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Bachelor Thesis in Financial Econometrics

Performance of Partial Least Squares models in Forecasts of Inflation.

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Abstract

This paper aims to compare the forecast performance of Partial Least Squares (PLS) models with Auto-Regressive and Principal Components (PC) models. Ordinary Least Squares (OLS) and Ridge estimations are used to approximate the coefficients. The main evaluation is done by applying Relative Mean Squared forecast Errors. It is shown that the Static PLS model often outperforms the other approaches and the Dynamic PLS model shows an improving results with an increase in the amount of steps ahead. It is also noted that the Ridge estimation enhances the prediction power of the PC approach compared to the OLS estimation.

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Contents

1. Introduction

Over the years the prediction of macroeconomic variables started to play an essential role in economic decisions. Not only for strategic decisions and business plans at various companies, but also economical policy of countries became highly dependant on the forecasts of such variables as GDP growth, interest rates and inflation (Panagiotelis, Athanasopoulos, Hyndman, Jiang, & Vahid, 2019). Particularly, inflation forecasting plays an important role as it influences a high range of other micro- and macroeconomic variables. Like this, Jones and Manuelli (1995) argue that inflation can have a direct effect on the economic growth rate of the country. Moreover, Friedman (1977) in his Nobel work claims that there exists a strong positive relationship between unemployment and inflation. Finally, inflation strongly influences monetary policy of countries because many central banks base their monetary policy decisions on the inflation targets and forecasts of those (Svensson, 1999). All the above mentioned social aspects require a deep understanding of processes connected to forecasts of inflation.

Following the reasoning above, it can be concluded that it is of a high importance to have econometric models, which would be used to predict inflation accurately. For forecast purposes various econometricians proposed a wide range of models to find the most important determinants of inflation. These models include the Dynamic Moving Average by Koop and Korobilis (2012) or Least Angular Regression used by Efron, Hastie, Johnstone, Tibshirani, et al. (2004). However, it was shown that a model which outperforms the other models consistently, does not exist so far, which makes it of a high scientific importance to investigate and create more models which would give better predictions (Panagiotelis et al., 2019). The relatively new econometric models presented by Pearson (1901) are based on Principal Components (PC), which not only aim to increase the predictive power but also to decrease the amount of predictors used in the model. This type of models extracts the most relevant information from the set of predictors by creating so-called factors.

A relatively new set of models in this field is Partial Least Squares (PLS) models, introduced by Wold (1966). The main difference between PC and PLS models is the logic behind the extraction of components. When using Principal Components, all factors are immediately extracted from the covariance matrix of the same set of predictors. It might, therefore, be the case that several factors explain the same characteristics of explanatory variables. Consequently, including these components in a forecast model means that it accounts for these characteristics several times. Such a complication could lead to multicollinearity issues. To avoid this problem, Wold proposed the PLS model, which would not extract factors from the covariance of the whole not-changing set of predictors, but from the not-yet explained parts of the covariance matrix between the dependent variable and the set of predictors. Like this, at each step of an iterative process the matrix, which is used to calculate components, is updated in such a way that only the characteristics that are not yet taken into account are left.

B. Li, Morris, and Martin (2002) discuss the relevance of Partial Least Squares models for forecasting of inflation and they note that these models might have a big potential in this field. This paper concentrates on the Static and Dynamic Partial Least Squares models, investigated by Fuentes et al. (2015). The dependent variable becomes then the targeted inflation rate, while the explanatory ones are the lags of the actual inflation and factors. However, some authors, for example Svensson (1997), prefer the forecast models which use the recursive relationship and include the lags of the targeted variables into the prediction framework. Following this idea, two more extensions are proposed in this paper. They take into account the lags of the targeted inflation rate in addition to the before mentioned explanatory variables. At the end, the paper investigates the performance of the Partial Least Squares models perform for the forecasts of inflation compared to the standard prediction models such as Principal Components and Auto-Regressive models.

Five PLS models are considered for this purpose, out of which one model is a Static, the other two are Dynamic models and the last two are the extended Dynamic PLS models. The description of the first three can be found in the work of Fuentes et al. (2015). The standard Principal Components model with a maximum of 10 lags (PC(10)) of the actual inflation rate and Auto-Regressive model with 4 lags (AR(4)) are taken as a benchmark for this research. The reasoning behind this choice is the fact that AR models have a high predictive power and PC models are the most well-known models used for forecasts (Fuentes et al., 2015). Also, two extensions of these models are assessed. The OLS estimation is used as a standard technique to approximate coefficients, but as an addition, the Ridge estimation is proposed. The forecasting performance is evaluated with the Relative Mean Squared Errors (Relative MSE), using AR(4) as a base model, and the standard Root Mean Squared Errors. To check if the difference in performance is significant the Diebold-Mariano and Harvey, Leybourne and Newbold tests are used. Moreover, the Mincer-Zarnowitz regression (MZ) is performed to check the fit of the achieved results with the targeted inflation rate. The Stock and Watson (2005) United States database of various macro- and microeconomic variables is used from the period 1960-2003. This data is separated into estimation and forecast sub-samples. For the prediction of the inflation rate an expanding window is used.

The results of this paper partially coincide with those from Fuentes et al. (2015). The Static Partial Least Squares model outperforms the competitors starting from the 6-step ahead forecast. It is also shown that according to the Relative MSE the second Dynamic PLS model has a strong potential and needs to be analyzed deeper. Moreover, it is found that the Ridge estimation improves the forecasting performance for the PC(10) model. However, the MZ-regression claims that these two models do not have the best fit with the targeted inflation rate due to the presence of an influential outliers, but the first Dynamic PLS and the second Extention PLS models do.

The report of the research is organised as follows. The section of Literature Review presents some relevant works of various econometricians to find out more about the background of models used for forecasting purposes. Next, the Data section presents the data and provides a look at the most influential historical aspects of U.S. inflation. Afterwards, all relevant models and tests are explained in the Methodology section. In the section of Results the main findings are presented. Finally, the Conclusion sums up all the work done and main results found. This sections also includes some critical assessment and proposals for future research.

2. Literature Review

The widely used forecasting techniques are regression-based models, which directly regression of the target variable on the whole set of predictors. However, there exists some issues which make the usage of these models problematic and inconvenient (Koop & Korobilis, 2012). Firstly, the decision of including an explanatory variable out of the large number of exogenous variables complicates the choice of the forecasting models. Like this, the total amount of models which can be created in the case of m potential predictors is 2^m. Secondly, the set of relevant predictors can vary over time, which forces researchers to recreate and check the model regularly. Taking the combination of the before mentioned two issues, the amount of possible models increases from 2^m to 2^{tm}, where t is the number of periods. Finally, one of the main assumptions of regression-based methods is the stationarity condition of multivariate time-series. Some researchers, among which Koop and Korobilis (2012) and Stock and Watson (1996), claim that multivariate series are unstable and have some structural breaks. Due to the before mentioned problems, the regression-based methods become a weak technique for forecasting.

Dynamic Factor Models, introduced by Geweke (1977), can partially deal with the before mentioned problems. These models do not only decrease the amount of predictors needed for forecasting, but also extract the most relevant information from each of the potential explanatory variables. This information is afterwards used to find out which part of the independent variables influences the variable at interest the most. Like this, the prediction procedure is increased in speed, quality and ease compared to the direct regression of the targeted variable on the whole set of predictors.

Stock and Watson (2012) provide an evidence for the improved forecasts relative to regression-based models. For example, the forecasts which are based on Principal Components models became very popular and are highly discussed in a lot of academic literature (Pearson, 1901). Stock and Watson (2002) investigate properties of PC in their work. The model, used for prediction, includes two stages: (i) extraction of the latent components from the explanatory variables, and (ii) usage of those in the linear regression for the forecast of a variable of interest. Using the Mean Squared Error as an evaluation technique, the authors show that the PC estimates constructed through the described stages give a consistent approximation for the latent components of explanatory variables and steady forecasts. Moreover, they provide evidence that the forecasts are steady even in case of some instabilities in the data. Boivin and Ng (2005) also investigate if the dynamic approach to Principal Components is better than the static one by Stock and Watson (2002). They conclude that the latter performs consistently better than the previous one in terms of the forecasting performance.

Another way to extract latent components from the predictors is through the Partial-Least Squares (PLS) model (Wold, 1966). The core part of the PLS technique estimates those factors while taking into account the covariance between the dependent and explanatory variables. The structure of the latent components varies among PLS models, which insures that different factors are achieved. The authors show that the estimates of those approximations are only consistent and unbiased when a large amount of explanatory variables is used for finding the components (Cassel, Hackl, & Westlund, 1999). Another result mentioned in their paper is that the Partial-Least Squares model is robust to measurement errors or sudden structural breaks.

The PLS model is also investigated by Fuentes et al. (2015). The paper combines various econometric techniques to forecast such macroeconomic variable as inflation. The authors introduce their versions of Partial-Least Squares which include one model for the Static and two for the Dynamic approach. They compare the forecast powers for different time intervals of those models to the Principal Components based on ten lags by means of Relative Mean-Squared Forecast Errors. It turns out that almost for all time intervals the Static PLS outperforms the other models, while one of the Dynamic approaches takes the second place.

As noted by Fuentes et al. (2015), the standard eigenvector-eigenvalue approach, which is used for example in case of Principal Components, cannot be used by Partial Least Squares models. The reasoning behind this is the fact that Partial Least Squares calculates factors iteratively from not yet explained parts of the covariance matrix between predictors and dependent variable (Wold, 1983). Therefore, another special algorithms should be used in this case. The most well-known approaches are summarized by Andersson (2009). The standard ones are the NIPALS algorithm, introduced by Wold (1975) and SIMPLS algorithm introduced by De Jong (1993). The NIPALS algorithm was firstly created for the case of Principal Components by Wold (1966). Only afterwards it is reviewed by the same author and an iterative algorithm is created for the Partial Least Squares. The SIMPLS algorithm is introduced as a modification of the NIPALS algorithm to achieve an increase in speed, efficiency and understanding of the results of algorithms.

3. Data

In this section the details of the Data used are presented. Firstly, the source and the estimation and the forecast sub-samples are discussed. Next, the historical inflation with some historical facts is analyzed to explain the possible presence of the historical bias.

3.1. The Main Aspects of the Data

To empirically compare the models used by Fuentes et al. (2015), the authors use the Stock and Watson (2005) database. It contains information about various macro- and microeconomic variables of the United States for the period 1959-2003. Due to missing observation, they examine only the period from the year 1960 onward, which is equivalent to 528 months. The same approach is, therefore, taken in this paper.

Bai and Ng (2008) note that the majority of data is non-stationary such that some transformations need to be made. Fuentes et al. (2015) and Bai and Ng (2008) use the transformations proposed by the original authors of this database, which mostly include logarithms and differences of variables (Stock & Watson, 2002). The details of the transformations can be found in the original paper by Stock and Watson (2002). After all the transformations, the set of predictors includes 132 variables and 526 observations, because not all the estimations start from January but from March, meaning that the first 2 observations should not be included into the estimation sub-sample.

The target inflation rate for the forecast becomes a transformation of the Consumer Price Index (CPI), because the annual percentage change can be seen as another measure of inflation. Following this logic, it can be calculated using the CPI as follows:

$$y_{t+h}^{h} = 1200\frac{(y_{t+h} - y_t)}{h} - 1200(y_t - y_{t-1}). \tag{1}$$

Here, y_t is the logarithm of CPI for each month from January, 1960 till October, 2003; h is the h-step ahead prediction, so y_{t+h} is the targeted value of the inflation h-step ahead which needs to be predicted at time t. Moreover, all the before mentioned authors also use an additional predictor of the actual inflation rate, which is calculated using:

$$z_t = 1200(y_t - y_{t-1}) - 1200(y_{t-1} - y_{t-2}). \tag{2}$$

The similarity of z_t and y_{t+h}^{h} can be noticed. The main difference is that in equation 1 the targeted variable is achieved through the difference between h-period ahead logarithmic value of CPI and the initial value. Therefore, to get the corresponding value for one month, the mentioned difference needs to be divided by h months.

Table 1: The estimation and forecast subsamples, where h is the forecast horizon.

Estimation Subsample	Forecast Subsample
1960.03 to 1970.03-h	1970.03 to 1980.12
1960.03 to 1980.03-h	1980.03 to 1990.12
1960.03 to 1990.03-h	1990.03 to 2000.12
1960.03 to 1970.03-h	1970.03 to 1990.12
1960.03 to 1970.03-h	1970.03 to 2000.12
1960.03 to 1980.03-h	1980.03 to 2000.12
1960.03 to 1970.03-h	1970.03 to 2003.12

Finally, following the same steps Fuentes et al. (2015), the whole period of 526 months is separated into estimation and forecast sub-samples, the exact dates of which can be found in Table 1. An expanding window is used to achieve the predictions of the target variable for the forecast sub-sample. Finally, the original targeted inflation rate from the forecast sub-sample is compared with predicted values through the Root MSE and the Relative MSE.

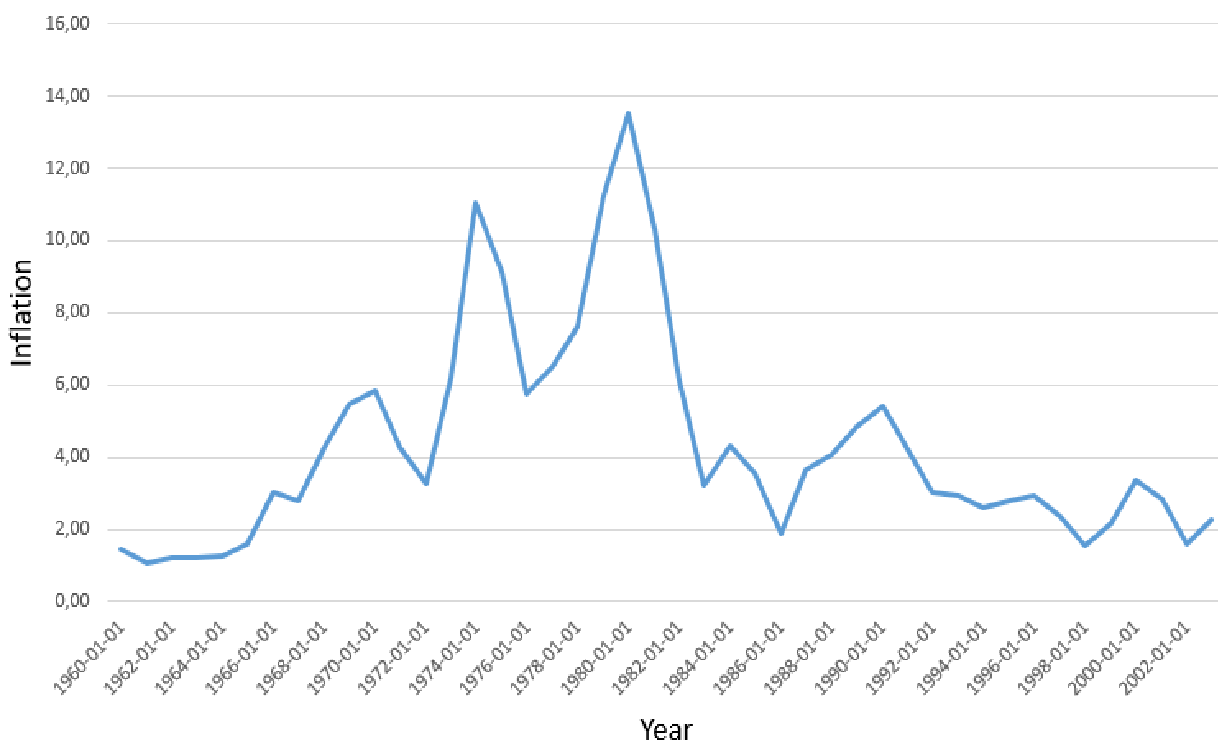

Figure 1: The Annual Historical Inflation for the period of 1960-2003.

3.2. Relevant Historical Facts

It is also important to analyse the historical events happening during the period of estimation subsample, because all the macroeconomic variables are highly connected to the U.S. policy. This estimation sample starts from March, 1960, and includes maximum three decades, meaning that some events during this period might have a strong influence on the inflation of the following decades and could, therefore, explain some of the results achieved in the research. Figure 1 presents the annualized historical inflation for the period of 1960-2003 (The World Bank, 2019).

Some note that the inflation during the post-war period is very difficult to predict as soon as it is quite volatile (Primiceri, 2006). This is due to the sharp increases and decreases during 1960s - middle of 1980s, which can be also found in Figure 1. These events are highly associated with historically and economically unstable situation present in the U.S.. For example, in the middle of 1960s, president B. Johnson launched a program called "Great Society", which main purposes were to rapidly decrease poverty rates and eliminate unfairness towards people of different race. This was happening by implementing tax cuts in a lot of spheres of people's life, business and trades. As a result, the wealth of individuals increased. However, at the beginning of 1970s the inflation in U.S. grew drastically from 1.6% to around 6%, which can be also noticed in Figure 1 (*Historical*

Inflation Rate, n.d.).

The period of 1970-1979 was even more unstable than the previous decade, especially for the U.S. currency. This is the period which includes the first oil crisis of 1973 and the second one of 1979 (Perron, 1989). During this period, the U.S. currency was becoming weaker, which is characterised by a dramatic raise in the inflation, reaching 11% and 13.5%, respectively (see Figure 1). The reason of this is that Arabian countries prohibited the trade of oil which negatively influenced the value of U.S. dollar. President R. Nixon admitted that the dollar cannot have the same value as gold, which caused an even more rapid fall of the value of the dollar. However, in 1974 an agreement with Saudi Arabia was signed to have all the oil trades denominated in U.S. dollars, which naturally increased the demand for the currency and allowed the inflation to decrease. This event influenced the inflation for the next several decades.

The next decade was characterized by decreasing trends in inflation and its' relative stability. Inflation was fluctuating around an average of 3.57%, but it never reached its' the lowest historical inflation of 1.07% from the beginning of 1960s. Taxes were dropping as well and trade agreements between several countries were signed to minimize some international trade tariffs.

Having an extra look at the history and to Figure 1, it becomes clear that the inflation is very volatile and almost does not have any trend. In this particular case, the inclusion of the sample starting from year of 1970 would influence the forecasts a lot due to high shocks and unusual fluctuations. This observation gives an idea of a presence of historical outliers in the data, which by themselves are expected to influence the results of the research.

4. Methodology

In this section all models that are used to forecast the value of inflation are explained. Firstly, the general forecasting model is presented. Secondly, forecast techniques used to estimate factors or components are discussed, which include Principal Components and three Partial-Least Squares models. Afterwards, two possible extensions of the paper are presented and are followed by explanation of evaluation technique used to compare the performance of the models.

4.1. General Forecasting Model

To forecast the macroeconomic value of inflation, the following model can be used (Fuentes et al., 2015):

$$y_{t+h} = \mu + \phi(L)z_t + \beta'(L)\hat{F}_t + \nu_{t+h}. \quad (3)$$

Here, y_{t+h} is the predicted target inflation rate which is supposed to occur in h periods, $\phi(L)z_t$ is a linear combination of the actual inflation rate lags occurred until and including period t. The term $\beta'(L)\hat{F}_t$ represents a linear combination of estimated factors or components, which are achieved through one of the estimation models that are described below. The forecast error is noted as ν_{t+h}. As it can be noticed, the only unknown explanatory variables of the model are the estimates of factors. Therefore, the following subsections are dedicated to various processes of extracting those factors from the set of predictors. When knowing those, it is possible to use estimation equations to get the approximations of coefficients and then use those to achieve forecasts.

A special case is when $h = 1$. One may argue that z_t and y_{t+1} take on the same values, however it is not true. Due to construction presented in equations (1)-(2), the variables include the same values, but the vector of z_t is bigger by one observation, which does not appear in the targeted inflation rate y_{t+1}. Consequently, when using the model in equation (3) for estimation purposes and taking lags of z_t, they will not include exactly the same observations as the vector y_{t+1}. Here, the vector of actual inflation rates includes one observation which is not present in the target variable. All the values of z_t are, therefore, moved by one up in all the cases where $h = 1$.

4.2. Auto-Regressive Model

The base model in this paper is an Auto-Regressive model with p lags of the target variable (AR(p)). This model is proposed by Yule (1927) and is widely used for the macroeconomic forecasts. Following Fuentes et al. (2015), only 4 lags are included into the estimation and forecast models. In the original forecasting model in equation (3), the lags of the actual inflation rate z_t of equation (2) are used. That is why the AR(4) model includes the lags of z_t, but not those of the target variable. This is not only done due to the construction of the forecast model, but also because the z_t represents the actual inflation rate, while y^h_{t+h} represents the targeted inflation rate. Following this logic, the AR(4) estimation model is constructed as:

$$\boldsymbol{y_t} = \mu + \phi_1 \boldsymbol{z_{t-h}} + \phi_2 \boldsymbol{z_{t-h-1}} + \phi_3 \boldsymbol{z_{t-h-2}} + \phi_4 \boldsymbol{z_{t-h-3}} + \boldsymbol{\varepsilon_t}, \tag{4}$$

where y_t is the last known inflation from the estimation sub-sample. At the same time the forecast model for the case of AR(4) is constructed as the following:

$$y_{t+h} = \hat{\mu} + \hat{\phi}_1 z_t + \hat{\phi}_2 z_{t-1} + \hat{\phi}_3 z_{t-2} + \hat{\phi}_4 z_{t-3}. \tag{5}$$

4.3. Principal Components Model

The general set up of the Principal Components model can be found in the papers of Fuentes et al. (2015) and of Stock and Watson (2002). The main idea is to find the decomposition of the explanatory variables through a linear combination of factors. Therefore, the simple model can be described as follows:

$$\boldsymbol{X_t} = \boldsymbol{\Lambda F_t} + \boldsymbol{\varepsilon_t}, \tag{6}$$

where $\boldsymbol{X_t} = [X_{t1} ... X_{t132}]$ is the t-by-132 matrix of all predictors, with t being the number of observations. The factor loadings $\boldsymbol{\Lambda}$ have the size t-by-r, where r is the amount of factors extracted. Consequently, $\boldsymbol{\Lambda F_t}$ is the linear combination of latent components which are used to decompose the explanatory variables. Therefore, the estimators of factors would be equal to $\boldsymbol{\hat{F}_t} = \boldsymbol{\hat{\Lambda}' X_t}$, which is a rx132 matrix.

The strategy picked by Fuentes et al. (2015) to find factor loadings $\boldsymbol{\Lambda}$ is to minimize the Mean-Squared Error. Also, Shlens (2014) notes in his paper that the factors which have a high variance are of the highest interest for forecasts due to the fact that they represent a small noisy parts of predictors. Combining these two ideas, the problem can be rewritten as the maximization of the summation of the diagonal elements of the Variance-Covariance matrix $\boldsymbol{\tilde{\Lambda}'} \Sigma_{\boldsymbol{X_T X_T}} \boldsymbol{\tilde{\Lambda}}$, where $\Sigma_{\boldsymbol{X_T X_T}}$ is the Variance-Covariance matrix of all predictors till observation T. Therefore, the model to estimate factors can be formulated as:

$$\begin{aligned} \max_{\tilde{\Lambda}} \quad & T tr(\boldsymbol{\tilde{\Lambda}' X_T' X_T \tilde{\Lambda}}) \\ \text{s. t.} \quad & \boldsymbol{\tilde{\Lambda}' \tilde{\Lambda}} = \boldsymbol{I_r}, \end{aligned} \tag{7}$$

where T is the size of estimation sub-sample, which is equal to to the number of observations. Therefore, the $\boldsymbol{X_T' X_T}$ is the 132-by-132 Variance-Covariance matrix. The restriction imposed on the matrix of loadings guarantees that the decomposition is a linear combination of factors. It is interesting to note that the solution of the above problem would be the set of largest eigenvectors of matrix $\boldsymbol{X}_T'\boldsymbol{X}_T$. Hence, the estimation and the forecast models for this case look like equation (3).

4.4. Partial-Least Squares

The Partial-Least Squares (PLS) models use the forecast model, which can be specified as (Fuentes et al., 2015):

$$y_{t+h} = \mu + \phi(L)z_t + \beta'(L)Z_t + u_{t+h}. \tag{8}$$

This forecast model is almost identical to the one in equation (3). The main difference is the approach which is used to extract the latent components of predictors. These components are taken from the covariance between not only the explanatory variables themselves but from the covariance between explanatory and forecast variables. Therefore, the latent components in equation (8) are $\boldsymbol{Z_t} = \boldsymbol{W}\boldsymbol{X_t}$ and are constructed through the eigenvectors of the matrix M_t, which usually have a representation as $\boldsymbol{X}_t'\boldsymbol{Y}_t\boldsymbol{Y}_t'\boldsymbol{X}_t$. It should also be noted that the eigenvector decomposition used on the matrix $\boldsymbol{M}$ is not standard. In the PLS approach, the matrix of predictors and the vector of targeted variable are being updated with each iteration by leaving only the part which is not yet explained by the component, which is extracted from the previous iteration. In the following subsection more details about the PLS approaches and the algorithm on components extraction are explained.

4.4.1. Static Partial-Least Squares

The main idea of the Static PLS is to get latent components for predictions of inflation through the covariance of the vector of the target variables ($\boldsymbol{Y_{t+h}}$) and the original matrix of predictors ($\boldsymbol{X_t} = [X_{t1}...X_{t132}]$). Consequently, the matrix of weights $\boldsymbol{W}$ is determined through the Partial Least Squares eigenvector decomposition of $\boldsymbol{M_t} = \boldsymbol{X}_t'\boldsymbol{Y}_{t+h}\boldsymbol{Y}_{t+h}'\boldsymbol{X}_t$. Therefore, the general set-up of the problem can be formulated as follows:

$$\begin{aligned} \max_{\boldsymbol{W}} \quad & \boldsymbol{W}'\boldsymbol{X}_t'\boldsymbol{Y}_{t+h}\boldsymbol{Y}_{t+h}'\boldsymbol{X}_t\boldsymbol{W} \\ \text{s. t.} \quad & \boldsymbol{W}'\boldsymbol{W} = \boldsymbol{I_r} \end{aligned} \tag{9}$$

,

where, r is the number of components being extracted from the matrix $\boldsymbol{M}$. It is important to note that $\boldsymbol{Y_{t+h}} = (y_{h+1},...,y_{t+h})$ is a vector of target values up to the period $t+h$. The estimated weight matrix is used to get the components $\boldsymbol{Z_t} = \boldsymbol{W}\boldsymbol{X_t}$, as mentioned in the introduction to the section

4.4.

4.4.2. The First Dynamic Partial-Least Squares

To capture the time dependence of the time series, a dynamic approach is incorporated. This can be done by ensuring sure that when the factors are estimated the lags of the target variable z_t are taken into account. Following this approach, the latent components are found through the ”expanded” matrix of explanatory variables $\boldsymbol{X_{te}} = [X_{t1}...X_{t132}, z_t]$ and the vector of targeted variable in equation (9). Here, the set of original predictors is added by a maximum of 6 lags of the actual inflation rate z_t. As soon as these lags are already taken into account during the extraction of the factor components, they are not included into the final forecast in equation (8). Therefore, the maximization problem can be formulated as follows:

$$\begin{aligned} \max_{\boldsymbol{W}} \quad & \boldsymbol{W}'\boldsymbol{X}'_{\boldsymbol{te}}\boldsymbol{Y}_{\boldsymbol{t+h}}\boldsymbol{Y}'_{\boldsymbol{t+h}}\boldsymbol{X}_{\boldsymbol{te}}\boldsymbol{W} \\ \text{s. t.} \quad & \boldsymbol{W}'\boldsymbol{W} = \boldsymbol{I_r} \end{aligned} \tag{10}$$

.

The specification of the $\boldsymbol{Y_{t+h}}$ is the same as in sub-section 4.3.1.

4.4.3. The Second Dynamic Partial-Least Squares

The approach for the second Dynamic PLS model is very similar to the Static. The dynamic component is taken into account by including the auto-regressive coefficient of AR(p) into the definition of the $\boldsymbol{M}$-matrix with $p = 1...6$. More specifically, the auto-regression is estimated for the target variable and p lags of z_t, as described in the section 4.2. The estimated coefficients ϕ are afterwards used in the $\boldsymbol{M}$-matrix, specified in the section 4.3: the Y-vector becomes the vector of errors of AR(p) estimation process determined as $\boldsymbol{\bar{Y}_{t+h}} = \boldsymbol{Y_{t+h}} - \boldsymbol{\hat{\phi}(L)z_t}$. Then the estimation of the matrix of weights is performed using the following model Fuentes et al. (2015):

$$\begin{aligned} \max_{\boldsymbol{W}} \quad & \boldsymbol{W}'\boldsymbol{X}'_{\boldsymbol{t}}\boldsymbol{\bar{Y}}_{\boldsymbol{t+h}}\boldsymbol{\bar{Y}}'_{\boldsymbol{t+h}}\boldsymbol{X}_{\boldsymbol{t}}\boldsymbol{W} \\ \text{s. t.} \quad & \boldsymbol{W}'\boldsymbol{W} = \boldsymbol{I_r} \end{aligned} \tag{11}$$

,

where, the $X_t = [X_{t1}...X_{t132}]$ is the original set of 132 predictors. After getting the estimates of weights $\boldsymbol{W}$, they are used in the forecast model 8, which in this case also includes the lags of the actual inflation rate.

