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2011

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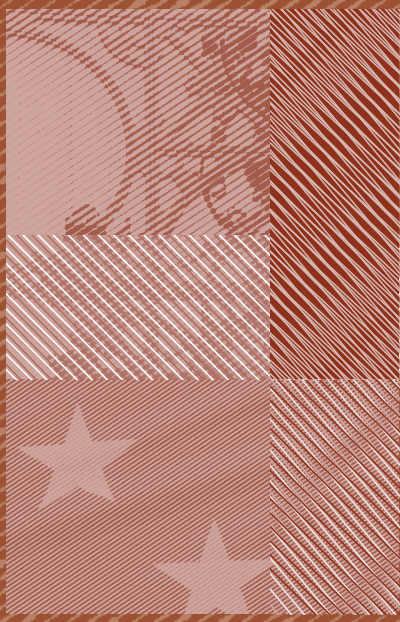

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Abstract

The evolution of Regional and Local governments' spending in Spain is currently under close scrutiny by national and international investors and analysts, international organizations and rating agencies. Indeed, some 50% of general government spending and some 70% of public employment are managed by Regions and Municipalities, which consequently have to bear a great portion of the overall fiscal consolidation plan currently under way. Despite recent efforts of the Spanish government at increasing transparency, the significant shortages of the existing data render the task of monitoring regional and local governments' public spending in real-time a complicated endeavor. Within this framework, we exploit all available short-term information on sub-national governments' spending from scattered sources, and find a subset of indicators usable for real-time policy analysis. In particular: (i) we compile a dataset on quarterly and monthly regional government's spending variables, by reviewing all available, scattered sources, and put together a database usable for economic and policy analysis; (ii) we exploit the compiled information, and other additional sources, by fitting time-series mixed-frequencies models to the data, and show the forecasting and monitoring capabilities of the selected short-term fiscal indicators; (iii) we show that official annual budgetary targets do present a reasonable forecasting performance when used as indicators of regional and local spending targets in national accounts terms, in particular when used in combination with time series indicators.

Keywords: Regional and local public finances; government expenditure; fiscal forecasting.

JEL classification: E17; E62; H68; H72.

Resumen

La evolución del gasto de las Comunidades Autónomas y Corporaciones Locales ha ido adquiriendo cada vez más relevancia y actualmente se encuentra en el punto de mira de inversores tanto nacionales como internaciones, analistas, organismos internacionales y agencias de calificación. Este interés está totalmente justificado ya que las Comunidades Autónomas y las Corporaciones Locales controlan el 50% del gasto de las Administraciones Públicas y cuentan con el 70% del empleo público. Por tanto, recae sobre ellas la mayor parte del ajuste requerido por el actual plan de consolidación fiscal. A pesar de los esfuerzos recientes del Gobierno español por aumentar la transparencia, existen todavía importantes limitaciones en la disponibilidad de datos necesarios para realizar un seguimiento en tiempo real del gasto público de las Comunidades Autónomas y Corporaciones Locales. En este contexto, se ha realizado una búsqueda, a través de diversas fuentes, de información de corto plazo referente al gasto público de los gobiernos subcentrales, encontrándose un conjunto de indicadores útiles para realizar análisis de políticas en tiempo real. En concreto: (i) se recopilan variables de gasto público de los gobiernos regionales a través de la revisión de todas las fuentes de datos disponibles, y en muchos casos dispersas, para construir una base de datos de frecuencia trimestral y mensual que resulte útil para realizar análisis económico y de políticas; (ii) se explota la información recopilada, conjuntamente con otras variables adicionales, a través de modelos de series temporales de frecuencias mixtas que se adecuen a los datos, para mostrar las capacidades predictivas y de seguimiento a corto plazo de los indicadores fiscales de corto plazo; (iii) se demuestra que los objetivos anuales oficiales incluidos en los presupuestos tienen una capacidad predictiva razonable cuando se emplean como indicadores del objetivo de gasto de las Comunidades Autónomas y Corporaciones Locales en Contabilidad Nacional, en particular cuando se utilizan en combinación con los indicadores de series temporales.

Palabras clave: Financiación autonómica y local; gasto público; predicción fiscal.

Códigos JEL: E17; E62; H68; H72.

1. Introduction

Over the period 2010 to 2014, the Spanish government plans to follow an extremely ambitious fiscal consolidation path that should lead to a reduction of the general government deficit by 7 points of GDP, with half of the fiscal restraint being borne by the central government, and the other half mostly by regions and municipalities. The latter layers of government manage jointly half of general government spending and two-thirds of public employment.[1] Within this framework, it is not surprising that the evolution of regional and local governments' spending is currently under close scrutiny by national and international investors and analysts, international organizations and rating agencies. For example, in the 10 March 2011 downgrade of Spain's government debt rating, Moody's justified its decision on the basis of two considerations, one of which was related to the challenges of the fiscal consolidation plans "*in part because of the uncertain fiscal outlook of some of the autonomous regional governments*". Also, in its placement of Spain's Aa2 ratings on review for possible revision of 29 July 2011, Moody's expressed again two considerations, one of which was "*the challenges posed to the government's fiscal consolidation efforts by the weak growth environment and the continued fiscal slippage among several regional governments"*.

