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Department of Economics

France's economy during the interwar period

Quantitative Economic History - Applications
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1 Introduction

The aim of this seminarpaper is to do a macroeconomic analysis of France during the inter-war period. This may be achieved by means of an insightful data analysis of the country's price index (CPI) and a reconstructed (industrial) production index (IP), but also by looking at impulse response functions (IR) and forecast error variance decompositions (FEDC). The investigated time period goes from 1919 to 1938 (Statistisches Handbuch, 1936).

Note that, to get to the right conclusions in my analysis, it is key to understand the very special socio-economic context in which the world was during the interwar period and that every country – including France – were impacted through various international political agreements (Feinstein *et al.*, 2008, Page 3-5). Especially when it comes to interpreting my results at the end of this paper, the aspect of looking at one global economy and the consequences this could have on a country like France will be in the center of my analysis.

2 Method

We estimate a vector autoregressive (VAR) model

$$\mathbf{y}_t = \mathbf{c} + \sum_{j=1}^{p} \mathbf{A}_j \mathbf{y}_{t-j} + \mathbf{u}_t;\ t = 1, 2, \ldots, T, \tag{1}$$

where $\mathbf{y}_t$ is a 2×1 vector containing output growth and inflation.[1] To identify supply and demand shocks, we use the implications of a simple AS-AD model and apply the Blanchard-Quah decomposition (Blanchard and Quah, 1989). Solving the identification problem requires to find the impact matrix $\mathbf{S}$, which links the structural shocks in $\boldsymbol{\epsilon}_t$ to the reduced form residuals in $\mathbf{u}_t$:

$$\mathbf{u}_t = \mathbf{S}\boldsymbol{\epsilon}_t. \tag{2}$$

[1] See e.g. Favero (2001, Chapter 6).

The moving-average representation of the reduced-form VAR in equation (1) is

$$\mathbf{y}_t = \mathbf{B}(L)\mathbf{u}_t, \tag{3}$$

and for the structural model, we have

$$\mathbf{y}_t = \mathbf{C}(L)\boldsymbol{\epsilon}_t. \tag{4}$$

Because of equation (2),

$$\begin{aligned} \mathbf{B}(L)\mathbf{u}_t =& \mathbf{C}(L)\boldsymbol{\epsilon}_t; \\ \mathbf{B}(L)\mathbf{S}\boldsymbol{\epsilon}_t =& \mathbf{C}(L)\boldsymbol{\epsilon}_t; \\ \mathbf{B}(L)\mathbf{S} =& \mathbf{C}(L). \end{aligned} \tag{5}$$

The relationship between the long-run multipliers is

$$\mathbf{B}(1)\mathbf{S} = \mathbf{C}(1). \tag{6}$$

Therefore, to find $\mathbf{S} = \mathbf{B}(1)^{-1}\mathbf{C}(1)$, we need $\mathbf{C}(1)$.

Pre- and postmultiplying the variance-covariance matrix $\boldsymbol{\Sigma}$ of the reduced form residuals $\mathbf{u}_t$ with $\mathbf{B}(1)$ and its transpose gives

$$\begin{aligned} \mathbf{B}(1)\boldsymbol{\Sigma}\mathbf{B}(1)' =& \mathbf{C}(1)\mathbf{S}^{-1}\boldsymbol{\Sigma}(\mathbf{S}')^{-1}\mathbf{C}(1)' = \\ =& \mathbf{C}(1)\mathbf{S}^{-1}\mathbf{S}\mathbf{S}'(\mathbf{S}')^{-1}\mathbf{C}(1)' = \\ =& \mathbf{C}(1)\mathbf{C}(1)'. \end{aligned} \tag{7}$$

If we assume a lower-triangular structure for $\mathbf{C}(1)$,[2] we can use the Cholesky decomposition of $\mathbf{B}(1)\boldsymbol{\Sigma}\mathbf{B}(1)'$ to recover $\mathbf{C}(1)$.

