Measuring the crisis-related economic uncertainty with Italian survey data

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Aim of the paper

We used data coming from BTS carried out by ISTAT to measure uncertainty in each Italian productive sector (manufacturing, construction, services and retail trade) to verify:

• what kind of relation (symmetrical/asymmetrical?) the obtained uncertainty measures present with respect to the positive or negative evolution of the Italian economy (with special attention to the latest economic crisis);

• the behaviour of uncertainty measures across economic Italian sectors (marked differences?)
The literature has linked:

- the possibility to measure uncertainty to the use of the survey data;
- as well as the uncertainty concept to the one of opinion variability.

Regarding this, both survey-based and variability-based measures of uncertainty have been defined in the recent literature (Bachmann, 2010, European Commission, 2013).
Measuring uncertainty: a bit of literature

Survey data: uncertainty attached to the expectations of the respondents

- Already in 1979, George Katona originally considered his Confidence Indicator an all-comprehensive measure of the certainty or uncertainty that was attached to the expectations of the respondents.

- To recognize this dualism, Katona defined the dimension of consumer confidence as ranging from optimism and confidence to pessimism and uncertainty.
Measuring uncertainty: a bit of literature

Uncertainty as the variability of opinion

- Lazarsfeld, Berelson and Gaudet: the authors wrote that “if the [period-to-period survey response] turnover is large, it indicates that the opinion or behaviour is unstable. We know that people feel uncertain”;

- We leave aside criticism and doubts that have been recently raised about the possibility of using the dispersion as measure of uncertainty.
The uncertainty indicators

*Uncertainty: relation with replies to the survey questions*

- the increase or decrease of uncertainty can be really due:
  - to the movement of balance values: e.g. the rising or falling dominance of “increase” over “decrease” replies, or vice versa;
  - but also to the movement of the share of “Unchanged” replies: the higher the “Unchanged” fraction, the lower the uncertainty.

- Thus, changes in uncertainty are difficult to interpret in particular when the changes in the “Unchanged” share are important and frequent.
The uncertainty indicators

Uncertainty: relation with replies to the survey questions

Graph 1: Manufacturing - Uncertainty Indicator based on the Bachmann's formula and "Unchanged" share. 2003Q1-2016Q2
The uncertainty indicators

_Uncertainty: the ideal characteristics_

- **the symmetry**: an uncertainty measure should tend to decrease when the economic evolution is very negative or very positive.

  ✓ Low uncertainty: managers show concordant views when the economic scenario is very negative or positive (situation is clear);

  ✓ High uncertainty: managers show discordant opinions when the economic situation is unclear.
The uncertainty indicators

Uncertainty indicators applied: the Bachmann’s formula (2010)

\[ U_t = \sqrt{\left(\text{Frac}_t(+) + \text{Frac}_t(-) - (\text{Frac}_t(+) - \text{Frac}_t(-))^2\right)} \]

where the expression “Frac\(_t\)” indicates the fraction of positive (+) and negative (-) responses to the survey question, at time \(t\).

It doesn’t take into account the unchanged share;
The uncertainty indicators

Uncertainty indicators applied: Theil’s entropy (European Commission, 2013)

\[ Te = - \sum_{i} (\alpha_i \log(\alpha_i))/3 \quad i = 1,2,3 \]

Where \( \alpha_i \) represents the share of responses to each of the three possible categories of reply (“Increase”; “Remain Unchanged”; “Decrease”).

It takes into account the unchanged share
The uncertainty indicators

Uncertainty indicators applied: the modified Bachmann’s formula (Friz, 2016)

The corrected positive and negative fractions of the modified Bachmann’s formula are defined as:

\[ \text{Fract}^*(+) = \text{Fract}(+) + 0.5 \ast \text{Fract}(=) \]

\[ \text{Fract}^*(-) = \text{Fract}(-) + 0.5 \ast \text{Fract}(=) \]

Thus the Uncertainty modified indicator will be:

\[ U_t^* = \sqrt{(\text{Fract}^*_t(+)) + (\text{Fract}^*_t(-)) - (\text{Fract}^*_t(+)) - (\text{Fract}^*_t(-))^2} \]

The modified formula of Bachmann, undoing the effect of the intermediate share, makes the interpretation of the measure easier.
The data used

The following questions have been investigated:

for the manufacturing sector, EC question 5:
“How do you expect your production to develop over the next 3 months?”

for the services sector, EC question 3:
“How do you expect the demand (turnover) for your company’s services to change over the next 3 months?”

for the retail trade sector, EC question 4:
“How do you expect your business activity (sales) to change over the next 3 months?”

for the construction sector, EC question 4:
“How do you expect your firm’s total employment to change over the next 3 months?”
The data used

• To assess the empirical evolution of our survey-based uncertainty indicators, we compare them to the developments in year-on-year growth of the quantitative reference series for each sector.

