT_IMP_3M**	0.32	0.60	0.77	0.78	0.50	0.11	-0.20	-0.43	-0.50
SIT_IMP_3Y***	0.83	0.80	0.56	0.21	-0.23	-0.46	-0.53	-0.50	-0.36
SIT_GEN**	0.53	0.66	0.74	0.71	0.51	0.26	0.00	-0.17	-0.24
PROMIG**	0.31	0.54	0.70	0.67	0.41	0.09	-0.22	-0.40	-0.42

Source: Bank of Italy Survey on Inflation and Growth Expectations and Istat.
* Series are available from 2000q1 **series are available from 2004q4 ***series are available from 2005q2

The results on inflation suggest that the contemporary correlation as compared with inflation expectations (INFL_EXP) is higher (0.91) than that compared with the firms' own prices survey indicator (D_PREZ, 0.29). Inflation expectations have no leading power[10] whereas expectations on firms' own prices are leading by two to three quarters. The expectations on employment over the next three months (OCC_TOT_EXP) are leading by one to two quarters with a very high correlation equal to 0.84. The investment business conditions (SIT_INV) indicators seems to be leading by two quarters (0.72) with respect to national accounts investments although firms are

[9] This evidence is in line with the findings of Keating and Valcarcel (2012). The authors show that, in several countries, the financial crisis has put an end to the Great Moderation. Clark (2009) concludes quite the opposite, arguing that the financial crisis would have caused a bad temporary shock as opposed to structural changes in the economy.

[10] On this result see also Tartaglia Polcini (2010).

asked about their situation over the last three months.

The cross correlations of the survey indicators with respect to GDP exhibit slightly different behaviour, namely:

- SIT_IMP_3M is pro-cyclical and leads the business cycle by one to two quarters, with a correlation of 0.78
- SIT_IMP_3Y is counter-cyclical and leads the business cycle by four quarters, with a correlation of 0.83.
- SIT_GEN is pro-cyclical and leads the business cycle by two quarters, with a correlation of 0.74.
- PROMIG is pro-cyclical and leads the business cycle by two quarters, with a cross correlation of 0.70.

4. Turning points analysis

Another important tool in assessing business cycle properties and the predictive content of survey indicators is the turning points inspection. In what follows, we evaluate the ability of the business survey data to detect early the turning points of the reference series (namely the points corresponding to an inversion of the pattern of the series) using the Harding-Pagan (2002) dating algorithm.

The procedure is a non-parametric method that detects the turning point of a series on the basis of rules concerning the characteristics of the identified local maximums and minimums of the series (i.e., requiring an alternation between peaks and troughs, a minimum distance between consecutive peaks and troughs, a minimum duration of an identified complete cycle). The algorithm can be considered an extension, for quarterly data, of the Bry-Boschan (1971) method originally used by the NBER on macroeconomic monthly series to date the US business cycle. Although in the beginning this method was thought to deal with a *'classical business cycle'* definition[11] *à la* Burns and Mitchell (1946) and thus consider the absolute levels of the series in the algorithm, in practice the current dating procedures take account of the so called *'growth cycle'* definition (Mintz, 1969). Growth cycles are based on deviations of the original series from its trend. In such setting the trend component of a series is extracted with the usual time series detrending methods (i.e. polynomial trend, statistical filters, moving averages, unobserved component models, etc.) in order to apply the dating procedure directly to the cyclical component. Clearly the final results of the dating procedure strongly depend both on the choice of the business cycle definition and on the

[11] The classical business cycle definition considers slowdowns and increases in the absolute levels of the economic activity.

detrending method used in the case of a growth cycle setting.[12] Another possibility for removing the long-run component from the data is to consider the quarterly growth rates of the reference series (*growth rate cycle*).[13] The result is comparable to what we obtain by filtering out the series, but there may be some differences in terms of phase shifts and turning points.

In dealing with national accounts data we use a *'growth cycle'* definition based on quarterly growth rates.[14] In this way we ensure a full comparison of the results with those obtained with forecasting models that we introduce in paragraph 5 of the paper in which we model yearly growth rates evolution of the series. By contrast, the turning points for the business survey indicators, given their cyclical pattern, have been directly identified at the indicator level.[15]

Table 4 Turning points of the NA series and SIGE business survey indicators. Period 2004-2014.

	P	***T***	***P***	***T***	***P***	***T***	***P***	***T***	***P***	***T***
INFL			2003Q2			2007Q3	2008Q3	2009Q3	2011Q4	
INFL_EXP			2003Q1	2004Q4	2005Q4	2007Q2	2008Q3	2009Q4	2011Q4	
D_PREZ	2000Q2	2003Q2			2007Q2	2008Q4			2011Q2	2013Q1
Δ^4**EMPL**	2000Q4	2005Q3	2006Q2	2009Q3	2011Q3	2013Q2				
OCC_TOT_EXP			2007Q2	2008Q4	2011Q1	2012Q4				
Δ^4**INV**		2001Q3	2002Q4	2003Q4	2006Q1	2009Q2	2010Q4	2012Q3		
SIT_INV				2005Q2	2006Q3	2008Q4	2009Q3	2011Q4	2014Q2	
Δ^4**GDP**		2002Q1	2006Q4	2009Q1	2010Q4	2012Q3				
SIT_IMP_3M			2007Q1	2008Q4	2010Q4	2011Q4	2014Q2			
SIT_IMP_3Y				2007Q4	2009Q4	2011Q3				
SIT_GEN			2007Q1	2008Q4	2009Q4	2011Q4	2014Q2			
PROMIG			2007Q1	2008Q4	2010Q3	2012Q4	2014Q1			

Source: Bank of Italy Survey on Inflation and Growth Expectations and Istat.

