How do companies form their opinions on their business prospects?

An analysis of expectation errors in business tendency surveys

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Business tendency surveys question a panel of companies about short-term changes in economic measurements such as output, employment and selling price. Companies express a qualitative opinion on expected changes ("over the next three months") in these factors, and on past changes ("over the last three months"). These responses provide a unique window of observation onto their expectation behaviour. By monitoring companies over time it is possible to analyse their short-term forecasts and identify any errors or surprises, when evolutions differ from their expectations.

These expectation errors do not happen by chance. They depend first of all on the economic variables being considered: businesses make fewer expectation errors over their selling prices and their workforce than over demand for their products or even their own output. In addition, errors have a seasonal component, which may be more or less significant depending on the nature of the economic variable. Businesses are therefore more often surprised during the April surveys when they contradict the expectations they expressed three months earlier more often than they do in the other quarters of the year. And finally, these errors appear to be procyclical: businesses are more often surprised by an increase during phases of recovery, and are more often surprised by a decrease during recessions. From one quarter to the next, expectation errors are therefore correlated with changes in activity the following quarter.

The observation of companies' expectation errors raises question about the process by which these expectations are formed. Responses to questions on expected changes in orders in industry, and turnover in services are modelled to reveal that these expectations display a certain inertia. Companies tend to expect the same changes that they have just observed in the recent past, either with an increase or a decrease. However, they take into account the global economic environment and their own mistakes, correcting their expectations when they have been surprised by an increase or a decrease. Thus they use the information available to them to shape their expectations, which appears to be compatible with the rational expectations hypothesis. When this hypothesis is formally tested, it is rarely rejected in the services sector. However, it is more difficult to test in industry, a sector where common short-term shocks at macroeconomic level can take companies by surprise. Forecasting economic turning points thus appears all the more difficult as they are not always anticipated by the companies themselves. ■

Expectation errors in the business tendency survey: additional information to balances of opinion

The business tendency surveys question business leaders on their recent activity and their short-term prospects

INSEE carries out business tendency surveys on companies in industry and the construction, trade and services sectors. These are monthly, bimonthly or quarterly surveys intended to collect early information on their recent activity and their short-term prospects. The questions asked are qualitative for the most part. They cover the company's situation (output, workforce, prices, etc.) at the time of the survey or a short time into the future, usually three months. Most questions call for a response chosen from three possibilities: "increase", "stable", or "decrease". For example, industrial companies are questioned on changes in output "in the last three months" and on probable change "in the next three months". Questions are phrased simply in order to relieve the response burden on the companies questioned and to facilitate exploitation of the data for a rapid dissemination of the results.

"Balances of opinion" summarise company responses

Individual company responses are aggregated by survey and by subsector. For the tri-modal questions in particular, "balances of opinion" are calculated: these are defined as the difference between the proportion of companies[1] declaring an increase in the variable in question and the proportion of companies declaring a decrease. The balance of opinion of business leaders in industry on their past output, for example, corresponds to the proportion of companies questioned who reported an increase in output in the course of the last three months, minus the proportion of companies declaring a decrease in their output over the same period. Balances of opinion are easy to interpret: when the balance is positive, companies report more increases than decreases for the variable in question, and conversely when it is negative. They are well correlated with the main economic aggregates and play a key role in short-term analysis (*Box 1*).

Balances of opinion calculations do not exploit the fact that surveys follow a panel of companies over time

Balances of opinion are used to extract aggregated information on expected or reported change in variables of interest based on responses provided by individual businesses. They are calculated on each survey date and are used to measure the variation over time of the aggregated opinion. However, the calculation to obtain the balances of opinion does not make use of the fact that the surveys partly question the same companies over a long period of time. In fact, the succession of samples

1. The proportions can be weighted by variables collected in the surveys or by auxiliary data. The weighting variables vary according to the questions. They may be turnover, workforce or investments.

Box 1 – Balances of opinion and short-term outlook analysis

Balances of opinion were first proposed in 1951 by the economist Oskar Anderson to exploit business surveys produced by the Institute for Economic Research in Munich (IFO). Despite their qualitative nature, they can be linked mathematically to the quantitative variable to which they refer. Assuming that businesses choose the modalities "increase", "stable" or "decrease" according to quantitative thresholds, it is possible to highlight a relationship between the aggregated change in the variable of interest and the balance of opinion (Theil, 1952; Fansten, 1976), for example between industrial output and the balance of opinion of industrialists on change in their output.

Economic analysts use the balances of opinion as a base for the short-term forecast of the main economic aggregates. Balances of opinion are used in so-called "calibration" equations which estimate past relations between balances and economic aggregates to forecast the short-term change in these aggregates (Dubois & Michaux, 2006). They are also mobilised to calculate composite indicators: business climate (Doz & Lenglart, 1995), employment climate (Dortet-Bernadet & Glotain, 2017), turning point indicator (Gregoir & Lenglart, 2000), output gap* (Guillet et al. 2018), etc.

* The output gap refers to the difference between observed gross domestic product (GDP) and a "potential" gross domestic product reflecting the structural productive capacities of the economy. Balances of opinion can be used to estimate the output gap.

How do compagnies form their opinions on their business prospects ?

in the business tendency surveys forms a relatively stable panel of companies in which the same company may be questioned many times. This follow-up makes it possible to study the response behaviour of the same company as a function of the short-term economic context and to verify consistency over time.

By interviewing the same companies on successive occasions, their expected and reported changes can be compared …

In particular, companies' responses regarding past changes can be compared with the responses they had given in the previous period on expected changes. In the survey on activity in industry, for example, companies are asked to note changes observed in output of their main products in the last three months and expected changes in the next three months. A company's response in January on a probable change in output can then be compared with its response in April on the reported change. In the outlook surveys in industry and in services, depending on the survey, this comparison can be made for questions on activity, demand, workforce, investment and selling prices (*Table 1*). For all these questions, the period under consideration is three months – in the past or in the future.

