# Accuracy of Expectations in Business Surveys[1]

Martin Galstyan*
Central Bank of Armenia, Yerevan, Armenia - martin.galstyan@cba.am

Vahe Movsisyan
Central Bank of Armenia, Dilijan, Armenia - vahe.movsisyan@cba.am

## Abstract

This paper presents an approach for numerically estimation of the accuracy of expectations of economic agents participating in business tendency surveys. Our purpose is to study how economic agents' future expectations meet the actual changes to suggest a quantitative method to estimate their differences, and finally revising the expectations time series by excluding the effects of not accurate expectations effects. In so doing, we examine whether the accuracy of expectations depends on companies' size. We do also study whether the companies managers' expectations are realistic (or optimistic/pessimistic) across variables and sectors. Finally we conclude that the revised expectations have a predictive power for sectors value added and could be used as leading indicators for corresponding sectoral indicators.
**Keywords:** Business tendency survey; leading indicator; economic agent

## 1. Introduction

Surveys of expectations of economic agents play an important role in understanding the general direction of economic changes and are used for construction of composite economic indices. They provide valuable information for economic policy makers.

Statistics Department of Central Bank of Armenia conducts Business Tendency Surveys in the main four sectors of economy (industry, construction, trade and services) since second quarter of 2005.

The main purpose of these surveys is to estimate the current stance, plans and expectations of non-financial organizations based on the answers of top managers.

Considering the fact, that the samples of companies for successive surveys doesn't significantly change from quarter to quarter, we can compare the agents' expectations and their realizations over several sequential quarters. Forward looking questions of business surveys encompass the leading ability of the final aggregate indices. Thus the accuracy of answers is of critical importance.

Although the business tendency surveys are widely used in many countries for decades, much attention has not been paid to the investigation and measurement of the inaccuracy of expectations.

The main goal of the current study is to develop an approach to quantify the accuracy of economic agents expectations involved in business tendency surveys and use these estimates for the adjustment of composite indicators.

To reach the above mentioned goal several questions are investigated. In particular, in the first part of the study the distributions of the accurate expectation ratios are presented, to illustrate how much the companies' expectations coincide with their realizations across sectors and variables. As could be expected sometimes the managers of companies expect different outcomes for the future. Some of the expectations are optimistic and some pessimistic. The distributions of these expectations are also investigated and the results indicated highly differing results by variables and sectors.

In the main part of study two versions of Expectations Accuracy Indices are introduced: one for cross sectional analysis and the second for the time series analysis. The rationale for differentiating these two parts is that cross section analysis provides a general presentation of accuracies for the observed period of time (2010-2016) without exploring the possible fluctuations and development of expectations accuracies. Moreover cross section analysis permits to analyze connectedness of expectations accuracy

[1] This paper expresses the views of the authors and not necessarily those of the Central Bank of Armenia

estimates with companies' size to understand whether big companies expectations are more accurate or not and whether these dynamics changes across variables and sectors.
From the time series analysis perspectives the Expectations Accuracy Indices are used to investigate the development of the accuracy of expectations over time. Another time series indicator of expectation accuracy is constructed to represent the optimistic and pessimistic expectations in one index, which further is used to adjust the economic variables balances (which are in general used for composite economic indicators construction).
In the last part of the research a leading ability of adjusted economic variables balances is tested combining them with the main macro variable of corresponding sectors of economy (value added).

## 2. Distributions of accurate expectations

The business tendency surveys in different sectors of Armenian economy are based on perceptions and expectations of companies' managers over several variables characterizing their activities. The main questions of the survey are listed in the table 1. The respondents answer twice: comparing current quarter to the last quarter (Actual), and the next quarter to the current one (Expectation).