Looking at the results reported in Table 4, we notice that the timing of the inflation cyclical component peaks and troughs identified by the inflation expectations (INFL_EXP), is synchronous for the 2008Q3 downturn and for the 2011Q4 upturn. The D_PREZ indicator, by contrast, does not

[12] The choice of the detrending method for removing trend components from the data also implies some priors on the true business cycles length and therefore may introduce some distortions in the dating algorithm.

[13] Although the quarterly growth rates of a series are able to detect trend components in the data, they produce a cyclical component that contains the highest business cycle frequencies with respect to detrended series obtained with moving averages.

[14] The definition of growth rate cycle that we adopt is based on a simple quarterly growth rate and is different from that used by ECRI (usually invoked in the literature) in which the growth rate is normalized with the previous six months cumulative growth rate of the series.

[15] In a growth cycle perspective, a turning point occurs in a series when the deviation-from-trend series reached a local maximum (Peak) or a local minimum (Trough). Growth cycle peaks (end of expansion) occur when activity is furthest above its trend level. Growth cycle troughs (end of contraction/recession) occur when activity is furthest below its trend level.

appears to be very synchronized and seems to fails in detecting the 2007 Q3 inflation downturn with a lead. The employment expectations indicator (OCC_TOT_EXP) is able to detect the 2009 Q3 downturn and 2011 Q3 upturn with a lead, while the other turning points of employment are detected with a lag. The SIT_INV indicator signals the 2009Q2 trough with a lead of two quarters and the 2012Q3 trough with a lead of three quarters. Looking at GDP turning points we notice that the timing in signaling the 2009 Q1 recession is good for all the SIGE business cycle indicators. More in detail, SIT_GEN, PROMIG and SIT_IMP_3M detect a downturn in correspondence of 2008Q4 showing an ability to predict the minimum of the business cycle recession (2009Q1) one quarter in advance.

Table 5 Leading properties of SIGE indicators with respect to NA turning points

	Inflation									
	P	T	P	T	P	T	Number of extra cycles	Average lag		
	2003Q2	2007Q3	2008Q3	2009Q3	2011Q4			P	T	All
INFL_EXP	-1	-1	0	+1	0		+1	-0.3	0.0	-0.2
D_PREZ	-	-	-5	-3	-2		-1	-3.5	-3.0	-3.3
	Employment									
	P	T	P	T	P	T	Number of extra cycles	Average lag		
		2005Q3	2006Q2	2009Q3	2011Q3	2013Q2		P	T	All
OCC_TOT_EXP		-	-	-3	-2	-2	0	-2.0	-2.5	-2.3
	Investments									
	P	T	P	T	P	T	Number of extra cycles	Average lag		
	2006Q1	2009Q2	2010Q4	2012Q3				P	T	All
SIT_INV	+2	-2	-5	-3			0	-1.5	-2.5	-2
	GDP									
	P	T	P	T	P	T	Number of extra cycles	Average lag		
	2006Q4	2009Q1	2010Q4	2012Q3				P	T	All
SIT_IMP_3M	+1	-1	0	-3			0	0.5	-2.0	-0.8
SIT_IMP_3Y	-	-5	-4	-4			0	-4.0	-4.5	-4.3
SIT_GEN	+1	-1	-4	-3			0	-1.5	-2.0	-1.8
PROMIG	+1	-1	-1	+1			+1	0.0	0.0	0.0

Source: Bank of Italy Survey on Inflation and Growth Expectations and Istat.

Table 5 provides a complete analysis of the business survey turning points with respect to the reference series.[16] More in detail, the table shows for each indicator the number of leads/lags in quarters, the number of possible extra cycles with respect to the reference series as well as the average lead or lag on the whole sample analysed. The table documents six main results of interest:

[16] The turning points reported in the table are detected on the common sample.

- D_PREZ misses two turning points while INFL_EXP displays one extra cycle, compared to the inflation rate. The average lead of the two survey indicators equals 3.3 quarters for D_PREZ and only 0.2 quarters for INFL_EXP. These findings confirm that inflation expectations are rather staggered and are not able to capture (signal) early the inflation dynamics.
- Regarding employment, the corresponding survey variable (OCC_TOT_EXP) misses one cycle and the average lead is 2.3 quarters.
- Regarding investments, the corresponding survey variable misses no turning point and the average lead of its turning points is equal to 2 quarters.
- Concerning GDP, survey variables do not miss any turning points (except the first peak for SIT_IMP_3Y) and only PROMIG seems to display one extra cycle.
- The average lead for GDP upturns and downturns for the survey turning points (except from PROMIG) spans from 0.8 for SIT_IMP_3M to 4.3 quarters for SIT_IMP_3Y showing a substantial ability of the indicators to detect changes in the status of economic activity (expansions/recessions) early.

