The relation between the policy interest rate and unemployment, does the growth of small firms play a mediating role ?

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https://www.eco-ena.ca/10-annual-conference.html

I – Research question

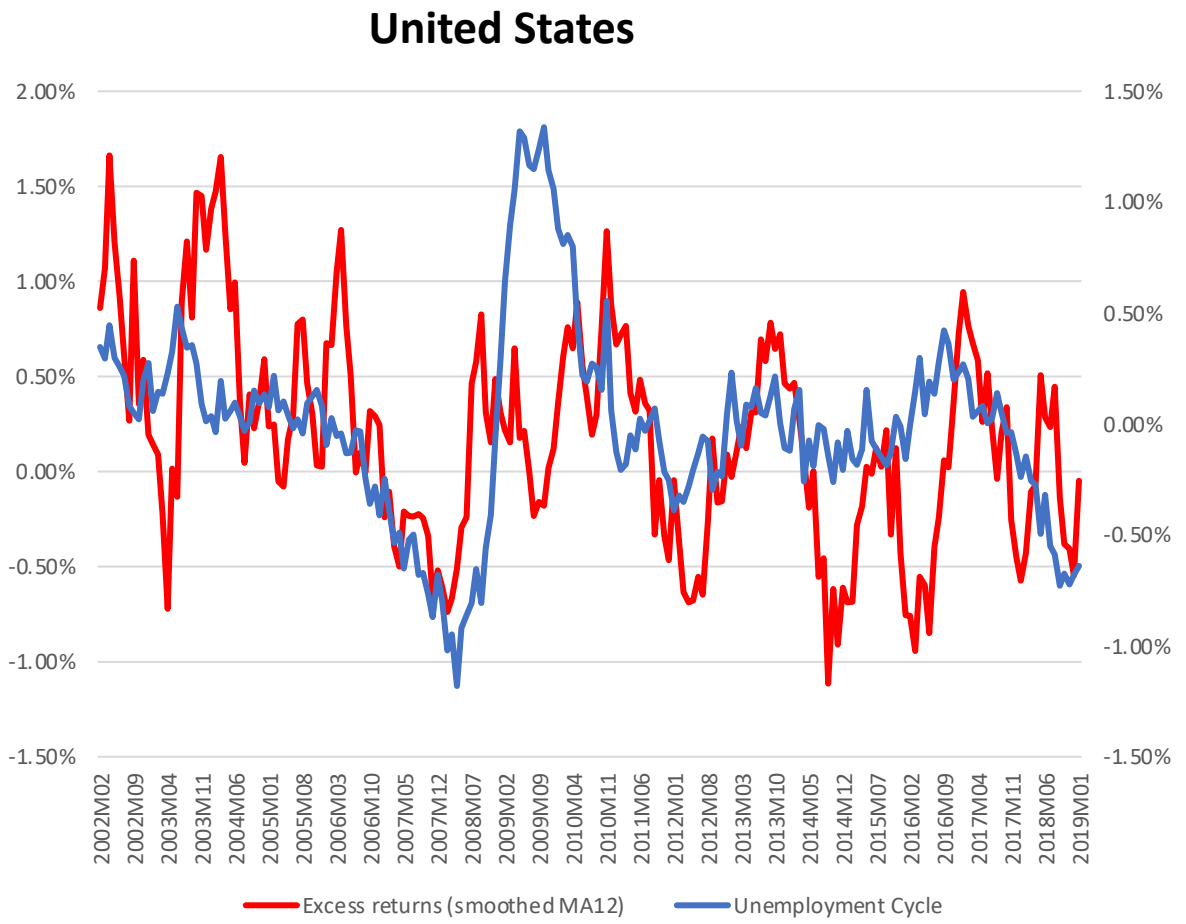
- The policy rate is one of the main conventional tools that central banks have at hand in order to control the value of their currency
- Increasing the cost of borrowing slows down the economy by decreasing the amount of investment projects that will become profitable and reducing the consumption of households.

- This increase should in theory affect smaller firms more than larger ones as they do not have the same leverage to finance themselves on the open market.
- Previous literature showed that the relative growth of small firms as compared to large ones is positively correlated with the unemployment rate

- If small firms are more constrained by the policy rate and are partly dependent on higher unemployment to grow then their growth could help to better understand the transmission from the interest rate to the unemployment rate.

II – Small cap excess returns

- There exists a relationship between the small and large cap stocks called the **small cap excess returns**
- This excess return **grows** the most **after recessions** and is **positively correlated with** higher **unemployment**.
- I first replicate the methodology of *Petajisto, Cremers, Zitzewitz* for two developed and two developing countries
- And check if this relationship also holds for them



III – Methodology

- Four points need to be tested:

$$i \overset{Tr}{\leftrightarrow} \pi \overset{Pc}{\leftrightarrow} u \overset{Xr}{\leftrightarrow} Scap$$

  - If a **Taylor rule** can be observed
  - If a **Philips curve** can be observed
  - How do **small companies react** to changes in the **interest rate**
  - Does the **growth of small companies influence** the **unemployment** rate in the country

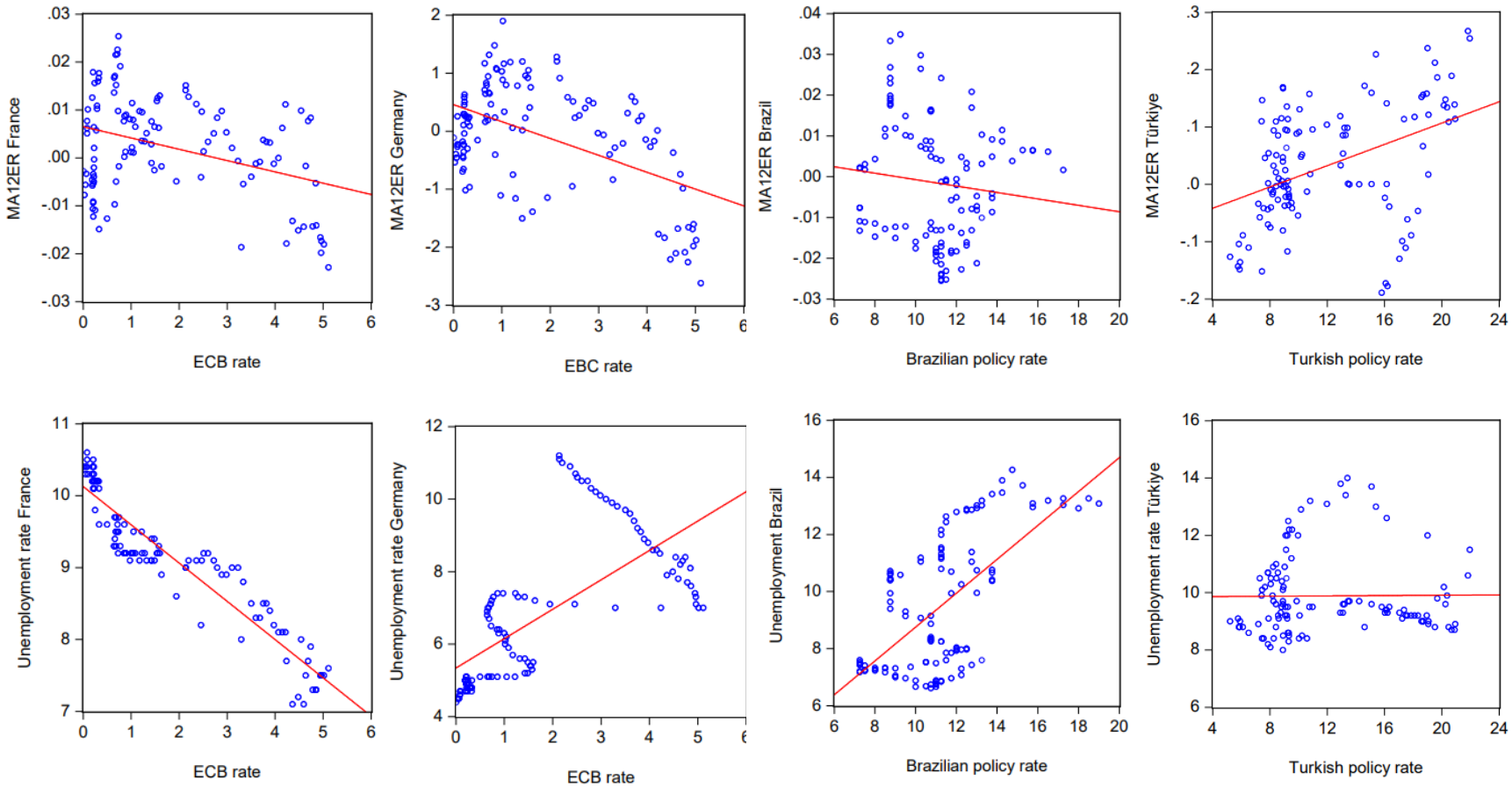
- VECM models on monthly data will be estimated to test these relationships:

$$\Delta y_t = \prod y_{t-1} + \Gamma_1 \Delta y_{t-1} + \cdots + \Gamma_{p-1} \Delta y_{t-p} + \epsilon_t$$

- One four-variables model including the unemployment rate, policy rate, inflation rate and industrial production index.
- And a second five-variable model that includes the same variables but with the small cap excess returns added at the end.
- From early 2006 to early 2022

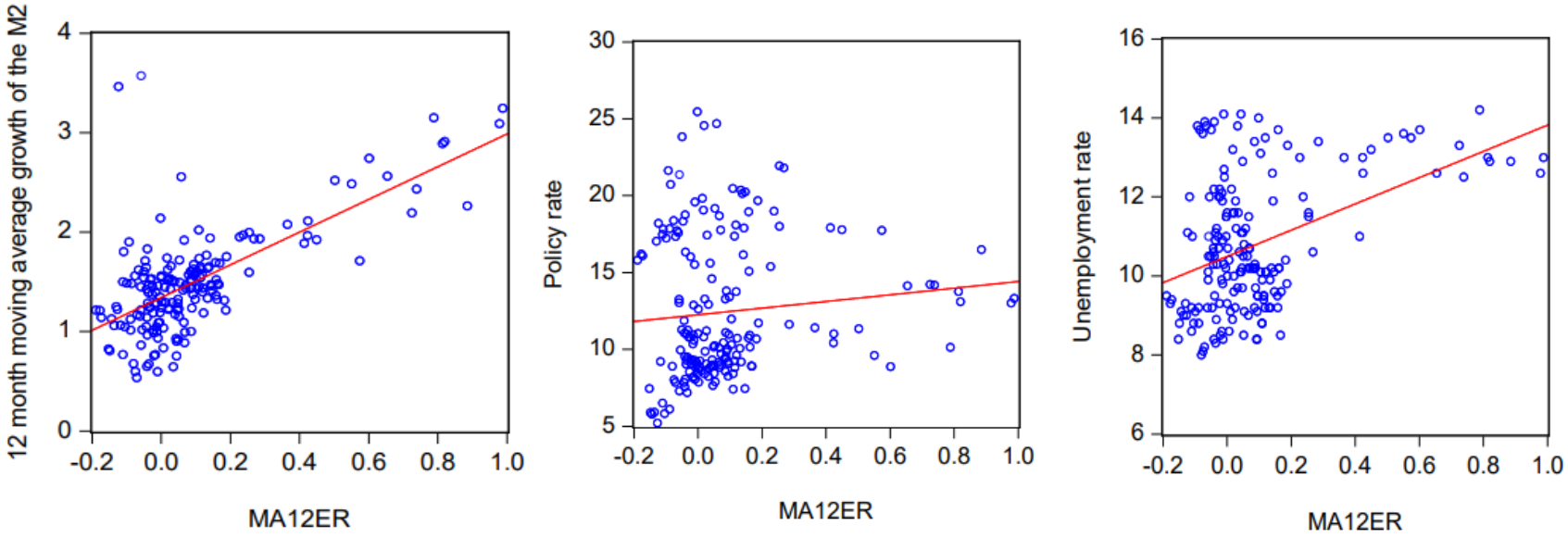
III – Methodology
Data used

- **The Index of industrial production** from the *UNIDO*
- ***Short-term rates*** from the OECD short-term rate series
- **Inflation rate** based on the *Total CPI* from the IMF
- The total **unemployment rate** from the OECD and World Bank



III – Methodology
Data used - Turkey

- Compared to other countries the turkish policy rate shows poor correlation with the growth of small firms.
- The M2 aggregate is picked instead for this analysis



IV – Results
Cointegration Equations: VECM with 4 variables

- Two cointegration equations are specified in order to test for the presence of a **Taylor rule:**

$$i_{t-1} = c + \beta ipi_{t-1} + \beta \pi_{t-1} + \varepsilon$$

- and **Philips curve:**

$$u_{t-1} = c + \beta ipi_{t-1} + \beta \pi_{t-1} + \varepsilon$$

- The **Philips curve** is validated for both France and Germany and the opposite is seen for Brazil and Turkey.
- The presence of a **Taylor rule** is less certain, being validated for France and Brazil and not for Germany and Turkey.