**Table 1: Main structure of business tendency surveys questionnaire**

| | | Quarter t | |
|---|---|---|---|
| 1. Change in production volume | **Quarter t-1** | **Actual**<br>1. 1. Increased compared to t-1<br>2.1. Didn't change compared to t-1<br>3.1. Decreased compared to t-1<br>**Expectation**<br>1.2. Will increase in t+1<br>2.2. Will not change in t+1<br>3.2. Will decrease in t+1 | **Quarter t+1** |
| 2. Change in production demand | | | |
| 3. Change in production price | | | |
| 4. Change in number of employees | | | |
| 5. Change in wage | | | |
| 6. Change in economic situation of Sector/subsector | | | |

The consistent structure of main variables in these surveys, regarding both present and upcoming quarters, gives an opportunity to analyze the accuracy of expectations of economic agents.
In the current research the data sets of business tendency surveys are used for the period from the 4th quarter of 2009 to the 3th quarter of 2016.
From the individual company perspectives it is possible to analyze several combinations of expectation and actual realization for the same quarter:

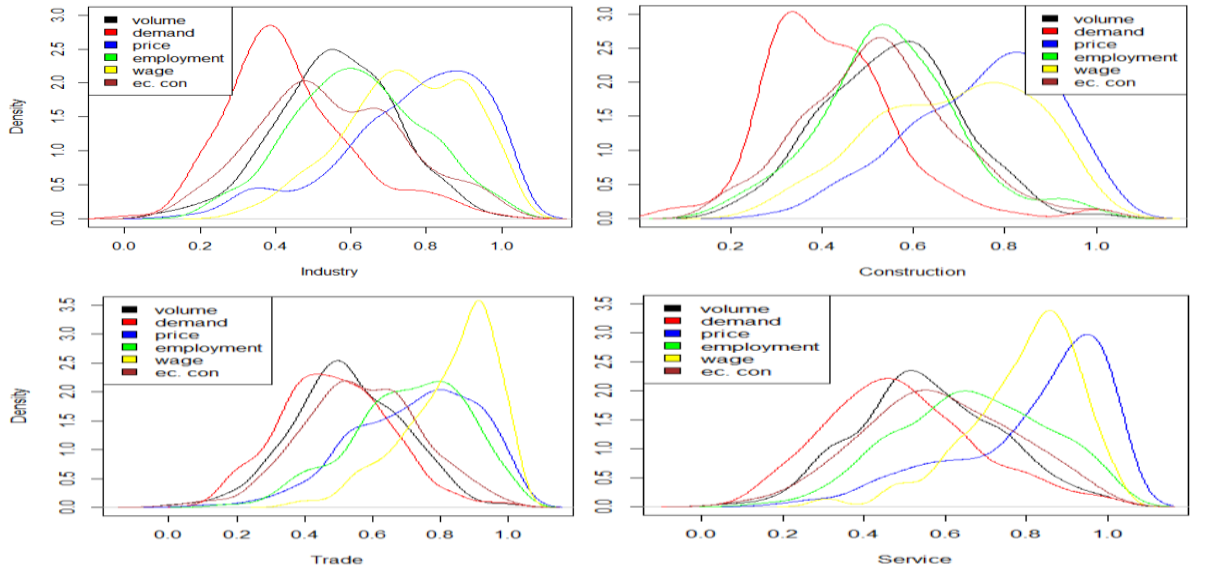
**Table 2: Expectation Accuracy Ratio for an individual company**

| | | |
|---|---|---|
| 0 | The expectation coincides with real changes | Accurate expectation ratio[2] $p_i^{"0"}$ |
| -1 | The expectation is overrated by "1 level"[3] | Optimistic expectation ratio $p_i^{"-1"}$ |
| -2 | The expectation is overrated by "2 level"[4] | Very optimistic expectation ratio $p_i^{"-2"}$ |
| 1 | The expectation is overrated by "1 level" | Pessimistic expectation ratio $p_i^{"1"}$ |
| 2 | The expectation is overrated by "2 level" | Very pessimistic expectation $p_i^{"2"}$ |

In the figure 1 the distributions of "Accurate Expectations" are provided for each sector across all 6 variables summarized for the observed quarters.

