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EARLY ESTIMATES OF EURO AREA REAL GDP GROWTH

A BOTTOM UP APPROACH FROM THE PRODUCTION SIDE

by Elke Hahn
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In 2008 all ECB publications feature a motif taken from the €10 banknote.

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Abstract

This paper derives forecasts for euro area real GDP growth based on a bottom up approach from the production side. That is, GDP is forecast via the forecasts of value added across the different branches of activity, which is quite new in the literature. Linear regression models in the form of bridge equations are applied. In these models earlier available monthly indicators are used to bridge the gap of missing GDP data. The process of selecting the best performing equations is accomplished as a pseudo real time forecasting exercise, i.e. due account is taken of the pattern of available monthly variables over the forecast cycle. Moreover, by applying a very systematic procedure the best performing equations are selected from a pool of thousands of test bridge equations. Our modelling approach, finally, includes a further novelty which should be of particular interest to practitioners. In practice, forecasts for a particular quarter of GDP generally spread over a prolonged period of several months. We explore whether over this forecast cycle, where GDP is repeatedly forecast, the same set of equations or different ones should be used. Changing the set of bridge equations over the forecast cycle could be superior to keeping the same set of equations, as the relative merit of the included monthly indictors may shift over time owing to differences in their data characteristics. Overall, the models derived in this forecast exercise clearly outperform the benchmark models. The variables selected in the best equations for different situations over the forecast cycle vary substantially and the achieved results confirm the conjecture that allowing the variables in the bridge equations to differ over the forecast cycle can lead to substantial improvements in the forecast accuracy.

Keywords: Forecasting, bridge equations, euro area, GDP, bottom up approach

JEL classification: C22, C52, C53, E27

Non-technical summary

Early information on the state of the economy is at the essence, in particular, for policy makers. Conjunctural analysis, however, is hampered by the publication delays of important official statistics such as those of national accounts. Meanwhile, the assessment of the state of the economy has to be based on more timely available monthly conjunctural indicators. In this connection, short-term forecasting models have proved a convenient way of combining and filtering the multitude of signals derived from the large number of relevant monthly indicators into an encompassing joint view on the prospects of GDP growth.

Different types of forecasting models have been applied in the literature to take up this challenge. These include, in particular, linear regression models and factor models. Apart from the type of models, a further distinguishing feature in forecasting GDP relates to the level of disaggregation at which the forecast is conducted. Most analyses focus on forecasting GDP directly at the aggregate level, but there may be benefits in forecasting GDP more indirectly via its sub-components. Such forecasts could outperform direct GDP forecasts as the included explanatory variables may be more tailor-made for predicting particular sub-components of GDP than the aggregate. Moreover, a forecast at disaggregate level contains the advantage of also providing background information on the drivers of the outcome of the GDP forecast. Baffigli, Golinelli and Parigi (2002) have taken up the disaggregated approach providing forecasts for GDP from the demand side via its expenditure components.

The current paper presents a new forecasting framework for euro area GDP based on its sub-components, where, different to Baffigli et al (2002), GDP is not forecast via the demand side but from the supply side of the economy. This can be seen as a complement to the demand side approach. But given the larger amount of specific conjunctural indicators for branches of activity compared with those for expenditure components, it could also turn out that the supply side approach outperforms the demand side forecast. The applied forecast framework is based on linear regression models. These models are used in the form of so called bridge equations. The name bridge equations reflects the idea of using earlier available monthly indicators to bridge the gap of missing GDP data. In order to mimic as close as possible the true forecast situation, these GDP forecasts are derived in two steps. In a first step, missing data points of the monthly indicators for some or all of the months of the quarter of interest are forecast with time series models. In a second step, quarterly GDP growth is predicted based on the quarterly aggregates of the already available and (otherwise) predicted monthly variables. A further specialty of our approach is the effort we put in finding the best performing bridge equations. By applying a very systematic procedure, we select the best equations among thousands of test bridge equations. Our modelling approach, finally, includes a novelty which should be of particular interest for practitioners. In practice, forecasts for a particular quarter of GDP generally spread over a prolonged period of several months. We explore whether over this forecast cycle, where GDP is repeatedly forecast, the same set of bridge equations or different ones should be used. Changing the set of bridge equations over the forecast cycle could be superior to keeping the same set of equations, as the relative merit of the different included monthly indictors may shift over time owing to differences in their data characteristics.

The results show that all models selected in this forecast exercise clearly outperform the benchmark models. The variables included in the best equations, that are specifically selected to forecast value added at particular stages over the forecast cycle, vary substantially over the cycle pointing to clear changes in the relative importance of individual variables over time. A general observation is, for instance, that survey information appears of particular value at the early stages of the forecast cycle, while hard data, such as industrial production, which are quite volatile but show a high degree of co-movement with quarterly value added growth, are very important only at the latest stages of the forecast cycle. In line with this, it clearly turns out that the forecast accuracy is higher for the equations that are more specifically selected to forecast GDP at particular stages over the forecast cycle compared to the equations that are kept unchanged over the whole cycle. This confirms the conjecture that changing the set of equations over the forecast cycle is superior to keeping the same equations over time. Comparing the forecast performance of the bridge equations across branches of activity, it turns out that the magnitude of the RMSEs varies substantially across sectors. Probably related to differences in the volatility of the data, the RMSEs are much higher in the construction and industrial sectors than in the services sectors. At the same time, however, the improvement in forecast accuracy over the cycle is smaller in services than in industry and construction, which most likely reflects the scarcity and quality of monthly hard data in services compared to industry and construction.

1. Introduction

Early information on the state of the economy is at the essence, in particular, for policy makers. Conjunctural analysis, however, is hampered by the publication delays of important official statistics such as those of national accounts. In the euro area, a flash estimate of GDP is released only one and a half months following the reference quarter and a first full release of national accounts, which also includes information on the breakdown of GDP by expenditure components and branches of activity, becomes available only two months after the end of the reference quarter. Meanwhile, the assessment of the state of the economy has to be based on more timely available monthly conjunctural indicators. In this connection, short-term forecasting models have proved a convenient way of combining and filtering the multitude of signals derived from the large number of relevant monthly indicators into an encompassing joint view on the prospects of GDP growth.[1]

Different types of forecasting models have been applied in the literature to take up this challenge. These include, in particular, linear regression models and factor models. The former class of models can probably be described as the most frequently used ones (for examples see e.g. Rünstler and Sédillot (2003) and Diron (2008)), but more recently the latter type of models has gained increasing popularity as well (see e.g. Angelini, Camba-Mendez, Giannone, Reichlin and Rünstler (2008), Giannone, Reichlin and Small (2006) and Altissimo, Cristadoro, Forni, Lippi and Veronese (2007)). Apart from the type of models, a further distinguishing feature in forecasting GDP relates to the level of disaggregation at which the forecast is conducted. Most analyses focus on forecasting GDP directly at the aggregate level, but there may be benefits in forecasting GDP more indirectly via its sub-components. Such forecasts could outperform direct GDP forecasts as the included explanatory variables may be more tailor-made for predicting particular sub-components of GDP than the aggregate. Moreover, a forecast at disaggregate level contains the advantage of also providing background information on the drivers of the outcome of the GDP forecast. Baffigli, Golinelli and Parigi (2002) have taken up the disaggregated approach. Besides providing a direct

[1] See also ECB (2008).

forecast for aggregate GDP, they also forecast GDP from the demand side via its expenditure components.

The current paper presents a new forecasting framework for euro area GDP based on linear regression models for its sub-components. Different to Baffigli et al (2002) but in line with Angelini, Banbura and Rünstler (2008), GDP is not forecast via the demand side but from the supply side of the economy. Taking the production perspective can be seen as a complement to the demand side approach. The benefits of applying both approaches include the possibility of accomplishing a more encompassing analysis of the sources of a particular outcome of GDP. It can for example be analysed whether GDP growth may be weak due to subdued growth in a specific expenditure component, or whether this may result from structural problems or shocks to a particular economic sector. Moreover, running both approaches contemporaneously not only helps to detect the stories behind the outcome of the forecast, but may likewise serve cross checking purposes. Given the known interconnections and significant overlaps between demand and supply side components of GDP (such as e.g. in the case of the euro area between private consumption on the one side and the services sector on the other side) applying both approaches helps to examine the plausibility of the results and to detect inconsistencies, in particular, in case of forecast deviations. With this information in mind, it may also be easier to draw conclusions on the relative trustworthiness of the deviating forecasts at that stage. More generally, given the larger amount of specific conjunctural indicators for branches of activity compared with those for expenditure components, it could also turn out that the supply side approach outperforms the demand side forecast.

As already indicated above, the modelling strategy followed in this paper is based on linear regression models. These models are applied in the form of so called bridge equations (see Parigi and Schlitzer (1995)). The name bridge equations reflects the idea of using earlier available monthly indicators to bridge the gap of missing GDP data. In order to mimic as close as possible the true forecast situation, these GDP forecasts are derived in two steps. In a first step, missing data points of the monthly indicators for some or all of the months of the quarter of interest are forecast with time series models. In a second step, quarterly GDP growth is predicted based on the quarterly aggregates of the already available and (otherwise) predicted monthly variables. A further specialty of our approach is the effort we put in finding the best performing bridge equations. By applying a very systematic procedure, we select the best equations among thousands of test bridge equations. Our modelling approach, finally, includes a novelty which should be of particular interest for practitioners. In practice, forecasts for a particular quarter of GDP generally spread over a prolonged period of several months. We explore whether over this forecast cycle the same set of bridge equations or different ones should be used to forecast GDP. Changing the set of bridge equations over the forecast cycle could be superior to keeping the same set of equations, as the relative merit of the different included monthly indictors may shift over time owing to differences in their data characteristics such as in the release timeliness, the data volatility and the closeness of co-movement with the target variable.

The structure of the rest of this paper is as follows: In Section 2 the methodological aspects underlying the bottom up early estimates from the production side are explained in depth. This includes the selection of data sets which form the basis of the sectoral bridge equations, the presentation of the general set up of the bridge equations and a discussion of the applied framework of forecast competition and evaluation. Section 3 presents the empirical results of this forecast competition. The best equations for all branches of activity across all of the different forecast situations over the forecast cycle are introduced and their relative forecast performance over the forecast cycle is examined. Section 4 concludes.

2. Methodology

This section explains the course of action taken in designing the euro area bottom up GDP forecast from the production side. This GDP forecast is derived as an aggregation of forecasts of its components on the production side, i.e. it is based mainly on the forecasts of value added across the different branches of activity.

Chart 1 in Appendix A provides an overview of these components along with the forecast approaches applied to each of them. The by far largest economic sector in terms of value added is the services sector with a share of around 70%. Industry (excluding construction), which covers the activities mining and quarrying, manufacturing and electricity, gas and water supply, contributes around 20%. Construction and agriculture are with respective shares of 6% and 2% much smaller. For the services sector also a finer breakdown into three sub-sectors is available. These cover trade and transportation services (21% of total value added), financial and business services (28%) and other services, which include mainly government related services such as education and health care (22%). The last component to consider is taxes less subsidies on products, which links total value added to GDP. Bridge equation forecasts can be conducted for value added in those sectors for which monthly conjunctural indicators are available. This is the case for industry (excluding construction), construction, total services and the two market services sub-sectors. For the remaining components, for which no monthly indicators are available, i.e. value added in agriculture and other services and taxes less subsidies on products, other extrapolation methods are used, which are described in more detail further below. The duplication in forecasting total services value added first directly and secondly also indirectly as a bottom up approach from its main sub-sectors results in two competing GDP forecasts of which the better one may be selected.

In brief, the main steps taken in setting up the bottom up GDP forecast include, first, the pre-selection of a set of monthly variables that prove promising in forecasting sectoral value added in the respective sectors by bridge equations. In a second step, bridge equations are formed for each of these sectors based on all possible combinations of the pre-selected sectoral indicator variables. Next, a forecast competition is conducted between the bridge equations and the best equations evaluated in terms of their root mean squared errors (RMSE) are selected for each sector. Finally, the forecast procedure for the remaining components is set up and the component forecasts are aggregated to the euro area GDP forecast. The details of this forecast framework are outlined in the sections below.

2.1. Pre-selection of the set of monthly variables

As mentioned above, the first step of developing the bridge equations entails selecting a set of the most promising variables to forecast value added in the respective sectors. As a large amount of data is available, the inclusion of all possibly useful variables in the bridge equations is infeasible, but a pre-selection of indicators has to be conducted. This is done in the framework of a correlation analysis between the respective target variables (sectoral value added growth) and all potential sectoral indicator variables, taking into account not only contemporaneous relationships, but also leading indicator properties as well as different data transformations for some indicator variables.

The initial set of data from which the best indicator variables are pre-selected differs across sectors, but it generally includes hard data on activity such as production, turnover, new orders, trade and labour market data, where available, as well as survey data from the European Commission (EC) and the Purchasing Managers' (PM) surveys, and indicator variables that may have a bearing on euro area growth such as oil prices and the exchange rate of the euro. The variables finally selected in this scanning procedure for inclusion in the test bridge equations are summarised in the Tables 1 to 5 in Appendix B for the different sectors together with the time series starting dates, the applied variable transformations and the lag structures included in the test bridge equations.[2] The tables show big differences in the choice and number of pre-selected indicator variables between the sectors, which reflects, among others, gaps in the sectoral data availability and also differences in the forecast quality of the sectoral variables.

The set of variables selected to forecast value added in industry (excluding construction) includes, in particular, several industrial production indices, survey information from both the EC and the PM surveys and trade data. The amount of variables selected for the construction sector is rather scarce, reflecting the limited data availability for this sector and the rather low correlation of some construction indicators with value added growth in that sector. The variables chosen include, in particular, construction production, some survey indicators for construction, building permits and new orders in construction. As regards total services, the selected information set consists mainly of survey data from the EC and the PM surveys for total services, services sub-sectors and also for other sectors, a choice that also highlights the lack of monthly hard data for this sector, which are only represented by some turnover, trade and labour market indicators.[3] A similar picture is evident for the two services sub-sectors trade and transportation services and financial and business services. The sets of selected variables for these two services sub-sectors differ, in particular, in the

[2] Variables rejected in the scanning procedure include for instance survey data for other than the selected sub-sectors such as the PM index for the food industry, the PM index for the textiles industry, EC industrial confidence for the computer industry and EC industrial confidence for the clothing industry. Other examples are export and import volumes for capital goods and consumer goods respectively. As a further example turnover data not selected include those of air transportation as well as of maintenance and repair of motor vehicles.

[3] Whereas for industry traditionally a large set of monthly production data is available, the only hard data that is published for euro area services activities on a monthly basis is turnover data, which, however, in most cases is not available in volume terms and does not cover all services sub-sectors.

choice of the respective sub-sector survey information and the selection of a set of retail trade and wholesale turnover data for the trade and transportation sector, which are not included in the data set for financial and business services.

2.2. Set up of the pool of bridge equations

In a second step, for each of the economic sectors test bridge equations are set up from which the best ten will be selected later in the process. The test bridge equations initially included up to four lags of the dependent variable (value added growth for the considered sector) and quarterly transformations of the pre-selected monthly indicator variables. The general set up of the equations, hence, follows the form of autoregressive distributed lag (ADL) models as depicted in equation (1), where y_t refers to sectoral value added, x_t to the quarterly transformations of the monthly indicators, L reflects the lag operator and Δ the difference operator, which is applied to most, albeit not all of the monthly variables.

$$\alpha(L)\Delta y_t = c + \sum_{i=1}^{k} \beta_i (L)\Delta x_{it} + \varepsilon_t \tag{1}$$

The lagged dependent variables turned out to be insignificant in many equations and were accordingly dropped from these equations. As regards the exogenous variables, the sectoral bridge equations were formed based on all possible combinations of the pre-selected variables subject to the following side constraint. Given the relatively short time-series of several of the indicator variables, to save degrees of freedom, an upper limit of four indicator variables in each equation was introduced. That is, bridge equations are estimated for each sector based on all possible combinations of one, two, three and four of the pre-selected sectoral indicator variables. This very systematic procedure, which aims at designing and picking the best possible forecast equations, however, entails estimating a huge number of bridge equations. To provide an example, for the industrial sector, taking also into account differences in the timing of the indicators (i.e. lagged variables), 36 indicator variables are pre-selected. Given the above procedure, this amounts to estimating and selecting the best equations for this sector from a pool of almost 70000 bridge equations.[4] Applying the same procedure to all economic sectors under scrutiny, all in all, this entails the estimation of

[4] More precisely, 36 + (36*35)/2 + (36*35*34)/(3*2) + (36*35*34*33)/(4*3*2) = 66.711 bridge equations for the industrial sector are estimated.

almost 190000 test bridge equations for all sectors.[5] This systematic procedure of estimating and picking the best models from a huge number of models of course represents data or model mining which can lead to biased results, in the sense that the selection of models might not be stable when changing the sample. In that respect, only future forecast performance may confirm the results derived with our approach.

2.3. Framework of forecast competition and evaluation

In the next step, the forecast competition is conducted in order to identify the best performers among the thousands of test bridge equations. This is carried out as a recursive forecasting exercise with the root mean squared error (RMSE) as the evaluation criterion. In this context, it is also explored whether the same set of bridge equations or different ones are best suited for forecasting GDP at different stages over the forecast cycle.

In the ideal case, the competition would be implemented as a real time out of sample forecast exercise. The terminology "real time" suggests that the forecast exercise is conducted under the same circumstances that would have been in place in the “true” forecast situation. This entails, first, that the time pattern of data used in the equations reflects the actual availability and differences in the availability of the indicators at that time. The second property of a true real time forecast exercise is that it is based on the figures of the data that were available at that time, i.e. later revisions of the data are not included. This exercise therefore necessitates the availability of large data vintages for all of the included variables. Based on these data vintages rolling "out of sample" forecasts would be conducted. That is, all models would be estimated over rolling samples of data and based on the subsequent rolling out of sample forecasts the equations with the lowest RMSE would be selected.

The data situation in the euro area limits the accomplishment of this ideal forecast exercise in two ways. First, a full set of vintage data for the monthly variables used in our test bridge equations is not available and a true real time forecast exercise therefore not feasible. Second, the time series of several monthly conjunctural indicators in the euro area are quite short

[5] Besides the 66711 equations for industry, 6195 equations for construction, 66711 equations for total services, 36456 equations for trade and transportation services and 9108 equations for financial and business services, i.e. 185181 equations in total, are estimated.

(e.g. those of the PM surveys) and a pure out of sample forecast exercise is therefore not possible.

The forecast approach applied in this paper takes account of these data problems, but aims at remaining as close as possible to the ideal forecast exercise. As regards the first problem, while the data vintages cannot be recovered, the pattern of data availability for each forecast situation is reconstructed. This kind of forecast exercise is usually called pseudo real time forecast. Missing data of the monthly variables in the quarters, for which value added is to be forecast, are forecast with autoregressive models of order six (AR(6)). Also the lags of the dependent variables which were not yet published were forecast. The extent to which the results of this pseudo real time exercise may deviate from those of a true real time forecast depends on the magnitude of the revisions of the underlying indicators. The large amount of survey data included in our data sets is generally not revised. By contrast, hard data such as euro area industrial production or construction production are often subject to relatively large revisions. This is documented in a revision analysis by Diron (2008). Comparing RMSEs of true and pseudo real time forecasts, she, however, also shows that despite the quite large revisions in hard data in the euro area, the overall assessment of reliability of the forecasts stemming from pseudo real time exercises does not seem to be biased by the use of revised data (i.e. the RMSEs of true and pseudo real time forecasts are very similar), which provides support to pseudo real time forecast analyses.

The problem related to short time series of several variables is tackled by estimating the quarterly bridge equations over the whole sample period that was respectively available. The starting dates of these estimations are determined by the respective starting dates of the included time series, while 2007Q4 was selected as the end date for all models. Based on these full-sample coefficient estimates, rolling forecasts are then conducted over the period 2003Q1 to 2007Q4, taking into account, as described above, the pattern of monthly variables that would be available in the true forecast situation. In view of the full sample coefficient estimates, the applied procedure no longer complies with the characteristics of a pure out of sample forecast, but can better be described as a mixture of an in and out of sample forecast exercise.

In practice, forecasts for GDP in a particular quarter spread over an extended period of several months in which the GDP figure for this quarter is repeatedly forecast based on a gradually extending data sample. The forecast cycle applied in our approach extends over a period of seven months and consists of one forecast per month each conducted after the important release of industrial production data (see Chart 2). The forecast round for a new quarter of GDP starts once the euro area flash GDP release for the period two quarters before has become available. This is scheduled to take place approximately one and a half months after the end of the reference quarter. If we take the period at the start of 2008 as an illustrative example, the euro area flash GDP estimate for the fourth quarter of 2007 was released on 14 February 2008 and industrial production (for December 2007) a day before such that immediately after the flash release the first GDP forecast for the second quarter of 2008 is run (see upper part of Chart 2). This forecast as well as the next one (in March) represents a "true" forecast as it refers to the next quarter (2008Q2). Three further forecasts or better "nowcasts" for GDP in 2008Q2 are conducted in the three months of 2008Q2. Finally, two further "backcasts" for GDP in 2008Q2 are carried out in the first two months of 2008Q3. At the time of the last one (in August) flash GDP for 2008Q2 has just been released, but as the value added breakdown becomes available only about two weeks later with the first full release of euro area national accounts a final value added forecast is accomplished at that time.