Overall the analysis shows that the survey indicators are more effective in detecting the beginning of a recession rather than that of an expansion.[17] This can be due to the fact that from a psychological point of view, economic operators could be more willing to signal a negative economic evolution that can be perceived as dangerous for them and the entire collectivity while they use more caution in signaling an economic recovery situation (‘*glass-half empty’ behaviour*).

In order to further describe the business cycle characteristics of the SIGE indicators, in Table 6 we report their average duration in quarters compared to the NA reference series. The results show that the average length of the contractionary phases is higher than that of the expansionary phases for almost all the survey indicators except for D_PREZ, OCC_TOT_EXP and SIT_IMP_3M.

Concerning the NA reference series, we find that in the sample analysed (2004-2014) expansions last shorter than recession periods, especially for inflation and employment data. This finding is in contrast with empirical evidence reported in the literature for industrialized countries derived from NBER and CEPR business cycle chronology, based on a classical business cycle for which recessions are considered rare episodes interposing expansions. However, in interpreting such results, we have to take into account that the period considered in the analysis is relatively short and includes two severe recession episodes (2009 and 2012).

Table 6 Average duration of SIGE and NA business cycle. Period: 2004q4-2014q3

	P-T	*T-P*	*P-P*	*T-T*
INFL	10.5	6.5	17.0	8.0
INFL_EXP	6.0	5.7	11.7	10.0
D_PREZ	8.3	13.0	22.0	19.5
Δ^4**EMPL**	13.0	5.5	21.5	15.5
OCC_TOT_EXP	6.5	9.0	15.0	16.0
Δ^4**INV**	9.3	9.2	19.5	17.0
SIT_INV	9.0	5.7	15.5	13.0
Δ^4**GDP**	9.1	7.4	17.5	15.0
SIT_IMP_3M	5.5	9.0	14.5	12.0
SIT_IMP_3Y	7.0	8.0	19.0	15.0
SITGEN	7.5	7.0	14.5	12.0
PROMIG	7.3	7.5	16.8	13.5

Source: Bank of Italy Survey on Inflation and Growth Expectations and Istat.

To gain further insights into the co-movements among series, we also measure the degree of concordance between SIGE indicators and NA reference cycles using the concordance indicator. The index measures the proportion of time that two series, x_t and y_t, are in the same phase (business cycle synchronization):

$$CI = T^{-1}\left[\sum_{t=1}^{T} S_{xt}S_{yt} + \sum_{t=1}^{T} (1 - S_{xt})(1 - S_{yt})\right]$$

where T is the number of observations, S_{xt} is a binary variable that takes value 1 if the series x is in expansion and 0 otherwise. *CI=1* indicates that the two cycle are in the same phase 100% of the times. The results for sample 2004-2014 are reported in Table 7.

Table 7 Concordance index

	INFL		Δ^4**EMPL**	Δ^4**INV**	Δ^4**GDP**			
lag	*INFL_EXP*	*D_PREZ*	*OCC_TOT*	*SIT_INV*	*SIT_IMP_3M*	*SIT_IMP_3Y*	*SIT_GEN*	*PROMIG*
0	0.88	0.28	0.63	0.60	0.85	0.47	0.75	0.85
1	0.86	0.34	0.69	0.67	0.87	0.57	0.82	0.87
2	0.78	0.43	0.76	0.71	0.82	0.67	0.82	0.79
3	0.68	0.49	0.73	0.70	0.76	0.77	0.81	0.68
4	0.59	0.52	0.64	0.69	0.64	0.88	0.75	0.56

Source: Bank of Italy Survey on Inflation and Growth Expectations and Istat.

[17] Costa and Iezzi (2013) find proof that short-term firms' expectations from survey data are generally pessimistic, while three years firms' expectations are more optimistic. This result supports, to a certain extent, the evidence that the beginnings of recessions are

The results show a high level of concordance for almost all the series. In particular, we find that short term business survey indicators (SIT_GEN, PROMIG and SIT_IMP_3M) are highly synchronized with GDP expansions/recessions at 1-2 quarter lag, while three year firms' business condition expectations (SIT_IMP_3Y) is highly synchronized at 4 quarter lag. Moreover, employment and investment survey indicators are synchronized at 2 quarter lag with their corresponding reference NA series. Regarding the consumer price index, inflation expectation is found to be highly contemporaneously synchronized with inflation, while firms' own prices are insignificantly synchronized with the reference series especially for short time lags.

5. Forecasting Models

A final purpose of the paper is to see how and whether SIGE business survey signals can help in predicting the NA series dynamics by placing them into structural models. To obtain a reliable quantitative forecast evaluation of business surveys, it is important to know not only their ability to improve the forecast of the variable pattern at a given horizon, but also their ability to predict the probability that a turning point will occur at a certain date in the future. Indeed, from a policy-making perspective, is equally as important as to know when an expansion/recession begins as it is to understand the precise magnitude of such a change. In order to address this issue and fully assess the predictive content survey variables, we therefore adopt a double strategy. First, we assess the forecast ability of SIGE indicators to predict expansion and recessions through Binary Autoregressive Models (**Discrete approach)**. Second, we assess the ability of SIGE indicators to improve the prediction of NA series dynamics through univariate dynamic models **(Continuous approach).**

The forecasting exercise is based on the following steps. An autoregressive benchmark model is estimated for each NA series and is compared with an augmented model, which also includes survey data selected on the basis of in-sample fitting and out-of-sample forecasting performance. The models are estimated on the fixed sample 2004 Q4-2011 Q1. Finally, forecast performance is evaluated from 1 to 4 step ahead forecasts (for example: for Step 1 the out of sample is 2012 Q2-2014 Q2. The models are then compared in terms of relative RM(F)SE at any step.

