Let's roll back! The challenging task of regulating temporary contracts

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Motivation

- Deregulation of temporary contracts during the 80s and 90s $\rightarrow$ surge of **dual labour markets**
- Some governments have tried **to roll back** some of the reforms, e.g., Spain
- What is the **effect of a roll back**? Reduction in labour market segmentation and/or unexpected outcomes (Cahuc et al., 2022)?

What do we do?

- Effect of a labour market reform in Italy in 2018 (*Decreto Dignitá*), which **increased the stringency** of EPL for temporary contracts, rolling back previous polies (i.e., Poletti Decree in 2014) on labour market transitions
- We estimate the **transition probabilities** between different labour market states (employment, unemployment, etc.), drawing from the search and matching theory the idea to model **labour dynamics** by a **continuous-time finite-state Markov process**.
- We estimate a causal- ARIMA model under the RCM framework, i.e., we compute "**counterfactuals**" by forecasting the transition probabilities just before the reform

Why interesting?

- The reform was very **controversial**: policy makers, union representatives and political parties had contrasting opinions about its potential impact.
- The Italian social security institute estimated that a large number of **temporary workers would lose their jobs** without finding new employment
- The Italian Ministry of Labour deemed these opinions "**unscientific** and disputable".

Institutional setting (I)

▸ Reform

In **July 2018** the Italian Government adopted the **Decreto Dignitá** which imposed **more restrictions** on the utilization of temporary contracts:

- it **reduced max length** of the contract;
- it reduced the **number of possible extensions**;
- it restricted the **circumstances** for utilization (if length $\geq$ 12 months) and renewals

Objective: reduce precarious work

Institutional setting (II)

The reform was **unexpected**:

- **Political elections** took place in Italy on March 4, 2018
- None of the parties had listed plans on implementing labour market reforms to reduce job uncertainty
- As no political group or party won an outright majority, the election resulted in a **hung parliament for 3 months**
- The Government made up of an **unexpected coalition** (Northern League and Five Stars) was officially formed on June 1, 2018.

The labour market dynamics modelled by a Markov process with K states

- Assume that the **labour market dynamics** can be expressed as follows:

$$\dot{\mathbf{x}}_t = \mathbf{Q}^T \mathbf{x}_t, \tag{1}$$

where:

- x is a $1 \times K$ vector collecting **the shares of individuals** in the working age population in different K (labour) **states**, and

- Since **observations are available at discrete time** a direct estimate of Q is not feasible.

Consider an **approximate** Markov model in discrete time:

$$\pi_{t+1} = \mathbf{M}^T \pi_t, \tag{2}$$

where $\mathbf{M}$ is a Markov matrix collecting transition probabilities. Then (Israel et al. 2001):

$$\mathbf{M} \approx \exp(\mathbf{Q}). \tag{3}$$

• $\mathbf{M}$ is a $K \times K$ matrix, whose elements are the **transition probabilities** between different states, with the constraint that:

$$\boldsymbol{\pi}_t \mathbf{1}^T = 1 \; \forall t, \tag{4}$$

where $\mathbf{1}$ is a $1 \times K$ vector of ones.
Equation (4) simply states that the shares of working age individuals in the K labour market states sum to one.

From the model to the estimates

• The matrix of transition probabilities **M** is assumed to satisfy the following conditions:

$$\begin{cases} m(i,j) \geq 0 \ \forall i,j; \text{ and} \\ \sum_{j=1}^{K} m(i,j) = 1 \ \forall i, \end{cases} \tag{5}$$

i.e., the process governing the labour market dynamics is **conservative**: the working age population is constant.

• Anderson and Goodman (1957) show that $\hat{m}(i,j)$, defined as:

$$\hat{m}(i,j)_{t+1} = \frac{M(i,j)_{t+1}}{M(i)_t}, \tag{6}$$

with $M(i,j)_{t+1}$ the number of transitions between states i and j in the period $[t, t+1]$ and $M(i)_t$ the total number of observations in state i at time t, is the **maximum likelihood estimate** of $m(i,j)_{t+1}$.

Causal-ARIMA estimation

• To estimate the effect of the Decreto Dignitá reform, we use the **causal-ARIMA (C-ARIMA)** methodology proposed by Menchetti et al. (2023)

• The C-ARIMA approach exploits a novel time-series technique within a RCM framework which allows for the estimation of the **causal effect** of an intervention **when no control group is available**, given a number of assumptions being satisfied.