An important element of our forecast evaluation procedure is that besides exploring which of the thousands of test bridge equations perform best over the forecast cycle as a whole, we also examine whether the forecast performance can be improved further if different sets of equations are used to forecast value added at the different stages over the forecast cycle. This could be the case as the relative merit of the different monthly conjunctural indicators may shift over the forecast cycle owing to differences in their data characteristics such as in the release timeliness, the data volatility and the closeness of co-movement with the target variable. A similar aim was followed by Banbura and Rünstler (2007) and Camacho and Perez-Quiros (2008), who explore in a factor model context the relative weight assigned to different groups of variables over different forecast horizons.

If we take the industrial sector as an example the prior is that once we start forecasting value added for that sector, among survey and production data, the survey information should be given the highest attention, while later in the process industrial production should receive a larger weight. The reason is that surveys are released well in advance of production data such that at some point in the forecast cycle already two months of surveys are available for the quarter of interest, while the latest information on production still refers to the previous quarter. This argumentation is even more important if we assume that the missing volatile monthly production data for that quarter are potentially also more difficult to forecast than those of the smoother surveys. Similarly, given their much lower volatility the information content of one or two months of available survey data appears higher than that of a month of highly volatile production data for the quarter. Later in the forecast cycle, however, exactly the smoothness property may become an increasing relative drawback for the surveys. The smooth pattern of surveys rather captures the underlying growth momentum in value added than the volatility in the quarterly growth rates of hard data. By contrast, production and value added data show a similar degree of volatility and a high degree of co-movement such that at the latest once the full quarter of monthly production data are available their information content should clearly exceed that of the surveys.

As a result, in the following, the forecast performance of three different forecast approaches is explored and compared: In the first one, in line with standard practice followed in the literature, the best performing equations in forecasting value added over the forecast cycle as a whole are selected. As in this approach the same equations are used in each of the seven different monthly forecast situations over the forecast cycle, this case is labelled "uniform equations". In the second approach, the best performing equations for each of the seven monthly forecast situations individually are selected. As the equations in this approach may change in each of the seven monthly forecast situations over the forecast cycle, this case is called "monthly equations". The last approach can be seen as an intermediate case between the previous two. In this approach the best performing equations for the two monthly situations in the forecast cycle which are true "forecasts", for the three monthly situations which are "nowcasts" and for the two monthly situations which are "backcasts" are respectively selected. This case could for instance be relevant if the change in forecast equations at monthly frequency would lead to excessively high forecast variability from one month to the next. As the equations in this case may change basically at quarterly frequency, they are labelled "quarterly equations".

An overview of the three approaches is given in the lower part of Chart 2. It highlights that the same set of "uniform equations" (U) is used to forecast GDP during all of the seven months of the forecast cycle. At the same time, different sets of "monthly equations" are used in each of the seven monthly situations of the forecast cycle. The abbreviations M1, M2 and M3 denote in which month of the current quarter the forecast is conducted, while the shortcuts LQ, CQ and NQ indicate whether the forecast of GDP refers to the last quarter, current quarter or next quarter. Denoted in this way, M2LQ for instance indicates the backcast for GDP in the previous quarter accomplished in the second month of the current quarter. Finally, regarding the "quarterly equations", Chart 2 shows that the same set of equations is used in the first two monthly forecast situations as both are forecasts of the next quarter (NQ), a different set of equations is used in the tree different monthly situations which represent nowcasts of the current quarter (CQ) and another set of equations is used to backcast the GDP outcome of the last quarter (LQ).

To sum up, the last step of the forecast evaluation and selection procedure entails the selection and fine-tuning of the respective ten best bridge equations for each sector based on their RMSE for all of the above mentioned eleven different forecast cases, i.e for the case of "uniform equations", the seven cases of "monthly equations" and the three cases of "quarterly equations". In this connection, the significance of the lagged dependent variables in the equations is examined and the equations are appropriately adjusted. It is also explored whether it is better, in particular with a view to the robustness of the results, to use the average outcome of the respective ten best equations or the forecast of the best individual equation. Last but not least, the forecast performance of the selected bridge equations is compared across the three different competitive forecast approaches to verify, whether in fact the conjecture proves correct, that changing the set of bridge equations over the forecast cycle is superior to using the same set of equations independent of the forecast situation. In addition, the forecast performance of the bridge equation models is also compared with that of several benchmark models (AR(1) and AR(4) models, naïve and unchanged average growth forecasts). To be consistent with the set up of the bridge equations, the AR coefficients are based on full sample estimates and the lagged dependent variables in the benchmark models are forecast when not yet available.

2.4. Treatment of remaining components and aggregation to GDP forecast

The three remaining components of GDP (i.e. value added in other services and in agriculture and taxes less subsidies on products), which are not appropriate for bridge equation forecasts due to the lack of monthly indicator variables, are forecast by AR models. For all three components both AR(1) and AR(4) forecasts are applied. Concerning the agricultural sector, also a refined AR model including some dummies has been estimated. As regards value added in other services, which mainly includes government related services, besides the two AR forecasts, also a more specific forecast equation based on the expenditure component government consumption is used. The services activity other services captured at the production side of national accounts strongly overlaps with the component government consumption on the expenditure side. Experimentation showed that forecasting value added in other services based on AR-forecasts for government consumption (as this variable is published at the same time as value added in other services) and own lags of value added in other services could prove promising as well. In a final step, once all components of GDP are forecast, the individual forecasts are added up to the overall GDP forecast. As for the bridge equation models, also the forecasts for the other components and GDP are compared to a set of benchmark models. The outcome of this comprehensive exercise will be revealed in the next section.

3. Empirical Results

In this section, first, the variables that have been selected in the best bridge equations for the different situations over the forecast cycle are presented for all branches of activity. Next, the forecast performance of the bridge equations and of the models for the remaining components of GDP is discussed. Moreover, the fitted values of our different sets of equations are compared to the final outcomes of the variables and their development over the forecast cycle is shown.

3.1 Variables selected in the best equations

The Tables 6 to 10 provide a complete overview of the variables chosen in all of the ten best equations across all forecast situations for all branches of activity. Summaries in terms of selection frequency of groups of related variables in the different equations over the forecast cycle across branches of activity are shown in the Tables 11 to 15 and an overview of the most important individual variables over the forecast cycle is provided in Table 16. A general impression is that the equations that were respectively chosen in the forecast competition for all branches of activity for the seven different monthly, the three different quarterly and the uniform forecast cases show a high degree of diversity in the selected indicator variables in the different forecast situations pointing to clear changes in the importance of individual variables over the forecasting cycle. At the same time, the pattern of selected variables appears consistent across the equations for the monthly and quarterly forecast situations as well as with the uniform situation.

Starting with the industrial sector, the set of selected variables in the equations for the monthly and quarterly situations shows that at the earlier stages of the forecast cycle, when no or only little information about the forecasted quarter is available (i.e. when next quarter GDP is forecast), EC surveys and the change in the unemployment rate are important variables. As the forecast cycle moves on to forecasting the current quarter EC surveys remain important but PM surveys become important as well. As suspected and consistent with the factor model results of Banbura and Rünstler (2007) and Camacho and Perez-Quiros (2008), only in the last part of the forecast cycle, which refers to the previous quarter, production data are frequently selected in the equations. This is likely to be the case, as at that stage some months of data of this variable, which is more difficult to forecast, have already been published for the quarter of interest. While EC surveys appear less important at that stage PM data are still frequently selected and also changes in oil prices are important. The variables that have been selected most frequently in the best ten uniform equations across the forecast cycle broadly match variables that appear important also in the monthly and quarterly cases. Frequently selected variables in these equations are the PM surveys, changes in oil prices, some trade variables (which also occasionally appear in the monthly and quarterly equations), and some industrial production data.

Turning to the construction sector, the pattern of selected variables shows that PM surveys for the construction sector are important over the whole forecast cycle, while EC surveys for construction are important for the next and current quarter forecasts. Building permits become important when it comes to forecasting current and last quarter construction value added. Forecasts for the last quarter also frequently include trade data. Finally, the hard data on construction production only appear in the best equations for the very latest monthly forecast situation (M2LQ), i.e. when in the second month of the current quarter last quarter value added in construction is forecast. At that stage, one month of construction production data for the quarter of interest is available. The pattern of variables selected over the forecast cycle for construction therefore confirms the observation for industry, that at earlier stages of the forecast cycle survey information is more important and the explanatory power of hard data takes effect only at the latest stages, i.e. when it is already backed by published information. With regard to the uniform equations, the most frequently selected variables are EC and PM surveys for construction and building permits. Given their relevance only at the very latest stages of the forecast cycle, the information contained in hard data on construction production is not included in the uniform equations at all.

Concerning total services, the best equations show that at the earlier stages of the forecast cycle EC surveys and the change in the unemployment rate are particularly important. When current quarter services value added is forecast, trade, exchange rate and unemployment data and PM surveys are most frequently selected. During the last parts of the cycle, PM surveys, trade, exchange rate and turnover data appear to have the largest explanatory power. In the uniform equations for services, in particular, unemployment, trade and exchange rate data and PM surveys play an important role.

As regards the best equations chosen more specifically for trade and transportation services, PM surveys, exchange rates and turnover data appear frequently in the equations over the whole forecast cycle and are also the most selected variables in the uniform equations. Finally, as regards financial and business services, PM surveys are the most important variables throughout the whole forecast cycle, while the importance of other variables varies. The high importance of the selected PM data is also reflected in the uniform equations.

3.2 Forecast performance of bridge equations

Turning to the forecast performance of the bridge equations, Tables 17 to 27 provide an overview of the RMSEs of the forecasts from the best equations for value added in the different branches of activity and GDP across the eleven different forecast cases, i.e. the monthly, quarterly and uniform equations. In the upper part of the tables the RMSEs of the seven different sets of monthly equations are shown. For easier comparison with the results of the quarterly and uniform equations, the upper right hand side part of the tables also shows the corresponding averages of the RMSEs from the monthly equations. The middle part of the tables displays the RMSEs for the equations that have been selected to forecast the three different quarterly situations. In order to be able to better compare the performance of the quarterly equations with that of the monthly and uniform equations, the RMSEs of the quarterly equations are not only shown with regard to the respective quarterly forecasts, but also separately for each of the corresponding monthly situations and also as an average over all situations. Finally, the lower part of the tables is devoted to the RMSEs derived from the best equations which are kept unchanged over the forecast cycle. Similar to the procedure above, their performance in all of the seven monthly situations as well as on average in the different quarterly situations over the forecast cycle is shown as well. In addition to these tables, the developments of the RMSEs from the different sets of equations over the forecast cycle for all branches of activity and GDP are also illustrated in the Charts 3 and 4.

The main results can be summarised as follows: First, as should be expected, the RMSEs of the bridge equation forecasts generally decline over the forecast cycle on account of the larger amount of information that becomes successively available. This is generally the case for all equations, i.e. the monthly, quarterly and uniform ones, over the cycle.[6]

Second, the RMSEs are generally lower for the equations that are more specifically designed for the respective situations. That is, for comparable situations the "monthly equations" have generally the lowest RMSEs, followed by the "quarterly equations", while the forecast accuracy of the uniform equations is clearly worse. This applies to all forecast situations, i.e. no matter whether past, current or next quarter value added in industry is forecast. The differences in RMSEs between the monthly and quarterly equations are, however, in most cases relatively minor, whereas they are clearly larger compared with the uniform equations. As is to be expected for equations that are selected to perform well over the whole cycle, the relative performance of the uniform equations compared to the monthly and quarterly

[6] That is, the RMSEs for the monthly forecast situations decline from M2NQ -> M3NQ -> M1CQ -> M2CQ -> M3CQ -> M1LQ -> M2LQ and those for the quarterly forecast situations from NQ -> CQ -> LQ. This feature applies systematically to all forecast situations over the forecast cycle for the industrial and services sector, whereas there are a few exceptions for the construction, trade and transportation services and financial and business services sectors. This could potentially be related to the quality and co-movement of the monthly indicators chosen for these sectors or likewise the forecast accuracy of their extrapolations.

equations is best in the middle part of the cycle, i.e. when current quarter GDP is forecast. This is likely to be the case as in these equations the emphasis is placed on getting the forecast in the average forecast situation correct and consequently less emphasis is put on the more "specific needs" in terms of variables chosen at the beginning or at the end of the forecast cycle. Overall, this shows that in fact changing the equations over the forecast cycle appears to provide generally more precise forecasts and seems to be superior to keeping the same set of equations over time.

Third, a further outcome is the good forecast performance of the average forecasts from the ten best equations compared to that of the individual best equations. The average forecasts from the ten best equations are in many cases even better than those of the very best equations and usually comparable to that of the first to third best equation, with slight differences across sectors.

Fourth, importantly, in all cases, the forecasts from the bridge equations do substantially outperform those of the benchmark models (AR(1) and AR(4) models, naïve and unchanged average growth forecasts, of which the AR models generally perform best). This is the case for all equations (monthly, quarterly and uniform) and across all stages over the forecasting cycle. Moreover, as the RMSEs of the bridge equations decline significantly over time the relative improvement in forecast performance on the AR models increases further in the course of the forecast cycle.

Fifth, the magnitude of the RMSEs and the relative forecast performance differs substantially across sectors. As concerns the industrial sector, the RMSEs vary between the extreme cases of 0.22 in the monthly equations used to forecast last quarter value added based on the largest possible amount of information and 0.56 in the uniform equations used to forecast next quarter value added in the first forecast month. This compares with an average quarterly growth rate of value added in industry of 0.5% (since the mid-1990s) and RMSEs of the AR benchmark models of around 0.57 to 0.62. Next quarter RMSEs are for all bridge equations relatively high (at around 0.46 for the monthly and quarterly equations and around 0.54 for the uniform equations), current quarter RMSEs are somewhat lower (between 0.37 and 0.42), while last quarter RMSEs are more moderate (between 0.23 and 0.32). That is, in the best case the RMSE of the bridge equations is around 60% lower than that of the AR forecasts. Importantly, also the use of monthly or quarterly equations reduces the RMSEs in the last quarter case by almost 30% compared with the uniform equations.

With regard to the construction sector, the magnitude of the RMSEs is large. They range between 0.50 in the best and 0.85 in the worst case, where they are, however, still clearly lower than those of the AR models (1.04 to 1.13). They are, nevertheless, very large when compared with the average quarterly growth rate of construction value added of 0.3%. This result probably reflects on the one hand the very high volatility of euro area quarterly growth in construction value added and on the other hand the generally relatively poor quality of many indicators for construction activity in the euro area.

For the services sector the RMSEs of the direct approach are generally slightly smaller than those of the indirect approach, where total services is forecast by aggregating the forecasts of its sub-sectors. The differences between the two approaches are, however, really marginal. Independent of which approach is used, the magnitude of the RMSEs of the services sector bridge equations is much smaller than that of the previous two sectors. They vary between 0.11 and 0.18, which is slightly lower than the RMSEs of the AR benchmark models (0.18 to 0.20) and also relatively small compared with the average quarterly growth rate of services value added of 0.6%. This probably reflects the much lower volatility of services activity compared to that of industry and, in particular, construction. At the same time, it is apparent that the improvement in forecast accuracy over the forecast cycle is much lower for the services forecasts than for those of construction and, in particular, industrial activity. This is most likely related to the lower amount and quality of data for services activity and, in particular, monthly hard data for that sector.

As regards the two market services sub-sectors, the range of the RMSEs in trade and transportation services spans 0.21 to 0.29 and is again lower than that of the best AR forecasts (0.37 to 0.39). By way of comparison, average quarterly growth in this sector amounts to 0.6%. As regards financial and business services, the RMSEs of the bridge equations vary between 0.24 and 0.31. Those of the best AR models amount to between 0.30 and 0.33 and the average growth rate of this sector stands at 0.7%. Hence, in line with the results for total services, the RMSEs for the two market services sectors are smaller than those of industry and construction and also the declines in the RMSEs over the forecast cycle are much smaller, again reflecting the data situation for the services sectors.

3.3 Forecast performance of the other components and GDP

The component "other services" is forecast with AR models and a model that includes government consumption (see Table 22). The RMSE of the latter model (0.14) is slightly lower than that of the AR models (0.14 – 0.15) and is relatively low also in relation to the average quarterly growth rate of 0.4% of value added in this sector. Value added in agriculture is forecast with various AR models of which the AR(4) extended with several dummies for large outliers performs best (see Table 23). But at 1.46 also the RMSE for this model has to be assessed as very large as it exceeds the average growth rate of value added in agriculture (0.2%) by a factor of almost 10. The component taxes less subsidies on products is best forecast with the AR(4) model (see Table 24). The RMSEs of this model (0.71), is, however, quite high compared with average quarterly growth of this component of 0.6%. The forecasts of the best performing models for the other components finally enter the overall GDP forecasts. When comparing the RMSEs from the direct and the indirect (i.e. the approach based on services sub-sectors) forecasts for GDP generally only very minor differences in the forecast performance are visible. The RMSEs from the indirect forecast appear generally slightly higher but these differences are very minor and have to be evaluated against the additional information content provided by this approach. As a result, further practical experience has to reveal which of the two approaches should be given the preference.

3.4 Comparison of fitted values and outcomes

Charts 5 to 13 show the fitted values from our mixture of in and out of sample forecast procedure together with the final outcomes across all components as well as GDP over the period 2003Q1 to 2007Q4. They illustrate how the fitted values have evolved over the seven months of the forecast cycle for both the respective average forecast (left hand side) and the best equation forecast (right hand side) across the three cases of the monthly, quarterly and uniform equations.

The main insights from visual inspection of these charts can be summarised as follows: First, in many cases the fitted values tend to approach the outcomes over the forecast cycle as more information becomes available. But there are also opposite cases. Second, the charts tend to confirm the generally better performance of the monthly and quarterly equations compared with the uniform equations. Third, no clear differences are visible as regards the performance of the best equation and the average forecast. There may be, however, sometimes a somewhat higher volatility of the best equation forecasts over the cycle. This could tentatively imply that in practice the average forecasts might be preferred to the best equation ones in order to gain somewhat more robust and stable results. The same could, fourth, apply also to the choice of whether to use the monthly or quarterly equations. While the forecast accuracy of the monthly equations was somewhat better than that of the quarterly equations, their volatility appears slightly higher which could make the quarterly equations more appealing in practice. Fifth, a comparison of the charts across sectors, highlights again the differences in the magnitude of the RMSEs across sectors with larger forecast errors e.g. for agricultural and construction activity and relatively lower errors for the services sectors, related also to the differences in volatility in quarterly growth in these sectors. It also shows the stronger improvements over the forecast cycle for instance in industry compared with services, related to hard data further improving forecasts of industrial value added growth at the end of the cycle and a lack of this effect for services. Finally, all of the above mentioned general features are also visible in the two charts for GDP, of which one is based on the forecast for total services and the other on the forecasts for the main services sub-sectors. Again, reflecting the only marginal differences in the RMSEs between these two approaches, a decision on which one of the two to prefer to the other is not possible from the charts.

Overall, while the outcomes of the forecast exercise clearly show that changing the set of equations over the forecast cycle appears superior to keeping the same set of equations, future practical experience with the equations needs to solve the outstanding questions, i.e., in particular, whether to use the monthly or quarterly equations and whether to include the direct forecast for total services or the indirect one via its sub-components in the GDP forecast.

4. Conclusions

This paper develops a forecasting framework for euro area real GDP growth based on a bottom up approach from the production side. The process of selecting the best performing equations is accomplished as a pseudo real time forecasting exercise, i.e. due account is taken of the pattern of available monthly variables over the forecast cycle. Moreover, by applying a very systematic procedure the best performing equations are selected from a pool of thousands of test bridge equations. Our modelling approach, finally, includes a novelty which should be of particular interest to practitioners. We explore whether over the forecast cycle faced by practitioners, when GDP in a particular quarter has to be repeatedly forecast based on different sets of available information, the same set of equations or different ones should be used. Differences in data characteristics suggest that the relative merit of the included monthly indicators may change over time, which should find its reflection in the bridge equations.

The results show that all models selected in this forecast exercise clearly outperform the benchmark models. The variables included in the best equations, that are specifically selected to forecast value added at particular stages over the forecast cycle, vary substantially over the cycle pointing to clear changes in the relative importance of individual variables over time. A general observation is, for instance, that survey information appears of particular value at the early stages of the forecast cycle, while hard data, such as industrial production, which are quite volatile but show a high degree of co-movement with quarterly value added growth, are very important only at the latest stages of the forecast cycle. In line with this, it clearly turns out that the forecast accuracy is higher for the equations that are more specifically selected to forecast GDP at particular stages over the forecast cycle compared to the set of selected best equations that are kept unchanged over the whole cycle. This confirms the conjecture that changing the set of equations over the forecast cycle is superior to keeping the same equations over time. Comparing the forecast performance of the bridge equations across branches of activity, it turns out that the magnitude of the RMSEs varies substantially across sectors. Probably related to differences in the volatility of the data, the RMSEs are clearly higher in the construction and industrial sectors than in the services sectors. At the same time, however, the improvement in the forecast accuracy over the cycle is smaller in services than in industry and construction, which most likely reflects in particular the scarcity and quality of monthly hard data in services compared to industry and construction.

Overall, this paper provides a new ingredient to the forecast toolbox for euro area GDP by extending the bridge equation analysis to the production side of national accounts.