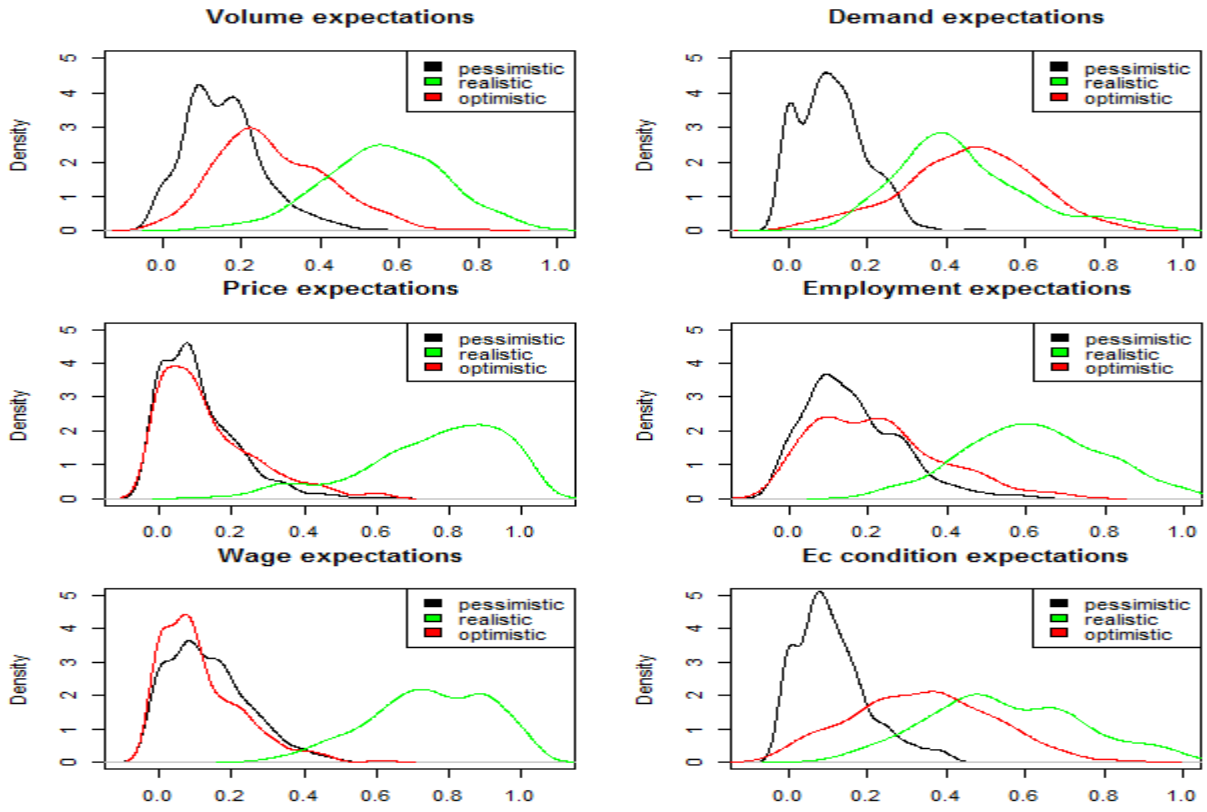
[2] $p_i^{"0"}$- is the proportion of quarters when the $i$-th company had accurate expectations (only the companies who participated in the survey at least 10 quarters during the observed period).
[3] For example, a company expected an increase of the production volume, but the real output didn't change.
[4] For example, a company expected an increase of the production volume, but the real output decreased.

**Figure 1: The distributions of the accurate expectations ratio across sectors and variables**




From the above figure we can conclude that the variables of Price and Wage changes have the most accurate expectations and this is true for all four sectors. The expectations of demand have the lowest accuracy in all sectors. We've also tried to label the analyzed expectations by using pessimistic; realistic; optimistic tags for each variable[5].

**Figure 2: The distributions of the types of variables expectations in industry**




[5] Pessimistic= $p_i^{"1"} + p_i^{"2"}$. Optimistic= $p_i^{"-1"} + p_i^{"-2"}$.

As can be seen, the distributions of the optimistic and pessimistic expectations of variables like, *price, employment*, and *wage* are pretty close to each other. They are skewed to the right but at the same time the proportions of companies with such expectations are lower. Expectations of industrial companies for these variables are mostly realistic.

The demand expectations are even more optimistic than realistic, meaning that industrial companies' expectations concerning demand change increase didn't materialize and the proportion of companies with such expectations was even higher than companies with realistic expectations.