• Conditional on the assumptions being satisfied, the potential outcome of "non-treated" individuals can be estimated by forecasting a **time-series model** (e.g., the ARIMA model).

Causal-ARIMA assumptions

• All units need to be subject at the same time to a **single and persistent** intervention

• Temporal no-interference (temporal stable unit treatment value assumption (**TSUTVA**)): the potential outcome only depends upon each unit individual's treatment path

• **No anticipatory effects**: the statistical units need to have no expectations about future interventions

• **Covariates treatment independence**: the covariates should not be affected by the intervention

• **Conditional stationary of the data generation process** of the potential outcome of the non-treated group: the model fitted prior to the intervention approximates the distribution of the potential outcome of the "non-treated" group after the intervention.

Counterfactual evaluation

• The crucial assumption for the identification is that in the period $[t+1, t+f]$ **no other significant shock** arrived in the labour market, i.e. there is a **single persistent intervention**.
Reforms might need some time for their effects to be fully displayed, i.e., f should be sufficiently long; but the need to exclude other significant event in the period of forecast suggests to limit the length of f.

• Other assumptions for the casual identification, i.e. **no anticipatory effects**, **temporal no-interference**, **covariates-treatment independence** and **conditional stationarity**, should be granted in our analysis.

Counterfactual evaluation

• Let $\mathbf{M}^F_{t+f:t+1|t} = \mathbf{M}^F_{t+1|t} \times \cdots \times \mathbf{M}^F_{t+f|t}$ be **the f-quarter ahead forecast transition matrix** estimated at period t. Then the **f-quarter ahead forecasted shares of individuals** $\boldsymbol{\pi}^F_{t+f|t}$ are given by:

$$\boldsymbol{\pi}^F_{t+f|t} = \boldsymbol{\pi}_t \mathbf{M}^F_{t+f:t+1|t}. \tag{7}$$

• The **asymptotic properties** of the estimated forecast $\hat{m}^F(i,j)_{t+f|t}$ are not easily characterized. **Bootstrap methods** provide a natural way to calculate the empirical distribution of the estimates.

• They can also be used to conduct **tests of hypothesis** on the equality between $\mathbf{M}_{t+f:t+1}$ and $\mathbf{M}^F_{t+f:t+1|t}$ and between $\boldsymbol{\pi}_{t+f}$ and $\boldsymbol{\pi}^F_{t+f|t}$, whose results will be be crucial to evaluate the **effective success/failure** of the policy reform under scrutiny.

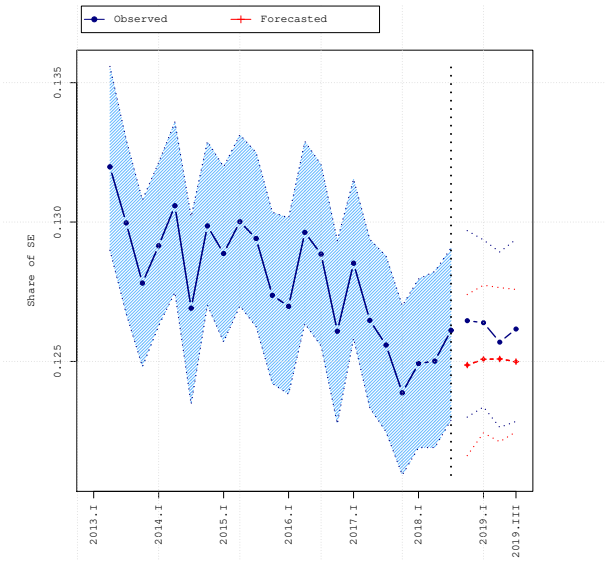
Methodology in summary

- We compute per each quarter the **transition probabilities** across five labour market states: **inactivity**(IN), **unemployment** (U), **fixed term employment** (FT), **permanent employment** (PE) and **self-employment** (SE). ▸ ItalianStats
- We compute per each quarter after Q3 2018 the **forecasted transition probabilities** (using a **combination of four forecasting models** (ETS, TSLM, THETAF, and ARIMA)).
- We evaluate the impact of Decreto Dignitá on the basis of the **counterfactuals**