Nevertheless, it is fair to say that regional and local governments' public finances only started to be the subject of close scrutiny by the markets as recently as mid 2010. The analysis of fiscal policy developments in Spain was typically confined to the examination of central government's accounts and central government's fiscal policy decisions. In this context, the sharp differences between available high-quality, easy-to-access short-term fiscal statistics pertaining to the central government, on the one hand, and the poor sub-national governments' short-term fiscal statistics, on the other hand, have created concerns on the implementation of fiscal adjustment plans by these levels of governments. The following quotation from the *Financial Times* may be helpful in providing an idea of market concerns in this respect: *"Is a 6 percent 2011 deficit realistically within reach for Spain? […] the part of the deficit which is apparently reducing at this point is the central government one: we are simply not being given the necessary information on the state of Autonomous Community and Local Authority finances to know whether their deficits are reducing, or even if they are increasing"* (FT, 4 October 2010).

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1 Spain is a highly decentralized country. The current Spanish Constitution (1978), in its second article, recognizes the rights to self-government of "regions and nationalities", within the Spanish nation. The 17 regional governments (*"Comunidades Autónomas"*) currently manage, among other competences, education (including universities), health and social services.

Aiming at increasing the transparency of fiscal accounts, the Spanish government published on 20 December 2010 regional governments' detailed public accounts' figures for 2010Q3. From that point on, a regular quarterly calendar has been followed. This newly available dataset has three virtues: it comprises homogeneous information for all regional governments, it is published, for the first time ever, at the quarterly frequency and, finally, it covers most government revenue and expenditure items.[2] Nevertheless, these newly published statistics still present some shortcomings that make them so far of limited use for economic analysis. First and foremost, the published figures cover a very limited period of time: as of August 2011 only the 2010Q3, 2010Q4 and 2011Q1 figures (and the growth rates with respect to the same periods of the previous year) had been made available to the public. Second, the statistical definitions used are not easy to reconcile with other sources of information on regional public finances, in particular the annual budgetary information that was regularly provided in the past, and the available within-the-year revenue statistics.

In the latter respect, regional and municipal revenue developments can be tracked reasonably well in real-time (within the year) by means of available monthly information on "shared taxes" [3] and (mainly) quarterly "ceded taxes" (own taxes) and other revenues. Nevertheless, the spending side of the budgets is not covered with such detail. Indeed, the weakest part of the Spanish statistics on the activities of the government is clearly on the availability of intra-annual data on sub-national governments' spending. Within this framework, we explore in our paper two approaches for monitoring the evolution of public spending by sub-national governments in the short-term by means of intra-annual fiscal data.

On the one hand, we follow a *direct* approach. Besides the newly published official information mentioned in a previous paragraph, some regional governments have been publishing quasi-regularly data on quarterly or monthly spending developments. Nevertheless, these data tend to be scattered

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[2] In fact, as signalled by Monasterio and Fernández-Llera (2008), under the 2007 reform of the Spanish national fiscal framework regions had to provide these data to the central government. For reasons not fully clear to us, this information was not made publicly available, though, until recently, and only with the limitations discussed in the text. The issue of the *transparency* of fiscal accounts was central to both the 2001 law regulating the national fiscal framework and its 2007 reform, but was not properly developed over the first decade of the 2000s (see also Monasterio and Fernández-Llera, 2004, 2010). On the benefits of data transparency as a device to improve fiscal discipline see González-Páramo (2001).

[3] These taxes are collected by the central government, but a given fraction of them is transferred to regional and local governments. In particular, since 2010, according to the most recent financial arrangement among the different levels of government, 50% of income taxes and 50% of VAT is due to sub-national governments each year.

among several different publication sources, are not homogeneous across regions, and do differ widely in both the time period covered and the spending items included. Thus it is not surprising to acknowledge that both international and national observers and analysts have ignored these figures. On the contrary, in our paper we take up an extensive data searching and processing task, being able to compile a database for a subset of 8 regions (including the three biggest ones in terms of public spending: Andalusia, Catalonia and Madrid).

On the other hand, we follow two *indirect* approaches. Firstly, we exploit the fact that, as mentioned before, there exist intra-annual statistics pertaining to the general government sector and the subsectors central and social security: thus, somehow sub-national governments' figures can be monitored as a residual difference (as implicitly done in Leal et al., 2011). Secondly, available indicators of sub-national governments' revenues (as mentioned above) and public deficits (change in quarterly debt, published by the Bank of Spain) can be used to monitor sub-national governments' spending developments, again as a residual.

In addition to intra-annual fiscal data, we analyze the use of annual regional government budgetary spending targets (in public accounts' terms) as indicators of the likely evolution of annual sub-national governments' spending in National Accounts terms (the official statistical definitions in which fiscal target are set in the framework of EU's fiscal rules). A priori, political economy arguments would advise against the use of governmental budgetary targets to anticipate the evolution of actual spending in a given year. On the other hand, though, had regions and municipalities been obliged to the strict fulfillment of targets, at least in the recent fiscal consolidation period, these targets would have provided useful information[4]. A final point linked to this discussion: the consideration of budgetary targets allows us to explore if the combination of "no policy change forecasts" (from time series models) and policy forecasts (that take into account forward-looking policy elements) contains more/less information than the two parts taken separately.

All in all, we make three contributions in our paper: (i) we compile a dataset on quarterly and monthly sub-national governments' spending variables, and indicators, by reviewing all available, scattered sources, and put together a database usable for economic analysis; (ii) we exploit the compiled information by fitting time-series, mixed-frequencies models to the data, and show the forecasting and monitoring capabilities of the selected short-term spending indicators[5]; (iii) we show that official

[4] On the properties of regional government's budgetary deviations from initial targets see Argimón and Martí (2006).

[5] For papers that use this type of models for short-term fiscal forecasting see Leal et al. (2011) and Pedregal and Pérez (2010). On related grounds see also Silvestrini et al. (2008) and Leal and Pérez (2005, 2009).

annual budgetary targets presented useful guidance as to the actual course of sub-national fiscal spending, in particular when combined with short-term indicators-based forecasts.