… and any expectation errors can be identified

Discrepancies between expected change in a given survey and subsequent reported change correspond to expectation errors on the part of the companies. These are "decreasing" surprises when companies who are questioned on economic data forecast stability or an increase over the next three months, but then report a decrease or stability, respectively, in these same data over the past three months in the survey carried out three months later; they are "increasing" surprises when the situation is reversed (*Table 2*). All in all, there are nine possible combinations, depending on the response modalities chosen by the company for its forecast and its subsequent observation.

1 - Questions on expected change and observed change in outlook surveys of activity in industry and in services

Survey	Periodicity	Main questionnaire	Unit for questioning
Industry	monthly	Your output	Product
	monthly	Your selling prices	
	quarterly	Total orders	
	quaterly	Foreign orders	
	monthly	Total workforce in your company	Company
Services	monthly	Turnover	Services
	quaterly	Export turnover	
	quaterly	Selling price or invoice price of your service provision	
	monthly	Total number of employees (including temporary employees)	Company
	quaterly	Operating results	
	monthly	Your opinion on your company's investments	

How to read the table: The column headed "Unit for questioning" represents the unit to which the questions relate. In both surveys, companies are asked about their activity as a whole, but also about their main products or services.

2 - Changes forecast then observed by companies: nine possible combinations

	Forecasted in Q–1		
Observed in Q	Decrease	Stability	Increase
Decrease		Decreasing surprise	
Stability			
Increase	Increasing surprise		

Aggregated surprise indicators are calculated from these errors

n 2015, so-called "surprise" indicators were defined based on the business tendency surveys (Gorin et al., 2015). They correspond to a linear combination of the proportions of the different types of forecasting error (*Table 3*). Negative surprises are allocated a negative weighting and positive surprises have a positive weighting. This weighting is greater for major surprises (increase observed when a decrease had been forecast and vice versa) than for surprises on a smaller scale (increase observed when stability forecast, stability observed when decrease forecast, etc.). Surprise indicators were constructed for the purpose of forecasting by maximising their correlation with macroeconomic series on output or investment in the quarterly accounts, employment series, etc. Thus in addition to the proportion of errors, the proportions of companies confirming an increase (or decrease) were also taken into account with a positive (or negative) weighting. Finally, the weightings selected for the surprise indicators were symmetrical. The indicators therefore cancel each other out when there are as many companies making a decreasing error as there are making an increasing error.

3 - Surprise indicators: weighting for different types of error

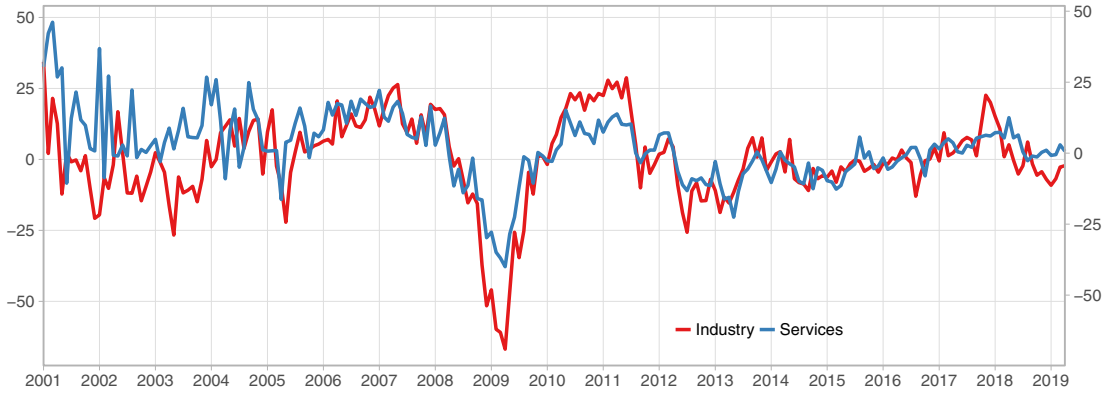
Observed in Q	Forecast in Q-1		
	Decrease	Stability	Increase
Decrease	–2	–1	–4
Stability	3	0	–3
Increase	4	1	2

In the way they are constructed, the surprise indicators are very similar to the balances of opinion, but with additional information on the errors made by companies in their expectations (*Graph 1*). As a result, they combine two pieces of information of a different nature. In this Special Analysis, we focus more specifically on expectation errors.

Expectation errors contain specific information on the way in which businesses view the future

These errors are more likely to occur when activity experiences sudden fluctuations that businesses had not anticipated. These errors therefore inform about both the process by which businesses form their expectations and about the presence of short-term shocks affecting the economy as a whole or certain sectors. In this analysis, we explore these two dimensions of the information contained in forecasting errors, by first highlighting the procyclical nature of these errors then defining in more detail the way companies decided on their expectations in the business tendency surveys.

1 - Surprise indicators in industry and services



How to read the graph: in April 2019, the surprise indicator in industry was at –2, below its long-term average (+4). It had reached a high point in November 2017 (+22).
Note: The surprise indicators for output in industry and in services have been published every month since April 2015 in INSEE's macroeconomic database at the same time as the results of the business tendency surveys.
Source: INSEE

How do compagnies form their opinions on their business prospects ?

Companies' expectation errors vary according to the economic variables and the position in the short-term outlook cycle

Change in expectation errors can be calculated over the long term

Most of the questions that can be used to identify expectation errors have a long historical record, dating back to 1990. To enter into the calculation of expectation errors, a company has to be present in the sample of respondents at a three-month interval, and therefore the number of available observations is smaller than when calculating balances of opinion, but it nevertheless remains high. In the survey of activity in industry, for example, the question on observed output has gathered between around 2,500 and 4,000 observations per survey since 1990, compared with about 500 fewer observations for the comparison between expected output and actual output three months later (*Graph 2*).

The size of the sample of firms available for a study of expectation errors over a long period is therefore quite large. This analysis is limited to surveys on activity in industry and in services which have the largest samples.