4.4.4. The First Extension Model

The first proposed extension model is based on the first and the second Dynamic models. It is noticed that the majority of the forecasting models have a recursive dependence on the target variable, in this case the targeted inflation rate but not the actual inflation rate. This means that in the standard framework the forecasting model would also include the lags of the dependent variable y:

$$y_{t+h} = \mu + \alpha(L)y_t + \phi(L)z_t + \beta'(L)Z_t, \tag{12}$$

where $\alpha(L)y_t$ is the linear combination of lags of the target variable. To incorporate this interdependence, not only the lags of the actual inflation rate z_t are taken into account but also the lags of the target variable y_{t+h} are used in the extraction of the components. Similarly to the approach of the second Dynamic PLS model, the $\boldsymbol{Y}$-vector from the $\boldsymbol{M}$-matrix is found using the errors of the AR(p) regression of targeted inflation and its' lags. Therefore, the error $\breve{\boldsymbol{Y}}_{\boldsymbol{t+h}} = \boldsymbol{Y}_{\boldsymbol{t+h}} - \hat{\boldsymbol{\phi}}(\boldsymbol{L})\boldsymbol{Y}_{\boldsymbol{t}}$ is used in the objective function. The first DPLS model is also included into the estimation model by expanding the matrix of predictors with p lags of z_t as it is described in section 4.4.2. Therefore, the latent components are extracted from the covariance of the errors-vector from the described AR(p) regression and the expanded set of the predictors. Consequently, the problem can be formulated as the following:

$$\begin{aligned} \max_{\boldsymbol{W}} \quad & \boldsymbol{W}'\boldsymbol{X}'_{\boldsymbol{te}}\breve{\boldsymbol{Y}}_{\boldsymbol{t+h}}\breve{\boldsymbol{Y}}_{\boldsymbol{t+h}}'\boldsymbol{X}_{\boldsymbol{te}}\boldsymbol{W} \\ \text{s. t.} \quad & \boldsymbol{W}'\boldsymbol{W} = \boldsymbol{I}_{\boldsymbol{r}} \\ . \end{aligned} \tag{13}$$

It is important to note, that the amount of lags of y_{t+h} used in the AR(p) regression and the amount of lags of z_t used to expand the matrix of predictors are the same.

4.4.5. The Second Extension

The second extension is similar to the first, but there is a difference. As mentioned before, in the first extension the amount of lags of the targeted variable in the AR(p) regression is the same as the amount of lags of z_t, which is included in the expanded set of predictors. For the case of the second extension, the different amount of lags of the targeted variable and the original inflation are considered.

4.4.6. SIMPLS Algorithm

As noted before, the main idea of PLS models is a special type of eigenvalue-eigenvector decomposition of a specifically formed matrix $\boldsymbol{M}$. As soon as in each iteration a new component needs to be extracted from the part of the matrix which is not yet explained, the simple methods of eigenvector-eigenvalue decomposition do not work in case of Partial Least Squares with one dependent variable (PLS1). Due to this complication various algorithms to calculate those latent components have been designed. A summary of these algorithms can be found in the work of Andersson (2009).

A SIMPLS algorithm is chosen for this research, which was created and developed by De Jong (1993). This algorithm is used because it is faster than a lot of standard algorithms, like, for example, NIPALS. Moreover, it was also noted that if there are only few factors being extracted, then the chosen algorithm is stable (Andersson, 2009). Finally, due to the fact that the algorithm does not break the data set from which components are being extracted, it becomes easy to understand and use (De Jong, 1993).

The objective of the algorithm is to form a forecasting model, which can be formulated as:

$$\hat{\boldsymbol{Y}}_{t+h} = \boldsymbol{X}_t \boldsymbol{B}, \tag{14}$$

where $\hat{\boldsymbol{Y}}_{t+h}$ is a target variable of a forecast, $\boldsymbol{X}_t$ is the matrix of predictors and $\boldsymbol{B}$ is the vector of coefficients. However, instead of a direct application of the model, the extraction of relevant latent components is needed to decrease the amount of predictors. The main idea of the algorithm is to extract factors from the covariance of orthogonal factors of predictors and respective components of dependent variable (De Jong, 1993). This algorithm calculates weights needed to construct latent components directly from the mentioned covariance. Therefore, it can be seen as one of the main advantages of the SIMPLS algorithm comparing to the other standard PLS algorithms (for example: NIPALS), because the later ones need to construct additional intermediate updated matrices of predictors and dependent variable. Consequently, the weights achieved in the algorithm can be directly used to calculate components:

$$\boldsymbol{F}_t = \boldsymbol{X}_t \boldsymbol{R}, \tag{15}$$

where $\boldsymbol{F}_t$ are the components and $\boldsymbol{R}$ is the matrix of weights. Another advantage of the SIMPLS algorithm is the fact that to apply the standard PLS algorithms with one targeted variable, all the needed data needs to be centered, while the SIMPLS algorithm requires centering only of a dependent variable (De Jong, 1993). A more detailed algorithm can be found in the Appendix A with all needed steps.

4.5. Ridge Estimation

Fuentes et al. (2015) use Ordinary Least Squares (OLS) estimation for their coefficients approximation. However, in the framework of the paper, the OLS forecasting is not likely to give accurate results. There might be several reasons of this. First of all, as it is shown before, the chosen time period includes some ourliers, which insures that the historical inflation does not follow a specific trend. Next, the amount of predictors included in the forecast models can be large, because of a high number of factors/components, their lags and lags of actual inflation rate. Finally, the interdependence among the independent variables might be present due to the nature of macroeconomic variables. To tackle these potential issues J. Li and Chen (2014) use another technique in their paper: Lasso regularisation. The main idea of a Lasso regularisation is that it sets the least meaningful coefficients of the corresponding predictors to zero. The authors show that when using the Lasso regularisation with the Dynamic Factor Models, the forecasting performance is improved.

However, setting some coefficients to zero also means an exclusion of information from the model. To smoothen the estimates, Tikhonov (1963) proposed the Ridge regularisation model. The aim of Ridge regularisation is not to set the least meaningful coefficients of the corresponding predictors to zero, but to shrink them towards zero (Olivares-Nadal & DeMiguel, 2018). Like this, it is still possible to keep all the information sources, but assign different weights to the most and the least relevant ones. The estimates of the Ridge regularization can be calculated by:

$$\boldsymbol{B} = (\boldsymbol{X}'\boldsymbol{X} + \lambda \boldsymbol{I})^{-1}\boldsymbol{X}'\boldsymbol{Y}, \tag{16}$$

where $\boldsymbol{X}$ is a set of independent variables used in the forecast equation, $\boldsymbol{Y}$ is a target variable and $\lambda \geq 0$ is a shrinkage coefficient. A shrinkage coefficient or penalty term is responsible for the speed of the coefficients getting closer to zero: the higher the value of λ, the closer coefficients go to zero. If the penalty term is equal to zero, the solution is equivalent to the OLS estimates. The shrinkage coefficient in this paper is picked such that the Mean-Squared Errors of the 1-step ahead forecasts are minimized. The chosen values are kept for the remainder of the prediction procedures.

4.6. Evaluation Techniques and Application

To assess the inflation forecasts by various models, Fuentes et al. (2015) use the Relative Mean-Square forecast Error (Relative MSE), which can be computed as follows:

$$RMSE(method) = \frac{MSE(method)}{MSE(AR(4))}. \tag{17}$$

The denumerator represents the Mean-Squared Error of the auto-regressive model, where the inflation is forecasted using four lags. If the value of the Relative MSE is greater than one, then it follows that the chosen method performs worse than the AR(4) model. Consequently, the lower the Relative MSE, the better the performance.

Except of the Relative Mean Squared Errors, the Root Mean Squared Errors are also considered to have a better understanding of the fit of the models and to visualize the difference in performance. Also, to statistically test whether the variation in the forecast errors of the models is significant, Diebold and Mariano (1995) propose the Diebold-Mariano (DM) test. If $v_{t+h,i}$ is the forecast error of model i, then the difference between forecast errors d_{ij} of the models i and j can be constructed as $d_{ij} = v_{t+h,i} - v_{t+h,j}$. Then, the DM-statistics can be calculated as:

$$DM_{ij} = \frac{\bar{d}_{ij}}{\sqrt{\frac{\hat{\gamma}_{d_{ij}}(0)+2\sum_{m=1}^{n-1}\hat{\gamma}_{d_{ij}}(m)}{T}}}, \tag{18}$$

where $\bar{d}_{ij}$ is the mean value of the difference between errors of models i and j; T is the length of the forecast period; $\hat{\gamma}_{d_{ij}}(m)$ is an autocovariance. The autocovariance can be calculated as $\frac{1}{T}\sum_{c=m+1}^{T}(d_{ij,c} - \bar{d}_{ij})(d_{ij,c-m} - \bar{d}_{ij})$; n has a standard value of $n = T^{1/3} + 1$. The null-hypothesis of this test requires the expected value of the difference in errors to be zero. Under the null-hypothesis the DM-statistics follows the Standard Normal distribution. The test rejects the null hypothesis, claiming that there is a significant difference in forecast errors, when the p-value of a test-statistics takes values higher than the significance level. Significance levels of 1%, 5% and 10% are used to test the null-hypothesis.

Although the before mentioned test is powerful, Harvey, Leybourne, and Newbold (1997) note that there is a high chance of series d_{ij} being autocorrelated. To overcome this issue, the authors propose the HLN test with the following test-statistics:

$$HLN_{ij} = \sqrt{\frac{T+1-2n+n(n-1)}{T}}DM_{ij}. \tag{19}$$

Under the same null-hypothesis, the HLN-test follows the Student-t distribution with $T-1$ degrees of freedom. The same significance levels are used to test the null-hypothesis.

Moreover, the Mincer-Zarnowitz regression is an another way to find out if the forecast results have a good fit with the targeted values of inflation rate (Mincer & Zarnowitz, 1969). The regression can be presented as the following:

$$y^h_{t+h} = \alpha + \beta \bar{y}^h_{t+h} + \varepsilon_{t+h}, \tag{20}$$

where y^h_{t+h} is the targeted inflation rate and $\bar{y}^h_{t+h}$ is the forecasted targeted inflation rate. For the null-hypothesis of the test, if the estimates of coefficients α and β are simultaneously 0 and 1, respectively, it would suggest that the forecasts are of a good fit. Otherwise, it could be the case of systematic bias in the predictions. The test can be done using the F-statistics for multiple coefficients restrictions.

Finally, the amount of lags of variables is chosen according to the Bayesian Information Criterion (BIC), which needs to be minimized. Following the approach of Fuentes et al. (2015), the maximum amount of factors extracted in the case of Principal Components is 10. It is also noted that the maximum amount of lags being included into the estimation model with PC is 6 for both the actual inflation rate z_t and for the extracted factors. In that case, the BIC matrix has a size of 6x10x6 (6 lags of z_t - 10 PC factors - 6 lags of PC factors). For the case of PLS, only a maximum of 2 components is extracted from the covariance matrix. As well as before, 6 lags of the actual inflation and of the components are taken into account. Therefore, in all cases of PLS except of the second extension the BIC matrix becomes 6x2x6. As of the last extension model, due to the fact that the amount of lags of actual inflation and targeted inflation are not simultaneously the same, the size of the BIC matrix becomes 6x6x2x6 (maximum amount of lags of y^h_t - maximum amount of lags of z_t - maximum amount of PLS components - maximum amount of lags of PLS components). It is also noted that such a construction basically implies that the first extension is a part of the second extension due to construction. Therefore, it can be said that the second extension should be at least as good as the first one due to the minimum of BIC matrix being equal or lower than the one of the first one.

5. Results

5.1. Main Results of the Research

The main results can be found in Tables 2-5. These tables present the Relative Mean-Squared forecast Error according to equation (17) for 1-, 6-, 12- and 24-step ahead forecasts, respectively. There are bold, underlined Relative MSEs and the values of those in italics. These represent the first, second and third best performing models according to the performance measure. It is important to note that the tables do not show the amount of factors' lags and actual inflation rate included into estimation model to minimize the BIC. The exact procedure of this algorithm can be found in the Appendix D.

The Principal Components model with a maximum of 10 lags outperforms the other the investigated predicting techniques for 1-step ahead forecasts, as seen in Table 2. The measurements of the Relative MSE varies from 0.8951 to 0.9754. Due to the fact that all these values are lower than one, it follows that this model performs better than the basic Auto-Regressive model with 4 lags. This result is also supported by Table 10 from the Appendix B.1, which shows the results for another forecast evaluation techniques, namely the Root Mean-Squared Errors. However, the Diebold-Mariano and Harvey, Leybourne and Newbold tests suggest that the forecast performance of AR(4) and PC(10) models is the same. Results in Tables 18-24 show that the p-values for DM and HLN statistics are higher than any of the significance intervals of 1%, 5% and 10%, which means that the null hypothesis of equivalence of forecast errors cannot be rejected and, consequently, should be accepted.

The second place according the Relative MSE is taken by two models: the S.PLS and the basic AR(4) models. This is due to the fact that for the forecast periods of 1990.03-2000.12 and 1980.03-2000.12 the Relative MSE, presented in the Table 2 in the second column, is smaller than 1, meaning that the corresponding model outperforms the AR(4) model. The DM and HLN tests for these periods do not reject their null hypothesis, which means that there is an insignificant difference between the performance of Static PLS and AR(4) models. For the rest of the periods except of 1980.03-1990.12 the Relative MSE takes values greater than 1, which means that the Mean-Squared Error of the Static PLS is greater than the one of AR(4) model. The difference between the prediction errors of these models for the forecast periods of 1970.03-1980.12 and 1970.03-1990.12 is significant while for the other periods it is not, as shown in Tables 18-24. The outlying result of the forecast time period of 1980.03-1990.12 suggests that the second Extension model shows the second lowest Relative MSE of 0.9718 which is lower than 0.9856 of the Static PLS. However, this difference is insignificant, according to the DM and HLN tests in Table 19.

In the majority of the cases the second Dynamic PLS model provides the third best forecast performance. This result sometimes deviates, because DM and HLN tests suggest that depending on the period, the difference between forecasting errors of this model and other models can be insignificant, as shown in Tables 18-24. Overall, basing the conclusion for the case of 1-step ahead forecasts only on the values of the Relative MSE and Root MSE, presented in Tables 2 and 10, respectively, Auto-Regressive model, Principal Components, Static and the second Dynamic PLS models perform the best comparing to the others. However, it is also evident that the PC(10) model is the only one that consistently outperforms the remaining six models.

Table 2: Relative Mean-Squared forecast Error for the 1-step ahead forecast.

h=1	PC(10)	S.PLS	D.PLS (a)	D.PLS (b)	E.PLS (a)	E.PLS (b)
70.03-80.12	**0.9688**	<u>1.1093</u>	1.1584	*1.1100*	1.6013	1.4727
80.03-90.12	**0.9534**	*0.9856*	0.9963	0.9944	1.0797	<u>0.9718</u>
90.03-00.12	**0.8951**	<u>0.9395</u>	1.1183	*0.9959*	1.4135	1.3987
70.03-90.12	**0.9754**	<u>1.0576</u>	*1.0593*	1.0673	1.3290	1.2464
70.03-00.12	**0.9632**	<u>1.0395</u>	1.0760	*1.0538*	1.3439	1.2795
80.03-00.12	**0.9395**	<u>0.9693</u>	1.0394	*0.9916*	1.1682	1.0961
70.03-03.12	**0.9535**	<u>1.0235</u>	1.0688	*1.0402*	1.3512	1.3029

Notes: The table contains the Relative Mean-Squared forecast Errors with the 1-step ahead forecasts of all the models with the AR(4) model as a benchmark. The bold, underlined and italics numbers refer to the models with the smallest, the second and the third smallest Relative MSE, respectively.

The results of Mincer-Zarnowitz regression can be found in Table 14 in Appendix B.2. According to the p-value of the F-test statistics, only during the forecast intervals of 10 years - 1970.03-1980.12; 1980.03-1990.12 and 1990.03-2000.12 - the predicted inflation values of a few models fit the targeted inflation. This can be seen from the fact that in the majority of cases the p-value of the test statistics is much lower than the significance level of 5%, such that H_0 is rejected. Therefore, the Auto-Regressive model and Principal Components provide a good fit only in 2 forecast subsamples according to this statistics, while Static and the second Dynamic PLS models with the second Extension give reliable results only once. As it was noted in Section 4.5, such results show that there are influencial shocks which affect forecasts. This is also supported by findings that for the period 1990.03-2000.12 the corresponding Root MSE is significantly lower than for the rest of the periods for all the models, as shown in Table 10.

Table 3 represents the results of the Relative MSE for the 6-step ahead forecasts of inflation. Here, all values of the evaluation measurement, except of some belonging to the second Extention model, are smaller than 1, which points out that the AR(4) model is outperformed by all the models in almost all the cases. However, the difference in forecast performance is not significant. The p-values of the DM and HLN statistics in Tables 25-31 is never smaller than any of the significance levels such that the equivalence of forecast errors is accepted.

In the case of 6-step ahead results, the Relative MSE shows that Principal Components with a maximum of 10 lags and Static PLS models outperform the remaining estimation approaches. The minimum value of Relative MSE is 0.6253, which belongs to the Static PLS for the forecast period of 1990.03-2000.03. The same result is supported by Table 11 in Appendix B.1, showing that the lowest Root MSEs belong to the PC(10) and Static PLS models. The lowest Relative MSE of 0.9641 is achieved by the Static PLS during the period of March, 1990-December, 2000. However, the difference in prediction errors of PC(10) and Static PLS models is almost always insignificant, except of forecast periods of March, 1970 - December, 1980 and March, 1970 - December, 1990, as seen in Table 25 and Table 28, respectively.

The second Dynamic PLS model and Principal Components take the second place according to the forecast evaluations. This is again due to the fact that depending on the period, one of the before mentioned models performs better or worse than the other one. The second lowest Root MSE is 1.0342 and it belongs to the PC(10) model. The results of the DM and HLN tests suggest that the difference in forecasts between the second Dynamic PLS and PC(10) models is significant only for the periods of 1990.03-2000.12 (see Table 27) and 1980.03-2000.12 (see Table 30), while the rest of periods show statistically the same results for prediction errors.

Finally, the third place is mostly taken by Static PLS and the second Dynamic PLS, except of the first period 1970.03-1980.12, where the first Extention PLS model takes the third place according to the Relative MSE. Nevertheless, it is again evident that the Root MSE of the period 1990.03-2000.12 are lower than the other values. However, this difference is not as drastic as the case of 1-step ahead forecasts. Although the Relative MSE show these results, the DM and HLN tests suggest that the difference in performance of the Static PLS and the second Dynamic PLS is significant only during the periods 1990.03-2000.12 and 1980.03-2000.12, but not for the remaining periods, as shown in Tables 25-31.

Table 3: Relative Mean-Square forecast Error for the 6-step ahead forecast.

h=6	PC(10)	S.PLS	D.PLS (a)	D.PLS (b)	E.PLS (a)	E.PLS (b)
70.03-80.12	**0.7117**	0.8181	0.7689	0.7123	*0.7217*	0.8283
80.03-90.12	0.6867	**0.6761**	0.7548	*0.7099*	0.7612	0.9748
90.03-00.12	0.7195	**0.6253**	*0.8203*	0.8392	0.9037	1.3570
70.03-90.12	**0.7234**	*0.7755*	0.7941	0.7297	0.7798	0.9513
70.03-00.12	**0.7139**	*0.7484*	0.7861	0.7287	0.7814	0.9731
80.03-00.12	0.6786	**0.6522**	0.7494	*0.7118*	0.7669	1.0041
70.03-03.12	**0.7208**	*0.7405*	0.7974	0.7321	0.7925	0.9898

Notes: The table contains the Relative Mean-Squared forecast Errors with the 6-step ahead forecasts of all the models with the AR(4) model as a benchmark. The bold, underlined and italics numbers refer to the models with the smallest, the second and the third smallest Relative MSE, respectively.

The p-value of the F-test is much higher than the significance level of 5% in the majority of cases, which indicates that the test accepts the null-hypothesis of a good fit, as shown in Table 15. To sum up the results of the Relative and Root MSE, it is obvious that Principal Component outperforms less often in the case of 6-step ahead forecasts, while PLS models gain more predictive power comparing to the PC(10) and AR(4) models.

The results of the 12-step ahead forecasts can be found in the Table 4. According to the Relative MSE, the Static PLS model outperforms all other models except in the period 1970.03-1980.12. For that period, the Principal Component model with maximum of 10 lags still performs the best. However, it is noted that the performance of Static PLS and PC(10) models is always statistically equivalent based on the DM and HLN test results in Tables 32-38. The second Dynamic PLS and PC(10) perform the second best, based on the Relative PLS. In this case the DM and HLN statistics again show no difference in the forecast performance between these two models. The third place is almost fully taken by the second Dynamic Partial Least Squares model. All these results are supported by the Root MSE values, which can be found in Table 12.

Table 4: Relative Mean-Square forecast Error for the 12-step ahead forecast.

h=12	PC(10)	S.PLS	D.PLS (a)	D.PLS (b)	E.PLS (a)	E.PLS (b)
70.03-80.12	**0.7320**	<u>0.7498</u>	*0.7728*	0.7782	0.8278	0.8748
80.03-90.12	*0.6187*	**0.5872**	0.6698	<u>0.6139</u>	0.6827	1.0248
90.03-00.12	*0.7941*	**0.6065**	0.7962	<u>0.7893</u>	0.8794	1.3655
70.03-90.12	<u>0.6683</u>	**0.6531**	0.7166	*0.6868*	0.7510	0.9561
70.03-00.12	<u>0.6745</u>	**0.6444**	0.7162	*0.6889*	0.7565	0.9803
80.03-00.12	*0.6378*	**0.5831**	0.6770	<u>0.6297</u>	0.7039	1.0555
70.03-03.12	<u>0.6764</u>	**0.6456**	0.7316	*0.6934*	0.7721	0.9992

Notes: The table contains the Relative Mean-Squared forecast Errors with the 12-step ahead forecasts of all the models with the AR(4) model as a benchmark. The bold, underlined and italics numbers refer to the models with the smallest, the second and the third smallest Relative MSE, respectively.

The results of Mincer-Zarnowitz regression show that all the models except of the first Dynamic PLS and the second Extension PLS models are unstable in fitting the regression. The F-statistics suggests that only the previous two models generate results which are very close to the targeted inflation. An interesting observation is that according to the F-test, the values of inflation predicted by the second Extention model fit the MZ regression for all time intervals. To sum up, according to the Relative MSE and Root MSE, the Static PLS model outperforms the other models. The results of the F-test and the Root MSE of the period 1990.03-2000.12 still indicate that there are outliers in the data.

Finally, the evaluation results of the forecasts with 24-step ahead can be found in the Table 5. Here, the first place is taken by the Static PLS and the second Dynamic PLS models, reaching the minimum value of 0.5177 by the Static PLS model. It is interesting to note, that the Relative MSE of the Principal Components model is never lower than of the remaining models. The second Dynamic PLS models shows an improvement of the performance comparing to the previous cases. The second Dynamic Partial Least Squares model takes the second place among the estimation models. Also, few times the second best forecast results are shown by the Static PLS, PC(10) and the first Dynamic PLS models. The third place is shared by all the models except of the Static and the second Extension PLS models. The findings are similar to the Relative MSE for the 24-step ahead forecasts, as shown in Table 13. The results of DM and HLN tests can be found in Tables 39-45. They reject the significant difference in forecasting power between the second Dynamic PLS and Static PLS models. They also show no significant difference between the PC(10) and the before mentioned models.

Table 5: Relative Mean-Square forecast Error for the 24-step ahead forecast.

h=24	PC(10)	S.PLS	D.PLS (a)	D.PLS (b)	E.PLS (a)	E.PLS (b)
70.03-80.12	0.7212	<u>0.6392</u>	*0.6890*	**0.6100**	0.7991	0.7608
80.03-90.12	<u>0.5209</u>	**0.5177**	0.5625	*0.5366*	0.5821	0.7929
90.03-00.12	0.7192	**0.5251**	0.8103	<u>0.5515</u>	*0.7179*	1.3181
70.03-90.12	*0.6335*	**0.5812**	<u>0.6298</u>	**0.5812**	0.6964	0.7829
70.03-00.12	*0.6409*	**0.5770**	0.6438	<u>0.5790</u>	0.6977	0.8255
80.03-00.12	*0.5496*	**0.5188**	0.5967	<u>0.5388</u>	0.6000	0.8677
70.03-03.12	*0.6456*	**0.5771**	0.6595	<u>0.5816</u>	0.7061	0.8544

Notes: The table contains the Relative Mean-Squared forecast Errors with the 24-step ahead forecasts of all the models with the AR(4) model as a benchmark. The bold, underlined and italics numbers refer to the models with the smallest, the second and the third smallest Relative MSE, respectively.

Even though the results of the Relative and Root MSE values show that the Static PLS model basically outperforms all the competitors, the Mincer-Zarnowitz regression provides a different conclusion. Table 17, which shows the results of estimates of MZ regression and corresponding p-values of the F-tests, provides the idea that the models which predict inflation rate the best are the first Dynamic PLS and two extensions, since in these three case the null-hypothesis is accepted most often. Overall, the Static and the first Dynamic PLS models show the performance for 24-step ahead forecasts.

5.2. Comparison to Results of Fuentes et al. (2015)

Fuentes et al. (2015) argue that in the case of the 1-step ahead forecasts the model which outperforms all the competitors is the second Dynamic PLS model. However, this paper finds that Principal Components model with the maximum of 10 lags becomes the winner for the case of 1-step ahead forecasts (see Table 2). Moreover, in the cases of 6-, 12- and 24-step ahead forecasts, Fuentes et al. (2015) claim that the Static PLS model consistently outperforms PC(10) and all the Dynamic PLS models, which is not fully in line with the results in this paper. Here, Tables 3-5 show that with the increase in the step size, the best results are provided firstly by PC then by Static PLS and then they are shared between Static PLS and the second Dynamic PLS models. Finally, it is interesting to note that, according to the results of the replicated paper, the first Dynamic PLS model performs often worse than the basic AR(4), while the results in this paper do not support this conclusion.

Multiple reasons for these dissimilarities can be found. First of all, starting from the moment of creating a target variable, it is not fully explained which sample should be used for this purpose. As it was mentioned before, the Stock and Watson database contains data from January, 1959 till

December, 2003 and due to some missing observations the investigation starts from March, 1960 onward. Therefore, when constructing the target variable by equation (1), there are two possible options. The first one is to cut out the first 12 months from January, 1959 till December, 1959 and construct the target variable based on the observation starting from January, 1960. The second option is to firstly construct the target variable based on the whole data set and only then cut a relevant sub-sample. Depending on the approach, the size of the target variable differs. This paper uses the second approach to calculate the target inflation, while it is not clear whether Fuentes et al. (2015) use the same way.

The second possible reason of the dissimilarities lays in the approach which was chosen to extract the latent components in the Partial Least Squares model. In Section 3 of the paper by Fuentes et al. (2015), the authors briefly explain how they calculate those components. They mention that for the first latent component the eigenvectors are extracted from the full $\boldsymbol{M}$-matrix. As of the second component, they mention that the eigenvalue-eigenvector decomposition is performed on the residuals matrix from the simple OLS regression of the target inflation and the matrix of predictors. However, it is not clearly explained how exactly the procedure looks like. Therefore, it is highly probable that the strategy chosen in this paper and the algorithm picked by the authors of the replicated paper differ in logic and steps. Also, as it was mentioned before there exist a lot of standard PLS algorithms, such as SIMPLS and NIPALS, and it is not clear whether Fuentes et al. (2015) chose any of them.

Finally, the forecast model picked by Fuentes et al. (2015) includes not only the lags of the actual inflation, but also lags of the factors when using Principal Components or components in the case of Partial Least Squares models. However, it is not straight-forward how exactly the lags of those are calculated. Consequently, there are at least two options. The first option is based on the one-time extraction of k latent components from the covariance matrix of predictors $\boldsymbol{X}_t'\boldsymbol{X}_t$ or the covariance matrix $\boldsymbol{M}_t$. The size of the matrix, which includes factors (components) is then txk, where t is the sample size and k is the number of factors (components). To get the first lag of the extracted factors, the calculated matrix must be moved one row down and delete the last row, so that the first row becomes empty. For example, let there be 3 extracted factors (components) for the sample period of 3 form:

$$\begin{vmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{vmatrix}$$

If the aim would be to create two more lags, then following the approach, described above, the final matrix of factors and lags would become:

$$\begin{vmatrix} 1 & 2 & 3 & & & & & & \\ 4 & 5 & 6 & 1 & 2 & 3 & & & \\ 7 & 8 & 9 & 4 & 5 & 6 & 1 & 2 & 3 \end{vmatrix}$$

Following this logic, filling in the matrix with original factors and their lags, in the framework of Fuentes et al. (2015), the size of the factors (components) matrix becomes t-by-$6k$, because 6 lags are needed for the estimation and forecast purposes.

The second option is to use the logic that the factors (components) strongly depend on the covariance matrix which is used in the extraction processes. The covariance matrix depends on the time period, which is used to form it. Like this, for example, $\boldsymbol{M_t}$ and $\boldsymbol{M_{t-1}}$ are two different matrices formed out of different sample variables. It is, therefore, expected that these matrices would give different factors of sizes txk and $(t-1)$xk, respectively. Therefore, the update of the relevant matrices used in calculation of factors (components) is needed. For example, to achieve the first factor (component) for the t^{th} period the matrix $\boldsymbol{X_t'X_t}$ is used, while to get its' first lag the matrix $\boldsymbol{X_{t-1}'X_{t-1}}$ should be used. Consequently, to get the k^{th} lag only the time period till $t-k+1$ is needed. Therefore, when calculating lags, each time a matrices of $\boldsymbol{X_{t-k+1}'X_{t-k+1}}$ and $\boldsymbol{M_{t-k+1}} = \boldsymbol{X_{t-k+1}'Y_{t+h-k+1}Y_{t+h-k+1}'X_{t-k+1}}$ are calculated.

5.3. Ridge results

As it is mentioned before, Ridge estimation is performed to approximate coefficients in the forecasting models. Tables 6-9 in present the Relative MSE with the standard AR(4) model as a benchmark. Here, it is important to note that these results are highly depend on the shrinkage coefficient.

First of all, it is noted that for some cases there is a decrease in the values of Relative MSE. This change can be noticed especially in the performance of PC(10) model. For example, for the 1-step ahead forecast the Relative MSE of PC(10) for the period of 1997.03-1980.12 dropped from 0.9688 to 0.9408. For this period, the Root MSE is decreased from 3.0277 (Table 10, Appendix C.1) to 2.9835 (Table 46, Appendix C.1). This positive trend can also be observed in case of Static PLS and the second Dynamic PLS models. Here, all values of the Relative MSE for 1-step ahead forecasts are smaller than one (Table 6), which is not the case when OLS estimation is used (Table 2).