5.1 Binary approach

With the discrete approach, the various SIGE survey variables are examined as predictors of the probability of expansion/recession through a binary autoregressive model.[18] In binary time

more easily detected by business survey indicators.

[18] The binary autoregressive models have been found very useful in modelling the US or German business cycle expansion periods, (see Chauvet and Potter, 2005; Dueker, 2005; Kauppi and Saikkonen, 2008).

series analysis, the dependent variable y_t, *t=1,2,…,T*, is a realization of a stochastic process that only takes on values one and zero.[19] In expansion forecasting, the value of an observable binary expansion indicator will depend on the state of the economy in the following way:

$$y_t = \begin{cases} 1, & if\ the\ economy\ is\ in\ an\ expansionary\ state\ at\ time\ t \\ 0, & if\ the\ economy\ is\ in\ a\ recessionary\ state\ at\ time\ t \end{cases}$$

Let $E_{t-1}(\ \ )$ and $P_{t-1}(\ \ )$ denote the conditional expectation and conditional probability given the information set Ω_{t-1}, respectively. In the logit model, the conditional probability that y_t takes the value one can be written as:

$$p_t = E_{t-1}(y_t) = P_{t-1}(y_t = 1) = F(\pi_t)$$

where π_t is a linear function of variables included in the information set Ω_{t-1} and $F(\ \ )$ is the logistic cumulative distribution function. The dynamic binary autoregressive model of order *p* implies that:

$$\pi_t = \alpha_0 + \alpha_1 y_{t-1} + \cdots + \alpha_p y_{t-p} + \boldsymbol{x}_{t-k}\boldsymbol{\beta}$$

where $\boldsymbol{x}_{t-k}$ are the SIGE business survey binary indicators representing the expansion/recession periods.

5.2 Continuous approach

Since our goal is to forecast changes in economic fluctuations, we use a baseline model in which we consider the lagged values of the dependent variable together with the survey indicators. The survey indicator, being qualitative (so called soft data) is usually included in the models together with past values of the dependent variable. The general specification of each single dynamic equation model is:

$$\Delta^4 y_t = \alpha + \beta \Delta^4 y_{t-h} + \gamma x_{t-k} + \delta D_{Y,m} + \varepsilon_t$$

where y_t is the log of the reference national account series, $\Delta^4 = 1 - L^4$ is the quarterly growth rate, x_t is the SIGE business survey indicator and $D_{Y,m}$ is a dummy variable.

6. Empirical results from forecast exercises

In this section we report the forecasting exercises for inflation, employment, investments and GDP using binary and continuous models. For inflation, we consider INFL_EXP and D_PREZ. For GDP, we consider four single equation models that separately evaluate the predictive content of

[19] In other words, conditional on the information set Ω_{t-1}, y_t has a Bernoulli distribution: $y_t|\Omega_{t-1} \sim B(p_t)$.

SIT_IMP_3M, SIT_IMP_3Y, SIT_GEN and PROMIG. For each equation, we generate recursively from one- to four-steps ahead, out-of-sample value static forecasts[20] and we compare the results with those obtained with the corresponding benchmark autoregressive models. To estimate our forecasting models, we use the period 2005 Q2-2011 Q1 as the estimation sample and 2011 Q2-2014 Q4 to analyse the out-of-sample forecasting properties of the series. In the out-of-sample exercise, we use recursive schemes. The econometric specifications are selected using a general-to-specific approach. Forecasting exercise results for binary models (BARIMA) are reported in Table 8a to Table 8d.

Table 8a. Forecasting model estimates and RMS(F)E for Inflation (INFL) – BARIMA model

	Model 0 Benchmark	**Model 1 INFL_EXP**	**Model 2 D_PREZ**
	Parameters estimates		
Intercept	-2.3514**	-3.0840**	-19.7224**
INFL t-1	4.4716**	3.5147**	21.1887**
INFL_EXP t-1		1.9445*	
D_PREZ t-1			-20.6021**
D_PREZ t-2			37.5519**
	Diagnostics		
AIC	36.6582	35.8240	29.0489
BIC	40.5218	41.6194	34.7850
	Forecasts - RMSE		
1-step dynamic forecast	0.0058	0.0015	0.0015
Relative RMSE wrt Model 0		**0.2581**	**0.2535**

Source: Bank of Italy Survey on Inflation and Growth Expectations and Istat.
All variables are binary variables indicating 1 for expansion and 0 per recession.
The unknown coefficients are estimated by the method of maximum likelihood through the Newton-Raphson iteration.
Estimation sample: 1999 Q4-2011 Q1. Forecasting sample: 2011 Q2-2014 Q4.
*: significant at 10 per cent; **: significant at 5 per cent.