Almost the same situation can be observed in case of economic conditions expectations. On average 30% of companies regularly participated in the business survey had optimistic expectations. The optimistic expectations of the volume changes were more widespread comparing to the pessimistic expectations.

So the main conclusion is that over the last 6-7 years the expectations regarding the volume, demand, and economic conditions have been overstated in industry, and the most part of positive expectations didn't realized. Similar patterns are observed for other sectors as well.

## 3. Expectations Accuracy Indices

Summarizing the accurate, optimistic and pessimistic expectations two types of aggregate expectation accuracy index are constructed for each variable: one for cross sectional and the second for the time series analysis. Cross sectional analysis will allow investigate the general accuracy of expectations of variables, while the time series analysis will allow analyze the change in the level of accuracy of expectations.

**Cross Sectional Analysis**

$$EAI_i^{jk} = 1 \cdot p_i^{"0"jk} + 0.5 \cdot p_i^{"1"jk} + 0.5 \cdot p_i^{"-1"jk} + 0 \cdot p_i^{"2"jk} + 0 \cdot p_i^{"-2"jk}$$

$EAI_i^{jk}$ – The expectations accuracy index of the $k$-th variable for $i$-th company in sector $j$ during observed period of time (2010-2016).

The comparison of expectations accuracy indices across sectors and variables have proved over again that the demand, volume, and economic condition are the most difficult to predict in all 4 sectors.

**Table 3: Mean expectations accuracy indices across sectors and variables**

| | Volume | Demand | Price | Employment | Wage | Economic Condition |
|---|---|---|---|---|---|---|
| **Industry** | 0.72 | 0.66 | 0.88 | 0.80 | 0.87 | 0.75 |
| **Construction** | 0.71 | 0.64 | 0.87 | 0.74 | 0.83 | 0.73 |
| **Service** | 0.71 | 0.70 | 0.86 | 0.85 | 0.91 | 0.76 |
| **Trade** | 0.73 | 0.71 | 0.90 | 0.82 | 0.89 | 0.77 |

The company level expectations accuracy indices are used to analyze the correlation between companies profit and the accuracy of expectations to test the hypothesis whether the big companies expectations are more accurate compared to small ones.

The correlation analysis is done for each sector separately and the results are summarized in table 4.

**Table 4: Correlation coefficients (and 95% CI) between expectation accuracy and profit**

| | Volume | Demand | Economic Conditions | Wage | Employment | Price |
|---|---|---|---|---|---|---|
| **Industry** | 0.21 [0.09, 0.32] | 0.2 [0.08, 0.31] | 0.16 [0.05, 0.28] | 0.10 [-0.02, 0.21] | 0.03 [-0.09, 0.15] | -0.07 [-0.18, 0.05] |
| **Construction** | 0.23 [0.05, 0.40] | 0.18 [0.00, 0.35] | 0.24 [0.06, 0.40] | 0.31 [0.31, 0.46] | 0.35 [0.18, 0.50] | 0.06 [-0.12, 0.24] |
| **Trade** | 0.05 [-0.06, 0.18] | 0.07 [-0.05, 0.18] | 0.18 [0.06, 0.28] | 0.00 [-0.12, 0.11] | 0.07 [-0.05, 0.18] | -0.02 [-0.14, 0.09] |
| **Service** | 0.12 [0.01, 0.23] | -0.04 [-0.16, 0.07] | 0.02 [-0.09, 0.13] | 0.06 [-0.05, 0.18] | -0.11 [-0.22, 0.01] | -0.13 [-0.24, -0.02] |

According to the above results accuracy of volume, demand, and economic conditions expectations have significant positive correlations with the profit, meaning that bigger industrial companies are more accurate in their expectations of the main three indicators. In construction sector, except the price variable, accuracy of expectations of all other five variables are significantly correlated with the company size. In the Trade sector the company's profit is significantly correlated only with the economic conditions expectations. In the Service sector the companies' size is significantly correlated only with the volume expectations accuracy.