It is worth mentioning that in this paper we do not tackle the issue of estimating or monitoring sub-national governments' contingent liabilities or accounts payable, in particular in the health sector. This is an interesting and hot policy topic that even though being related to the theme of our paper, is nonetheless beyond its scope.

The rest of the paper is organized as follows. In Section 2 we first provide some stylized facts on annual sub-national governments' spending, in national accounts terms, over the period 1985-2010, and next we describe the construction of the dataset of monthly and quarterly indicators. In Section 3 we organize the available data using the lens of the *direct* and *indirect* approaches mentioned above, while in Section 4 we describe the empirical methodology and the empirical exercises performed. In Section 5 we show the results, and in Section 6 the main conclusions of our study.

2. Some stylized facts and description of the data

Some stylized facts based on annual data

Official public deficit targets are expressed in terms of annual National Accounts (NA henceforth) standards. These variables are the object of interest, and the subject of this study. In the case of regional and local governments (AATT from now on[6]) in Spain, the publication of public deficit targets following NA standards is not accompanied by a corresponding set of detailed government revenue and spending items. The latter are only available from the annual budgets of regional and local governments, and thus follow a different accounting standard, call it budgetary accounting (BA hereafter).[7]

The first panel of Figure 1 shows growth rates of regional governments' spending following NA standards over the period 1986-2010. In Figure 1, the underlying NA series follow the ESA95 (European System of National Accounts 1995) standards for the period 2000-2010 (base 2000) and 1995-1999 (base 1995), while for 1986-1994 it follows ESA79 and it is aggregated with local governments' spending. It is worth mentioning that the presented time period portrays several waves of decentralization of spending competences from the central and social security sectors to the regional

[6] We will use the acronym AATT (after *Administraciones Territoriales*) to refer to "regional and local governments" for the sake of simplicity.

[7] For a comparison of NA and BA figures for regional and local governments in Spain see also Argimón and Martí (2008).

and local levels. End-1980, 1995 and 2002 mark the milestones.[8] Thus, it is not strange to observe extra spending growth in these periods. Particularly sizeable was the 2002 devolution phase, by which all regions acquired the competences on health services. In the period 1985-2010 nominal spending growth was on average 11% per year, with significant decelerations in some crisis years (mid 1990s and, in particular, 2009-2010).

The second panel of Figure 1, in turn, displays the growth rates of NA figures together with annual BA figures. As regards the latter, two lines are added: the one available in real-time, i.e. budgeted figures in year t over budgeted figures in year t-1, and the ex-post final numbers (only available with a delay of 2 years). It is apparent from the chart that the growth rates based on final BA numbers trace better the evolution of NA growth rates. In fact, the simple correlation coefficient between NA growth rates (assuming a homogeneous NA time series for 1986-2009) and BA final figures is 0.86, while it drops to a, still reasonable, 0.65 when considering BA real-time annual figures (0.72 if the year 2002 is excluded).

Direct sources of information on intra-annual regional and local public spending developments

As previously stated, revenue and spending regional governments' annual plans/targets for a given year are only available timely through regional government's budgets and are thus expressed in BA. This fact poses the problem that BA targets are only an approximation to the concept of interest, NA targets (only available for the public deficit, but not for revenues or expenditures), but at the same time presents the advantage that all available intra-annual data are expressed in BA terms.

There are currently two pieces of available information on intra-annual regional government's spending developments in Spain. On the one hand, the Spanish government started to disseminate on December 2010 regional governments' detailed BA figures following a regular quarterly calendar. The data refer to the aggregate of the subsector and to all individual regions, include a significant disaggregation of spending items and are homogeneous across regions. Nevertheless, for the reasons mentioned in the Introduction, these figures still present some shortcomings that limit its usefulness for real-time economic analysis. On the other hand, some regional governments disseminate information through their institutional web pages – typically in PDF and for short periods of time in each individual publication –, the web page of the corresponding regional statistical institute and/or via hard paper publications. Given the dispersion of the available information, we had to make an

[8] See Gordo and Hernández de Cos (2001).

extensive search throughout all potential sources, the results of which are summarized in Table 1 (Panel 1). [9]

As apparent from Table 1 (Panel 1), we were only able to gather some aggregate measure of total spending for a limited number of regions, over a limited period of time, that even so can be considered representative of the regional government sector as a whole given that the three biggest regions are covered (Andalusia, Catalonia and Madrid) in addition to a number of smaller ones (Canary Islands, Cantabria, Castile-La Mancha, Castile and León and Galicia). The assumption, that has to be validated by empirical analysis, is that spending dynamics of this group of regions is representative of the total. We compiled quarterly series (when available, monthly series are converted into quarterly) for the period starting in the fourth quarter of 1990; when only a shorter period of intra-annual information is available, the corresponding 4th quarter observation is filled-in with annual data,[10] while the rest of the quarters are marked as missing observations. Turning to the details, we were able to compile quarterly series as of the 4th quarter of 1990 for Canary Islands and Castile and León, as of the 4th quarter of 1998 for Madrid[11] and Castile-La Mancha, as of the 4th quarter of 2001 for Galicia and Cantabria, and as of the 4th quarter of 2006 for Andalusia and Catalonia. In many cases there were missing points in some quarters within the mentioned time spans, due to changes in the frequency of the source publications over the considered time period.

Indirect sources of information

Table 1 (Panel 2) also displays other intra-annual variables pertaining to the regional and local government sectors, but not directly referred to public spending. In particular: (i) revenue indicators; (ii) quarterly public debt.

