Generating unemployment expectations of the "man in the street"*

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Abstract

Why are unemployment expectations of the "man in the street" markedly different from professional forecasts? We present an agent-based model to explain this disconnection using boundedly rational agents with different levels of education.

Keywords: Agent-based modeling; Bounded rationality; Unemployment expectations.

1 Introduction

Why are unemployment expectations widely heterogeneous among the "men in the street" and strikingly different from the ones produced by highly regarded institutions? The question is extremely important, as economic decisions of households strongly depend on their expectations.

2 Main purpose

Empirical surveys show that economic agents produce vastly different sets of unemployment forecasts that appear to be quite disconnected from professional expectations. Even if the assumption of perfect rationality of agents is still present in the majority of scholarly work, this is at odds with the observed data.

The present model assumes that households are boundedly rational in the sense that their expectations are often based on wrong grounds, due to their limited ability or willingness to detect (and digest!) relevant information. The framework is related to the

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epidemiological metaphor used in Carroll [1]: information is modeled like a virus, which may "infect" the agents. Households can probabilistically absorb the information at time t by a common source (say, mass media coverage) and react accordingly, or keep using the obsolete information or even act on the basis of spurious facts. We will explore the implications of different degrees of (bounded) rationality on aggregate expectations.

3 Demonstration

Assume there are N agents, whose education level is $edu_i \in E = \{lths, hs, col\}$, with the strings denoting *Less than High School, High School* and *College*, respectively. Agents develop their expectations differently as a function of their education level.

At each time step agents can either get an informative signal o_t, with some probability $\lambda_i = \lambda(edu_i)$ that depends on their education or remember the old signal $s_{i,t-1}$ if they get no fresh news, or forget even the old signal. Formally the signal is given by:

$$s_{it} = \begin{cases} o_t & \text{with probability } \lambda_i \\ s_{i,t-1} & \text{with probability } \beta(1-\lambda_i) \\ 0 & \text{with probability } (1-\beta)(1-\lambda_i) \end{cases}, \tag{1}$$

where o_t is the latest professional forecast released by the media and β is the probability to remember the past signal if one does not obtain a fresh forecast.

Once the (informative or uninformative) signal is available, agents convert it into an answer ans_{it} to the question "How do you expect the number of people unemployed to change over the next 12 months?". Similarly to the Michigan Survey or the European Commission's Consumer Survey, answers are encoded with integers in $\{-2, -1, 0, +1, +2\}$ corresponding to qualitative answers {decrease sharply, decrease slightly, remain the same, increase slightly, increase sharply}, respectively.

We assume that agents stubbornly report $ans_{it} = 2$ with probability $\mu_i = \mu(edu_i)$; otherwise they "translate" their signal based on its perceived magnitude in the following way:

$$ans_{it} = \begin{cases} +2 & \text{with probability } \mu_i \\ f(s_{it}|\gamma) & \text{with probability } 1-\mu_i \end{cases}. \tag{2}$$

The translation function f depends on a threshold $\gamma > 0$ that shapes 5 ranges of values driving the interpretation of the signal: the details are given in the companion paper "Unemployment expectations in an agent-based model with education" but, in essence, if the signal is large and positive, the agent will claim that unemployment will increase sharply; if the signal is intermediate and positive, the milder conclusion is that unemployment is about to increase slightly; finally, if the signal is small, no change is reported (and a similar mechanism for negative signals will induce decrements of varying sizes).

At the end of period t, when all answers $ans_{it}, i = 1, ..., N$, are available, it is straightforward to compute an aggregate balance index:

$$x_t = \frac{100}{N} \sum_{i=1}^{N} ans_{it}.$$

We start from the assumption that the more educated are more "rational", in the sense that they read newspapers more frequently and they have higher attention (i.e., higher $\lambda(edu)$) and higher trust (i.e,. lower $\mu(edu)$) towards the forecasts released by the mass media. The values of the parameters are reported in Table 1.

Table 1: Calibrated values of μ and λ

Parameter	$\lambda(lths)$	$\mu(lths)$	$\lambda(hs)$	$\mu(hs)$	$\lambda(col)$	$\mu(col)$
Value	0.1	0.3	0.2	0.2	0.3	0.1

We present five simulations. The baseline scenario is simulation (i), where $\beta = 0.8$, $\gamma = 0.4$ and, of the N agents, one third is *lths*, one third *hs* and one third is *col*. Then, in simulation (ii) two thirds of the population are *lths* and one third is *hs*, while in (iii) one third is *hs* and two thirds are *col*. Then, in simulation (iv) $\beta = 0.6$ and in simulation (v) $\beta = 1$.