Table 6: Relative Mean-Square forecast Error for the 1-step ahead forecast.

h=1	PC(10)	S.PLS	D.PLS (a)	D.PLS (b)	E.PLS (a)	E.PLS (b)
70.03-80.12	**0,9408**	<u>0,9845</u>	1,0721	*0,9891*	1,4548	1,4690
80.03-90.12	<u>0,9272</u>	*0,9655*	**0,9071**	0,9878	0,9905	0,9974
90.03-00.12	**0,9038**	*0,9623*	1,0335	<u>0,9415</u>	1,3559	1,3428
70.03-90.12	**0,9492**	<u>0,9789</u>	1,0045	*0,9902*	1,2236	1,2527
70.03-00.12	**0,9426**	<u>0,9764</u>	1,0098	*0,9821*	1,2447	1,2658
80.03-00.12	**0,9223**	*0,9649*	<u>0,9407</u>	0,9754	1,0847	1,0844
70.03-03.12	**0,9361**	<u>0,9735</u>	1,0071	*0,9765*	1,2477	1,2622

Notes: The table contains the Relative Mean-Squared forecast Errors with the 1-step ahead forecasts with Ridge estimation of all the models with the AR(4) model as a benchmark. The bold, underlined and italics numbers refer to the models with the smallest, the second and the third smallest Relative MSE, respectively.

The Mincer-Zarnowitz regression results for the 1-step ahead forecasting, presented in Table 50 from Appendix C.2, also show an improved fit for all models. The p-value of the F-statistics is more often higher than the largest significance value of 10%. This means that the forecasts created with the Ridge estimation fit the targeted inflation rate better than when the OLS regression is used. But, as in the case of OLS estimations, the DM and HLN tests often reject a significant difference between the forecast errors of the models, as shown in Tables 54-59 from Appendix C.3.1.

However, the Ridge estimation with the picked shrinkage coefficient does not constantly improve the forecasting performance. In the case of 6-step ahead forecasts, the Ridge regression improves the Relative MSE and Root MSE only for the PC(10) model, as shown in Table 7 and Table 47, respectively. For the remaining models this estimation worsens the values of Relative MSE, drastically. Like this the Root MSE, shown in Table 47 are in the majority of cases higher than the ones with OLS approximation (Table 11).

Table 7: Relative Mean-Square forecast Error for the 6-step ahead forecast.

h=1	PC(10)	S.PLS	D.PLS (a)	D.PLS (b)	E.PLS (a)	E.PLS (b)
70.03-80.12	**0,6942**	0,9828	0,9430	*0,9175*	0,8143	1,7612
80.03-90.12	**0,6951**	0,9230	0,8806	*0,8066*	0,7604	1,7737
90.03-00.12	0,7301	*0,8060*	1,0237	**0,7053**	0,8739	2,5223
70.03-90.12	**0,7152**	0,9489	0,9460	*0,8570*	0,8327	1,8718
70.03-00.12	**0,7072**	0,9327	0,9411	*0,8390*	0,8225	1,9246
80.03-00.12	**0,6865**	0,9028	0,8845	*0,7879*	0,7575	1,8713
70.03-03.12	**0,7092**	0,9198	0,9512	*0,8290*	0,8277	1,9585

Notes: The table contains the Relative Mean-Squared forecast Errors with the 6-step ahead forecasts with Ridge estimation of all the models with the AR(4) model as a benchmark. The bold, underlined and italics numbers refer to the models with the smallest, the second and the third smallest Relative MSE, respectively.

The results of the MZ regression in Table 51, as well as in the case of OLS estimation (Table 15), show a good fit when Ridge estimation is used. However, the DM and HLN do not always show the significant difference in the forecasting power, as can be seen in Tables 61-67 from Appendix C.3.2.

The same pattern can be also observed for the Relative MSE and Root MSE of the 12- and 24-step ahead forecasts. The results for the Relative MSE for 12-step and 24-step ahead forecasts, presented in Table 8 and Table 9, respectively, show that there is an improvement in the accuracy of the predictions when the PC(10) model is used. The other models do not outperform those, where the OLS estimation is used. Tables 48 and 49 from Appendix C.1 support this conclusion, because all the Root MSE values, except of PC(10), are higher than the ones of the OLS approach in Tables 12 and 13.

Table 8: Relative Mean-Square forecast Error for the 12-step ahead forecast.

h=1	PC(10)	S.PLS	D.PLS (a)	D.PLS (b)	E.PLS (a)	E.PLS (b)
70.03-80.12	**0,6454**	0,9648	*0,8871*	0,9211	0,8363	1,6866
80.03-90.12	**0,6033**	0,9480	*0,7518*	0,8130	0,6871	1,5950
90.03-00.12	0,8006	*0,8572*	1,0033	**0,7022**	0,8693	2,4176
70.03-90.12	**0,6212**	0,9578	*0,8207*	0,8615	0,7605	1,6548
70.03-00.12	**0,6311**	0,9494	*0,8302*	0,8445	0,7628	1,7356
80.03-00.12	**0,6236**	0,9351	*0,7799*	0,7914	0,7034	1,7460
70.03-03.12	**0,6364**	0,9415	0,8525	*0,8406*	0,7767	1,7879

Notes: The table contains the Relative Mean-Squared forecast Errors with the 12-step ahead forecasts with Ridge estimation of all the models with the AR(4) model as a benchmark. The bold, underlined and italics numbers refer to the models with the smallest, the second and the third smallest Relative MSE, respectively.

Table 9: Relative Mean-Square forecast Error for the 24-step ahead forecast.

h=1	PC(10)	S.PLS	D.PLS (a)	D.PLS (b)	E.PLS (a)	E.PLS (b)
70.03-80.12	**0,6090**	0,9883	0,7855	0,8340	*0,8074*	1,4753
80.03-90.12	**0,5037**	0,9444	*0,6132*	0,6786	0,5811	1,3102
90.03-00.12	0,7282	0,8899	0,9578	**0,6042**	*0,7404*	2,2943
70.03-90.12	**0,5647**	0,9634	*0,7012*	0,7558	0,6995	1,3978
70.03-00.12	**0,5781**	0,9574	*0,7208*	0,7437	0,7021	1,4652
80.03-00.12	**0,5361**	0,9363	*0,6603*	0,6676	0,6020	1,4426
70.03-03.12	**0,5852**	0,9530	0,7499	*0,7423*	0,7116	1,5336

Notes: The table contains the Relative Mean-Squared forecast Errors with the 24-step ahead forecasts with Ridge estimation of all the models with the AR(4) model as a benchmark. The bold, underlined and italics numbers refer to the models with the smallest, the second and the third smallest Relative MSE, respectively.

Finally, the Mincer-Zarnowitz regression, results of which can be found in Tables 52 and 53 for 12-step and 24-step ahead forecasts, respectively, show that there is still a good fit of the predicted values with the target inflation rate. As well as before, the DM and HLN tests results, shown in Appendix C.3.3-C.3.4 in Tables 68-74 and 75-81 of 12-step and 24-step ahead forecasts, respectively, often conclude that there is not significant difference between the prediction errors of models.

6. Conclusion

This paper analyzes to which extend the Partial Least Squares models can improve the forecasting power compared to the standard methods as AR and PC models. To do so, the Static and two Dynamic PLS models, proposed by Fuentes et al. (2015), are compared with the standard Autoregressive model with 4 lags and Principal Components model with a maximum of 10 lags. As an addition, two new Dynamic PLS models are created by combining the before mentioned two Dynamic PLS models. The forecast of inflation rate is performed using the Stick and Watson (2005) United States data base. All the models use the expanding window to predict the targeted variable. Following the approach of Fuentes et al. (2015), OLS estimation is used to achieve the estimates for the standard forecast results. It is also proposed to use Ridge estimation to overcome to deal with such issues as no trend in historical inflation and interdependence in the predictors. The comparison between approaches is done through the Relative Mean-Squared Errors with the AR(4) model as a benchmark and the Root Mean-Squared Errors. To check if the difference in forecast results is significant the Diebold-Mariano and Harvey, Leybourne and Newbold tests are used. Moreover, to find out the fit of the predicted inflation rates with the targeted inflation rates, the Mincer-Zarnowitz regression is used.

Fuentes et al. (2015) show that the Static Partial Least Squares model outperforms the Principal Components and two Dynamic PLS models. The results of this paper are partially in line with their conclusions. Based on the Relative MSE and the Root MSE, the PLS models improve forecasts of the inflation rate and the model which outperforms in the majority of cases is the Static PLS model. However, it is also shown that the model outperforms the others according to the Relative Mean Squared Errors only when the amount of steps ahead forecasts increases. Another potential model is the second Dynamic Partial Least Squares model. The reasons why the results of this paper are different from the results of Fuentes et al. (2015) are found in the missing details in the latter paper.

Moreover, it is also shown that the Ridge estimation improves the prediction power of all the models when 1-step ahead forecasting is performed. Unfortunately, according to the results of the Root and Relative MSE, this effect stays for the remaining h-step ahead forecasts only for the PC(10) model, while for the others the estimation approach worsens the results. The reason behind this inconsistency might be the strategy of choosing a shrinkage coefficient. The decision to keep the values of the penalty terms constant, that minimize the MSE during the 1-step ahead forecasts, does not guarantee the same effect on 6-, 12- and 24-step ahead forecasts. Therefore, it is proposed to work on a better strategy of picking the shrinkage coefficient, because the Ridge estimation approach with factors/components shows a significant improvements in the forecasts.

However, not only the Relative and Root MSEs are considered in this paper, but also DM and HLN tests. Those ones suggest that, even though the before mentioned performance measures point at the improved performance when using PLS models, in the majority of cases there are no significant differences in the forecasting errors of the Static PLS and the PC(10) models, which implies an equivalence in the evaluation measures. Except of this, the Mincer-Zarnowitz regression is investigated to evaluate the results of the paper. Surprisingly, it is found that according to the joint test on the intercept and the relevant coefficient being 0 and 1, respectively, the first Dynamic PLS model and the second Extension PLS model create the most reliable results. This conclusion is not in line with the previous research and needs to be investigated deeper. This result also indicates the presence of influential outliers which affect the conclusion. Therefore, it might be the case that another data set without that many instabilities should be taken to get more reliable conclusions about the performance of the models.

Finally, one of the possible limitations of the paper could be that the investigation is based on only one data set. It would be also relevant to apply the same models on the other data sets to check the reliability of the achieved results. Moreover, only three PLS models are replicated and analyzed, while there exist other Partial Least Squares models (Vinzi, Chin, Henseler, Wang, et al., 2010). Also, it is interesting to note that even though it is expected that the second Extension PLS model should outperform or be at least good as the first Extension PLS model, it is actually not the case. The second Extension model often takes values of the Root MSE higher than the ones of the first extension. This leads to the idea that the choice to pick the number of lags according to the BIC might be misleading and some other options such as Akaike Information Criterion or Wald's R - criterion should be tried as well (B. Li et al., 2002). Taking into account these improvements in forecasting power, the research in the field of Partial Least Squares should be continued by maybe also including some more specific characteristics of the targeted variables, such as a fitted distribution. Also, it is shown that the Ridge estimation enhances the predictive power in some cases, meaning that a combination of PLS modeling and Ridge approach could become a new possible breakthrough in the forecasting framework of inflation rate.

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A. SIMPLS Algorithm

INPUT: n-by-m matrix **X**; n-by-1 matrix **Y**; number of factors k

$Y_0 = Y - mean(Y)$ ▹ Centering Y

$M1 = X'Y_0$ ▹ getting a cross product

$a = 1$

while $a \leq k$ **do**

$q = dominant eigenvector of M1'M1$ ▹ A dominant eigenvector of M=M1'M1

$r = M1q$ ▹ Weights of X to put into factors

$t = Xr$ ▹ Coefficients of factors extracted from X

$t = t - mean(t)$ ▹ Centering coefficients

$r = \frac{r}{norm(t)}$ ▹ Adapting weights according to normalization

$t = \frac{t}{norm(t)}$ ▹ Normalizing coefficients

$p = X't$ ▹ Factor loadings from X

$q = Y_0't$ ▹ Factor loadings from Y

$u = Y_0q$ ▹ Factor coefficients form Y

$v = p$ ▹ Orthogonal loadings

if $a > 1$ **then**

$v = v - VV'p$ ▹ v orthogonal to previous loadings

$u = u - TT'u$ ▹ u orthogonal to previous t' values

end if

$v = \frac{v}{norm(v)}$ ▹ Normalize loadings

$M1 = M1 - vv'M1$ ▹ Update M1 matrix

Store r, t, p, q, u, v into respective matrices

$a = a + 1$

end while

OUTPUT: Y=XB=XRQ' and, therefore, F=XR

B. OLS: Additional Results

B.1. Root Mean Squared Errors

Table 10: Root Mean-Squared forecast Error for the 1-step ahead forecast.

h=1	AR(4)	PC(10)	S.PLS	D.PLS (a)	D.PLS (b)	E.PLS (a)	E.PLS (b)
70.03-80.12	3.0760	**3.0277**	*3.2398*	3.3107	3.2408	3.8924	3.7329
80.03-90.12	3.1165	**3.0430**	*3.0940*	3.1108	3.1078	3.2383	3.0723
90.03-00.12	1.9866	**1.8795**	1.9255	2.1008	*1.9824*	2.3618	2.3494
70.03-90.12	3.0314	**2.9938**	*3.1175*	3.1200	3.1317	3.4946	3.3843
70.03-00.12	2.7204	**2.6699**	*2.7688*	2.8218	2.7926	3.1537	3.0771
80.03-00.12	2.6104	**2.5302**	2.5700	2.6613	*2.5994*	2.8214	2.7329
70.03-03.12	2.7384	**2.6740**	*2.7704*	2.8311	2.7928	3.1832	3.1258

Notes: The table contains the Root Mean-Squared forecast Errors with the 1-step ahead forecasts of all the models. The bold, underlined and italics numbers refer to the models with the smallest, the second and the third smallest Root MSE, respectively.

Table 11: Root Mean-Squared forecast Error for the 6-step ahead forecast.

h=6	AR(4)	PC(10)	S.PLS	D.PLS (a)	D.PLS (b)	E.PLS (a)	E.PLS (b)
70.03-80.12	2.2411	**1.8906**	2.0271	1.9652	1.8915	*1.9038*	2.0396
80.03-90.12	2.4497	2.0300	**2.0143**	2.1283	*2.0639*	2.1373	2.4187
90.03-00.12	1.2193	1.0342	**0.9641**	*1.1043*	1.1170	1.1591	1.4203
70.03-90.12	2.2583	**1.9207**	*1.9887*	2.0125	1.9292	1.9942	2.2026
70.03-00.12	1.9728	**1.6668**	*1.7066*	1.7491	1.6841	1.7439	1.9461
80.03-00.12	1.9444	1.6018	**1.5702**	1.6832	*1.6404*	1.7027	1.9483
70.03-03.12	1.9628	**1.6664**	*1.6890*	1.7527	1.6794	1.7473	1.9527

Notes: The table contains the Root Mean-Squared forecast Errors with the 6-step ahead forecasts of all the models. The bold, underlined and italics numbers refer to the models with the smallest, the second and the third smallest Root MSE, respectively.

Table 12: Root Mean-Squared forecast Error for the 12-step ahead forecast.

h=12	AR(4)	PC(10)	S.PLS	D.PLS (a)	D.PLS (b)	E.PLS (a)	E.PLS (b)
70.03-80.12	2.2777	**1.9487**	1.9723	*2.0023*	2.0093	2.0723	2.1304
80.03-90.12	2.3689	*1.8633*	**1.8153**	1.9387	1.8561	1.9573	2.3981
90.03-00.12	1.1772	*1.0490*	**0.9168**	1.0504	1.0459	1.1039	1.3756
70.03-90.12	2.3510	1.9220	**1.9000**	1.9901	*1.9484*	2.0373	2.2989
70.03-00.12	2.0326	1.6693	**1.6316**	1.7201	*1.6871*	1.7679	2.0125
80.03-00.12	1.8722	*1.4952*	**1.4296**	1.5404	1.4857	1.5707	1.9235
70.03-03.12	1.9985	1.6436	**1.6058**	1.7094	*1.6642*	1.7561	1.9977

Notes: The table contains the Root Mean-Squared forecast Errors with the 12-step ahead forecasts of all the models. The bold, underlined and italics numbers refer to the models with the smallest, the second and the third smallest Root MSE, respectively.

Table 13: Root Mean-Squared forecast Error for the 24-step ahead forecast.

h=24	AR(4)	PC(10)	S.PLS	D.PLS (a)	D.PLS (b)	E.PLS (a)	E.PLS (b)
70.03-80.12	2.8985	2.4616	2.3174	*2.4060*	**2.2639**	2.5910	2.5282
80.03-90.12	2.9163	2.1049	**2.0984**	2.1873	*2.1364*	2.2250	2.5968
90.03-00.12	1.1821	1.0025	**0.8566**	1.0641	0.8778	*1.0016*	1.3571
70.03-90.12	2.9093	*2.3156*	**2.2180**	2.3089	**2.2179**	2.4278	2.5742
70.03-00.12	2.4886	*1.9922*	**1.8903**	1.9968	1.8936	2.0786	2.2611
80.03-00.12	2.2637	*1.6781*	**1.6305**	1.7486	1.6616	1.7535	2.1087
70.03-03.12	2.4197	*1.9442*	**1.8382**	1.9651	1.8454	2.0333	2.2366

Notes: The table contains the Root Mean-Squared forecast Errors with the 24-step ahead forecasts of all the models. The bold, underlined and italics numbers refer to the models with the smallest, the second and the third smallest Root MSE, respectively.

B.2. Mincer-Zarnowitz Regression Results

Table 14: Mincer-Zarnowitz estimates and p-value of F-statistics for 1-step ahead forecasts.

h=1		AR(4)	PC(10)	S.PLS	D.PLS (a)	D.PLS (b)	E.PLS (a)	E.PLS (b)
70.03-80.12	α	0.0328	-0.0069	0.0115	-0.0782	-0.2144	-0.0100	0.0386
	β	0.8168	0.8311	0.7264	0.6919	0.7022	0.3450	0.4927
	p-value	**0.1988**	**0.2371**	0.0295	0.0109	0.0040	0.0004	0.0437
80.03-90.12	α	-0.1580	-0.0843	-0.1256	-0.0940	-0.0392	-0.0693	-0.0115
	β	0.5024	0.5435	0.5147	0.5012	0.5019	0.3454	0.5843
	p-value	0.0007	0.0005	0.0004	0.0009	0.0001	0.0007	**0.1815**
90.03-00.12	α	-0.0750	0.0901	0.0038	0.2553	0.2722	0.0396	0.0354
	β	1.0171	1.0445	0.9539	0.7502	0.9525	0.3513	0.2920
	p-value	**0.9094**	**0.8256**	**0.9373**	0.0261	**0.2439**	0.0099	0.0443
70.03-90.12	α	-0.0438	-0.0024	-0.0219	-0.0329	-0.0572	-0.0148	0.0306
	β	0.7200	0.7175	0.6505	0.6411	0.6271	0.3846	0.5153
	p-value	0.0031	0.0013	0.0001	0.0000	0.0000	0.0000	0.0058
70.03-00.12	α	-0.0470	0.0089	-0.0237	0.0336	0.0135	0.0010	0.0375
	β	0.7509	0.7531	0.6886	0.6450	0.6563	0.3768	0.4675
	p-value	0.0019	0.0008	0.0000	0.0000	0.0000	0.0002	0.0008
80.03-00.12	α	-0.1117	-0.0316	-0.0820	0.0192	0.0559	-0.0222	0.0139
	β	0.6134	0.6521	0.6288	0.5432	0.5985	0.3399	0.4602
	p-value	0.0004	0.0003	0.0002	0.0000	0.0000	0.0000	0.0080
70.03-03.12	α	-0.0506	0.0374	-0.0163	0.0376	0.0296	0.0010	0.0300
	β	0.7585	0.7655	0.6991	0.6527	0.6698	0.3554	0.3971
	p-value	0.0021	0.0009	0.0000	0.0000	0.0000	0.0000	0.0000

Notes: The table contains the Mincer-Zarnowitz estimates and p-value of F-statistics with the 1-step ahead forecasts of all the models. The bold p-values refer to the models with the good fit to the targeted inflation according to the MZ-test.

Table 15: Mincer-Zarnowitz estimates and p-value of F-statistics for 6-step ahead forecasts.

h=6		AR(4)	PC(10)	S.PLS	D.PLS (a)	D.PLS (b)	E.PLS (a)	E.PLS (b)
	α	-0.0305	-0.0238	-0.0205	0.0396	-0.0866	-0.0095	0.0215
70.03-80.12	β	0.8702	0.9501	0.8466	0.9376	0.9246	0.9620	0.9568
	p-value	**0.3198**	**0.7600**	**0.0774**	**0.6734**	**0.4475**	**0.8641**	**0.8574**
	α	-0.3524	-0.1052	-0.2720	-0.3661	-0.1360	-0.4085	-0.5608
80.03-90.12	β	0.9500	0.9215	1.0004	0.9408	0.8993	0.9093	0.8870
	p-value	**0.2098**	**0.4056**	**0.3080**	**0.0884**	**0.2230**	0.0271	0.0053
	α	-0.0647	0.0833	0.0248	0.1955	0.3356	0.2988	0.0768
90.03-00.12	β	1.0767	0.9941	0.9922	0.9636	0.9603	0.9219	0.9165
	p-value	**0.5063**	**0.6496**	**0.9451**	**0.0863**	0.0010	0.0018	**0.4865**
	α	-0.1116	-0.0134	-0.0570	-0.0914	-0.0539	-0.1441	-0.1993
70.03-90.12	β	0.9208	0.9218	0.9078	0.9251	0.9036	0.9159	0.8954
	p-value	**0.3084**	**0.2360**	**0.1390**	**0.2407**	**0.0925**	**0.1017**	0.0501
	α	-0.1283	-0.0247	-0.0742	-0.0406	0.0264	-0.0394	-0.1521
70.03-00.12	β	0.9382	0.9292	0.9195	0.9237	0.9031	0.9042	0.8986
	p-value	**0.2008**	**0.1541**	**0.0717**	**0.1433**	0.0266	0.0416	0.0248
	α	-0.2618	-0.0771	-0.1920	-0.1573	0.0219	-0.1282	-0.3160
80.03-00.12	β	0.9705	0.9328	0.9949	0.9285	0.9008	0.8865	0.8816
	p-value	**0.0876**	**0.2485**	**0.1527**	**0.1084**	**0.0766**	0.0246	0.0027
	α	-0.1422	0.0004	-0.0707	-0.0831	0.0176	-0.0855	-0.1258
70.03-03.12	β	0.9548	0.9356	0.9269	0.9257	0.9110	0.9067	0.9101
	p-value	**0.2062**	**0.1906**	**0.0840**	**0.0889**	0.0359	0.0233	**0.0530**

Notes: The table contains the Mincer-Zarnowitz estimates and p-value of F-statistics with the 6-step ahead forecasts of all the models. The bold p-values refer to the models with the good fit to the targeted inflation according to the MZ-test.

Table 16: Mincer-Zarnowitz estimates and p-value of F-statistics for 12-step ahead forecasts.

Period	Estimates	AR(4)	PC(10)	S.PLS	D.PLS (a)	D.PLS (b)	E.PLS (a)	E.PLS (b)
70.03-80.12	α	0.1884	0.1816	0.4014	0.3208	0.1782	0.2368	0.1918
	β	0.8566	0.8865	0.8565	0.9301	0.8513	0.8979	0.9308
	p-value	**0.2003**	**0.1567**	0.0044	**0.1208**	**0.0639**	**0.1907**	**0.4491**
80.03-90.12	α	-0.5353	-0.2111	-0.3734	-0.3803	-0.2969	-0.4078	-0.1544
	β	0.8928	0.8570	0.9027	0.9113	0.8815	0.8953	0.9034
	p-value	0.0133	0.0265	0.0147	0.0309	0.0283	0.0143	**0.5442**
90.03-00.12	α	-0.1333	0.1407	-0.0644	0.1473	0.2330	0.2632	0.0842
	β	1.0482	0.9454	0.9716	0.9838	0.9322	0.9376	0.8690
	p-value	**0.3727**	**0.1611**	**0.5941**	**0.2538**	0.0091	0.0068	**0.2097**
70.03-90.12	α	-0.1843	-0.0303	0.0005	-0.0451	-0.0722	-0.0899	0.0041
	β	0.8773	0.8803	0.8845	0.9256	0.8774	0.9028	0.9300
	p-value	**0.0706**	0.0291	0.0354	**0.3213**	0.0234	**0.1271**	**0.5966**
70.03-00.12	α	-0.1907	-0.0110	-0.0106	0.0116	-0.0082	-0.0057	-0.0084
	β	0.9021	0.8873	0.8958	0.9327	0.8806	0.9019	0.9286
	p-value	0.0284	0.0082	0.0133	**0.2494**	0.0050	**0.0567**	**0.4298**
80.03-00.12	α	-0.3763	-0.0956	-0.2096	-0.1783	-0.0933	-0.1324	-0.0974
	β	0.9283	0.8741	0.9143	0.9219	0.8851	0.8901	0.9093
	p-value	0.0024	0.0074	0.0076	0.0492	0.0166	0.0281	**0.3551**
70.03-03.12	α	-0.2036	-0.0200	-0.0595	0.0715	-0.0291	-0.0690	0.0000
	β	0.9233	0.8995	0.9043	0.9424	0.8945	0.9096	0.9410
	p-value	0.0303	0.0142	0.0127	**0.2330**	0.0102	**0.0503**	**0.5330**

Notes: The table contains the Mincer-Zarnowitz estimates and p-value of F-statistics with the 12-step ahead forecasts of all the models. The bold p-values refer to the models with the good fit to the targeted inflation according to the MZ-test.

Table 17: Mincer-Zarnowitz estimates and p-value of F-statistics for 24-step ahead forecasts.

Period	Estimates	AR(4)	PC(10)	S.PLS	D.PLS (a)	D.PLS (b)	E.PLS (a)	E.PLS (b)
70.03-80.12	α	0.3461	0.7118	0.5374	0.5012	0.4157	0.6452	0.3670
	β	0.8558	0.8430	0.9474	0.9961	0.9245	0.8783	0.9865
	p-value	**0.2394**	0.0003	0.0254	**0.0590**	**0.0784**	0.0061	**0.2622**
80.03-90.12	α	-0.7782	-0.5635	-0.6810	-0.6085	-0.6476	-0.6387	-0.3772
	β	0.8365	0.8077	0.8847	0.9051	0.8337	0.9000	0.8885
	p-value	0.0016	0.0000	0.0001	0.0016	0.0000	0.0010	**0.1466**
90.03-00.12	α	-0.2835	-0.0296	-0.1722	-0.1123	-0.0058	0.1591	-0.0006
	β	1.0496	0.8925	0.9720	1.0062	0.9489	0.9823	0.8079
	p-value	0.0212	**0.1257**	**0.0596**	**0.4833**	**0.5575**	**0.1636**	**0.0553**
70.03-90.12	α	-0.3379	0.0219	-0.1441	-0.1133	-0.1759	-0.0559	-0.0619
	β	0.8585	0.8126	0.9067	0.9414	0.8703	0.8800	0.9474
	p-value	0.0232	0.0002	**0.0797**	**0.3949**	0.0060	**0.0844**	**0.6830**
70.03-00.12	α	-0.3453	-0.0053	-0.1723	-0.1296	-0.1380	-0.0062	-0.0367
	β	0.8876	0.8217	0.9151	0.9493	0.8782	0.8902	0.9223
	p-value	0.0029	0.0000	0.0149	**0.2259**	0.0012	0.0433	**0.3473**
80.03-00.12	α	-0.5752	-0.3238	-0.4653	-0.3960	-0.3677	-0.2831	-0.2002
	β	0.8869	0.8178	0.8984	0.9202	0.8478	0.8987	0.8595
	p-value	0.0000	0.0000	0.0000	0.0003	0.0000	0.0048	0.0484
70.03-03.12	α	-0.3512	-0.0270	-0.2120	-0.1647	-0.1788	-0.0558	-0.0263
	β	0.9238	0.8419	0.9295	0.9697	0.8962	0.9088	0.9338
	p-value	0.0035	0.0000	0.0070	**0.1766**	0.0012	**0.7750**	**0.4366**

Notes: The table contains the Mincer-Zarnowitz estimates and p-value of F-statistics with the 24-step ahead forecasts of all the models. The bold p-values refer to the models with the good fit to the targeted inflation according to the MZ-test.

B.3. DM and HLN tests results

B.3.1. Results for 1-step Ahead Forecasts

Table 18: Diebold-Mariano and Harvey, Leybourne and Newbold test results for the forecast period of 1970.03-1980.12

70.03-80.12	DM	p-value DM	HLN	p-value HLN
AR(4) vs PC(10)	0.6663	0.7474	0.7134	0.7615
AR(4) vs S.PLS	-1.7782**	0.0377	-1.9037**	0.0296
AR(4) vs D.PLS (a)	-1.5304*	0.0630	-1.6384*	0.0519
AR(4) vs D.PLS (b)	-1.0640	0.1437	-1.1391	0.1284
AR(4) vs E.PLS (a)	-2.6232***	0.0044	-2.8083***	0.0029
AR(4) vs E.PLS (b)	-2.0922**	0.0182	-2.2399**	0.0134
PC(10) vs S.PLS	-1.6955**	0.0450	-1.8152**	0.0359
PC(10) vs D.PLS (a)	-1.6054*	0.0542	-1.7187**	0.0440
PC(10) vs D.PLS (b)	-1.5789*	0.0572	-1.6903**	0.0467
PC(10) vs E.PLS (a)	-2.5976***	0.0047	-2.7809***	0.0031
PC(10) vs E.PLS (b)	-2.1933**	0.0141	-2.3481**	0.0102
S.PLS vs D.PLS (a)	-0.5738	0.2830	-0.6144	0.2700
S.PLS vs D.PLS (b)	-0.0068	0.4973	-0.0073	0.4971
S.PLS vs E.PLS (a)	-2.2987**	0.0108	-2.4609***	0.0076
S.PLS vs E.PLS (b)	-1.7102**	0.0436	-1.8310**	0.0347
D.PLS (a) vs D.PLS (b)	0.3655	0.6426	0.3913	0.6519
D.PLS (a) vs E.PLS (a)	-2.0778**	0.0189	-2.2244**	0.0139
D.PLS (a) vs E.PLS (b)	-1.4265*	0.0769	-1.5272*	0.0646
D.PLS (b) vs E.PLS (a)	-1.8284**	0.0337	-1.9575**	0.0262
D.PLS (b) vs E.PLS (b)	-1.3606*	0.0868	-1.4567*	0.0738
E.PLS (a) vs E.PLS (b)	1.3845	0.9169	1.4822	0.9296

Notes: The table contains the results of Diebold-Mariano and Harvey, Leybourne and Newbold tests of 1-step ahead forecasts for the period 1970.03-1980.12. $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.10$.