3 The Data

As already stated in the introductory section, I use data for output and price level that lie within a period of 20 years, from January 1919 until December

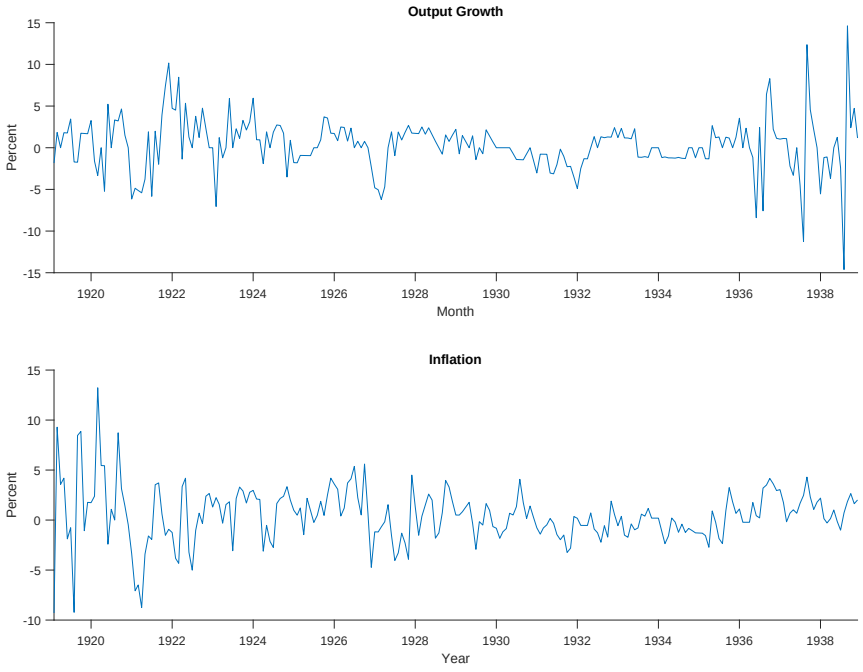
[2]Output is only affected by supply shocks, while the price level reacts to both demand and supply shocks.

1938. The data was collected on monthly basis, which means that we have a total number of 240 observations.

Before looking at any results, note that I transformed all my data in growth rates by taking the first differences of their logarithm. The reason behind this is that many times series exhibit exponential growth and have a linear time trend (Stock and Watson, 2015, Page 572). To get rid of this problem, I performed this transformation.

Now, we can take a first look on our data by plotting the time series of the GDP growth rate and inflation over time:

Figure 1: Growth Rates of Output and Price Level



The fist thing that I can note from this visualization is the high variability in the inflation rates at the the beginning of the 1920s, which lead to an increase in the price level up from 200 index points in 1919 to above

400 points in 1921.[3] The main driver that caused the prices to inflate that drastically was France's high debt created during World War I to finance its military actions. In addition - to finance postwar restauration - France had to indebt themselves even more. Note that this fiscal problem wasn't only limited to the French, but rather to many other European countries such as Germany, Italy or the UK. Furthermore, the war also transformed social and political attitudes completely, weakened the old world order and accelerated the influence of the working classes. This lead politicians into a dilemma on how to tax the different social classes. Politicians therefore decided on a very aggresive expanding monetary policy, which finally lead to these high inflation rates during 1919 to 1922, not only in France, but everywhere in Europe, especially in Germany with the occurance of hyperinflation (Feinstein *et al.*, 2008, Chapter 3).

During the mid 1920s, policy makers around the world began to worry about the negative effects of having too much inflation. On very short term, inflation in Europe helped to decrease the real weight of the highly indebted European countries and to increase exports. However, the pace in which inflation progessed was very concerning. Output, employment and incomes began to fall in almost all European contries. That's why measures to reduce government spendings, increase taxes, restrict creation of credits and - most importantly, as we will see - the restauration of the gold standard were discussed on international economic meetings (Feinstein *et al.*, 2008, Chapter 3).

Progressively, major European countries like Germany, Italy, the UK and also France reached a high enough financial stability between 1922 and 1927, which was necessary to re-instore the gold standard like it was in place before WWI, with its implication of fixed exchange rates[4].
This can also be seen by looking at the output graph in figure 1, where the growth rate is oscillating around zero, starting at 1926, when France entered

[3]To see this, plot the data for price level for the given period (Statistisches Handbuch, 1936).

[4]The fixed exchange rates were a result of binding the countries' currencies at some gold-parity level.

the gold standard, to 1936, when France left the gold standard (Feinstein *et al.*, 2008, Chapter 3).

The reason behind the re-introduction of the gold standard was that - before WWI - this system worked quite well during 40 years and a majority of economists and policy makers believed in this system. In retrospect, going back to the gold standard was one of the main reasons that lead to the Great Depression (Zurlinden, 2003, Inroduction). There are several conditions which explained the failure of the international financial system:

- **Bad coordination between the countries**: many European countries reached financial stability successively and entered the gold standard at different points in time, which ultimately lead to the believes that parities could not be credibly defended anymore.[5] Additionally, uncoordinated maneuvers continued, when the different central banks had trouble to agree on a common monetary policy (Zurlinden, 2003, Chapter 1).