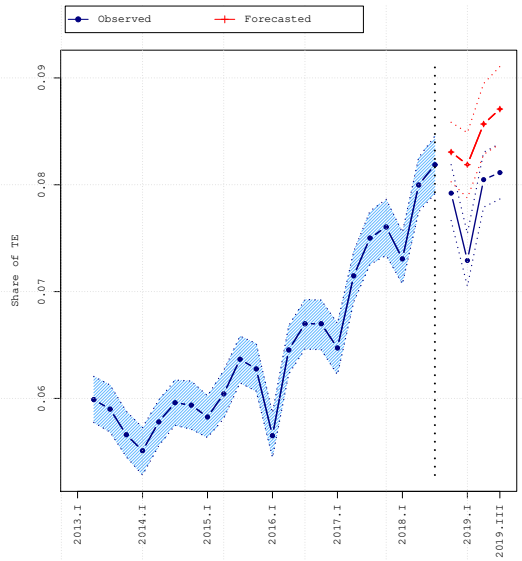
Data

- We use the 3-month longitudinal Labour Force Survey
- We observe a large number of individual and labour market characteristics **at the time of the interview and 3 months before**
- On average approximately **70.000 individuals** are interviewed each quarter, of which 45.000 are part of the working age population
- The average quarterly inflow of new individuals in the working age population is 0.3%, while the average quarterly outflow of older individuals is 0.4%, backing our hypothesis of a (almost) **constant working age population** within quarters

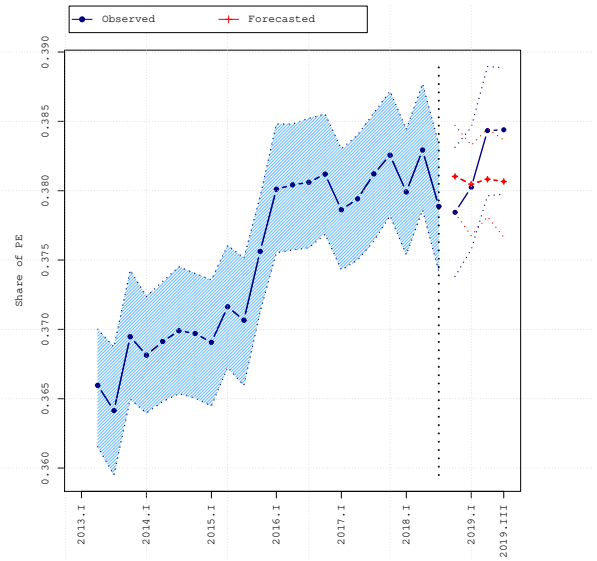
The shares of individuals in different labour market states



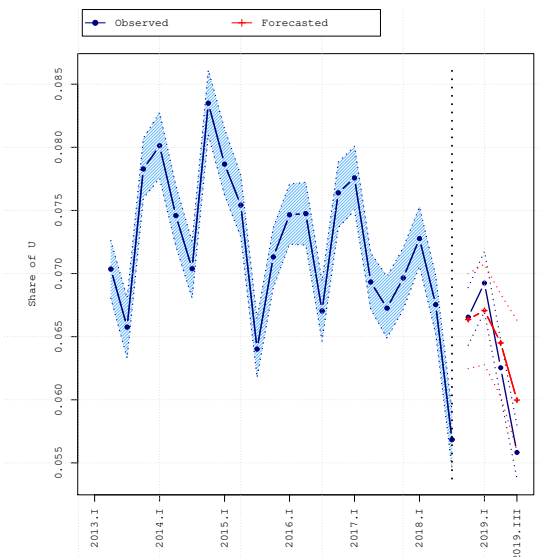
(a) Self-employed.



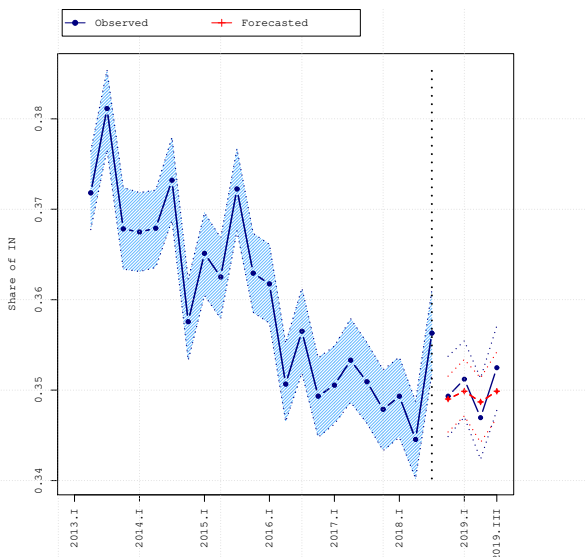
(b) Temporary employed.



