A Work Project, presented as part of the requirements for the Award of a Master Degree in Economics from the NOVA School of Business and Economics.

# Tourism In Portugal: Dynamics, Persistence and Impact

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A Project carried out on the Master in Economics Program, under the supervision of:
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May 2018

**Abstract**

This study presents an empirical evaluation of the impact of tourism on the Portuguese economy. We use a two-step FAVAR with a five principal component estimation to nest the effect of tourism in other 127 macroeconomic variables. Our findings point to some channels in which tourism can help an economy develop and recover from a crisis. The overall effect on the variables is positive, but the most prominent dynamics concern the labour market. The variance decomposition, with an $R^2$ ranging from 29.7% to 89.0%, is more robust in indicators such as Unemployment (14.0%) and Industrial Employment Index (18.3%). It also accounts for 3.7% of the overall Economic Sentiment Indicator, showing improvements in economic agents' expectations. Finally, the representation of tourism shocks along time backs the hypothesis of tourism helping the Portuguese economy in recovering from a financial crisis.

**Keywords: Tourism**, **Portugal**, **FAVAR**, **Dynamic Factor Models**, **Macroeconomics**.

# Introduction

Tourism has become one of the fastest growth economic sectors worldwide. Despite being a highly valuable economic sector in Portugal, it is not crystal clear that exogenous variations have an effect in the economy. In particular, for a small open economy that shares common policies with very different countries, there is no evidence on which economic channels can benefit from tourism an enhance growth. In this respect, Easterly & Kray (2000) advocate that smallness is not a disadvantage for a country's economic performance. While some work and discussion exist on the matter a more insightful quantitative research is needed to guide Portugal into more compelling and useful policy formulations. According to the World Tourism Organization, the sector is one of the largest and most active economic industries in the world accounting for about 9% of both employment and GDP worldwide (UNWTO, 2015). However, the main scope of the project is not only to assess tourism itself but instead its dynamics and quantitative impact on an economy such as the Portuguese. Ten years after the subprime mortgage crisis triggered in the USA some grounds can be built on how

a country-specific event can have systemic effects and global implications. On this matter, the UNWTO advocates that tourism began to decline during that time with tourism arrivals plummeted by around 8% between January and April 2009. Further research confirmed a similar drop in passenger traffic around the globe (Papatheodorou et al., 2010; Smeral, 2010). Therefore, we will focus on tourism and try to answer a similar question. How does tourism impact an economy? Does it help in recovering from a financial crisis? As following, how can we use its dynamics and quantitative measures to further tailor its policies and shocks to help the economy overcome slumps. The present work contributes to the literature as a novelty in various manners: to the best of our knowledge it is the first among literature which investigates tourism dynamics, shocks and impact in the real economy, especially regarding Portugal; besides, it is an extension of a FAVAR framework that enables us to in-depth investigate the tourism outcomes in various parts of the economy. Therefore, the primary goal of this thesis is to empirically analyse the Portuguese key economic variables in response to to a tourism exogenous shock using a Dynamic Factor Model. By unfolding the extent to which tourism shocks affect an economy, we analyse a set of 127 macroeconomic variables and try to understand its dynamics for a given period. We further investigate the behaviour of those distresses before and after the economic crisis as well as the quantitative forces that might drive each economic indicator helping us to formulate policies better.

The remainder of this thesis is divided into five chapters. Chapter I will give a review into the most recent literature on tourism worldwide, its relationship with macroeconomic variables, economic growth and tourism in Portugal. Later on, a theoretical background on the usage of Dynamic Factor Models is assessed. Chapter II aims to describe the data collection and its correction for this work circumstance following firstly, a similar fashion as previous literature and secondly, an out-and-out explana-

tion of the methodology choice and its estimations. In Chapter III the framework is described thoroughly with special care on the specifications of how a Dynamic Factor Model is formulated through a FAVAR. Afterwards, Chapter IV will present the empirical results followed by a conclusion on the results, shortcoming and recommendations on further research in Chapter V.

# I Literature Review

Since the early days after the revolution of 1974 Portugal has presented throughout the years unbalenced economic aspects. From economic and social growth to credit booms and slumps, the country always faced different economic concerns. Much literature describes what led Portugal to the crisis and what is making its recovery from now on. Blanchard & Pedro Portugal (2017) revisited the firsts' work of 2007 to analyse what is coming next supporting the idea that structural measures are necessary, but few studies show perceptive work on the sectors that are pulling economy through. Cao, Li & Song (2017) helped on this matter by analysing the tourism financial front, where they show that many countries remained subdued by the credit constraints restricting economic activities and the capacity of tourism firms to expand. As of 2009, the labour market also suffered from the unemployment worldwide, with a rate estimated between 6.5% and 7.4% (Papatheodorou et al., 2010).To link such relationships between macroeconomic indicators, crisis and tourism we resort to the study of Brida, Cortes-Jimenez & Pulina (2016) where is formulated the *tourism-led-growth (TLG)* hypothesis that explains the causal relationship between local economic growth and incoming tourism. The latest variable is mainly subjective by economic factors in the source countries, and its macroeconomic performance is dependent on the external macro environment and world business cycles, particularly in such a small open econ-

omy as the Portuguese. Consequently, it is imperative to reinforce our perspective of tourism as a leading macroeconomic variable while exploring its additional features on the economic environment at a country level. Besides the contribution of its revenues to financing the current account tourism can also help solve regional problems such as unemployment (Soukiazis & Proena, 2008). Likewise, when analysed *per se*, tourism has both direct and indirect spillover effects on other economic activities, such as transportation, construction, commerce, retail and other services. Again, Cao, Li & Song (2017) touch a perspective that reinforces the curiosity around this work's scope. On the one hand, they advocate that many crucial players are both top destinations and top source markets, for example, Australia, China, and the USA. The same happens in Europe where France, Germany, Italy and the UK are mentioned. By looking at those countries, one can also infer that they are major world economies, indicating the close relationship between economic development and tourism. On the other hand, Jafari et al., (2000) and Stabler et al., (2010) argue that developing countries tend to have a trade surplus on the tourism account,[1] while developed ones are more likely to foster deficits. In fact, citizens of top performing countries are more likely to travel abroad and usually are topmost spenders. Therefore, countries such as Portugal, Italy and Spain are usually well-coordinated with developments worldwide concerning tourism, which connected them as top destination henceforth, making them capture a large number of tourists (Cao, Li & Song, 2017).Engagement in international tourism activities is a global phenomenon. Considering the geographic location, the key players are widely spread across all the different continents. Consequently, they are not limited to a particular region but include not only developed countries in Europe but also emerging economies such as Russia and China. Tourism is widely known by its positive effects on the economy, specially in countries that are well endowed concerning

[1]The tourism account is part of a country's balance of payments which records its economic and financial situation. It is affected by international tourism.

weather, gastronomy and other variables of the sort. In fact, it is important to understand what is driving economic growth nowadays. Some authors advocate in favour of some industries while others focus their research on external variables that affect the economy. For example, scholars used to believe that exports drive growth. All things considered, it is not crystal clear that tourism is related to a country's GDP growth. Ivanov & Webster (2007) ask for what we chiefly do throughout this work by saying that the economic impact of tourism requests a much more far-reaching view on the analysis of the interaction between tourism and GDP. For illustration purpose, the authors say that an increase in tourisms share in GDP may be a consequence of stagnation of other industries. Hence, we cannot perceive the benefit of tourism accurately to be the growth generated by itself and its share on GDP, or the simulation of tourism in other industries. This pitfall reinforces the importance of this study as we can forcefully show tourism impact on other industries and economic growth activities. If we focus our inquiry in Portugal, a country that has been reported as a top destination, and benefiting from tourism to fast-growth, tourism is becoming one of the most important economic sectors. While we aim to confirm the tourism role in the Portuguese economy, this is not the first time someone analyses this topic. In 2010, Rodrigues & Andraz aimed to explain the role of tourism and its multiplier effect in other sectors of the economy using an outlier detection procedure to investigate pronounced effects in Portugal. Certainly, it is possible to conclude after all, that international events can illustrate how tourism is model worldwide and how destinations and markets can be affected by external disruption. These external events are sometimes the key. This work adds science to the discussion since it is not plain vanilla that tourism drives growth. For the American economy, Tang & Jang (2009) support the plausible argument that there is no long-run relationship between the tourism industry development and an economy. Moreover, they advocate th at there might be a