IV – Results
Cointegration Equations: VECM with 5 variables

- The same methodology is repeated for the model including the small cap excess returns, with difference that two cointegration equations exist:

$$scap_{t-1} = c + u_{t-1} + ipi_{t-1} + i_{t-1} + \varepsilon$$

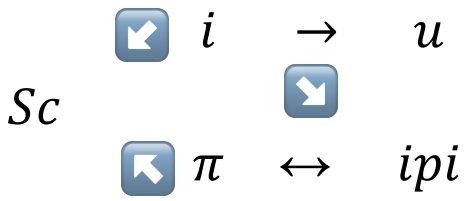
$$u_{t-1} = c + \pi_{t-1} + ipi_{t-1} + i_{t-1} + \varepsilon$$

- Greater unemployment and IPI have a positive effect and the interest rate has a negative effect on the relative growth of small firms for every country but Turkey.
- The only variable that has any significant long-term effect for Turkey is the M2 aggregate

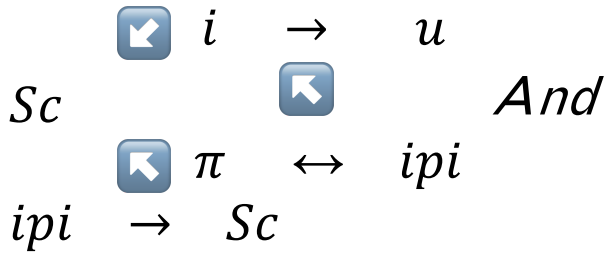
IV – Results
Cointegration Equations: VECM with 5 variables

- Granger causality is run on the last equation in order to understand the direction of these relationships:

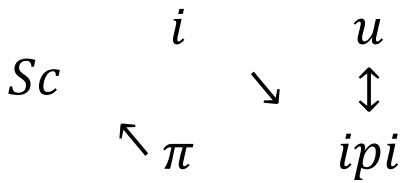
Germany



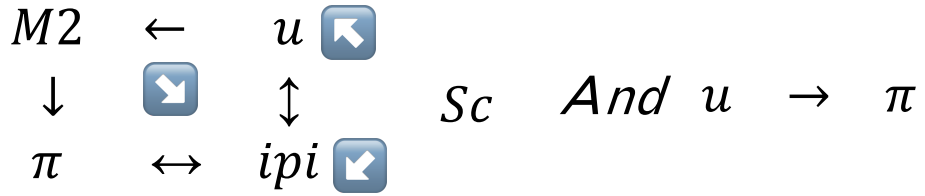
Brazil



France



Turkey



IV – Results
Impulse responses and Variance decomposition

- Lastly, two out-of sample methdologies are used in order to see how the unemployment and small cap excess returns react given a positive shock to the other variables

- Hawkish monetary policies have a signficant negative effect on the relative growth of small firms accros a countries in the dataset.
- On the other hand the growth of small firms responds positively to shocks in the unemployment rate for France, Germany and Brazil but not for Turkey.
- Only Germany and Turkey's unemployment rate respond significantly to a positive shock on the small cap excess returns with Turkey showing the strongest effect.

V – Conclusion

- For all countries there exist a significant positive correlation between the growth of small firms as compared to large ones and higher unemployment.
- Small firms grow more than large ones when expansionary monetary policies are undertaken.
- While the unemployment rate is found to be an important factor for the long-run growth of small firms, the inverse is not true indicating cyclical rather than structural effect on unemployment
- But the presence and strength of these effects could be dictated by the composition, development, and financialization of the economy.
- Small firms do react to monetary policies but the strength of their mediating role on the unemployment will depend on these factors

Literature review

Small cap excess returns

- *Banz (1981)*

Discussed the existence of a "size effect" Small firms have higher returns than large ones (1936-75, US)

- *Kim, Burnie (2002)*

Effect is tied to economic conditions, Small firms grow less when economy is in a slump (1976-95, US)

- *Switzer (2010)*

Small firms outperform large ones after recessions, and underperform before peaks (1926-2010, US/Canada)

- ***Moscarini & Postel-Vinay (2010)***

High levels of unemployment are positively correlated with relative growth of small firms.

Interest rate and unemployment:

If the CB follows a Taylor rule, this relation could be mediated by the monetary policies implemented. They use a VAR(2) with:

u => CPI => FFR => Scap

- *Cambazoglu, Karaalp (2012)*

VAR(2) with:

M2=>Total loans =>Employment rate=>industrial production index

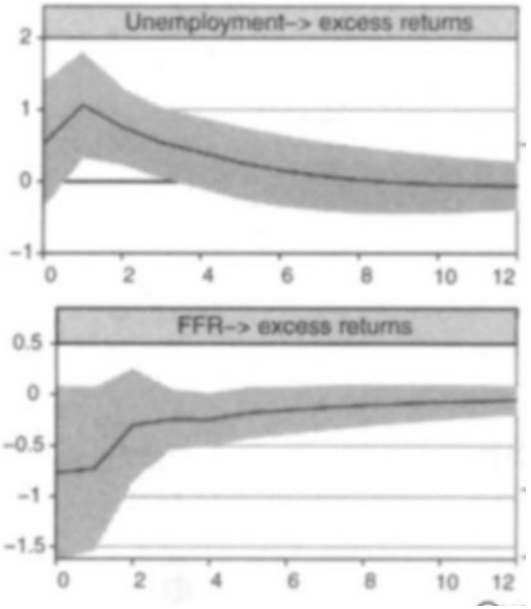
Done to see if TCB can use M2 as a target

- *Epstein (2009)*

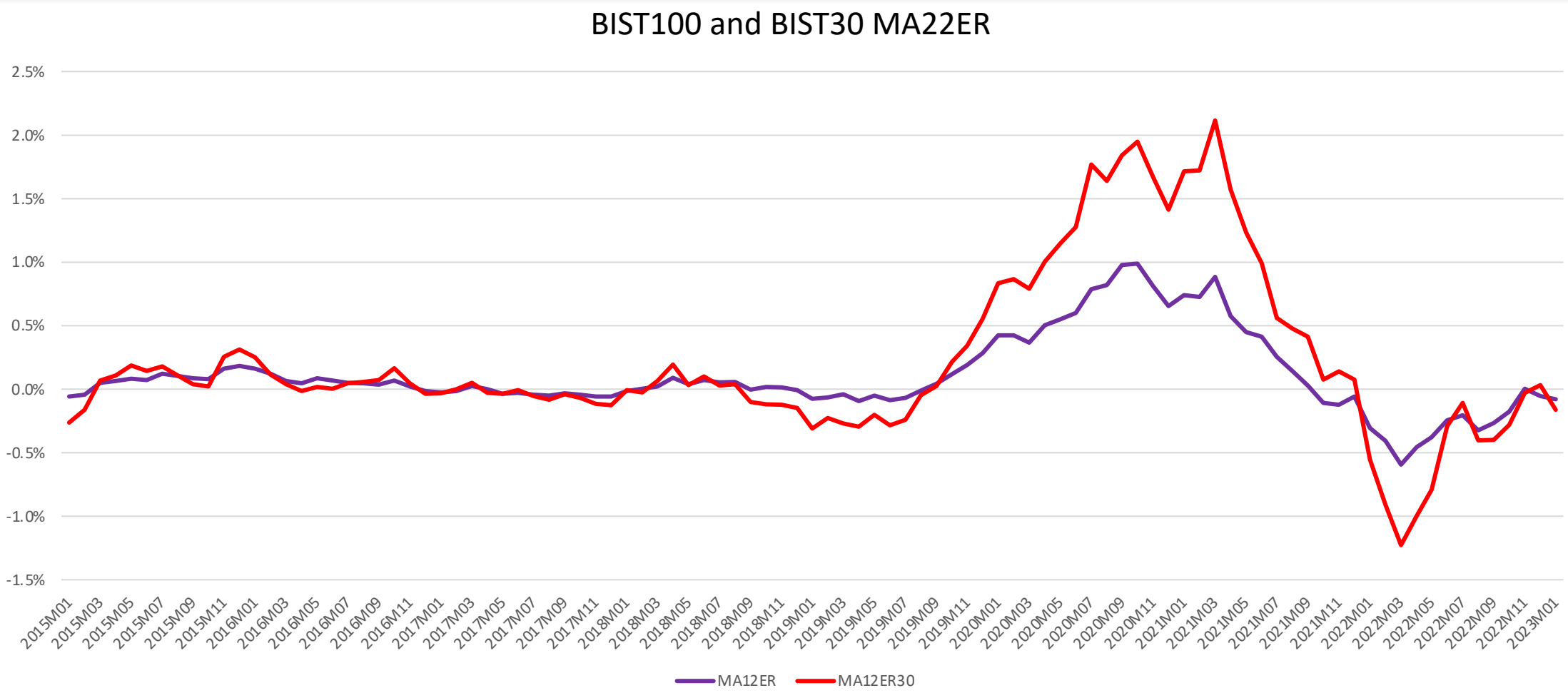
VAR(4) with:

(Prime rate=>Change ER=>infl=>growth rate) + T10 bonds

Proposes a switch to employment targeting for S.A.