- **France and the United States neglecting the common interest**: In theory, the gold standard forced countries that were facing an outflow of their stock in gold to reduce their monney supply and vice versa for countries which faced an inflow of gold. However, in reality, this mechanism was only true for countries that faced an outflow of their stock in gold. The others could avoid increasing the money supply by simply reducing the stock of domestic assets, which the central banks of France and the United States did, because they feared the cost of inflation at that time and thus, chose to privilege their domestic economies. Violating the rules of gold standard was the starting point which ultimately put an end to the whole system (Zurlinden, 2003, Chapter 1).

- **Other factors**: People didn't trust the system of the gold standard anymore, countries faced speculative attacks on their currencies, which

[5]For example, Germany entered the gold standard already in 1923, whereas UK or France entered in 1925 and 1926 respectively (Zurlinden, 2003).

forced them further into deflation. In combination with other factors like rigid nominal wages[6], a high real interest rate[7] and the increasing weight of the debt for creditors, the gold standard - in the end - gave birth to what we today know as the Great Depression (Zurlinden, 2003, Chapter 1).

Last but not least, Zurlinden (2003) notes correctly that economic recovery was observed only after the country had been freed from the constraints of gold parity. This is not different for France, as we can see from figure 1. A look at the high fluctuation of the output growth[8] - starting in 1936 when France left the gold standard - confirms this statement.

4 Results

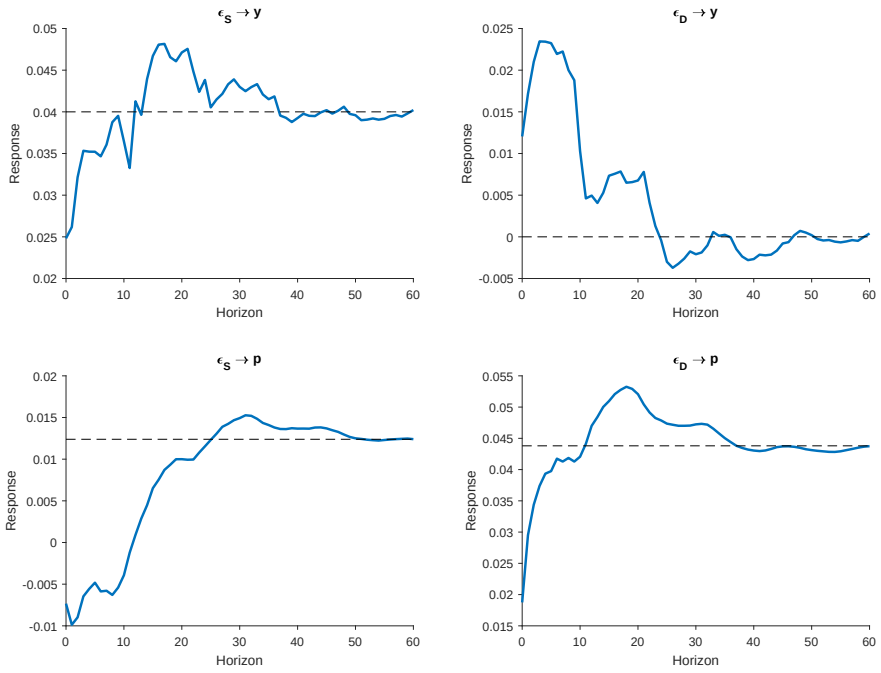
Before I analyze the results of the impulse responses and the FEDV, I need to adapt the model to my data, by determining the lag length. Note that I am using monthly data. According to Brandt and Williams (2007), one should include a minimum of 12 lags for monthly data. By simulating different models in Matlab, I get the smallest AIC value for a lag length of 14, that's why I will use this VAR model to interpret my result. With that, I am ready to plot my results. For the impulse responses I get:

[6]The creation of unions gave much power to employees.

[7]Because of high deflation.

[8]Or by looking at industrial production in levels, starting in 1936 (Statistisches Handbuch, 1936).