Table 2, in turn, describes the available sources of monthly and quarterly information for the sub-sectors of the general government other than local and regional, and also for the general government sector as a whole. For the Central government and the Social Security subsectors, short-term public finance statistics in Spain are published timely, with a broad coverage of budgetary categories. For the former, monthly figures in ESA95 (NA) standards covering all the relevant revenue and expenditure details are published within one month while for the latter monthly cash figures are made available with a short delay and cover both the Social Security System and the Public Employment System. At

[9] This information can be potentially incomplete because we might have overlooked sources of data, given the publication-by-publication cumbersome approach that we had to follow.

[10] The source of the annual data is the budgetary execution for that year.

[11] The regional statistical institute of Madrid published during the period 1995 to 2004 monthly consolidated spending figures (*"*crédito *actual o comprometido"*). Nevertheless this publication was discontinued in 2004, and thus these figures have not been included in the analysis.

the same time, quarterly NA-ESA95 figures for the overall general government sector are made available with a delay of up to 90 days.

For two reasons, in what follows, we will focus on the aggregate of regional and local government's spending (AATT henceforth), and will focus the attention on the latter aggregate. First, because annual figures are only available in aggregate terms (regional plus local) for the period prior to 1995; second, because, as will become clear in the next Section, indirect approaches that try to exploit the available intra-annual information for the overall general government sector and the central and social security sectors, only allows the study of AATT in a residual manner.

3. Approaches to monitor regional and local governments' spending: discussion and modeling approach

Direct approach: using information on intra-annual regional governments' spending

On the basis of the description of the available data, a first natural model is one that uses the "direct spending indicators" to anticipate NA annual spending developments. In such a way, we set up a multivariate mixed-frequencies time series model that combines: (i) annual NA nominal spending for the aggregate of the regional and local government, and (ii) individual spending variables built up for the BA spending of the regional governments of Andalusia, Catalonia, Madrid, Canary Islands, Cantabria, Castile-La Mancha, Castile and León and Galicia. The outputs of such a model are: (i) a quarterly interpolation of the input annual AATT NA nominal spending; (ii) quarterly AATT spending forecasts in NA terms.

The basic model is of the Unobserved Component Model class (Harvey, 1989; Pedregal and Young, 2002) that decomposes a set of time series in unobserved though meaningful components from an economic point of view (mainly trend, seasonal and irregular). For all the details on this model and the subsequent ones presented in this section, see Appendix A.

Indirect approach, model 1: using information on regional and local governments' revenues and the changes in their public debt

The change in quarterly public debt can be used to proxy the unobserved intra-annual developments of NA annual public deficit. In addition, the available revenue intra-annual indicators for the regional and local sectors can be used to anticipate unobserved intra-annual developments of the annual NA revenue series. Thus, we set up a multivariate mixed-frequencies time series model that combines the following regional and local governments' time series: (i) annual NA public revenues; (ii) annual NA public deficit; (ii) changes in quarterly public debt; (iii) quarterly revenue indicators. The outputs of such a model are quarterly interpolated series and projections of NA public revenues and deficit. The

difference between the revenue and the deficit series would provide the corresponding public spending numbers.

Indirect approach, model 2: using information for the general government, the central government and the social security sector

In principle, given the available intra-annual coverage of the general government, the central government and the social security sector, one possible approach could be to derive, almost following an accounting approach, a quarterly representation of the aggregate of regional and local governments' spending.[12] Nevertheless, a purely accounting approach would fail to account for the fact that monthly central government and social security data (apart from cash-accrual considerations) are not published in a consolidated way (i.e. are not published netting out transfers from/to the other sub-sectors). One may proxy a consolidation on the basis of existing information, but it would not be fully accurate. The same picture applies to annual NA data. Annual general government accounts in NA are a consolidated representation of the sum of all the sub-sectors: central, regional, local and social security; nevertheless, the annual accounts for the individual sectors as published by the budget office (IGAE) are not consolidated. Only the public deficit of the subsectors, by definition, is consolidated, in such a way that the sum of the deficit of the subsectors is equal to the general government deficit. Thus, on the basis of publicly available information it is not possible to net out individually the subsectors in order to properly account for, in particular, a consolidated AATT spending.

To overcome the problems posed by the issue of data consolidation, we propose to use the available data for the general government, the central government and the social security sector in a more indicator-like way. Thus, we set up a multivariate mixed-frequencies time series model that combines: (i) AATT annual NA total spending: (ii) quarterly NA general government total expenditure; (iii) monthly NA central government total expenditure; (iv) monthly cash social security total spending. The outputs of such a model are: (i) a quarterly interpolation of the input annual NA AATT spending; (ii) quarterly AATT spending forecasts in NA terms.

As a summary, in Figure 2 we chart a selection of the used indicators (at the annual frequency) and the variable of interest (AATT variables in NA terms) over the past three decades. The indicators seem to

[12] This is the approach followed by Leal et al. (2011). In their paper the aim is to forecast and monitor general government developments, on the basis of the information available for all its sub-sectors. Thus, given the available mix of data, the NA annual aggregate of regional and local governments is computed as a residual variable, after some corrections to account for breaks in the series due to the mentioned fiscal decentralization process. While this is a valid approach given the stated aims of that paper, in the current paper, given that the focus is on monitoring and forecasting sub-national government spending, we prefer to take a different approach, as discussed in the main text.

trace the evolution of the target variables reasonably well, and simple unconditional correlation coefficients show high values.