We present a simulation with a total of 3000 agents for 200 periods. o_0 is drawn from an uniform $U[-0.5, 0.5]$, then $o_t = 0.8o_{t-1} + \epsilon_t$, where $\epsilon_t \sim N(0, 0.25)$.

Table 2: Calibration and Summary statistics

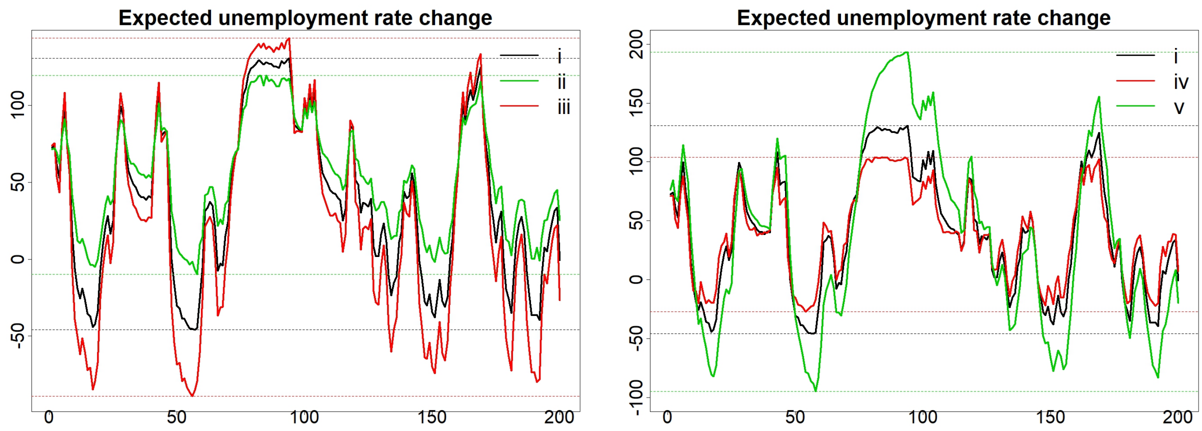
	β	% *lths*	% *hs*	% *col*	Min	1st Qu	Median	Mean	3rd Qu	Max	St.Dev	$\rho(x_t,$
i	0.8	33.3	33.3	33.3	-46.00	-4.56	37.17	38.44	81.75	130.70	51.27	0.9
ii	0.8	66.7	33.3	0	-9.93	23.65	50.95	52.39	82.87	119.60	35.94	0.9
iii	0.8	0	33.3	66.7	-89.13	-31.14	23.33	24.49	80.39	143.90	66.85	0.9
iv	0.6	33.3	33.3	33.3	-27.13	7.37	39.08	38.79	69.76	104.60	38.87	0.9
v	1	33.3	33.3	33.3	-94.93	-26.96	39.82	38.15	94.27	193.20	77.83	0.9

Table 2 contrasts the distributions under the five simulations. Comparing the baseline with simulation (ii) [(iii)], a decrease [increase] in the proportion of educated individuals leads to an aggregate expectation which is more [less] pessimistic (higher [lower] mean), less [more] dispersed (lower [higher] standard deviation) and slightly more [less] persistent (higher [lower] one-lag autocorrelation $\rho(x_t, x_{t-1})$).

Then, comparing the baseline with simulation (iv) [(v)], a decrease [increase] in the probability of remembering the past information has no appreciable effect on the mean, but leads to a lower [higher] dispersion (lower [higher] standard deviation) and lower [higher] persistence (lower [higher] autocorrelation).

Figure 1 plots the results of the five simulations: in the left panel simulations (i), (ii) and (iii) are compared, (i), (iv) and (v) are contrasted in the right panel. Dotted lines delimit the range of values attained by the different simulations. Note also that these

Figure 1: Households unemployment expectations balance



ranges are much narrower than the theoretical span of [-200,200] but, actually, much larger than the ranges observed in the real data analyzed in the companion paper.

The practical session will also contain a demonstration of the use of NetLogo's ([2]) `BehaviorSpace` to calibrate the parameters to empirical data. We will show how to modify the code to relax the assumption that information can *only* be obtained by a central source, allowing for more peer-to-peer interaction. The time series obtained when agents can (copy and) use the information of other households will be discussed and compared with the previous results.

4 Conclusion

The present demonstration, based on (simulated) fictitious series of inputs, has shown ways to reproduce real time series by suitably calibrating the parameters of an agent-based model populated with individuals who have different education and may, to different extents, fail to update information or get it from other agents. The aggregate expectations depend on the degree of (bounded) rationality of the agents and are affected in particular by the presence of an average, or "permanent", level of pessimism that prompts agents to declare that unemployment will increase sharply disregarding the professional forecasts (whatever is their content).

References

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