Table 19: Diebold-Mariano and Harvey, Leybourne and Newbold test results for the forecast period of 1980.03-1990.12

80.03-90.12	DM	p-value DM	HLN	p-value HLN
AR(4) vs PC(10)	1.0095	0.8436	1.0808	0.8591
AR(4) vs S.PLS	0.4071	0.6580	0.4358	0.6682
AR(4) vs D.PLS (a)	0.0424	0.5169	0.0454	0.5181
AR(4) vs D.PLS (b)	0.1115	0.5444	0.1194	0.5474
AR(4) vs E.PLS (a)	-0.7161	0.2370	-0.7666	0.2224
AR(4) vs E.PLS (b)	0.3245	0.6272	0.3474	0.6356
PC(10) vs S.PLS	-0.7310	0.2324	-0.7826	0.2177
PC(10) vs D.PLS (a)	-0.4097	0.3410	-0.4386	0.3309
PC(10) vs D.PLS (b)	-1.0014	0.1583	-1.0720	0.1429
PC(10) vs E.PLS (a)	-0.9224	0.1782	-0.9875	0.1626
PC(10) vs E.PLS (b)	-0.1972	0.4218	-0.2111	0.4166
S.PLS vs D.PLS (a)	-0.1435	0.4430	-0.1536	0.4391
S.PLS vs D.PLS (b)	-0.1584	0.4371	-0.1696	0.4328
S.PLS vs E.PLS (a)	-0.7436	0.2286	-0.7961	0.2137
S.PLS vs E.PLS (b)	0.1332	0.5530	0.1426	0.5566
D.PLS (a) vs D.PLS (b)	0.0189	0.5075	0.0202	0.5081
D.PLS (a) vs E.PLS (a)	-0.6835	0.2472	-0.7317	0.2328
D.PLS (a) vs E.PLS (b)	0.1842	0.5731	0.1972	0.5780
D.PLS (b) vs E.PLS (a)	-0.6956	0.2434	-0.7447	0.2289
D.PLS (b) vs E.PLS (b)	0.2723	0.6073	0.2915	0.6144
E.PLS vs E.PLS (b)	1.1888	0.8827	1.2727	0.8973

Notes: The table contains the results of Diebold-Mariano and Harvey, Leybourne and Newbold tests of 1-step ahead forecasts for the period 1990.03-1990.12. $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.10$.

Table 20: Diebold-Mariano and Harvey, Leybourne and Newbold test results for the forecast period of 1990.03-2000.12

90.03-00.12	DM	p-value DM	HLN	p-value HLN
AR(4) vs PC(10)	2.2865	0.9889	2.4479	0.9921
AR(4) vs S.PLS	1.1783	0.8807	1.2615	0.8953
AR(4) vs D.PLS (a)	-1.3489*	0.0887	-1.4441*	0.0756
AR(4) vs D.PLS (b)	0.0675	0.5269	0.0723	0.5288
AR(4) vs E.PLS (a)	-2.1057**	0.0176	-2.2543**	0.0129
AR(4) vs E.PLS (b)	-2.4566***	0.0070	-2.6301***	0.0048
PC(10) vs S.PLS	-1.4657*	0.0714	-1.5691*	0.0595
PC(10) vs D.PLS (a)	-2.4705***	0.0067	-2.6449***	0.0046
PC(10) vs D.PLS (b)	-1.8513**	0.0321	-1.9819**	0.0248
PC(10) vs E.PLS (a)	-2.4392***	0.0074	-2.6113***	0.0050
PC(10) vs E.PLS (b)	-2.7213***	0.0033	-2.9134***	0.0021
S.PLS vs D.PLS (a)	-2.0160**	0.0219	-2.1584**	0.0164
S.PLS vs D.PLS (b)	-1.0490	0.1471	-1.1230	0.1318
S.PLS vs E.PLS (a)	-2.1411**	0.0161	-2.2923**	0.0118
S.PLS vs E.PLS (b)	-2.3895***	0.0084	-2.5582***	0.0058
D.PLS (a) vs D.PLS (b)	1.7180	0.9571	1.8392	0.9659
D.PLS (a) vs E.PLS (a)	-1.5365*	0.0622	-1.6450**	0.0512
D.PLS (a) vs E.PLS (b)	-1.8642**	0.0312	-1.9957**	0.0240
D.PLS (b) vs E.PLS (a)	-2.2102**	0.0135	-2.3662***	0.0097
D.PLS (b) vs E.PLS (b)	-2.4186***	0.0078	-2.5894***	0.0054
E.PLS (a) vs E.PLS (b)	0.1612	0.5640	0.1725	0.5684

Notes: The table contains the results of Diebold-Mariano and Harvey, Leybourne and Newbold tests of 1-step ahead forecasts for the period 1990.03-2000.12. $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.10$.

Table 21: Diebold-Mariano and Harvey, Leybourne and Newbold test results for the forecast period of 1970.03-1990.12

70.03-90.12	DM	p-value DM	HLN	p-value HLN
AR(4) vs PC(10)	0.6672	0.7477	0.7048	0.7592
AR(4) vs S.PLS	-1.4864*	0.0686	-1.5703*	0.0588
AR(4) vs D.PLS (a)	-1.0206	0.1537	-1.0781	0.1410
AR(4) vs D.PLS (b)	-1.0885	0.1382	-1.1500	0.1256
AR(4) vs E.PLS (a)	-2.3405***	0.0096	-2.4726***	0.0070
AR(4) vs E.PLS (b)	-1.8605**	0.0314	-1.9654**	0.0252
PC(10) vs S.PLS	-2.1361**	0.0163	-2.2566**	0.0125
PC(10) vs D.PLS (a)	-1.2051	0.1141	-1.2731	0.1021
PC(10) vs D.PLS (b)	-1.9683**	0.0245	-2.0793**	0.0193
PC(10) vs E.PLS (a)	-2.2031**	0.0138	-2.3274**	0.0104
PC(10) vs E.PLS (b)	-1.8359**	0.0332	-1.9395**	0.0268
S.PLS vs D.PLS (a)	-0.0291	0.4884	-0.0307	0.4878
S.PLS vs D.PLS (b)	-0.1881	0.4254	-0.1987	0.4213
S.PLS vs E.PLS (a)	-1.8297**	0.0336	-1.9329**	0.0272
S.PLS vs E.PLS (b)	-1.3186*	0.0936	-1.3930*	0.0824
D.PLS (a) vs D.PLS (b)	-0.1047	0.4583	-0.1106	0.4560
D.PLS (a) vs E.PLS (a)	-1.9438**	0.0260	-2.0535**	0.0205
D.PLS (a) vs E.PLS (b)	-1.3937*	0.0817	-1.4724*	0.0711
D.PLS (b) vs E.PLS (a)	-1.5755*	0.0576	-1.6644**	0.0486
D.PLS (b) vs E.PLS (b)	-1.1438	0.1264	-1.2083	0.1140
E.PLS (a) vs E.PLS (b)	1.3916	0.9180	1.4701	0.9286

Notes: The table contains the results of Diebold-Mariano and Harvey, Leybourne and Newbold tests of 1-step ahead forecasts for the period 1970.03-1990.12. ***$p < 0.01$; **$p < 0.05$; *$p < 0.10$.

Table 22: Diebold-Mariano and Harvey, Leybourne and Newbold test results for the forecast period of 1970.03-2000.12

70.03-00.12	DM	p-value DM	HLN	p-value HLN
AR(4) vs PC(10)	1.1523	0.8754	1.2145	0.8873
AR(4) vs S.PLS	-1.0146	0.1552	-1.0693	0.1428
AR(4) vs D.PLS (a)	-1.3026*	0.0964	-1.3728*	0.0853
AR(4) vs D.PLS (b)	-1.1060	0.1344	-1.1657	0.1222
AR(4) vs E.PLS (a)	-2.6932***	0.0035	-2.8385***	0.0024
AR(4) vs E.PLS (b)	-2.2652**	0.0118	-2.3874***	0.0087
PC(10) vs S.PLS	-2.0121**	0.0221	-2.1206**	0.0173
PC(10) vs D.PLS (a)	-1.6920**	0.0453	-1.7833**	0.0377
PC(10) vs D.PLS (b)	-2.1447**	0.0160	-2.2604**	0.0122
PC(10) vs E.PLS (a)	-2.7900***	0.0026	-2.9406***	0.0017
PC(10) vs E.PLS (b)	-2.4568***	0.0070	-2.5893***	0.0050
S.PLS vs D.PLS (a)	-0.8206	0.2059	-0.8649	0.1938
S.PLS vs D.PLS (b)	-0.3622	0.3586	-0.3818	0.3514
S.PLS vs E.PLS (a)	-2.3427***	0.0096	-2.4691***	0.0070
S.PLS vs E.PLS (b)	-1.9156**	0.0277	-2.0190**	0.0221
D.PLS (a) vs D.PLS (b)	0.3333	0.6306	0.3513	0.6372
D.PLS (a) vs E.PLS (a)	-2.1634**	0.0153	-2.2801**	0.0116
D.PLS (a) vs E.PLS (b)	-1.6330*	0.0512	-1.7211**	0.0430
D.PLS (b) vs E.PLS (a)	-2.0134**	0.0220	-2.1220**	0.0173
D.PLS (b) vs E.PLS (b)	-1.6001*	0.0548	-1.6864**	0.0463
E.PLS (a) vs E.PLS (b)	1.1602	0.8770	1.2228	0.8889

Notes: The table contains the results of Diebold-Mariano and Harvey, Leybourne and Newbold tests of 1-step ahead forecasts for the period 1970.03-2000.12. ***$p < 0.01$; **$p < 0.05$; *$p < 0.10$.

Table 23: Diebold-Mariano and Harvey, Leybourne and Newbold test results for the forecast period of 1980.03-2000.12

80.03-00.12	DM	p-value DM	HLN	p-value HLN
AR(4) vs PC(10)	1.6817	0.9537	1.7766	0.9616
AR(4) vs S.PLS	0.8870	0.8125	0.9371	0.8252
AR(4) vs D.PLS (a)	-0.5741	0.2830	-0.6064	0.2724
AR(4) vs D.PLS (b)	0.2557	0.6009	0.2702	0.6064
AR(4) vs E.PLS (a)	-1.5795*	0.0571	-1.6686**	0.0482
AR(4) vs E.PLS (b)	-1.0460	0.1478	-1.1050	0.1351
PC(10) vs S.PLS	-0.8280	0.2038	-0.8747	0.1913
PC(10) vs D.PLS (a)	-1.1421	0.1267	-1.2065	0.1144
PC(10) vs D.PLS (b)	-1.5390*	0.0619	-1.6258*	0.0526
PC(10) vs E.PLS (a)	-1.8009**	0.0359	-1.9025**	0.0291
PC(10) vs E.PLS (b)	-1.4882*	0.0684	-1.5721*	0.0586
S.PLS vs D.PLS (a)	-1.0883	0.1382	-1.1497	0.1257
S.PLS vs D.PLS (b)	-0.5075	0.3059	-0.5361	0.2962
S.PLS vs E.PLS (a)	-1.6094*	0.0538	-1.7001**	0.0452
S.PLS vs E.PLS (b)	-1.1302	0.1292	-1.1940	0.1168
D.PLS (a) vs D.PLS (b)	0.6036	0.7269	0.6376	0.7379
D.PLS (a) vs E.PLS (a)	-1.1390	0.1274	-1.2032	0.1150
D.PLS (a) vs E.PLS (b)	-0.5246	0.2999	-0.5542	0.2900
D.PLS (b) vs E.PLS (a)	-1.6972**	0.0448	-1.7930**	0.0371
D.PLS (b) vs E.PLS (b)	-1.2421	0.1071	-1.3122*	0.0953
E.PLS (a) vs E.PLS (b)	1.0740	0.8586	1.1346	0.8712

Notes: The table contains the results of Diebold-Mariano and Harvey, Leybourne and Newbold tests of 1-step ahead forecasts for the period 1980.03-2000.12. ***$p < 0.01$; **$p < 0.05$; *$p < 0.10$.

Table 24: Diebold-Mariano and Harvey, Leybourne and Newbold test results for the forecast period of 1970.03-2003.12

70.03-03.12	DM	p-value DM	HLN	p-value HLN
AR(4) vs PC(10)	1.4953	0.9326	1.5690	0.9413
AR(4) vs S.PLS	-0.7004	0.2419	-0.7349	0.2314
AR(4) vs D.PLS (a)	-1.2935*	0.0979	-1.3572*	0.0877
AR(4) vs D.PLS (b)	-0.8901	0.1867	-0.9340	0.1754
AR(4) vs E.PLS (a)	-3.0152***	0.0013	-3.1638***	0.0008
AR(4) vs E.PLS (b)	-2.6859***	0.0036	-2.8183***	0.0025
PC(10) vs S.PLS	-2.1330**	0.0165	-2.2381**	0.0129
PC(10) vs D.PLS (a)	-1.8932**	0.0292	-1.9864**	0.0238
PC(10) vs D.PLS (b)	-2.2546**	0.0121	-2.3657***	0.0092
PC(10) vs E.PLS (a)	-3.1839***	0.0007	-3.3408***	0.0005
PC(10) vs E.PLS (b)	-2.9393***	0.0016	-3.0842***	0.0011
S.PLS vs D.PLS (a)	-1.0053	0.1574	-1.0548	0.1461
S.PLS vs D.PLS (b)	-0.3709	0.3553	-0.3892	0.3487
S.PLS vs E.PLS (a)	-2.7161***	0.0033	-2.8499***	0.0023
S.PLS vs E.PLS (b)	-2.3782***	0.0087	-2.4954***	0.0065
D.PLS (a) vs D.PLS (b)	0.4771	0.6834	0.5006	0.6916
D.PLS (a) vs E.PLS (a)	-2.5014***	0.0062	-2.6247***	0.0045
D.PLS (a) vs E.PLS (b)	-2.0473**	0.0203	-2.1482**	0.0161
D.PLS (b) vs E.PLS (a)	-2.3655***	0.0090	-2.4821***	0.0067
D.PLS (b) vs E.PLS (b)	-2.0309**	0.0211	-2.1310**	0.0168
E.PLS (a) vs E.PLS (b)	0.9377	0.8258	0.9839	0.8371

Notes: The table contains the results of Diebold-Mariano and Harvey, Leybourne and Newbold tests of 1-step ahead forecasts for the period 1970.03-2003.12. $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.10$.

B.3.2. Results for 6-step Ahead Forecasts

Table 25: Diebold-Mariano and Harvey, Leybourne and Newbold test results for the forecast period of 1970.03-1980.12

70.03-80.12	DM	p-value DM	HLN	p-value HLN
AR(4) vs PC(10)	2.7750	0.9972	2.9709	0.9982
AR(4) vs S.PLS	2.3483	0.9906	2.5141	0.9934
AR(4) vs D.PLS (a)	2.5359	0.9944	2.7149	0.9962
AR(4) vs D.PLS (b)	2.8932	0.9981	3.0974	0.9988
AR(4) vs E.PLS (a)	2.6352	0.9958	2.8212	0.9972
AR(4) vs E.PLS (b)	2.6478	0.9960	2.8347	0.9973
PC(10) vs S.PLS	-1.6496**	0.0495	-1.7660**	0.0399
PC(10) vs D.PLS (a)	-0.7943	0.2135	-0.8504	0.1983
PC(10) vs D.PLS (b)	-0.0188	0.4925	-0.0202	0.4920
PC(10) vs E.PLS (a)	-0.1433	0.4430	-0.1534	0.4392
PC(10) vs E.PLS (b)	-1.4255*	0.0770	-1.5261*	0.0647
S.PLS vs D.PLS (a)	0.7991	0.7879	0.8555	0.8031
S.PLS vs D.PLS (b)	1.5352	0.9376	1.6435	0.9486
S.PLS vs E.PLS (a)	1.3921	0.9181	1.4904	0.9307
S.PLS vs E.PLS (b)	-0.1838	0.4271	-0.1968	0.4222
D.PLS (a) vs D.PLS (b)	0.9166	0.8203	0.9813	0.8359
D.PLS (a) vs E.PLS (a)	1.4123	0.9211	1.5120	0.9335
D.PLS (a) vs E.PLS (b)	-1.0078	0.1568	-1.0790	0.1413
D.PLS (b) vs E.PLS (a)	-0.1566	0.4378	-0.1677	0.4335
D.PLS (b) vs E.PLS (b)	-1.4744*	0.0702	-1.5785*	0.0585
E.PLS (a) vs E.PLS (b)	-1.4659*	0.0713	-1.5694*	0.0595

Notes: The table contains the results of Diebold-Mariano and Harvey, Leybourne and Newbold tests of 6-step ahead forecasts for the period 1970.03-1980.12. ***$p < 0.01$; **$p < 0.05$; *$p < 0.10$.

Table 26: Diebold-Mariano and Harvey, Leybourne and Newbold test results for the forecast period of 1980.03-1990.12

80.03-90.12	DM	p-value DM	HLN	p-value HLN
AR(4) vs PC(10)	3.5390	0.9998	3.7888	0.9999
AR(4) vs S.PLS	4.0941	1.0000	4.3831	1.0000
AR(4) vs D.PLS (a)	3.3926	0.9997	3.6320	0.9998
AR(4) vs D.PLS (b)	3.2369	0.9994	3.4654	0.9996
AR(4) vs E.PLS (a)	3.3157	0.9995	3.5497	0.9997
AR(4) vs E.PLS (b)	0.3740	0.6458	0.4004	0.6552
PC(10) vs S.PLS	0.3349	0.6312	0.3586	0.6397
PC(10) vs D.PLS (a)	-1.3374*	0.0905	-1.4318*	0.0773
PC(10) vs D.PLS (b)	-0.9329	0.1755	-0.9987	0.1599
PC(10) vs E.PLS (a)	-1.1622	0.1226	-1.2442	0.1078
PC(10) vs E.PLS (b)	-3.7806	0.7822	-4.0475	0.4435
S.PLS vs D.PLS (a)	-1.8678**	0.0309	-1.9996**	0.0238
S.PLS vs D.PLS (b)	-0.8644	0.1937	-0.9254	0.1782
S.PLS vs E.PLS (a)	-1.8923**	0.0292	-2.0259**	0.0224
S.PLS vs E.PLS (b)	-4.4020*	0.0536	-4.7128**	0.0312
D.PLS (a) vs D.PLS (b)	0.8253	0.7954	0.8836	0.8107
D.PLS (a) vs E.PLS (a)	-0.2842	0.3881	-0.3043	0.3807
D.PLS (a) vs E.PLS (b)	-4.3930*	0.0559	-4.7031***	0.0032
D.PLS (b) vs E.PLS (a)	-0.8149	0.2076	-0.8724	0.1923
D.PLS (b) vs E.PLS (b)	-3.3566***	0.0004	-3.5935***	0.0002
E.PLS (a) vs E.PLS (b)	-3.6412***	0.0001	-3.8982	0.7749

Notes: The table contains the results of Diebold-Mariano and Harvey, Leybourne and Newbold tests of 6-step ahead forecasts for the period 1980.03-1990.12. ***$p < 0.01$; **$p < 0.05$; *$p < 0.10$.

Table 27: Diebold-Mariano and Harvey, Leybourne and Newbold test results for the forecast period of 1990.03-2000.12

90.03-00.12	DM	p-value DM	HLN	p-value HLN
AR(4) vs PC(10)	2.0239	0.9785	2.1668	0.9840
AR(4) vs S.PLS	2.9107	0.9982	3.1161	0.9989
AR(4) vs D.PLS (a)	1.3686	0.9144	1.4652	0.9274
AR(4) vs D.PLS (b)	1.1264	0.8700	1.2059	0.8850
AR(4) vs E.PLS (a)	0.6623	0.7461	0.7090	0.7602
AR(4) vs E.PLS (b)	-3.8925	0.4961	-4.1673	0.2805
PC(10) vs S.PLS	2.9435	0.9984	3.1512	0.9990
PC(10) vs D.PLS (a)	-1.9378**	0.0263	-2.0746**	0.0200
PC(10) vs D.PLS (b)	-1.9897**	0.0233	-2.1301**	0.0175
PC(10) vs E.PLS (a)	-2.9305***	0.0017	-3.1373***	0.0011
PC(10) vs E.PLS (b)	-3.7888	0.7568	-4.0563	0.4290
S.PLS vs D.PLS (a)	-3.5596***	0.0002	-3.8108***	0.0001
S.PLS vs D.PLS (b)	-2.9116***	0.0018	-3.1171***	0.0011
S.PLS vs E.PLS (a)	-3.9232	0.4368	-4.2002	0.2469
S.PLS vs E.PLS (b)	-4.2885*	0.0899	-4.5912*	0.0516
D.PLS (a) vs D.PLS (b)	-0.2781	0.3905	-0.2977	0.3832
D.PLS (a) vs E.PLS (a)	-2.0387**	0.0207	-2.1826**	0.0154
D.PLS (a) vs E.PLS (b)	-3.2171***	0.0006	-3.4441***	0.0004
D.PLS (b) vs E.PLS (a)	-1.2067	0.1138	-1.2919*	0.0994
D.PLS (b) vs E.PLS (b)	-3.1741***	0.0008	-3.3981***	0.0005
E.PLS (a) vs E.PLS (b)	-2.6647***	0.0039	-2.8527***	0.0025

Notes: The table contains the results of Diebold-Mariano and Harvey, Leybourne and Newbold tests of 6-step ahead forecasts for the period 1990.03-2000.12. ***$p < 0.01$; **$p < 0.05$; *$p < 0.10$.

Table 28: Diebold-Mariano and Harvey, Leybourne and Newbold test results for the forecast period of 1970.03-1990.12

70.03-90.12	DM	p-value DM	HLN	p-value HLN
AR(4) vs PC(10)	3.7365	0.9999	3.9473	1.0000
AR(4) vs S.PLS	3.4131	0.9997	3.6057	0.9998
AR(4) vs D.PLS (a)	2.8495	0.9978	3.0102	0.9986
AR(4) vs D.PLS (b)	3.5909	0.9998	3.7935	0.9999
AR(4) vs E.PLS (a)	2.8765	0.9980	3.0388	0.9987
AR(4) vs E.PLS (b)	0.6453	0.7407	0.6817	0.7520
PC(10) vs S.PLS	-1.5128*	0.0652	-1.5981*	0.0556
PC(10) vs D.PLS (a)	-1.3204*	0.0934	-1.3949*	0.0822
PC(10) vs D.PLS (b)	-0.2734	0.3923	-0.2889	0.3865
PC(10) vs E.PLS (a)	-1.1289	0.1295	-1.1926	0.1171
PC(10) vs E.PLS (b)	-3.1721***	0.0008	-3.3510***	0.0005
S.PLS vs D.PLS (a)	-0.3950	0.3464	-0.4173	0.3384
S.PLS vs D.PLS (b)	1.2616	0.8965	1.3328	0.9081
S.PLS vs E.PLS (a)	-0.0924	0.4632	-0.0976	0.4612
S.PLS vs E.PLS (b)	-2.6571***	0.0039	-2.8070***	0.0027
D.PLS (a) vs D.PLS (b)	1.3317	0.9085	1.4068	0.9196
D.PLS (a) vs E.PLS (a)	0.6237	0.7336	0.6589	0.7447
D.PLS (a) vs E.PLS (b)	-3.4229***	0.0003	-3.6160***	0.0002
D.PLS (b) vs E.PLS (a)	-1.1454	0.1260	-1.2100	0.1137
D.PLS (b) vs E.PLS (b)	-3.0958***	0.0010	-3.2704***	0.0006
E.PLS (a) vs E.PLS (b)	-3.4837***	0.0002	-3.6802***	0.0001

Notes: The table contains the results of Diebold-Mariano and Harvey, Leybourne and Newbold tests of 6-step ahead forecasts for the period 1970.03-1990.12. ***$p < 0.01$; **$p < 0.05$; *$p < 0.10$.

Table 29: Diebold-Mariano and Harvey, Leybourne and Newbold test results for the forecast period of 1970.03-2000.12

70.03-00.12	DM	p-value DM	HLN	p-value HLN
AR(4) vs PC(10)	3.8272	0.9999	4.0337	1.0000
AR(4) vs S.PLS	3.9249	1.0000	4.1367	1.0000
AR(4) vs D.PLS (a)	2.6718	0.9962	2.8160	0.9974
AR(4) vs D.PLS (b)	3.5558	0.9998	3.7477	0.9999
AR(4) vs E.PLS (a)	2.6062	0.9954	2.7468	0.9968
AR(4) vs E.PLS (b)	0.3033	0.6192	0.3197	0.6253
PC(10) vs S.PLS	-1.0516	0.1465	-1.1084	0.1342
PC(10) vs D.PLS (a)	-1.5103*	0.0655	-1.5917*	0.0562
PC(10) vs D.PLS (b)	-0.6614	0.2542	-0.6971	0.2431
PC(10) vs E.PLS (a)	-1.3871*	0.0827	-1.4619*	0.0723
PC(10) vs E.PLS (b)	-3.6896***	0.0001	-3.8886*	0.0598
S.PLS vs D.PLS (a)	-0.8615	0.1945	-0.9079	0.1823
S.PLS vs D.PLS (b)	0.5515	0.7094	0.5813	0.7193
S.PLS vs E.PLS (a)	-0.7035	0.2409	-0.7415	0.2294
S.PLS vs E.PLS (b)	-3.4382***	0.0003	-3.6237***	0.0002
D.PLS (a) vs D.PLS (b)	1.3896	0.9177	1.4646	0.9281
D.PLS (a) vs E.PLS (a)	0.2084	0.5825	0.2196	0.5869
D.PLS (a) vs E.PLS (b)	-4.1802	0.1456	-4.4057*	0.0692
D.PLS (b) vs E.PLS (a)	-1.3081*	0.0954	-1.3787*	0.0844
D.PLS (b) vs E.PLS (b)	-3.6387***	0.0001	-3.8350	0.7382
E.PLS (a) vs E.PLS (b)	-3.9143	0.4534	-4.1255**	0.0229

Notes: The table contains the results of Diebold-Mariano and Harvey, Leybourne and Newbold tests of 6-step ahead forecasts for the period 1970.03-2000.12. ***$p < 0.01$; **$p < 0.05$; *$p < 0.10$.

Table 30: Diebold-Mariano and Harvey, Leybourne and Newbold test results for the forecast period of 1980.03-2000.12

80.03-00.12	DM	p-value DM	HLN	p-value HLN
AR(4) vs PC(10)	3.7711	0.9999	3.9838	1.0000
AR(4) vs S.PLS	4.2448	1.0000	4.4843	1.0000
AR(4) vs D.PLS (a)	3.0357	0.9988	3.2069	0.9992
AR(4) vs D.PLS (b)	3.2286	0.9994	3.4108	0.9996
AR(4) vs E.PLS (a)	2.6262	0.9957	2.7743	0.9970
AR(4) vs E.PLS (b)	-0.0466	0.4814	-0.0492	0.4804
PC(10) vs S.PLS	1.1264	0.8700	1.1900	0.8824
PC(10) vs D.PLS (a)	-1.3042*	0.0961	-1.3777*	0.0848
PC(10) vs D.PLS (b)	-1.3160*	0.0941	-1.3903*	0.0828
PC(10) vs E.PLS (a)	-1.5999*	0.0548	-1.6901**	0.0461
PC(10) vs E.PLS (b)	-4.1592	0.1597	-4.3938***	0.0082
S.PLS vs D.PLS (a)	-2.1336**	0.0164	-2.2540**	0.0125
S.PLS vs D.PLS (b)	-1.7970**	0.0362	-1.8984**	0.0294
S.PLS vs E.PLS (a)	-2.5508***	0.0054	-2.6947***	0.0038
S.PLS vs E.PLS (b)	-4.8169***	0.0073	-5.0886***	0.0036
D.PLS (a) vs D.PLS (b)	0.7294	0.7671	0.7705	0.7791
D.PLS (a) vs E.PLS (a)	-0.7687	0.2210	-0.8121	0.2088
D.PLS (a) vs E.PLS (b)	-5.0618***	0.0021	-5.3474***	0.0010
D.PLS (b) vs E.PLS (a)	-1.0745	0.1413	-1.1351	0.1287
D.PLS (b) vs E.PLS (b)	-3.8554**	0.0578	-4.0729**	0.0312
E.PLS (a) vs E.PLS (b)	-4.1979	0.1347	-4.4347	0.0692

Notes: The table contains the results of Diebold-Mariano and Harvey, Leybourne and Newbold tests of 6-step ahead forecasts for the period 1980.03-2000.12. $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.10$.

Table 31: Diebold-Mariano and Harvey, Leybourne and Newbold test results for the forecast period of 1980.03-2003.12

70.03-03.12	DM	p-value DM	HLN	p-value HLN
AR(4) vs PC(10)	4.0056	1.0000	4.2030	1.0000
AR(4) vs S.PLS	4.3009	1.0000	4.5128	1.0000
AR(4) vs D.PLS (a)	2.7023	0.9966	2.8355	0.9976
AR(4) vs D.PLS (b)	3.7675	0.9999	3.9532	1.0000
AR(4) vs E.PLS (a)	2.6446	0.9959	2.7749	0.9971
AR(4) vs E.PLS (b)	0.1235	0.5491	0.1295	0.5515
PC(10) vs S.PLS	-0.6335	0.2632	-0.6647	0.2533
PC(10) vs D.PLS (a)	-1.6997**	0.0446	-1.7835*	0.0376
PC(10) vs D.PLS (b)	-0.5341	0.2966	-0.5604	0.2878
PC(10) vs E.PLS (a)	-1.5635*	0.0590	-1.6405*	0.0508
PC(10) vs E.PLS (b)	-4.0409	0.2663	-4.2400	0.1386
S.PLS vs D.PLS (a)	-1.3827*	0.0834	-1.4509*	0.0738
S.PLS vs D.PLS (b)	0.2541	0.6003	0.2667	0.6051
S.PLS vs E.PLS (a)	-1.1851	0.1180	-1.2435	0.1072
S.PLS vs E.PLS (b)	-3.9536	0.3849	-4.1484	0.2041
D.PLS (a) vs D.PLS (b)	1.6928	0.9548	1.7762	0.9618
D.PLS (a) vs E.PLS (a)	0.2355	0.5931	0.2471	0.5975
D.PLS (a) vs E.PLS (b)	-4.2288	0.1175	-4.4372*	0.0588
D.PLS (b) vs E.PLS (a)	-1.6075*	0.0540	-1.6867**	0.0462
D.PLS (b) vs E.PLS (b)	-3.9972	0.3205	-4.1942	0.1683
E.PLS (a) vs E.PLS (b)	-3.9832	0.3400	-4.1795	0.1791

Notes: The table contains the results of Diebold-Mariano and Harvey, Leybourne and Newbold tests of 6-step ahead forecasts for the period 1970.03-2003.12. ***$p < 0.01$; **$p < 0.05$; *$p < 0.10$.