Moreover, by introducing the idea of changing forecast equations over the forecast cycle and thereby aligning the forecast framework closer to the relative information content of the underlying data, it also adds more generally to the forecast literature. More specifically, this paper may be seen as a first major step in developing the bottom up euro area GDP early estimates from the production side. A second not less important step ahead would entail revisiting the extrapolations of the monthly conjunctural indicators. As the quality of these extrapolations is vital for the overall performance of the early estimates for GDP, additional efforts in that direction could help to increase the forecast performance further. Of course, if the forecasts of variables such as industrial production could be improved further, also the relative importance of the variables in the equations could change and the process of selecting the best equations would need to be revisited. We leave this issue for future research.

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Appendix A: Charts

Chart 1: GDP breakdown by branches of activity and applied forecast approaches

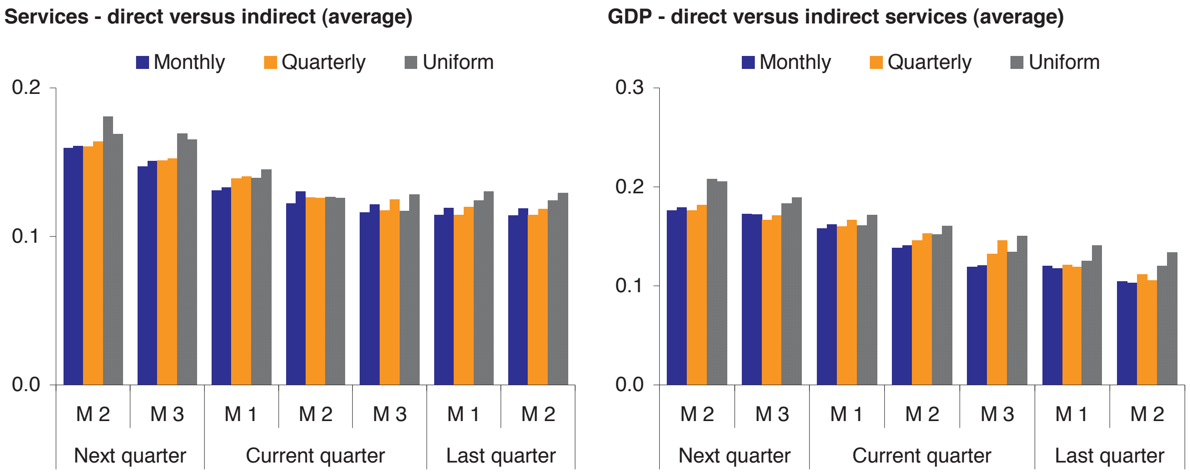
Chart 2: Example of forecast cycle for GDP in 2008Q2

2008Q1			2008Q2			2008Q3		
Jan.	Feb.	March	April	May	June	July	Aug.	Sept.
	1st fcst	2nd	3rd	4th	5th	6th	7th	
	(1) Uniform equations							
	U							
	(2) Monthly equations							
	M2NQ	M3NQ	M1CQ	M2CQ	M3CQ	M1LQ	M2LQ	
	(3) Quarterly equations							
	NQ		CQ			LQ		

Chart 3: RMSEs across branches of activity over the forecast cycle

Note: For the bridge equations, the first (second) bar of each colour shows the best (average of 10 best) equation(s). For the AR, the first (second) bar shows an AR1 (AR4).

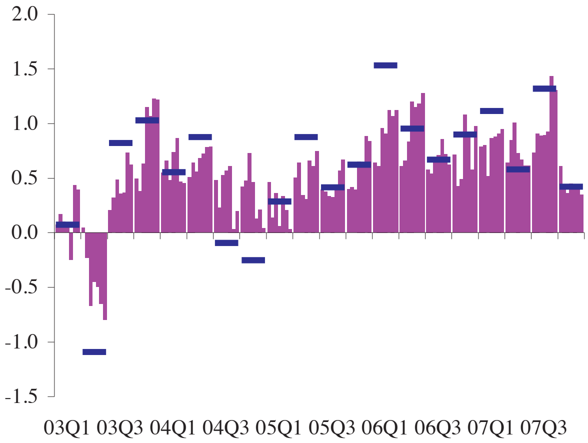
Chart 4: Comparison of RMSEs: direct versus indirect approach for services and GDP



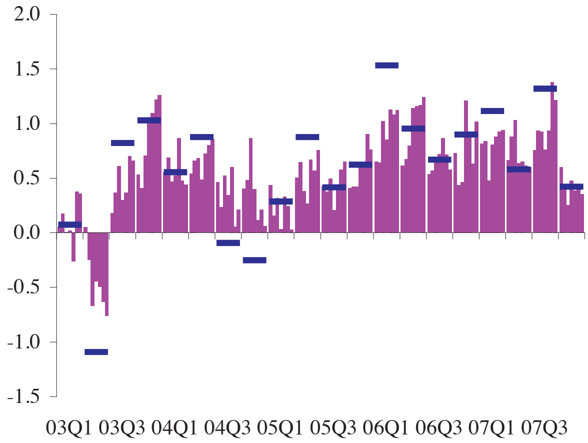
Note: First (second) bar of each colour: direct (indirect) approach

Chart 5: Fitted values and outcome – Industry (excluding construction)

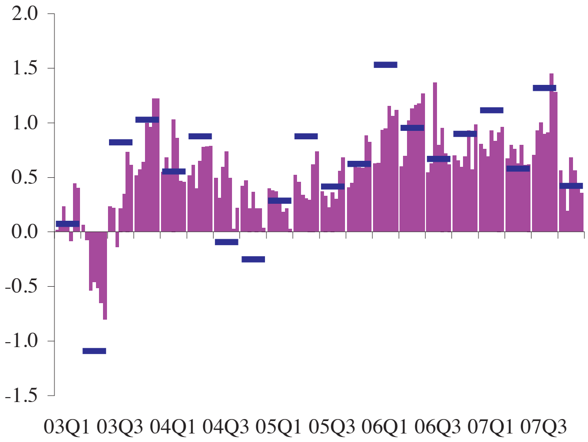
Industry excl. constr. (monthly equ., average)
(quarterly growth rates)



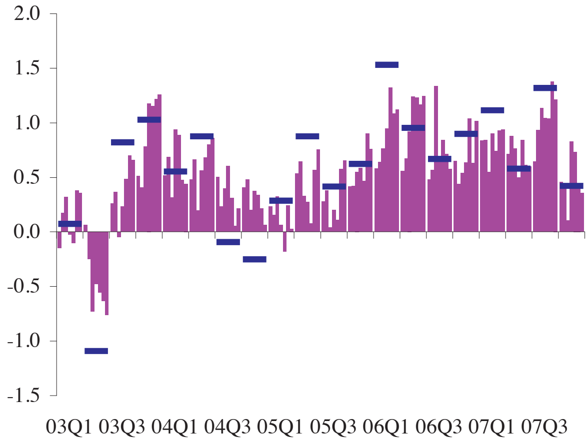
Industry excl. constr. (monthly equ., best equ.)
(quarterly growth rates)



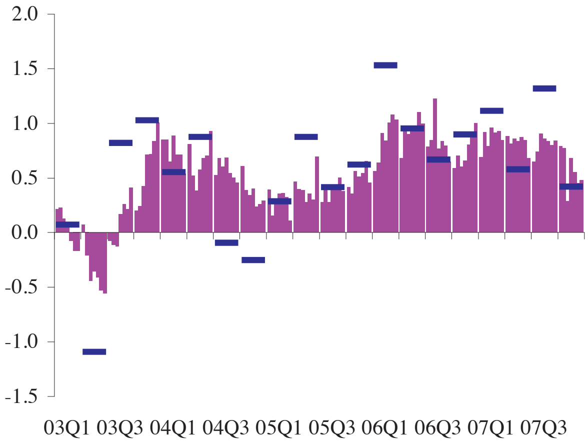
Industry excl. constr. (quarterly equ., average)
(quarterly growth rates)



Industry excl. constr. (quarterly equ., best equ.)
(quarterly growth rates)



Industry excl. constr. (uniform equation, average)
(quarterly growth rates)



Industry excl. constr. (uniform equation, best equ.)
(quarterly growth rates)

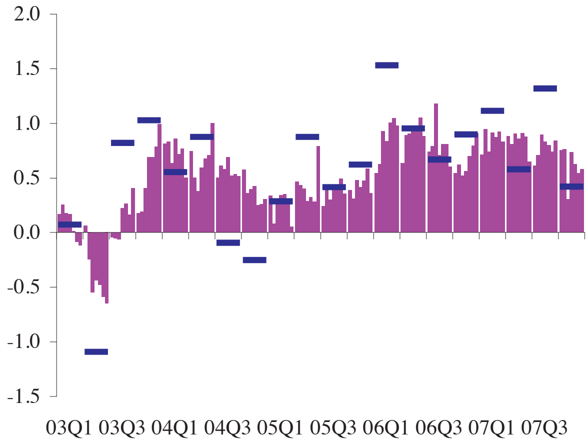
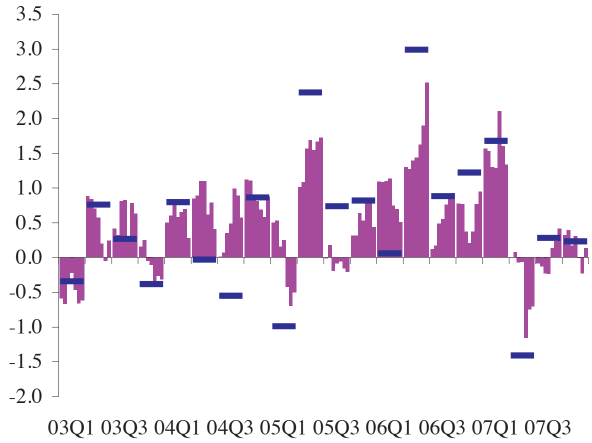
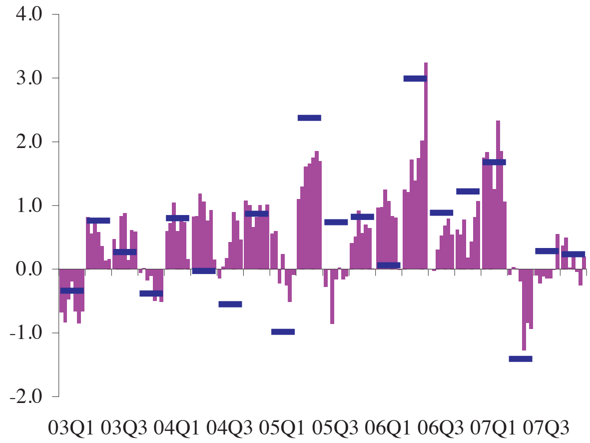


Chart 6: Fitted values and outcome - Construction

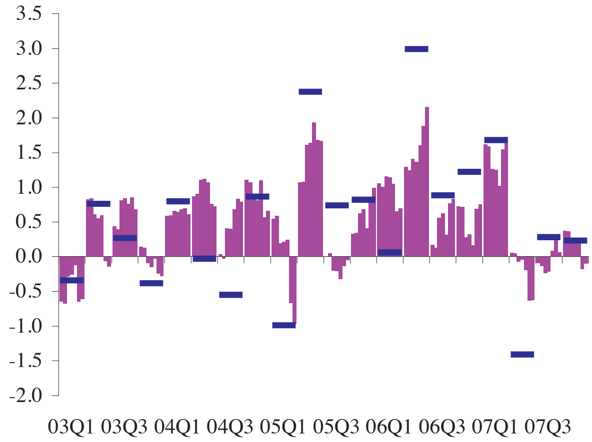
Construction (monthly equ., average)
(quarterly growth rates)



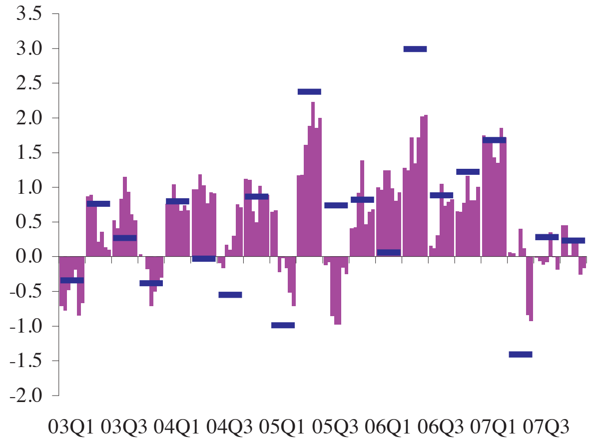
Construction (monthly equ., best equ.)
(quarterly growth rates)



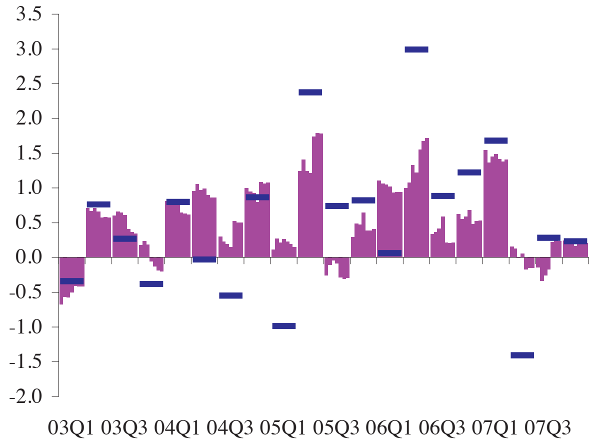
Construction (quarterly equ., average)
(quarterly growth rates)



Construction (quarterly equ., best equ.)
(quarterly growth rates)



Construction (uniform equation, average)
(quarterly growth rates)



Construction (uniform equation, best equ.)
(quarterly growth rates)

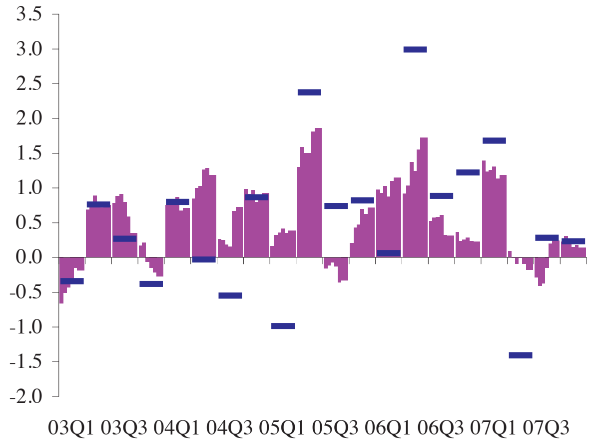
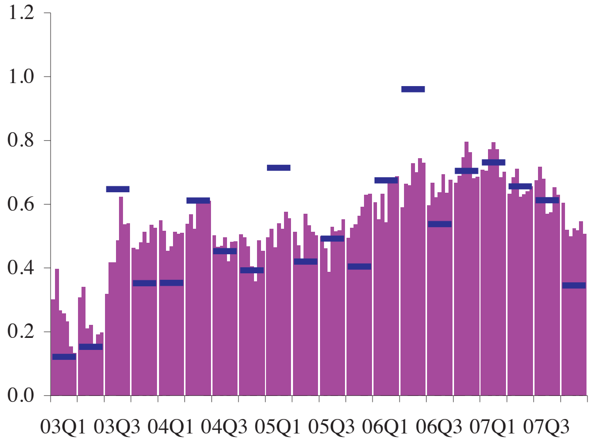
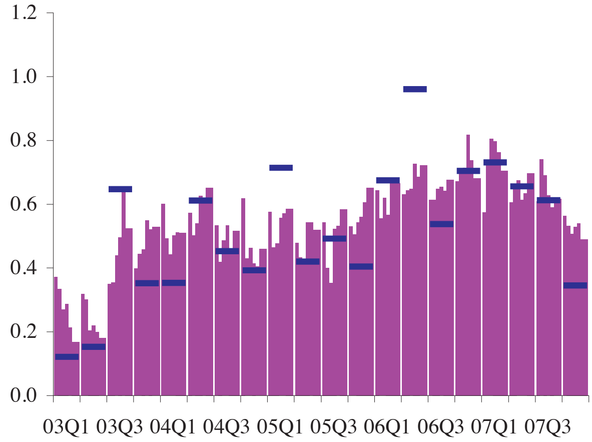


Chart 7: Fitted values and outcome – Services (direct)

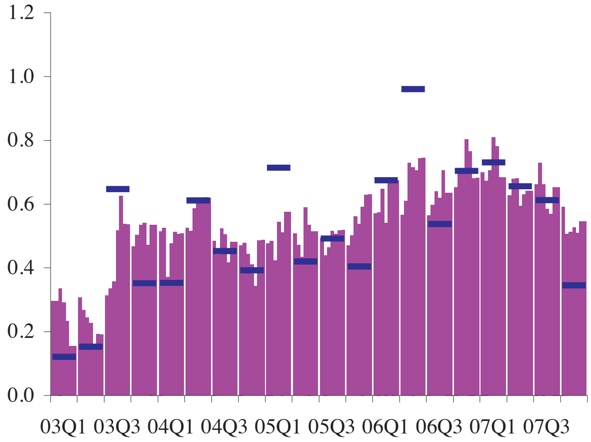
Services, direct (monthly equ., average)
(quarterly growth rates)



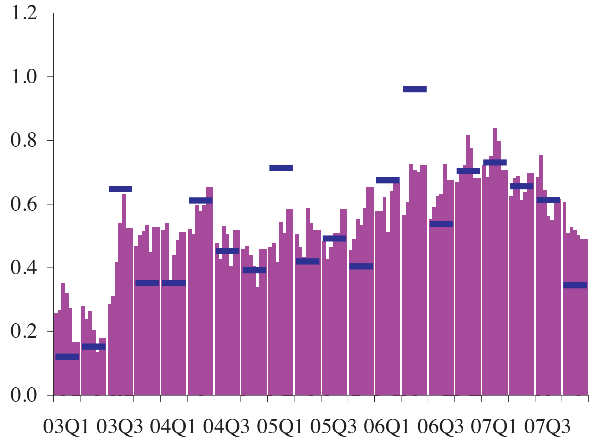
Services, direct (monthly equ., best equ.)
(quarterly growth rates)



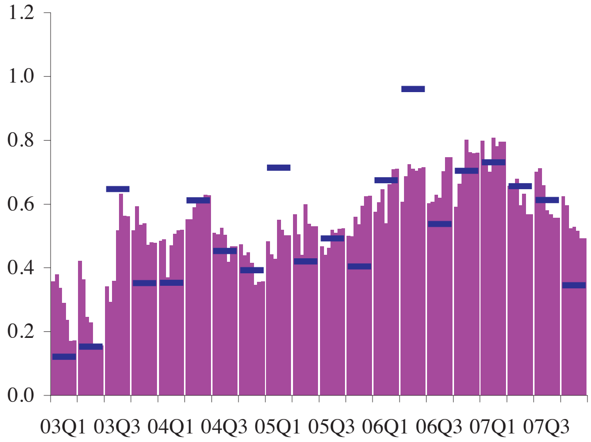
Services, direct (quarterly equ., average)
(quarterly growth rates)



Services, direct (quarterly equ., best equ.)
(quarterly growth rates)



Services, direct (uniform equation, average)
(quarterly growth rates)



Services, direct (uniform equation, best equ.)
(quarterly growth rates)