uni-directional causality and by improving GDP and the general business and industry situation, the tourism sector could benefit from it. Those effects could pull the country factors as a destination which will, in the end, lead to benefits on the overall economy. To support our model, one must bear in mind that these empirical studies are mostly based on different countries reflecting inconsistent results backing the so-called country effect (Tang & Jang, 2009). Most studies entail to explain the relationship between tourism and economic growth and its causality but fail to study its roots, dynamics and impact. Oh (2005), produces a VAR approach trying to understand the role of tourism in the Korean economy and concludes that policies for tourism-attracting, as a means of economic development, might not be entirely effective in expanding the economy, neither lead to tourism growth. Not totally out of scope, but further from our intents, is the relationship between the exporting profile of a country and its economic performance that might be useful for tourism. However, many kinds of literature are published (Darrat, 1986; Dodaro, 1993; Hsiao, 1987) and fail to support, that exports-led economic growth. Rodrigues & Andraz (2010) conclude that negative or positive events in one particular place lead to demand shifts in others, a conclusion that could be upheld when Portugal received the Expo back in 1998 and reacted positively. The contrary can be said when there is a recession such as in 2008. Kasimati & Dawson (2009) studied the impact of the Olympic games in the Greek economy attesting to evidence of these events improving economic activity. In particular, from 1997 to 2005 they estimated a 1.3% growth of GDP per year, while at the same time unemployment fell by 1.9% per year. Moreover, economic resembles can be drawn between Greece and Portugal. In that sense, Dritsakis (2004) describe as a strong causal relationship between the tourism earnings and real exchange rate on the economic growth while adding that more significant public policies are justified. Not only is important to increase tourism demand but also to develop its supply. Finally, we do not disregard

many conclusions from Rodrigues (2012). Besides his remarkable work on the sector, having a wide range of literature focusing mainly on regional sectors in Portugal, he also exploits other countries' implications in the Portuguese tourism. All in all, it is not a dull field that tourism can affect an economy, mainly because we do not know the cause and the magnitude of its shocks in all the macroeconomic indicators. To empirically study such a matter many scholars germane to ask which models suit a question best. No doubt that the same learners assessed the Portuguese situation, however, estimation methods that are more reliable and present fewer pitfalls are imperative. These models have the purpose of satisfying the empirical macroeconomic ultimate goal on estimating the effect of unforeseen structural instabilities, mostly known as shocks. Thanks to Sims (1980), the dominant framework and an updated version of a simple VAR is the structural vector autoregressive (SVARs). We extend our study to a broader scope and investigate a more extensive set of suitable models. Serving this work goal, initially developed by Geweke in 1977, the extension of the Dynamic Factor Models erupted since then. For example, the seminal work of Sargent & Sims (1977) showed that DFM could explain a significant fraction of the variance of important U.S. quarterly macroeconomic variables such as output and prices.[2]

Despite the variety of Dynamic Factor Models existent, we resort to the second generation using a Principal Component Analysis. This estimation, yields a small number of the so called common factors which summarise the complex co-movements of a potentially large number of observable series, making it useful to analyse the specific variable under consideration.[3]Consequently, this supports that, despite the extensive usage of simple VARS among time-series analysis, a two-step approach using a FAVAR model stands out in macroeconomic application.

[2]More empirical findings backed this idea on the importance of DFM, see for instance Watson (2004) or Giannone, Reichlin & Sala (2004).

[3]To select them accurately, scholars proposed various manners such as Bai & Ng (2002), Stock & Watson (2006) or Owen & Wang (2015) as we will discuss later.

# II Data Collection

Following Stock & Watson (2012) methodology, this work uses a wide range of data to incorporate the model and yield more accurate results[4]. Using monthly data this work complies 127 data series. Starting from 1995 to the latest year of 2017 it comprises Business and Consumers Surveys *(43 series of soft data)*, Industrial Production *(7 series)*, Retailing Sales *(4 series)*, Industry and Services Turnover *(20 series)*, Labour Market Data *(5 series)*, Hours Worked and Wage Indexes in Industry and Services *(24 series)*, Automotive Industry *(3 series)*, Tourism *(3 series),* Energy Consumption *(3 series)*, Goods Exports and Imports *(10 series)*, Real Effective Exchange Rate, Cement Sales, PSI20 *(Portuguese stock market index*), ATM/POS series and Consumer Price Index . All the data presented is listed in *Appendix C* with the corresponding source. Macroeconomic data asks for a more compelling screening when looking to future pitfalls that can add noise to our assessments and therefore produce less robust results. Henceforth, despite most of the data being in seasonally adjusted basis, the ones which were not and presented any seasonal pattern were adjusted using an X13-ARIMA.

Finally, to ensure the stationarity of the series we performed two transformations: for the survey data the first difference was made, while for the remaining the first difference was taken after taking the respective logarithms.

## II.I Estimation

Afterwards, we estimate the common factors.An outlier-adjusted series was used, following the methodology of Stock & Watson (2005). This correction consists on replacing observations of the transformed series with absolute deviations surpassing six times the interquartile range by the median value of the anterior five observations and

[4]Appreciations to Dias, Pinheiro & Rua (2014) since they make it more possible for the Portuguese case.

was previously used for the same data set giving it even more robustness. From the 127 data-series, extra conservative measures were made since PCA is sensitive to double counting. A subset of the data, including only 80 series[5] and without our tourism variable, was used. Moreover, pure GDP was avoided since many of its components were present. Therefore, mainly two things were achieved: we used Industrial Production as a proxy of GDP following Bernanke, Boivin, & Eliasz (2005) and disaggregated series were privileged instead of altogether series, avoiding high-level aggregate series. The number of components to use is far from being a clear-cut. Many scholars present

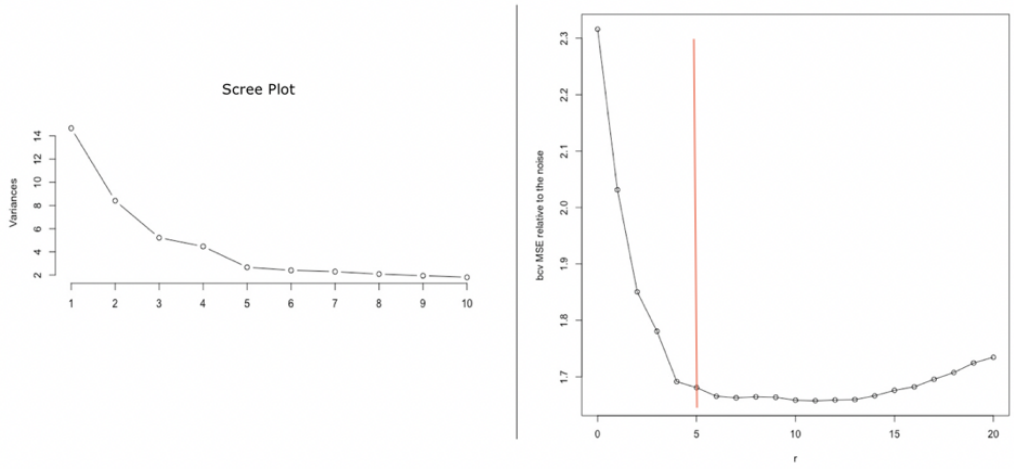


Figure 1: Scree plot and bi-cross-validation method proposed by Owen & Wang (2015)

literature on which the number of factors should be, and they all present different results fortunately possible for one to draw some conclusions on. In 1966, Catell (1966), introduced a scree plot - a visual diagnosis that plots the fraction of the total variance in the data explained by each component. As of this work, besides the necessary scree plot assessment, the number of common factors $\mathbf{r}$ relies on information criteria and a specific number of tests. Specifically, we estimated them by means of the test proposed by Onatski (2010), using the eigenvalue difference suggesting $\mathbf{r = 4}$. The criterion by

[5]The list in *Appendix C* presents the variables included and excluded from the PC estimation.

Bai & Ng (2002) suggesting $\mathbf{r = 7}$, and the bi-cross-validation method proposed by Owen & Wang (2015) suggesting $\mathbf{r = 8}$. By retaining the eigenvalues higher than one and looking at the scree plots, some conclusions can be made. Our baseline specification was made with $\mathbf{r = 5}$ and this decision was made weighing three factors: firstly, concerning the numbers suggested by the tests, five was the more plausible to rely between them. Secondly, the scree plot suggests five in our interpretation. Thirdly, the previous study of Dias, Pinheiro & Rua (2014) used four, and their data was substantially close to ours. These five factors account for 44% of the total data variance. Figure 1, shows the scree plot and the plot proposed by Owen & Wang (2015). More on the estimation of the Principal Components will be presented in the next chapter as we make the connection between this step, as the first, and the second, which is our model estimation using these results.