ANNEX


BIST100 and BIST30 MA22ER
2.5%
2.0%
1.5%
1.0%
0.5%
0.0%
-0.5%
-1.0%
-1.5%
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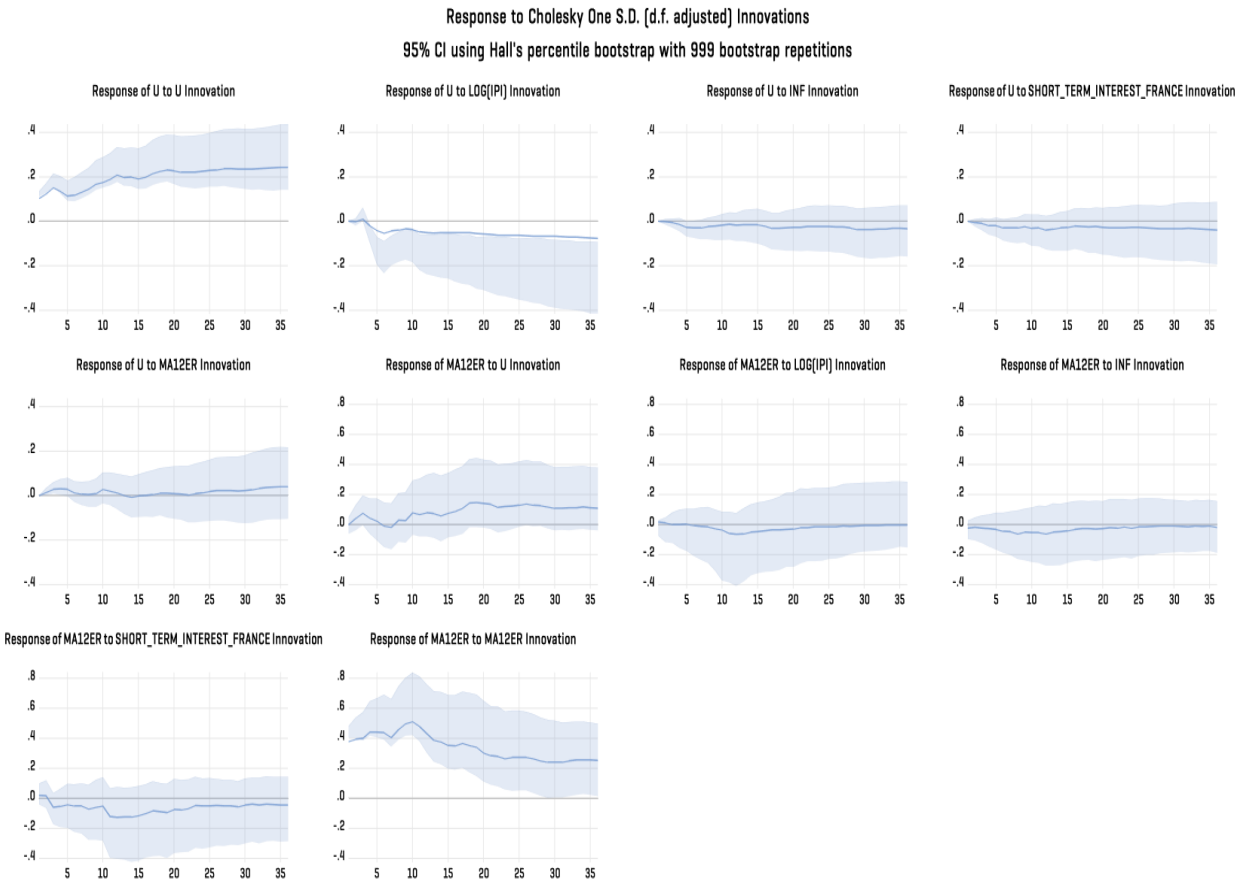
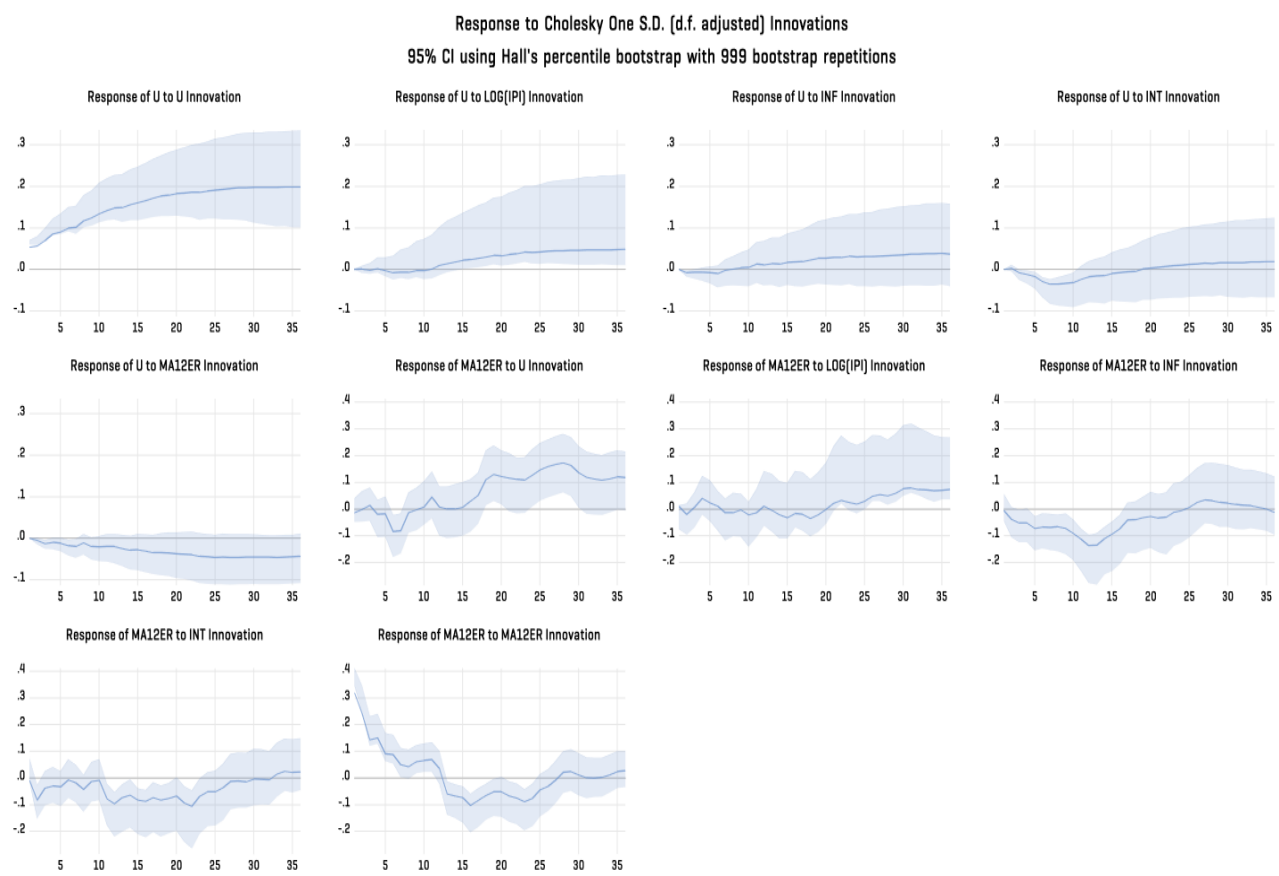
ANNEX
Impulse responses