4. Empirical exercises and results

In-sample interpolation

The models presented in the previous section may serve two purposes. In-sample, it is possible to obtain quarterly AATT spending time series for the period subject to study. In itself, that interpolation exercise is useful, insofar as it fills-in a lag on the data availability front. Figure 3 displays the constructed quarterly time series using the three models at hand.[13]

Some salient features are the following: (i) the *direct approach* and the *indirect approach* that uses general, central and social security information, deliver similar quarterly growth rates over the whole sample period considered; (ii) the *indirect approach* that uses public debt and revenue indicators generates a more volatile profile in the period up to 2001Q4, maybe related to the fact that regional and local government debt was not too relevant in those years, while in the period 2002Q1-end it broadly traces the dynamics of the other two approaches.

In-sample interpolation would not be extremely useful for short-term monitoring if the out-of-sample, forecasting properties of the models were not up to certain standards. Therefore, in the next subsection we analyze the forecasting properties of the indicators.

Out-of-sample quantitative and qualitative forecasting exercises

We setup an out-of-sample, pseudo real-time, forecasting exercise, as follows: [14]

- *Forecast origins and forecast horizons*. We run each one of the models described in the previous section using as forecast origin the 1st, the 2nd, the 3rd and the 4th quarters of each year, to produce forecasts for the the current year and the next year (one year-ahead forecasts) horizons. We replicate this exercise for each one of the years of the time span 1999-2010. Thus we are able to evaluate 48 and 44 current year and one-year-ahead forecasts, respectively.
- *Timing convention.* At each origin, we recreate the information set that would have been available at each point of time. For the monthly information, we take a 2-month lag as a fair approximation

[13] Notice that for the three methods the year-on-year growth rate over a four-quarter moving sum in the fourth quarter is the same, and coincides with the annual. This is imposed in the number of aggregation constraints, to guarantee the consistency of input annual NA figures and the output quarterly NA series.

[14] The exercise is a *pseudo* real-time one in that we do not use different vintages of the data as published in each different date. Nevertheless, it resembles a real-time exercise in that we follow a real-time timing convention as regards data availability (see the main text for details).

of the real-time availability of monthly public spending indicators. For example, at the March origin, we take as the last monthly observation January. For monthly shared revenue indicators, a 1-month lag would be in accordance with the usual publication lags. In the case of public debt quarterly general government figures, a 1-quarter lag is assumed, following the usual publication calendar. As regards the availability of annual data, we assume that, in line with the standard publication practice, the yearly figure corresponding to year t-1 is only available in the second quarter of year t.

- *Simple benchmarks*. We check the forecasting performance of the mixed-frequencies models against two standard benchmark alternatives: an annual random walk approach and an annual random walk plus drift approach.

- *Official targets*. In addition, we contrast the performance of the model against the only official forecast available in real-time for an independent, non-governmental analyst/observer: regional spending as presented in regional governments' budgetary plans. The latter are typically approved in the course of the last quarter of each year, and are almost always expressed in BA terms (not NA). Also, budget plans for year t+1 are presented by regional governments in comparison with the budget plans for the current year (year t), given that at the time of preparation of the budget for t+1 the final budgetary execution in year t is not yet known. Thus, budget plans can be considered as a forecast for next year (one-year-ahead) with forecast origin in the 4th quarter of the current year. Budgeted figures for t+1 can be expressed in terms of rates of growth with respect to budgeted figures for year t. In our forecasting exercise we apply the so computed growth rate of budgetary spending to the available NA AATT historical annual spending figure (see timing convention) to compute a projection of AATT spending in NA terms. [15]

- *Combination*. We construct a final forecasting alternative by combining the projections based on official budgetary plans and the most-successful the time-series alternative (as will become clear in the subsequent analysis). This approach is worth exploring given that time series models provide "no policy change forecasts" (i.e. forecasts fully driven by the observed data to date, with

[15] An aggregate of regional budgets is provided with a certain lag by the official institute IGAE. It is also possible to compile an aggregate on the basis of the budgets of individual regions with some effort (by checking the web pages of the 17 regions). As regards Municipal budgets, no official aggregate is made available by the government. Theoretically, a similar approach as the one we took with regional budgets (aggregate individual institutions' budgets) could have been followed. Nevertheless, in practical terms, it turned out to be such a cumbersome task that, given the number of individual municipalities (even disregarding a fraction of them) and the difficulties in accessing the relevant information, we decided not to pursue it to the end.

no forward-looking information) and official targets provide "policy forecasts" (that embed forward-looking elements).

- *Levels and growth rates*. With all the alternative models described we project the level of the relevant variables. On the basis of these projected levels, and the historical NA figures, we compute growth rates of the relevant variables when needed.

Table 3 presents some basic quantitative results. We show the Root Mean Squared Errors (RMSEs) for each alternative model, at each forecasting horizon, in all cases relative to the annual random walk alternative. The following results are worth highlighting: (i) all the models outperform the annual RW alternative, thus showing the value added of exploiting intra-annual AATT information; (ii) contrary to what would have been expected, model's forecast accuracy is better in many instances for next-year horizons than for current year horizons, probably signaling that short-run information is more noisy than it would have been desired; (iii) forecasts prepared from forecast origins closer to the forecast horizons show a better forecast record overall; nevertheless, in many instances Q2 and Q3 information do not seem to provide much valuable information for current year forecasts; (iv) among the model-based alternatives, the ones based on direct AATT data shows the best performance at all horizons; (v) in fact, the latter model is the one closer to annual budgetary plans, and the only one that beats them in many cases; (vi) in this respect, it is worth noting that the approach of using annual budgetary spending plans to forecast the growth rate of spending in NA terms seems to be a reasonable approach, even though it cannot be updated within the year; (vii) the combination approach is clearly the best among all the presented alternatives; (viii) the exclusion of 2010 improves time series models' performance by the range 10% to 20% in the current year forecast cases.