# III A Dynamic Factor Model for Tourism

To answer our research question in a structured and organised manner, we used a framework that is close but more captivating than the widely used Vector-Auto Regressive. There is indeed considerable evidence that DFM[6] can capture the idea that unobserved shocks determine macroeconomy. The presented model is then driven by one variable making it possible for us to assess how tourism, as an utterly exogenous variable without measurement error, was capable of impacting and span along the Portuguese macroeconomic variables available in our data set. Among the classes of DFM, it is framed the one regarding macroeconomic interaction following Bernanke, Boivin, & Eliasz (2005). Given a vector of $n$ macroeconomic series we define $Y_t = (Y_{1t}, \cdots, Y_{nt})'$ as observable variables with strong effects on the economy. It can be

[6] As described by Stock & Watson (2016) our Dynamic Factor model (DFM) is a linear time-series model where the macroeconomic shocks are the main drivers of the movements of the remaining variables.

the the *Unemployment rate*. Let $J_t$ [7] be a *Kx1* vector of unobserved factors, such as *Economic Sentiment Indicator* or *Bussiness Activity*. In our case, we will relax on $Y_t$ and refer to $T_t$ as an (M x1) vector of macro variables, which in our case will be our tourism variable – *Number of nights spent in Portugal by non-residents*. Since the notation is getting unwieldy, we describe the joint dynamics of $T_t', J_t'$ into the following equation:

$$\begin{bmatrix} J_t \\ T_t \end{bmatrix} = \Phi(L) \begin{bmatrix} J_{t-1} \\ T_{t-1} \end{bmatrix} + \eta_t \tag{1}$$

Here, $\phi(L)$ is an PxR matrix of the lag polynomials and $\eta_t$ a vector of $r$ innovations with mean zero.

Following the literature, a variable $X_t$ is introduced for the propose of concreteness where it has available some *informational* time-series with some background. The transition equation relates the factors estimated and our macroeconomic variable, commonly known as a *factor-augmented vector autoregression*, FAVAR. The macroeconomic series is related to both tourism variable and the unonbserable factors through the measurement equation of the FAVAR yielding what Stock & Watson (1998) classify - without observable factors - as a dynamic factor model:

$$X_t' = \Lambda^J J_t' + \Lambda^T T_t' + \varepsilon_t' \tag{2}$$

where deterministic components have been suppressed, $\Lambda^J$is an N x K matrix of loading factors, $\Lambda^T$the vector of tourism, and $\varepsilon_t = (\varepsilon_{1t}, \cdots, \varepsilon_{nt})'$, with mean zero following the normal distribution displaying a small amount of cross-correlation since we use principal components[8] estimation. Moreover, in general terms, PCA analysis delivers

[7] Principal component analysis solves the least square problem in which the parameters $J_t$and $\Lambda$ are treated as unknown to be estimated parameters in the equation (2). The number of static factors were selected according to the information criteria previous explained.

[8] The PCA estimation opens room for some cross-correlation since it will vanish as N goes to infinity. For more information refer to Stock & Watson (2002).

a small number of factors that explain the most variation in the data. As it was shown by Connor & Korajczyk (1986), in an exact static factor model, they also avoid overlap between the factors, since they are orthogonal to each other. This was already emphasised but becomes highly relevant as we compute our model, that with a small number of factors, can be as much parsimonious as possible, preserving degrees of freedom.

## III.I Estimation - Two-step approach

Let us disentangle our two-step principal components approach that, following previous literature, provides a nonparametric way of uncovering the space spanned by the common components $K_t$ $(J_t', Y_t')$ in equation (2) . Firstly, and as previously explained, the factors ( and the space spanned ) are estimated using the K+M principal components of $X_t$ which are now $\hat{K}(J_t, Y_t)$ [9]. Notwithstanding, $\hat{K}(J_t, Y_t)$is an arbitrary linear combination of its arguments so obtaining the estimation $\hat{J}_t$ involves determining the part that is not spanned by $Y_t$. Secondly, the FAVAR equation (1) follows a classical estimation methodology with $J_t$ being replaced by $\hat{J}_t$.In other words, $J_t$ is estimated consistently up to pre-multiplication by an arbitrary nonsingular r x r matrix. Afterwards, we impose the restriction that $\Lambda^{\hat{J}'}\Lambda^J/N = I_r$. The main caveat of the model comes with the factors not being directly interpreted in an economic sense since the previous restrictions are arbitrarily chosen.

## III.II Identification

We can see in both equations (1) and (2) that the tourism variable affects the macroeconomic variables both directly, by impact, and indirectly through the factors. In their work, Bernanke, Boivin, & Eliasz (2005) distinguish between slow and fast

[9] At this point, we disregard that $Y_t$ is observed and translated in our tourism variable.

moving variables backing for the latest to adjust much more rapidly to a Monetary Policy shock. This distinction depends on the application at hand, and we abstained from using it, assuming that all variables are allowed to respond contemporaneously to our shock.Hence, to be free of contemporaneous effects of tourism we must *clean* them. We estimate the factors associated with our variables $\hat{J}$ and its correlations of the components with tourism: $\hat{K} = b_T T_t + e_t$. After, we clean the factors and get $\hat{J} = \hat{K} - \hat{b}_T T_t$. Lastly, we use the recursive identification [10] with **tourism ordering last since now, it does not affect any factor contemporaneously**. Therefore, our impulse response function is given as follows, mapping the observables and factors:

$$\frac{\partial X_t}{\partial \epsilon_{Tt}} = \Lambda^J \frac{\partial \hat{J}_t}{\partial \epsilon_{Tt}} + \Lambda^T \frac{\partial T_t}{\partial \epsilon_{Tt}} \tag{3}$$

# IV Empirical Results

This section provides an outline of this work empirical findings pointing out the most important results as well as highlighting others that merit additional research. Hence, we begin by analysing our FAVAR specification with seven lags and five latent factors. We used both 7 and 13 lags yielding similar results and decided to go with the first as the econometric tests indicated.

By looking at figure 2 and 3, we have the response of the variables to a fundamental tourism shock with a period horizon of 48 months (4 years) with confidence intervals of 68% [11], widely used in literature. These responses are reported as the percentage of

[10] Also conventionally known as Cholesky. A given VAR has an A, nxn matrix, hence yielding n regression residuals and n structural shocks. Exact identification of the systems, that are latter solving using OLS, require that $\frac{n^2 - n}{2}$ restrictions to be placed on the relationship between the structural innovations and the residuals. Choleski decomposition follows a triangular for forcing exactly the $\frac{n^2 - n}{2}$ on the A matrix to equal zero. For more on Choleski please refer to *Enders, Walter. Applied Econometric Time-Series. Fourth Edition (2014).*

[11] Bootstrapping with 48 steps.

a tourism positive shock of 25 basis points (b.p.).

## IV.I Impulse Responses Analysis

As of the dynamics of some variables present less direct results others are straightforward and predictable according to economic literature. The employment is reduced severely, as shown in figure 2, until -1.2 b.p. and counting, within the period. In contrast, the number of vacancies increases slightly while the new occupied jobs present a more volatile figure. Starting negative it rises by around 0.2 b.p. and then becomes negative again converging after 40 periods. These job market dynamics reflects somehow what happens in the economy, but the existence of a puzzle could merit additional research. Commonly among economics, tourism is highly significant in the labour market and represents a positive seasonal pattern. Therefore, in times that tourism demand rises, reflected as a positive shock, more people are employed to answer the job market needs, more vacancies appear, and the new jobs start being occupied. However, some of those jobs are temporary, and there is also the existence of jobs that people do not accept. Touching the end of the line that defines the scope of this work, impulse response functions cannot tell us the whole story of the job market once more asking for further research on the field. Regarding economic performance and the indexes related to industries, services and retail, they all present a positive response to a tourism shock within the period. Regarding industrial indexes – turnover, employment and wages - they all rise being the turnover the most reluctant. In fact, Industrial production index,our proxy for GDP, presents a 0.4 b.p. increase after a shock, backing many literature, on the discussion that tourism generates growth. However, the hours worked respond negatively with around -0.1 b.p in the first 5 periods showing a consequence of perhaps a reduction of the hours worked after tourism strikes. This could also be explained by job market dynamics. A very similar analysis is dragged to services.