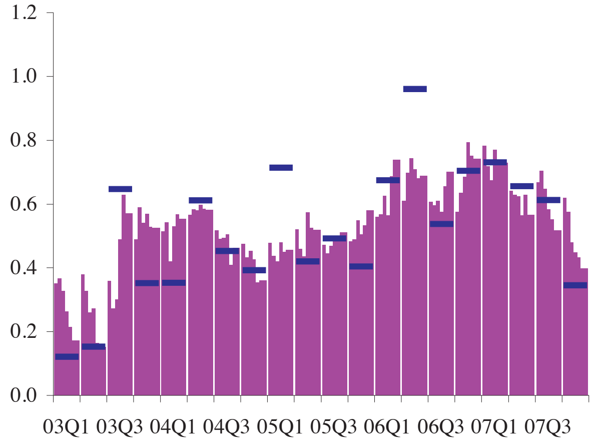
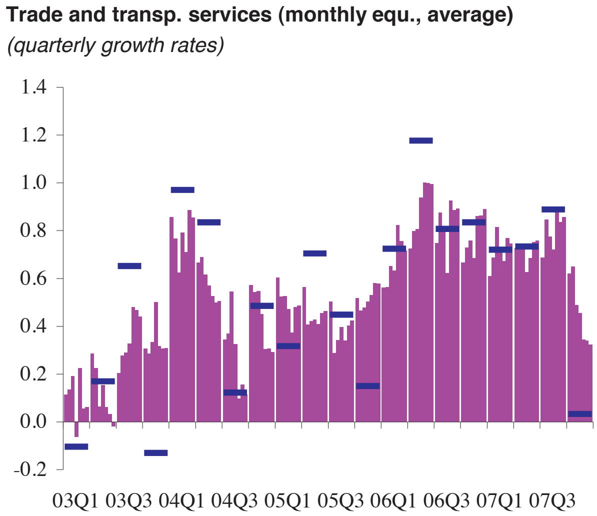
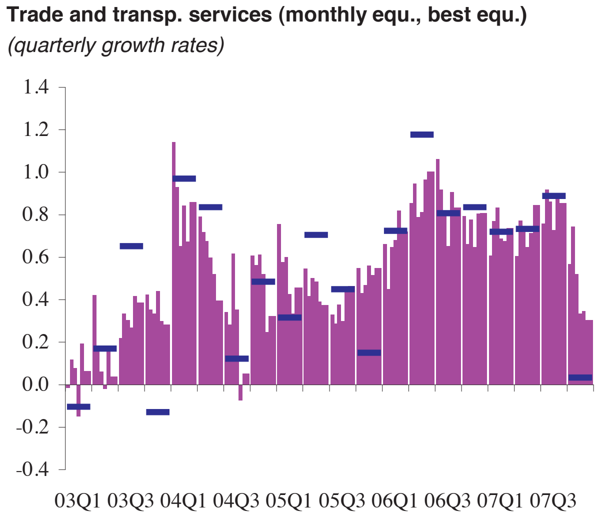
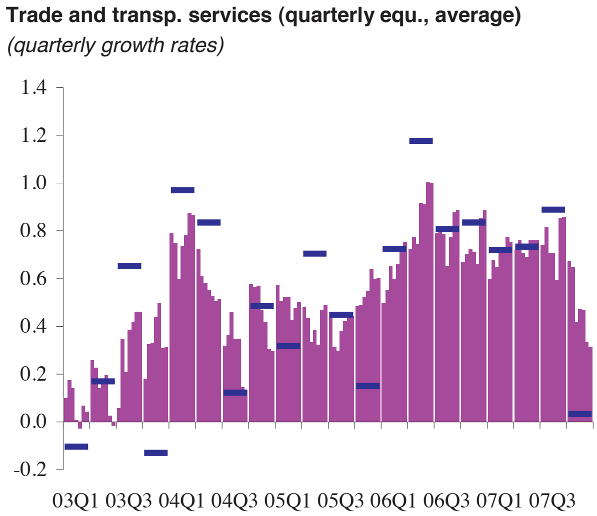
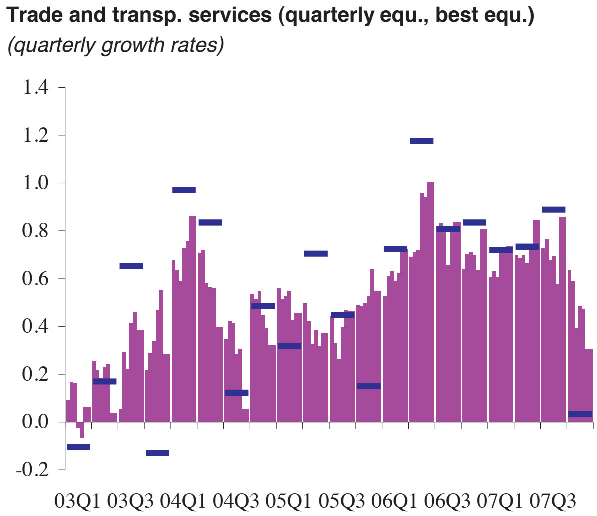


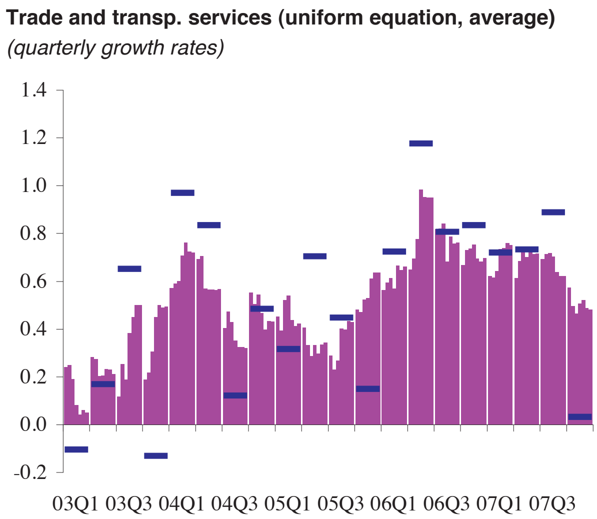
Chart 8: Fitted values and outcome – Trade and transportation services











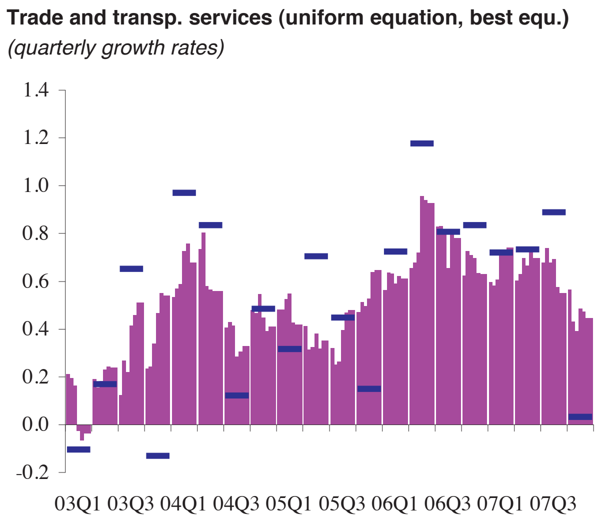
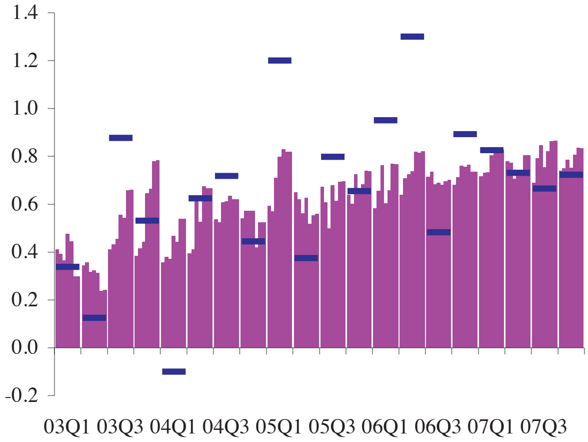
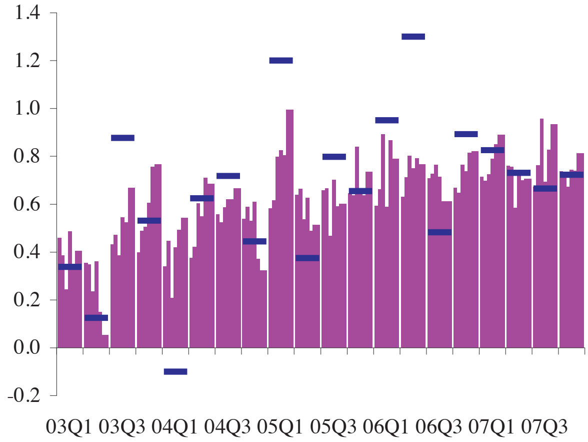


Chart 9: Fitted values and outcome – Financial and business services

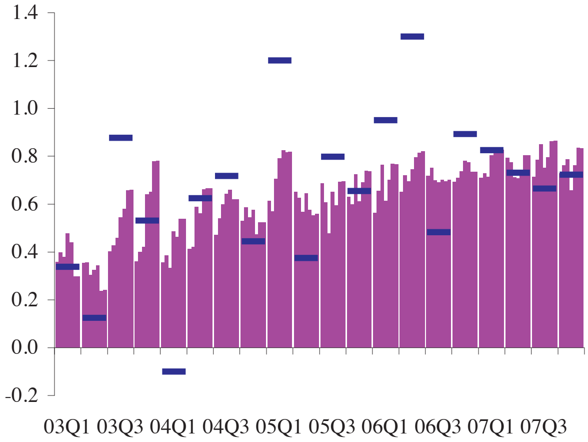
Fin. and bus. services (monthly equ., average)
(quarterly growth rates)



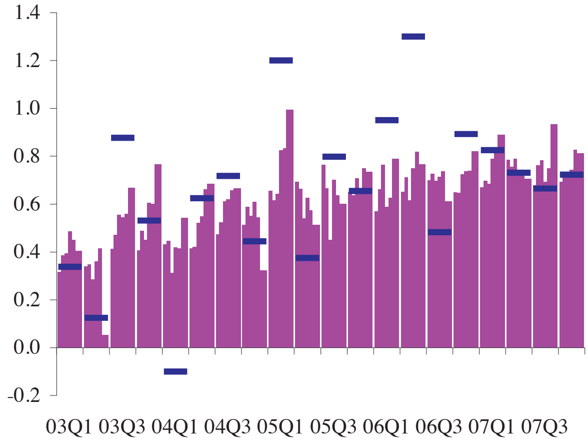
Fin. and bus. services (monthly equ., best equ.)
(quarterly growth rates)



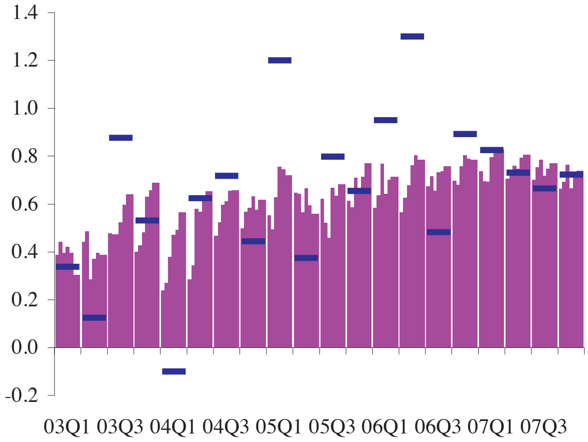
Fin. and bus. services (quarterly equ., average)
(quarterly growth rates)



Fin. and bus. services (quarterly equ., best equ.)
(quarterly growth rates)



Fin. and bus. services (uniform equation, average)
(quarterly growth rates)



Fin. and bus. services (uniform equation, best equ.)
(quarterly growth rates)

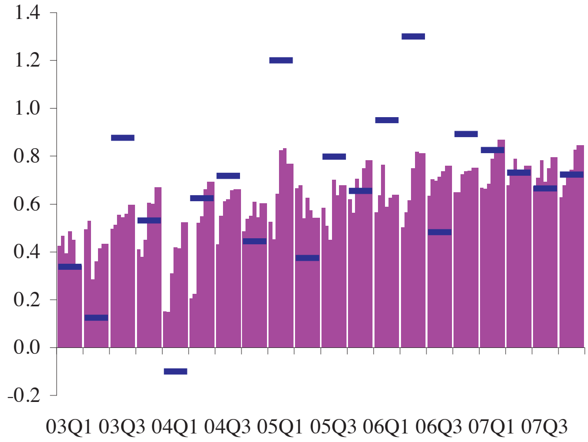
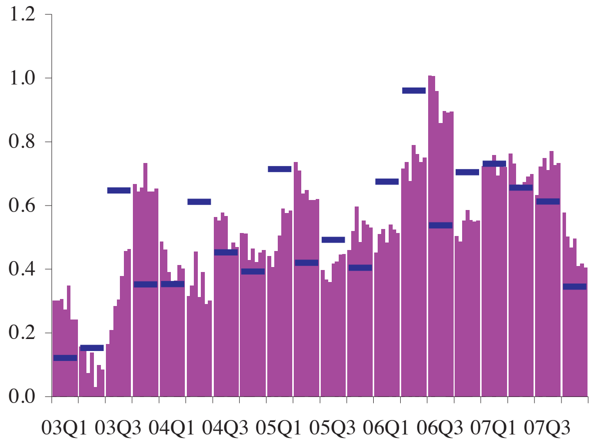
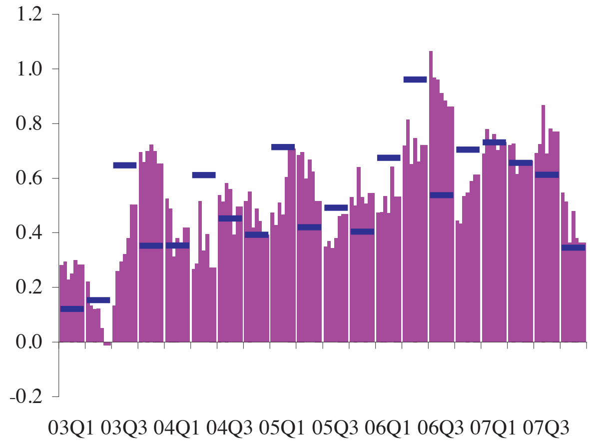


Chart 10: Fitted values and outcome – Services (indirect)

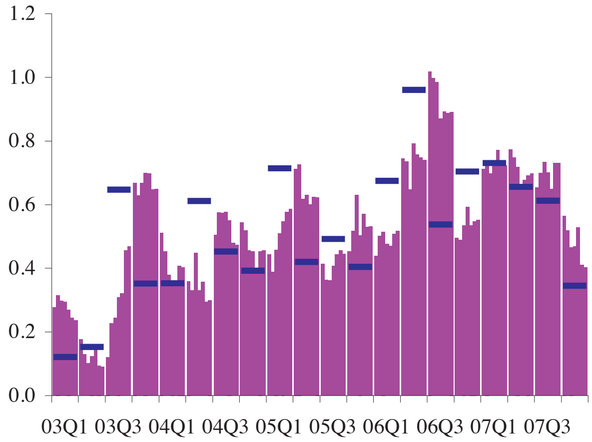
Services (indirect) (monthly equ., average)
(quarterly growth rates)



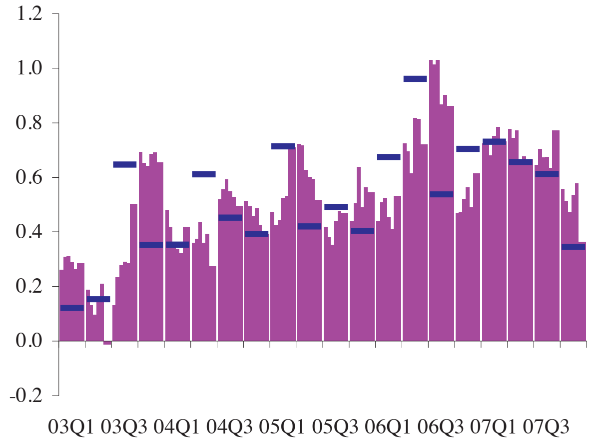
Services (indirect) (monthly equ., best equ.)
(quarterly growth rates)



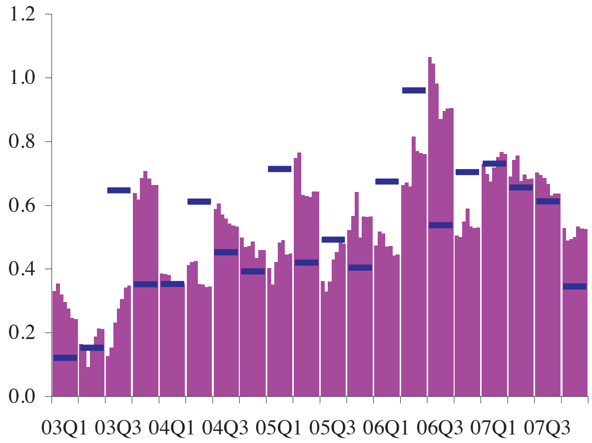
Services (indirect) (quarterly equ., average)
(quarterly growth rates)



Services (indirect) (quarterly equ., best equ.)
(quarterly growth rates)



Services (indirect) (uniform equation, average)
(quarterly growth rates)



Services (indirect) (uniform equation, best equ.)
(quarterly growth rates)

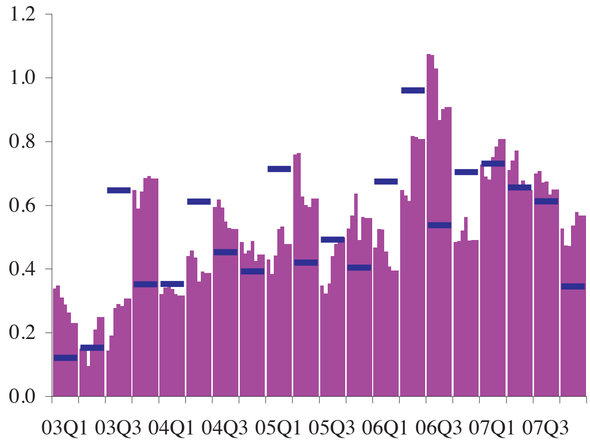
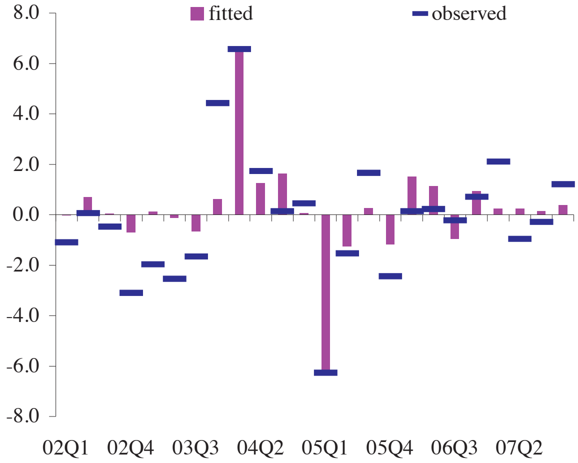
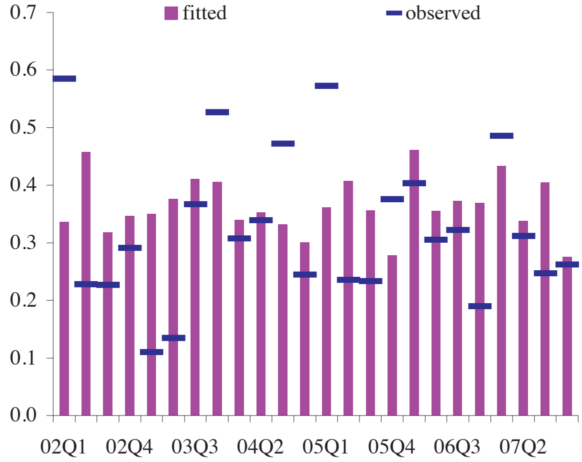


Chart 11: Fitted values and outcome – Agriculture, other services and taxes less subsidies on products

Agriculture
(quarterly growth rates)



Other services
(quarterly growth rates)



Taxes less subsidies on products
(quarterly growth rates)

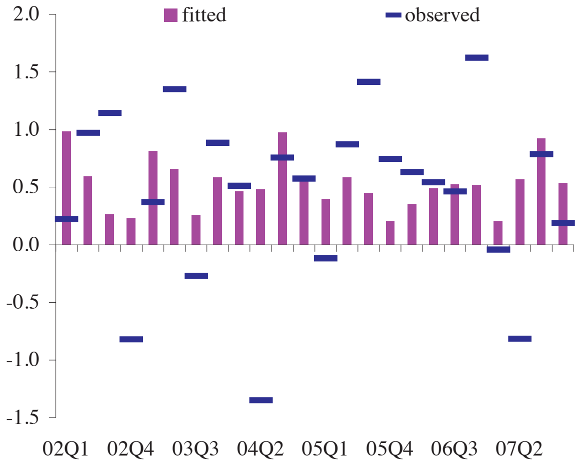
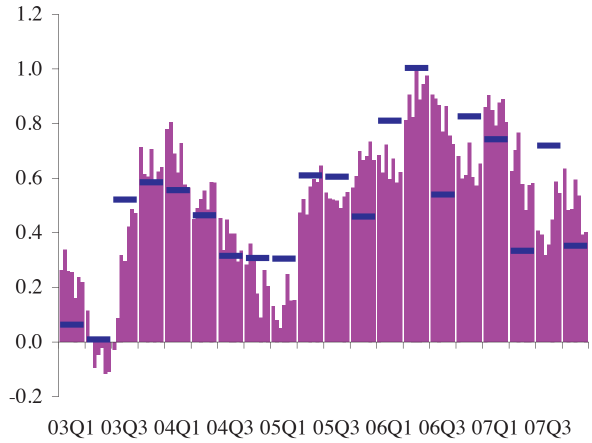
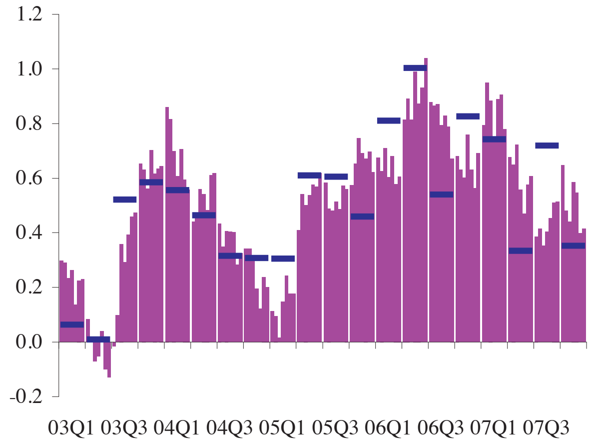


Chart 12: Fitted values and outcome – GDP (using direct forecast for services)

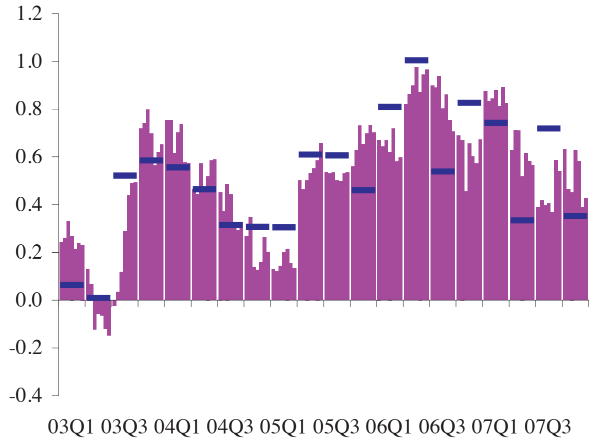
GDP (with direct services) (monthly equ., average)
(quarterly growth rates)



