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Socio - Economic Predictions

Unemployment (FAU)

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Unemployment (FAU)

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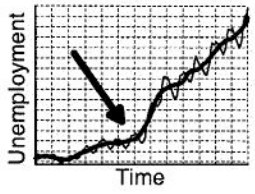
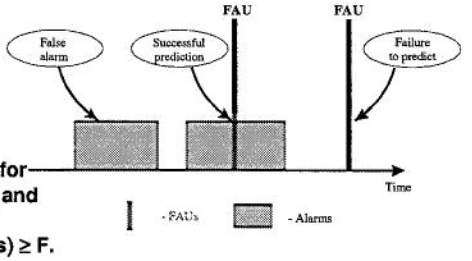
FAST ACCELERATION OF UNEMPLOYMENT ("FAU")

Patterns of macroeconomic indicators preceding the unemployment rise in Western Europe and the USA
V. I. Keilis-Borok, A. A. Soloviev, C. B. Allègre, A. N. Sobolevskii, and M. D. Intriligator
Pattern Recognition, ***38***(3), 423-435, (2005). http://dx.doi.org/10.1016/j.patcog.2004.08.005

Prediction target: moment of a sharp and lasting upward bend of monthly unemployment rate



Schematic definition of FAU. Thin line - monthly unemployment; note seasonal quasiperiodic variations. Thick line - monthly unemployment, with seasonal variations smoothed away. The arrow indicates a *FAU* - the sharp upward bend of the smoothed curve. The moment of a *FAU* is the target of prediction.



Formal definition:

- ***U(m) = a + bm*** **– linear least square regression of *U*, *m* – time in months.**
- ***b⁺(s)*** **and *b⁻(s)* – values of the slope *b* for regressions over *s* months preceding and following m respectively.**
- **FAU is defined by condition $b^+(s) - b^-(s) \geq F$.**

THE DATA

Composite characteristics of national economy

1. ***IP*: *Industrial production index.***
2. ***L*: *Long-term interest rate*** **on 10-year government bonds, in %.**
3. ***S*: *Short-term interest rate*** **on 3-month bills, in %.**

Characteristics of more narrow areas of economy which are sensitive to its overall state

4. ***NC*: *The number of new passenger car registrations*, in thousands of units.**
5. ***EI*: The experts' prospects for the national industrial sector.**
6. ***EP*: The experts' prospects for selected manufacturers.**
7. ***EO*: The estimated current volume of orders.**

The last three indicators are subjective estimates that distinguish "good" from "bad" situations.
They are obtained by a poll of a group of 2,500 manufacturers.

Two indicators related to the American economy

8. ***FF/$*: Value of U.S. dollar in French francs.**
9. ***AR*: The state of the American economy: is it close to a recession or not? These two states are distinguished by the pre-recession alarms determined for the United States economy (*Keilis-Borok et al., 2000*). A brief explanation of the *AR* indicator follows.**

AR INDICATOR

- All five U.S. economic recessions in 1962–2000 were preceded by a certain pattern of 6 leading macroeconomic indicators for the U.S. This pattern emerged 5 to 13 months before each recession and at no other time. On that basis, a prediction algorithm was suggested. The indicator *AR* (for "American Recession") shows whether an alarm is or is not determined by this algorithm.
- As a precursor to the American recessions this pattern was identified retrospectively. As a potential precursor to *FAUs* in France, however, *it was determined independently on the present study, and it includes no European indicators.*
- It is trivial, that these nine indicators are *relevant* to prediction of unemployment
- It is new, that they are *sufficient* for prediction of *FAUs*.

DISCRETIZATION

1. Indicators have been replaced by their *trends* – values of b in linear regression

$$l(m) = a_l + b_l(s_l)t, \quad m - s_l <= t <= m.$$

2. Comparison of the plots $b_l(m)$ with the moments of FAUs suggests a hypothesis on what trends are "premonitory" (occur more frequently in proximity of a FAU).
3. Discretization: Values of the trends b_l have been replaced by binary signals S_l. For first three indicators:

$$\text{If } b_l >= C_l, S_l = 1; \quad \text{If } b_l < C_l, S_l = 0$$

For other indicators inequalities are reversed.

The thresholds are determined as Q-level percentiles of the trend (for example with Q_L = 33%, one third of observed values of b_L is regarded as premonitory).