Here, both the hours worked, and wage index are reduced residually at the beginning, a patent consequence of the frictions produced in the job market after a tourism shock. Usually, to face the seasonal effect more people are employed, usually in part time and with lower wages. Concerning exports and imports of goods they both rise with a similar behaviour. This effect is far from having a simple explanation, and we can argue in favour of different economic theories. However, one could say that tourism increases exports by the direct impact it prints on other industries, while the increase of imports could be explained by the additional need of employing resources by the Portuguese economy in response to a shock. Other analysis can be drawn in not such commonplace variables. The PSI-20, Portuguese stock market, presents a jump in the first ten periods, around 1.2 b.p., showing signs of convergence after the entire horizon displayed. Similar results are produced by the ATM variable that represents the difference on the number of withdrawals made in Portuguese ATMs. With a response of around 0.1 b.p. to a tourism positive shock, we choose to display it given its possible feedback on policymakers and regulators. The (REER) [12] real effective exchange rate was used to give us a more quantitative idea of the strength of Euro, from a Portuguese perspective currency, regarding trades during this time. Notwithstanding, and despite its adverse effect after 35 periods, it increases around 0.03 b.p after the shock. The variance decomposition shown in advance in this work reflects very little confidence in this indicator. Tourism is also known for creating pressure for a rise in prices in response to the high demand for certain services. This pressure can create inflation that we study under the consumer price index. Therefore, aligned with economic literature , the CPI increases by around 0.003 b.p and maintains the tendency until 25 periods ahead where it starts to become negative. Regarding the so-called soft variables, that

[12]The effective exchange rate is described as an index that reflects the strength of a specific currency comparative to a basket of other currencies. The Real is just an adjustment to the nominal rate by the appropriate foreign price level further deflated by the home country price level.

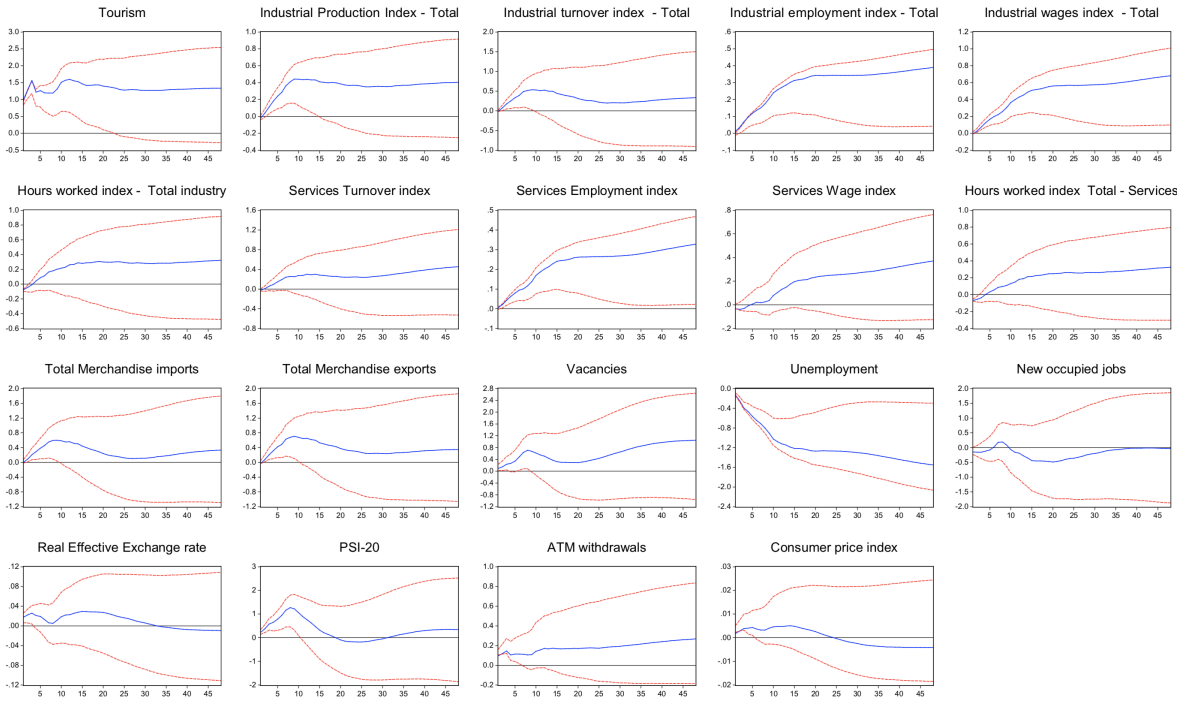


Figure 2: Impulse esponses with five factors and tourism Variables class 5 - (Cumulative of Orthogonal)

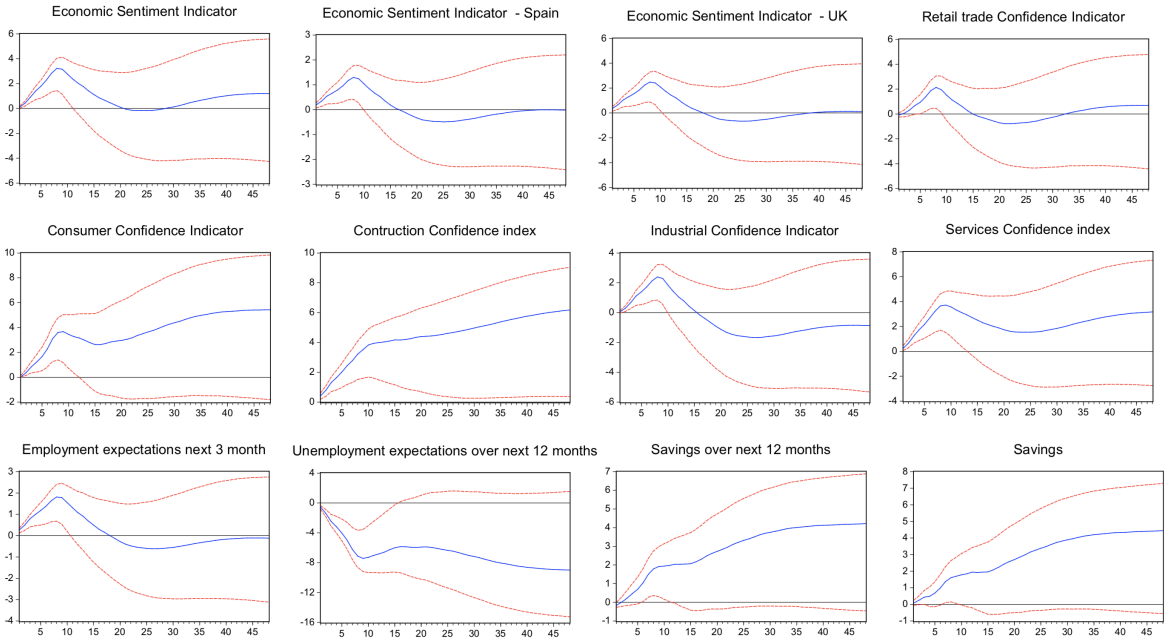


Figure 3: Impulse responses with five factors and tourism Variable class 2 - (Orthogonal)

is, the variables extracted from the surveys, the dynamics and analysis presented are different. The (Portuguese) economic sentiment indicator presents a huge hick on the overall sound perspectives. Responding to a tourism shock, it rises to 2.5 units. The inclusion of the Economic sentiment indicator for Spain and UK are presented next for the sake of enriching our analysis. Some studies, as previous mentioned, refer tourism as having spillover effects and other such as Rodrigues (2012) study countries such as Germany, Spain and UK on the Portuguese tourism demand. We use Spain just to have a flavour of the possible spillover effects to the Iberia. Indeed, the sentiment indicator also rises but by a smaller amount. As we move further to England, the effect does not surpass the 2.1 units and converges afterwards. Regarding employment expectations some interesting dynamics rise, supporting our thesis of a strong link between tourism and the labour market. If we stick to the next three month, the overall sentiment rises, while acting accordingly, the unemployment expectations, this time for a 12-month period, falls drastically to - 7 units. Other confidence variables presented reflect the good perspectives. Consumer confidence indicator rises, and the index of construction, services, retail and industrial go along. Finally, savings represent a good perspective where consumers allegedly save more at the time (present) of the shock, but if we look at the savings over the next 12 months, they follow a similar fashion. Moreover, this indicator of savings is also linked with more investment. In fact, one can say that tourism dynamics all point to better expectations and improved performance of the markets regarding the perception of tourism in economic agents: major improvements are expected as well as a sign of recovery. More money is circulating, business is generating more revenue and unemployment is being reduced. We could investigate 127 variables exhaustively, but still, out of the 31 we choose, only a few show signs of small and not significant effects, within the first four years. The significance of the IRF are somehow satisfactory and one should bear in mind that tourism shocks are expected

recurrently. This could call for attention of policymakers in order to extensively extract the persistence of this impact when it is positive and account for measures when they are negative.