Figure 2: Impulse Responses



By definition, an impulse response (IR) function is showing the effect over time of structural shocks on the endogeneous variable (Pesaran and Shin, 1998). To get to the IR, one must have identified the structural parameters of the model by transforming the structural VAR into the Wold representation. However, because we have a model with 2 variables, we only get to know 9 out of the 10 parameters of the model.[9] Nevertheless, we can solve this problem by imposing 1 economic restriction on the parameters of the structural VAR, that is, I will assume that demand shocks have no impact on output in the long run (Favero, 2001; Sims, 2002).[10]

Interpretation of the graph: If we assume France's economy to react in the framework of an AS-AD model, then the graphs on the upper triangular

[9]We can find out the number of restrictions by applying the formula Sims(2002) suggests in his paper in Chapter 3, Page 4: $(n^2 - n)/2$, where n is the number of variables used in the model. Here, n equals to 2, e.g. we have 1 restriction.

[10]I draw this insight from the AS-AD model.

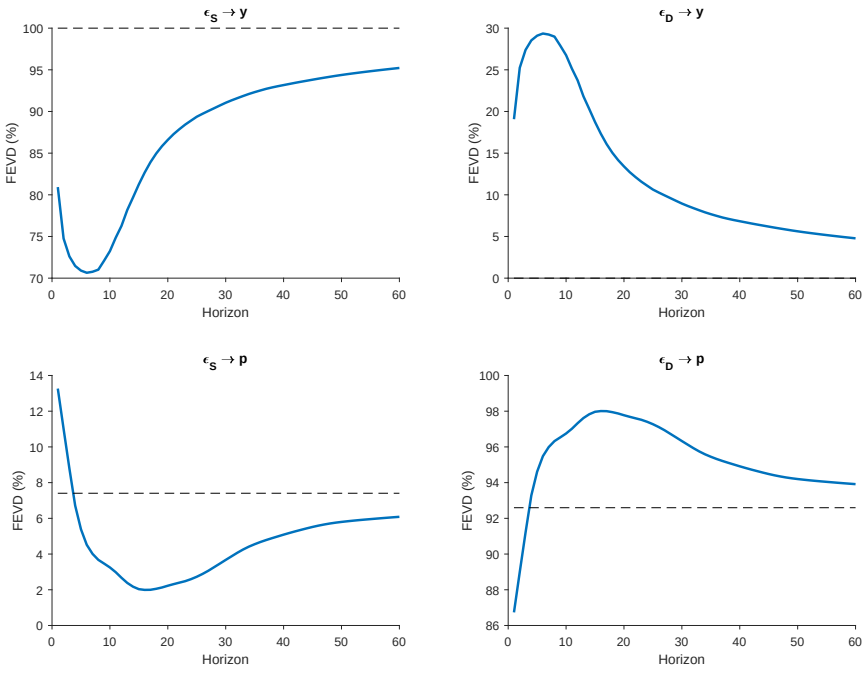
of figure 2 make sense.

- The IR-function on the upper right graph converges to zero in the long run, because of the restriction.
- The upper left graph, where a supply shock hits the economy, will lead to higher output in the long run.[11]
- The lower right graph, where a demand shock hits the economy, will lead to higher prices in the long run.[12]
- Finally, the lower left corner is the only graph which does not appear to be explained by the AS-AD framework. According to Eggertson (2012) , this is due to the fact that the slope of the aggregated demand curve was changed from downward-sloping to upward-sloping during the interwar period. Thus, any supply shock in such a world would lead to increasing output as well as increasing prices in the long run, which would be in line with what we can see in figure 2. Note that - even in such a framework with an increasing AD-curve - we would still get the same results for demand shocks, as in the standard AS-AD model.

Note that - for all four graphs in figure 2 - the y-axis is in percent, since we did a log-transformation to both variables of our model.

[11] Which is in line with the theoretical approach of the AS-AD model
[12] Which is in line with the theoretical approach of the AS-AD model

Figure 3: Forecast Error Variance Decomposition



Interpretation of the graphs:

- If we look at the upper two graphs of figure 3, we see that - in the long run - 100% of the variation in output is due to supply shocks, which is what we expect, since we assume to be in an AS-AD world.

- If we look at the two graphs in the second row of figure 3, we see that - in the long run - approximately 93% of the variation in prices is due to demand shocks. This result also seem to make sense when we look back at the historical context I described briefly in chapter 3: France and many other countries in Europe had to adapt their monetary policies quite alot because of the gold-standard. The 7% of the variation in prices due to supply shocks may be explained by the creation of many unions in France, which empowered the workers (Feinstein *et al.*, 2008, Chapter 3).

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Zurich, March 11th, 2019