B.3.3. Results for 12-step Ahead Forecasts

Table 32: Diebold-Mariano and Harvey, Leybourne and Newbold test results for the forecast period of 1970.03-1980.12

70.03-80.12	DM	p-value DM	HLN	p-value HLN
AR(4) vs PC(10)	2.6294	0.9957	2.8150	0.9972
AR(4) vs S.PLS	3.2357	0.9994	3.4641	0.9996
AR(4) vs D.PLS (a)	2.2456	0.9876	2.4041	0.9912
AR(4) vs D.PLS (b)	2.0227	0.9785	2.1654	0.9839
AR(4) vs E.PLS (a)	1.8745	0.9696	2.0068	0.9766
AR(4) vs E.PLS (b)	1.2437	0.8932	1.3314	0.9073
PC(10) vs S.PLS	-0.3333	0.3695	-0.3568	0.3609
PC(10) vs D.PLS (a)	-0.6230	0.2666	-0.6670	0.2530
PC(10) vs D.PLS (b)	-1.0815	0.1397	-1.1579	0.1245
PC(10) vs E.PLS (a)	-1.3624*	0.0865	-1.4586**	0.0736
PC(10) vs E.PLS (b)	-1.6858**	0.0459	-1.8048**	0.0367
S.PLS vs D.PLS (a)	-0.3659	0.3572	-0.3917	0.3480
S.PLS vs D.PLS (b)	-0.5095	0.3052	-0.5454	0.2932
S.PLS vs E.PLS (a)	-1.2319	0.1090	-1.3189*	0.0948
S.PLS vs E.PLS (b)	-1.4675*	0.0711	-1.5711*	0.0593
D.PLS (a) vs D.PLS (b)	-0.0941	0.4625	-0.1007	0.4600
D.PLS (a) vs E.PLS (a)	-1.4476*	0.0739	-1.5498*	0.0618
D.PLS (a) vs E.PLS (b)	-1.2997*	0.0968	-1.3915*	0.0832
D.PLS (b) vs E.PLS (a)	-0.7580	0.2242	-0.8115	0.2093
D.PLS (b) vs E.PLS (b)	-1.0174	0.1545	-1.0892	0.1391
E.PLS (a) vs E.PLS (b)	-0.7151	0.2373	-0.7656	0.2227

Notes: The table contains the results of Diebold-Mariano and Harvey, Leybourne and Newbold tests of 12-step ahead forecasts for the period 1970.03-1980.12. ***$p < 0.01$; **$p < 0.05$; *$p < 0.10$.

Table 33: Diebold-Mariano and Harvey, Leybourne and Newbold test results for the forecast period of 1980.03-1990.12

80.03-90.12	DM	p-value DM	HLN	p-value HLN
AR(4) vs PC(10)	3.1546	0.9992	3.3772	0.9995
AR(4) vs S.PLS	3.0321	0.9988	3.2461	0.9993
AR(4) vs D.PLS (a)	2.5620	0.9948	2.7429	0.9965
AR(4) vs D.PLS (b)	3.2928	0.9995	3.5252	0.9997
AR(4) vs E.PLS (a)	2.4701	0.9933	2.6444	0.9954
AR(4) vs E.PLS (b)	-0.1820	0.4278	-0.1949	0.4229
PC(10) vs S.PLS	0.5516	0.7094	0.5906	0.7221
PC(10) vs D.PLS (a)	-0.6821	0.2476	-0.7302	0.2333
PC(10) vs D.PLS (b)	0.2011	0.5797	0.2153	0.5850
PC(10) vs E.PLS (a)	-0.8318	0.2028	-0.8905	0.1874
PC(10) vs E.PLS (b)	-2.7096***	0.0034	-2.9009***	0.0022
S.PLS vs D.PLS (a)	-1.7157**	0.0431	-1.8368**	0.0343
S.PLS vs D.PLS (b)	-0.5368	0.2957	-0.5746	0.2833
S.PLS vs E.PLS (a)	-1.8941**	0.0291	-2.0278**	0.0223
S.PLS vs E.PLS (b)	-2.8904***	0.0019	-3.0944***	0.0012
D.PLS (a) vs D.PLS (b)	0.8513	0.8027	0.9114	0.8181
D.PLS (a) vs E.PLS (a)	-0.8685	0.1926	-0.9299	0.1771
D.PLS (a) vs E.PLS (b)	-2.6273***	0.0043	-2.8127***	0.0028
D.PLS (b) vs E.PLS (a)	-1.0382	0.1496	-1.1114	0.1342
D.PLS (b) vs E.PLS (b)	-2.8526***	0.0022	-3.0540***	0.0014
E.PLS (a) vs E.PLS (b)	-2.4793***	0.0066	-2.6543***	0.0045

Notes: The table contains the results of Diebold-Mariano and Harvey, Leybourne and Newbold tests of 12-step ahead forecasts for the period 1980.03-1990.12. $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.10$.

Table 34: Diebold-Mariano and Harvey, Leybourne and Newbold test results for the forecast period of 1990.03-2000.12

90.03-00.12	DM	p-value DM	HLN	p-value HLN
AR(4) vs PC(10)	1.1999	0.8849	1.2846	0.8994
AR(4) vs S.PLS	2.2904	0.9890	2.4521	0.9922
AR(4) vs D.PLS (a)	1.2355	0.8917	1.3227	0.9059
AR(4) vs D.PLS (b)	1.1976	0.8845	1.2821	0.8990
AR(4) vs E.PLS (a)	0.6858	0.7536	0.7342	0.7679
AR(4) vs E.PLS (b)	-2.3542***	0.0093	-2.5204***	0.0065
PC(10) vs S.PLS	4.4769	1.0000	4.7929	1.0000
PC(10) vs D.PLS (a)	-0.0334	0.4867	-0.0357	0.4858
PC(10) vs D.PLS (b)	0.1268	0.5504	0.1357	0.5539
PC(10) vs E.PLS (a)	-1.2480	0.1060	-1.3361*	0.0919
PC(10) vs E.PLS (b)	-3.0336***	0.0012	-3.2477***	0.0007
S.PLS vs D.PLS (a)	-2.8239***	0.0024	-3.0232***	0.0015
S.PLS vs D.PLS (b)	-2.9096***	0.0018	-3.1150***	0.0011
S.PLS vs E.PLS (a)	-3.4498***	0.0003	-3.6933***	0.0002
S.PLS vs E.PLS (b)	-3.8392	0.6172	-4.1102	0.3493
D.PLS (a) vs D.PLS (b)	0.1321	0.5526	0.1414	0.5561
D.PLS (a) vs E.PLS (a)	-1.7610**	0.0391	-1.8853**	0.0308
D.PLS (a) vs E.PLS (b)	-3.4826***	0.0002	-3.7284***	0.0001
D.PLS (b) vs E.PLS (a)	-1.8815**	0.0300	-2.0143**	0.0230
D.PLS (b) vs E.PLS (b)	-3.1699***	0.0008	-3.3936***	0.0005
E.PLS (a) vs E.PLS (b)	-2.8726***	0.0020	-3.0754***	0.0013

Notes: The table contains the results of Diebold-Mariano and Harvey, Leybourne and Newbold tests of 12-step ahead forecasts for the period 1990.03-2000.12. ***$p < 0.01$; **$p < 0.05$; *$p < 0.10$.

Table 35: Diebold-Mariano and Harvey, Leybourne and Newbold test results for the forecast period of 1970.03-1990.12

70.03-90.12	DM	p-value DM	HLN	p-value HLN
AR(4) vs PC(10)	4.0084	1.0000	4.2346	1.0000
AR(4) vs S.PLS	4.1604	1.0000	4.3951	1.0000
AR(4) vs D.PLS (a)	3.3054	0.9995	3.4918	0.9997
AR(4) vs D.PLS (b)	3.7129	0.9999	3.9223	0.9999
AR(4) vs E.PLS (a)	3.0147	0.9987	3.1848	0.9992
AR(4) vs E.PLS (b)	0.5186	0.6980	0.5478	0.7079
PC(10) vs S.PLS	0.3977	0.6546	0.4201	0.6626
PC(10) vs D.PLS (a)	-0.9769	0.1643	-1.0320	0.1515
PC(10) vs D.PLS (b)	-0.7497	0.2267	-0.7920	0.2146
PC(10) vs E.PLS (a)	-1.6158*	0.0531	-1.7069**	0.0445
PC(10) vs E.PLS (b)	-3.1867***	0.0007	-3.3665***	0.0004
S.PLS vs D.PLS (a)	-1.6162*	0.0530	-1.7073**	0.0445
S.PLS vs D.PLS (b)	-0.9644	0.1674	-1.0188	0.1547
S.PLS vs E.PLS (a)	-2.3185**	0.0102	-2.4493***	0.0075
S.PLS vs E.PLS (b)	-3.3987***	0.0003	-3.5904***	0.0002
D.PLS (a) vs D.PLS (b)	0.6787	0.7513	0.7169	0.7630
D.PLS (a) vs E.PLS (a)	-1.6397*	0.0505	-1.7322**	0.0422
D.PLS (a) vs E.PLS (b)	-2.9427***	0.0016	-3.1087***	0.0010
D.PLS (b) vs E.PLS (a)	-1.3565*	0.0875	-1.4331*	0.0765
D.PLS (b) vs E.PLS (b)	-2.9363***	0.0017	-3.1020***	0.0011
E.PLS (a) vs E.PLS (b)	-2.5828***	0.0049	-2.7284***	0.0034

Notes: The table contains the results of Diebold-Mariano and Harvey, Leybourne and Newbold tests of 12-step ahead forecasts for the period 1970.03-1990.12. ***$p < 0.01$; **$p < 0.05$; *$p < 0.10$.

Table 36: Diebold-Mariano and Harvey, Leybourne and Newbold test results for the forecast period of 1970.03-2000.12

70.03-00.12	DM	p-value DM	HLN	p-value HLN
AR(4) vs PC(10)	4.0698	1.0000	4.2893	1.0000
AR(4) vs S.PLS	4.4295	1.0000	4.6685	1.0000
AR(4) vs D.PLS (a)	3.3531	0.9996	3.5340	0.9998
AR(4) vs D.PLS (b)	3.8307	0.9999	4.0373	1.0000
AR(4) vs E.PLS (a)	2.9260	0.9983	3.0838	0.9989
AR(4) vs E.PLS (b)	0.2327	0.5920	0.2453	0.5968
PC(10) vs S.PLS	0.8796	0.8105	0.9271	0.8228
PC(10) vs D.PLS (a)	-0.9880	0.1616	-1.0413	0.1492
PC(10) vs D.PLS (b)	-0.6490	0.2582	-0.6840	0.2472
PC(10) vs E.PLS (a)	-1.7848**	0.0371	-1.8811**	0.0304
PC(10) vs E.PLS (b)	-4.1636	0.1567	-4.3882*	0.0747
S.PLS vs D.PLS (a)	-2.0617**	0.0196	-2.1730**	0.0152
S.PLS vs D.PLS (b)	-1.4565*	0.0726	-1.5351*	0.0628
S.PLS vs E.PLS (a)	-2.8104***	0.0025	-2.9620***	0.0016
S.PLS vs E.PLS (b)	-4.5075**	0.0328	-4.7507**	0.0145
D.PLS (a) vs D.PLS (b)	0.7342	0.7686	0.7738	0.7802
D.PLS (a) vs E.PLS (a)	-2.0776**	0.0189	-2.1897**	0.0146
D.PLS (a) vs E.PLS (b)	-3.8887	0.5038	-4.0985	0.2558
D.PLS (b) vs E.PLS (a)	-1.5719*	0.0580	-1.6567**	0.0492
D.PLS (b) vs E.PLS (b)	-3.8425	0.6089	-4.0498	0.3125
E.PLS (a) vs E.PLS (b)	-3.4525***	0.0003	-3.6388***	0.0002

Notes: The table contains the results of Diebold-Mariano and Harvey, Leybourne and Newbold tests of 12-step ahead forecasts for the period 1970.03-2000.12. ***$p < 0.01$; **$p < 0.05$; *$p < 0.10$.

Table 37: Diebold-Mariano and Harvey, Leybourne and Newbold test results for the forecast period of 1980.03-2000.12

80.03-00.12	DM	p-value DM	HLN	p-value HLN
AR(4) vs PC(10)	3.2374	0.9994	3.4200	0.9996
AR(4) vs S.PLS	3.3746	0.9996	3.5650	0.9998
AR(4) vs D.PLS (a)	2.7313	0.9969	2.8854	0.9979
AR(4) vs D.PLS (b)	3.3586	0.9996	3.5480	0.9998
AR(4) vs E.PLS (a)	2.5202	0.9941	2.6624	0.9959
AR(4) vs E.PLS (b)	-0.4993	0.3088	-0.5275	0.2992
PC(10) vs S.PLS	1.2601	0.8962	1.3312	0.9078
PC(10) vs D.PLS (a)	-0.6564	0.2558	-0.6935	0.2443
PC(10) vs D.PLS (b)	0.4059	0.6576	0.4288	0.6658
PC(10) vs E.PLS (a)	-1.0626	0.1440	-1.1226	0.1314
PC(10) vs E.PLS (b)	-3.2743***	0.0005	-3.4590***	0.0003
S.PLS vs D.PLS (a)	-2.2579**	0.0120	-2.3853***	0.0089
S.PLS vs D.PLS (b)	-1.2254	0.1102	-1.2945*	0.0983
S.PLS vs E.PLS (a)	-2.7684***	0.0028	-2.9246***	0.0019
S.PLS vs E.PLS (b)	-3.8605	0.5657	-4.0783	0.3055
D.PLS (a) vs D.PLS (b)	0.9252	0.8226	0.9774	0.8353
D.PLS (a) vs E.PLS (a)	-1.9151**	0.0277	-2.0231**	0.0221
D.PLS (a) vs E.PLS (b)	-3.2538***	0.0006	-3.4374***	0.0003
D.PLS (b) vs E.PLS (a)	-1.4171*	0.0782	-1.4970*	0.0678
D.PLS (b) vs E.PLS (b)	-3.4395***	0.0003	-3.6335***	0.0002
E.PLS (a) vs E.PLS (b)	-2.9813***	0.0014	-3.1495***	0.0009

Notes: The table contains the results of Diebold-Mariano and Harvey, Leybourne and Newbold tests of 12-step ahead forecasts for the period 1980.03-2000.12. ***$p < 0.01$; **$p < 0.05$; *$p < 0.10$.

Table 38: Diebold-Mariano and Harvey, Leybourne and Newbold test results for the forecast period of 1970.03-2003.12

70.03-03.12	DM	p-value DM	HLN	p-value HLN
AR(4) vs PC(10)	4.2597	1.0000	4.4696	1.0000
AR(4) vs S.PLS	4.6447	1.0000	4.8735	1.0000
AR(4) vs D.PLS (a)	3.3250	0.9996	3.4888	0.9997
AR(4) vs D.PLS (b)	3.9712	1.0000	4.1669	1.0000
AR(4) vs E.PLS (a)	2.8691	0.9979	3.0104	0.9986
AR(4) vs E.PLS (b)	0.0099	0.5039	0.0104	0.5041
PC(10) vs S.PLS	0.9483	0.8285	0.9950	0.8398
PC(10) vs D.PLS (a)	-1.3525	0.0881	-1.4191*	0.0783
PC(10) vs D.PLS (b)	-0.8010	0.2116	-0.8404	0.2006
PC(10) vs E.PLS (a)	-2.1584**	0.0155	-2.2647**	0.0120
PC(10) vs E.PLS (b)	-4.5425**	0.0278	-4.7664**	0.0131
S.PLS vs D.PLS (a)	-2.5325***	0.0057	-2.6573***	0.0041
S.PLS vs D.PLS (b)	-1.6522**	0.0492	-1.7336**	0.0419
S.PLS vs E.PLS (a)	-3.2840***	0.0005	-3.4459***	0.0003
S.PLS vs E.PLS (b)	-4.8904**	0.0050	-5.1314***	0.0022
D.PLS (a) vs D.PLS (b)	1.0700	0.8577	1.1227	0.8689
D.PLS (a) vs E.PLS (a)	-2.1891**	0.0143	-2.2970**	0.0111
D.PLS (a) vs E.PLS (b)	-4.0381	0.2694	-4.2371**	0.0140
D.PLS (b) vs E.PLS (a)	-1.9147**	0.0278	-2.0090**	0.0226
D.PLS (b) vs E.PLS (b)	-4.1699	0.1524	-4.3754*	0.0772
E.PLS (a) vs E.PLS (b)	-3.5621***	0.0002	-3.7376***	0.0001

Notes: The table contains the results of Diebold-Mariano and Harvey, Leybourne and Newbold tests of 12-step ahead forecasts for the period 1970.03-2003.12. ***$p < 0.01$; **$p < 0.05$; *$p < 0.10$.

B.3.4. Results for 24-step Ahead Forecasts

Table 39: Diebold-Mariano and Harvey, Leybourne and Newbold test results for the forecast period of 1970.03-1980.12

70.03-80.12	DM	p-value DM	HLN	p-value DM
AR(4) vs PC(10)	1.5540	0.9399	1.6637	0.9507
AR(4) vs S.PLS	3.4237	0.9997	3.6654	0.9998
AR(4) vs D.PLS (a)	2.7809	0.9973	2.9772	0.9983
AR(4) vs D.PLS (b)	3.3616	0.9996	3.5989	0.9998
AR(4) vs E.PLS (a)	1.5134	0.9349	1.6203	0.9462
AR(4) vs E.PLS (b)	2.1436	0.9840	2.2949	0.9883
PC(10) vs S.PLS	0.6256	0.7342	0.6698	0.7479
PC(10) vs D.PLS (a)	0.2443	0.5965	0.2615	0.6030
PC(10) vs D.PLS (b)	0.8608	0.8053	0.9215	0.8208
PC(10) vs E.PLS (a)	-0.5709	0.2840	-0.6112	0.2711
PC(10) vs E.PLS (b)	-0.2630	0.3963	-0.2815	0.3894
S.PLS vs D.PLS (a)	-1.1292	0.1294	-1.2089	0.1145
S.PLS vs D.PLS (b)	0.7842	0.7835	0.8396	0.7986
S.PLS vs E.PLS (a)	-3.1820***	0.0007	-3.4066***	0.0004
S.PLS vs E.PLS (b)	-1.5971*	0.0551	-1.7098**	0.0449
D.PLS (a) vs D.PLS (b)	1.9294	0.9732	2.0656	0.9796
D.PLS (a) vs E.PLS (a)	-2.7343***	0.0031	-2.9273***	0.0020
D.PLS (a) vs E.PLS (b)	-1.2200	0.1112	-1.3061*	0.0969
D.PLS (b) vs E.PLS (a)	-3.6443***	0.0001	-3.9015	0.7655
D.PLS (b) vs E.PLS (b)	-2.4464***	0.0072	-2.6190***	0.0049
E.PLS (a) vs E.PLS (b)	0.4787	0.6839	0.5125	0.6954

Notes: The table contains the results of Diebold-Mariano and Harvey, Leybourne and Newbold tests of 24-step ahead forecasts for the period 1970.03-1980.12. ***$p < 0.01$; **$p < 0.05$; *$p < 0.10$.

Table 40: Diebold-Mariano and Harvey, Leybourne and Newbold test results for the forecast period of 1980.03-1990.12

80.03-90.12	DM	p-value DM	HLN	p-value DM
AR(4) vs PC(10)	3.0218	0.9987	3.2351	0.9992
AR(4) vs S.PLS	2.8887	0.9981	3.0926	0.9988
AR(4) vs D.PLS (a)	2.5791	0.9951	2.7611	0.9967
AR(4) vs D.PLS (b)	2.7856	0.9973	2.9822	0.9983
AR(4) vs E.PLS (a)	3.0400	0.9988	3.2546	0.9993
AR(4) vs E.PLS (b)	1.6934	0.9548	1.8129	0.9639
PC(10) vs S.PLS	0.0687	0.5274	0.0735	0.5292
PC(10) vs D.PLS (a)	-0.7748	0.2192	-0.8295	0.2042
PC(10) vs D.PLS (b)	-0.4112	0.3405	-0.4403	0.3302
PC(10) vs E.PLS (a)	-0.9787	0.1639	-1.0478	0.1484
PC(10) vs E.PLS (b)	-3.4238***	0.0003	-3.6655***	0.0002
S.PLS vs D.PLS (a)	-0.8611	0.1946	-0.9219	0.1792
S.PLS vs D.PLS (b)	-0.6076	0.2717	-0.6505	0.2583
S.PLS vs E.PLS (a)	-1.1475	0.1256	-1.2285	0.1108
S.PLS vs E.PLS (b)	-2.9646***	0.0015	-3.1738***	0.0009
D.PLS (a) vs D.PLS (b)	0.6284	0.7351	0.6728	0.7489
D.PLS (a) vs E.PLS (a)	-0.3727	0.3547	-0.3990	0.3453
D.PLS (a) vs E.PLS (b)	-2.7279***	0.0032	-2.9204***	0.0021
D.PLS (b) vs E.PLS (a)	-0.8763	0.1904	-0.9382	0.1750
D.PLS (b) vs E.PLS (b)	-2.8732***	0.0020	-3.0760***	0.0013
E.PLS (a) vs E.PLS (b)	-3.1673***	0.0008	-3.3909***	0.0005

Notes: The table contains the results of Diebold-Mariano and Harvey, Leybourne and Newbold tests of 24-step ahead forecasts for the period 1980.03-1990.12. ***$p < 0.01$; **$p < 0.05$; *$p < 0.10$.

Table 41: Diebold-Mariano and Harvey, Leybourne and Newbold test results for the forecast period of 1990.03-2000.12

90.03-00.12	DM	p-value DM	HLN	p-value DM
AR(4) vs PC(10)	1.4269	0.9232	1.5277	0.9355
AR(4) vs S.PLS	2.5415	0.9945	2.7209	0.9963
AR(4) vs D.PLS (a)	1.1324	0.8713	1.2123	0.8862
AR(4) vs D.PLS (b)	2.3394	0.9903	2.5045	0.9933
AR(4) vs E.PLS (a)	1.6525	0.9508	1.7691	0.9604
AR(4) vs E.PLS (b)	-1.8988**	0.0288	-2.0328**	0.0221
PC(10) vs S.PLS	2.8092	0.9975	3.0075	0.9984
PC(10) vs D.PLS (a)	-1.0523	0.1463	-1.1266	0.1310
PC(10) vs D.PLS (b)	3.0824	0.9990	3.3000	0.9994
PC(10) vs E.PLS (a)	0.0175	0.5070	0.0187	0.5075
PC(10) vs E.PLS (b)	-3.0348***	0.0012	-3.2490***	0.0007
S.PLS vs D.PLS (a)	-2.8527***	0.0022	-3.0541***	0.0014
S.PLS vs D.PLS (b)	-0.6649	0.2531	-0.7118	0.2389
S.PLS vs E.PLS (a)	-2.0017**	0.0227	-2.1430**	0.0170
S.PLS vs E.PLS (b)	-3.7047***	0.0001	-3.9662	0.6022
D.PLS (a) vs D.PLS (b)	2.7966	0.9974	2.9940	0.9984
D.PLS (a) vs E.PLS (a)	1.4192	0.9221	1.5194	0.9344
D.PLS (a) vs E.PLS (b)	-3.5827***	0.0002	-3.8356	0.9754
D.PLS (b) vs E.PLS (a)	-2.0716**	0.0192	-2.2179**	0.0142
D.PLS (b) vs E.PLS (b)	-3.7868	0.7632	-4.0540	0.4326
E.PLS (a) vs E.PLS (b)	-4.0511	0.2549	-4.3371	0.1443

Notes: The table contains the results of Diebold-Mariano and Harvey, Leybourne and Newbold tests of 24-step ahead forecasts for the period 1990.03-2000.12. ***$p < 0.01$; **$p < 0.05$; *$p < 0.10$.

Table 42: Diebold-Mariano and Harvey, Leybourne and Newbold test results for the forecast period of 1970.03-1990.12

70.03-90.12	DM	p-value DM	HLN	p-value DM
AR(4) vs PC(10)	2.9913	0.9986	3.1601	0.9991
AR(4) vs S.PLS	4.1465	1.0000	4.3804	1.0000
AR(4) vs D.PLS (a)	3.5272	0.9998	3.7261	0.9999
AR(4) vs D.PLS (b)	4.0023	1.0000	4.2281	1.0000
AR(4) vs E.PLS (a)	3.0983	0.9990	3.2731	0.9994
AR(4) vs E.PLS (b)	2.5869	0.9952	2.7329	0.9966
PC(10) vs S.PLS	0.7287	0.7669	0.7698	0.7789
PC(10) vs D.PLS (a)	0.0489	0.5195	0.0517	0.5206
PC(10) vs D.PLS (b)	0.7513	0.7738	0.7937	0.7859
PC(10) vs E.PLS (a)	-0.7909	0.2145	-0.8356	0.2021
PC(10) vs E.PLS (b)	-1.6440*	0.0501	-1.7367**	0.0418
S.PLS vs D.PLS (a)	-1.4283*	0.0766	-1.5089*	0.0663
S.PLS vs D.PLS (b)	0.0018	0.5007	0.0019	0.5008
S.PLS vs E.PLS (a)	-2.9112***	0.0018	-3.0754***	0.0012
S.PLS vs E.PLS (b)	-3.2220***	0.0006	-3.4038***	0.0004
D.PLS (a) vs D.PLS (b)	1.4964	0.9327	1.5808	0.9424
D.PLS (a) vs E.PLS (a)	-1.9336**	0.0266	-2.0426**	0.0211
D.PLS (a) vs E.PLS (b)	-2.8625***	0.0021	-3.0239***	0.0014
D.PLS (b) vs E.PLS (a)	-2.7220***	0.0032	-2.8755***	0.0022
D.PLS (b) vs E.PLS (b)	-3.3883***	0.0004	-3.5794***	0.0002
E.PLS (a) vs E.PLS (b)	-1.5730**	0.0579	-1.6617**	0.0489

Notes: The table contains the results of Diebold-Mariano and Harvey, Leybourne and Newbold tests of 24-step ahead forecasts for the period 1970.03-1990.12. ***$p < 0.01$; **$p < 0.05$; *$p < 0.10$.

Table 43: Diebold-Mariano and Harvey, Leybourne and Newbold test results for the forecast period of 1970.03-2000.12

70.03-00.12	DM	p-value DM	HLN	p-value DM
AR(4) vs PC(10)	3.0628	0.9989	3.2280	0.9993
AR(4) vs S.PLS	4.4103	1.0000	4.6482	1.0000
AR(4) vs D.PLS (a)	3.4903	0.9998	3.6786	0.9999
AR(4) vs D.PLS (b)	4.1529	1.0000	4.3770	1.0000
AR(4) vs E.PLS (a)	3.2081	0.9993	3.3812	0.9996
AR(4) vs E.PLS (b)	2.0620	0.9804	2.1733	0.9848
PC(10) vs S.PLS	0.9629	0.8322	1.0149	0.8446
PC(10) vs D.PLS (a)	-0.0429	0.4829	-0.0452	0.4820
PC(10) vs D.PLS (b)	0.9634	0.8323	1.0153	0.8447
PC(10) vs E.PLS (a)	-0.7618	0.2231	-0.8029	0.2113
PC(10) vs E.PLS (b)	-2.1460**	0.0159	-2.2618**	0.0121
S.PLS vs D.PLS (a)	-2.3151**	0.0103	-2.4401***	0.0076
S.PLS vs D.PLS (b)	-0.0820	0.4673	-0.0865	0.4656
S.PLS vs E.PLS (a)	-3.0844***	0.0010	-3.2508***	0.0006
S.PLS vs E.PLS (b)	-4.1856	0.1422	-4.4114*	0.0675
D.PLS (a) vs D.PLS (b)	2.1562	0.9845	2.2725	0.9882
D.PLS (a) vs E.PLS (a)	-1.6907**	0.0454	-1.7819**	0.0378
D.PLS (a) vs E.PLS (b)	-3.4940***	0.0002	-3.6825***	0.0001
D.PLS (b) vs E.PLS (a)	-2.8369***	0.0023	-2.9900***	0.0015
D.PLS (b) vs E.PLS (b)	-4.2401	0.1117	-4.4688***	0.0052
E.PLS (a) vs E.PLS (b)	-2.4916***	0.0064	-2.6260***	0.0045

Notes: The table contains the results of Diebold-Mariano and Harvey, Leybourne and Newbold tests of 24-step ahead forecasts for the period 1970.03-2000.12. $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.10$.

Table 44: Diebold-Mariano and Harvey, Leybourne and Newbold test results for the forecast period of 1980.03-2000.12

80.03-00.12	DM	p-value DM	HLN	p-value DM
AR(4) vs PC(10)	3.1127	0.9991	3.2883	0.9994
AR(4) vs S.PLS	3.2428	0.9994	3.4257	0.9996
AR(4) vs D.PLS (a)	2.6586	0.9961	2.8086	0.9973
AR(4) vs D.PLS (b)	3.0830	0.9990	3.2570	0.9994
AR(4) vs E.PLS (a)	3.2915	0.9995	3.4772	0.9997
AR(4) vs E.PLS (b)	1.2205	0.8889	1.2894	0.9008
PC(10) vs S.PLS	0.6849	0.7533	0.7236	0.7650
PC(10) vs D.PLS (a)	-0.9625	0.1679	-1.0168	0.1551
PC(10) vs D.PLS (b)	0.3332	0.6305	0.3520	0.6374
PC(10) vs E.PLS (a)	-0.9040	0.1830	-0.9550	0.1703
PC(10) vs E.PLS (b)	-3.8968	0.4875	-4.1166	0.2617
S.PLS vs D.PLS (a)	-1.7450**	0.0405	-1.8435**	0.0332
S.PLS vs D.PLS (b)	-0.5984	0.2748	-0.6322	0.2639
S.PLS vs E.PLS (a)	-1.7692**	0.0384	-1.8690**	0.0314
S.PLS vs E.PLS (b)	-4.1689	0.1530	-4.4041*	0.0789
D.PLS (a) vs D.PLS (b)	1.4821	0.9308	1.5657	0.9407
D.PLS (a) vs E.PLS (a)	-0.0751	0.4701	-0.0793	0.4684
D.PLS (a) vs E.PLS (b)	-3.5636***	0.0002	-3.7646***	0.0001
D.PLS (b) vs E.PLS (a)	-1.2615	0.1036	-1.3326*	0.0919
D.PLS (b) vs E.PLS (b)	-3.8916	0.4979	-4.1111	0.2675
E.PLS (a) vs E.PLS (b)	-4.3971*	0.0549	-4.6451***	0.0028

Notes: The table contains the results of Diebold-Mariano and Harvey, Leybourne and Newbold tests of 24-step ahead forecasts for the period 1980.03-2000.12. ***$p < 0.01$; **$p < 0.05$; *$p < 0.10$.