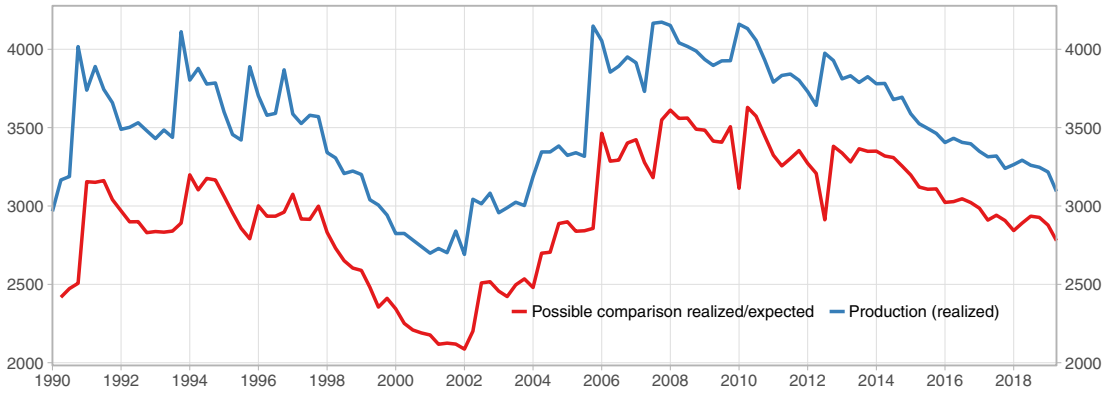
Companies make expectation errors about their output more often than about their selling prices

In general, companies' expectations are correct: the changes they observe over the previous three months tend to coincide overall with the changes they had forecast three months earlier. In industry and services, errors represent less than half of responses for most variables. Major errors (decrease observed when an increase had been forecast and vice versa) are rare (on average between April 1990 and April 2019, industrial firms observed major surprises in only 5% of cases).

Nevertheless, some economic variables are more difficult for companies to predict. In industry, companies make more mistakes, either positive or negative, over future change in global demand or output than over changes in their selling prices. Between October 1990 and April 2019, on average, industrial firms observed a different change in their output from what they had expected three months earlier in 42% of cases, against 24% of cases concerned with selling price (*Graph 3*). The question about selling prices is also the one that produced the fewest expectation errors[2] in the monthly business survey in services (18% on average from April 1990 to

2. This observation is linked to the fact that businesses' selling prices do not change much throughout the year. Catalogue costs account in part for this rigidity in pricing and the fact that in the surveys companies often forecast prices as "stable". Companies also have more control over changes in prices than over demand for their products.

2 - Number of responses available per quarter to the question in the industry survey on change in output



How to read the graph: businesses questioned in the survey on activity in industry replied to the question on past change in output for 3,093 products in April 2019 (blue curve). In the January 2019 survey, for these same products, they had replied to the question on expected change in output in 2,779 cases (red curve).
Note: the occasional reduction in the number of observations available for comparison purposes corresponds to the partial survey sample renewal, as companies coming into and leaving the sample cannot be counted on the renewal date.
Source: Monthly outlook survey in industry, calculations by the authors, INSEE

April 2019; *Graph 4*), whereas companies in this sector made more errors over expected change in their operating results (for the company globally) or turnover (for their main services).

Expectation errors have a seasonal component

The tendency for companies to make mistakes depends on the quarter in which the survey is conducted. Discrepancies between observed changes and changes predicted three months earlier occur more frequently in April for most economic variables, and less frequently in October. This seasonality in expectation errors is particularly noticeable for selling prices, both in industry and in services. From 1991 to 2019, industrial firms observed a change in prices that was different from the expectations they had expressed three months earlier in 29% of cases in April, against 21% in October. Significantly more companies forecast an increase in selling prices in January than in the following quarters. This schedule of pricing by companies is reflected in thecollection of producer prices and corresponds to the time when contracts are signed (Gautier, 2008). At

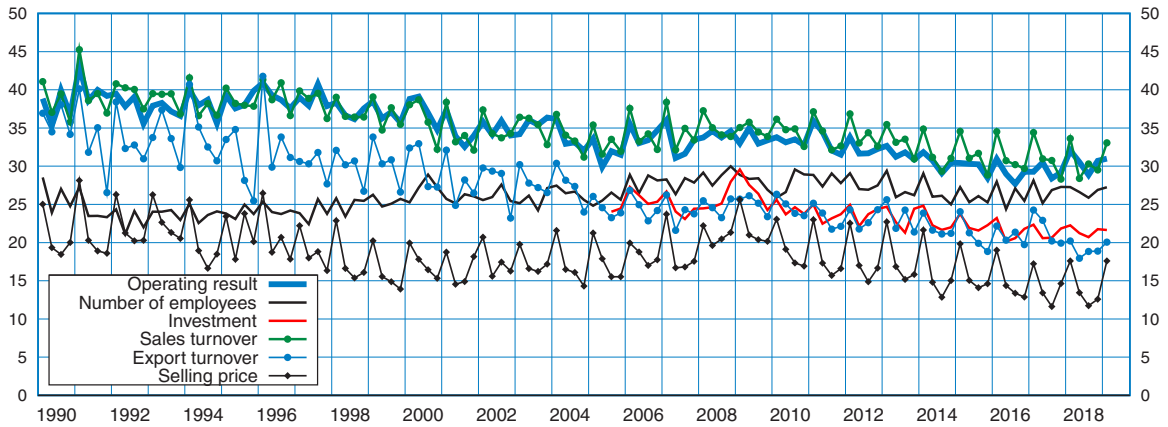
3 - Proportion of expectation errors by companies in the survey on activity in industry

in %

How to read the graph: between October 1990 and April 2019, businesses questioned in the survey on activity in industry observed on average a different change in output from that expected three months earlier in 42% of cases.
Scope: for each question, proportions are calculated from businesses that responded on the survey date and three months earlier. The proportions are not weighted and are calculated according to the unit of questioning: companies for workforce, main products for other questions. As some questions were asked quarterly and others monthly, only quarterly occurrences are retained. These correspond to the first month of each quarter: January, April, July and October.
Source: Monthly outlook survey in industry, calculations by the authors, INSEE