(c) Permanent employed.

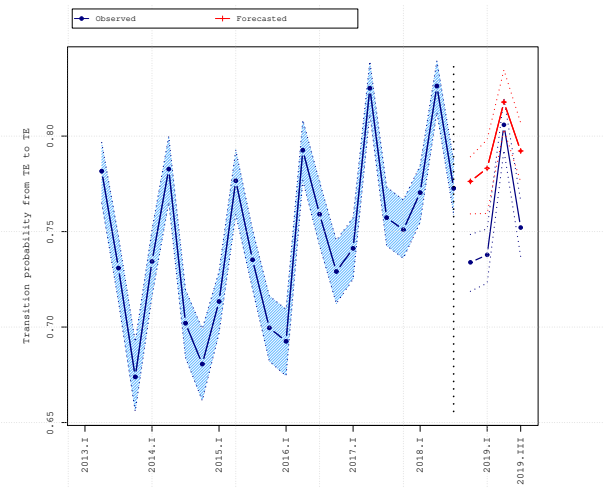


(d) Unemployed.

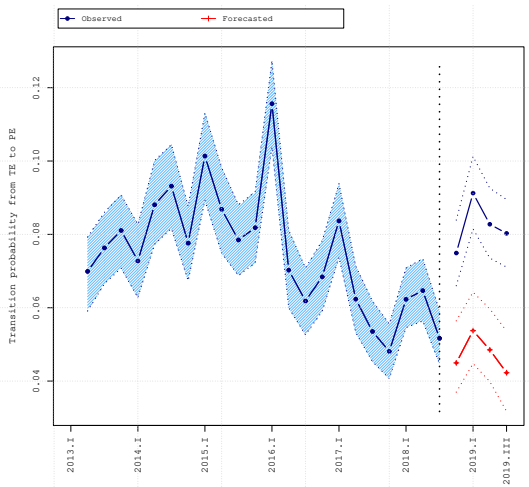


(e) Inactive individuals.

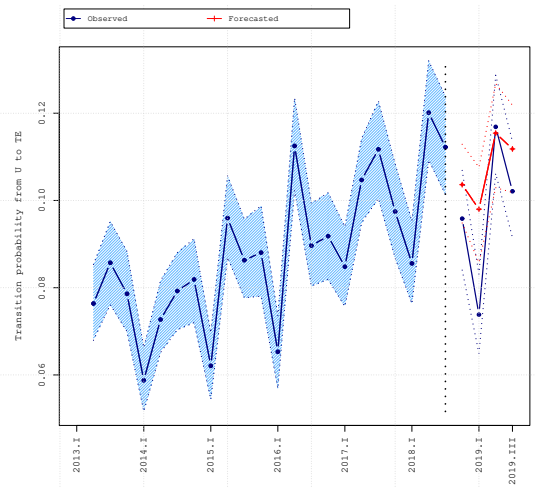
Transition probabilities across labour market states



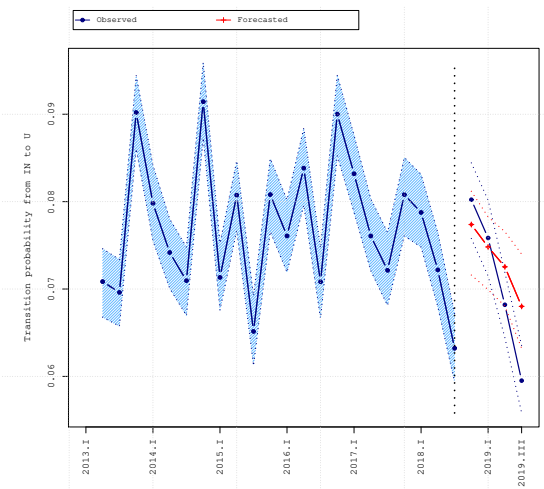
(a) From TE to TE.