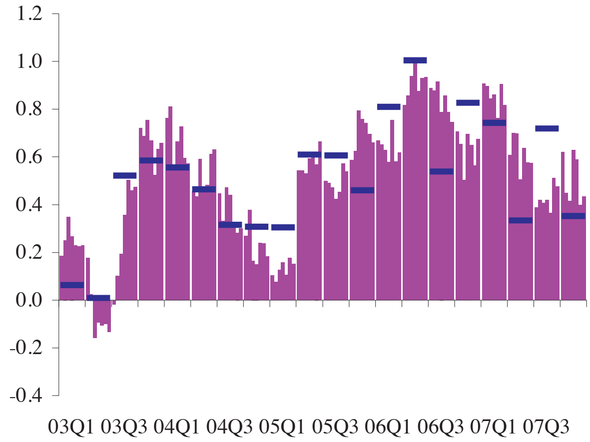
GDP (with direct services) (monthly equ., best equ.)
(quarterly growth rates)



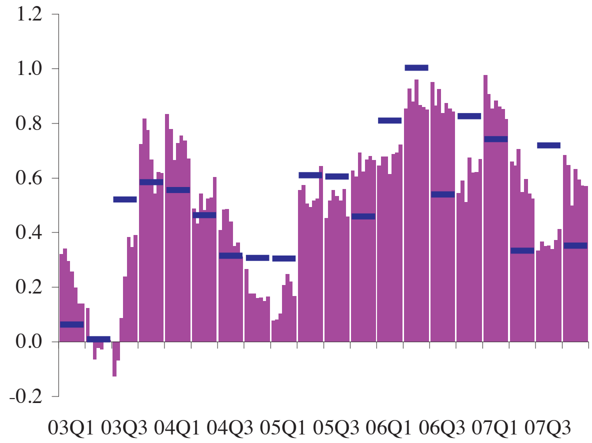
GDP (with direct services) (quarterly equ., average)
(quarterly growth rates)



GDP (with direct services) (quarterly equ., best equ.)
(quarterly growth rates)



GDP (with direct services) (uniform equation, average)
(quarterly growth rates)



GDP (with direct services) (uniform equation, best equ.)
(quarterly growth rates)

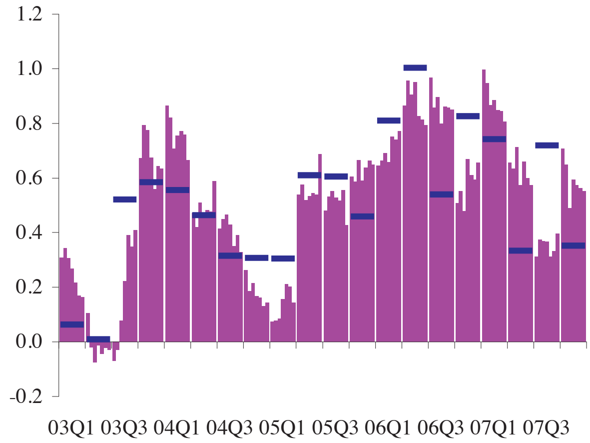
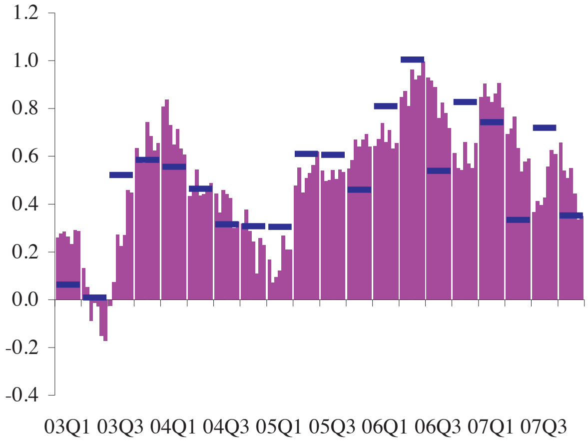
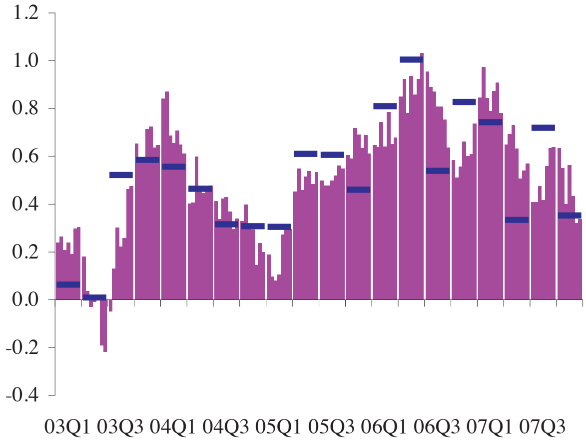


Chart 13: Fitted values and outcome – GDP (using indirect forecast for services)

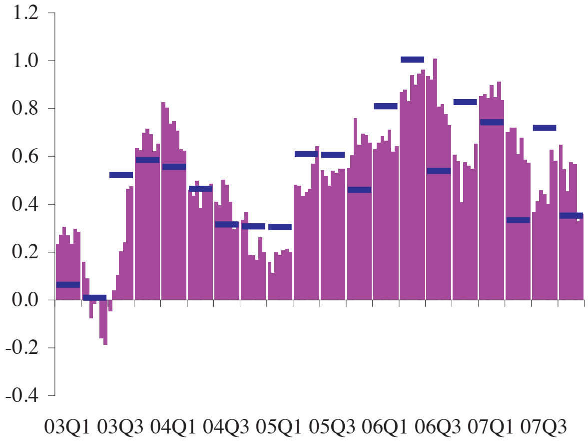
GDP (with indirect services) (monthly equ., average)
(quarterly growth rates)



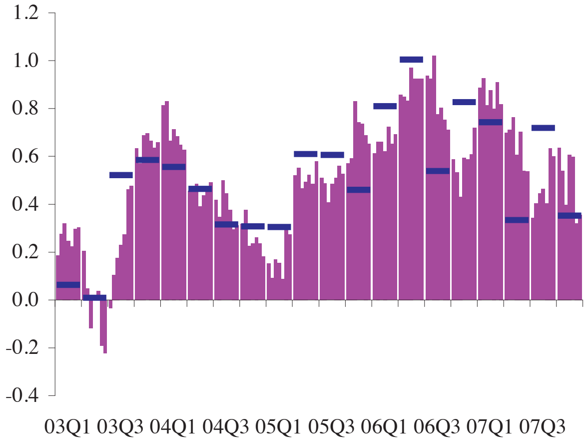
GDP (with indirect services) (monthly equ., best equ.)
(quarterly growth rates)



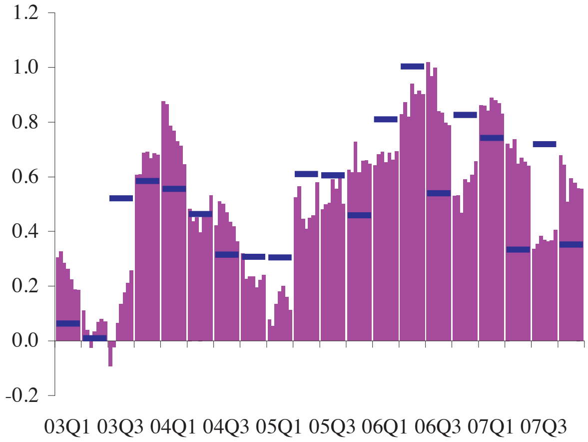
GDP (with indirect services) (quarterly equ., average)
(quarterly growth rates)



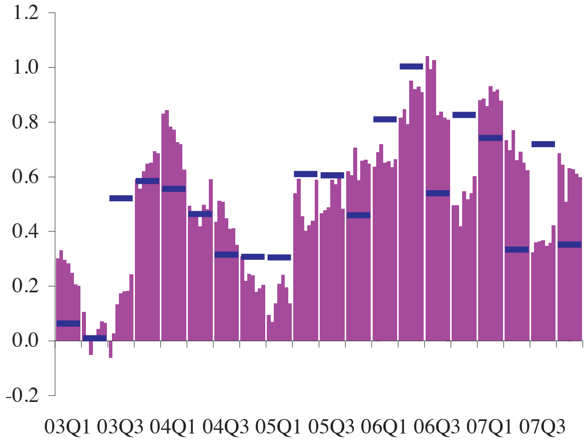
GDP (with indirect services) (quarterly equ., best equ.)
(quarterly growth rates)



GDP (with indirect services) (uniform equation, average)
(quarterly growth rates)



GDP (with indirect services) (uniform equation, best equ.)
(quarterly growth rates)



Appendix B: Tables

Table 1: List of pre-selected variables for industry (excluding construction)

Variable	Start of series	Transformation	Lags
Value added in industry (ex. constr.)	1991 Q1	dlog	1,2,3,4
IP (excl. constr.)	Jan. 1990	dlog	0
IP intermediate goods	Jan. 1990	dlog	0
IP capital goods	Jan. 1990	dlog	0
IP consumer goods	Jan. 1990	dlog	0
IP energy	Jan. 1990	dlog	0
New orders in manuf. working on orders (excl. N. 35)	Jan. 1995	dlog	0
EC economic sentiment indicator (ESI)	Jan. 1995	level	0
EC industrial confidence	Jan. 1985	dlevel	0
EC industrial confidence intermed.	Jan. 1985	dlevel	0
EC industrial confidence capital	Jan. 1985	dlevel	0
EC industrial confidence consumer	Jan. 1985	dlevel	0
EC industrial confidence textile	Jan. 1985	dlevel	0
EC industrial confidence pulp	Jan. 1991	dlevel	0
EC industrial confidence min. prod.	Jan. 1985	dlevel	0
EC industrial confidence elect. mach.	Dec. 1990	dlevel	0
EC consumer confidence	Jan. 1985	dlevel	0
PMI manufacturing	Aug. 1997	level	0
PMI intermediate	Jan. 1998	level	0
PMI coke, chemicals, rubber (NACE 23,24,25,26)	Jan. 1998	level	0
PMI chemicals (NACE 24)	Jan. 1998	level	0
PMI rubber (NACE 25)	Jan. 1998	level	0
PMI office machinery, elect. machinery (N. 30, 31)	Jan. 1998	level	0
PMI services: business activity index	July 1998	level	0
PMI composite: output index	July 1998	level	0
Oil prices in USD	Apr. 1985	dlog	0,1
Nominal effective exchange rate of the euro	Jan. 1980	dlog	0,1
Exports total	Jan. 1992	dlog	0
Exports intermediate products	Jan. 1992	dlog	0
Exports manufactured products	Jan. 1992	dlog	0
Imports total	Jan. 1992	dlog	0
Imports intermediate products	Jan. 1992	dlog	0
Imports manufactured products	Jan. 1992	dlog	0
Unemployment rate	Jan. 1993	dlevel	0,1

Note: dlog and dlevel stand for the first difference of the log and the level of the series, respectively. In the column lags, 0 indicates the contemporaneous inclusion of the variables and 1, 2 etc. the number of lags tested in the equations. Exports and imports refer to intra plus extra euro area trade. Abbreviations: IP: industrial production, NACE: Classification system of economic activities in the European Union, EC: European Commission, PMI: Purchasing Manager's Index.

Table 2: List of pre-selected variables for construction

Variable	Start of series	Transformation	Lags
Value added in construction	1991 Q1	dlog	1,2,3,4
Construction production	Jan. 1990	dlog	0
EC construction confidence	Jan. 1985	dlevel	0,1,2
PMI construction output	Jan. 2000	level	0
PMI real estate (NACE 70, 71, 72, 73, 74)	Jan. 2001	level	0,1
Building permits	Jan. 1994	dlog	0,1,2,3
New orders total construction	Jan. 1998	dlog	0,1,2,3
Imports intermediate products	Jan. 1992	dlog	0
Nominal effective exchange rate of the euro	Jan. 1980	dlog	0,1
Unemployment rate	Jan. 1993	dlevel	0,1

Note: dlog and dlevel stand for the first difference of the log and the level of the series, respectively. In the column lags, 0 indicates the contemporaneous inclusion of the variables and 1, 2 etc. the number of lags tested in the equations. Exports and imports refer to intra plus extra euro area trade. Abbreviations: IP: industrial production, NACE: Classification system of economic activities in the European Union, EC: European Commission, PMI: Purchasing Manager's Index.

Table 3: List of pre-selected variables for services

Variable	Start of series	Transformation	Lags
Value added in services	1991 Q1	dlog	1,2,3,4
EC services confidence	Apr. 1995	level	0
EC services: demand in recent months	Apr. 1995	level	0
EC consumer confidence	Jan. 1985	level	0
EC industrial confidence	Jan. 1985	level	0,1
EC economic sentiment indicator (ESI)	Jan. 1985	level	0,1
PMI services: business activity index	Jul. 1998	level	0
PMI real estate etc. (N. 70,71,72,73)	Jan. 1998	level	0
PMI other business activities (N. 74)	Jan. 1998	level	0
PMI financial intermediation (N. 65,66,67)	Jan. 1998	level	0
PMI land transportation (N. 60)	Jan. 1998	level	0
PMI land, water, air transport. (N. 60,61,62)	Jan. 1998	level	0
PMI transportation (N. 60)	Jan. 1998	level	0
PMI hotels and restaurants (N. 55)	Jan. 1998	level	0
PMI manufacturing	Aug. 1997	level	0,1
PMI composite: output index	Jul. 1998	level	0,1
Exports total	Jan. 1992	dlog	1
Exports manufactured products	Jan. 1992	dlog	0
Exports intermediate products	Jan. 1992	dlog	1
Imports total	Jan. 1992	dlog	1,2
Imports manufactured products	Jan. 1992	dlog	0,1,2
Imports intermediate products	Jan. 1992	dlog	1,2
Unemployment rate	Jan. 1993	dlevel	0,1
Nominal effective exchange rate of the euro	Jan. 1980	dlog	0,1,2
Turnover: Wholesale trade, etc. (N. 51)	Jan. 1999	dlog	0
Turnover: Retail sale of household equipment	Jan. 1995	dlog	0

Note: dlog and dlevel stand for the first difference of the log and the level of the series, respectively. In the column lags, 0 indicates the contemporaneous inclusion of the variables and 1, 2 etc. the number of lags tested in the equations. Exports and imports refer to intra plus extra euro area trade. Abbreviations: IP: industrial production, NACE: Classification system of economic activities in the European Union, EC: European Commission, PMI: Purchasing Manager's Index.

Table 4: List of pre-selected variables for trade and transportation services

Variable	Start of series	Transformation	Lags
Value added in trade and transportation services	1991 Q1	dlog	1,2,3,4
EC services confidence	Apr. 1995	level	0
EC services: demand in recent months	Apr. 1995	level	0
EC economic sentiment indicator (ESI)	Jan. 1985	level	0
EC consumer confidence	Jan. 1985	level	0
EC industrial confidence	Jan. 1985	level	0
PMI services: business activity index	Jul. 1998	level	0
PMI services: hotels and restaurants (N. 55)	Jan. 1998	level	0
PMI services: transportation (N. 60,61,62,63)	Jan. 1998	level	0
PMI services: land, water, air transport (N. 60,61,62)	Jan. 1998	level	0
PMI services: land transportation (N. 60)	Jan. 1998	level	0
PMI services: financial intermediation (N. 65,66,67)	Jan. 1998	level	0
PMI services: real estate etc. (N. 70, 71, 72, 73)	Jan. 1998	level	0
PMI services: other business activities (N. 74)	Jan. 1998	level	0
PMI manufacturing	Aug. 1997	level	0
PMI composite: output index	Jul. 1998	level	0
Retail trade	Jan. 1995	dlog	0
Turnover: wholesale trade etc. (N. 51)	Jan. 1999	dlog	0,1,2
Turnover: Wholesale of household goods (N. 51.4)	Jan. 2000	dlog	0,1,2
Retail sales of household equipment	Jan. 1995	dlog	0
Unemployment rate	Jan. 1993	dlevel	0,1
Oil prices (USD)	Apr. 1985	dlog	0,1,2
Nominal effective exchange rate of the euro	Jan. 1980	dlog	0,1,2

Note: dlog and dlevel stand for the first difference of the log and the level of the series, respectively. In the column lags, 0 indicates the contemporaneous inclusion of the variables and 1, 2 etc. the number of lags tested in the equations. Exports and imports refer to intra plus extra euro area trade. Abbreviations: IP: industrial production, NACE: Classification system of economic activities in the European Union, EC: European Commission, PMI: Purchasing Manager's Index.

Table 5: List of pre-selected variables for financial and business services

Variable	Start of series	Transformation	Lags
Value added in financial and business services	1991 Q1	dlog	1,2,3,4
EC services confidence	Apr. 1995	level	0
EC services: demand in recent months	Apr. 1995	level	0
EC economic sentiment indicator (ESI)	Jan. 1995	level	0
EC consumer confidence	Jan. 1995	level	0
EC industrial confidence	Jan. 1995	level	0
PMI services: business activity index	Jul. 1998	level	0
PMI services: financial intermediation (N. 65,66,67)	Jan. 1998	level	0,1
PMI services: real estate (N. 70,71,72,73,74)	Jan. 2001	level	0
PMI services: real estate (N. 70,71,72,73)	Jan. 1998	level	0,1
PMI services: computers and related activities (N. 72)	Jan. 2001	level	0
PMI services: other business activities (N. 74)	Jan. 1998	level	0,1
PMI manufacturing	Aug. 1997	level	0
PMI composite: output index	Jul. 1998	level	0,1
Unemployment rate	Jan. 1993	dlevel	0,1
Oil prices in USD	Apr. 1985	dlog	0
Nominal effective exchange rate of the euro	Jan. 1980	dlog	0,1

Note: dlog and dlevel stand for the first difference of the log and the level of the series, respectively. In the column lags, 0 indicates the contemporaneous inclusion of the variables and 1, 2 etc. the number of lags tested in the equations. Exports and imports refer to intra plus extra euro area trade. Abbreviations: IP: industrial production, NACE: Classification system of economic activities in the European Union, EC: European Commission, PMI: Purchasing Manager's Index.