## IV.II Variance Decomposition

Table 1 follows a Bernanke, Boivin, & Eliasz (2005) approach of a variance decomposition [13] and reports the results for the same macroeconomic indicators previous analysed as IRF in the figures. Naturally, while the first column tales the contribution of the tourism shock to the variance of the forecast error at five years period (60-month horizon) the second comprises the $R^2$ of the standard component for each one of the 31 variables. The contribution of the shock sorts from 0 to 18.3% suggesting, within a certain order of magnitude, relevant effects of the tourism shock. However, and in line with previous literature and this research conclusions its results are stronger in employment related matters. It explains 14.0% and 18.3% of the unemployment and industrial employment index respectively which might be considered relevant. Accounts for 3.7% of the overall sentiment indicator in Portugal and 2.0 % and 2.5% for Spain and UK respectively. With an $R^2$ ranging from 29.7% to 89.0% the confidence we have in the results, its explanation and the impulse response functions are robust and highly reliable. Considering the set of variables of financial data, the impact is slim to none. The PSI-20, REER and ATM variables just accounts for 2.3%, 0.9% and 5.7% respectively. Here, and as previously mentioned, the main caveat is the REER variable that has an $R^2$of only 8.00% reflecting no robustness. The consumer price index, mostly known as inflation, just accounts for exactly 1% of the contribution of the shock. However, the $R^2$ of 17.2% it presents give us little confidence on the response functions as in the REER case. Closing, the $R^2$ of the common component following, the two-step

[13]The product of the columns represents the VAR variance Decomposition.

Table 1: Contribution of the shock to variance of the common omponent

| **Contribution of the shock to Variance of the Common Component** | | |
|---|---|---|
| **Variables in log first difference** | Variance Decomposition | $R^2$ |
| Tourism | 0.815 | *1.00 |
| Industrial Production Index - Total | 0.030 | 0.398 |
| Industrial Turnover Index - Total | 0.024 | 0.805 |
| Industrial Employment Index - Total | 0.183 | 0.799 |
| Industrial Wages Index -Total | 0.066 | 0.547 |
| Hours Worked Index - Total Industry | 0.027 | 0.780 |
| Services Turnover Index | 0.011 | 0.615 |
| Services Employment Index | 0.063 | 0.696 |
| Services Wage Index | 0.008 | 0.361 |
| Hours worked Index - Total Services | 0.029 | 0.778 |
| Total Merchandise Imports | 0.017 | 0.564 |
| Total Merchandise Exports | 0.025 | 0.708 |
| Vacancies | 0.006 | 0.215 |
| Unemployment | 0.140 | 0.509 |
| New Occupied Jobs | 0.005 | 0.199 |
| Real Effective Exchange rate | 0.009 | 0.080 |
| PSI-20 | 0.023 | 0.306 |
| ATM Withdrawals | 0.057 | 0.259 |
| Consumer Price Index | 0.010 | 0.172 |
| **Variables in first difference** | | |
| Economic Sentiment Indicator | 0.037 | 0.803 |
| Economic Sentiment Indicator - Spain | 0.020 | 0.331 |
| Economic Sentiment Indicator - UK | 0.025 | 0.370 |
| Consumer Confidence Indicator | 0.024 | 0.890 |
| Contruction Confidence Index | 0.037 | 0.297 |
| Industrial Confidence Indicator | 0.029 | 0.789 |
| Retail Trade Confidence Indicator | 0.013 | 0.491 |
| Services Confidence Index | 0.031 | 0.409 |
| Unemployment Expectations Over Next 12 Months | 0.050 | 0.599 |
| Employment Expectations Over Next 3 Months | 0.030 | 0.429 |
| Savings | 0.008 | 0.465 |
| Savings Over Next 12 Months | 0.012 | 0.478 |

approach FAVAR, does capture important vectors of the business cycle dynamics on the Portuguese economy. One can say that, overall, for the variables in the analysis the factors explain a great fraction of them. We can point out that range from 15% to 90% excluding our outlier. The consumer confidence index has the highest (89.0%) followed by the industrial turnover index (80.5%) and the industrial employment index (79.9%). Unemployment which explains 14.0% has a fairly good representation (50.9%) as well as the economic sentiment indicator and the Industrial confidence indicator with 80.3% and 78.9% respectively. The most reliable variable is the industrial employment index that while having 18.3% of explanation in the variation caused by a tourism shock, it has an $R^2$of 79.9%.

## IV.III The Role of Tourism Shocks In The Recent Debt Crisis

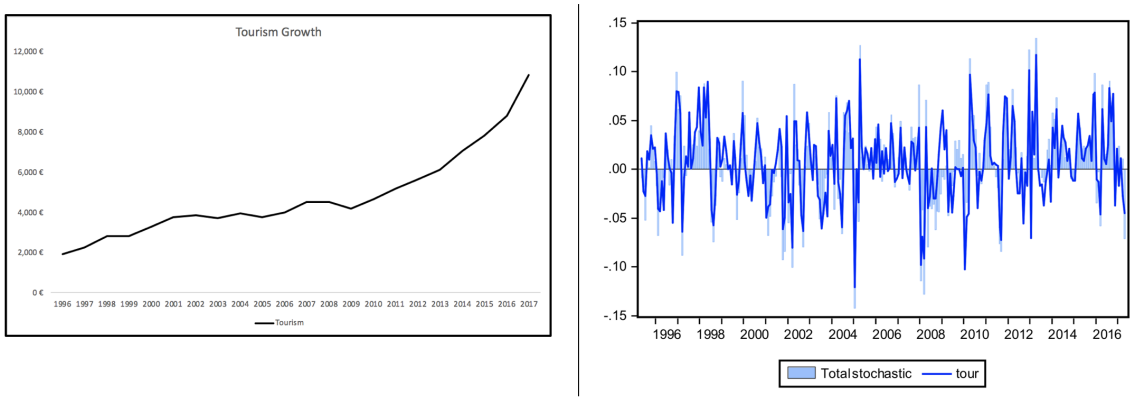


Figure 4: Tourism growth (Balance net result) ; Tourism shocks along time

To get a better understanding of our variable, we plot figure 4 assembling two figures regarding tourism. In particular, we want to stress two things: firstly, the increasing in the value of tourism along time. By looking at the left-hand side, one can perceive the growth of the tourism on the Portuguese economy, this time measured by the net result on the tourism account, since the beginning of 1996, with special emphasis after

the crisis of 2008. Secondly, we can point out events that led to variations and large positive or negative values of our variable to develop our perception of the behaviour of our series along time and within the model. Hence, on the right-hand side, we can see the residuals of the shock of our variable tourism, showing the importance of the shock and the overall fit regarding our data. Finally, we highlight the fact that tourism is increasing since 2008 and that its fit on the data, thus importance on the Portuguese economy, is becoming bigger as well.

All things considered, our variable is completely exogenous from the Portuguese economy and it highly contributes to its improvement and recovering after the periods of crisis as one can perceive the increased importance comparing the period before and after crisis.

# V Conclusion, Shortcomings & Further Research

This study uses a two-step FAVAR to measure the impact of tourism on the Portuguese economy. Empirically, it was assessed in a range of more than 100 variables the persistence, impact and dynamics of tourism. It can be said now that the impact of tourism is mainly positive throughout economic variables and that its increasing importance as a fast-growing sector had help us recovering from the financial crisis. Therefore, tailored policies can be helpful to accommodate such disturbs. It was extensively discussed what other scholars had concluded regarding tourism. On the one hand, we cannot assess interlay if tourism helps regional improvements or if some events like the Olympic Games help the economy. Neither can we explain tourism demand and supply movements precisely. On the other hand, many things can be drawn and maintain previous literature. We can say that economy prospers since the effects are reflected in many of its macroeconomic indicators. Our proxy of GDP rises as well

as other industry indexes which can, in the end, boost tourism. Likewise, it breaks down the hypothesis of stagnation regarding other industries proposed by Ivanov & Webster (2007). By becoming more economic reliable and sustainable Portugal can both be the developed economy with top spenders travelling worldwide and the small open economy that receives tons of tourists for being well endowed. Tourism can, in the end, have a long-run effect on economic growth. This work does not solely try to underline causality relations between economic growth and tourism. It is precisely this point that we intend to explore and that had been pointed out for supplementary research by many academics. Economic growth is not only GDP, and development it is not only achieved by increasing it. The detailed quantitative analysis we present reports that. From the point we stand on now, our FAVAR model enriches the discussion where tourism is vital and highly contributes to economies worldwide. The principal component analysis helped us to summarise the co-movements of many variables to nest a FAVAR model where impulse response functions were drawn in consequence of a tourism shock. A significant breakthrough was made with this, overcoming many structural problems and, delivering what many studies fail to do since more than just causality relations can be made without loss of generality throughout this work. In fact, a VAR model with too few variables or study of causalities cannot represent the impact of tourism in an economy wholly. In our discussion, while unemployment is reduced, and new jobs vacancies are occupied, indexes of overall production in services, manufacturing and retailing improve after tourism strikes. It is essential to take advantage of the benefits of these shocks and perpetuate economically favourable variations to reduce imbalances that economies sometimes present, in times of crisis. Expectations are key in economic formulation and policy guidance, and they are also appraised in this work. The sentiment indicator improves as well as the consumer confidence indicator. Furthermore, the expectations of becoming employed improve as the overall

economy shows clear signs of prospering. On this, many findings can be corroborated since spillover effects might be advocated looking at the enhancement of the economic sentiment in close by economies such as Spain or even the UK, an economy that influences the demand for Portuguese tourism. Again, we stress that in-depth studies of sectors such as tourism, that account for a substantial percentage of GDP, are necessary. The effects of tourism in the Portuguese exchange market could be meaningful to understand how some sectors outperform others. ATM withdrawals movements could be an excellent insight for the European Central Bank and other variables such as gas sales and the movements in retailing, services and industry could help each responsible entity to understand its overall performance at such times.