4 - Proportion of expectation errors by companies in the survey on activity in services

in %



How to read the graph: Between October 1990 and April 2019, businesses questioned in the survey on activity in services observed on average a different change in selling price from that expected three months earlier in 18% of cases.
Scope: for each question, proportions are calculated from responses from companies on the date of the survey and three months earlier. The proportions are not weighted and are calculated according to the unit of questioning: companies for operating results, workforce and investments; main services for turnover and selling prices. As some questions were asked quarterly and others monthly, only quarterly occurrences are retained. These correspond to the first month of each quarter: January, April, July and October.
Source: Monthly outlook survey in industry, calculations by the authors, INSEE

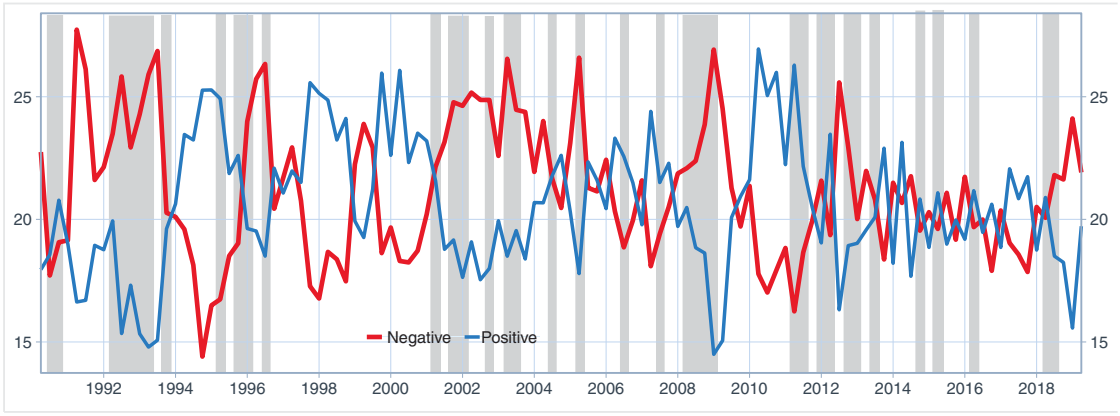
the time of the April survey, companies do not systematically confirm the increase they expected in January.

Expectation errors are procyclical

The occurrence of different types of expectation errors, either positive or negative, depends on the business cycle. Positive surprises (increase or stability observed when stability or decrease, respectively, had been forecast) are more frequent in the upswing phase whereas negative surprises reach their maximum during recessions. In industry, the proportion of negative surprises concerning changes in output exceeded that of positive surprises and reached a maximum at the beginning of 2008 (*Graph 5*). Then in Q3 2009 and until the end of 2011, positive surprises again became more frequent. Similarly, many service companies overestimated their output at the beginning of the 2009 financial crisis; they also overestimated the change in their operating results more often than average (*Graph 6*). More recently, in the industry and services sectors alike, companies had more positive surprises over changes in their output in 2017, then, from 2018, they had more negative surprises. Nevertheless, the scale of fluctuation for errors appears to be fairly limited, even in the event of a short-term economic shock. Thus the procyclicity of

5 - Proportion of positive and negative surprises – question on output in industry

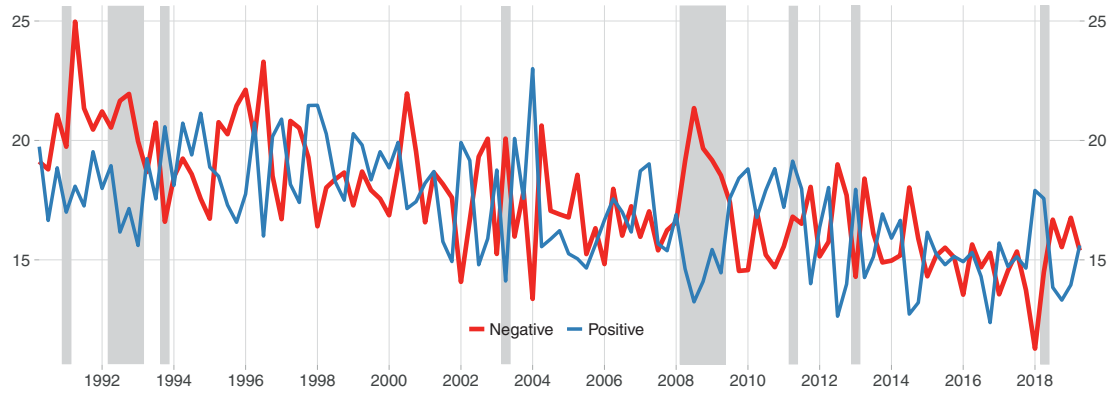
in %



How to read the graph: positive surprises (or, conversely, negative surprises) correspond to the proportion of products for which the businesses questioned in the survey on activity in industry reported a more favourable (or less favourable) change than what they had expected three months earlier.
The quarters in which industrial output declined are shaded in grey.
Scope: proportions are calculated on the basis of businesses that responded both on the survey date and three months earlier.
Source : Monthly outlook survey in industry, calculations by the authors, INSEE

6 - Proportion of positive and negative surprises – question on operating results in services

in %



How to read the graph: positive surprises (or, conversely, negative surprises) correspond to the proportion of services for which the businesses questioned in the survey on activity in services observed a more favourable (or less favourable) change than what they had expected three months earlier.
The quarters in which output in services declined are shaded in in grey.
Scope: proportions are calculated on the basis of businesses that responded both on the survey date and three months earlier.
Source : Monthly outlook survey in industry, calculations by the authors, INSEE

the errors does not challenge the ability of balances of opinion to trace the economic cycle correctly.