Table 6: Selected equations for industry (excluding construction)

		Lags of dependent variable	Ind. prod. (excl. constr.)	Ind. prod. consumer	Ind. prod. energy	Ind. prod. interm.	Ind. prod. capital	New orders	Imports interm. goods	Imports manuf. goods	Imports total	Exports interm. goods	Exports manuf. goods	Exports total	NEER	NEER	Oil prices	Oil prices	Unemployment	Unemployment	EC consumer conf.	EC consumer goods	EC ind. conf. elect. mach.	EC ind. conf. interm.	EC ind. conf. total	EC ind. conf. capital	EC ind. conf. min. goods	EC ind. conf. pulp	EC ind. conf. of textiles	Economic Sent. Indic.	PMI chemicals	PMI coke, chem., rubber	PMI composite output	PMI intermediate goods	PMI machinery	PMI manuf.	PMI rubber	PMI serv. bus. activity index
lags of indic.			0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
M2NQ	1	0			x															x	x																	
	2	0																		x	x																	
	3	0			x										x					x	x																	
	4	0													x					x	x																	
	5	0			x															x	x									x								
	6	0																		x	x									x								
	7	0																	x		x									x								
	8	0			x														x		x									x								
	9	0													x				x		x									x								
	10	0																	x	x	x																	
M3NQ	1	0															x			x	x																	
	2	0			x												x			x	x																	
	3	0													x		x			x	x																	
	4	0															x		x		x																	
	5	0			x												x		x		x																	
	6	0															x		x	x	x																	
	7	0															x	x		x	x																	
	8	0													x		x		x		x																	
	9	0															x		x		x									x								
	10	0									x						x			x	x																	
M1CQ	1	0													x		x			x	x																	
	2	0															x			x	x																	
	3	0			x												x			x	x																	
	4	0													x		x		x		x																	
	5	0													x		x				x																x	
	6	0															x		x		x																	
	7	0														x					x											x					x	
	8	0									x						x			x	x																	
	9	0		x													x			x	x																	
	10	0							x								x			x	x																	
M2CQ	1	0																		x							x										x	x	
	2	0																		x							x				x							x	
	3	0													x		x			x							x											
	4	0																		x						x	x												x
	5	0													x											x	x												x
	6	0																	x							x	x												x
	7	0																		x							x				x								x
	8	0															x			x	x						x												
	9	0																									x								x			x	x
	10	0																		x							x								x			x	
M3CQ	1	0		x						x																				x									x
	2	0		x							x																			x									x
	3	0		x	x																									x									x
	4	0		x																x										x									x
	5	0		x															x											x									x
	6	0		x																										x									x
	7	0		x					x																					x									x
	8	0		x													x													x									x
	9	0		x											x															x									x
	10	0		x																	x									x									x
M1LQ	1	0	x										x					x															x					
	2	0	x										x					x															x					
	3	0	x											x				x																				x
	4	0	x											x				x															x					
	5	0	x			x												x															x					
	6	0	x			x												x																				x
	7	0	x															x				x											x					
	8	0	x															x				x																x
	9	0	x															x															x			x		
	10	0	x												x			x															x					
M2LQ	1	0	x										x					x																				x
	2	0	x															x										x										x
	3	0	x										x					x															x					
	4	0	x			x												x																				x
	5	0	x															x										x					x					
	6	0	x			x												x															x					
	7	0	x															x							x													x
	8	0	x															x							x								x					
	9	0	x											x				x																				x
	10	0	x															x						x														x
NQ	1	0															x			x	x																	
	2	0																		x	x																	
	3	0			x												x			x	x																	
	4	0			x															x	x																	
	5	0													x		x			x	x																	
	6	0			x										x					x	x																	
	7	0													x					x	x																	
	8	0			x															x	x									x								
	9	0																		x	x									x								
	10	0																	x	x	x																	
CQ	1	0																								x								x			x	x
	2	0																		x										x							x	x
	3	0												x				x												x									x
	4	0																								x							x	x			x	
	5	0													x															x							x	x
	6	0													x										x	x												x
	7	0		x													x													x									x
	8	0		x													x				x																	x
	9	0																	x											x							x	x
	10	0											x					x												x									x
LQ	1	0	x										x					x																				x
	2	0	x										x					x															x					
	3	0	x			x												x																				x
	4	0	x			x												x															x					
	5	0	x											x				x																				x
	6	0	x											x				x															x					
	7	0	x															x							x								x					
	8	0	x															x				x																x
	9	0	x															x							x													x
	10	0	x															x				x											x					
U	1	0												x			x	x																				x
	2	0		x													x				x																	x
	3	0											x				x	x																				x
	4	0						x						x				x																				x
	5	0			x									x				x																				x
	6	0												x				x												x									x
	7	0						x					x					x																				x
	8	0		x					x								x																					x
	9	0												x				x			x																	x
	10	0		x										x				x																				x

Table 7: Selected equations for construction

		Lags of dependent variable	Constr. production	New orders constr.	New orders constr.	New orders constr.	New orders constr.	Building permits	Building permits	Building permits	Building permits	Imports interm. goods	NEER	NEER	Unemployment	Unemployment	EC constr. conf.	EC constr. conf.	EC constr. conf.	PMI constr. output	PMI reale estate etc.	PMI reale estate etc.
lags of indic.			0	0	1	2	3	0	1	2	3	0	0	1	0	1	0	1	2	0	0	1
M2NQ	1	1			x						x								x			x
	2	1			x							x							x			x
	3	1			x												x		x			x
	4	1			x							x							x		x	
	5	1									x						x		x			x
	6	1									x		x						x			x
	7	1			x			x											x			x
	8	1			x														x			x
	9	1			x								x						x			x
	10	1						x			x								x			x
M3NQ	1	1									x			x					x			x
	2	1									x		x						x			x
	3	1											x	x					x			x
	4	1										x	x						x			x
	5	1										x		x					x			x
	6	1									x						x		x			x
	7	1										x	x						x		x	
	8	1											x						x			x
	9	1						x					x						x			x
	10	1												x					x			x
M1CQ	1	1								x						x			x		x	
	2	1								x					x				x		x	
	3	1				x				x									x		x	
	4	1				x				x									x			x
	5	1								x				x					x		x	
	6	1						x		x									x			x
	7	1						x		x									x		x	
	8	1								x									x		x	x
	9	1								x				x					x			x
	10	1								x			x						x			x
M2CQ	1	1								x		x							x		x	
	2	1								x							x		x		x	
	3	1								x							x		x			x
	4	1								x		x							x			x
	5	1								x				x					x			x
	6	1								x				x					x		x	
	7	1								x								x	x		x	
	8	1								x			x						x		x	
	9	1								x								x	x			x
	10	1								x									x			x
M3CQ	1	1								x									x	x	x	
	2	1								x									x	x		x
	3	1				x				x										x	x	
	4	1								x				x						x		x
	5	1								x			x							x	x	
	6	1								x	x							x		x		
	7	1								x								x		x	x	
	8	1				x				x				x						x		
	9	1								x								x		x		x
	10	1								x			x							x		x
M1LQ	1	1								x									x	x	x	
	2	1								x			x							x	x	
	3	1								x									x	x		x
	4	1								x	x	x								x		
	5	1						x		x										x	x	
	6	1				x				x										x	x	
	7	1			x					x										x	x	
	8	1								x				x						x	x	
	9	1								x		x							x	x		
	10	1								x										x	x	
M2LQ	1	1	x							x		x								x		
	2	1								x					x					x	x	
	3	1								x									x	x	x	
	4	1								x	x	x								x		
	5	1								x					x					x		x
	6	1								x					x	x				x		
	7	1								x		x							x	x		
	8	1	x							x								x		x		
	9	1	x							x										x	x	
	10	1	x							x										x		x
NQ	1	1									x		x						x			x
	2	1			x						x								x			x
	3	1									x						x		x			x
	4	1									x			x					x			x
	5	1			x							x							x		x	
	6	1			x												x		x			x
	7	1			x							x							x			x
	8	1										x	x						x			x
	9	1						x			x								x			x
	10	1										x	x						x		x	
CQ	1	1								x						x			x		x	
	2	1								x				x					x			x
	3	1								x				x					x		x	
	4	1				x				x									x		x	
	5	1								x		x							x			x
	6	1								x									x		x	x
	7	1								x								x	x			x
	8	1								x									x			x
	9	1								x		x							x		x	
	10	1								x								x	x		x	
LQ	1	1								x									x	x	x	
	2	1								x	x	x								x		
	3	1								x									x	x		x
	4	1								x		x							x	x		
	5	1								x			x							x	x	
	6	1			x					x										x	x	
	7	1								x		x								x	x	
	8	1							x	x		x								x		
	9	1								x		x		x						x		
	10	1								x		x	x							x		
U	1	1				x				x									x		x	
	2	1														x			x	x	x	
	3	1								x						x			x		x	
	4	1				x				x									x			x
	5	1				x						x							x		x	
	6	1								x		x							x			x
	7	1								x				x					x			x
	8	1							x										x	x		x
	9	1								x				x					x		x	
	10	1				x										x			x		x	

Table 8: Selected equations for services

		Lags of dependent variable	Retail sales househ. equip.	Turnover: wholesale trade	Imports interm. goods	Imports interm. goods	Imports manuf. goods	Imports manuf. goods	Imports manuf. goods	Imports total	Imports total	Exports interm. goods	Exports manuf. goods	Exports total	NEER	NEER	NEER	Unemployment	Unemployment	EC consumer conf.	EC ind. conf. total	EC ind. conf. total	EC serv recent demand	EC services confidence	Economic Sent. Indic.	Economic Sent. Indic.	PMI composite output	PMI composite output	PMI financial interm.	PMI hotel restaurants	PMI land, water, air transport	PMI manuf.	PMI manuf.	PMI other serv. bus. act.	PMI real estate (smaller)	PMI serv. bus. activity index	PMI transportation	PMI land transportation
lags of indic.			0	0	1	2	0	1	2	1	2	1	0	1	0	1	2	0	1	0	0	1	0	0	0	1	0	1	0	0	0	0	1	0	0	0	0	0
M2NQ	1	2															x			x				x									x					
	2	1																x		x				x									x					
	3	2																	x	x				x									x					
	4	1																x		x				x									x					
	5	2													x				x	x										x								
	6	2				x													x	x													x					
	7	1													x				x	x									x									
	8	2																x		x						x							x					
	9	2													x				x	x										x								
	10	1						x									x			x													x					
M3NQ	1	2																x		x				x														x
	2	1				x														x				x														x
	3	2				x														x				x														x
	4	1				x														x				x														x
	5	2		x		x														x				x														
	6	1																		x		x		x														x
	7	2																	x	x				x														x
	8	2		x	x															x				x														
	9	2																		x		x		x														x
	10	2			x															x				x				x										
M1CQ	1	2																x		x				x														x
	2	0																x		x				x														x
	3	1																x		x				x														x
	4	2																	x	x				x														x
	5	2			x														x	x								x										
	6	1			x														x	x													x					
	7	2			x														x	x													x					
	8	0																	x	x				x														x
	9	1			x														x	x								x										
	10	2			x										x				x																			x
M2CQ	1	2			x										x				x								x											
	2	2			x										x				x																		x	
	3	2		x	x										x				x																			
	4	0				x									x				x											x								
	5	2			x										x				x											x								
	6	2			x										x				x									x										
	7	2				x									x				x											x								
	8	2			x										x				x												x							
	9	2			x										x				x																			x
	10	0				x									x					x										x								
M3CQ	1	2			x										x				x																x			
	2	2			x										x				x																		x	
	3	2			x										x				x															x				
	4	2			x										x				x								x											
	5	2			x										x				x									x										
	6	2			x										x				x												x							
	7	2			x										x				x																			x
	8	1			x										x				x																x			
	9	2			x										x				x											x								
	10	2			x										x				x										x									
M1LQ	1	1				x									x																x			x				
	2	1				x									x																x			x				
	3	1		x											x																			x			x	
	4	0		x											x																			x			x	
	5	1			x										x				x															x				
	6	1													x						x										x			x				
	7	1		x	x			x																										x				
	8	1		x	x			x																										x				
	9	2		x	x					x																								x				
	10	1		x	x					x																								x				
M2LQ	1	2				x									x																x			x				
	2	1				x									x																x			x				
	3	2		x											x																			x			x	
	4	0		x											x																			x			x	
	5	1													x			x											x					x				
	6	0													x			x											x					x				
	7	2													x			x										x									x	
	8	1			x										x				x															x				
	9	1													x						x										x			x				
	10	1		x	x					x																								x				
NQ	1	2																x		x				x									x					
	2	1		x														x		x				x														
	3	2		x															x	x				x														
	4	1		x														x		x				x														
	5	2																x		x				x									x					
	6	2				x												x		x													x					
	7	1				x													x	x													x					
	8	2		x													x			x				x														
	9	2		x		x														x				x														
	10	1																x		x				x				x										
CQ	1	2			x										x				x																			x
	2	2			x										x				x									x										
	3	2			x										x				x												x							
	4	2			x										x				x											x								
	5	2		x	x										x				x																			
	6	2			x										x				x																		x	
	7	2			x										x				x								x											
	8	2			x										x				x										x									
	9	2			x										x				x																x			
	10	2			x										x				x																	x		
LQ	1	1				x									x																x			x				
	2	2				x									x																x			x				
	3	2		x											x																			x			x	
	4	1		x											x																			x			x	
	5	0			x										x				x															x				
	6	1													x						x										x			x				
	7	1		x	x			x																										x				
	8	1		x	x			x																										x				
	9	1		x	x					x																								x				
	10	1		x	x					x																								x				
U	1	2			x										x				x										x									
	2	2			x										x				x																x			
	3	2			x										x				x																			x
	4	2			x										x				x															x				
	5	2			x										x				x											x								
	6	2			x										x				x									x										
	7	2			x										x				x												x							
	8	2		x	x										x				x																			
	9	2			x										x				x																		x	
	10	2			x										x				x								x											

Table 9: Selected equations for trade and transportation services

		Lags of dependent variable	Retail sales	Retail sales househ. equip.	Turnover: wholesale hh goods	Turnover: wholesale hh goods	Turnover: wholesale hh goods	Turnover: wholesale trade	Turnover: wholesale trade	Turnover: wholesale trade	Oil prices	Oil prices	Oil prices	NEER	NEER	NEER	Unemployment	Unemployment	EC consumer conf.	EC ind. conf. total	EC serv recent demand	EC services confidence	Economic Sent. Indic.	PMI composite output	PMI financial interm.	PMI hotel restaurants	PMI land, water, air transport	PMI manuf.	PMI other serv. bus. act.	PMI real estate (smaller)	PMI serv. bus. activity index	PMI transportation	PMI land transportation
lags of indic.			0	0	0	1	2	0	1	2	0	1	2	0	1	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
M2NQ	1	0													x							x	x							x			
	2	1				x			x			x																		x			
	3	1					x								x							x								x			
	4	0				x						x			x															x			
	5	1				x						x			x															x			
	6	0					x	x							x															x			
	7	0					x	x							x															x			
	8	1													x							x	x							x			
	9	1					x								x						x									x			
	10	1					x								x							x								x			
M3NQ	1	0													x							x			x					x			
	2	1													x							x			x					x			
	3	1													x							x			x				x				
	4	0				x									x											x				x			
	5	1													x							x				x				x			
	6	0													x							x			x				x				
	7	1				x									x											x				x			
	8	1				x									x											x			x				
	9	0				x									x				x							x							
	10	0				x									x											x			x				
M1CQ	1	0				x													x	x								x					
	2	0				x													x	x												x	
	3	0				x													x				x					x					
	4	0				x													x	x				x									
	5	1				x													x	x						x							
	6	0				x						x			x													x					
	7	1					x					x			x													x					
	8	0					x					x			x													x					
	9	1			x							x			x													x					
	10	0				x						x								x								x					
M2CQ	1	1				x													x			x				x							
	2	1				x									x				x							x							
	3	0				x													x			x				x							
	4	0				x									x				x							x							
	5	1				x													x				x			x							
	6	1				x									x										x	x							
	7	1			x										x										x	x							
	8	0			x										x										x	x							
	9	0				x									x										x	x							
	10	0												x	x										x	x							
M3CQ	1	0				x									x												x						x
	2	0					x								x												x						x
	3	1				x									x												x						x
	4	1					x								x												x						x
	5	0			x										x												x						x
	6	1			x										x												x						x
	7	1												x	x							x										x	
	8	0												x	x							x										x	
	9	1				x									x							x										x	
	10	1				x								x	x																	x	
M1LQ	1	0					x								x												x						x
	2	0					x								x												x						x
	3	1												x	x							x										x	
	4	1				x									x												x						x
	5	0				x									x												x						x
	6	0												x	x							x										x	
	7	1			x										x												x						x
	8	1			x										x							x										x	
	9	0												x	x								x									x	
	10	0				x									x							x										x	
M2LQ	1	0					x								x												x						x
	2	1					x								x												x						x
	3	0												x	x							x										x	
	4	0				x									x												x						x
	5	0				x									x												x						x
	6	1			x										x												x						x
	7	1			x										x							x										x	
	8	0			x										x												x						x
	9	1												x	x							x										x	
	10	1			x										x							x										x	
NQ	1	0				x									x											x				x			
	2	1													x							x			x					x			
	3	1													x							x			x					x			
	4	0				x									x											x				x			
	5	1													x							x			x				x				
	6	0					x								x							x								x			
	7	1					x								x											x				x			
	8	0					x								x							x								x			
	9	1					x								x											x			x				
	10	1					x								x											x				x			
CQ	1	1				x									x				x							x							
	2	0				x									x				x							x							
	3	1				x													x				x			x							
	4	1					x								x											x		x					
	5	0				x									x											x		x					
	6	1				x													x	x						x							
	7	1				x									x											x		x					
	8	1				x													x			x				x							
	9	1					x								x				x							x							
	10	0					x								x				x							x							
LQ	1	0					x								x												x						x
	2	0					x								x												x						x
	3	1												x	x							x										x	
	4	1				x									x												x						x
	5	1				x									x												x						x
	6	1			x										x												x						x
	7	0			x										x							x										x	
	8	0												x	x							x										x	
	9	0			x										x												x						x
	10	1												x	x								x									x	
U	1	1				x									x				x							x							
	2	1					x								x											x		x					
	3	0				x									x				x							x							
	4	1				x									x											x		x					
	5	0				x									x											x		x					
	6	1			x										x											x		x					
	7	0					x								x				x							x							
	8	1					x								x				x							x							
	9	0					x								x											x		x					
	10	1				x									x											x				x			

Table 10: Selected equations for financial and business services

		Lags of dependent variable	Oil prices	NEER	NEER	Unemployment	Unemployment	EC consumer conf.	EC ind. conf. total	EC serv recent demand	EC services confidence	Economic Sent. Indic.	PMI composite output	PMI composite output	PMI financial interm.	PMI financial interm.	PMI computers	PMI manuf.	PMI other serv. bus. act.	PMI other serv. bus. act.	PMI real estate (smaller)	PMI real estate (smaller)	PMI reale estate etc.	PMI serv. bus. activity index
lags of indic.			0	0	1	0	1	0	0	0	0	0	0	1	0	1	0	0	0	1	0	1	0	0
M2NQ	1	0	x	x	x																		x	
	2	0											x				x			x			x	
	3	0	x		x					x													x	
	4	0											x				x					x	x	
	5	0			x								x									x	x	
	6	0		x	x																	x	x	
	7	0		x	x				x														x	
	8	0							x								x			x			x	
	9	0		x	x															x			x	
	10	0	x		x																	x	x	
M3NQ	1	0												x			x					x	x	
	2	0					x						x				x						x	
	3	0												x			x			x			x	
	4	0											x				x					x	x	
	5	0											x				x			x			x	
	6	0							x	x							x						x	
	7	0							x								x					x	x	
	8	0	x											x								x	x	
	9	0					x							x			x						x	
	10	0					x			x							x						x	
M1CQ	1	0									x			x				x					x	
	2	0										x		x				x					x	
	3	0												x	x			x					x	
	4	0							x					x				x					x	
	5	0		x														x					x	x
	6	0		x									x										x	x
	7	0											x	x				x					x	
	8	0					x							x				x				x		
	9	0			x													x					x	x
	10	0												x				x					x	x
M2CQ	1	0												x	x			x					x	
	2	0											x	x	x								x	
	3	0					x							x	x								x	
	4	0						x						x				x					x	
	5	0							x					x				x					x	
	6	0					x							x				x					x	
	7	0											x	x	x		x							
	8	0												x	x								x	x
	9	0		x										x	x								x	
	10	0				x								x	x								x	
M3CQ	1	0									x			x				x					x	
	2	0												x	x			x					x	
	3	0										x		x				x					x	
	4	0											x	x	x								x	
	5	0												x	x		x	x						
	6	0											x	x	x		x							
	7	0					x							x	x								x	
	8	0									x			x			x	x						
	9	0						x						x				x					x	
	10	0												x	x						x		x	
M1LQ	1	0										x		x				x					x	
	2	0						x		x				x					x					
	3	0										x		x			x	x						
	4	0						x						x				x					x	
	5	0						x						x					x	x				
	6	0					x	x						x					x					
	7	0				x		x						x					x					
	8	0						x						x					x			x		
	9	0						x						x					x					
	10	0	x					x						x					x					
M2LQ	1	0										x		x				x					x	
	2	0				x		x						x					x					
	3	0										x		x			x	x						
	4	0						x		x				x					x					
	5	0						x						x				x					x	
	6	0						x						x					x	x				
	7	0					x	x						x					x					
	8	0						x						x					x			x		
	9	0						x						x					x					
	10	0	x					x						x					x					
NQ	1	0												x			x					x	x	
	2	0											x				x					x	x	
	3	0											x				x			x			x	
	4	0												x			x			x			x	
	5	0							x								x					x	x	
	6	0							x								x			x			x	
	7	0							x	x							x						x	
	8	0					x						x				x						x	
	9	0	x														x					x	x	
	10	0								x							x					x	x	
CQ	1	0												x	x			x					x	
	2	0									x			x				x					x	
	3	0											x	x	x								x	
	4	0										x		x				x					x	
	5	0							x					x				x					x	
	6	0					x							x	x								x	
	7	0		x									x										x	x
	8	0		x														x					x	x
	9	0						x						x				x					x	
	10	0											x	x				x					x	
LQ	1	0										x		x				x					x	
	2	0						x		x				x					x					
	3	0										x		x			x	x						
	4	0				x		x						x					x					
	5	0						x						x				x					x	
	6	0						x						x					x	x				
	7	0					x	x						x					x					
	8	0						x						x					x			x		
	9	0						x						x					x					
	10	0	x					x						x					x					
U	1	0												x	x			x					x	
	2	0					x							x			x						x	
	3	0											x	x	x								x	
	4	0		x														x					x	x
	5	0					x							x				x					x	
	6	0		x									x										x	x
	7	0											x	x				x					x	
	8	0					x							x	x						x			
	9	0		x									x					x					x	
	10	0			x													x					x	x

Table 11: Selected variables – Industry (excluding construction)

	IP	New orders	Trade	NEER	Oil prices	Unempl.	EC surveys	PMI
M2NQ	4	0	0	3	0	10	10	0
M3NQ	2	0	1	2	10	10	10	0
M1CQ	2	0	2	4	9	8	10	2
M2CQ	0	0	0	2	2	8	10	8
M3CQ	10	0	3	1	1	2	10	10
M1LQ	10	0	4	1	10	0	2	10
M2LQ	10	0	3	0	10	0	5	10
NQ	4	0	0	3	3	10	10	0
CQ	2	0	2	2	4	2	10	10
LQ	10	0	4	0	10	0	4	10
U	4	2	9	0	10	0	3	10

Table 12: Selected variables – Construction

	IPC	New orders	Build. perm.	Trade	NEER	Unempl.	EC surveys	PMI
M2NQ	0	7	5	2	2	0	10	10
M3NQ	0	0	4	3	9	0	10	10
M1CQ	0	2	10	0	3	2	10	10
M2CQ	0	0	10	2	3	0	10	10
M3CQ	0	2	10	0	4	0	5	10
M1LQ	0	2	10	2	2	0	3	10
M2LQ	4	0	10	3	0	3	3	10
NQ	0	4	5	4	4	0	10	10
CQ	0	1	10	2	2	1	10	10
LQ	0	1	10	6	3	0	3	10
U	0	4	7	2	2	3	10	10