Notwithstanding, we intend to overview the shortcomings of this thesis as well. Many other variables of tourism could be studied to estimate the overall tourism impact in an economy. The one we chose, it was, at least to the best of our capabilities, the most suitable and presents valid results. In reality, others have been used and failed to return interpretive scores. Moreover, our principal components fulfil about 44% of the explained of the data. Despite this being emphasised in literature as more than enough, numbers close to 80% would be much more comfortable. Likewise, given the estimation method and confidence intervals, some impulse response functions show no or small statistical significance. As an end note, this study entails many explanations and opens the scope to more studies that do not necessarily need to focus on tourism. Following Stock & Watson (2012) the main idea was to disentangle the channels of the Portuguese recession, but that was not possible due to the lack of exogenous measurement instruments.

Finally, the results presented help us to conjecture some conclusions that are particularly relevant to tourism policymakers such as government, that is linked to monitoring the macroeconomic environment. These observational results turn to be even

more significant in times of turbulence such as the 2008 crisis. In that matter, the residuals of the shocks of tourism during the period, presented in the previous chapter, draw the baseline of this thesis as they support our conclusions. Being completely exogenous from the factors and the economy, tourism can in the end, be a factor of enhancing economic growth throughout several different channels. In any case, its overall impact can help us to better accommodate external and disruptive shocks that drive an economy.

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# Appendix

# A – Additional Figures

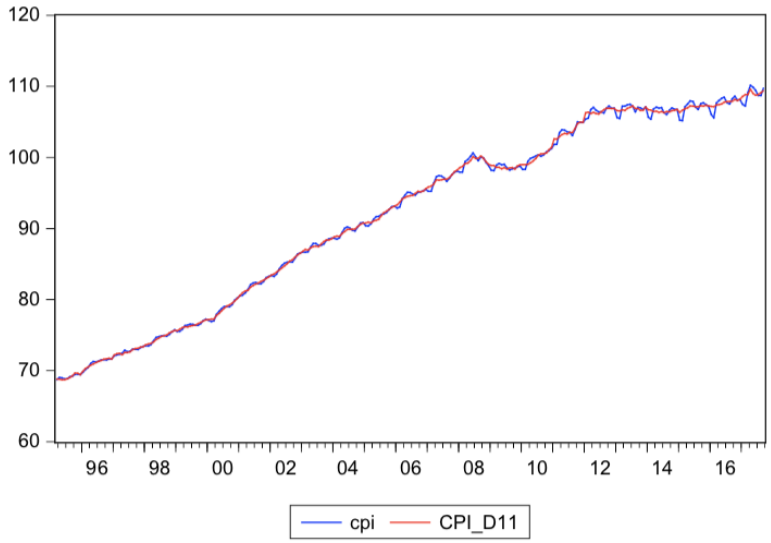


Figure 5: Seasonal Adjustment of CPI

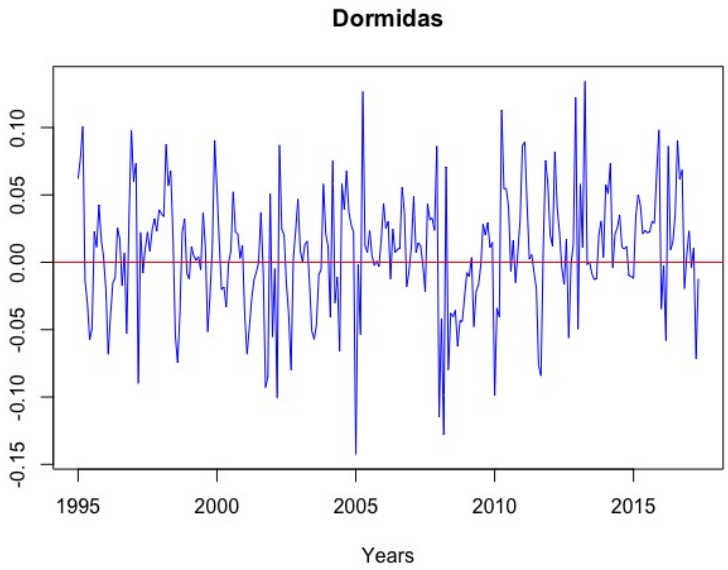


Figure 6: Tourism - Number of nights spent in Portugal by non-residents

# B – Interpreting Factors

In table 2, following the same procedure of previous literature[14] we regressed the 80 transformed variable on each of the five factors and stated the six with highest $R^2$. Usually, principal components do not identify the economic rationale behind the variables; however, this table gives us an indication of the information that can be presented. Dias, Pinheiro & Rua (2014) did the same with a similar data set, and their results help to hypothesis our idea.Factor 1 present the variables with highest $R^2$ and represents mostly turnovers on both industrial activities and services. It is highly linked with the economic interpretation of intermediate and consumer goods. Therefore, also linked to a significant stake in the overall production. Factor 2 follows a different foundation representing mainly the consumer indicators, either of confidence or financial and economic situation. They give us an idea of the overall perspective of economic agents on the economic situation. Factor 3 has a clear-cut interpretation. It is closely related to measures of employment. Either the employment indexes on different industry areas, services and finally on the general unemployment measure. Factor 4 as a decaying explanation but follows the factor 2 fashion by presenting indicators of confidence. This one is more related to markets and trends making here the clear distinction between the second. Moreover, savings and price trends are described as well as confidence in industry and production for the months ahead. Therefore, closer to macroeconomic activity. The latest, Factor 5, presents a hard to define clarification. With an $R^2$very small compared to the other factors, it aims to explain retailing activities. With consumption of commodities such as electricity, gasoline and also vehicle sales the variables seem more singular but have a joint correlation with the last factor. Overall, factor 2 and 4 aim to explain macroeconomic activity and confidence indicators, either general or specific. Factor 3 is related to the labour market dynamics while 1 and 5 could be interpreted as measures of services, industry and retailing activities.

[14]See for example,Dias, Pinheiro & Rua (2014) and Corsetti G., Duarte J. & Mann S. (2018).

Table 2: Variables that are best explained by a single extracted factor - $R^2$ of linear regression between the variable and the factor

| | **Variable** | $R^2$ |
|---|---|---|
| **Factor 1** | Industrial turnover index - Intermediate goods | 0.60 |
| | Merchandise imports - Consumer goods | 0.56 |
| | Industrial turnover index - Domestic market - Intermediate goods | 0.56 |
| | Services Turnover index | 0.51 |
| | Hours worked index - Intermediate goods | 0.48 |
| | Merchandise exports - Intermediate goods | 0.40 |
| **Factor 2** | Consumer Confidence Indicator | 0.58 |
| | General economic situation over next 12 months | 0.52 |
| | General economic situation over last 12 months | 0.47 |
| | Financial situation over next 12 months | 0.46 |
| | Unemployment expectations over next 12 months | 0.36 |
| | Financial situation over last 12 months | 0.33 |
| **Factor 3** | Industrial employment index - Manufacturing | 0.49 |
| | Industrial employment index - Intermediate goods | 0.46 |
| | Services Employment index | 0.44 |
| | Industrial employment index - Investment goods | 0.33 |
| | Industrial employment index - Manufacturing | 0.32 |
| | Unemployment | 0.29 |
| **Factor 4** | Industrial Confidence Indicator | 0.39 |
| | Saving at present | 0.22 |
| | Production expectations for the months ahead | 0.22 |
| | Savings over next 12 months | 0.21 |
| | Employment expectations for the months ahead | 0.19 |
| | Price trends over next 12 months | 0.18 |
| **Factor 5** | Retail trade turnover index - Durable goods | 0.25 |
| | Consumption of gasoline | 0.22 |
| | Retail trade turnover index - Non-Durable Non-Food | 0.21 |
| | Consumption of electricity | 0.15 |
| | Light passenger vehicle sales | 0.11 |
| | Industrial Production Index - Manufacturing | 0.11 |