Errors are more correlated with macroeconomic variables in industry than in services

Errors are therefore directly correlated with changes in economic activity overall or in a single sector. This is a property shared with the balances of opinion but which in this case derives from information of a different nature. In periods of recession or upswing, companies adjust their assessment of the change in their economic variables downwards or upwards, but they have a heightened tendency to make mistakes in their expectation. For the survey questions on output and employment, the correlation between errors committed (concerning the previous quarter) and changes in macroeconomic aggregates (during the coincident quarter) is greater in industry than in services (*Table 4*). In the majority of cases, balances of opinion remain better correlated with macroeconomic series than the proportion of positive or negative expectation errors made by the companies. Nevertheless, the proportions of expectation errors form a pool of alternative indicators that can be used for short-term economic forecasting, like surprise indicators. In particular, "positive" expectation errors concerning change in output in industry appear to be slightly better correlated with change in industrial output than the balance of opinion on past output.

Companies' expectations are based on their past situation but also on the global economic environment

Business tendency surveys can be used to explore the way companies shape their expectations

Individual data from business tendency surveys represent a vital source of information which we can use to analyse the way that expectations announced by companies are formed. In attempting to describe how decisions and behaviours of a large number of varied agents interact and express themselves with any consistency on the aggregate scale, economics is a prospective discipline. In order to take an economic decision, each agent must have an expectation, no matter how cursory, of the future state of the economic environment in order to be able to correctly envisage the possible consequences of their decision. Thus expectations occupy a central place in economic theory.

Companies' expectation behaviour can be analysed by econometric modelling

To analyse how companies form their expectations, we estimate the probability that an industrial company will anticipate an increase (decrease or stability) in its orders according to determinants specific to the company (past changes in orders, the fact of having been surprised by this past change) and determinants relating to the global economic environment (growth in gross domestic product (GDP) forecast in INSEE's

Table 4 - Correlation between balances of opinion on past changes, proportion of positive or negative errors and macroeconomic series

Survey	Question relating to...	Correlation between corresponding balance of opinion (output or employment) and...		Correlation between corresponding macroeconomic series (output or employment) and...		
		Positive errors	Negative errors	Balance	Positive errors	Negative errors
Industry	Output	0,80	–0,74	0,43	0,49	–0,43
	Employment	0,61	–0,16	0,84	0,64	–0,43
Services	Output	0,18	–0,30	0,55	0,38	–0,16
	Employment	0,27	–0,03	0,62	0,22	–0,38

Note: correlations are calculated from Q1 1991 to Q2 2019, based on proportions of errors and balances of opinion calculated in the first month of the quarter. The series of errors and balances have been seasonally adjusted. Output and employment correspond to output in chained volume measured in the quarterly national accounts and to payroll employment of natural persons.
How to read the graph: the correlation between the balance of opinion on past output in the survey on activity in industry and positive errors on this same question in this same survey is 0.80; the correlation between this balance (or positive errors on this question in this survey) and output in industry estimated from the quarterly national accounts is 0.43 (or 0.49).
Source: Insee, calculs des auteurs

Conjoncture in France, past GDP growth, inflation, unemployment rate, *Appendix 1*). An equivalent model is estimated for services, which looks at expected change in turnover instead of in order books.

Company expectations experience inertia over time…

When estimating these models an adaptive expectations component is highlighted: in reporting their expectations businesses have a tendency to take into account the last change observed. In services (*Table 5a*), the fact of reporting a decrease in turnover over the previous three months causes the probability of predicting a decrease in activity for the coming quarter to increase by almost 43%. In industry, the fact of reporting an increase in orders over the past quarter causes the probability of predicting an increase for the coming quarter to increase by almost 24%. Businesses in the services sector are characterised by a fairly strong tendency to expect a decrease in their turnover after reporting that there had been a change during the past three months, whether this past change was an increase or a decrease.

… even if companies also take their mistakes into account…

In both industry and services, when businesses are surprised by an increase or a decrease, they tend to use this information to correct their expectations for the following quarter. For example, for an industrial company, the fact that they have underestimated the change in their order books in the previous quarter, i.e. a positive surprise, increases the probability that they will expect stability or an increase for the next three months. This result suggests that companies' expectations deviate from their routine behaviour, dictated solely by their past changes.

5a - Estimation results of an ordered logit model to forecast turnover in services

Marginal effects (in %) – Turnover in services			
Probability of forecastin a:	Increase	Stability	Decrease
$\Delta DGDP^{pre}_{Conj}$	1,9	4,4	–2,5
Lag ($\Delta DGDP_{trim}$)	–0,7	1,6	–0,9
Lag(inflation)	0,2	0,5	–0,3
lag (Unemployment)	–0,4	0,9	–0,5
Surprise=Positive	0,5	–1,1	–0,6
Surprise=Negative	–1,8	4,2	2,3
Reality=Increase	10,3	–39,2	28,9
Reality=Decrease	9,5	–52,9	43,4

5b- Estimation results of an ordered logit model to forecast order books in industry

Marginal effects (in %) – Order books in industry			
Probability of forecasting a:	Increase	Stability	Decrease
$\Delta DGDP^{pre}_{Conj}$	0,1	–0,1	0,0
Lag ($\Delta DGDP_{trim}$)	0,5	–0,7	0,2
Lag(inflation)	0,3	–0,4	0,1
lag (Unemployment)	–0,4	0,4	–0,1
Surprise=Positive	3,2	5,1	–2,0
Surprise=Negative	–2,8	–4,3	1,5
Reality=Increase	24,3	–32,1	7,1
Reality=Decrease	18,4	–25,6	7,8

How to read the table: observing that activity has increased over the last 3 months increases by almost 24% (or 10%), the probability that a business in the industry sector (or services sector) will predict a further rise for the following quarter. Conversely, observing a decrease in activity increases by about 8% (or 43%) the probability of predicting a further decrease. All the coefficients estimated in these logistic regressions are significant at a 5% threshold, with the exception, for forecasting orders placed in industry, of the coefficient associated with the GDP growth forecast in *Conjoncture in France*.

Source: calculations by the authors

… and also consider the global economic environment.