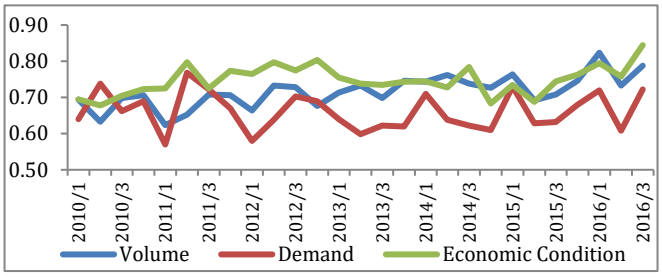
**Time Series Analysis**

*The expectations accuracy index*

$$EAI_t^{jk} = 1 \cdot p_t^{"0"jk} + 0.5 \cdot p_t^{"1"jk} + 0.5 \cdot p_t^{"-1"jk} + 0 \cdot p_t^{"2"jk} + 0 \cdot p_t^{"-2"jk}$$

Where $EAI_t^{jk}$ – The expectations accuracy index of the $k$-th variable for the quarter $t$ in sector $j$

**Figure 3: Expectations accuracy index in industry**




From figure 3 we can observe increasing trends in almost all variables expectations accuracy indices.

The next step of our study is to construct expectations accuracy index, which would encompass both pessimistic and optimistic expectations and would be used to adjust the original composite index.

*The optimistic/pessimistic expectations*

$$OptPes_t^{jk} = p_t^{"1"jk} + p_t^{"2"jk} - p_t^{"-1"jk} - p_t^{"-2"jk}$$

$OptPes_t^{jk}$ – The indicator describing the optimistic/pessimistic expectations of the $k$-th variable for the quarter $t$ in sector $j$ (proportion of companies with optimistic expectations minus proportion of companies with pessimistic expectations). Negative values of $OptPes_t^{jk}$ shows that in a given quarter the expectation of the $k$-th variable are more pessimistic than optimistic and vice versa.

Currently in the final Business Climate Index of sectors the so called balances of volume, demand, and economic conditions expectations are included (proportion of companies who expect increase of particular variable plus the half of companies who expected no change):

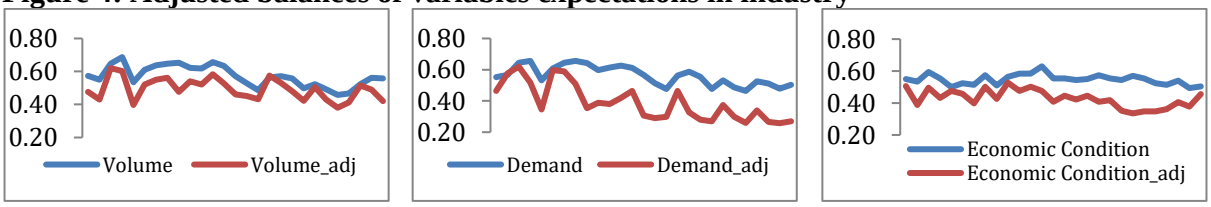
$$Bal_t^{jk} = p_t^{"+"jk} + 0.5p_t^{"="jk}$$

Now, when we estimate optimistic/pessimistic character of expectations, we suggest adjusting these balances using $OptPes_t^{jk}$:

$$AdjBal_t^{jk} = \left(1 - OptPes_t^{jk}\right)Bal_t^{jk}$$

We assume that using adjusted balances of expectations in the Business Climate Indices computation will increase their overall accuracy as leading indicator for the main economic indicators of a particular sector.