Table 3: Importance of first k=5 (out of 80) components

| | **PC1** | **PC2** | **PC3** | **PC4** | **PC5** |
|---|---|---|---|---|---|
| **Standard Deviation** | 3.8290 | 2.9002 | 2.2842 | 2.1132 | 1.6331 |
| **Proportion of Variance** | 0.1833 | 0.1051 | 0.0652 | 0.0558 | 0.0333 |
| **Cumulative Proportion** | 0.1833 | 0.2884 | 0.3536 | 0.4094 | 0.4428 |

# C – Data Set

Table 4 contains the complete list of series regarding our data set. It contains the name, source and time frame as well as transformation code, seasonal adjustment and if it was included in the PCA. Abbreviations are as following:

**Transformation code (T)** 2 - difference in levels 5 - difference in logs

**Factor analysis (F)** Y - included in data set for principal component analysis N - Not included

**Seasonal adjustment** SA - seasonally adjusted NA - neither working day nor seasonally adjusted

| Number | Name | Start | End | Factors | Source | Seasonal adjustment | T |
|---|---|---|---|---|---|---|---|
| | **Soft Data Surveys** | | | | | | |
| 1 | Economic Sentiment Indicator | 1995M4 | 2017M7 | Y | European Comission | SA | 2 |
| 2 | Consumer Confidence Indicator | 1995M4 | 2017M7 | Y | European Comission | SA | 2 |
| 3 | Financial situation over last 12 months | 1995M4 | 2017M7 | Y | European Comission | SA | 2 |
| 4 | Financial situation over next 12 months | 1995M4 | 2017M7 | Y | European Comission | SA | 2 |
| 5 | General economic situation over last 12 months | 1995M4 | 2017M7 | Y | European Comission | SA | 2 |
| 6 | General economic situation over next 12 months | 1995M4 | 2017M7 | Y | European Comission | SA | 2 |
| 7 | Major purchases at present | 1995M4 | 2017M7 | Y | European Comission | SA | 2 |
| 8 | Major purchases over next 12 months | 1995M4 | 2017M7 | Y | European Comission | SA | 2 |
| 9 | Unemployment expectations over next 12 months | 1995M4 | 2017M7 | Y | European Comission | SA | 2 |
| 10 | Saving at present | 1995M4 | 2017M7 | Y | European Comission | SA | 2 |
| 11 | Savings over next 12 months | 1995M4 | 2017M7 | Y | European Comission | SA | 2 |
| 12 | Price trends over last 12 months | 1995M4 | 2017M7 | Y | European Comission | SA | 2 |
| 13 | Price trends over next 12 months | 1995M4 | 2017M7 | Y | European Comission | SA | 2 |
| 14 | Statement on financial situation of household | 1995M4 | 2017M7 | Y | European Comission | SA | 2 |
| 15 | Contruction confidence index | 1995M4 | 2017M7 | Y | European Comission | SA | 2 |
| 16 | Building activity development over the past 3 months | 1995M4 | 2017M7 | Y | European Comission | SA | 2 |
| 17 | Assessment of order books | 1995M4 | 2017M7 | Y | European Comission | SA | 2 |
| 18 | Employment expectations over the next 3 months | 1995M4 | 2017M7 | N | European Comission | SA | 2 |
| 19 | Prices expectations over the Next 3 months | 1995M4 | 2017M7 | Y | European Comission | SA | 2 |
| 20 | Industrial Confidence Indicator | 1995M4 | 2017M7 | Y | European Comission | SA | 2 |
| 21 | Production trend observed in recent months | 1995M4 | 2017M7 | Y | European Comission | SA | 2 |
| 22 | Assessment of order-book levels | 1995M4 | 2017M7 | N | European Comission | SA | 2 |
| 23 | Assessment of export order-book levels | 1995M4 | 2017M7 | N | European Comission | SA | 2 |
| 24 | Assessment of stocks of finished products | 1995M4 | 2017M7 | Y | European Comission | SA | 2 |
| 25 | Production expectations for the months ahead | 1995M4 | 2017M7 | Y | European Comission | SA | 2 |
| 26 | Selling price expectations for the months ahead | 1995M4 | 2017M7 | Y | European Comission | SA | 2 |
| 27 | Employment expectations for the months ahead | 1995M4 | 2017M7 | Y | European Comission | SA | 2 |
| 28 | Retail trade Confidence Indicator | 1995M4 | 2017M7 | Y | European Comission | SA | 2 |
| 29 | Business activity over recent months | 1995M4 | 2017M7 | Y | European Comission | SA | 2 |
| 30 | Assessment of stocks | 1995M4 | 2017M7 | Y | European Comission | SA | 2 |
| 31 | Expected business activity | 1995M4 | 2017M7 | Y | European Comission | SA | 2 |
| 32 | Orders placed with suppliers | 1995M4 | 2017M7 | Y | European Comission | SA | 2 |
| 33 | Employment expectations | 1995M4 | 2017M7 | N | European Comission | SA | 2 |
| 34 | Economic Sentiment Indicator - Germany | 1995M4 | 2017M7 | N | European Comission | SA | 2 |
| 35 | Economic Sentiment Indicator - Spain | 1995M4 | 2017M7 | N | European Comission | SA | 2 |
| 36 | Economic Sentiment Indicator - France | 1995M4 | 2017M7 | N | European Comission | SA | 2 |
| 37 | Economic Sentiment Indicator - UK | 1995M4 | 2017M7 | N | European Comission | SA | 2 |
| 38 | Services confidence index | 1995M4 | 2017M7 | Y | European Comission | SA | 2 |
| 39 | Business activity over the pas 3 month | 1995M4 | 2017M7 | N | European Comission | SA | 2 |
| 40 | Demand evolution over the past 3 month | 1995M4 | 2017M7 | Y | European Comission | SA | 2 |
| 41 | Expectations on the demand evolution on the next 3 month | 1995M4 | 2017M7 | N | European Comission | SA | 2 |
| 42 | Employment evolution over th past 3 month | 1995M4 | 2017M7 | Y | European Comission | SA | 2 |
| 43 | Employment expectation over the past 3 month | 1995M4 | 2017M7 | N | European Comission | SA | 2 |
| | **Industrial Production** | | | | | | |
| 44 | Industrial Production Index - Total | 1995M4 | 2017M7 | N | INE | SA | 5 |
| 45 | Industrial Production Index - Manufacturing | 1995M4 | 2017M7 | Y | INE | SA | 5 |
| 46 | Industrial Production Index - Consumer goods | 1995M4 | 2017M7 | Y | INE | SA | 5 |
| 47 | Industrial Production Index - Consumer goods non-durable | 1995M4 | 2017M7 | N | INE | SA | 5 |
| 48 | Industrial Production Index - Consumer goods durable | 1995M4 | 2017M7 | N | INE | SA | 5 |
| 49 | Industrial Production Index - Investment goods | 1995M4 | 2017M7 | Y | INE | SA | 5 |
| 50 | Industrial Production Index - Intermediate goods | 1995M4 | 2017M7 | Y | INE | SA | 5 |
| | **Retailing sales** | | | | | | |
| 51 | Retail trade turnover index - Total | 1995M4 | 2017M7 | N | INE | SA | 5 |
| 52 | Retail trade turnover index - Food | 1995M4 | 2017M7 | Y | INE | SA | 5 |
| 53 | Retail trade turnover index - Non-Durable Non-Food | 1995M4 | 2017M7 | Y | INE | SA | 5 |
| 54 | Retail trade turnover index - Durable goods | 1995M4 | 2017M7 | Y | INE | SA | 5 |
| | **Hours worked and wage indexes in industry and services** | | | | | | |
| 55 | Industrial employment index - Total | 1995M4 | 2017M7 | N | INE | SA | 5 |
| 56 | Industrial employment index - Manufacturing | 1995M4 | 2017M7 | Y | INE | SA | 5 |
| 57 | Industrial employment index - Consumer goods | 1995M4 | 2017M7 | Y | INE | SA | 5 |
| 58 | Industrial employment index - Consumer goods durables | 1995M4 | 2017M7 | N | INE | SA | 5 |