In services, changes in the unemployment rate, in inflation, or in the quarterly GDP growth rate observed over the previous quarter, can significantly alter the probability of businesses forecasting an increase or decrease or stability in turnover for the coming quarter. This is also the case for the GDP growth forecast, which appears, for example in INSEE's Conjoncture in France, which also seems to have a significant influence on the expectations of service companies. In industry, the global economic environment seems to have a lesser, although still significant, influence on the probability of anticipating an increase in the order books. Be that as it may, when they form their expectations, businesses in these two major sectors seem to give consideration both to their own development concerns and to those relating to their global environment.

Companies' expectations seem to be consistent with the rationality hypothesis

A test to check the rationality of companies' expectations

The previous results on the determinants of companies' expectations seem to go in the direction of a frequently used hypothesis in economic theory, that of rational expectations. According to this hypothesis, businesses form their expectations by taking into account their exhaustive knowledge of the workings of the economy, the characteristics of other economic agents, etc.[3] In practice, economic agents find themselves constrained in their knowledge of the economic environment, in their access to information, or they rely in part on their intuitions, so that their expectations may deviate from what the rationality hypothesis would dictate: we then talk about bounded rationality.

One way to evaluate the empirical relevance of the strict rationality hypothesis is to use individual expectation errors from the business tendency surveys. A simple statistical test, taken from the literature, is used to characterise discrete choice models (Manski, 1990), and applied here. It consists in identifying the quarters during which the hypothesis cannot be validated a posteriori: this is considered to be the case when more than half of businesses expecting an increase or a decrease in a given quarter contradict it in the following quarter (*Appendix 2*). In the context of this test, we consider that under the rational expectations hypothesis, it is not possible that the majority of companies are mistaken in their expectations of an increase or a decrease, unless an unforeseen shock is affecting all of them at the same time (e.g. macroeconomic shock). In fact, the quarters for which the rationality hypothesis is rejected do not necessarily correspond to an absence or a limitation of the companies' rational expectations, they may also reflect the presence of a short-term outlook shock, common to all the businesses in a sector.

This purely statistical approach does have the merit of not relying on an explicit behavioural model to describe expectations nor of imposing particular functional forms in an ad hoc fashion to represent the probability distributions of answers in surveys. On the other hand, it is only able to test the rational expectations hypothesis jointly with other relatively strong hypotheses (*Appendix 2*). This joint testing of hypotheses automatically reduces the power of the test used. A rejection of joint hypotheses will therefore not be interpreted, strictly speaking, as just a rejection of the rational expectations hypothesis but as an indication of a one-off disturbance in the process of forming expectations. Some phases of short-term turbulence may therefore be mistakenly identified by this test as deviations from strict rationality.

3. More specifically, the rational expectations hypothesis requires that expectations identify with the statistical conditional expectation that would be provided by a model capable of describing the entire functioning of the economy.

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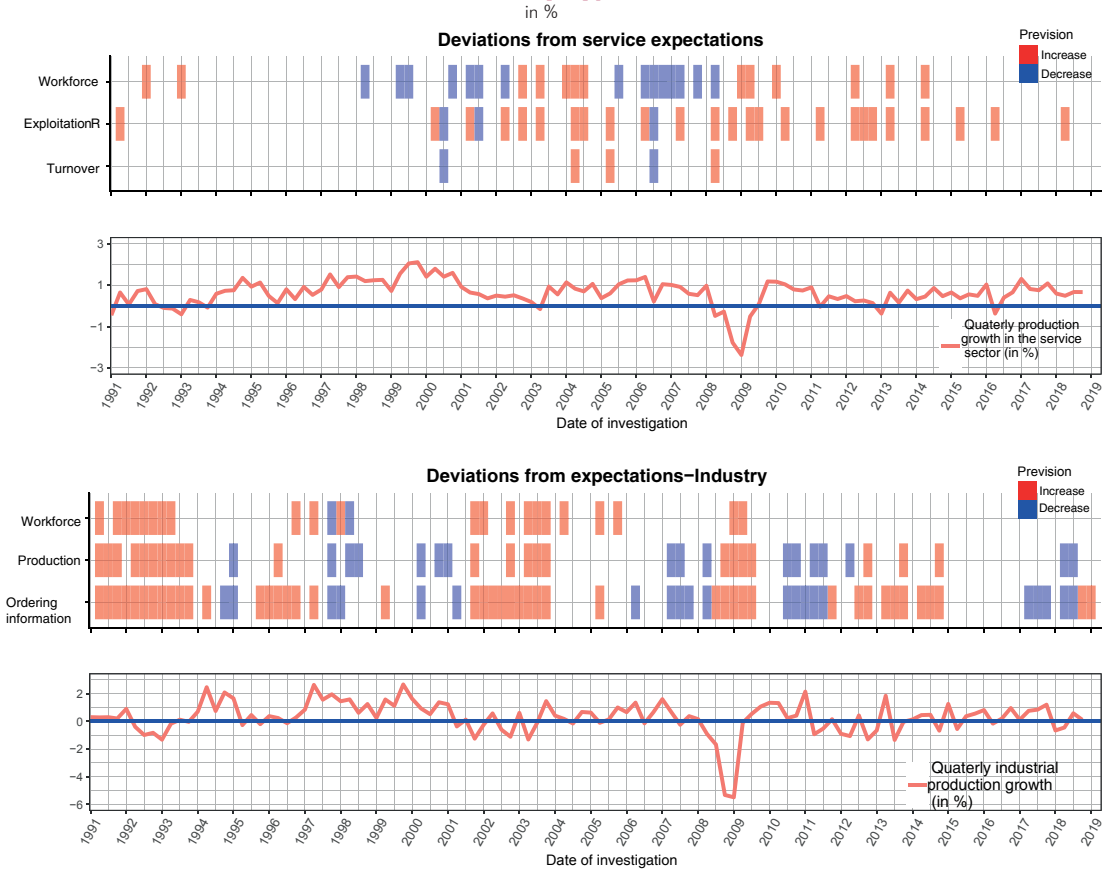
In services, companies' expectations remain rational overall

In the monthly outlook survey of businesses in the services sector, the rationality of expectations is very rarely rejected, in other words, forecasting errors in this sector are very much in the minority. The quarters where the rationality hypothesis is rejected are not linked in any particular way to the short-term outlook cycle: only the question on change in workforce reveals a few deviations from the rationality hypothesis, in line with the short-term outlook situation in the sector (*Graph 7*). For the other two questions analysed (change in turnover and operating results), the quarters where the rationality of expectations is rejected have no strong links with the short-term outlook. Concerning change in operating results, however, there is a small degree of seasonality in deviations from the rationality hypothesis: in the first quarter of the year, service companies have a tendency to be systematically more optimistic than what would strictly be assumed by the rational expectations hypothesis.