France

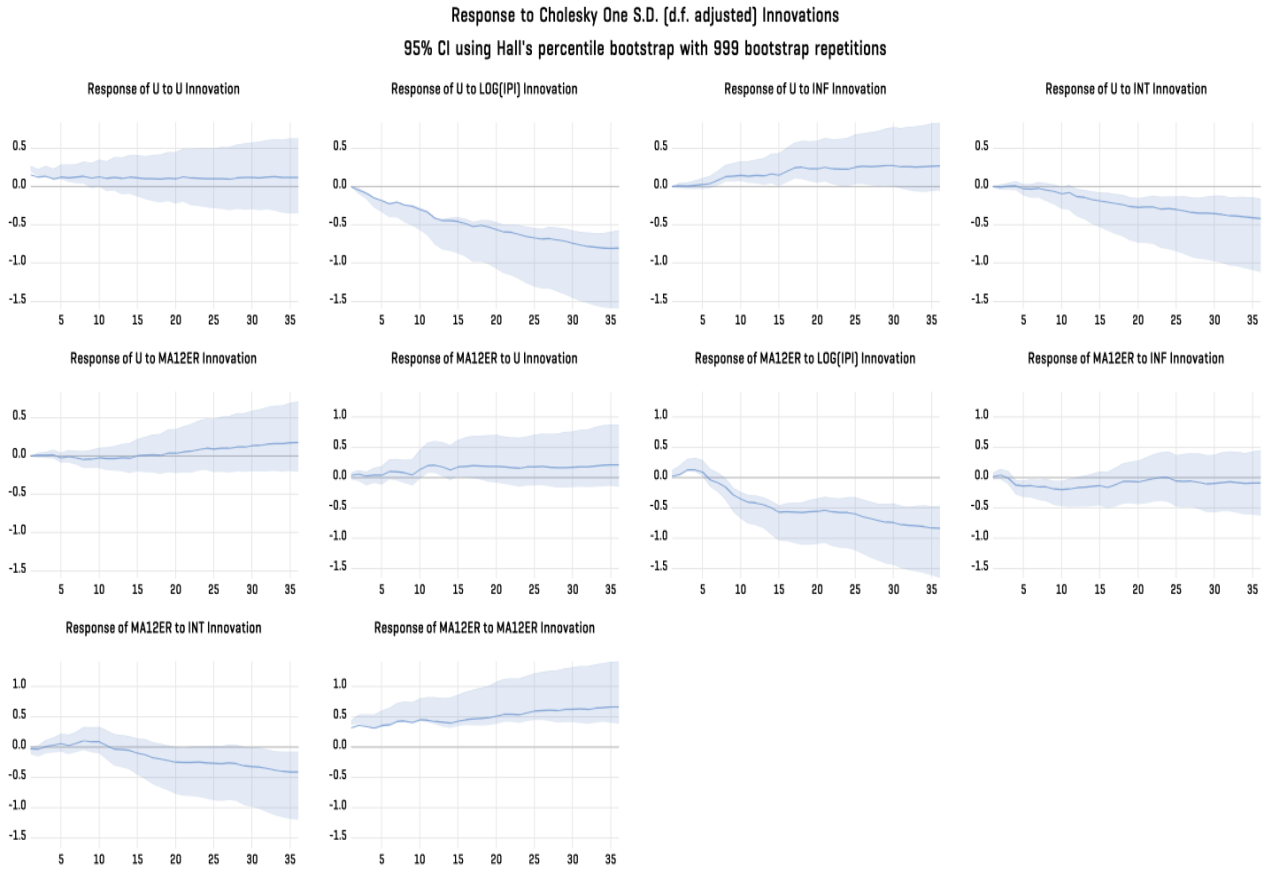


Germany

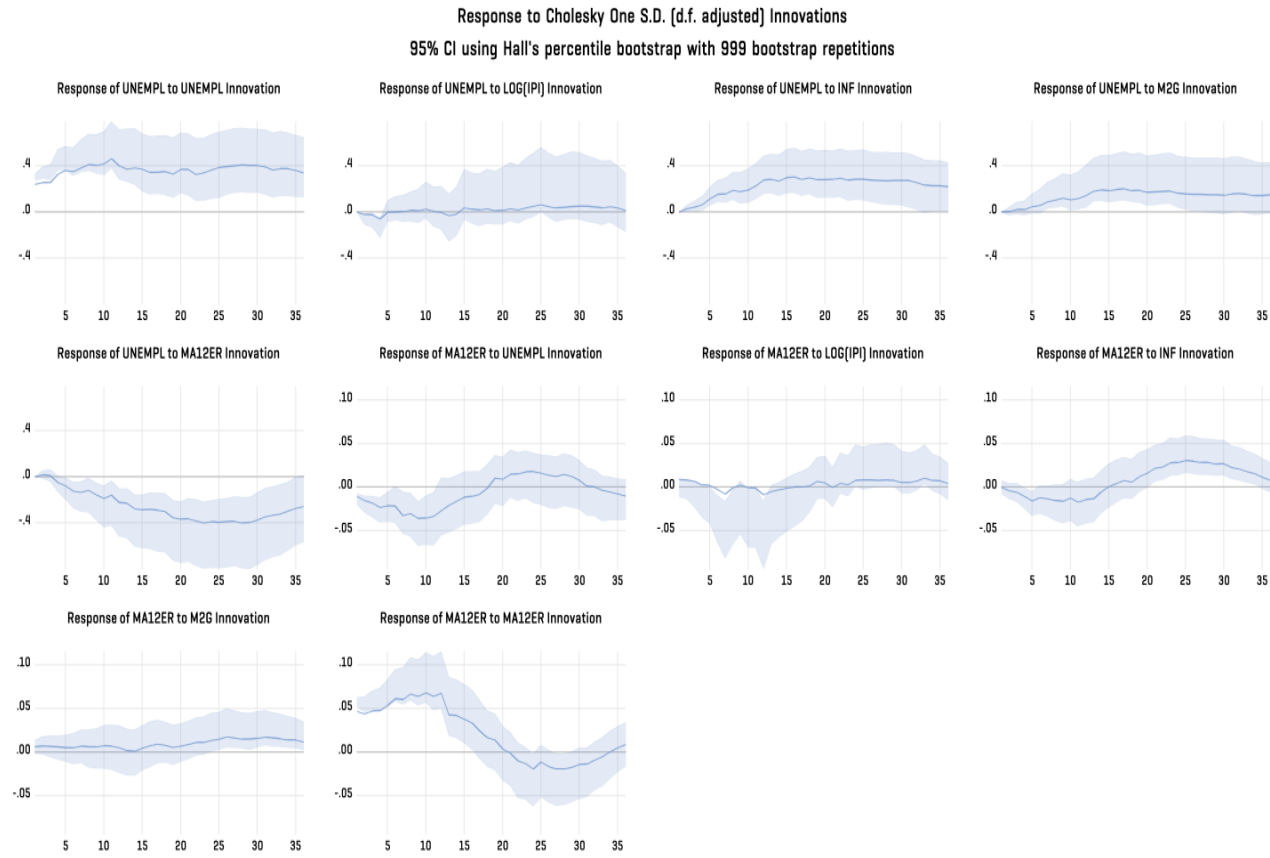


ANNEX
Impulse responses

Brazil

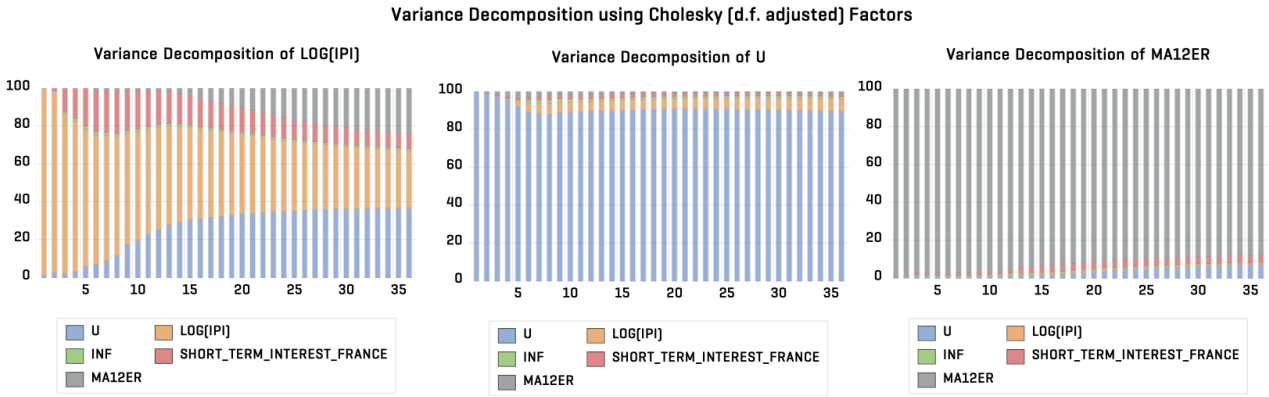


Turkey

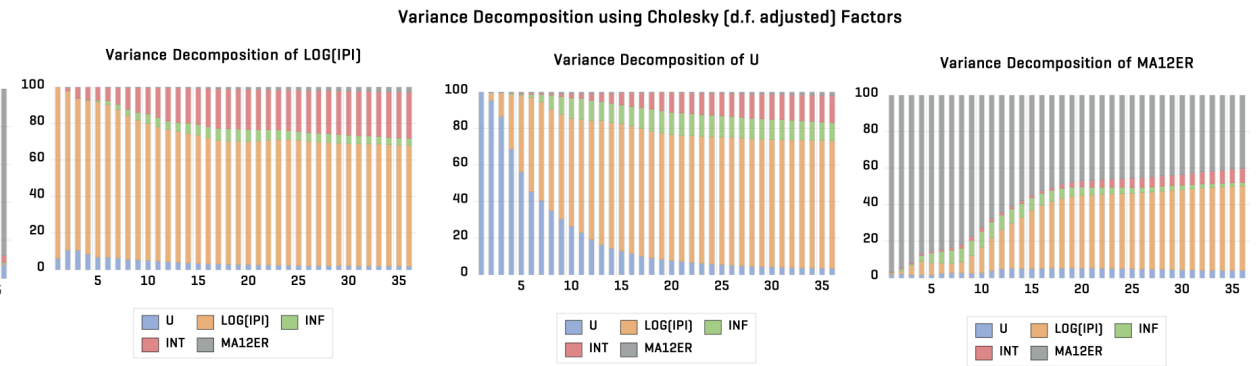


ANNEX
Variance decomposition

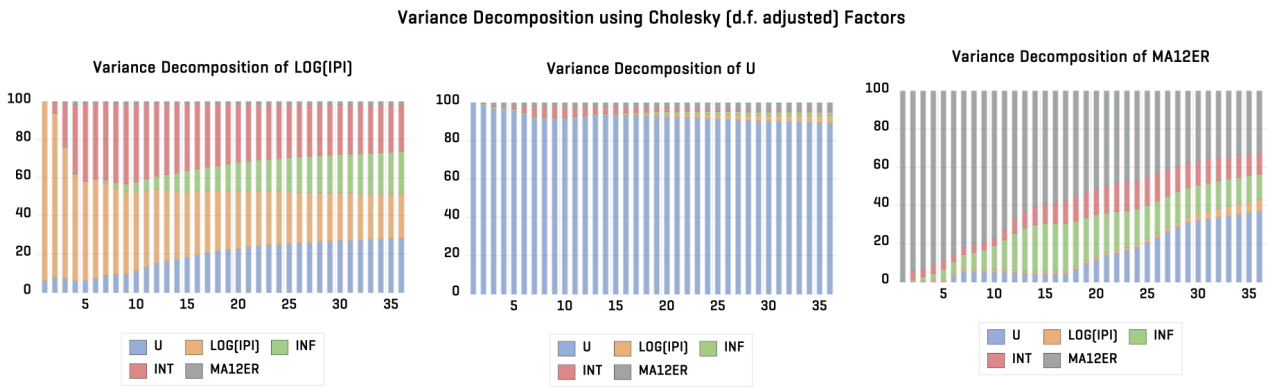
France



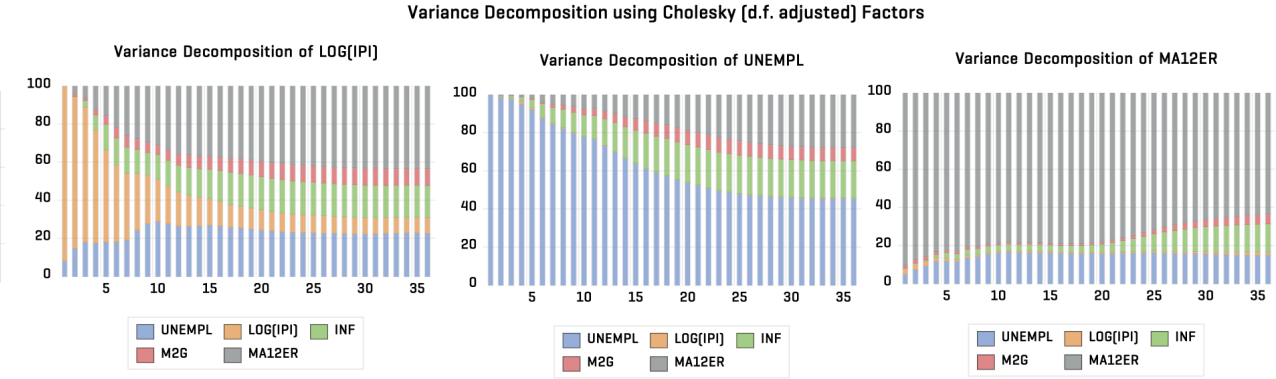
Brazil



Germany



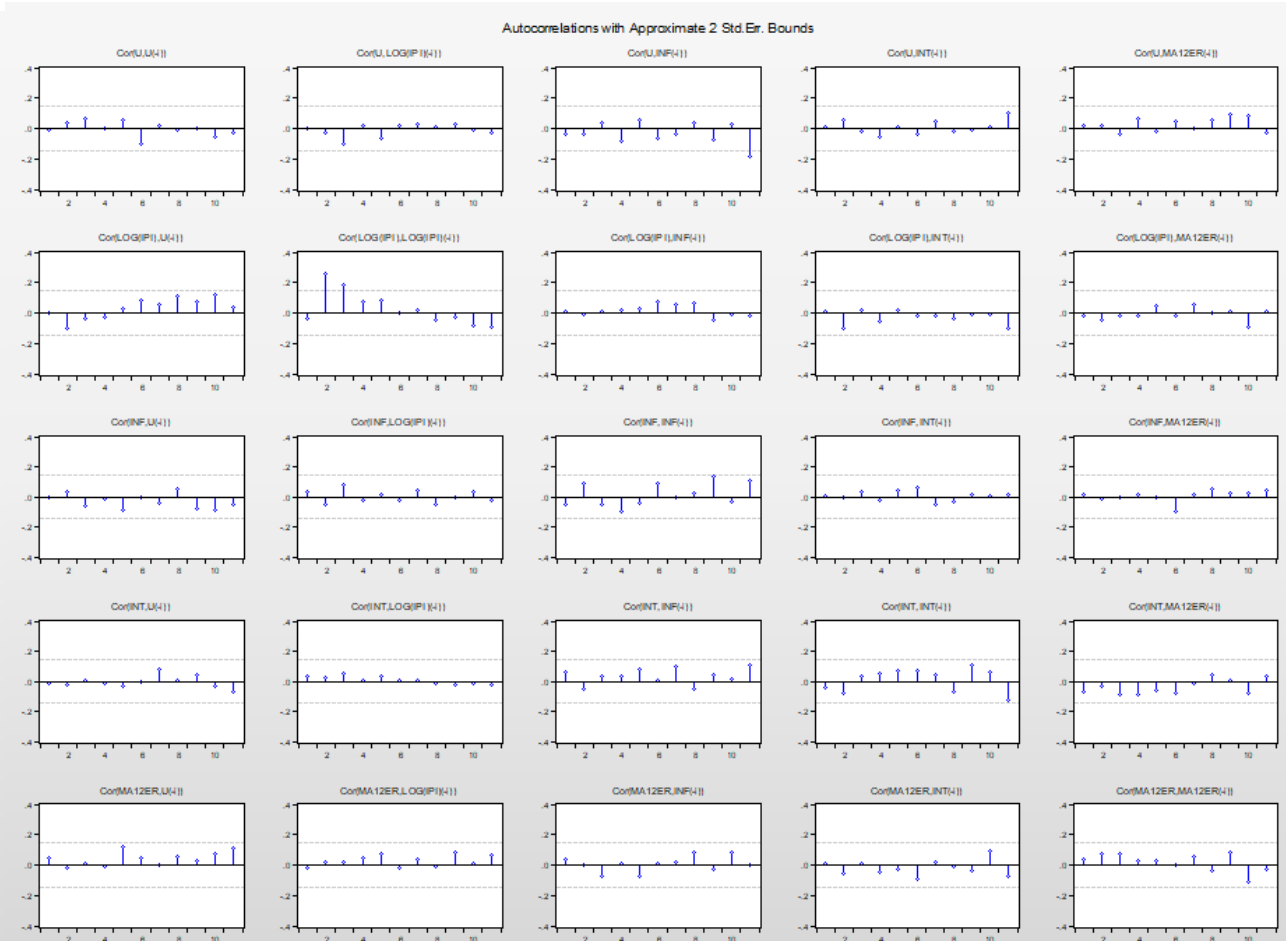
Turkey



ANNEX
Autororrelation

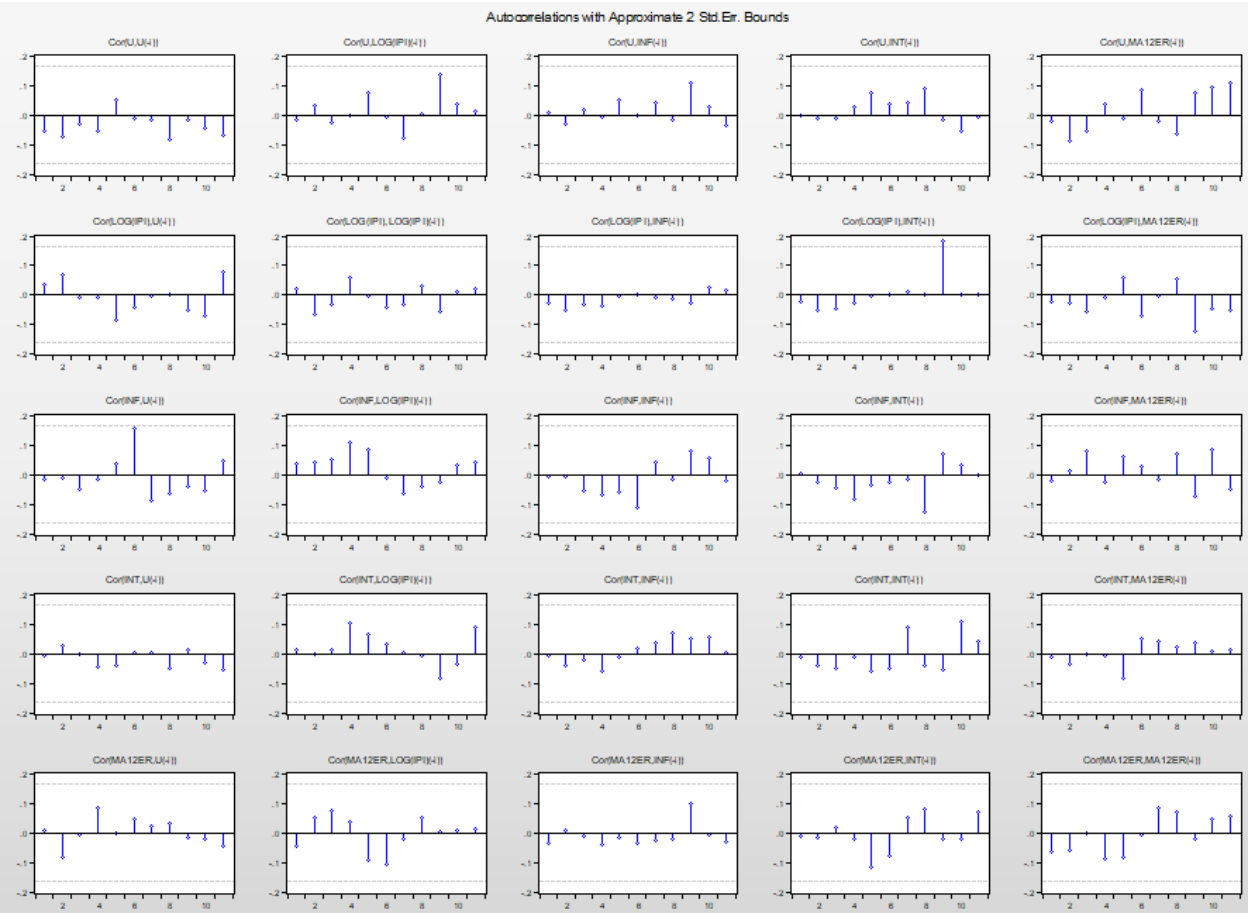