Table 45: Diebold-Mariano and Harvey, Leybourne and Newbold test results for the forecast period of 1970.03-2003.12

70.03-03.12	DM	p-value DM	HLN	p-value DM
AR(4) vs PC(10)	3.1189	0.9991	3.2726	0.9994
AR(4) vs S.PLS	4.5473	1.0000	4.7713	1.0000
AR(4) vs D.PLS (a)	3.4367	0.9997	3.6061	0.9998
AR(4) vs D.PLS (b)	4.2585	1.0000	4.4683	1.0000
AR(4) vs E.PLS (a)	3.2169	0.9994	3.3754	0.9996
AR(4) vs E.PLS (b)	1.7583	0.9607	1.8449	0.9671
PC(10) vs S.PLS	1.0637	0.8563	1.1161	0.8675
PC(10) vs D.PLS (a)	-0.2107	0.4166	-0.2211	0.4126
PC(10) vs D.PLS (b)	1.0252	0.8474	1.0757	0.8587
PC(10) vs E.PLS (a)	-0.8370	0.2013	-0.8782	0.1902
PC(10) vs E.PLS (b)	-2.4954***	0.0063	-2.6184***	0.0046
S.PLS vs D.PLS (a)	-2.8799***	0.0020	-3.0218***	0.0013
S.PLS vs D.PLS (b)	-0.1932	0.4234	-0.2027	0.4197
S.PLS vs E.PLS (a)	-3.3939***	0.0003	-3.5611***	0.0002
S.PLS vs E.PLS (b)	-4.7044**	0.0127	-4.9363***	0.0058
D.PLS (a) vs D.PLS (b)	2.6428	0.9959	2.7731	0.9971
D.PLS (a) vs E.PLS (a)	-1.5058*	0.0661	-1.5800**	0.0574
D.PLS (a) vs E.PLS (b)	-3.7764	0.7956	-3.9625	0.4383
D.PLS (b) vs E.PLS (a)	-3.0765***	0.0010	-3.2281***	0.0007
D.PLS (b) vs E.PLS (b)	-4.7270**	0.0114	-4.9599***	0.0005
E.PLS (a) vs E.PLS (b)	-2.8937***	0.0019	-3.0363***	0.0013

Notes: The table contains the results of Diebold-Mariano and Harvey, Leybourne and Newbold tests of 24-step ahead forecasts for the period 1970.03-2003.12. $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.10$.

C. Ridge: Additional Results

C.1. Root Mean Squared Errors

Table 46: Root Mean-Squared forecast Errors for the 1-step ahead forecast.

h=1	AR(4)	PC(10)	S.PLS	D.PLS (a)	D.PLS (b)	E.PLS (a)	E.PLS (b)
70.03-80.12	3.0760	**2.9835**	3.0521	3.1850	*3.0592*	3.7102	3.7282
80.03-90.12	3.1165	3.0009	*3.0623*	**2.9682**	3.0975	3.1017	3.1125
90.03-00.12	1.9866	**1.8886**	*1.9488*	2.0195	1.9276	2.3132	2.3020
70.03-90.12	3.0314	**2.9534**	2.9993	3.0382	*3.0166*	3.3532	3.3929
70.03-00.12	2.7204	**2.6412**	2.6881	2.7336	*2.6960*	3.0350	3.0606
80.03-00.12	2.6104	**2.5069**	*2.5641*	2.5318	2.5781	2.7187	2.7184
70.03-03.12	2.7384	**2.6495**	2.7019	2.7481	*2.7061*	3.0588	3.0765

Notes: The table contains the Root Mean-Squared forecast Errors with the 1-step ahead forecasts of all the models with Ridge estimation. The bold, underlined and italics numbers refer to the models with the smallest, the second and the third smallest Root MSE, respectively.

Table 47: Root Mean-Squared forecast Errors for the 6-step ahead forecast.

h=6	AR(4)	PC(10)	S.PLS	D.PLS (a)	D.PLS (b)	E.PLS (a)	E.PLS (b)
70.03-80.12	2.2411	**1.8672**	2.2218	2.1763	*2.1467*	2.0223	2.9742
80.03-90.12	2.4497	**2.0424**	2.3535	2.2988	*2.2001*	2.1362	3.2625
90.03-00.12	1.2193	1.0418	*1.0946*	1.2336	**1.0239**	1.1398	1.9364
70.03-90.12	2.2583	**1.9098**	2.1999	2.1966	*2.0906*	2.0608	3.0897
70.03-00.12	1.9728	**1.6591**	1.9053	1.9139	*1.8070*	1.7891	2.7369
80.03-00.12	1.9444	**1.6110**	1.8475	1.8287	*1.7259*	1.6922	2.6598
70.03-03.12	1.9628	**1.6529**	1.8825	1.9143	*1.7871*	1.7857	2.7468

Notes: The table contains the Root Mean-Squared forecast Errors with the 6-step ahead forecasts of all the models with Ridge estimation. The bold, underlined and italics numbers refer to the models with the smallest, the second and the third smallest Root MSE, respectively.

Table 48: Root Mean-Squared forecast Errors for the 12-step ahead forecast.

h=12	AR(4)	PC(10)	S.PLS	D.PLS (a)	D.PLS (b)	E.PLS (a)	E.PLS (b)
70.03-80.12	2.2777	**1.8299**	2.2373	*2.1453*	2.1860	2.0830	2.9581
80.03-90.12	2.3689	**1.8399**	2.3065	*2.0540*	2.1359	1.9636	2.9917
90.03-00.12	1.1772	1.0533	*1.0899*	1.1791	**0.9865**	1.0975	1.8304
70.03-90.12	2.3510	**1.8530**	2.3008	*2.1298*	2.1822	2.0502	3.0243
70.03-00.12	2.0326	**1.6148**	1.9805	*1.8520*	1.8679	1.7752	2.6778
80.03-00.12	1.8722	**1.4784**	1.8105	*1.6535*	1.6655	1.5703	2.4739
70.03-03.12	1.9985	**1.5943**	1.9392	1.8452	*1.8324*	1.7613	2.6722

Notes: The table contains the Root Mean-Squared forecast Errors with the 12-step ahead forecasts of all the models with Ridge estimation. The bold, underlined and italics numbers refer to the models with the smallest, the second and the third smallest Root MSE, respectively.

Table 49: Root Mean-Squared forecast Errors for the 24-step ahead forecast.

h=24	AR(4)	PC(10)	S.PLS	D.PLS (a)	D.PLS (b)	E.PLS (a)	E.PLS (b)
70.03-80.12	2.8985	**2.2620**	2.8815	2.5689	2.6470	*2.6044*	3.5205
80.03-90.12	2.9163	**2.0699**	2.8342	*2.2836*	2.4024	2.2231	3.3381
90.03-00.12	1.1821	1.0087	1.1151	1.1569	**0.9188**	*1.0171*	1.7905
70.03-90.12	2.9093	**2.1863**	2.8556	*2.4362*	2.5292	2.4333	3.4397
70.03-00.12	2.4886	**1.8922**	2.4350	*2.1129*	2.1461	2.0853	3.0123
80.03-00.12	2.2637	**1.6574**	2.1904	*1.8394*	1.8496	1.7564	2.7189
70.03-03.12	2.4197	**1.8510**	2.3622	2.0954	*2.0848*	2.0413	2.9965

Notes: The table contains the Root Mean-Squared forecast Errors with the 24-step ahead forecasts of all the models with Ridge estimation. The bold, underlined and italics numbers refer to the models with the smallest, the second and the third smallest Root MSE, respectively.

C.2. Mincer-Zarnowitz Regression Results

Table 50: Mincer-Zarnowitz estimates and p-value of F-statistics for 1-step ahead forecasts.

Period	Estimates	AR(4)	PC(10)	S.PLS	D.PLS (a)	D.PLS (b)	E.PLS (a)	E.PLS (b)
70.03-80.12	α	0.0328	0.0179	0.0401	-0.0737	0.0070	-0.0159	2.1240
	β	0.8168	0.9584	0.9266	1.1231	0.8183	0.5500	-1687.1525
	p-value	**0.1988**	**0.9325**	**0.8104**	**0.7314**	**0.1958**	**0.2769**	0.0000
80.03-90.12	α	-0.1580	-0.0873	-0.1599	-0.1210	-0.1563	-0.0559	0.7901
	β	0.5024	0.5826	0.5497	0.7588	0.5160	0.5282	-1543.8498
	p-value	0.0007	0.0046	0.0043	**0.4244**	0.0007	**0.2089**	0.0000
90.03-00.12	α	-0.0750	0.0807	-0.0888	0.1453	-0.0487	0.0438	0.2835
	β	1.0171	1.0860	1.1100	1.2843	1.0906	0.4521	-3436.6941
	p-value	**0.9094**	**0.7459**	**0.6944**	**0.3024**	**0.7974**	**0.1879**	0.0000
70.03-90.12	α	-0.0438	0.0040	-0.0393	-0.0604	-0.0475	-0.0112	1.2233
	β	0.7200	0.7998	0.7954	0.9864	0.7219	0.6237	-1435.0123
	p-value	0.0031	0.0688	0.0810	**0.9456**	0.0027	**0.1851**	0.0000
70.03-00.12	α	-0.0470	0.0129	-0.0485	-0.0110	-0.0451	0.0084	0.7754
	β	0.7509	0.8352	0.8317	1.0219	0.7589	0.5890	-1326.2107
	p-value	0.0019	0.0760	0.0885	**0.9758**	0.0021	0.0521	0.0000
80.03-00.12	α	-0.1117	-0.0348	-0.1190	-0.0269	-0.1059	-0.0114	0.4761
	β	0.6134	0.6987	0.6770	0.8982	0.6378	0.4965	-1683.5184
	p-value	0.0004	0.0062	0.0057	**0.7732**	0.0007	0.0393	0.0000
70.03-03.12	α	-0.0506	0.0416	-0.0538	-0.0129	-0.0484	0.0086	0.6909
	β	0.7585	0.8446	0.8396	1.0267	0.7699	0.5609	-1329.2598
	p-value	0.0021	0.0776	0.0915	**0.9619**	0.0025	0.0248	0.0000

Notes: The table contains the Mincer-Zarnowitz estimates and p-value of F-statistics with the 1-step ahead forecasts of all the models with Ridge estimation. The bold p-values refer to the models with the good fit to the targeted inflation according to the MZ-test.

Table 51: Mincer-Zarnowitz estimates and p-value of F-statistics for 6-step ahead forecasts.

Period	Estimates	AR(4)	PC(10)	S.PLS	D.PLS (a)	D.PLS (b)	E.PLS (a)	E.PLS (b)
70.03-80.12	α	-0.0305	0.0492	0.0109	-0.0229	-0.0091	0.0902	0.3670
	β	0.8702	1.1198	1.0363	1.4499	0.9151	1.2666	-77.3618
	p-value	**0.3198**	**0.3037**	**0.9379**	0.0020	**0.5975**	0.0259	**0.7392**
80.03-90.12	α	-0.3524	-0.0770	-0.3363	-0.2718	-0.3457	-0.2101	-0.0295
	β	0.9500	1.0209	1.0848	1.4393	1.0210	1.0988	-48.1523
	p-value	**0.2098**	**0.8723**	**0.2041**	0.0004	**0.2024**	**0.2719**	**0.7567**
90.03-00.12	α	-0.0647	0.0701	-0.0687	0.1716	-0.0385	0.2857	-0.2753
	β	1.0767	1.0414	1.1882	1.4410	1.1168	1.0366	321.1481
	p-value	**0.5063**	**0.6072**	0.0208	0.0000	**0.1418**	0.0191	**0.1529**
70.03-90.12	α	-0.1116	0.0341	-0.0847	-0.0949	-0.1022	-0.0207	-0.0150
	β	0.9208	1.0485	1.0742	1.4251	0.9731	1.1415	7.7699
	p-value	**0.3084**	**0.6260**	**0.4783**	0.0000	**0.6518**	0.0866	**0.9952**
70.03-00.12	α	-0.1283	0.0041	-0.1111	-0.0495	-0.1161	0.0464	-0.0883
	β	0.9382	1.0445	1.0864	1.4171	0.9901	1.1077	21.8596
	p-value	**0.2008**	**0.5611**	**0.1621**	0.0000	**0.4513**	0.0858	**0.8981**
80.03-00.12	α	-0.2618	-0.0687	-0.2549	-0.1193	-0.2489	-0.0262	-0.0934
	β	0.9705	1.0214	1.0992	1.4200	1.0351	1.0609	-31.9583
	p-value	0.0876	**0.7185**	0.0358	0.0000	0.0649	**0.5228**	**0.6076**
70.03-03.12	α	-0.1422	0.0349	-0.1279	-0.0924	-0.1230	-0.0068	-0.0948
	β	0.9548	1.0472	1.0942	1.4188	0.9998	1.0979	25.8257
	p-value	**0.2062**	**0.4500**	0.0783	0.0000	**0.3831**	**0.1075**	**0.8589**

Notes: The table contains the Mincer-Zarnowitz estimates and p-value of F-statistics with the 6-step ahead forecasts of all the models with Ridge estimation. The bold p-values refer to the models with the good fit to the targeted inflation according to the MZ-test.

Table 52: Mincer-Zarnowitz estimates and p-value of F-statistics for 12-step ahead forecasts.

Period	Estimates	AR(4)	PC(10)	S.PLS	D.PLS (a)	D.PLS (b)	E.PLS (a)	E.PLS (b)
70.03-80.12	α	0.1884	0.1538	0.2486	0.1999	0.1987	0.4143	1.5944
	β	0.8566	1.1212	1.0555	1.3994	0.9084	1.2446	-160.7968
	p-value	**0.2003**	**0.1669**	**0.3864**	0.0023	**0.3626**	0.0058	0.0374
80.03-90.12	α	-0.5353	-0.1783	-0.5159	-0.3730	-0.5436	-0.2874	0.5811
	β	0.8928	0.9368	1.0126	1.3595	0.9740	1.0351	-136.8251
	p-value	0.0133	**0.3613**	0.0383	0.0004	0.0119	**0.2238**	0.0085
90.03-00.12	α	-0.1333	0.1271	-0.1337	0.1133	0.0011	0.2655	0.2142
	β	1.0482	0.9853	1.1565	1.4175	1.0924	1.0320	-120.2675
	p-value	**0.3727**	**0.3634**	0.0450	0.0001	**0.3215**	0.0254	**0.4068**
70.03-90.12	α	-0.1843	-0.0189	-0.1465	-0.0943	-0.1876	0.0517	0.9771
	β	0.8773	1.0226	1.0333	1.3905	0.9462	1.1220	-139.1602
	p-value	0.0706	**0.8930**	**0.5675**	0.0000	**0.2459**	**0.1621**	0.0040
70.03-00.12	α	-0.1907	-0.0036	-0.1629	-0.0617	-0.1528	0.0988	0.4924
	β	0.9021	1.0147	1.0515	1.3989	0.9651	1.1009	-98.7712
	p-value	0.0284	**0.9335**	**0.2156**	0.0000	**0.2109**	0.0879	0.0057
80.03-00.12	α	-0.3763	-0.0838	-0.3632	-0.1919	-0.3188	-0.0656	0.3005
	β	0.9283	0.9468	1.0436	1.3767	0.9917	1.0235	-119.5602
	p-value	0.0024	**0.3596**	0.0058	0.0000	0.0095	**0.7126**	0.0006
70.03-03.12	α	-0.2036	-0.0147	-0.1782	-0.1107	-0.1718	0.0265	0.3886
	β	0.9233	1.0202	1.0643	1.4168	0.9763	1.0994	-88.4207
	p-value	0.0303	**0.8493**	**0.1045**	0.0000	**0.1386**	**0.1111**	0.0104

Notes: The table contains the Mincer-Zarnowitz estimates and p-value of F-statistics with the 12-step ahead forecasts of all the models with Ridge estimation. The bold p-values refer to the models with the good fit to the targeted inflation according to the MZ-test.

Table 53: Mincer-Zarnowitz estimates and p-value of F-statistics for 24-step ahead forecasts.

Period	Estimates	AR(4)	PC(10)	S.PLS	D.PLS (a)	D.PLS (b)	E.PLS (a)	E.PLS (b)
70.03-80.12	α	0.3461	0.5334	0.4643	0.2587	0.2938	0.8451	1.7971
	β	0.8558	1.1146	1.0991	1.4670	1.0096	1.2788	-79.7278
	p-value	**0.2394**	0.0072	**0.1223**	0.0003	**0.4407**	0.0001	0.0206
80.03-90.12	α	-0.7782	-0.5392	-0.7269	-0.6864	-0.7862	-0.5003	1.4692
	β	0.8365	0.8598	0.9655	1.2447	1.0642	1.0065	-133.4834
	p-value	0.0016	0.0004	0.0112	0.0002	0.0008	0.0358	0.0000
90.03-00.12	α	-0.2835	-0.0387	-0.2774	-0.1253	-0.1832	0.1909	0.3067
	β	1.0496	0.9258	1.1419	1.4319	1.1189	1.0583	-78.0116
	p-value	0.0212	**0.3948**	0.0043	0.0000	0.0087	**0.1057**	**0.2089**
70.03-90.12	α	-0.3379	-0.0445	-0.2482	-0.2646	-0.3517	0.1112	1.7809
	β	0.8585	0.9502	1.0343	1.3368	1.0451	1.0928	-126.2817
	p-value	0.0232	**0.5707**	**0.3901**	0.0001	0.0891	**0.3263**	0.0000
70.03-00.12	α	-0.3453	-0.0478	-0.2834	-0.2350	-0.3207	0.1310	0.9616
	β	0.8876	0.9459	1.0569	1.3458	1.0557	1.0858	-90.0256
	p-value	0.0029	**0.3549**	0.0739	0.0000	0.0131	**0.1617**	0.0000
80.03-00.12	α	-0.5752	-0.3140	-0.5478	-0.4420	-0.5292	-0.1916	0.7367
	β	0.8869	0.8672	1.0152	1.2691	1.0703	1.0032	-104.3919
	p-value	0.0000	0.0001	0.0004	0.0000	0.0000	**0.2245**	0.0000
70.03-03.12	α	-0.3512	-0.0683	-0.2937	-0.2645	-0.3374	0.0693	0.7746
	β	0.9238	0.9656	1.0864	1.3802	1.0723	1.0993	-79.2941
	p-value	0.0035	**0.5029**	0.0273	0.0000	0.0029	**0.1254**	0.0001

Notes: The table contains the Mincer-Zarnowitz estimates and p-value of F-statistics with the 24-step ahead forecasts of all the models with Ridge estimation. The bold p-values refer to the models with the good fit to the targeted inflation according to the MZ-test.

C.3. DM and HLN tests results

C.3.1. Results for 1-step Ahead Forecasts

Table 54: Diebold-Mariano and Harvey, Leybourne and Newbold test results for the forecast period of 1970.03-1980.12

70.03-80.12	DM	p-value DM	HLN	p-value DM
AR(4) vs PC(10)	1.3213	0.9068	1.4145	0.9202
AR(4) vs S.PLS	0.3774	0.6470	0.4040	0.6566
AR(4) vs D.PLS (a)	-0.6596	0.2548	-0.7062	0.2407
AR(4) vs D.PLS (b)	0.4293	0.6662	0.4596	0.6767
AR(4) vs E.PLS (a)	-1.8125**	0.0350	-1.9404**	0.0273
AR(4) vs E.PLS (b)	-1.6090*	0.0538	-1.7226**	0.0437
PC(10) vs S.PLS	-1.0721	0.1418	-1.1478	0.1266
PC(10) vs D.PLS (a)	-1.4330*	0.0759	-1.5342*	0.0637
PC(10) vs D.PLS (b)	-0.9919	0.1606	-1.0619	0.1451
PC(10) vs E.PLS (a)	-2.1850**	0.0144	-2.3393**	0.0104
PC(10) vs E.PLS (b)	-1.9308**	0.0268	-2.0671**	0.0204
S.PLS vs D.PLS (a)	-1.0486	0.1472	-1.1226	0.1318
S.PLS vs D.PLS (b)	-0.1133	0.4549	-0.1213	0.4518
S.PLS vs E.PLS (a)	-2.0818**	0.0187	-2.2287**	0.0138
S.PLS vs E.PLS (b)	-1.8173**	0.0346	-1.9455**	0.0269
D.PLS (a) vs D.PLS (b)	0.7195	0.7641	0.7703	0.7787
D.PLS (a) vs E.PLS (a)	-2.2320**	0.0128	-2.3896***	0.0092
D.PLS (a) vs E.PLS (b)	-1.7933**	0.0365	-1.9199**	0.0285
D.PLS (b) vs E.PLS (a)	-1.8046**	0.0356	-1.9320**	0.0278
D.PLS (b) vs E.PLS (b)	-1.6158*	0.0531	-1.7299**	0.0430
E.PLS (a) vs E.PLS (b)	-0.1523	0.4395	-0.1630	0.4354

Notes: The table contains the results of Diebold-Mariano and Harvey, Leybourne and Newbold tests of 1-step ahead forecasts for the period 1970.03-1980.12 with Ridge estimation. ***$p < 0.01$; **$p < 0.05$; *$p < 0.10$.

Table 55: Diebold-Mariano and Harvey, Leybourne and Newbold test results for the forecast period of 1980.03-1990.12

80.03-90.12	DM	p-value DM	HLN	p-value DM
AR(4) vs PC(10)	1.8063	0.9646	1.9338	0.9723
AR(4) vs S.PLS	2.0545	0.9800	2.1995	0.9852
AR(4) vs D.PLS (a)	1.7016	0.9556	1.8217	0.9646
AR(4) vs D.PLS (b)	0.5702	0.7157	0.6105	0.7287
AR(4) vs E.PLS (a)	0.0958	0.5382	0.1025	0.5408
AR(4) vs E.PLS (b)	0.0240	0.5096	0.0257	0.5102
PC(10) vs S.PLS	-0.9945	0.1600	-1.0647	0.1445
PC(10) vs D.PLS (a)	0.3345	0.6310	0.3581	0.6396
PC(10) vs D.PLS (b)	-1.5348*	0.0624	-1.6431*	0.0514
PC(10) vs E.PLS (a)	-0.5591	0.2880	-0.5986	0.2753
PC(10) vs E.PLS (b)	-0.6104	0.2708	-0.6535	0.2573
S.PLS vs D.PLS (a)	1.1619	0.8774	1.2439	0.8921
S.PLS vs D.PLS (b)	-1.2906*	0.0984	-1.3817*	0.0847
S.PLS vs E.PLS (a)	-0.2522	0.4005	-0.2700	0.3938
S.PLS vs E.PLS (b)	-0.3094	0.3785	-0.3312	0.3705
D.PLS (a) vs D.PLS (b)	-1.2616	0.1035	-1.3507*	0.0896
D.PLS (a) vs E.PLS (a)	-1.1641	0.1222	-1.2463	0.1075
D.PLS (a) vs E.PLS (b)	-1.2744	0.1013	-1.3643*	0.0874
D.PLS (b) vs E.PLS (a)	-0.0244	0.4903	-0.0262	0.4896
D.PLS (b) vs E.PLS (b)	-0.0827	0.4671	-0.0885	0.4648
E.PLS (a) vs E.PLS (b)	-0.1115	0.4556	-0.1194	0.4526

Notes: The table contains the results of Diebold-Mariano and Harvey, Leybourne and Newbold tests of 1-step ahead forecasts for the period 1980.03-1990.12 with Ridge estimation. ***$p < 0.01$; **$p < 0.05$; *$p < 0.10$.

Table 56: Diebold-Mariano and Harvey, Leybourne and Newbold test results for the forecast period of 1990.03-2000.12

90.03-00.12	DM	p-value DM	HLN	p-value DM
AR(4) vs PC(10)	2.4655	0.9932	2.6395	0.9953
AR(4) vs S.PLS	1.6253	0.9480	1.7400	0.9579
AR(4) vs D.PLS (a)	-0.6643	0.2532	-0.7112	0.2391
AR(4) vs D.PLS (b)	1.8974	0.9711	2.0314	0.9779
AR(4) vs E.PLS (a)	-1.9894**	0.0233	-2.1298**	0.0175
AR(4) vs E.PLS (b)	-2.3215**	0.0101	-2.4854***	0.0071
PC(10) vs S.PLS	-1.7618**	0.0390	-1.8862**	0.0308
PC(10) vs D.PLS (a)	-2.0310**	0.0211	-2.1743**	0.0158
PC(10) vs D.PLS (b)	-1.2110	0.1130	-1.2964*	0.0986
PC(10) vs E.PLS (a)	-2.3625***	0.0091	-2.5292***	0.0063
PC(10) vs E.PLS (b)	-2.6699***	0.0038	-2.8583***	0.0025
S.PLS vs D.PLS (a)	-1.1677	0.1215	-1.2501	0.1068
S.PLS vs D.PLS (b)	1.7596	0.9608	1.8838	0.9691
S.PLS vs E.PLS (a)	-2.0711**	0.0192	-2.2173**	0.0142
S.PLS vs E.PLS (b)	-2.4082***	0.0080	-2.5782***	0.0055
D.PLS (a) vs D.PLS (b)	1.3980	0.9189	1.4967	0.9315
D.PLS (a) vs E.PLS (a)	-2.2803**	0.0113	-2.4412***	0.0080
D.PLS (a) vs E.PLS (b)	-2.6268***	0.0043	-2.8123***	0.0028
D.PLS (b) vs E.PLS (a)	-2.1276**	0.0167	-2.2778**	0.0122
D.PLS (b) vs E.PLS (b)	-2.4297***	0.0076	-2.6012***	0.0052
E.PLS (a) vs E.PLS (b)	0.1956	0.5776	0.2094	0.5828

Notes: The table contains the results of Diebold-Mariano and Harvey, Leybourne and Newbold tests of 1-step ahead forecasts for the period 1990.03-2000.12 with Ridge estimation. ***$p < 0.01$; **$p < 0.05$; *$p < 0.10$.

Table 57: Diebold-Mariano and Harvey, Leybourne and Newbold test results for the forecast period of 1970.03-1990.12

70.03-90.12	DM	p-value DM	HLN	p-value DM
AR(4) vs PC(10)	1.8354	0.9668	1.9389	0.9732
AR(4) vs S.PLS	1.1440	0.8737	1.2085	0.8860
AR(4) vs D.PLS (a)	-0.0711	0.4717	-0.0751	0.4701
AR(4) vs D.PLS (b)	0.4442	0.6716	0.4693	0.6804
AR(4) vs E.PLS (a)	-1.5195*	0.0643	-1.6053*	0.0549
AR(4) vs E.PLS (b)	-1.5089*	0.0657	-1.5940*	0.0561
PC(10) vs S.PLS	-1.1007	0.1355	-1.1628	0.1230
PC(10) vs D.PLS (a)	-0.8767	0.1903	-0.9262	0.1776
PC(10) vs D.PLS (b)	-1.3954*	0.0815	-1.4741*	0.0709
PC(10) vs E.PLS (a)	-1.8791**	0.0301	-1.9851**	0.0241
PC(10) vs E.PLS (b)	-1.8357**	0.0332	-1.9392**	0.0268
S.PLS vs D.PLS (a)	-0.4632	0.3216	-0.4894	0.3125
S.PLS vs D.PLS (b)	-0.4068	0.3421	-0.4297	0.3339
S.PLS vs E.PLS (a)	-1.7897**	0.0368	-1.8907**	0.0299
S.PLS vs E.PLS (b)	-1.7436**	0.0406	-1.8419**	0.0333
D.PLS (a) vs D.PLS (b)	0.1890	0.5750	0.1997	0.5791
D.PLS (a) vs E.PLS (a)	-2.2054**	0.0137	-2.3298**	0.0103
D.PLS (a) vs E.PLS (b)	-1.9812**	0.0238	-2.0930**	0.0187
D.PLS (b) vs E.PLS (a)	-1.4816*	0.0692	-1.5652*	0.0594
D.PLS (b) vs E.PLS (b)	-1.4891*	0.0682	-1.5731*	0.0585
E.PLS (a) vs E.PLS (b)	-0.5730	0.2833	-0.6053	0.2728

Notes: The table contains the results of Diebold-Mariano and Harvey, Leybourne and Newbold tests of 1-step ahead forecasts for the period 1970.03-1990.12 with Ridge estimation. ***$p < 0.01$; **$p < 0.05$; *$p < 0.10$.

Table 58: Diebold-Mariano and Harvey, Leybourne and Newbold test results for the forecast period of 1970.03-2000.12

70.03-00.12	DM	p-value DM	HLN	p-value DM
AR(4) vs PC(10)	1.7898	0.9633	1.8864	0.9700
AR(4) vs S.PLS	1.0086	0.8434	1.0630	0.8558
AR(4) vs D.PLS (a)	-0.1642	0.4348	-0.1730	0.4314
AR(4) vs D.PLS (b)	0.9974	0.8407	1.0512	0.8531
AR(4) vs E.PLS (a)	-1.8090**	0.0352	-1.9066**	0.0287
AR(4) vs E.PLS (b)	-1.7518**	0.0399	-1.8463**	0.0328
PC(10) vs S.PLS	-1.3342*	0.0911	-1.4062	0.0803
PC(10) vs D.PLS (a)	-1.3040*	0.0961	-1.3743*	0.0851
PC(10) vs D.PLS (b)	-1.4145*	0.0786	-1.4908*	0.0684
PC(10) vs E.PLS (a)	-2.3926***	0.0084	-2.5217***	0.0061
PC(10) vs E.PLS (b)	-2.3101**	0.0104	-2.4347***	0.0077
S.PLS vs D.PLS (a)	-0.7214	0.2353	-0.7603	0.2238
S.PLS vs D.PLS (b)	-0.2719	0.3929	-0.2865	0.3873
S.PLS vs E.PLS (a)	-2.2285**	0.0129	-2.3487***	0.0097
S.PLS vs E.PLS (b)	-2.1314**	0.0165	-2.2464**	0.0126
D.PLS (a) vs D.PLS (b)	0.4446	0.6717	0.4685	0.6802
D.PLS (a) vs E.PLS (a)	-2.6742***	0.0037	-2.8185***	0.0025
D.PLS (a) vs E.PLS (b)	-2.4382***	0.0074	-2.5697***	0.0053
D.PLS (b) vs E.PLS (a)	-1.9211**	0.0274	-2.0248**	0.0218
D.PLS (b) vs E.PLS (b)	-1.8693**	0.0308	-1.9702**	0.0248
E.PLS (a) vs E.PLS (b)	-0.4914	0.3116	-0.5180	0.3024

Notes: The table contains the results of Diebold-Mariano and Harvey, Leybourne and Newbold tests of 1-step ahead forecasts for the period 1970.03-2000.12 with Ridge estimation. ***$p < 0.01$; **$p < 0.05$; *$p < 0.10$.