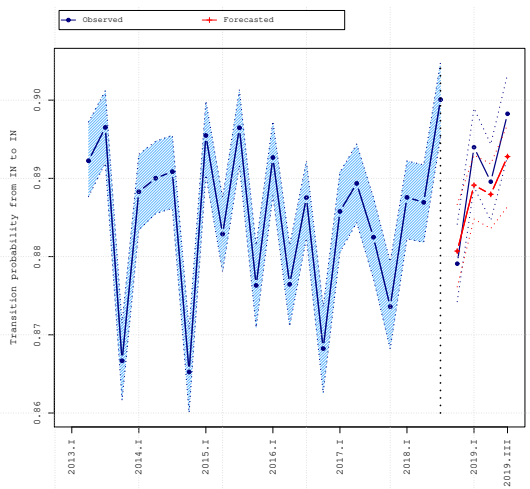
(b) From TE to PE.



(c) From U to TE.



(d) From IN to U.



(e) From IN to IN.

Impact of the reform - **All individuals** (I)

(a) Fitted versus forecasted shares of all individuals in different labour market states.

	SE	TE	PE	U	IN
Fitted	0.125	**0.080**	**0.380**	**0.054**	0.361
(s.e.)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
Forecasted	0.123	**0.090**	**0.369**	**0.059**	0.359
(s.e.)	(0.001)	(0.002)	(0.002)	(0.001)	(0.002)

(b) Difference between fitted and forecasted numbers of individuals in different labour market states.

	SE	TE	PE	U	IN
C.I. 97.5%	154,685	-196,169	548,449	-13,979	290,559
Difference	74,275	**-379,650**	**407,857**	**-172,624**	70,142
C.I. 2.5%	-80,843	-519,063	218,816	-289,958	-112,291

Note: Confidence intervals are calculated via 1000 bootstraps.

Impact of the reform - **All individuals** (II)

Fitted versus forecasted cumulative transition probabilities.

	SE	TE	PE	U	IN
SE	0.014	-**0.005**	-0.001	-0.003	-0.005
TE	-0.001	-**0.066**	**0.081**	-0.005	-0.009
PE	0.001	-**0.003**	0.005	-0.002	-0.001
U	-0.003	-**0.019**	**0.014**	-0.006	0.013
IN	0	-0.004	0.004	-**0.008**	0.008

Note: in bold we report probabilities, calculated via 1000 bootstraps, which are statistically significant at 5% level.

Impact of the reform - **Females** (I)

(a) Fitted versus forecasted shares of individuals in different labour market states.

	SE	TE	PE	U	IN
Fitted	0.079	**0.072**	**0.339**	0.049	0.461
(s.e)	(0.001)	(0.002)	(0.002)	(0.001)	(0.002)
Forecasted	0.074	**0.083**	**0.327**	0.053	0.464
(s.e)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)

(b) Difference between fitted and forecasted numbers of individuals in different labour market states.

	SE	TE	PE	U	IN
C.I. 97.5%	159, 382	-88, 441	315, 576	42, 535	90, 551
Difference	93, 995	-**209,467**	**225,384**	-62, 653	-47, 259
C.I. 2.5%	3, 621	-296, 672	108, 292	-133, 085	-191, 607

Impact of the reform - **Females** (II)

Table 3: Fitted versus forecasted cumulative transition probabilities.

	SE	TE	PE	U	IN
SE	**0.031**	**-0.012**	-0.012	-0.001	-0.006
TE	0.008	**-0.074**	**0.105**	-0.002	**-0.037**
PE	0.002	-0.003	0.002	-0.001	0
U	-0.004	**-0.015**	**0.019**	-0.003	0.004
IN	0.003	-0.006	**0.007**	-0.006	0.001

Note: in bold we report probabilities, calculated via 1000 bootstraps, which are statistically significant at 5% level.

Impact of the reform - **Low educated** (I)

Fitted versus forecasted shares of individuals in different labour market states.

	SE	TE	PE	U	IN
Fitted	0.171	**0.089**	**0.420**	**0.059**	**0.260**
(s.e.)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
Forecasted	0.173	**0.099**	**0.411**	**0.066**	**0.252**
(s.e.)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)

(a) Difference between fitted and forecasted numbers of individuals in different labour market states.