Table 8b. Forecasting model estimates and RMS(F)E for Employment (EMPL) – BARIMA model

	Model 0 Benchmark	**Model 1 OCC_TOT_EXP**
	Parameters estimates	
Intercept	-2.8034**	-4.1308**
EMPLt-1	4.2697**	3.8442**
OCC_TOT_EXPt-1		2.5372*
	Diagnostics	
AIC	34.7748	25.8483
BIC	38.6384	30.1503
	Forecasts - RMSE	
1-step dynamic forecast	0.1282	0.0962
Relative RMSE wrt Model 0		**0.7499**

Source: Bank of Italy Survey on Inflation and Growth Expectations and Istat.
All variables are binary variables indicating 1 for expansion and 0 per recession.
The unknown coefficients are estimated by the method of maximum likelihood through the Newton-Raphson iteration.
Estimation sample: 1999 Q4-2011 Q1. Forecasting sample: 2011 Q2-2014 Q4.
*: significant at 10 per cent; **: significant at 5 per cent.

[20] More specifically, the forecast of the first observation in the 1997 Q3 period was obtained with parameter estimates using data up to 1997 Q2. Subsequent forecasts were calculated by re-estimating each model with the new data point and then forecasting the next observation.

Table 8c. Forecasting model estimates and RMS(F)E for Investments (INV) – BARIMA model

	Model 0 Benchmark	Model 1 SIT_INV
	Parameters estimates	
Intercept	-1.6740**	-19.4366**
INVt-1	20.2047**	75.2815**
INVt-4	-17.5499**	-54.4585**
SIT_INVt-2		19.4363**
SIT_INVt-3		-37.913**
	Diagnostics	
AIC	35.4651	17.7766
BIC	41.0787	24.6131
	Forecasts - RMSE	
1-step dynamic forecast	0.1182	0.1329
Relative RMSE wrt Model 0		**1.1248**

Source: Bank of Italy Survey on Inflation and Growth Expectations and Istat.
All variables are binary variables indicating 1 for expansion and 0 per recession.
The unknown coefficients are estimated by the method of maximum likelihood through the Newton-Raphson iteration.
Estimation sample: 1999 Q4-2011 Q1. Forecasting sample: 2011 Q2-2014 Q4.
*: significant at 10 per cent; **: significant at 5 per cent.

Table 8d. Forecasting model estimates and RMS(F)E for GDP – BARIMA model

	Model 0 Benchmark	Model 1 SIT_IMP_3M	Model 2 SIT_IMP_3Y	Model 3 SIT_GEN	Model 4 PROMIG
		Parameters estimates			
Intercept	-2.4423**	-18.6372**	-18.4317**	-3.5861**	-19.0548**
GDP t-1	4.9272**	19.1225**	18.8372**	4.32091**	2.6388
SIT_IMP_3M t-1		17.9441**			
SIT_IMP_3M t-4		-16.9253**			
SIT_IMP_3Y t-4			18.4317**		
SIT_GEN t-1				2.04145	
PROMIG t-1					19.0548**
		Diagnostics			
AIC	32.0403	20.2501	15.5027	22.8440	16.1205
BIC	35.9040	24.2468	19.2770	27.1459	20.4224
		Forecasts – RMSE			
1-step dynamic forecast	0.1100	0.0746	0.0313	0.0864	0.2230
Relative RMSE wrt Model 0		0.6782	0.2845	0.7855	2.0273

Source: Bank of Italy Survey on Inflation and Growth Expectations and Istat.
All variables are binary variables indicating 1 for expansion and 0 per recession.
The unknown coefficients are estimated by the method of maximum likelihood through the Newton-Raphson iteration.
Estimation sample: 1999 Q4-2011 Q1. Forecasting sample: 2011 Q2-2014 Q4.
*: significant at 10 per cent; **: significant at 5 per cent.

The results show that when predicting inflation rate expansion/recessions, the best forecasting model, in terms of in-sample fitting, is the one that includes inflation expectations lagging by one quarter, or firm's own price expectation variation with one and two quarter lags. The two models seem to be equivalent to each other and better than the benchmark in terms of out-of-sample RMSE. Regarding employment, the forecasting model that includes the survey binary indicator lagging by one quarter is slightly superior to the benchmark model. The binary model for investments does not seem to offer an improvement in terms of forecasting content with respect to the benchmark. Finally, regarding the forecasting model for GDP we find that, with the exception of the PROMIG indicator, the other three survey binary indicators are able to add a forecasting content to the GDP autoregressive benchmark model.

Tables 9-a, b, c, and d report the forecast evaluation exercise from the continuous dynamic models for inflation, employment, investments and GDP growth from 1 to 4 steps ahead. The forecasting exercise is carried out using recursive schemes with a forecast window of 12 quarters.