France

Germany

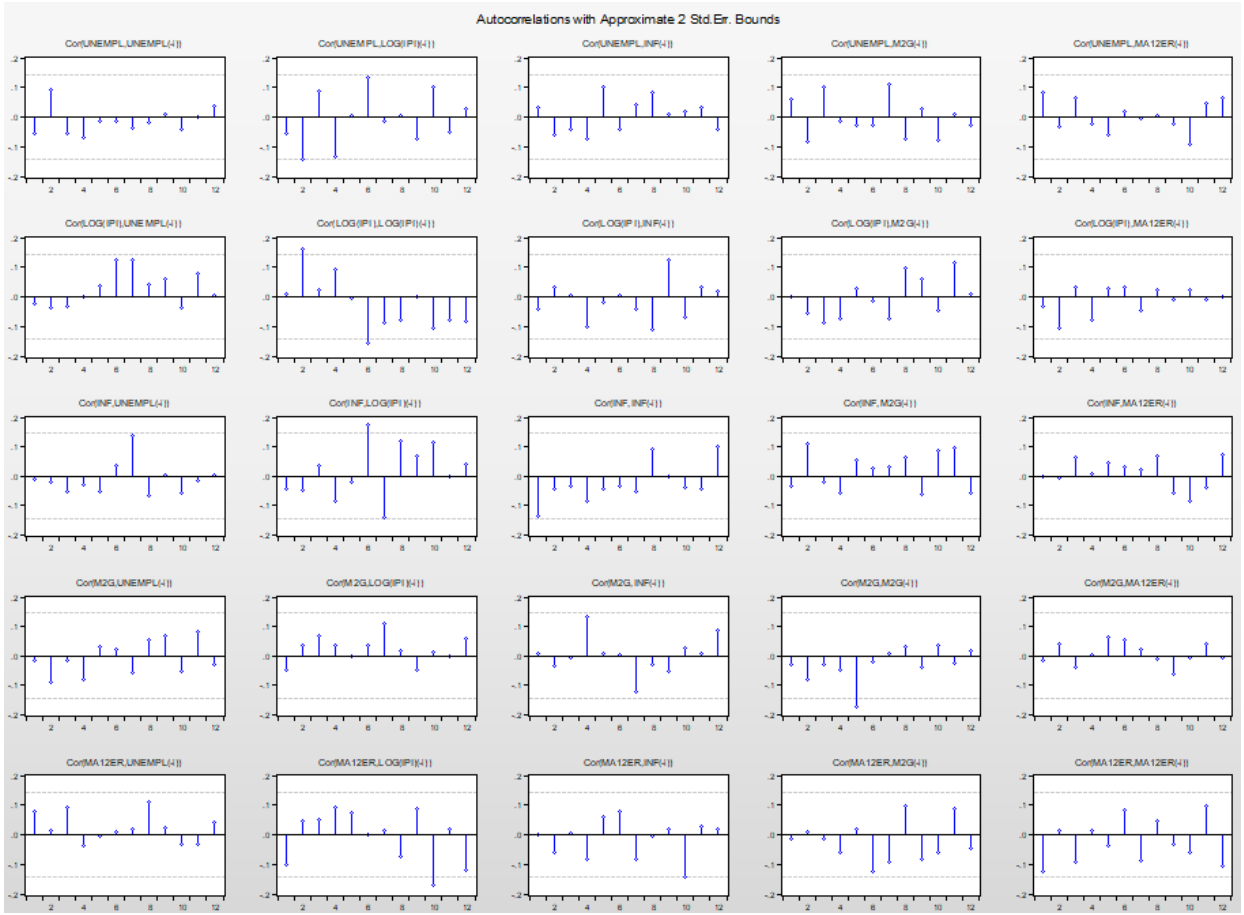


ANNEX
Autororrelation

Brazil



Turkey



III – Model

$$Y_t = \alpha + GY_{t-1} + \varepsilon_t$$

$$Y_t = \begin{pmatrix} u \\ \widehat{y} \\ \pi \\ i|M2 \\ Sc \end{pmatrix} G = \begin{bmatrix} g_{11} & g_{12} & g_{13} & g_{14} & g_{15} \\ g_{21} & g_{22} & g_{23} & g_{24} & g_{25} \\ g_{31} & g_{32} & g_{33} & g_{34} & g_{35} \\ g_{41} & g_{42} & g_{43} & g_{44} & g_{45} \\ g_{51} & g_{52} & g_{53} & g_{54} & g_{55} \end{bmatrix}$$

The VAR model will be specified as above, and the presence of **cointegrating vectors** tested, if none, a **recursive ordering** as in vector Y_t will be applied.

Once the system has been created there are 3 things I will look at

1. <u>Impulse response functions:</u>
   Given a **1% shock** to "$\boldsymbol{i|M2}$" what will be the **reaction** of "$\boldsymbol{Sc}$"
   Given a **1% shock** to "$\boldsymbol{Sc}$" what will be the reaction of "$\boldsymbol{u}$"
   and vice-versa.
   Given a **1% shock** to "$\boldsymbol{i|M2}$" what will be the reaction of "$\boldsymbol{u}$"
2. <u>Variance decomposition:</u>
   What % of the variance of "$\boldsymbol{Sc}$" is due to "$\boldsymbol{i|M2}$" or "$\boldsymbol{u}$"
   What % of the variance of "$\boldsymbol{u}$" is due to each variable.
3. <u>Historical decomposition:</u>
   During the **periods of crisis** what was the **% of the variance** of "$\boldsymbol{Sc}$"
   that was **due to** "$\boldsymbol{u}$" **.**