Table 13: Selected variables – Services

	Turnover	Trade	NEER	Unempl.	EC surveys	PMI
M2NQ	0	2	5	8	10	10
M3NQ	2	6	0	2	10	8
M1CQ	0	5	1	10	9	10
M2CQ	1	10	10	9	1	9
M3CQ	0	10	10	10	0	10
M1LQ	6	7	6	1	1	10
M2LQ	3	4	9	4	1	10
NQ	5	3	1	8	10	5
CQ	1	10	10	10	0	9
LQ	6	7	6	1	1	10
U	1	10	10	10	0	9

Table 14: Selected variables - Trade and transportation services

	Turnover	Oil prices	NEER	Unempl.	EC surveys	PMI
M2NQ	8	3	9	0	5	10
M3NQ	5	0	10	0	6	10
M1CQ	10	5	4	0	6	10
M2CQ	9	0	7	0	5	10
M3CQ	8	0	10	0	3	10
M1LQ	7	0	10	0	5	10
M2LQ	8	0	10	0	4	10
NQ	7	0	10	0	5	10
CQ	10	0	7	0	7	10
LQ	7	0	10	0	4	10
U	10	0	10	0	4	10

Table 15: Selected variables - Financial and business services

	Oil prices	NEER	Unempl.	EC surveys	PMI
M2NQ	3	7	0	3	10
M3NQ	1	0	3	3	10
M1CQ	0	3	1	3	10
M2CQ	0	1	3	2	10
M3CQ	0	0	1	4	10
M1LQ	1	0	2	10	10
M2LQ	1	0	2	10	10
NQ	1	0	1	4	10
CQ	0	2	1	4	10
LQ	1	0	2	10	10
U	0	4	3	0	10

Table 16: Summary of frequently selected individual variables

Sector	Forecast cycle NQ	Forecast cycle CQ	Forecast cycle LQ	Uniform equations
Industry	EC consumer confidence unemployment rate oil prices production of energy ESI	ESI PMI services PMI rubber unemployment rate EC ind. conf. capital goods	Industrial production PMI composite PMI services oil prices	PMI services oil prices exports prod. of consumer goods
Construction	EC construction confidence PMI real estate, etc. Building permits	EC construction confidence Building permits PMI real estate, etc.	PMI construction Building permits PMI real estate, etc. Imports intermed. Goods Construction production	EC construction confidence Building permits PMI real estate, etc. PMI construction
Services	EC consumer confidence EC services confidence unemployment rate Turnover wholesale	Imports of intermed. goods neer unemployment rate	Imports of intermed. goods neer PMI other business services Turnover wholesale	unemployment rate Imports of intermed. goods neer
Trade and transportation	neer PMI real estate etc. turnover wholesale PMI hotels and restaurants EC services confidence	PMI hotels and rest. neer turnover wholesale EC consumer confidence	neer turnover wholesale Pmi land, water, air PMI land transportation PMI transportation EC services confidence	PMI hotels and rest. neer PMI for manufacturing turnover wholesale EC consumer confidence
Financial and business	PMI real estate, etc. PMI computers PMI composite	PMI real estate, etc. PMI composite PMI manufacturing PMI financial intermediation	PMI composite EC consumer confidence PMI other business activities	PMI real estate PMI composite PMI manufacturing

Table 17: RMSE – Industry (excluding construction)

	M2 NQ	M3 NQ	M1 CQ	M2 CQ	M3 CQ	M1 LQ	M2 LQ	NQ	CQ	LQ	U
Monthly equations											
Equ1	0.469	0.421	0.422	0.384	0.309	0.241	0.218	0.445	0.375	0.230	0.363
Equ2	0.470	0.422	0.423	0.387	0.311	0.243	0.219	0.447	0.377	0.231	0.365
Equ3	0.474	0.426	0.429	0.390	0.311	0.248	0.220	0.451	0.380	0.235	0.368
Equ4	0.474	0.436	0.429	0.390	0.312	0.249	0.220	0.456	0.380	0.235	0.370
Equ5	0.476	0.437	0.430	0.391	0.312	0.250	0.221	0.457	0.381	0.236	0.371
Equ6	0.478	0.438	0.431	0.392	0.312	0.250	0.222	0.458	0.381	0.236	0.372
Equ7	0.482	0.438	0.431	0.392	0.312	0.250	0.223	0.461	0.382	0.237	0.373
Equ8	0.482	0.439	0.432	0.395	0.313	0.250	0.223	0.461	0.383	0.237	0.374
Equ9	0.483	0.439	0.432	0.396	0.314	0.252	0.224	0.462	0.384	0.238	0.375
Equ10	0.483	0.440	0.432	0.397	0.315	0.252	0.225	0.462	0.385	0.239	0.375
Avg	0.476	0.433	0.417	0.373	0.311	0.247	0.219	0.455	0.370	0.234	0.365
Quarterly equations											
	NQ	NQ	CQ	CQ	CQ	LQ	LQ	NQ	CQ	LQ	U
Equ1	0.490	0.421	0.451	0.396	0.362	0.241	0.218	0.457	0.405	0.230	0.381
Equ2	0.470	0.445	0.438	0.405	0.374	0.243	0.220	0.458	0.407	0.232	0.382
Equ3	0.491	0.422	0.464	0.413	0.339	0.250	0.220	0.458	0.408	0.236	0.384
Equ4	0.469	0.447	0.453	0.407	0.361	0.250	0.222	0.458	0.409	0.236	0.384
Equ5	0.490	0.426	0.444	0.423	0.357	0.248	0.224	0.459	0.410	0.237	0.385
Equ6	0.474	0.454	0.492	0.391	0.338	0.249	0.226	0.464	0.412	0.238	0.388
Equ7	0.474	0.454	0.489	0.417	0.313	0.253	0.223	0.464	0.412	0.238	0.388
Equ8	0.476	0.464	0.457	0.422	0.353	0.250	0.225	0.470	0.413	0.238	0.390
Equ9	0.478	0.463	0.446	0.417	0.374	0.254	0.223	0.471	0.414	0.239	0.391
Equ10	0.483	0.459	0.461	0.421	0.351	0.250	0.227	0.471	0.414	0.239	0.391
Avg	0.477	0.439	0.444	0.397	0.331	0.247	0.221	0.458	0.394	0.234	0.377
Uniform equations											
	U	U	U	U	U	U	U	U	U	U	U
Equ1	0.559	0.506	0.450	0.424	0.363	0.361	0.307	0.533	0.414	0.335	0.432
Equ2	0.565	0.503	0.457	0.422	0.353	0.334	0.347	0.535	0.413	0.341	0.434
Equ3	0.557	0.507	0.449	0.430	0.375	0.362	0.320	0.532	0.419	0.342	0.435
Equ4	0.549	0.515	0.469	0.438	0.375	0.355	0.300	0.532	0.429	0.329	0.437
Equ5	0.559	0.514	0.465	0.426	0.372	0.368	0.302	0.537	0.423	0.337	0.437
Equ6	0.594	0.529	0.464	0.413	0.339	0.355	0.297	0.563	0.408	0.327	0.439
Equ7	0.548	0.516	0.466	0.441	0.383	0.361	0.307	0.532	0.432	0.335	0.439
Equ8	0.580	0.523	0.473	0.430	0.348	0.325	0.327	0.552	0.420	0.326	0.439
Equ9	0.557	0.512	0.460	0.426	0.374	0.379	0.319	0.535	0.422	0.350	0.439
Equ10	0.564	0.520	0.470	0.431	0.368	0.358	0.310	0.543	0.425	0.335	0.440
Avg	0.561	0.512	0.458	0.424	0.359	0.347	0.298	0.537	0.416	0.324	0.432
Benchmark models											
AR1	0.581	0.581	0.581	0.581	0.567	0.567	0.567	0.581	0.576	0.567	0.575
AR4	0.618	0.595	0.595	0.595	0.570	0.570	0.570	0.606	0.587	0.570	0.588
naïve	0.780	0.777	0.777	0.777	0.715	0.715	0.715	0.778	0.757	0.715	0.751
avg 95-07	0.586	0.586	0.586	0.586	0.586	0.586	0.586	0.586	0.586	0.586	0.586

Table 18: RMSE – Construction

	M2 NQ	M3 NQ	M1 CQ	M2 CQ	M3 CQ	M1 LQ	M2 LQ	NQ	CQ	LQ	U
Monthly equations											
Equ1	0.816	0.824	0.773	0.782	0.632	0.594	0.529	0.820	0.732	0.563	0.716
Equ2	0.837	0.825	0.784	0.782	0.636	0.628	0.573	0.831	0.737	0.601	0.730
Equ3	0.835	0.826	0.789	0.786	0.647	0.629	0.576	0.830	0.744	0.603	0.734
Equ4	0.836	0.827	0.796	0.794	0.650	0.632	0.585	0.832	0.749	0.609	0.738
Equ5	0.826	0.829	0.797	0.799	0.652	0.635	0.588	0.827	0.753	0.612	0.739
Equ6	0.825	0.830	0.798	0.801	0.654	0.636	0.594	0.828	0.754	0.615	0.740
Equ7	0.849	0.830	0.799	0.802	0.654	0.637	0.594	0.840	0.755	0.616	0.744
Equ8	0.842	0.831	0.799	0.803	0.654	0.641	0.596	0.836	0.755	0.619	0.744
Equ9	0.843	0.832	0.799	0.803	0.655	0.642	0.597	0.837	0.755	0.620	0.745
Equ10	0.827	0.832	0.800	0.803	0.655	0.643	0.598	0.830	0.756	0.621	0.743
Avg	0.826	0.822	0.775	0.790	0.640	0.621	0.502	0.824	0.738	0.564	0.720
Quarterly equations											
	NQ	NQ	CQ	CQ	CQ	LQ	LQ	NQ	CQ	LQ	U
Equ1	0.825	0.825	0.773	0.863	0.740	0.594	0.576	0.825	0.794	0.585	0.750
Equ2	0.816	0.835	0.799	0.799	0.801	0.632	0.585	0.825	0.800	0.609	0.758
Equ3	0.826	0.830	0.797	0.801	0.801	0.629	0.606	0.828	0.800	0.617	0.761
Equ4	0.831	0.824	0.789	0.805	0.812	0.642	0.594	0.827	0.802	0.619	0.762
Equ5	0.836	0.834	0.805	0.794	0.810	0.628	0.616	0.835	0.803	0.622	0.766
Equ6	0.835	0.834	0.799	0.809	0.805	0.637	0.609	0.834	0.804	0.623	0.766
Equ7	0.837	0.835	0.803	0.803	0.808	0.644	0.603	0.836	0.804	0.624	0.767
Equ8	0.841	0.827	0.803	0.803	0.808	0.649	0.600	0.834	0.805	0.625	0.767
Equ9	0.827	0.834	0.815	0.782	0.817	0.651	0.600	0.830	0.805	0.626	0.766
Equ10	0.840	0.830	0.803	0.802	0.810	0.651	0.605	0.835	0.805	0.629	0.768
Avg	0.824	0.824	0.789	0.792	0.791	0.624	0.580	0.824	0.791	0.602	0.752
Uniform equations											
	U	U	U	U	U	U	U	U	U	U	U
Equ1	0.849	0.836	0.789	0.805	0.812	0.785	0.785	0.842	0.802	0.785	0.809
Equ2	0.923	0.938	0.891	0.889	0.685	0.653	0.632	0.931	0.827	0.642	0.812
Equ3	0.906	0.898	0.773	0.863	0.740	0.729	0.729	0.902	0.794	0.729	0.809
Equ4	0.846	0.838	0.796	0.812	0.825	0.785	0.785	0.842	0.811	0.785	0.813
Equ5	0.833	0.837	0.822	0.826	0.827	0.797	0.778	0.835	0.825	0.788	0.817
Equ6	0.874	0.851	0.805	0.794	0.810	0.814	0.772	0.863	0.803	0.794	0.818
Equ7	0.884	0.845	0.799	0.799	0.801	0.801	0.801	0.864	0.800	0.801	0.819
Equ8	0.926	0.935	0.900	0.873	0.707	0.690	0.662	0.931	0.831	0.676	0.821
Equ9	0.888	0.849	0.797	0.801	0.801	0.800	0.800	0.869	0.800	0.800	0.820
Equ10	0.871	0.897	0.830	0.840	0.778	0.752	0.752	0.884	0.816	0.752	0.819
Avg	0.847	0.836	0.781	0.782	0.734	0.714	0.703	0.841	0.766	0.708	0.773
Benchmark models											
AR1	1.077	1.044	1.044	1.044	1.092	1.092	1.092	1.061	1.061	1.092	1.070
AR4	1.109	1.104	1.104	1.104	1.134	1.134	1.134	1.106	1.114	1.134	1.118
naïve	1.361	1.324	1.324	1.324	1.582	1.582	1.582	1.343	1.415	1.582	1.445
avg 95-07	1.121	1.121	1.121	1.121	1.121	1.121	1.121	1.121	1.121	1.121	1.121

Table 19: RMSE – Services – direct approach

	M2 NQ	M3 NQ	M1 CQ	M2 CQ	M3 CQ	M1 LQ	M2 LQ	NQ	CQ	LQ	U
Monthly equations											
Equ1	0.157	0.150	0.131	0.127	0.116	0.118	0.118	0.153	0.125	0.118	0.132
Equ2	0.163	0.150	0.134	0.127	0.118	0.118	0.118	0.156	0.126	0.118	0.134
Equ3	0.164	0.150	0.134	0.127	0.119	0.119	0.119	0.157	0.127	0.119	0.134
Equ4	0.165	0.150	0.134	0.128	0.119	0.119	0.119	0.157	0.127	0.119	0.134
Equ5	0.164	0.150	0.134	0.128	0.119	0.120	0.119	0.157	0.127	0.120	0.135
Equ6	0.164	0.151	0.134	0.128	0.120	0.120	0.119	0.158	0.128	0.120	0.135
Equ7	0.164	0.151	0.135	0.128	0.120	0.121	0.120	0.158	0.128	0.120	0.135
Equ8	0.164	0.151	0.135	0.128	0.121	0.121	0.120	0.158	0.128	0.121	0.135
Equ9	0.164	0.152	0.135	0.129	0.121	0.121	0.120	0.158	0.128	0.121	0.136
Equ10	0.159	0.152	0.135	0.129	0.121	0.121	0.121	0.155	0.129	0.121	0.135
Avg	0.159	0.147	0.131	0.122	0.116	0.115	0.114	0.153	0.123	0.114	0.130
Quarterly equations											
	NQ	NQ	CQ	CQ	CQ	LQ	LQ	NQ	CQ	LQ	U
Equ1	0.163	0.154	0.135	0.129	0.120	0.118	0.118	0.158	0.128	0.118	0.135
Equ2	0.165	0.152	0.138	0.128	0.119	0.118	0.118	0.159	0.129	0.118	0.135
Equ3	0.169	0.154	0.139	0.128	0.120	0.119	0.119	0.162	0.129	0.119	0.137
Equ4	0.166	0.154	0.139	0.128	0.121	0.119	0.119	0.160	0.129	0.119	0.136
Equ5	0.165	0.156	0.137	0.127	0.124	0.120	0.120	0.160	0.130	0.120	0.137
Equ6	0.165	0.155	0.143	0.127	0.118	0.120	0.120	0.160	0.130	0.120	0.137
Equ7	0.164	0.156	0.143	0.127	0.119	0.121	0.121	0.160	0.130	0.121	0.137
Equ8	0.159	0.156	0.143	0.130	0.121	0.121	0.121	0.158	0.132	0.121	0.137
Equ9	0.168	0.150	0.146	0.132	0.116	0.121	0.121	0.159	0.132	0.121	0.137
Equ10	0.166	0.156	0.148	0.131	0.121	0.121	0.121	0.161	0.134	0.121	0.139
Avg	0.161	0.151	0.139	0.126	0.117	0.115	0.115	0.156	0.128	0.115	0.133
Uniform equations											
	U	U	U	U	U	U	U	U	U	U	U
Equ1	0.171	0.168	0.143	0.130	0.121	0.125	0.125	0.169	0.132	0.125	0.142
Equ2	0.175	0.169	0.146	0.132	0.116	0.122	0.122	0.172	0.132	0.122	0.142
Equ3	0.186	0.168	0.135	0.129	0.120	0.127	0.127	0.177	0.128	0.127	0.143
Equ4	0.178	0.173	0.148	0.135	0.119	0.120	0.120	0.175	0.134	0.120	0.144
Equ5	0.179	0.168	0.139	0.128	0.121	0.131	0.131	0.174	0.129	0.131	0.144
Equ6	0.181	0.171	0.138	0.128	0.119	0.130	0.130	0.176	0.129	0.130	0.144
Equ7	0.189	0.169	0.139	0.128	0.120	0.126	0.126	0.179	0.129	0.126	0.144
Equ8	0.182	0.168	0.137	0.127	0.124	0.132	0.133	0.175	0.130	0.132	0.145
Equ9	0.190	0.172	0.143	0.127	0.118	0.126	0.126	0.181	0.130	0.126	0.145
Equ10	0.187	0.179	0.143	0.127	0.119	0.126	0.126	0.183	0.130	0.126	0.146
Avg	0.181	0.169	0.139	0.126	0.117	0.124	0.124	0.175	0.128	0.124	0.142
Benchmark models											
AR1	0.201	0.202	0.202	0.202	0.197	0.197	0.197	0.201	0.200	0.197	0.200
AR4	0.183	0.199	0.199	0.199	0.192	0.192	0.192	0.191	0.197	0.192	0.194
naïve	0.222	0.253	0.253	0.253	0.234	0.234	0.234	0.238	0.247	0.234	0.241
avg 95-07	0.226	0.226	0.226	0.226	0.226	0.226	0.226	0.226	0.226	0.226	0.226

Table 20: RMSE - Trade and transportation services

	M2 NQ	M3 NQ	M1 CQ	M2 CQ	M3 CQ	M1 LQ	M2 LQ	NQ	CQ	LQ	U
Monthly equations											
Equ1	0.279	0.261	0.265	0.246	0.224	0.215	0.215	0.270	0.245	0.215	0.245
Equ2	0.280	0.267	0.271	0.249	0.224	0.216	0.216	0.273	0.249	0.216	0.247
Equ3	0.279	0.267	0.273	0.250	0.224	0.217	0.217	0.273	0.250	0.217	0.248
Equ4	0.280	0.267	0.273	0.253	0.225	0.217	0.217	0.273	0.251	0.217	0.249
Equ5	0.280	0.267	0.275	0.255	0.229	0.217	0.217	0.274	0.254	0.217	0.250
Equ6	0.281	0.267	0.275	0.255	0.234	0.226	0.221	0.274	0.255	0.223	0.252
Equ7	0.280	0.268	0.275	0.256	0.234	0.227	0.222	0.274	0.256	0.224	0.253
Equ8	0.280	0.269	0.275	0.256	0.242	0.228	0.224	0.274	0.258	0.226	0.254
Equ9	0.282	0.270	0.276	0.258	0.242	0.229	0.226	0.276	0.259	0.227	0.255
Equ10	0.282	0.270	0.276	0.258	0.245	0.229	0.228	0.276	0.260	0.229	0.256
Avg	0.269	0.257	0.266	0.247	0.217	0.204	0.207	0.263	0.244	0.206	0.240
Quarterly equations											
	NQ	NQ	CQ	CQ	CQ	LQ	LQ	NQ	CQ	LQ	U
Equ1	0.284	0.267	0.277	0.249	0.271	0.215	0.215	0.276	0.266	0.215	0.255
Equ2	0.289	0.261	0.282	0.253	0.271	0.216	0.216	0.276	0.269	0.216	0.257
Equ3	0.285	0.267	0.278	0.255	0.279	0.217	0.217	0.276	0.271	0.217	0.258
Equ4	0.284	0.268	0.285	0.266	0.262	0.217	0.217	0.276	0.271	0.217	0.258
Equ5	0.288	0.267	0.284	0.261	0.271	0.217	0.217	0.278	0.272	0.217	0.259
Equ6	0.279	0.275	0.275	0.262	0.279	0.227	0.221	0.277	0.272	0.224	0.261
Equ7	0.283	0.273	0.290	0.265	0.260	0.228	0.222	0.278	0.272	0.225	0.261
Equ8	0.282	0.274	0.287	0.246	0.283	0.226	0.226	0.278	0.273	0.226	0.262
Equ9	0.285	0.271	0.285	0.258	0.275	0.231	0.224	0.278	0.273	0.228	0.262
Equ10	0.283	0.273	0.285	0.258	0.275	0.229	0.229	0.278	0.273	0.229	0.263
Avg	0.278	0.263	0.276	0.250	0.266	0.205	0.206	0.271	0.264	0.205	0.251
Uniform equations											
	U	U	U	U	U	U	U	U	U	U	U
Equ1	0.293	0.270	0.277	0.249	0.271	0.272	0.272	0.282	0.266	0.272	0.272
Equ2	0.295	0.287	0.285	0.266	0.262	0.253	0.253	0.291	0.271	0.253	0.272
Equ3	0.295	0.272	0.282	0.253	0.271	0.271	0.271	0.284	0.269	0.271	0.274
Equ4	0.302	0.291	0.290	0.265	0.260	0.250	0.250	0.297	0.272	0.250	0.273
Equ5	0.300	0.286	0.284	0.261	0.271	0.262	0.262	0.293	0.272	0.262	0.275
Equ6	0.302	0.290	0.289	0.263	0.267	0.268	0.246	0.296	0.273	0.257	0.276
Equ7	0.291	0.271	0.285	0.258	0.275	0.276	0.276	0.281	0.273	0.276	0.276
Equ8	0.291	0.271	0.285	0.258	0.275	0.276	0.276	0.281	0.273	0.276	0.276
Equ9	0.294	0.284	0.282	0.264	0.275	0.267	0.267	0.289	0.274	0.267	0.276
Equ10	0.284	0.268	0.298	0.275	0.267	0.270	0.270	0.276	0.281	0.270	0.276
Avg	0.292	0.275	0.281	0.256	0.264	0.261	0.259	0.283	0.268	0.260	0.270
Benchmark models											
AR1	0.376	0.379	0.379	0.379	0.384	0.384	0.384	0.378	0.380	0.384	0.381
AR4	0.375	0.392	0.392	0.392	0.392	0.392	0.392	0.383	0.392	0.392	0.389
naïve	0.415	0.495	0.495	0.495	0.488	0.488	0.488	0.456	0.492	0.488	0.481
avg 95-07	0.404	0.404	0.404	0.404	0.404	0.404	0.404	0.404	0.404	0.404	0.404