Table 9a. Forecasting model estimates and RMS(F)E for Inflation (INFL)

	Model 0 Benchmark	**Model 1 INFL_EXP**	**Model 2 D_PREZ**
	Parameters estimates		
Intercept	1.0911**	0.7869**	0.8264***
INFL t-1	0.7695**	0.5166**	0.6885***
INFL t-2			0.2493
INFL t-3			-0.4507***
INFL t-4	-0.3105**		
INFL_EXP t-1		0.5232**	
INFL_EXP t-3		-0.4336**	
D_PREZ t-4			1.1139
2008Q1	0.5750*		
2008Q3			0.6795***
2009Q1	-0.9373**	-0.8332**	-0.9330***
	Diagnostics		
R^2	0.7598	0.7578	0.7578
Normality test	2.2104	1.3603	1.4751
Heteroschedasticity test	1.8099	1.1824	1.9622
AR test	2.0965	2.0967	0.9093
	Forecasts - RMSE		
1-step dynamic forecast	1.1519	0.73135	1.1406
2-step dynamic forecast	1.2116	0.70613	1.1322
3-step dynamic forecast	1.4068	0.85594	1.2613
4-step dynamic forecast	1.3173	0.75738	1.1368
	Test of equal accuracy WRT Model 0		
	H0: Forecast accuracy is equal		
1-step dynamic forecast		4.651**	0.174
2-step dynamic forecast		3.483**	0.990
3-step dynamic forecast		4.841**	1.485
4-step dynamic forecast		2.667**	1.437

Source: Bank of Italy Survey on Inflation and Growth Expectations and Istat.
The dependent variable (NA series) is expressed in yearly variations.
Estimation sample: 1999 Q4-2011 Q1. Forecasting sample: 2011 Q2-2014 Q4.
*: significant at 10 per cent; **: significant at 5 per cent.

Table 9b. Forecasting model estimates and RMS(F)E for Employment (EMPL)

	Model 0 Benchmark	Model 1 OCC_TOT_EXP
Parameters estimates		
Intercept	-0.0003	0.0025 **
Δ^4EMPLt-1	-0.2919**	0.8987***
Δ^4EMPLt-2		-0.3016**
Δ^4EMPLt-3	-0.3105**	
OCC_TOT_EXPt-1		0.00035**
2006Q1	0.0120**	
Diagnostics		
R^2	0.8722	0.9240
Normality test	0.7140	0.8557
Heteroschedasticity test	0.5836	2.5558
AR test	0.6682	0.6682
Forecasts - RMSE		
1-step dynamic forecast	0.0098	0.0056
2-step dynamic forecast	0.0100	0.0058
3-step dynamic forecast	0.0098	0.0057
4-step dynamic forecast	0.0090	0.0058
Test of equal accuracy WRT Model 0		
H0: Forecast accuracy is equal		
1-step dynamic forecast		3.582**
2-step dynamic forecast		8.230**
3-step dynamic forecast		6.057**
4-step dynamic forecast		3.101**

Source: Bank of Italy Survey on Inflation and Growth Expectations and Istat.
The dependent variable (NA series) is expressed in yearly variations.
Estimation sample: 1999Q4-2011Q1. Forecasting sample: 2011Q2-2014Q4.
*: significant at 10 per cent; **: significant at 5 per cent.

Table 9c. Forecasting model estimates and RMS(F)E for Investments (INV)

	Model 0 Benchmark	Model 1 SIT_INV
Parameters estimates		
Intercept	-0.0016	0.0125**
Δ^4INVt-1	1.3914**	0.6573**
Δ^4INVt-4	-0.5400**	
SIT_INVt-1		0.0010**
SIT_INVt-4		0.0002
Diagnostics		
R^2	0.8689	0.9321
Normality test	0.2937	0.7780
Heteroschedasticity test	0.8740	0.1571
AR test	0.0584	2.0311
Forecasts - RMSE		
1-step dynamic forecast	0.0619	0.03619
2-step dynamic forecast	0.0569	0.03605
3-step dynamic forecast	0.0526	0.03543
4-step dynamic forecast	0.0433	0.03548
Test of equal accuracy wrt Model 0		
Test of equal accuracy WRT Model 0		
H0: Forecast accuracy is equal		
1-step dynamic forecast		2.861**
2-step dynamic forecast		1.914*
3-step dynamic forecast		1.495
4-step dynamic forecast		1.021

Source: Bank of Italy Survey on Inflation and Growth Expectations and Istat.
The dependent variable (NA series) is expressed in yearly variations.
Estimation sample: 1999 Q4-2011 Q1. Forecasting sample: 2011 Q2-2014 Q4.
*: significant at 10 per cent; **: significant at 5 per cent.