Table 59: Diebold-Mariano and Harvey, Leybourne and Newbold test results for the forecast period of 1980.03-2000.12

80.03-00.12	DM	p-value DM	HLN	p-value DM
AR(4) vs PC(10)	2.6151	0.9955	2.7626	0.9969
AR(4) vs S.PLS	2.7211	0.9968	2.8746	0.9978
AR(4) vs D.PLS (a)	1.1912	0.8832	1.2584	0.8953
AR(4) vs D.PLS (b)	1.3133	0.9055	1.3874	0.9167
AR(4) vs E.PLS (a)	-0.8240	0.2050	-0.8705	0.1924
AR(4) vs E.PLS (b)	-0.7846	0.2163	-0.8289	0.2040
PC(10) vs S.PLS	-1.5989*	0.0549	-1.6890**	0.0462
PC(10) vs D.PLS (a)	-0.3157	0.3761	-0.3335	0.3695
PC(10) vs D.PLS (b)	-2.1332**	0.0165	-2.2536**	0.0125
PC(10) vs E.PLS (a)	-1.4309*	0.0762	-1.5116*	0.0660
PC(10) vs E.PLS (b)	-1.3937*	0.0817	-1.4723*	0.0711
S.PLS vs D.PLS (a)	0.4981	0.6908	0.5262	0.7004
S.PLS vs D.PLS (b)	-0.7841	0.2165	-0.8283	0.2042
S.PLS vs E.PLS (a)	-1.1612	0.1228	-1.2267	0.1105
S.PLS vs E.PLS (b)	-1.1227	0.1308	-1.1860	0.1184
D.PLS (a) vs D.PLS (b)	-0.5868	0.2787	-0.6199	0.2680
D.PLS (a) vs E.PLS (a)	-2.1322**	0.0165	-2.2525**	0.0126
D.PLS (a) vs E.PLS (b)	-2.0776**	0.0189	-2.1948**	0.0146
D.PLS (b) vs E.PLS (a)	-0.9769	0.1643	-1.0320	0.1515
D.PLS (b) vs E.PLS (b)	-0.9376	0.1742	-0.9905	0.1614
E.PLS (a) vs E.PLS (b)	0.0054	0.5022	0.0057	0.5023

Notes: The table contains the results of Diebold-Mariano and Harvey, Leybourne and Newbold tests of 1-step ahead forecasts for the period 1980.03-2000.12 with Ridge estimation. ***$p < 0.01$; **$p < 0.05$; *$p < 0.10$.

Table 60: Diebold-Mariano and Harvey, Leybourne and Newbold test results for the forecast period of 1970.03-2003.12

70.03-03.12	DM	p-value DM	HLN	p-value DM
AR(4) vs PC(10)	2.0748	0.9810	2.1771	0.9850
AR(4) vs S.PLS	1.2335	0.8913	1.2943	0.9019
AR(4) vs D.PLS (a)	-0.1329	0.4471	-0.1395	0.4446
AR(4) vs D.PLS (b)	1.3864	0.9172	1.4548	0.9267
AR(4) vs E.PLS (a)	-2.0145**	0.0220	-2.1138**	0.0176
AR(4) vs E.PLS (b)	-1.9047**	0.0284	-1.9986**	0.0232
PC(10) vs S.PLS	-1.5359*	0.0623	-1.6116*	0.0539
PC(10) vs D.PLS (a)	-1.4939*	0.0676	-1.5675*	0.0589
PC(10) vs D.PLS (b)	-1.5401*	0.0618	-1.6160*	0.0534
PC(10) vs E.PLS (a)	-2.6989***	0.0035	-2.8319***	0.0024
PC(10) vs E.PLS (b)	-2.5513***	0.0054	-2.6770***	0.0039
S.PLS vs D.PLS (a)	-0.8026	0.2111	-0.8422	0.2001
S.PLS vs D.PLS (b)	-0.1567	0.4377	-0.1644	0.4347
S.PLS vs E.PLS (a)	-2.4943***	0.0063	-2.6173***	0.0046
S.PLS vs E.PLS (b)	-2.3348***	0.0098	-2.4498***	0.0074
D.PLS (a) vs D.PLS (b)	0.5449	0.7071	0.5718	0.7161
D.PLS (a) vs E.PLS (a)	-2.9888***	0.0014	-3.1361***	0.0009
D.PLS (a) vs E.PLS (b)	-2.6628***	0.0039	-2.7940***	0.0027
D.PLS (b) vs E.PLS (a)	-2.1790**	0.0147	-2.2864**	0.0114
D.PLS (b) vs E.PLS (b)	-2.0711**	0.0192	-2.1732**	0.0152
E.PLS (a) vs E.PLS (b)	-0.3718	0.3550	-0.3901	0.3483

Notes: The table contains the results of Diebold-Mariano and Harvey, Leybourne and Newbold tests of 1-step ahead forecasts for the period 1970.03-2003.12 with Ridge estimation. ***$p < 0.01$; **$p < 0.05$; *$p < 0.10$.

C.3.2. Results for 6-step Ahead Forecasts

Table 61: Diebold-Mariano and Harvey, Leybourne and Newbold test results for the forecast period of 1970.03-1980.12

70.03-80.12	DM	p-value DM	HLN	p-value DM
AR(4) vs PC(10)	3.7666	0.9999	4.0324	1.0000
AR(4) vs S.PLS	0.6125	0.7299	0.6557	0.7434
AR(4) vs D.PLS (a)	0.6819	0.7523	0.7300	0.7667
AR(4) vs D.PLS (b)	2.7448	0.9970	2.9385	0.9981
AR(4) vs E.PLS (a)	2.4391	0.9926	2.6113	0.9950
AR(4) vs E.PLS (b)	-2.6911***	0.0036	-2.8810***	0.0023
PC(10) vs S.PLS	-3.9628	0.3703	-4.2426	0.2093
PC(10) vs D.PLS (a)	-3.3281***	0.0004	-3.5630***	0.0003
PC(10) vs D.PLS (b)	-3.7625	0.8413	-4.0280	0.4773
PC(10) vs E.PLS (a)	-1.9293**	0.0268	-2.0654**	0.0204
PC(10) vs E.PLS (b)	-3.7989	0.7267	-4.0670	0.4118
S.PLS vs D.PLS (a)	0.5697	0.7156	0.6099	0.7285
S.PLS vs D.PLS (b)	2.0789	0.9812	2.2256	0.9861
S.PLS vs E.PLS (a)	2.5266	0.9942	2.7050	0.9961
S.PLS vs E.PLS (b)	-2.8852***	0.0020	-3.0889***	0.0012
D.PLS (a) vs D.PLS (b)	0.3299	0.6293	0.3532	0.6378
D.PLS (a) vs E.PLS (a)	2.8073	0.9975	3.0054	0.9984
D.PLS (a) vs E.PLS (b)	-3.5524***	0.0002	-3.8032***	0.0001
D.PLS (b) vs E.PLS (a)	1.5160	0.9353	1.6231	0.9465
D.PLS (b) vs E.PLS (b)	-3.0374***	0.0012	-3.2518***	0.0007
E.PLS (a) vs E.PLS (b)	-3.6986***	0.0001	-3.9597	0.6169

Notes: The table contains the results of Diebold-Mariano and Harvey, Leybourne and Newbold tests of 6-step ahead forecasts for the period 1970.03-1980.12 with Ridge estimation. ***$p < 0.01$; **$p < 0.05$; *$p < 0.10$.

Table 62: Diebold-Mariano and Harvey, Leybourne and Newbold test results for the forecast period of 1980.03-1990.12

80.03-90.12	DM	p-value DM	HLN	p-value DM
AR(4) vs PC(10)	4.2660	1.0000	4.5671	1.0000
AR(4) vs S.PLS	2.1708	0.9850	2.3240	0.9892
AR(4) vs D.PLS (a)	1.8170	0.9654	1.9453	0.9730
AR(4) vs D.PLS (b)	4.0133	1.0000	4.2966	1.0000
AR(4) vs E.PLS (a)	3.8016	0.9999	4.0699	1.0000
AR(4) vs E.PLS (b)	-2.9545***	0.0016	-3.1630***	0.0010
PC(10) vs S.PLS	-3.0892***	0.0010	-3.3072***	0.0006
PC(10) vs D.PLS (a)	-2.3556***	0.0092	-2.5219***	0.0064
PC(10) vs D.PLS (b)	-2.7120***	0.0033	-2.9034***	0.0022
PC(10) vs E.PLS (a)	-1.3032*	0.0963	-1.3951*	0.0827
PC(10) vs E.PLS (b)	-3.7692	0.8189	-4.0352	0.4645
S.PLS vs D.PLS (a)	0.7645	0.7777	0.8184	0.7927
S.PLS vs D.PLS (b)	3.0594	0.9989	3.2753	0.9993
S.PLS vs E.PLS (a)	2.4212	0.9923	2.5921	0.9947
S.PLS vs E.PLS (b)	-3.5345***	0.0002	-3.7840***	0.0001
D.PLS (a) vs D.PLS (b)	1.1602	0.8770	1.2421	0.8918
D.PLS (a) vs E.PLS (a)	2.5729	0.9950	2.7545	0.9966
D.PLS (a) vs E.PLS (b)	-4.0088	0.3051	-4.2918	0.1726
D.PLS (b) vs E.PLS (a)	0.8288	0.7964	0.8873	0.8117
D.PLS (b) vs E.PLS (b)	-3.6861***	0.0001	-3.9463	0.6484
E.PLS (a) vs E.PLS (b)	-3.8810	0.5201	-4.1550	0.2941

Notes: The table contains the results of Diebold-Mariano and Harvey, Leybourne and Newbold tests of 6-step ahead forecasts for the period 1980.03-1990.12 with Ridge estimation. ***$p < 0.01$; **$p < 0.05$; *$p < 0.10$.

Table 63: Diebold-Mariano and Harvey, Leybourne and Newbold test results for the forecast period of 1990.03-2000.12

90.03-00.12	DM	p-value DM	HLN	p-value DM
AR(4) vs PC(10)	2.1080	0.9825	2.2568	0.9872
AR(4) vs S.PLS	3.4141	0.9997	3.6551	0.9998
AR(4) vs D.PLS (a)	-0.2328	0.4080	-0.2493	0.4018
AR(4) vs D.PLS (b)	3.6793	0.9999	3.9390	0.9999
AR(4) vs E.PLS (a)	0.9733	0.8348	1.0420	0.8503
AR(4) vs E.PLS (b)	-4.3159*	0.0795	-4.6205**	0.0458
PC(10) vs S.PLS	-0.7328	0.2318	-0.7846	0.2171
PC(10) vs D.PLS (a)	-3.3959***	0.0003	-3.6356***	0.0002
PC(10) vs D.PLS (b)	0.3159	0.6240	0.3382	0.6321
PC(10) vs E.PLS (a)	-2.7080***	0.0034	-2.8991***	0.0022
PC(10) vs E.PLS (b)	-4.3512*	0.0677	-4.6584**	0.0391
S.PLS vs D.PLS (a)	-2.1071**	0.0176	-2.2558**	0.0129
S.PLS vs D.PLS (b)	2.9196	0.9983	3.1257	0.9989
S.PLS vs E.PLS (a)	-0.5770	0.2820	-0.6177	0.2689
S.PLS vs E.PLS (b)	-4.7071**	0.0126	-5.0393***	0.0008
D.PLS (a) vs D.PLS (b)	3.0744	0.9990	3.2914	0.9994
D.PLS (a) vs E.PLS (a)	2.0410	0.9794	2.1851	0.9847
D.PLS (a) vs E.PLS (b)	-4.3286*	0.0750	-4.6341**	0.0433
D.PLS (b) vs E.PLS (a)	-1.6573**	0.0487	-1.7743**	0.0392
D.PLS (b) vs E.PLS (b)	-4.6781**	0.0145	-5.0083***	0.0088
E.PLS (a) vs E.PLS (b)	-4.0638	0.2414	-4.3507	0.1367

Notes: The table contains the results of Diebold-Mariano and Harvey, Leybourne and Newbold tests of 6-step ahead forecasts for the period 1990.03-2000.12 with Ridge estimation. ***$p < 0.01$; **$p < 0.05$; *$p < 0.10$.

Table 64: Diebold-Mariano and Harvey, Leybourne and Newbold test results for the forecast period of 1970.03-1990.12

70.03-90.12	DM	p-value DM	HLN	p-value DM
AR(4) vs PC(10)	4.9303	1.0000	5.2084	1.0000
AR(4) vs S.PLS	1.6975	0.9552	1.7933	0.9629
AR(4) vs D.PLS (a)	0.7441	0.7716	0.7861	0.7837
AR(4) vs D.PLS (b)	3.7298	0.9999	3.9402	1.0000
AR(4) vs E.PLS (a)	2.5977	0.9953	2.7442	0.9968
AR(4) vs E.PLS (b)	-3.9355	0.4151	-4.1575	0.2215
PC(10) vs S.PLS	-4.4362	0.0046	-4.6864**	0.0229
PC(10) vs D.PLS (a)	-3.3750***	0.0004	-3.5654***	0.0002
PC(10) vs D.PLS (b)	-4.4500**	0.0429	-4.7010**	0.0214
PC(10) vs E.PLS (a)	-2.5509***	0.0054	-2.6948***	0.0038
PC(10) vs E.PLS (b)	-4.9144***	0.0045	-5.1916***	0.0022
S.PLS vs D.PLS (a)	0.0483	0.5193	0.0511	0.5203
S.PLS vs D.PLS (b)	2.7671	0.9972	2.9232	0.9981
S.PLS vs E.PLS (a)	2.0179	0.9782	2.1317	0.9830
S.PLS vs E.PLS (b)	-4.4505***	0.0428	-4.7016**	0.0214
D.PLS (a) vs D.PLS (b)	1.2895	0.9014	1.3622	0.9128
D.PLS (a) vs E.PLS (a)	2.7821	0.9973	2.9390	0.9982
D.PLS (a) vs E.PLS (b)	-4.9618***	0.0035	-5.2417***	0.0017
D.PLS (b) vs E.PLS (a)	0.4564	0.6760	0.4821	0.6849
D.PLS (b) vs E.PLS (b)	-4.4965**	0.0345	-4.7501**	0.0172
E.PLS (a) vs E.PLS (b)	-4.7872***	0.0085	-5.0573 ***	0.0041

Notes: The table contains the results of Diebold-Mariano and Harvey, Leybourne and Newbold tests of 6-step ahead forecasts for the period 1970.03-1990.12 with Ridge estimation. ***$p < 0.01$; **$p < 0.05$; *$p < 0.10$.

Table 65: Diebold-Mariano and Harvey, Leybourne and Newbold test results for the forecast period of 1970.03-2000.12

70.03-00.12	DM	p-value DM	HLN	p-value DM
AR(4) vs PC(10)	4.3879	1.0000	4.6246	1.0000
AR(4) vs S.PLS	2.3581	0.9908	2.4853	0.9933
AR(4) vs D.PLS (a)	0.8037	0.7892	0.8470	0.8012
AR(4) vs D.PLS (b)	4.6792	1.0000	4.9316	1.0000
AR(4) vs E.PLS (a)	2.3233	0.9899	2.4486	0.9926
AR(4) vs E.PLS (b)	-5.0271***	0.0025	-5.2983***	0.0010
PC(10) vs S.PLS	-3.9213	0.4403	-4.1329	0.2219
PC(10) vs D.PLS (a)	-4.3699*	0.0622	-4.6057**	0.0283
PC(10) vs D.PLS (b)	-3.1136***	0.0009	-3.2816***	0.0006
PC(10) vs E.PLS (a)	-2.6581***	0.0039	-2.8015***	0.0027
PC(10) vs E.PLS (b)	-6.2126	0.0000	-6.5478***	0.0000
S.PLS vs D.PLS (a)	-0.1436	0.4429	-0.1514	0.4399
S.PLS vs D.PLS (b)	3.3350	0.9996	3.5149	0.9998
S.PLS vs E.PLS (a)	1.6884	0.9543	1.7795	0.9620
S.PLS vs E.PLS (b)	-5.7684***	0.0000	-6.0796***	0.0000
D.PLS (a) vs D.PLS (b)	1.6688	0.9524	1.7589	0.9603
D.PLS (a) vs E.PLS (a)	3.6418	0.9999	3.8383	0.9999
D.PLS (a) vs E.PLS (b)	-6.0988***	0.0000	-6.4279***	0.0000
D.PLS (b) vs E.PLS (a)	0.2856	0.6124	0.3010	0.6182
D.PLS (b) vs E.PLS (b)	-5.7559***	0.0000	-6.0664***	0.0000
E.PLS (a) vs E.PLS (b)	-5.9531***	0.0000	-6.2743***	0.0000

Notes: The table contains the results of Diebold-Mariano and Harvey, Leybourne and Newbold tests of 6-step ahead forecasts for the period 1970.03-2000.12 with Ridge estimation. ***$p < 0.01$; **$p < 0.05$; *$p < 0.10$.

Table 66: Diebold-Mariano and Harvey, Leybourne and Newbold test results for the forecast period of 1980.03-2000.12

80.03-00.12	DM	p-value DM	HLN	p-value DM
AR(4) vs PC(10)	4.5010	1.0000	4.7549	1.0000
AR(4) vs S.PLS	2.7952	0.9974	2.9528	0.9983
AR(4) vs D.PLS (a)	1.6776	0.9533	1.7722	0.9612
AR(4) vs D.PLS (b)	4.2291	1.0000	4.4677	1.0000
AR(4) vs E.PLS (a)	3.1927	0.9993	3.3728	0.9996
AR(4) vs E.PLS (b)	-3.5717***	0.0002	-3.7732***	0.0001
PC(10) vs S.PLS	-3.3782***	0.0004	-3.5688***	0.0002
PC(10) vs D.PLS (a)	-2.7915***	0.0026	-2.9489***	0.0017
PC(10) vs D.PLS (b)	-3.2510***	0.0006	-3.4344***	0.0003
PC(10) vs E.PLS (a)	-1.4252*	0.0771	-1.5056*	0.0667
PC(10) vs E.PLS (b)	-4.3602*	0.0650	-4.6061**	0.0328
S.PLS vs D.PLS (a)	0.3114	0.6222	0.3289	0.6288
S.PLS vs D.PLS (b)	3.0624	0.9989	3.2351	0.9993
S.PLS vs E.PLS (a)	2.0046	0.9775	2.1177	0.9824
S.PLS vs E.PLS (b)	-4.2103	0.1275	-4.4478*	0.0654
D.PLS (a) vs D.PLS (b)	1.4602	0.9279	1.5426	0.9379
D.PLS (a) vs E.PLS (a)	2.6954	0.9965	2.8474	0.9976
D.PLS (a) vs E.PLS (b)	-4.5463**	0.0273	-4.8028**	0.0135
D.PLS (b) vs E.PLS (a)	0.5108	0.6953	0.5396	0.7050
D.PLS (b) vs E.PLS (b)	-4.2528	0.1055	-4.4927*	0.0539
E.PLS (a) vs E.PLS (b)	-4.3367*	0.0723	-4.5813**	0.0366

Notes: The table contains the results of Diebold-Mariano and Harvey, Leybourne and Newbold tests of 6-step ahead forecasts for the period 1980.03-2000.12 with Ridge estimation. ***$p < 0.01$; **$p < 0.05$; *$p < 0.10$.

Table 67: Diebold-Mariano and Harvey, Leybourne and Newbold test results for the forecast period of 1970.03-2003.12

70.03-03.12	DM	p-value DM	HLN	p-value DM
AR(4) vs PC(10)	4.6717	1.0000	4.9019	1.0000
AR(4) vs S.PLS	2.8799	0.9980	3.0218	0.9987
AR(4) vs D.PLS (a)	0.7156	0.7629	0.7509	0.7734
AR(4) vs D.PLS (b)	5.1586	1.0000	5.4128	1.0000
AR(4) vs E.PLS (a)	2.4184	0.9922	2.5376	0.9942
AR(4) vs E.PLS (b)	-5.5616***	0.0001	-5.8356***	0.0001
PC(10) vs S.PLS	-3.9231	0.4372	-4.1164	0.2333
PC(10) vs D.PLS (a)	-4.7586***	0.0010	-4.9931***	0.0044
PC(10) vs D.PLS (b)	-3.0240***	0.0012	-3.1730***	0.0008
PC(10) vs E.PLS (a)	-2.8986***	0.0019	-3.0414***	0.0013
PC(10) vs E.PLS (b)	-6.7960***	0.0000	-7.1309***	0.0000
S.PLS vs D.PLS (a)	-0.5683	0.2849	-0.5963	0.2757
S.PLS vs D.PLS (b)	3.4919	0.9998	3.6640	0.9999
S.PLS vs E.PLS (a)	1.5250	0.9364	1.6001	0.9448
S.PLS vs E.PLS (b)	-6.3984***	0.0000	-6.7137***	0.0000
D.PLS (a) vs D.PLS (b)	2.1197	0.9830	2.2241	0.9867
D.PLS (a) vs E.PLS (a)	3.8908	1.0000	4.0825	1.0000
D.PLS (a) vs E.PLS (b)	-6.6685***	0.0000	-6.9971***	0.0000
D.PLS (b) vs E.PLS (a)	0.0243	0.5097	0.0255	0.5102
D.PLS (b) vs E.PLS (b)	-6.3631***	0.0000	-6.6767***	0.0000
E.PLS (a) vs E.PLS (b)	-6.4890***	0.0000	-6.8087***	0.0000

Notes: The table contains the results of Diebold-Mariano and Harvey, Leybourne and Newbold tests of 6-step ahead forecasts for the period 1970.03-2003.12 with Ridge estimation. ***$p < 0.01$; **$p < 0.05$; *$p < 0.10$.

C.3.3. Results for 12-step Ahead Forecasts

Table 68: Diebold-Mariano and Harvey, Leybourne and Newbold test results for the forecast period of 1970.03-1980.12

70.03-80.12	DM	p-value DM	HLN	p-value DM
AR(4) vs PC(10)	4.7435	1.0000	5.0783	1.0000
AR(4) vs S.PLS	1.2324	0.8911	1.3194	0.9053
AR(4) vs D.PLS (a)	1.2374	0.8920	1.3247	0.9062
AR(4) vs D.PLS (b)	2.6748	0.9963	2.8636	0.9976
AR(4) vs E.PLS (a)	1.9287	0.9731	2.0649	0.9795
AR(4) vs E.PLS (b)	-2.8477***	0.0022	-3.0487***	0.0014
PC(10) vs S.PLS	-4.8877***	0.0051	-5.2327***	0.0033
PC(10) vs D.PLS (a)	-3.6545***	0.0001	-3.9125*	0.0735
PC(10) vs D.PLS (b)	-4.9830***	0.0031	-5.3347***	0.0021
PC(10) vs E.PLS (a)	-3.3391***	0.0004	-3.5748***	0.0002
PC(10) vs E.PLS (b)	-4.2228	0.1206	-4.5209*	0.0689
S.PLS vs D.PLS (a)	0.9938	0.8398	1.0640	0.8553
S.PLS vs D.PLS (b)	1.4135	0.9213	1.5133	0.9337
S.PLS vs E.PLS (a)	1.7984	0.9639	1.9253	0.9718
S.PLS vs E.PLS (b)	-3.0857***	0.0010	-3.3035***	0.0006
D.PLS (a) vs D.PLS (b)	-0.4510	0.3260	-0.4829	0.3150
D.PLS (a) vs E.PLS (a)	1.7695	0.9616	1.8944	0.9698
D.PLS (a) vs E.PLS (b)	-3.7923	0.7463	-4.0600	0.4230
D.PLS (b) vs E.PLS (a)	1.2196	0.8887	1.3057	0.9030
D.PLS (b) vs E.PLS (b)	-3.2090***	0.0007	-3.4355***	0.0004
E.PLS (a) vs E.PLS (b)	-3.8758	0.5314	-4.1494**	0.0301

Notes: The table contains the results of Diebold-Mariano and Harvey, Leybourne and Newbold tests of 12-step ahead forecasts for the period 1970.03-1980.12 with Ridge estimation. ***$p < 0.01$; **$p < 0.05$; *$p < 0.10$.

Table 69: Diebold-Mariano and Harvey, Leybourne and Newbold test results for the forecast period of 1980.03-1990.12

80.03-90.12	DM	p-value DM	HLN	p-value DM
AR(4) vs PC(10)	3.4311	0.9997	3.6733	0.9998
AR(4) vs S.PLS	2.1518	0.9843	2.3037	0.9886
AR(4) vs D.PLS (a)	2.4230	0.9923	2.5940	0.9947
AR(4) vs D.PLS (b)	4.3939	1.0000	4.7040	1.0000
AR(4) vs E.PLS (a)	2.7196	0.9967	2.9116	0.9979
AR(4) vs E.PLS (b)	-2.4890***	0.0064	-2.6647***	0.0043
PC(10) vs S.PLS	-2.8899***	0.0019	-3.0939***	0.0012
PC(10) vs D.PLS (a)	-1.8242**	0.0341	-1.9530**	0.0265
PC(10) vs D.PLS (b)	-2.3882***	0.0085	-2.5568***	0.0059
PC(10) vs E.PLS (a)	-1.2283	0.1097	-1.3150*	0.0954
PC(10) vs E.PLS (b)	-3.4257***	0.0003	-3.6675***	0.0002
S.PLS vs D.PLS (a)	2.0225	0.9784	2.1652	0.9839
S.PLS vs D.PLS (b)	2.7775	0.9973	2.9735	0.9982
S.PLS vs E.PLS (a)	2.2810	0.9887	2.4420	0.9920
S.PLS vs E.PLS (b)	-2.9152***	0.0018	-3.1209***	0.0011
D.PLS (a) vs D.PLS (b)	-0.6714	0.2510	-0.7188	0.2368
D.PLS (a) vs E.PLS (a)	1.6644	0.9520	1.7819	0.9614
D.PLS (a) vs E.PLS (b)	-3.6219***	0.0001	-3.8776	0.8361
D.PLS (b) vs E.PLS (a)	1.2874	0.9010	1.3783	0.9148
D.PLS (b) vs E.PLS (b)	-3.0660***	0.0011	-3.2824***	0.0007
E.PLS (a) vs E.PLS (b)	-3.4063***	0.0003	-3.6467***	0.0002

Notes: The table contains the results of Diebold-Mariano and Harvey, Leybourne and Newbold tests of 12-step ahead forecasts for the period 1980.03-1990.12 with Ridge estimation. ***$p < 0.01$; **$p < 0.05$; *$p < 0.10$.

Table 70: Diebold-Mariano and Harvey, Leybourne and Newbold test results for the forecast period of 1990.03-2000.12

90.03-00.12	DM	p-value DM	HLN	p-value DM
AR(4) vs PC(10)	1.2569	0.8956	1.3456	0.9096
AR(4) vs S.PLS	2.6764	0.9963	2.8653	0.9976
AR(4) vs D.PLS (a)	-0.0255	0.4898	-0.0273	0.4891
AR(4) vs D.PLS (b)	3.1019	0.9990	3.3208	0.9994
AR(4) vs E.PLS (a)	0.8137	0.7921	0.8712	0.8074
AR(4) vs E.PLS (b)	-3.3788***	0.0004	-3.6173***	0.0002
PC(10) vs S.PLS	-0.3891	0.3486	-0.4166	0.3389
PC(10) vs D.PLS (a)	-2.1743**	0.0148	-2.3277**	0.0107
PC(10) vs D.PLS (b)	1.0904	0.8622	1.1674	0.8774
PC(10) vs E.PLS (a)	-1.2347	0.1085	-1.3218*	0.0943
PC(10) vs E.PLS (b)	-3.3849***	0.0004	-3.6238***	0.0002
S.PLS vs D.PLS (a)	-1.1652	0.1220	-1.2474	0.1073
S.PLS vs D.PLS (b)	2.4149	0.9921	2.5853	0.9946
S.PLS vs E.PLS (a)	-0.0774	0.4691	-0.0829	0.4670
S.PLS vs E.PLS (b)	-3.7645	0.8343	-4.0303	0.4733
D.PLS (a) vs D.PLS (b)	2.8240	0.9976	3.0234	0.9985
D.PLS (a) vs E.PLS (a)	1.5554	0.9401	1.6652	0.9509
D.PLS (a) vs E.PLS (b)	-3.5566***	0.0002	-3.8076***	0.0001
D.PLS (b) vs E.PLS (a)	-1.4895*	0.0682	-1.5947*	0.0566
D.PLS (b) vs E.PLS (b)	-3.8154	0.6799	-4.0847	0.3850
E.PLS (a) vs E.PLS (b)	-3.2986***	0.0005	-3.5314***	0.0003

Notes: The table contains the results of Diebold-Mariano and Harvey, Leybourne and Newbold tests of 12-step ahead forecasts for the period 1990.03-2000.12 with Ridge estimation. ***$p < 0.01$; **$p < 0.05$; *$p < 0.10$.