Table 21: RMSE - Financial and business services

	M2 NQ	M3 NQ	M1 CQ	M2 CQ	M3 CQ	M1 LQ	M2 LQ	NQ	CQ	LQ	U
Monthly equations											
Equ1	0.295	0.286	0.243	0.248	0.232	0.231	0.231	0.290	0.241	0.231	0.253
Equ2	0.295	0.288	0.259	0.252	0.238	0.244	0.245	0.292	0.250	0.245	0.261
Equ3	0.296	0.288	0.266	0.258	0.242	0.246	0.246	0.292	0.256	0.246	0.264
Equ4	0.296	0.288	0.267	0.258	0.243	0.248	0.247	0.292	0.256	0.248	0.265
Equ5	0.296	0.288	0.270	0.260	0.244	0.248	0.248	0.292	0.258	0.248	0.266
Equ6	0.296	0.290	0.271	0.263	0.246	0.248	0.248	0.293	0.260	0.248	0.267
Equ7	0.296	0.290	0.272	0.263	0.246	0.249	0.248	0.293	0.260	0.248	0.267
Equ8	0.296	0.291	0.272	0.263	0.246	0.249	0.249	0.294	0.260	0.249	0.267
Equ9	0.296	0.291	0.272	0.263	0.246	0.249	0.249	0.294	0.261	0.249	0.267
Equ10	0.296	0.291	0.272	0.263	0.248	0.250	0.250	0.294	0.261	0.250	0.268
Avg	0.295	0.288	0.256	0.253	0.232	0.239	0.239	0.291	0.247	0.239	0.258
Quarterly equations											
	NQ	NQ	CQ	CQ	CQ	LQ	LQ	NQ	CQ	LQ	U
Equ1	0.297	0.286	0.266	0.248	0.238	0.231	0.231	0.292	0.251	0.231	0.258
Equ2	0.296	0.288	0.243	0.291	0.232	0.244	0.247	0.292	0.257	0.246	0.264
Equ3	0.295	0.288	0.276	0.252	0.243	0.246	0.246	0.292	0.257	0.246	0.265
Equ4	0.298	0.288	0.259	0.274	0.242	0.249	0.245	0.293	0.258	0.247	0.266
Equ5	0.296	0.290	0.267	0.260	0.251	0.248	0.248	0.293	0.259	0.248	0.266
Equ6	0.296	0.292	0.281	0.258	0.246	0.248	0.248	0.294	0.262	0.248	0.268
Equ7	0.297	0.290	0.271	0.266	0.251	0.248	0.248	0.294	0.263	0.248	0.268
Equ8	0.301	0.288	0.270	0.267	0.251	0.249	0.249	0.294	0.263	0.249	0.268
Equ9	0.297	0.292	0.285	0.258	0.246	0.249	0.249	0.294	0.264	0.249	0.269
Equ10	0.298	0.292	0.272	0.268	0.253	0.250	0.250	0.295	0.264	0.250	0.269
Avg	0.296	0.288	0.260	0.256	0.235	0.239	0.239	0.292	0.250	0.239	0.260
Uniform equations											
	U	U	U	U	U	U	U	U	U	U	U
Equ1	0.325	0.326	0.266	0.248	0.238	0.258	0.258	0.325	0.251	0.258	0.276
Equ2	0.304	0.291	0.278	0.270	0.267	0.268	0.268	0.297	0.272	0.268	0.278
Equ3	0.326	0.319	0.276	0.252	0.243	0.261	0.261	0.323	0.257	0.261	0.279
Equ4	0.305	0.320	0.270	0.267	0.251	0.265	0.265	0.312	0.263	0.265	0.279
Equ5	0.313	0.317	0.273	0.263	0.258	0.262	0.262	0.315	0.264	0.262	0.279
Equ6	0.308	0.323	0.271	0.266	0.251	0.264	0.264	0.315	0.263	0.264	0.279
Equ7	0.308	0.317	0.272	0.268	0.253	0.265	0.265	0.312	0.264	0.265	0.279
Equ8	0.327	0.305	0.287	0.265	0.249	0.256	0.256	0.316	0.268	0.256	0.279
Equ9	0.304	0.314	0.273	0.271	0.254	0.268	0.268	0.309	0.266	0.268	0.279
Equ10	0.302	0.318	0.272	0.270	0.256	0.268	0.268	0.310	0.266	0.268	0.280
Avg	0.305	0.309	0.269	0.259	0.247	0.260	0.260	0.307	0.258	0.260	0.274
Benchmark models											
AR1	0.331	0.330	0.330	0.330	0.330	0.330	0.330	0.331	0.330	0.330	0.330
AR4	0.302	0.306	0.306	0.306	0.306	0.306	0.306	0.304	0.306	0.306	0.305
naïve	0.389	0.425	0.425	0.425	0.462	0.462	0.462	0.407	0.438	0.462	0.437
avg 95-07	0.351	0.351	0.351	0.351	0.351	0.351	0.351	0.351	0.351	0.351	0.351

Table 22: RMSE – Other services

	U
Lag 3 of dep. var. and dlog of government consumption	0.141
AR1	0.147
AR4	0.144
naïve	0.176
avg 95-07	0.154

Table 23: RMSE – Agriculture

	U
AR4 with dummies for 2004Q1 and 2005Q1	1.463
AR1	2.501
AR4	1.965
naïve	3.077
avg 95-07	2.659

Table 24: RMSE – Taxes less subsidies on products

	U
AR1	0.725
AR4	0.714
naïve	1.082
avg 95-07	0.744

Table 25: RMSE – Services – indirect (bottom-up) approach

	M2 NQ	M3 NQ	M1 CQ	M2 CQ	M3 CQ	M1 LQ	M2 LQ	NQ	CQ	LQ	U
Monthly equations											
Equ1	0.161	0.150	0.129	0.131	0.123	0.119	0.119	0.156	0.128	0.119	0.134
Equ2	0.152	0.153	0.147	0.129	0.128	0.122	0.123	0.153	0.135	0.122	0.137
Equ3	0.167	0.156	0.134	0.135	0.131	0.118	0.118	0.162	0.133	0.118	0.138
Equ4	0.160	0.151	0.136	0.130	0.129	0.125	0.125	0.155	0.132	0.125	0.137
Equ5	0.162	0.150	0.142	0.132	0.126	0.124	0.125	0.156	0.134	0.124	0.138
Equ6	0.164	0.160	0.140	0.129	0.129	0.119	0.126	0.162	0.133	0.122	0.139
Equ7	0.166	0.152	0.138	0.140	0.122	0.134	0.125	0.159	0.134	0.129	0.140
Equ8	0.163	0.155	0.132	0.137	0.118	0.129	0.126	0.159	0.129	0.127	0.138
Equ9	0.165	0.148	0.141	0.136	0.137	0.123	0.119	0.157	0.138	0.121	0.139
Equ10	0.166	0.154	0.139	0.129	0.125	0.125	0.122	0.160	0.131	0.124	0.138
Avg	0.161	0.151	0.133	0.130	0.121	0.119	0.119	0.156	0.128	0.119	0.134
Quarterly equations											
	NQ	NQ	CQ	CQ	CQ	LQ	LQ	NQ	CQ	LQ	U
Equ1	0.163	0.149	0.144	0.126	0.130	0.119	0.119	0.156	0.134	0.119	0.137
Equ2	0.164	0.151	0.138	0.128	0.123	0.122	0.123	0.158	0.130	0.122	0.136
Equ3	0.166	0.155	0.141	0.136	0.132	0.118	0.118	0.161	0.137	0.118	0.139
Equ4	0.164	0.151	0.146	0.130	0.129	0.127	0.125	0.157	0.135	0.126	0.140
Equ5	0.168	0.160	0.138	0.127	0.127	0.125	0.125	0.164	0.131	0.125	0.139
Equ6	0.165	0.155	0.146	0.135	0.133	0.132	0.126	0.160	0.138	0.129	0.142
Equ7	0.166	0.154	0.149	0.127	0.128	0.130	0.125	0.160	0.135	0.127	0.141
Equ8	0.164	0.152	0.137	0.132	0.128	0.119	0.119	0.158	0.132	0.119	0.137
Equ9	0.165	0.155	0.156	0.132	0.133	0.131	0.126	0.160	0.141	0.128	0.143
Equ10	0.164	0.154	0.149	0.129	0.132	0.123	0.123	0.159	0.137	0.123	0.140
Avg	0.164	0.152	0.140	0.126	0.125	0.120	0.118	0.158	0.131	0.119	0.136
Uniform equations											
	U	U	U	U	U	U	U	U	U	U	U
Equ1	0.174	0.165	0.144	0.126	0.130	0.133	0.133	0.170	0.134	0.133	0.145
Equ2	0.168	0.163	0.146	0.128	0.132	0.131	0.131	0.166	0.136	0.131	0.144
Equ3	0.177	0.163	0.149	0.130	0.133	0.136	0.136	0.170	0.138	0.136	0.147
Equ4	0.176	0.179	0.148	0.126	0.128	0.128	0.128	0.178	0.134	0.128	0.147
Equ5	0.173	0.170	0.142	0.125	0.128	0.126	0.126	0.171	0.132	0.126	0.143
Equ6	0.176	0.177	0.147	0.126	0.123	0.139	0.129	0.177	0.132	0.134	0.147
Equ7	0.167	0.164	0.149	0.129	0.132	0.134	0.134	0.165	0.137	0.134	0.145
Equ8	0.163	0.151	0.151	0.133	0.136	0.137	0.137	0.157	0.140	0.137	0.144
Equ9	0.170	0.174	0.147	0.127	0.128	0.128	0.128	0.172	0.134	0.128	0.144
Equ10	0.167	0.165	0.153	0.134	0.133	0.133	0.133	0.166	0.140	0.133	0.146
Avg	0.169	0.165	0.145	0.126	0.128	0.130	0.129	0.167	0.133	0.130	0.143
Benchmark models											
AR1	0.201	0.202	0.202	0.202	0.197	0.197	0.197	0.201	0.200	0.197	0.200
AR4	0.183	0.199	0.199	0.199	0.192	0.192	0.192	0.191	0.197	0.192	0.194
naïve	0.222	0.253	0.253	0.253	0.234	0.234	0.234	0.238	0.247	0.234	0.241
avg 95-07	0.226	0.226	0.226	0.226	0.226	0.226	0.226	0.226	0.226	0.226	0.226

Table 26: RMSE – GDP with direct approach for services

	M2 NQ	M3 NQ	M1 CQ	M2 CQ	M3 CQ	M1 LQ	M2 LQ	NQ	CQ	LQ	U
Monthly equations											
Equ1	0.181	0.168	0.158	0.135	0.119	0.122	0.107	0.175	0.138	0.115	0.144
Equ2	0.174	0.178	0.163	0.142	0.114	0.126	0.117	0.176	0.141	0.122	0.147
Equ3	0.173	0.175	0.162	0.145	0.123	0.117	0.110	0.174	0.144	0.113	0.146
Equ4	0.176	0.177	0.159	0.143	0.123	0.120	0.114	0.177	0.143	0.117	0.147
Equ5	0.177	0.173	0.158	0.140	0.125	0.121	0.106	0.175	0.142	0.114	0.145
Equ6	0.177	0.176	0.160	0.143	0.117	0.125	0.111	0.176	0.141	0.118	0.146
Equ7	0.181	0.170	0.153	0.145	0.121	0.125	0.109	0.176	0.140	0.117	0.145
Equ8	0.172	0.173	0.165	0.149	0.125	0.123	0.096	0.173	0.147	0.111	0.146
Equ9	0.178	0.177	0.163	0.142	0.120	0.124	0.105	0.178	0.143	0.115	0.147
Equ10	0.182	0.173	0.161	0.142	0.118	0.123	0.109	0.178	0.142	0.116	0.146
Avg	0.176	0.173	0.158	0.139	0.119	0.120	0.105	0.174	0.140	0.113	0.144
Quarterly equations											
	NQ	NQ	CQ	CQ	CQ	LQ	LQ	NQ	CQ	LQ	U
Equ1	0.176	0.166	0.158	0.143	0.138	0.122	0.115	0.171	0.146	0.119	0.147
Equ2	0.176	0.165	0.160	0.147	0.143	0.125	0.118	0.171	0.150	0.122	0.149
Equ3	0.177	0.166	0.163	0.151	0.129	0.120	0.111	0.171	0.148	0.116	0.147
Equ4	0.175	0.164	0.157	0.143	0.137	0.125	0.115	0.170	0.146	0.120	0.146
Equ5	0.178	0.168	0.158	0.145	0.139	0.117	0.110	0.173	0.148	0.114	0.147
Equ6	0.178	0.169	0.168	0.143	0.127	0.123	0.114	0.174	0.147	0.119	0.148
Equ7	0.176	0.167	0.170	0.157	0.131	0.125	0.112	0.172	0.153	0.119	0.150
Equ8	0.183	0.178	0.163	0.151	0.131	0.125	0.113	0.181	0.149	0.119	0.151
Equ9	0.190	0.178	0.163	0.147	0.139	0.126	0.114	0.184	0.150	0.120	0.153
Equ10	0.177	0.167	0.166	0.156	0.138	0.128	0.116	0.172	0.154	0.122	0.151
Avg	0.177	0.167	0.160	0.146	0.132	0.121	0.112	0.172	0.147	0.116	0.147
Uniform equations											
	U	U	U	U	U	U	U	U	U	U	U
Equ1	0.205	0.184	0.160	0.153	0.138	0.131	0.127	0.195	0.151	0.129	0.159
Equ2	0.210	0.184	0.165	0.153	0.128	0.114	0.113	0.197	0.149	0.114	0.156
Equ3	0.211	0.184	0.162	0.159	0.145	0.132	0.130	0.198	0.155	0.131	0.163
Equ4	0.202	0.184	0.162	0.157	0.142	0.134	0.128	0.193	0.154	0.131	0.160
Equ5	0.203	0.179	0.161	0.151	0.138	0.134	0.128	0.191	0.150	0.131	0.158
Equ6	0.213	0.184	0.163	0.152	0.136	0.132	0.128	0.199	0.150	0.130	0.161
Equ7	0.209	0.185	0.166	0.155	0.137	0.126	0.122	0.197	0.153	0.124	0.160
Equ8	0.210	0.184	0.164	0.152	0.126	0.111	0.109	0.198	0.148	0.110	0.155
Equ9	0.207	0.185	0.164	0.150	0.133	0.130	0.124	0.197	0.150	0.127	0.159
Equ10	0.215	0.190	0.162	0.155	0.137	0.130	0.123	0.203	0.152	0.127	0.162
Avg	0.208	0.183	0.161	0.152	0.134	0.125	0.120	0.196	0.149	0.123	0.158
Benchmark models											
AR1	0.240	0.231	0.231	0.231	0.214	0.214	0.214	0.235	0.225	0.214	0.225
AR4	0.246	0.230	0.230	0.230	0.208	0.208	0.208	0.238	0.223	0.208	0.223
naïve	0.309	0.288	0.288	0.288	0.258	0.258	0.258	0.299	0.279	0.258	0.279
avg 95-07	0.249	0.249	0.249	0.249	0.249	0.249	0.249	0.249	0.249	0.249	0.249

Table 27: RMSE – GDP with indirect (bottom-up) approach for services

	M2 NQ	M3 NQ	M1 CQ	M2 CQ	M3 CQ	M1 LQ	M2 LQ	NQ	CQ	LQ	U
Monthly equations											
Equ1	0.176	0.170	0.150	0.138	0.111	0.113	0.098	0.173	0.134	0.106	0.139
Equ2	0.172	0.173	0.162	0.139	0.118	0.119	0.110	0.173	0.141	0.114	0.144
Equ3	0.182	0.170	0.168	0.142	0.120	0.119	0.114	0.176	0.145	0.116	0.147
Equ4	0.179	0.173	0.157	0.144	0.121	0.118	0.108	0.176	0.142	0.113	0.145
Equ5	0.179	0.170	0.169	0.150	0.127	0.122	0.109	0.175	0.150	0.116	0.149
Equ6	0.182	0.177	0.171	0.144	0.124	0.120	0.111	0.180	0.148	0.116	0.150
Equ7	0.183	0.174	0.165	0.152	0.120	0.123	0.107	0.179	0.147	0.115	0.149
Equ8	0.178	0.173	0.160	0.148	0.130	0.126	0.101	0.176	0.146	0.114	0.147
Equ9	0.184	0.174	0.173	0.150	0.130	0.118	0.103	0.179	0.152	0.111	0.150
Equ10	0.183	0.175	0.170	0.133	0.129	0.121	0.105	0.179	0.145	0.113	0.148
Avg	0.179	0.172	0.162	0.141	0.121	0.118	0.103	0.176	0.142	0.111	0.145
Quarterly equations											
	NQ	NQ	CQ	CQ	CQ	LQ	LQ	NQ	CQ	LQ	U
Equ1	0.181	0.171	0.170	0.146	0.149	0.113	0.102	0.176	0.155	0.108	0.150
Equ2	0.185	0.171	0.161	0.145	0.144	0.118	0.107	0.178	0.150	0.112	0.149
Equ3	0.184	0.174	0.166	0.161	0.149	0.123	0.115	0.179	0.159	0.119	0.155
Equ4	0.177	0.167	0.169	0.157	0.156	0.122	0.107	0.172	0.160	0.114	0.152
Equ5	0.186	0.175	0.171	0.160	0.158	0.118	0.108	0.180	0.163	0.113	0.156
Equ6	0.181	0.170	0.164	0.142	0.139	0.122	0.106	0.176	0.149	0.115	0.149
Equ7	0.184	0.173	0.180	0.164	0.146	0.125	0.108	0.178	0.164	0.116	0.156
Equ8	0.181	0.173	0.169	0.163	0.152	0.123	0.111	0.177	0.161	0.117	0.155
Equ9	0.184	0.178	0.176	0.153	0.151	0.127	0.108	0.181	0.160	0.118	0.156
Equ10	0.184	0.174	0.175	0.162	0.156	0.123	0.111	0.179	0.165	0.117	0.157
Avg	0.182	0.171	0.167	0.153	0.146	0.119	0.106	0.177	0.155	0.113	0.151
Uniform equations											
	U	U	U	U	U	U	U	U	U	U	U
Equ1	0.206	0.189	0.174	0.164	0.158	0.151	0.144	0.197	0.165	0.147	0.170
Equ2	0.210	0.191	0.172	0.162	0.140	0.126	0.125	0.200	0.158	0.125	0.164
Equ3	0.210	0.186	0.173	0.161	0.155	0.144	0.142	0.198	0.163	0.143	0.169
Equ4	0.207	0.201	0.179	0.167	0.159	0.149	0.141	0.204	0.168	0.145	0.173
Equ5	0.206	0.192	0.171	0.163	0.156	0.149	0.139	0.199	0.163	0.144	0.169
Equ6	0.216	0.199	0.175	0.161	0.149	0.147	0.134	0.207	0.162	0.140	0.171
Equ7	0.199	0.191	0.177	0.163	0.158	0.148	0.144	0.195	0.166	0.146	0.170
Equ8	0.207	0.181	0.173	0.155	0.135	0.121	0.118	0.195	0.155	0.120	0.159
Equ9	0.203	0.195	0.174	0.164	0.158	0.152	0.146	0.199	0.166	0.149	0.172
Equ10	0.200	0.183	0.170	0.161	0.152	0.142	0.135	0.192	0.161	0.139	0.165
Avg	0.205	0.189	0.172	0.160	0.150	0.141	0.134	0.198	0.161	0.137	0.166
Benchmark models											
AR1	0.240	0.231	0.231	0.231	0.214	0.214	0.214	0.235	0.225	0.214	0.225
AR4	0.246	0.230	0.230	0.230	0.208	0.208	0.208	0.238	0.223	0.208	0.223
naïve	0.309	0.288	0.288	0.288	0.258	0.258	0.258	0.299	0.279	0.258	0.279
avg 95-07	0.249	0.249	0.249	0.249	0.249	0.249	0.249	0.249	0.249	0.249	0.249

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