**Figure 4: Adjusted balances of variables expectations in industry[6]**

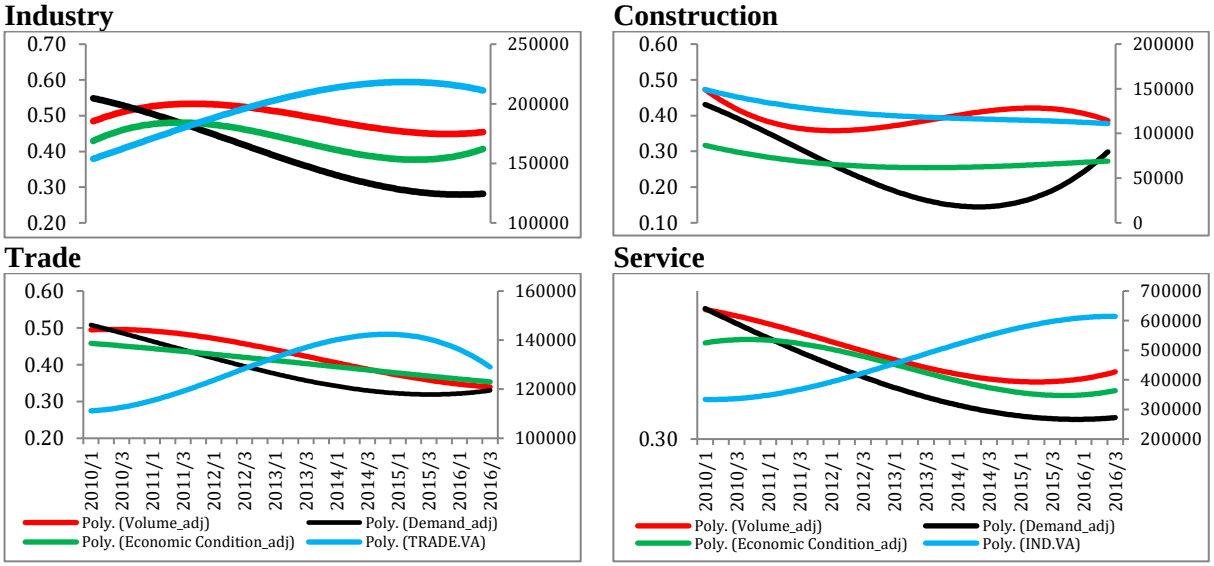



Thus after implementation of suggested algorithm these expectations moved down for almost all observed quarters. One of the main outcomes of business tendency surveys results is the ability of composite economic indicators and their components to predict macro variables in different sectors to use the forward looking insights for policy formulation. From these perspectives it is interesting to analyze the relationships between individual variables expectations coming from the business surveys and quarterly value added in each sector of economy.

The trends of adjusted balances of expectations of variables like volume, demand, and economic conditions are provided together with the trend of value added indicators of particular sector.

[6] All time series are seasonally adjusted.

**Figure 5: Trends of adjusted balances of variables expectations and value added (right scale)**




Looking at the trends (3th orders polynomials) one can conclude that in the industry the expectations of volume and economic conditions were increasing in 2010 and 2011 and after the trends were reversed. At the same time the value added of industry increased up to the end of 2015 and then only started to decrease slightly. The expectations of demand showed steep decline during the whole observed period. The time period is too short to make a reliable conclusion about lagged effects of expectations on value added, however a visual inspection of trends allow to say that companies expectations have a predictive power and can be used as leading indicator for value added of industry. Similar results can be observed also in trade and service sectors. Only in construction sector the business surveys expectations go in line with the construction value added with very short lag period.

## 4. Conclusion

This study provides empirical approach to investigate the accuracy of expectations of variables included in the business surveys conducting in Armenia during the last decade.

Our first set of result shows that the managers of companies have the lowest expectations accuracy on short term demand, volume, and economic conditions changes and higher accuracy for a relatively nominal variables like price and wage changes. At the same time these expectations are overstated and more optimistic answers prevail over realistic or pessimistic ones.

The second set of result shows that the sizes of companies affect the expectations accuracy: the expectations of big companies are significantly more accurate for variables like volume, demand, and economic conditions. Moreover, expectations have significant positive correlations with the industrial companies profit level.

The **expectation accuracy indices**, introduced in the study help to measure the optimism of economic agents and eliminate these effects from the balances of variables thus providing the adjusted time series of balances which can be used for aggregate composite indicator calculations in the future.

One of the key findings of the paper is that the adjusted balances of the main variables of business tendency surveys have a leading power for the corresponding sectors value added thus can play an important role for policy makers and researches in macroeconomic predictions.

## 5. References

1. Mirjana Cizmesija and Vlasta Bahovec (2009). Forecasting the direction of changes in Croatia's industrial production with ICI and CROLEI. University of Zagreb, Faculty of Economics and Business

2. Business Tendency Surveys: A Handbook (2003). OECD

3. Howard E.A.Tinsley, Steve D.Brown (2000). Handbook of Applied Multivariate Statistics and Mathematical Modeling.