| 59 | Industrial employment index - Consumer goods non-durables | 1995M4 | 2017M7 | N | INE | SA | 5 |
| 60 | Industrial employment index - Intermediate goods | 1995M4 | 2017M7 | Y | INE | SA | 5 |
| 61 | Industrial employment index - Investment goods | 1995M4 | 2017M7 | Y | INE | SA | 5 |
| 62 | Industrial wages index - Total | 1995M4 | 2017M7 | N | INE | SA | 5 |
| 63 | Industrial wages index - Manufacturing | 1995M4 | 2017M7 | Y | INE | SA | 5 |
| 64 | Industrial wages index - Consumer goods | 1995M4 | 2017M7 | Y | INE | SA | 5 |
| 65 | Industrial wages index - Consumer goods durables | 1995M4 | 2017M7 | N | INE | SA | 5 |
| 66 | Industrial wages index - Consumer goods non-durables | 1995M4 | 2017M7 | N | INE | SA | 5 |
| 67 | Industrial wages index - Intermediate goods | 1995M4 | 2017M7 | Y | INE | SA | 5 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 68 | Industrial wages index - Investment goods | 1995M4 | 2017M7 | Y | INE | SA | 5 |
| 69 | Hours worked index - Total industry | 1995M4 | 2017M7 | N | INE | SA | 5 |
| 70 | Hours worked index - Manufacturing | 1995M4 | 2017M7 | Y | INE | SA | 5 |
| 71 | Hours worked index - Consumer goods | 1995M4 | 2017M7 | Y | INE | SA | 5 |
| 72 | Hours worked index - Consumer goods durables | 1995M4 | 2017M7 | N | INE | SA | 5 |
| 73 | Hours worked index - Consumer goods non-durables | 1995M4 | 2017M7 | N | INE | SA | 5 |
| 74 | Hours worked index - Intermediate goods | 1995M4 | 2017M7 | Y | INE | SA | 5 |
| 75 | Hours worked index - Investment goods | 1995M4 | 2017M7 | Y | INE | SA | 5 |
| 76 | Services Employment index | 1995M4 | 2017M7 | Y | INE | SA | 5 |
| 77 | Services Wage index | 1995M4 | 2017M7 | Y | INE | SA | 5 |
| 78 | Hours worked index services | 1995M4 | 2017M7 | Y | INE | SA | 5 |
| | **Industry and services turnover** | | | | | | |
| 79 | Services Turnover index | 1995M4 | 2017M7 | Y | INE | SA | 5 |
| 80 | Industrial turnover index - Total | 1995M4 | 2017M7 | N | INE | SA | 5 |
| 81 | Industrial turnover index - Manufacturing | 1995M4 | 2017M7 | Y | INE | SA | 5 |
| 82 | Industrial turnover index - Consumer goods | 1995M4 | 2017M7 | Y | INE | SA | 5 |
| 83 | Industrial turnover index - Consumer goods durable | 1995M4 | 2017M7 | N | INE | SA | 5 |
| 84 | Industrial turnover index - Consumer goods non-durable | 1995M4 | 2017M7 | N | INE | SA | 5 |
| 85 | Industrial turnover index - Intermediate goods | 1995M4 | 2017M7 | Y | INE | SA | 5 |
| 86 | Industrial turnover index - Investment goods | 1995M4 | 2017M7 | Y | INE | SA | 5 |
| 87 | Industrial turnover index - Domestic market - Total | 1995M4 | 2017M7 | N | INE | SA | 5 |
| 88 | Industrial turnover index - Domestic market - Consumer goods | 1995M4 | 2017M7 | Y | INE | SA | 5 |
| 89 | Industrial turnover index - Domestic market - Consumer goods durable | 1995M4 | 2017M7 | N | INE | SA | 5 |
| 90 | Industrial turnover index - Domestic market - Consumer goods non-durable | 1995M4 | 2017M7 | N | INE | SA | 5 |
| 91 | Industrial turnover index - Domestic market - Intermediate goods | 1995M4 | 2017M7 | Y | INE | SA | 5 |
| 92 | Industrial turnover index - Domestic market - Investment goods | 1995M4 | 2017M7 | Y | INE | SA | 5 |
| 93 | Industrial turnover index - External market - Total | 1995M4 | 2017M7 | N | INE | SA | 5 |
| 94 | Industrial turnover index - External market - Consumer goods | 1995M4 | 2017M7 | Y | INE | SA | 5 |
| 95 | Industrial turnover index - External market - Consumer goods durable | 1995M4 | 2017M7 | N | INE | SA | 5 |
| 96 | Industrial turnover index - External market - Consumer goods non-durable | 1995M4 | 2017M7 | N | INE | SA | 5 |
| 97 | Industrial turnover index - External market - Intermediate goods | 1995M4 | 2017M7 | Y | INE | SA | 5 |
| 98 | Industrial turnover index - External market - Investment goods | 1995M4 | 2017M7 | Y | INE | SA | 5 |
| | **Tourism** | | | | | | |
| 99 | Tourism - Number of nights spent in Portugal | 1995M4 | 2017M7 | Y | INE | SA | 5 |
| 100 | Tourism - Number of nights spent in Portugal by residents | 1995M4 | 2017M7 | N | INE | SA | 5 |
| 101 | Tourism - Number of nights spent in Portugal by non-residents | 1995M4 | 2017M7 | N | INE | SA | 5 |
| | **Automotive industry** | | | | | | |
| 102 | Light passenger vehicle sales | 1995M4 | 2017M7 | Y | ACAP -Associação automovel de Portugal | SA | 5 |
| 103 | Light commercial vehicle sales | 1995M4 | 2017M7 | Y | ACAP -Associação automovel de Portugal | SA | 5 |
| 104 | Heavy commercial vehicle sales | 1995M4 | 2017M7 | Y | ACAP -Associação automovel de Portugal | SA | 5 |
| 105 | Cement sales | 1995M4 | 2017M7 | Y | CIMPOR, SECIL | SA | 5 |
| | **Labour Market Data** | | | | | | |
| 106 | Vacancies | 1995M4 | 2017M7 | Y | Instituto do Emprego e Formação profissional | SA | 5 |
| 107 | Unemployment | 1995M4 | 2017M7 | Y | Instituto do Emprego e Formação profissional | SA | 5 |
| 108 | New applications for employment by the unemployed | 1995M4 | 2017M7 | N | Instituto do Emprego e Formação profissional | SA | 5 |
| 109 | New job vacancies | 1995M4 | 2017M7 | N | Instituto do Emprego e Formação profissional | SA | 5 |
| 110 | New occupied jobs | 1995M4 | 2017M7 | Y | Instituto do Emprego e Formação profissional | SA | 5 |
| | **Energy consumption** | | | | | | |
| 111 | Consumption of electricity | 1995M4 | 2017M7 | Y | Rede Electrica nacional | SA | 5 |
| 112 | Consumption of gasoline | 1995M4 | 2017M7 | Y | Direção geral de Energia | SA | 5 |
| 113 | Consumption of diesel | 1995M4 | 2017M7 | Y | Direção geral de Energia | SA | 5 |
| | **Goods imports and Exports** | | | | | | |
| 114 | Merchandise imports - Total | 1995M4 | 2017M7 | N | INE | SA | 5 |
| 115 | Merchandise imports - Total exc. Fuels | 1995M4 | 2017M7 | N | INE | SA | 5 |
| 116 | Merchandise imports - Consumer goods | 1995M4 | 2017M7 | Y | INE | SA | 5 |
| 117 | Merchandise imports - Intermediate goods | 1995M4 | 2017M7 | Y | INE | SA | 5 |
| 118 | Merchandise imports - Investment goods | 1995M4 | 2017M7 | Y | INE | SA | 5 |
| 119 | Merchandise exports - Total | 1995M4 | 2017M7 | N | INE | SA | 5 |
| 120 | Merchandise exports - Total exc. Fuels | 1995M4 | 2017M7 | N | INE | SA | 5 |
| 121 | Merchandise exports - Consumer goods | 1995M4 | 2017M7 | Y | INE | SA | 5 |
| 122 | Merchandise exports - Intermediate goods | 1995M4 | 2017M7 | Y | INE | SA | 5 |
| 123 | Merchandise exports - Investment goods | 1995M4 | 2017M7 | Y | INE | SA | 5 |
| | **Financial Data** | | | | | | |
| 124 | Real Effective Exchange Rate | 1995M4 | 2017M7 | Y | Bank of Portugal | SA | 5 |
| 125 | PSI-20 | 1995M4 | 2017M7 | Y | Eureonext Lisboa | SA | 5 |
| 126 | ATM/POS | 1995M4 | 2017M7 | Y | Bank of Portugal | SA | 5 |
| 127 | Consumer Price Index | 1995M4 | 2017M7 | N | OECD | SA | 5 |

Table 4: List of the 127 Variables used