Table 9d. Forecasting model estimates and RMS(F)E for GDP

	Model 0 Benchmark	Model 1 SIT_IMP_3M	Model 2 SIT_IMP_3Y	Model 3 SIT_GEN	Model 4 PROMIG
		Parameters estimates			
Intercept	0.0002	0.0056**	-0.0208**	0.0037*	-0.0252*
Δ^4GDP t-1	1.4492**	0.5815***	0.8359**	1.0649**	1.1883**
Δ^4GDP t-2		-0.3103**		-0.3742**	-0.5138**
Δ^4GDP t-3					
Δ^4GDP t-4	-0.6526**				
SIT_IMP_3M t-1		0.00073***			
SIT_IMP_3M t-3		0.00046**			
SIT_IMP_3Y t-2			0.00052**		
SIT_GEN t-1				0.0001**	
PROMIG t-1					0.0019**
PROMIG t-2					-0.0002
2009Q1			-0.0439**	-0.0329**	
		Diagnostics			
R^2	0.8654	0.9496	0.9452	0.9462	0.9147
Normality test	5.6501	1.0641	3.2195	3.6830	5.8509
Heteroschedasticity test	5.2860**	0.45612	3.9260*	4.5484**	3.3256*
AR test	0.0053	0.35716	0.7690	0.2475	0.5139
		Forecasts – RMSE			
1-step dynamic forecast	0.0187	0.0097	0.0384	0.0117	0.0111
2-step dynamic forecast	0.0185	0.0098	0.0348	0.0110	0.0108
3-step dynamic forecast	0.0170	0.0085	0.0289	0.0100	0.0114
4-step dynamic forecast	0.0143	0.0077	0.0247	0.0095	0.0123
		Test of equal accuracy WRT Model 0			
		H0: Forecast accuracy is equal			
1-step dynamic forecast		3.974**	-11.03**	4.598**	2.930**
2-step dynamic forecast		2.398**	-25.00**	5.031**	2.453**
3-step dynamic forecast		1.812*	-45.54**	4.035**	1.931*
4-step dynamic forecast		1.812*	-4.524**	6.347**	1.737*

Source: Bank of Italy Survey on Inflation and Growth Expectations and Istat.
The dependent variable (NA series) is expressed in yearly variations.
Estimation sample: 1999 Q4-2011 Q1. Forecasting sample: 2011 Q2-2014 Q4.
*: significant at 10 per cent; **: significant at 5 per cent.

Results show that, as expected, all the indicators (except for SIT_IMP_3Y) are able to improve the forecast performance of GDP with respect to its benchmark. SIT_GEN and PROMIG are found to be significant in one lag confirming the results found from the cross correlation analysis. SIT_IMP_3M and SiT_IMP_3Yenters in 2/3 lags. For all the indicators except for PROMIG the RMS(F)E decreases when the h steps ahead forecast raise.

The results of the inflation expectation model show that inflation expectation is significant at 1, 3 lag and improves the forecast errors with respect to the benchmark for inflation. The firms' own prices indicator (DPREZ) is significant at 1 lag and seem to show a forecasting power especially one step ahead. The employment expectations model is found to improve the RMS(F)E for all time horizons, as does the investment expectation model.[21]

[21] Concerning investments survey data predictive content Osterholm (2013) finds that survey data on investment goods industry can improve the forecasts of business investment growth.

To assess whether the differences between the forecast errors from the benchmark are significantly different statistically from the dynamic models, we also report in the tables the Diebold-Mariano (DM) test for forecast accuracy. The null hypothesis is that the models show the same forecast accuracy.

The results show that in almost all cases the forecast accuracy is significantly better than the benchmarks. In interpreting this result, we must take into account that, compared with other tests, the DM test has been found to be very conservative in shorter *h* steps. Overall, we find that the national accounts forecasts can be improved by introducing SIGE business survey data into the dynamic structural models.

Main findings

In the paper we provided a complete characterization of the predictive content of the SIGE indicators, providing information on all their relevant cyclical features. More in detail:

- Cross correlations show that almost all indicators (with the exception of inflation expectations) are leading from one to four quarters with respect to their reference NA series.
- Turning point analysis confirms the leading properties of the survey indicators. More in detail:
  - The three-month firms' business condition expectations indicator is able to predict troughs with an average lead of two quarters, but it seems to lag with respect to peaks.
  - Overall, SIGE data seem to lead better the troughs than the peaks. The average lead on troughs is higher than that of peaks, for almost series with the exception of firms' own prices expectations (D_PREZ).
- Almost all business survey indicators (with the exclusion of D_PREZ) display an high coherence with NA series. In particular:
  - For the general economic situation (SIT_GEN), the concordance index is always higher than 0.75 at all lags.
  - SIT_IMP_3M and PROMIG are highly synchronized with GDP at one- to two-quarter lags.
  - The three-year firms' business condition expectations indicator is highly synchronized at a four-quarter lag.
  - Employment and investment survey data are synchronized with their respect NA reference series at two quarter lag.
  - The inflation expectation indicator (INFL_EXP) is highly contemporaneously synchronized with inflation, while firms' own prices expectations are insignificantly

synchronized.

- The binary approach to forecast modelling shows that:
  - All the models that include survey binary variables provide better predictions of the GDP expansion/recession phases than the benchmark (except for PROMIG).
  - The two forecasting models for the inflation expansion/recession phases, including survey data on inflation expectations and own prices have good predictive power.
  - The model for employment shows a limited predictive power, while the investment model shows no improvement with respect to the benchmark.
- The forecasting models that use business surveys in levels show that:
  - At any horizon the augmented models used to forecast GDP (except for SIT_IMP_3Y) have significant predictive power.
  - The inflation expectations indicator significantly improves the predictive content of the model at any horizon, while the firms' own price indicator does not.
  - Both employment and investment condition indicators show a strong ability to improve the forecast accuracy with respect to the benchmark.

7. Conclusions

The literature provides mixed evidence on the predictive power of business survey data. In this paper we explore this issue considering all the relevant information available in the Italian Survey on Inflation and Growth Expectations (SIGE). More in detail, we explore the information content of short-term indicators, such as expectations on the number of employees in the next three months, firms' expectations on own prices and inflation, investments expectations and prospects on the general economic situation with respect to their reference series (namely employment, inflation, investments and economic activity as whole). These series, built as balances between positive and negative answers provided by economic agents are meant to capture firms' sentiment and represent an important tool for the economy assessment in the short run.