Trends and thresholds

Indicator	Premonitory trend	*s*	*Q*, %
IP: Industrial production index	Upward	12	50%
L: Interest rate, long-term bonds	Upward	12	33%
S: Interest rate, short-term bills	Upward	12	25%
NC: New passenger cars registrations	Downward	6	33%
EI: Prospects for industrial sector	Downward	6	33%
EP: Prospects for selected manufacturers	Downward	6	33%
EO: Orders	Downward	6	33%
FF/$: French francs per USD, exchange rate	Downward	6	33%
AR: Recession alarm in the U.S.	Is current		

CHRONOLOGY OF THE INDICATORS FOR FRANCE

- **Columns 2 - 9 correspond to the single indicators. Headings show their symbols, as explained in Section 2 of the paper. Code "1" indicates the "premonitory" value, which appears more frequently in the proximity of a *FAU*.**
- **The last six columns correspond to the group of indicators indicated in caption to error diagram (slide 8). The number of a group in that table is given in the heading. Each column shows the number D of non-premonitory values, where "+" marks the months when $D \le \overline{D}$, that is, when the *FAU* alarm is diagnosed. Thresholds $\overline{D}$ are indicated in Table 3.**
- **Shaded lines show the moments of *FAU*s.**

Dates	*IP*	*L*	*S*	1
'65:01	.	.	.	3 .
'65:02	.	.	.	3 .
'65:03	.	.	.	3 .
'65:04	.	.	.	3 .
'65:05	.	.	.	3 .
'65:06	.	.	.	3 .
'65:07	.	1	.	2 .
'65:08	.	.	.	3 .
'65:09	.	.	.	3 .
'65:10	.	.	.	3 .
'65:11	1	.	.	2 .
'65:12	1	.	.	2 .
'66:01	1	.	.	2 .
'66:02	1	.	.	2 .

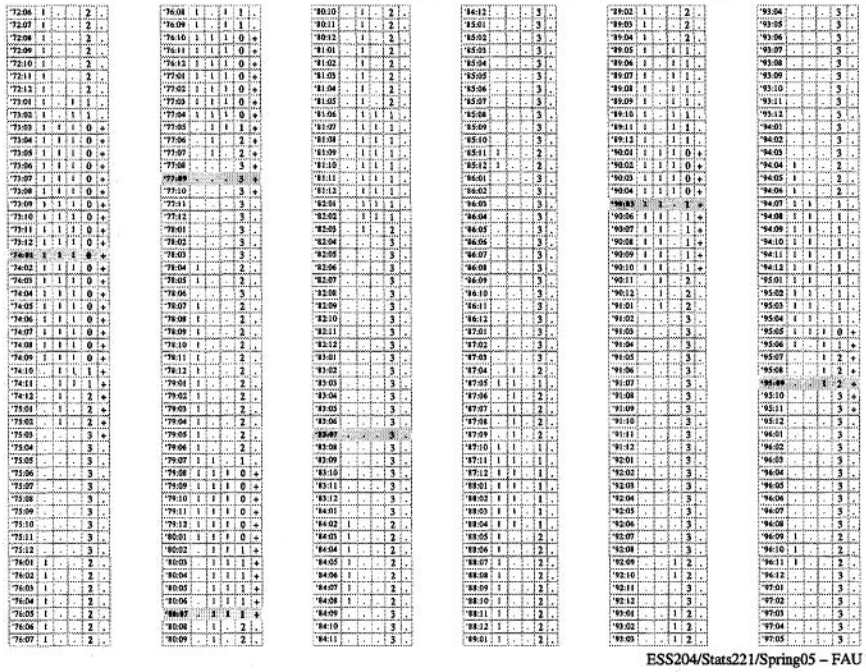
'66:03	1	.	.	2 .
'66:04	1	.	.	2 .
'66:05	1	.	.	2 .
'66:06	1	.	.	2 .
'66:07	1	.	.	2 .
'66:08	1	.	.	2 .
'66:09	1	.	.	2 .
'66:10	1	.	.	2 .
'66:11	1	1	.	1 .
'66:12	1	.	.	2 .
'67:01	1	.	1	1 .
'67:02	.	.	.	3 .
'67:03	.	.	.	3 .
'67:04	.	.	.	3 .
'67:05	.	.	.	3 .

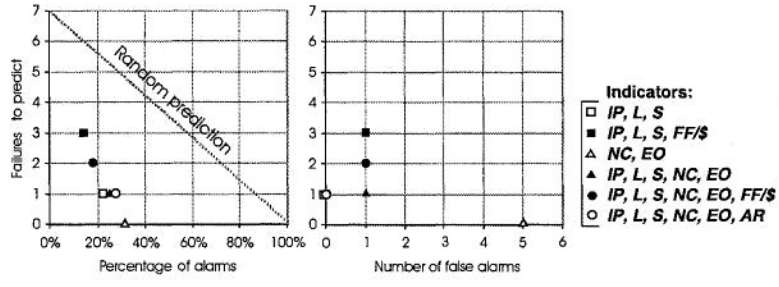
'67:06	.	1	.	2 .
'67:07	.	1	.	2 .
'67:08	.	.	.	3 .
'67:09	.	.	.	3 .
'67:10	.	.	.	3 .
'67:11	.	.	.	3 .
'67:12	1	.	.	2 .
'68:01	1	.	.	2 .
'68:02	1	.	.	2 .
'68:03	1	.	.	2 .
'68:04	1	.	.	2 .
'68:05	.	.	.	3 .
'68:06	.	.	.	3 .
'68:07	.	.	.	3 .
'68:08	.	.	1	2 .