Points (vi) and (vii) above reveal the fact that all time series models produce no policy change forecast. Model forecasts are purely based on past data, and most recent data weigh little in the overall estimation. This is important in the face of structural policy changes like the one witnessed at the end of the sample in which the average 1984-2008 growth of AATT spending of 10% was reduced to 5% in 2009 and down to -2% in 2010. Even in this situation the time series models performed reasonably well, in particular the *direct* approach. As regards the *indirect* approach based on revenue indicators, a reason why its track record is the worst might be reflecting the fact that 2008, 2009 and 2010 are years affected by significant transitory events affecting the link between BA and NA figures, linked to a change in the calendar of intra-governmental revenue transfers.

The best forecast performance of the *combination* approach between *direct* (no policy change) and budgetary-target-based (policy assumed to hold) forecasts has important policy implications. First, pursuing such an approach in real-time would allow for an update of official plans within the year. Second, it would allow having a (no-policy-change) forecast when budgetary figure still not available.

Table 4, in turn, presents some basic qualitative results. In the table we show a directional accuracy test, the number of correctly predicted changes in the growth rate, i.e. if the growth rate of spending is to accelerate or decelerate. The percent of correctly predicted changes in the growth rate of spending amounts to some 40% in the current-year forecasts, and up to some 50-60% for one-year-ahead horizons. Projections based on official targets fare worse than the average in this qualitative exercise, while forecasts produced using the *direct* approach are the best.

A real-time example

To give a flavor of the usefulness of the models in real-time, we recreate the significant deceleration of AATT spending that took place since the end of 2007. The economic and financial crisis amounted to a significant reduction in AATT spending growth, from 10.5% in 2007 (in line with the average of the previous 20 years), to 8.7% in 2008, 4.9% in 2009 and -2.2% in 2010. This pattern reflects the strong inertia of the public spending managed by AATT (mostly focused on education and health), the fiscal stimulus plans put in place in 2008 and 2009, and the subsequent fiscal retrenchment put in place by all levels of the general government as of June 2010. In the latter date, the government announced significant consolidation measures because the execution of central and AATT fiscal accounts was not considered to be restrictive enough by financial markets and EU partners.

The detection of the drastic change in spending dynamics over 2007-2010 represents a challenge to models based on time series data, given that they weigh heavily on past information, and only internalized drastic changes through incoming data. The forecasts based on official budgetary targets and the combination approach should be able to better capture the break.

In each panel of Figure 4 we show the *pseudo* real-time forecasts produced for a given year (2007, 2008, 2009 and 2010, respectively) from eight consecutive forecast origins (the 10 quarters right before the end of the year being forecast).

Thus, in the first panel of the figure we show the forecasts for 2007 computed on the basis of the information available in 2006Q1 to 2007Q4 (following the timing convention described in the previous section). The *direct* approach forecasts showed adaptation over time as new information became available to approach the ex-post actual figure of 10%, from a 5% forecasts in the 2006Q1, one-year-ahead forecast, to the 9% of the 2007Q4, current-year forecast. The *indirect* approach shown approached fairly well the actual figure from almost all forecast origins. The forecasts based on official budgetary targets, in turn, were far from the ex-post, actual figure from all the available origins, most likely reflecting the spending overruns witnessed in the second half of the 2000s lead by buoyant tax revenues.

The second panel of the figure presents forecasts for the year 2008. Again, the *direct* approach, starting from far-off one-year-ahead forecasts in 2007Q1, gets closer to the ex-post, actual figure in an almost monotonic fashion to produce quite accurate forecasts as of 2008Q2. *Indirect* approach forecasts for 2008 show a sum of squared errors that is 40% lower than the *direct* approach, because one-year-ahead forecasts for the two longest horizons were quite accurate; nevertheless, current-year forecasts over-predicted the actual figure, also in line with official-targets-based projections after the 2007 initial release of NA data was known (in 2008Q2).

Both the *direct* approach and the approach based on official budgetary targets present a reasonable set of projections, from all origins, for the year 2009. In particular, as it would have been expected, predictions based on short-term regional governments' spending indicators for the current year computed on the basis of the information available in the second half of 2009.The *indirect* approach, though, only shows sensible forecasts as of the second half of 2009; projections computed from forecasts origins within the range 2008Q1-2009Q2 anticipated a growth rate of spending close to or in excess of 10%, against the ex-post, actual figure of 5%, most likely *misled* by the information of central and general government spending figures, influenced by sizeable stimulus measures.

Finally, the lower right panel presents forecasts prepared for 2010 from forecast origins 2009Q1-20010Q4. The chart is interesting because it shows how time-series based models did not adjust drastically to the severe change in policy witnessed in 2010 (reduction of NA spending from 5% in 2009 to -2% in 2010) until the third quarter of 2010, after a huge pick-up in 2010Q1-based predictions. Indeed, forced in part by doubts in sovereign debt markets, that spur a reaction by the EU Commission and some EU partner countries, the Spanish government had to harden its initially milder fiscal consolidation plan for 2010 as of 2010Q2 (Central government measures) and, especially, as of 2010Q3 (measures affecting the General Government). Forward looking projections embedded in budgetary targets, prepared at the end of 2009 anticipated part of the deceleration in spending. In any case, even though a substantial deceleration in AATT spending was captured within 2010 by most models, none of the analyzed alternative approaches anticipated the negative growth rate in NA spending shown by ex-post NA data. A possible explanation for this discrepancy lies in the substantial differences between NA and BA figures observed in 2010, due to the implementation of the reformed financial arrangement between AATT and the central government and other statistical transitory factors.