	SE	TE	PE	U	IN
C.I. 97.5%	130,769	-109,306	436,588	-42,996	282,646
Difference	37,230	-**263,163**	**286,377**	-**169,367**	108,922
C.I. 2.5%	-70,503	-384,561	129,230	-290,958	-92,901

Impact of the reform - **Low educated** (II)

Table 5: Fitted versus forecasted cumulative transition probabilities.

	SE	TE	PE	U	IN
SE	0.008	-**0.006**	-0.001	-0.001	0
TE	0.001	-**0.053**	**0.069**	-**0.009**	-0.007
PE	0.002	-0.003	0.005	-0.001	-0.002
U	-0.002	-**0.017**	0.005	-0.007	**0.021**
IN	-0.001	-0.003	**0.004**	-**0.009**	0.009

Note: in bold we report probabilities, calculated via 1000 bootstraps, which are statistically significant at 5% level.

Conclusions

- Rolling back policies carries risks of unexpected outcomes
- We casually estimate the effect of one such reforms (**Decreto Dignita'**) implemented in July 2018 in Italy
- The reform mainly achieved its objective of reducing job insecurity with some negative effects (increased inactivity), particularly among low-educated individuals

Thank you for your attention!
Comments welcome

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Decreto Dignità

▸ Backstory

- **Max duration of temporary contracts reduced** from 36 to 24 months.

- A temporary contract can **last more than 12 months** only for:
  - temporary reasons, external to ordinary business;
  - substitution reasons;
  - temporary, large and unforeseeable increases in ordinary business.

- In case of a contract longer than 12 months without justification or with a different justification, the contract is **automatically converted into a permanent contract**.

- For contracts of duration below 12 months, no justification is needed.

Decreto Dignità

- A temporary contract can be **renewed** only for the reasons listed above.
- A temporary contract can be extended without justification within 12 months, otherwise it has to be for one of the reasons listed above.
- **Max number of extensions reduced** from 5 to 4 within the 24 months.
- Per each renewal an **additional contribution** of 0.5 percentage points towards social security

Italian labour market

▸ Methodology

Country	**Self-employment** (% total employment)	**Temporary-employment** (% dependent employment)	**Unemployment** (% labour force)	**Labour force participation** (% working age)
Greece	31.9	12.5	17.5	68.4
Italy	**22.7**	**17.0**	**10.2**	**65.7**
Portugal	16.9	20.8	6.7	75.5
Spain	15.7	26.3	14.2	75.0
United Kingdom	15.6	5.2	4.0	78.8
Ireland	14.4	9.8	4.5	73.1
Belgium	14.3	10.9	5.4	69.0
France	12.1	16.4	8.5	71.7
Germany	9.6	12.0	3.2	79.2
EU average	**15.3**	**13.2**	**6.4**	**74.2**

Source: OECD, 2019.

Counterfactual evaluation

• The f-**quarter ahead forecast** of transition rate m_{ij} in quarter t can be expressed as:

$$m\left(i,j\right)_{t+f} = m^{F}\left(i,j\right)_{t+f|t} + \epsilon\left(i,j\right)_{t+f}, \tag{8}$$

where $m\left(i,j\right)_{t+f}$ is the **observed** transition rate (i,j) in quarter $t+f$, $m^{F}\left(i,j\right)_{t+f|t}$ is the **forecasted** transition rate for the quarter $t+f$ calculated in quarter t and $\epsilon\left(i,j\right)_{t+f}$ is the **forecasting error**.

• If the forecast is computed exploiting all the information available in period t, denoted by Ω_t, then the expected value of $\epsilon\left(i,j\right)_{t+f}$ is zero and $\epsilon\left(i,j\right)_{t+f}$ and $m\left(i,j\right)_{t+f|t}$ are orthogonal, i.e.:

$$E[m\left(i,j\right)_{t+f} - m^{F}\left(i,j\right)_{t+f|t}\,|\Omega_t] = 0. \tag{9}$$

• Hence, any **significant** divergence between $m\left(i,j\right)_{t+f}$ and $m^{F}\left(i,j\right)_{t+f|t}$ signals a **novelty** with respect to the information set available in period t, Ω_t or, alternatively, $m^{F}\left(i,j\right)_{t+f|t}$ can be interpreted as a **counterfactual** with respect to all news happening after time t assuming that **no other significant event** happens in the period of forecast $[t+1, t+f]$.