'68:09	.	.	1	2 .
'68:10	1	.	1	1 .
'68:11	1	.	1	1 .
'68:12	1	.	1	1 .
'69:01	1	1	1	0 +
'69:02	1	1	1	0 +
'69:03	1	1	1	0 +
'69:04	1	1	1	0 +
'69:05	1	1	1	0 +
'69:06	1	1	1	0 +
'69:07	1	1	1	0 +
'69:08	1	1	1	0 +
'69:09	1	1	1	0 +
'69:10	1	1	1	0 +
'69:11	1	1	1	0 +

'69:12	1	1	1	0 +
'70:01	1	1	1	0 +
'70:02	1	1	1	0 +
'70:03	1	1	1	0 +
'70:04	1	1	.	1 +
'70:05	1	1	.	1 +
'70:06	1	1	.	1 +
'70:07	1	1	.	1 +
'70:08	1	1	.	1 +
'70:09	1	.	.	2 +
'70:10	1	.	.	2 .
'70:11	1	.	.	2 .
'70:12	1	.	.	2 .
'71:01	1	.	.	2 .
'71:02	1	.	.	2 .

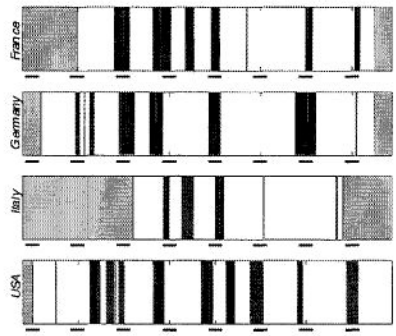
'71:03	1	.	.	2 .
'71:04	1	.	.	2 .
'71:05	1	.	.	2 .
'71:06	1	.	.	2 .
'71:07	1	.	.	2 .
'71:08	1	.	.	2 .
'71:09	1	.	.	2 .
'71:10	1	.	.	2 .
'71:11	1	.	.	2 .
'71:12	1	.	.	2 .
'72:01	1	.	.	2 .
'72:02	1	.	.	2 .
'72:03	1	.	.	2 .
'72:04	1	.	.	2 .
'72:05	1	.	.	2 .





Error diagrams for predictions with various groups of indicators

PREDICTION OF FAST ACCELERATION OF UNEMPLOYMENT ("FAU")



Precursor is the steep rise of three national macroeconomic indicators.
Red vertical lines - moments of FAU. Blue bars - periods of alarms.
Green bars - false alarms.
Gray areas on both sides - periods, for which the economic indicators were unavailable.

WHAT IS THE PLACE OF OUR APPROACH IN RESEARCH IN THE PREDICTION OF UNEMPLOYMENT?

Our approach is complementary to *"cause and effect"* approach. The cause that triggered each *FAU* is usually known: a certain governmental decision, a change in international trade, rise of price of oil, etc. Accordingly, one might predict an imminent *FAU* when a triggering cause occurs.

That does not exclude predictability of *FAU*s with a longer lead time, as in this study. A *FAU* may be triggered only if and when the situation becomes "ripe" for a *FAU*; otherwise the government would not make that decision; unemployment would be less sensitive to international trade etc. If that conjecture is correct our approach can predict such a "ripe" situation.

DISCUSSION

1. We have found collective behavior patterns, transcending immense complexity of economy. They are applicable in very different conditions:
   (i) *Through the whole time period* considered (the last 40 yrs) despite extraordinary changes in labor market.
   (ii) *To the FAUs of different origin.* E.g., the *FAUs* in Europe reflect the cyclical fluctuations in the economy, in the U.S. they reflect the onset of a recession.
   (iii) *To different countries*: prediction algorithm, developed for France is applicable without readaptation to Germany, Italy, and the U.S.
2. *If* our results are correct, what do they tell us about the unemployment?
   (i) Heuristic constraints for macroeconomic models of unemployment.
   (ii) Diagnosis of situations, ripe for FAU. Only in such situations *FAUs* may be triggered in the short-term scale by usually known causes, such as the announcement of new economic regulations, an oil crisis, unfortunate decision, etc.
3. Unemployment has been traditionally associated with a decline in the economy. This relation becomes more complex and can even be reversed. A decrease of unemployment can be regarded as a threat of "inflation by wages". On the contrary, when a corporation announces massive layoffs of employees the price of its stock often increases, with the stock owners (especially the pension funds) considering the wage bill a fixed "cost".
   Small and medium businesses, by contrast, reduce unemployment.
4. Will our results become irrelevant due to some drastic change of the mechanisms controlling the fast acceleration of modern economy? Not necessarily, since the premonitory patterns considered here probably reflect some type of scenario of transition to critical phenomena