5. Conclusions

We construct a dataset on regional government's indicators from raw sources of data, and evaluate their information content. In addition, we also compile other relevant intra-annual information from indirect data sources, firstly directly related to the regional and local government sectors (revenue and

public debt) and secondly pertaining to other subsectors of the general government and the aggregate general government sector directly. On the basis of these information sources, we built up alternative time-series mixed-frequencies models and perform pseudo real-time forecasting exercises.

Our results show that available intra-annual information on regional and local governments' spending seems to contain relevant information, usable for real-time monitoring of aggregate NA sub-national government spending. Thus, even though transparency is not a strength of available intra-year fiscal information pertaining to AATT governments in Spain, our investigation shows that on the basis of publicly available information it is possible to compile a fair amount of data usable for short-term monitoring activities. In addition, we show that official annual budgetary targets do contain information useful to anticipate the actual course of AATT spending in NA terms, in particular when used in conjunction with time series indicators.

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Appendix A. Approaches to monitor regional and local governments' spending: models

The basic model is of the Unobserved Component Model class known as the Basic Structural Model (Harvey, 1989), that decomposes a set of time series in unobserved though meaningful components from an economic point of view (mainly trend, seasonal and irregular). The model is multivariate, and may be written as equation (1), where *t* is a time sub-index measured in quarters,

$$\begin{bmatrix} \mathbf{z}_t \\ \mathbf{u}_t \end{bmatrix} = \mathbf{T}_t + \mathbf{S}_t + \mathbf{D}\mathbf{y}_t + \mathbf{v}_t \tag{1}$$

$[z^t\ u^t]^T$, T_t, S_t, D, y_t and v_t, denote the *m* dimensional output time series (broken down into the variables that requires time aggregation, $\mathbf{z}_t$, and indicators, $\mathbf{u}_t$), trend, seasonal, a block of linear regression terms to deal with exogenous intervention effects on a set of dummy variables (y_t) and irregular components, respectively. Equation (1) is in fact a set of observation equations in a State Space system, which has to be completed by the standard transition or state equations. The state equations qualify the dynamic behaviour of the components, and a full model may be built by block concatenation of the individual components. The transition equations for models of the trend and seasonal components are a Local Linear Trend and the Trigonometric Seasonal in equation (2), where $\mathbf{D}_t$ and $\mathbf{S}_{it}'$ are additional states necessary to define the components; **I** and **0** are the identity matrix and a square block of zeros of dimension m; $\mathbf{w}_j$ and $\mathbf{w}_j'$ (j=0, 1, 2) are multivariate Gaussian white noises serially independent and independent of each other; and ω_i (j=0, 1, …, 6) are the fundamental frequency of the seasonal component and its harmonics.

$$\begin{cases} \text{Trend}: & \begin{pmatrix} \mathbf{T} \\ \mathbf{D} \end{pmatrix}_t = \begin{pmatrix} \mathbf{I} & \mathbf{I} \\ \mathbf{0} & \mathbf{I} \end{pmatrix} \begin{pmatrix} \mathbf{T} \\ \mathbf{D} \end{pmatrix}_{t-1} + \begin{pmatrix} \mathbf{I} & \mathbf{0} \\ \mathbf{0} & \mathbf{I} \end{pmatrix} \begin{pmatrix} \mathbf{w}_0 \\ \mathbf{w}_0' \end{pmatrix}_t \\ \text{Seasonal}: & \mathbf{S}_t = \sum_{i=1}^{2} \mathbf{S}_{i\,t}; \qquad i = 1,2 \\ & \begin{pmatrix} \mathbf{S}_i \\ \mathbf{S}_i' \end{pmatrix}_t = \begin{pmatrix} \cos\omega_i \mathbf{I} & \sin\omega_i \mathbf{I} \\ -\sin\omega_i \mathbf{I} & \cos\omega_i \mathbf{I} \end{pmatrix} \begin{pmatrix} \mathbf{S}_i \\ \mathbf{S}_i' \end{pmatrix}_{t-1} + \begin{pmatrix} \mathbf{I} & \mathbf{0} \\ \mathbf{0} & \mathbf{I} \end{pmatrix} \begin{pmatrix} \mathbf{w}_i \\ \mathbf{w}_i' \end{pmatrix}_t, \quad \omega_i = \frac{2\pi i}{4} \end{cases} \tag{2}$$

The model including all the components model may be written in compact form as a composite of a set of Transition and Observation Equations, like equation (3) written in compact form (see details in Harvey, 1989; Pedregal and Young, 2002),

$$\begin{cases} \mathbf{x}_t = \mathbf{\Phi}\mathbf{x}_{t-1} + \mathbf{\Gamma}\mathbf{y}_t + \mathbf{E}\mathbf{w}_t: & \text{Transition Equations} \\ \begin{bmatrix} \mathbf{z}_t \\ \mathbf{u}_t \end{bmatrix} = \begin{bmatrix} \mathbf{H} \\ \mathbf{H}^u \end{bmatrix} \mathbf{x}_t + \mathbf{D}\mathbf{y}_t + \begin{bmatrix} \boldsymbol{\varepsilon}_t \\ \mathbf{v}_t \end{bmatrix}: & \text{Observation Equations} \end{cases} \tag{3}$$

System (3) is exactly equivalent to a model in which the state vector is extended to include the output variables and the vector of transition noises is also extended with the corresponding observed noises. Such model is (4) with C_t=1.