  ➢ Manufacturing sector: Industrial Production Index;
  ➢ Construction sector: Production Index in construction;
  ➢ Services: Value Added
  ➢ Retail trade sector: Private Final Consumption

• All the uncertainty indicators were become quarterly, which facilitated the comparison with the reference series.

• The time span analyzed is 2003Q1-2016Q2.
The empirical results

*Symmetry/asymmetry of the uncertainty indicators calculated*

Manufacturing sector: Bachmann’s formula – results confirm the ones obtained by the European Commission – no Symmetry.
The empirical results

Symmetry/asymmetry of the uncertainty indicators calculated

Manufacturing sector: the modified Bachmann’s formula – It seems not to respect entirely the principle of symmetry of uncertainty, in particular, between 2008Q3 and 2009Q4.
The empirical results

Symmetry/asymmetry of the uncertainty indicators calculated

Manufacturing sector: Theil’s entropy – behaviour very similar to Bachmann’s formula.

Graph 3: Manufacturing - Uncertainty Indicator (Theil's entropy formula) and Industrial Production Index. 2003Q1-2016Q2
The empirical results

_Symmetry/asymmetry of the uncertainty indicators calculated_

Service sector - Bachmann’s formula: the dispersion among managers’ replies does not increase in worsening periods (between the end of 2007 and the beginning of 2009) and confirms its negative trend, finding itself at a minimum just when the Value Added in Services reaches its maximum (2011Q1).

_Graph 7: Services - Uncertainty Indicator (Bachmann’s formula) and Value Added. 2003Q1-2016Q2_
The empirical results

**Symmetry/asymmetry of the uncertainty indicators calculated**

Service sector – modified Bachmann’s formula: until 2008Q2 the indicator seems coherent. Starting from 2008Q3, it remains broadly stable: apparently, the managers of this sector show themselves continuously discordant in their opinions both when the economic evolution is negative, but also when it is positive.
The empirical results

Symmetry/asymmetry of the uncertainty indicators calculated

Service sector – Theil’s formula: very similar to the results obtained by using the Bachmann’s formula. The measure doesn’t increase when the Value Added decreases and it goes down even while the reference series is improving (from 2009Q1 to 2011Q1). The indicator regains a symmetrical behaviour between mid-2014 and mid-2016 showing a negative trend when a more positive economic evolution seems to become stable.

Graph 9: Services - Uncertainty Indicator (Theil's formula) and Value Added. 2003Q1-2016Q2
Symmetry

• The uncertainty indicator, obtained by applying the Bachmann’s formula, seems not to respect entirely the principle of symmetry of uncertainty: it tends to decrease when the economic evolution is negative, but not when the latter is positive.

• Even the modified Bachmann’s formula and the Theil’s entropy formula provide results not completely clear. In theory, they would be more reliable, but the empirical results actually underline irregular behaviours and only occasionally respectful of the principle of symmetry.
Concluding remarks

Behaviour of the uncertainty measures across Italian economic sectors

- Homogeneous behaviours of the three indicators: they do not respect entirely the principle of symmetry of uncertainty in all the economic sectors analysed;

- Interpretation: on the base of results we could argue that abrupt economic fluctuations (positive or negative) make the Italian managers unprepared and make their views more discordant (high uncertainty):
  
  ✓ in conjunction with both the marked worsening and the improvement of economic evolutions, the uncertainty indicators in all the economic sectors considered present trends that are generally hard to reconcile with a symmetric reaction pattern.
Concluding remarks

Behaviour of the uncertainty measures across Italian economic sectors

• Among the sectors analysed, the ones of services and of retail trade seem to present the uncertainty indicators more respectful of the principle of symmetry of uncertainty. In particular:

• The measures based on the Bachmann’s formula and on the Theil’s entropy formula seem to be the more coherent:

  ✓ Service sector: the measures show a symmetric reaction in respect with the evolution of the Value Added between the end of 2007 and the beginning of 2011;

  ✓ Retail trade: the results show a good level of symmetry of uncertainty from the end of 2011 to the end of the period taken into consideration.
Thank you for your attention!

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