Overall the results indicate that SIGE business indicators are able to early detect turning points of their corresponding national account reference series. However, the average lead is higher for recessions than for expansions. The indicators are also able to improve the forecast accuracy of models used to predict both recession/expansion phases and the growth rate dynamics of NA series. These findings confirm the strength of tendency business survey indicators as tools to support policy decisions.

References

Abberger S. (2007) Qualitative business surveys and the assessment of employment – A case study for Germany *International Journal of Forecasting 23,* 249-258.

Banca d'Italia (2013) Survey on Inflation and Growth Expectations, Supplements to the Statistical Bulletin, XXIII, no. 50, October.

Bergstrom R. (1995) The relationship between manufacturing production and different business survey series in Sweden 1968-1992. *International Journal of Forecasting, 11,* 379-393.

Bruno G. and C. Lupi (2004) Forecasting industrial production and the early detection of turning points, *Empirical Economics*, Springer, vol. 29(3), 647-671, 09.

Bry G. and C. Boschan (1971) Cyclical analysis of Time Series: Selected procedures and Computer Programs, NBER Technical paper no. 20.

Cesaroni T. (2011) The cyclical behaviour of business survey data *Empirical Economics 41 (3),* 747-768.

Cesaroni T., L. Maccini and M. Malgarini (2011) Business cycle stylized facts and inventories behavior: new evidence for the euro area, in *International Journal of Production Economics* vol. 133 n. 1 September, 12-24.

Chauvet M. and S. Potter (2005) Forecasting recession using the yield curve. *Journal of Forecasting* 24, 77-103.

Clark, T. E. (2009) Is the Great Moderation over? An empirical analysis. Economic Review Federal Reserve Bank of Kansas City, Q IV, 5-42.

Claveria Pons Ramos (2007) Business and Consumer expectations and Macroeconomic forecasts *International Journal of Forecasting vol. 23,* 47-69.

Costa M. and S. Iezzi (2013) On the consistency expectations of firms' business conditions in the Bank of Italy's tendency survey.

Dueker M.J. (2005) Dynamic Forecasts of qualitative variables: a qual VAR model of U.S. recessions. *Journal of Business and Economic Statistics* 23, 96-104.

Harding D. and A. Pagan (2002) Dissecting the cycle: A methodological investigation *Journal of Monetary Economics* 49 (2), 365-381.

Kauppi H. and P. Saikkonen (2008) Predicting U.S. recessions with dynamic binary response models. *Review of Economics and Statistics* 90, 777-791.

Keating and Valcarcel (2012) What's so Great about the Great Moderation? A Multi-Country Investigation of Time-Varying Volatilities of Output Growth and Inflation. Working Paper Series in Theoretical and Applied Economics 201204, University of Kansas, Department of Economics.

Lemmens A. Croux C. and M. Dekimpe (2005) On the predictive content of production surveys: A pan- European Study *International Journal of Forecasting, 21,* 363-375.

Tartaglia Polcini R. (2010) Inflation forecasts from the Bank of Italy-Sole 24 Ore survey of expectations of inflation and growth, in: Proceedings of the IFC Conference on "Initiatives to address data gaps revealed by the financial crisis", Basel, 25-26 August 2010.

Appendix – Data description

Survey data :

- **INFL_EXP**: Inflation expectations
  "In October consumer price inflation, measured by the 12-month change in the Harmonized Index of Consumer Prices, was 0.0 per cent in Italy and 0.4 per cent in the Euro Area. What do you think it will be in Italy in March 2015?"
- **D_PREZ**: Expectations on firms' own selling prices
  "For the next 12 months, what do you expect will be the average change in your firm's prices?"
- **OCC_TOT_EXP**: Expectations on number of employees
  "Your firm's total number of employees in the next three months will be Lower, Unchanged or Higher?"
- **SIT_INV**: Expectations on investment conditions
  "Compared with three months ago, do you think conditions for investment are Better, The same, Worse?"
- **SIT_IMP_3M**: Three-month firms' business condition expectations
  "How do you think business conditions for your company will be in the next three months? Much better, Better, The same, Worse, Much worse"
- **SIT_IMP_3Y**: Three-year firm business condition expectations
  "How do you think business conditions for your company will be in the next three years? Much better, Better, The same, Worse, Much worse"
- **SIT_GEN**: Expectations on Italy's general economic situation
  "Compared with three months ago, do you consider Italy's general economic situation Better, The same, Worse?"
- **PROMIG**: Probability of improvement of the economy in the next three months
  "What do you think is the probability of an improvement in Italy's general economic situation in the next three months? Zero, 1-25 per cent, 26-50 per cent, 51-75 per cent, 76-99 per cent, 100 per cent"

National accounts data:

- **HICP**: Harmonized index of consumer prices
- **EMPL**: Number of total employed population, adjusted for seasonality, total economy
- **INV**: Gross fixed investments, adjusted for seasonality, total economy
- **GDP**: Gross domestic product, adjusted for seasonality, total economy

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