7 - Quarters during which businesses' expectations are considered to deviate from the rationality hypothesis



How to read the graph: quarters in red (or, conversely, in blue) correspond to quarters when more than half of businesses had expected stability or an increase (or a decrease or stability) in the previous quarter, regarding change in the variable concerned, but they in fact observed a decrease or stability (or stability or an increase). These quarters correspond to dates when the rationality hypothesis regarding companies' expectations (in the absence of any correlation of these expectations) is rejected statistically. This may therefore mean that companies have formulated their expectations in a non-rational way on the date in question and/or that companies' responses are inter-correlated, especially as the result of a common shock across the entire sector.
Source: INSEE, calculations by the authors

How do compagnies form their opinions on their business prospects ?

In industry, the influence of the short-term outlook cycle on expectations makes it impossible to properly assess their rationality

The industry sector, because of its international exposure, is more sensitive to the economic outlook worldwide. Businesses in this sector are affected by shared shocks which automatically generate discrepancies between their expectations and reports in the following quarter. Thus at every turning point in the outlook in this sector, perceived by the growth rate of whole industrial production (*Graph 7*), the majority of industrial companies see their expectations invalidated when it comes to changes in their output and their order books. This result confirms the procyclicity of forecasting errors, as discussed above.

However, at the end of the 1990s, also from 2004 to 2007, then from 2015 to 2017, the rational expectations hypothesis is not rejected, or only slightly. These years correspond to periods when the proportion of forecasting errors involving an increase or a decrease seems relatively static (*Graph 5*), reflecting a lesser impact by shocks in the short-term outlook that are shared by all companies. This suggests that in the industry sector, business leaders' expectations very rarely deviate from rationality, provided the influence of the short-term outlook cycle remains sufficiently weak to be able to make the judgement.

Across the entire period, expectations of change in the workforce seem to be less subject to deviations from the rationality hypothesis than other economic measures. There has not even been any deviation since the 2008 crisis. The best predictability of employment is due in part to the fact that this variable is better controlled by the companies than those that are more directly linked to demand for their products. Hiring and downsizing decisions are generally medium- to long-term strategic choices for companies as a result of institutional rigidity in the labour market, which makes it difficult to introduce any sudden variations into employment, either upwards or downwards. It is therefore justifiable that expectations of fluctuations in employment from one quarter to another are usually confirmed the following quarter. ■

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Appendix 1 – Econometric characterisation of expectations

There are many ways of representing the way in which economic agents form their expectations, apart from the strict rationality paradigm. Among these alternatives, one particular process which represents the agents' bounded rationality in a simple form, and is called the formula for "adaptive expectations", is used particularly often in the economic literature.

This theory is based on the principle that agents predict what happens in the future based only on what has already happened in the past, which limits the range of possibilities by restricting it only to situations that have already been encountered or experienced. Expressed in more formal terms, the forecast y^a of any variable y is interpreted in this process as a combination of expectation produced during the previous period and a term for surprise or forecasting error, representing the gradual adjustment of expectations. It can be written thus:

$$y_t^a = y_{t-1}^a + \lambda\left(y_{t-1} - y_{t-1}^a\right) = \lambda\, y_{t-1} + (1-\lambda)\, y_{t-1}^a$$

The theoretical advantage of this process is its great adaptability according to what the modeller considers to be the source of the forecasting errors. Purely statistical expectations (case where $\lambda = 1$) represent a situation where forecasting errors are solely the result of the presence of permanent shocks leading to long-lasting deviations in variables: in this case, agents produce their forecast based on the last value observed for the variable. If, on the contrary, the deviations are thought to be purely temporary (case where $\lambda = 0$), expectations are then simply repeated in identical format from one period to the next. By re-writing the formula, a remarkable property is highlighted:

$$y_t^a = \lambda\, y_{t-1} + (1-\lambda)\left[\lambda\, y_{t-2} + (1-\lambda)\, y_{t-2}^a\right] = \cdots = \lambda \sum_{k=1}^{\infty} (1-\lambda)^{k-1}\, y_{t-k}$$

When expectations are adaptive, the forecast is written only as a weighted sum of previous values, with weights decreasing exponentially as we move away from the date the forecast was made. This type of formula appears to be consistent with the empirical observations proposed by behavioural economics, which highlights the fact that economic agents rely in general on a collection of past observations to best forecast change in an economic variable.

In order to test the adaptive nature of companies' expectations, a specific econometric estimate is required. The qualitative responses provided by companies in the business tendency surveys in services and in industry can be modelled using a polytomous discrete choice model. Since the responses can easily be ordered along a scale from "decrease" to "increase", here we use an ordered polytomous model to study expected change in business activity (turnover in services or orders for goods in industry).

According to the mathematical framework that underlies this model, modelled variable Y (qualitative response by the company regarding expected change in activity) is set in relation to a hidden variable Y^*, called the latent variable (quantitative anticipation of change in its activity) The value of variable Y is assumed to be determined from the positioning of the value taken by the latent variable Y^* in relation to non-observed thresholds (μ_k). Latent variable Y^* is then explained linearly by a set of macroeconomic short-term variables X and by a set of variables Z specific to each company. The residuals ε of this regression are assumed to follow a logistic distribution.

$$Y^* = \alpha + \gamma\, Z + \quad Z + \epsilon$$

$$Y = k \text{ pour } k \in \{\text{ decrease, stable, increase}\} \text{ si } \mu_1 < Y^* < \mu_2$$

• X includes short-term variables such as GDP growth, inflation and the unemployment rate observed in the quarter that precedes the forecast. We also add the quarterly GDP growth forecast published in INSEE's Conjoncture in France, making the implicit assumption that this publicly available information is used by companies to form an opinion on the state of the macroeconomic short-term outlook.