Table 71: Diebold-Mariano and Harvey, Leybourne and Newbold test results for the forecast period of 1970.03-1990.12

70.03-90.12	DM	p-value DM	HLN	p-value DM
AR(4) vs PC(10)	5.3187	1.0000	5.6187	1.0000
AR(4) vs S.PLS	1.9646	0.9753	2.0754	0.9805
AR(4) vs D.PLS (a)	2.3450	0.9905	2.4773	0.9931
AR(4) vs D.PLS (b)	4.7191	1.0000	4.9853	1.0000
AR(4) vs E.PLS (a)	3.0859	0.9990	3.2600	0.9994
AR(4) vs E.PLS (b)	-3.5387***	0.0002	-3.7383***	0.0001
PC(10) vs S.PLS	-4.8236***	0.0071	-5.0957***	0.0003
PC(10) vs D.PLS (a)	-3.4558***	0.0003	-3.6507***	0.0002
PC(10) vs D.PLS (b)	-4.6008**	0.0210	-4.8604**	0.0104
PC(10) vs E.PLS (a)	-3.0652***	0.0011	-3.2381***	0.0007
PC(10) vs E.PLS (b)	-5.0395***	0.0023	-5.3238***	0.0011
S.PLS vs D.PLS (a)	2.0219	0.9784	2.1359	0.9832
S.PLS vs D.PLS (b)	2.8280	0.9977	2.9876	0.9985
S.PLS vs E.PLS (a)	2.7643	0.9972	2.9203	0.9981
S.PLS vs E.PLS (b)	-4.0106	0.3028	-4.2368	0.1597
D.PLS (a) vs D.PLS (b)	-0.6179	0.2683	-0.6528	0.2573
D.PLS (a) vs E.PLS (a)	2.1601	0.9846	2.2819	0.9883
D.PLS (a) vs E.PLS (b)	-5.0518***	0.0022	-5.3368***	0.0011
D.PLS (b) vs E.PLS (a)	1.6010	0.9453	1.6913	0.9540
D.PLS (b) vs E.PLS (b)	-4.1363	0.1765	-4.3696*	0.0914
E.PLS (a) vs E.PLS (b)	-4.8475***	0.0063	-5.1209***	0.0030

Notes: The table contains the results of Diebold-Mariano and Harvey, Leybourne and Newbold tests of 12-step ahead forecasts for the period 1970.03-1990.12 with Ridge estimation. ***$p < 0.01$; **$p < 0.05$; *$p < 0.10$.

Table 72: Diebold-Mariano and Harvey, Leybourne and Newbold test results for the forecast period of 1970.03-2000.12

70.03-00.12	DM	p-value DM	HLN	p-value DM
AR(4) vs PC(10)	5.1450	1.0000	5.4225	1.0000
AR(4) vs S.PLS	2.3299	0.9901	2.4556	0.9927
AR(4) vs D.PLS (a)	2.2329	0.9872	2.3534	0.9904
AR(4) vs D.PLS (b)	5.4004	1.0000	5.6918	1.0000
AR(4) vs E.PLS (a)	2.9094	0.9982	3.0664	0.9988
AR(4) vs E.PLS (b)	-4.2880*	0.0901	-4.5194**	0.0418
PC(10) vs S.PLS	-4.7528**	0.0100	-5.0093***	0.0042
PC(10) vs D.PLS (a)	-4.1168	0.1921	-4.3389*	0.0925
PC(10) vs D.PLS (b)	-4.1504	0.1659	-4.3744***	0.0079
PC(10) vs E.PLS (a)	-3.1465***	0.0008	-3.3163***	0.0005
PC(10) vs E.PLS (b)	-5.9586***	0.0000	-6.2801***	0.0000
S.PLS vs D.PLS (a)	1.7996	0.9640	1.8967	0.9707
S.PLS vs D.PLS (b)	3.4838	0.9998	3.6718	0.9999
S.PLS vs E.PLS (a)	2.5535	0.9947	2.6912	0.9963
S.PLS vs E.PLS (b)	-4.9260***	0.0042	-5.1918***	0.0017
D.PLS (a) vs D.PLS (b)	-0.2316	0.4084	-0.2441	0.4037
D.PLS (a) vs E.PLS (a)	2.7972	0.9974	2.9481	0.9983
D.PLS (a) vs E.PLS (b)	-5.8602***	0.0000	-6.1764***	0.0000
D.PLS (b) vs E.PLS (a)	1.2845	0.9005	1.3538	0.9117
D.PLS (b) vs E.PLS (b)	-5.0749***	0.0019	-5.3487***	0.0008
E.PLS (a) vs E.PLS (b)	-5.7013***	0.0001	-6.0089***	0.0000

Notes: The table contains the results of Diebold-Mariano and Harvey, Leybourne and Newbold tests of 12-step ahead forecasts for the period 1970.03-2000.12 with Ridge estimation. ***$p < 0.01$; **$p < 0.05$; *$p < 0.10$.

Table 73: Diebold-Mariano and Harvey, Leybourne and Newbold test results for the forecast period of 1980.03-2000.12

80.03-00.12	DM	p-value DM	HLN	p-value DM
AR(4) vs PC(10)	3.5211	0.9998	3.7197	0.9999
AR(4) vs S.PLS	2.7983	0.9974	2.9561	0.9983
AR(4) vs D.PLS (a)	2.2980	0.9892	2.4276	0.9921
AR(4) vs D.PLS (b)	4.6646	1.0000	4.9278	1.0000
AR(4) vs E.PLS (a)	2.8210	0.9976	2.9802	0.9984
AR(4) vs E.PLS (b)	-3.1793***	0.0007	-3.3587***	0.0005
PC(10) vs S.PLS	-2.9040***	0.0018	-3.0678***	0.0012
PC(10) vs D.PLS (a)	-2.1296**	0.0166	-2.2498**	0.0127
PC(10) vs D.PLS (b)	-2.2218**	0.0131	-2.3471***	0.0099
PC(10) vs E.PLS (a)	-1.4677*	0.0711	-1.5504*	0.0612
PC(10) vs E.PLS (b)	-4.0045	0.3108	-4.2304	0.1640
S.PLS vs D.PLS (a)	1.7286	0.9581	1.8261	0.9655
S.PLS vs D.PLS (b)	3.1403	0.9992	3.3175	0.9995
S.PLS vs E.PLS (a)	2.2525	0.9879	2.3796	0.9910
S.PLS vs E.PLS (b)	-3.6705***	0.0001	-3.8776	0.6752
D.PLS (a) vs D.PLS (b)	-0.1421	0.4435	-0.1501	0.4404
D.PLS (a) vs E.PLS (a)	1.9690	0.9755	2.0801	0.9807
D.PLS (a) vs E.PLS (b)	-4.3007*	0.0851	-4.5433***	0.0000
D.PLS (b) vs E.PLS (a)	1.0818	0.8603	1.1428	0.8729
D.PLS (b) vs E.PLS (b)	-3.8189	0.6704	-4.0343	0.3645
E.PLS (a) vs E.PLS (b)	-4.0401	0.2671	-4.2680	0.1403

Notes: The table contains the results of Diebold-Mariano and Harvey, Leybourne and Newbold tests of 12-step ahead forecasts for the period 1980.03-2000.12 with Ridge estimation. ***$p < 0.01$; **$p < 0.05$; *$p < 0.10$.

Table 74: Diebold-Mariano and Harvey, Leybourne and Newbold test results for the forecast period of 1970.03-2003.12

70.03-03.12	DM	p-value DM	HLN	p-value DM
AR(4) vs PC(10)	5.3305	1.0000	5.5931	1.0000
AR(4) vs S.PLS	2.7292	0.9968	2.8637	0.9978
AR(4) vs D.PLS (a)	2.0296	0.9788	2.1296	0.9831
AR(4) vs D.PLS (b)	5.6492	1.0000	5.9276	1.0000
AR(4) vs E.PLS (a)	2.8748	0.9980	3.0165	0.9986
AR(4) vs E.PLS (b)	-4.8125***	0.0075	-5.0496***	0.0034
PC(10) vs S.PLS	-4.7950***	0.0081	-5.0313***	0.0037
PC(10) vs D.PLS (a)	-4.5662**	0.0248	-4.7912**	0.0117
PC(10) vs D.PLS (b)	-4.1812	0.1450	-4.3873*	0.0733
PC(10) vs E.PLS (a)	-3.4733***	0.0003	-3.6444***	0.0002
PC(10) vs E.PLS (b)	-6.4996***	0.0000	-6.8199***	0.0000
S.PLS vs D.PLS (a)	1.3931	0.9182	1.4618	0.9277
S.PLS vs D.PLS (b)	3.5333	0.9998	3.7074	0.9999
S.PLS vs E.PLS (a)	2.3685	0.9911	2.4852	0.9933
S.PLS vs E.PLS (b)	-5.5262***	0.0002	-5.7986***	0.0000
D.PLS (a) vs D.PLS (b)	0.1992	0.5789	0.2090	0.5827
D.PLS (a) vs E.PLS (a)	3.1588	0.9992	3.3145	0.9995
D.PLS (a) vs E.PLS (b)	-6.3649***	0.0000	-6.6785***	0.0000
D.PLS (b) vs E.PLS (a)	1.0561	0.8546	1.1082	0.8658
D.PLS (b) vs E.PLS (b)	-5.6361***	0.0001	-5.9138***	0.0000
E.PLS (a) vs E.PLS (b)	-6.2048***	0.0000	-6.5106***	0.0000

Notes: The table contains the results of Diebold-Mariano and Harvey, Leybourne and Newbold tests of 12-step ahead forecasts for the period 1970.03-2003.12 with Ridge estimation. ***$p < 0.01$; **$p < 0.05$; *$p < 0.10$.

C.3.4. Results for 24-step Ahead Forecasts

Table 75: Diebold-Mariano and Harvey, Leybourne and Newbold test results for the forecast period of 1970.03-1980.12

70.03-80.12	DM	p-value DM	HLN	p-value DM
AR(4) vs PC(10)	3.4562	0.9997	3.7001	0.9998
AR(4) vs S.PLS	0.4754	0.6828	0.5090	0.6942
AR(4) vs D.PLS (a)	2.1672	0.9849	2.3202	0.9891
AR(4) vs D.PLS (b)	4.5024	1.0000	4.8202	1.0000
AR(4) vs E.PLS (a)	1.7784	0.9623	1.9039	0.9704
AR(4) vs E.PLS (b)	-2.7188***	0.0033	-2.9107***	0.0021
PC(10) vs S.PLS	-3.7244	0.9789	-3.9873	0.5564
PC(10) vs D.PLS (a)	-4.3169*	0.0791	-4.6216**	0.0456
PC(10) vs D.PLS (b)	-2.6291***	0.0043	-2.8146***	0.0028
PC(10) vs E.PLS (a)	-5.4484***	0.0003	-5.8330***	0.0002
PC(10) vs E.PLS (b)	-4.7533**	0.0100	-5.0888***	0.0062
S.PLS vs D.PLS (a)	2.3150	0.9897	2.4784	0.9928
S.PLS vs D.PLS (b)	4.4372	1.0000	4.7504	1.0000
S.PLS vs E.PLS (a)	1.8780	0.9698	2.0106	0.9768
S.PLS vs E.PLS (b)	-2.9663***	0.0015	-3.1757***	0.0009
D.PLS (a) vs D.PLS (b)	-0.6309	0.2641	-0.6754	0.2503
D.PLS (a) vs E.PLS (a)	-0.6671	0.2524	-0.7142	0.2382
D.PLS (a) vs E.PLS (b)	-4.2392	0.1122	-4.5384*	0.0641
D.PLS (b) vs E.PLS (a)	0.3100	0.6217	0.3319	0.6297
D.PLS (b) vs E.PLS (b)	-3.7630*	0.0839	-4.0286	0.4763
E.PLS (a) vs E.PLS (b)	-3.8045	0.7104	-4.0731	0.4025

Notes: The table contains the results of Diebold-Mariano and Harvey, Leybourne and Newbold tests of 24-step ahead forecasts for the period 1970.03-1980.12 with Ridge estimation. ***$p < 0.01$; **$p < 0.05$; *$p < 0.10$.

Table 76: Diebold-Mariano and Harvey, Leybourne and Newbold test results for the forecast period of 1980.03-1990.12

80.03-90.12	DM	p-value DM	HLN	p-value DM
AR(4) vs PC(10)	3.1020	0.9990	3.3210	0.9994
AR(4) vs S.PLS	2.6733	0.9963	2.8620	0.9975
AR(4) vs D.PLS (a)	2.7178	0.9967	2.9096	0.9979
AR(4) vs D.PLS (b)	4.6645	1.0000	4.9938	1.0000
AR(4) vs E.PLS (a)	3.2370	0.9994	3.4655	0.9996
AR(4) vs E.PLS (b)	-2.0709**	0.0192	-2.2171**	0.0142
PC(10) vs S.PLS	-2.9312***	0.0017	-3.1381***	0.0011
PC(10) vs D.PLS (a)	-1.8116**	0.0350	-1.9395**	0.0273
PC(10) vs D.PLS (b)	-1.7063**	0.0440	-1.8268**	0.0350
PC(10) vs E.PLS (a)	-1.4212*	0.0776	-1.5215*	0.0653
PC(10) vs E.PLS (b)	-3.7587	0.8542	-4.0240**	0.0485
S.PLS vs D.PLS (a)	2.5582	0.9947	2.7388	0.9965
S.PLS vs D.PLS (b)	4.4881	1.0000	4.8049	1.0000
S.PLS vs E.PLS (a)	3.0532	0.9989	3.2688	0.9993
S.PLS vs E.PLS (b)	-2.6717***	0.0038	-2.8603***	0.0025
D.PLS (a) vs D.PLS (b)	-0.7460	0.2278	-0.7987	0.2130
D.PLS (a) vs E.PLS (a)	0.9912	0.8392	1.0611	0.8547
D.PLS (a) vs E.PLS (b)	-3.8738	0.5357	-4.1472	0.3030
D.PLS (b) vs E.PLS (a)	1.3301	0.9083	1.4240	0.9216
D.PLS (b) vs E.PLS (b)	-3.8341	0.6302	-4.1047	0.3567
E.PLS (a) vs E.PLS (b)	-3.9057	0.4698	-4.1814	0.2656

Notes: The table contains the results of Diebold-Mariano and Harvey, Leybourne and Newbold tests of 24-step ahead forecasts for the period 1980.03-1990.12 with Ridge estimation. ***$p < 0.01$; **$p < 0.05$; *$p < 0.10$.

Table 77: Diebold-Mariano and Harvey, Leybourne and Newbold test results for the forecast period of 1990.03-2000.12

90.03-00.12	DM	p-value DM	HLN	p-value DM
AR(4) vs PC(10)	1.4475	0.9261	1.5497	0.9382
AR(4) vs S.PLS	2.3157	0.9897	2.4792	0.9928
AR(4) vs D.PLS (a)	0.2472	0.5976	0.2647	0.6042
AR(4) vs D.PLS (b)	3.6220	0.9999	3.8777	0.9999
AR(4) vs E.PLS (a)	1.5885	0.9439	1.7006	0.9543
AR(4) vs E.PLS (b)	-2.8799***	0.0020	-3.0832***	0.0013
PC(10) vs S.PLS	-0.8967	0.1849	-0.9600	0.1694
PC(10) vs D.PLS (a)	-1.6986**	0.0447	-1.8185**	0.0357
PC(10) vs D.PLS (b)	1.1334	0.8715	1.2134	0.8864
PC(10) vs E.PLS (a)	-0.1858	0.4263	-0.1990	0.4213
PC(10) vs E.PLS (b)	-2.9799***	0.0014	-3.1902***	0.0009
S.PLS vs D.PLS (a)	-0.4092	0.3412	-0.4381	0.3310
S.PLS vs D.PLS (b)	3.0906	0.9990	3.3088	0.9994
S.PLS vs E.PLS (a)	0.9198	0.8212	0.9847	0.8367
S.PLS vs E.PLS (b)	-3.1679***	0.0008	-3.3915***	0.0005
D.PLS (a) vs D.PLS (b)	2.3548	0.9907	2.5210	0.9935
D.PLS (a) vs E.PLS (a)	1.8505	0.9679	1.9811	0.9752
D.PLS (a) vs E.PLS (b)	-3.3343***	0.0004	-3.5696***	0.0003
D.PLS (b) vs E.PLS (a)	-1.1987	0.1153	-1.2833	0.1009
D.PLS (b) vs E.PLS (b)	-3.3978***	0.0003	-3.6377***	0.0002
E.PLS (a) vs E.PLS (b)	-3.0927***	0.0010	-3.3110***	0.0006

Notes: The table contains the results of Diebold-Mariano and Harvey, Leybourne and Newbold tests of 24-step ahead forecasts for the period 1990.03-2000.12 with Ridge estimation. ***$p < 0.01$; **$p < 0.05$; *$p < 0.10$.

Table 78: Diebold-Mariano and Harvey, Leybourne and Newbold test results for the forecast period of 1970.03-1990.12

70.03-90.12	DM	p-value DM	HLN	p-value DM
AR(4) vs PC(10)	4.3648	1.0000	4.6111	1.0000
AR(4) vs S.PLS	1.7321	0.9584	1.8298	0.9658
AR(4) vs D.PLS (a)	3.2287	0.9994	3.4108	0.9996
AR(4) vs D.PLS (b)	5.7965	1.0000	6.1235	1.0000
AR(4) vs E.PLS (a)	3.3573	0.9996	3.5467	0.9998
AR(4) vs E.PLS (b)	-3.0020***	0.0013	-3.1713***	0.0009
PC(10) vs S.PLS	-4.3323*	0.0738	-4.5767**	0.0373
PC(10) vs D.PLS (a)	-3.2595***	0.0006	-3.4434***	0.0003
PC(10) vs D.PLS (b)	-2.9674***	0.0015	-3.1348***	0.0010
PC(10) vs E.PLS (a)	-3.5938***	0.0002	-3.7966	0.9218
PC(10) vs E.PLS (b)	-5.4373***	0.0003	-5.7441***	0.0001
S.PLS vs D.PLS (a)	3.2313	0.9994	3.4136	0.9996
S.PLS vs D.PLS (b)	5.3706	1.0000	5.6736	1.0000
S.PLS vs E.PLS (a)	3.3658	0.9996	3.5557	0.9998
S.PLS vs E.PLS (b)	-3.6247***	0.0001	-3.8292	0.8138
D.PLS (a) vs D.PLS (b)	-0.8980	0.1846	-0.9487	0.1719
D.PLS (a) vs E.PLS (a)	0.0679	0.5271	0.0717	0.5286
D.PLS (a) vs E.PLS (b)	-5.3679***	0.0004	-5.6707***	0.0000
D.PLS (b) vs E.PLS (a)	0.9889	0.8386	1.0447	0.8514
D.PLS (b) vs E.PLS (b)	-4.6981**	0.0131	-4.9631***	0.0064
E.PLS (a) vs E.PLS (b)	-5.0138***	0.0027	-5.2966***	0.0013

Notes: The table contains the results of Diebold-Mariano and Harvey, Leybourne and Newbold tests of 24-step ahead forecasts for the period 1970.03-1990.12 with Ridge estimation. ***$p < 0.01$; **$p < 0.05$; *$p < 0.10$.

Table 79: Diebold-Mariano and Harvey, Leybourne and Newbold test results for the forecast period of 1970.03-2000.12

70.03-00.12	DM	p-value DM	HLN	p-value DM
AR(4) vs PC(10)	4.3012	1.0000	4.5332	1.0000
AR(4) vs S.PLS	1.9893	0.9767	2.0966	0.9817
AR(4) vs D.PLS (a)	3.0746	0.9990	3.2405	0.9994
AR(4) vs D.PLS (b)	5.9202	1.0000	6.2396	1.0000
AR(4) vs E.PLS (a)	3.3606	0.9996	3.5419	0.9998
AR(4) vs E.PLS (b)	-3.5828***	0.0002	-3.7761*	0.0928
PC(10) vs S.PLS	-4.1909	0.1389	-4.4170*	0.0658
PC(10) vs D.PLS (a)	-3.7998	0.7241	-4.0048	0.3754
PC(10) vs D.PLS (b)	-2.6734***	0.0038	-2.8176***	0.0025
PC(10) vs E.PLS (a)	-3.4014***	0.0003	-3.5849***	0.0002
PC(10) vs E.PLS (b)	-5.8860***	0.0000	-6.2035***	0.0000
S.PLS vs D.PLS (a)	2.9677	0.9985	3.1278	0.9991
S.PLS vs D.PLS (b)	5.4146	1.0000	5.7067	1.0000
S.PLS vs E.PLS (a)	3.3096	0.9995	3.4882	0.9997
S.PLS vs E.PLS (b)	-4.3571***	0.0000	-4.5922**	0.0301
D.PLS (a) vs D.PLS (b)	-0.3929	0.3472	-0.4141	0.3395
D.PLS (a) vs E.PLS (a)	0.8511	0.8027	0.8971	0.8149
D.PLS (a) vs E.PLS (b)	-5.8411***	0.0000	-6.1563***	0.0000
D.PLS (b) vs E.PLS (a)	0.7425	0.7711	0.7825	0.7828
D.PLS (b) vs E.PLS (b)	-5.3672***	0.0004	-5.6567***	0.0002
E.PLS (a) vs E.PLS (b)	-5.7155***	0.0001	-6.0239***	0.0000

Notes: The table contains the results of Diebold-Mariano and Harvey, Leybourne and Newbold tests of 24-step ahead forecasts for the period 1970.03-2000.12 with Ridge estimation. ***$p < 0.01$; **$p < 0.05$; *$p < 0.10$.

Table 80: Diebold-Mariano and Harvey, Leybourne and Newbold test results for the forecast period of 1980.03-2000.12

80.03-00.12	DM	p-value DM	HLN	p-value DM
AR(4) vs PC(10)	3.1899	0.9993	3.3698	0.9996
AR(4) vs S.PLS	3.1459	0.9992	3.3233	0.9995
AR(4) vs D.PLS (a)	2.6130	0.9955	2.7604	0.9969
AR(4) vs D.PLS (b)	4.9879	1.0000	5.2693	1.0000
AR(4) vs E.PLS (a)	3.3910	0.9997	3.5823	0.9998
AR(4) vs E.PLS (b)	-2.7452***	0.0030	-2.9001***	0.0020
PC(10) vs S.PLS	-2.9323***	0.0017	-3.0977***	0.0011
PC(10) vs D.PLS (a)	-2.1962**	0.0140	-2.3201**	0.0106
PC(10) vs D.PLS (b)	-1.4887*	0.0683	-1.5727*	0.0585
PC(10) vs E.PLS (a)	-1.3350*	0.0909	-1.4103*	0.0798
PC(10) vs E.PLS (b)	-4.1862	0.1419	-4.4223*	0.0730
S.PLS vs D.PLS (a)	2.3338	0.9902	2.4654	0.9928
S.PLS vs D.PLS (b)	4.6558	1.0000	4.9184	1.0000
S.PLS vs E.PLS (a)	3.1189	0.9991	3.2949	0.9994
S.PLS vs E.PLS (b)	-3.3640***	0.0004	-3.5538***	0.0002
D.PLS (a) vs D.PLS (b)	-0.0944	0.4624	-0.0998	0.4603
D.PLS (a) vs E.PLS (a)	1.7212	0.9574	1.8183	0.9649
D.PLS (a) vs E.PLS (b)	-4.3884*	0.0571	-4.6359**	0.0287
D.PLS (b) vs E.PLS (a)	1.0530	0.8538	1.1124	0.8665
D.PLS (b) vs E.PLS (b)	-4.4042*	0.0531	-4.6527**	0.0266
E.PLS (a) vs E.PLS (b)	-4.4142*	0.0507	-4.6632**	0.0254

Notes: The table contains the results of Diebold-Mariano and Harvey, Leybourne and Newbold tests of 24-step ahead forecasts for the period 1980.03-2000.12 with Ridge estimation. ***$p < 0.01$; **$p < 0.05$; *$p < 0.10$.

Table 81: Diebold-Mariano and Harvey, Leybourne and Newbold test results for the forecast period of 1970.03-2003.12

70.03-03.12	DM	p-value DM	HLN	p-value DM
AR(4) vs PC(10)	4.3537	1.0000	4.5682	1.0000
AR(4) vs S.PLS	2.2423	0.9875	2.3528	0.9904
AR(4) vs D.PLS (a)	2.8195	0.9976	2.9585	0.9984
AR(4) vs D.PLS (b)	6.1011	1.0000	6.4018	1.0000
AR(4) vs E.PLS (a)	3.3546	0.9996	3.5199	0.9998
AR(4) vs E.PLS (b)	-4.2028	0.1318	-4.4100*	0.0663
PC(10) vs S.PLS	-4.1832	0.1437	-4.3893*	0.0726
PC(10) vs D.PLS (a)	-4.3950*	0.0554	-4.6116**	0.0268
PC(10) vs D.PLS (b)	-2.6103***	0.0045	-2.7390***	0.0032
PC(10) vs E.PLS (a)	-3.5285***	0.0002	-3.7023***	0.0001
PC(10) vs E.PLS (b)	-6.4657***	0.0000	-6.7844***	0.0000
S.PLS vs D.PLS (a)	2.5931	0.9952	2.7209	0.9966
S.PLS vs D.PLS (b)	5.4955	1.0000	5.7663	1.0000
S.PLS vs E.PLS (a)	3.2227	0.9994	3.3815	0.9996
S.PLS vs E.PLS (b)	-5.0656***	0.0002	-5.3152***	0.0000
D.PLS (a) vs D.PLS (b)	0.1321	0.5525	0.1386	0.5551
D.PLS (a) vs E.PLS (a)	1.6854	0.9540	1.7684	0.9611
D.PLS (a) vs E.PLS (b)	-6.3387***	0.0000	-6.6510***	0.0000
D.PLS (b) vs E.PLS (a)	0.5648	0.7139	0.5927	0.7231
D.PLS (b) vs E.PLS (b)	-6.0205***	0.0000	-6.3171***	0.0000
E.PLS (a) vs E.PLS (b)	-6.3124***	0.0000	-6.6235***	0.0000

Notes: The table contains the results of Diebold-Mariano and Harvey, Leybourne and Newbold tests of 24-step ahead forecasts for the period 1970.03-2003.12 with Ridge estimation. ***$p < 0.01$; **$p < 0.05$; *$p < 0.10$.

D. Matlab code

1. **get-index**: Calculates the index of a starting date and an ending date of the forecast period
2. **main**: Uploads the data; Calculates the actual and target inflation rates; Picks the forecast periods; Picks the estimation model (OLS or Ridge); Provides output for the Relative and Root MSE, MZ-regression and DM and HLN tests; Performs the following functions:
   (a) **DataTrans**: given the set of predictors, performs the data transformation as in Fuentes

et al. (2015).

(b) **AR-forecast**: Creates a vector of Auto-Regressive forecasts; Calculates the MSE; Calculates the MZ output; Calculates the forecast errors; Calls for the following function:

   i. AR: Performs Auto-Regressive estimation with p lags; provides the estimates of coefficients

(c) **PC-forecast**: Creates a vector of Principal Components forecasts with a maximum of 10 lags; Calculates the MSE; Calculates the MZ output; Calculates the forecast errors; Calls for the following function:

   i. PC10: Calculates the estimates of coefficients: chooses the amount of factors, the amount of lags of factors and the amount of lags of actual inflation rate by minimizing the BIC; Calls the following function:

      A. *PCFactors*: Performs the eigenvector-eigenvalue decomposition; Orders eigenvectors by dominance and calculates factors

(d) **PLSforecast**: Creates a vector of Static PLS forecasts with a maximum of 6 lags; Calculates the MSE; Calculates the MZ output; Calculates the forecast errors; Calls for the following function:

   i. PLSEst: Performs the SIMPLS algorithm; Calculates 2 components and 6 lags of those; Calculates the estimates of Static PLS coefficients by trying all the combinations of the amount of components, the amount of lags of components and the amount of lags of actual inflation rate; Fills in the BIC matrix, calculated according to the Static PLS approach; Picks the minimum BIC value and corresponding amount of components, their lags and lags of actual inflation rate and the estimates of coefficients

(e) **DPLSAforecast**: Creates a vector of the first Dynamic PLS forecasts with a maximum of 6 lags; Calculates the MSE; Calculates the MZ output; Calculates the forecast errors; Calls for the following function:

   i. DPLSAest: Performs the SIMPLS algorithm; Calculates 2 components and 6 lags of those; Calculates the estimates of the first Dynamic PLS coefficients by trying all the combinations of the amount of components, the amount of lags of components and the amount of lags of actual inflation rate; Fills in the BIC matrix, calculated according to the first Dynamic PLS approach; Picks the minimum BIC value and corresponding amount of components, their lags and lags of actual inflation rate and the estimates of coefficients

(f) **DPLSBforecast**: Creates a vector of the second Dynamic PLS forecasts with a maximum of 6 lags; Calculates the MSE; Calculates the MZ output; Calculates the forecast errors; Calls for the following function:

   i. <u>DPLSBest</u>: Performs the SIMPLS algorithm; Calculates 2 components and 6 lags of those; Calculates the estimates of the second Dynamic PLS coefficients by trying all the combinations of the amount of components, the amount of lags of components and the amount of lags of actual inflation rate; Fills in the BIC matrix, calculated according to the second Dynamic PLS approach; Picks the minimum BIC value and corresponding amount of components, their lags and lags of actual inflation rate and the estimates of coefficients

(g) **EPLSforecast**: Creates a vector of the first Extension PLS forecasts with a maximum of 6 lags; Calculates the MSE; Calculates the MZ output; Calculates the forecast errors; Calls for the following function:

   i. <u>EPLSest</u>: Performs the SIMPLS algorithm; Calculates 2 components and 6 lags of those; Calculates the estimates of the first Extension PLS coefficients by trying all the combinations of the amount of components, the amount of lags of components and the amount of lags of actual inflation rate; Fills in the BIC matrix, calculated according to the first Extension PLS approach; Picks the minimum BIC value and corresponding amount of components, their lags and lags of actual inflation rate and the estimates of coefficients

(h) **EPLSAforecast**: Creates a vector of the second Extension PLS forecasts with a maximum of 6 lags; Calculates the MSE; Calculates the MZ output; Calculates the forecast errors; Calls for the following function:

   i. <u>EPLSAest</u>: Performs the SIMPLS algorithm; Calculates 2 components and 6 lags of those; Calculates the estimates of the second Extension PLS coefficients by trying all the combinations of the amount of components, the amount of lags of components and the amount of lags of actual and target inflation rates; Fills in the BIC matrix, calculated according to the second Extension PLS approach; Picks the minimum BIC value and corresponding amount of components, their lags and lags of actual and target inflation rates and the estimates of coefficients

(i) **DMtest**: Performs the DM and HLN tests