• Z includes variables specific to the recent situation of each business, such as the type of change their activity has recently experienced (increase, stability or decrease) and the type of forecasting error it made when last questioned (increasing surprise[1], no surprise, decreasing surprise). By adding these variables the theoretical adaptive expectations framework can be used and we can therefore test whether it is significantly validated or empirically rejected.

1. According to the convention adopted in this paper, an increasing surprise will occur, for example when a company that expected a decrease in its activity in fact finally observes stability or even an increase.

In the usual econometric methods, coefficients resulting from regression correspond to the effects of an exogenous change[2] in the explanatory variable over the dependent variable. Conversely, in the ordered polytomous model, coefficients correspond to effects on the latent variable only. The effects on the observed variable are then expressed in the form of an increase or decrease in percentage points of probability of replying in a certain category rather than in the reference category (in this case an expectation of stability).

Appendix 2 – Testing the rationality of expectations in the business tendency surveys

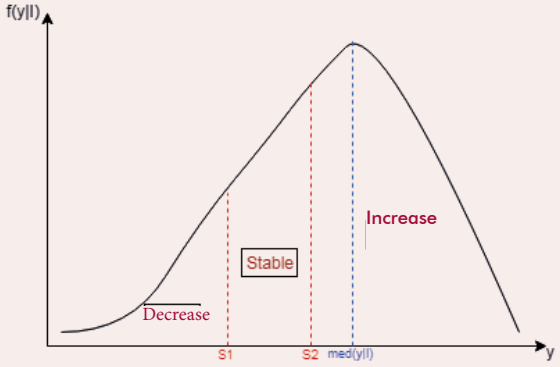
Normally, the Rational Expectations Hypothesis (REH) is formulated thus: there is a set of information such that the announced forecast (i.e. the forecast in the business tendency survey) corresponds to the optimum forecast, in the sense of the general running of the economy. This definition implies, in particular, that the stochastic processes governing the changes in observable economic measurements, and those that the econometric agents mobilise subjectively in their forecasts, are identical. This affirmation can be expressed in the form of several propositions that can be tested statistically , according to the nature of the data available.

In the case where the collected data are qualitative or categorical (response distribution into modalities such as "increase", "stable" or "decrease", for example), the tests are based on a probabilistic approach.

The probabilistic approach starts from the hypothesis that the categorical responses obtained from the forward-looking questions in the business tendency surveys provide information on "subjective" distributions of probability of change in the variables under consideration. Responses to retrospective questions, on the other hand, provide us with information on "objective" distributions of probability on which they are based. Under the REH, these distributions must coincide, the former being expressed subjectively beforehand and the latter observed objectively afterwards. The rationality tests that can be carried out based on this probabilistic approach are basically statistical tests to ensure consistency between company expectations expressed in a given quarter and their observations in the following quarter.

Using this approach, the probability distribution of an economic variable's values (demand for company products, output, turnover or workforce) is correctly described by a response category "Increase", "Stable" or "Decrease" depending on the position of a certain characteristic of this probability distribution in relation to well-defined thresholds. In this Special Analysis, we assume that companies systematically report the category containing the median of their subjective probability distribution (*Figure*) even if other approaches may be possible (Das & Van Soest, 1999).

Figure - Subjective probability distribution of change in a variable



How to read this graph: *f(y|I)* represents the subjective probability distribution of variable *y*, conditionally on all of the information set *I*. The median of this distribution is located above the *S2* threshold defining entry into the "Increase" category. The company therefore reports an increase in the variable *y* in the business tendency survey.

The underlying reasoning to this probabilistic approach is similar to that described by the companies when they were questioned on the way they respond to business tendency surveys. A "survey on the survey" carried out in September 2014 by INSEE on businesses in industry that made up the panel of respondents to the monthly outlook survey on activity, showed that about half of businesses say that they respond with the "Stable" modality if the growth rate in their order books falls within the interval +/– 5% and almost a quarter of businesses do this if their growth rate falls within the interval –1% to +1% (Gorin et al., 2015).

2. The effect of an exogenous change in the variable while all the other variables remain unchanged.

How do compagnies form their opinions on their business prospects ?

Under REH, the median of the "objective" probability distribution is believed to be in the same response category as the median of the "subjective" distribution of forecasts. As a result, among the businesses expecting, for example, a downward change in a given economic variable, the proportion of those that report an increase or stability after the fact should not be more than 50%. Thus, in considering the estimated conditional proportions pkj of the 9 combinations of modalities based on responses to two successive surveys[3], the REH results in the following two conditions:

$$\begin{cases} p_{BS} + p_{BH} < 0{,}5 \quad (1) \\ p_{HS} + p_{HB} < 0{,}5 \quad (2) \end{cases}$$

These conditions are valid in the absence of any correlation between the responses by companies, especially outside of any common macroeconomic or categorical shock affecting all or only some companies simultaneously. The conditional proportions are calculated for each economic value and for each survey date, in order to check whether these two conditions are respected in a significant way, with the statistical significance here being to understand in the sense of the asymptotic law expected under the null hypothesis for these estimators[4]. In the graphs presented in the text, we show, for each economic value, the quarters for which the condition (1) (called "Decrease forecast") and/or condition (2) (called "Increase forecast") is/are significantly invalidated (*Graph 7*). ■

3. Thus the conditional proportion p_{BS} refers to, for example, the proportion of businesses that observed stability in the variable considered over the three months of the current quarter, knowing that they had forecast a decrease in the previous quarter.
4. The associated probability law here is the asymptotic law of a stochastic Bernoulli variable, i.e. according to the central limit theorem, a normal law whose variance is inversely proportional to the number of observations in each survey.