$$\begin{bmatrix} \mathbf{z}_t \\ \mathbf{x}_t \end{bmatrix} = \begin{bmatrix} \mathbf{C}_t \otimes \mathbf{I} & \mathbf{H}\boldsymbol{\Phi} \\ \mathbf{0} & \boldsymbol{\Phi} \end{bmatrix} \begin{bmatrix} \mathbf{z}_{t-1} \\ \mathbf{x}_{t-1} \end{bmatrix} + \boldsymbol{\Gamma}\mathbf{y}_t + \begin{bmatrix} \mathbf{I} & \mathbf{HE} \\ \mathbf{0} & \mathbf{E} \end{bmatrix} \begin{bmatrix} \boldsymbol{\varepsilon}_t \\ \mathbf{w}_t \end{bmatrix}$$
$$\begin{bmatrix} \mathbf{z}_t \\ \mathbf{u}_t \end{bmatrix} = \begin{bmatrix} \mathbf{I} & \mathbf{0} \\ \mathbf{0} & \mathbf{H}^u \end{bmatrix} \begin{bmatrix} \mathbf{z}_t \\ \mathbf{x}_t \end{bmatrix} + \mathbf{D}\mathbf{y}_t + \begin{bmatrix} \mathbf{0} \\ \mathbf{I} \end{bmatrix} \mathbf{v}_t \tag{4}$$

The main question now is temporal aggregation, i.e. variables $\mathbf{z}_t$ are sampled annual, while $\mathbf{u}_t$ are quarterly sampled, and the annual data is the addition of the three quarters counterparts, were they available. A general treatment of time aggregation in these circumstances (even when $\mathbf{z}_t$ is sampled at irregular intervals, like annual in some part of the sample and quarterly in another part) is by selecting an appropriate accumulating variable C_t, defined in equation (5).

$$\mathbf{C}_t = \begin{cases} 0, & t = \text{every sample where data is found} \\ 1, & \text{otherwise} \end{cases} + 1 \tag{5}$$

Equation (4) with the definition in (5) is in fact written exactly with the same structure of (3), with the only differences that the transition matrix Φ is time varying and the noises in the transition and observation equations are contemporaneously correlated. Bearing in mind these two facts, all methods applicable to system (3) may be applied to system (4) or (6) below. System (4) may be then written as

$$\begin{cases} \mathbf{x}_t^* = \boldsymbol{\Phi}_t^* \mathbf{x}_{t-1}^* + \boldsymbol{\Gamma}\mathbf{y}_t + \mathbf{E}^* \mathbf{w}_t^* : & \text{Transition Equations} \\ \mathbf{z}_t^* = \mathbf{H}^* \mathbf{x}_t^* + \mathbf{D}\mathbf{y}_t + \mathbf{v}_t^* : & \text{Observatio n Equations} \end{cases} \tag{6}$$

Some further comments apply to the general formulation. First, terms affecting the dummy variables are necessary, because of some abnormal events found in the data. Such effects may be introduced simply by the term Dy_t in the observation equation when they affect the indicator variables, but necessarily have to be introduced in the transition equation Γy_t when they affect the output variables, in order to take into account the time aggregation constraints. Second, bearing in mind that the output variable (namely the AATT total expenditure, measured in NA terms) is only available for the end of the year (one observation per year), it is impossible to identify any seasonal pattern from it, due to the time aggregation constraint. Therefore, the seasonal model for the first variable in all models below is not present. Third, for models with more than one indicator (i.e. non-scalar u_t), the seasonal components are assumed independent of each other: This is a fair hypothesis given the different accounting standards used in each case.

Take as an example a bivariate model in which only one indicator is in place and there are no intervention effects. Then, the system matrices in (6) are:

$$\boldsymbol{\Phi}_t^* = \left[\begin{array}{c|cccc|cccc} C_t & 1 & 0 & 1 & 0 & 0 & 0 & 0 & 0 \\ \hline 0 & 1 & 0 & 1 & 0 & 0 & \cdots & & 0 \\ & 0 & 1 & 0 & 1 & \vdots & \ddots & & \vdots \\ & 0 & 0 & 1 & 0 & & & & \\ & 0 & 0 & 0 & 1 & 0 & \cdots & & 0 \\ \hline \vdots & 0 & \cdots & & 0 & 0 & 1 & 0 & 0 \\ & \vdots & \ddots & & \vdots & -1 & 0 & 0 & 0 \\ & & & & & 0 & 0 & -1 & 0 \\ 0 & 0 & \cdots & & 0 & 0 & 0 & 0 & -1 \end{array}\right] = \left[\begin{array}{ccc} C_t & \boldsymbol{\Phi}_a & \mathbf{0} \\ \mathbf{0} & \boldsymbol{\Phi}_T & \mathbf{0} \\ \mathbf{0} & \mathbf{0} & \boldsymbol{\Phi}_S \end{array}\right]$$

where C_t and Φ_a deals with the time constraints, Φ_T is the block concerning the trends and Φ_s is the block assigned to the seasonal component. Similarly,

$$\mathbf{E}^* = \left[\begin{array}{ccc} 1 & \mathbf{P} & \mathbf{0} \\ \mathbf{0} & \mathbf{I}_4 & \mathbf{0} \\ \mathbf{0} & \mathbf{0} & \mathbf{I}_4 \end{array}\right] \text{ and } \mathbf{H}^* = \left[\begin{array}{c|cccc|cccc} 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 & 1 & 0 & 1 & 0 \end{array}\right]$$

with P = [1 0 0 0] and I_4 $\mathbf{I}_4$ is an identity matrix of dimension 4. A final point is that $w_t^* = [\boldsymbol{\varepsilon}_t \; w_t]$ and $v_t^* = [0 \; v_t]$ are the system noises, that by construction are correlated with each other because in the initial system (3) $\boldsymbol{\varepsilon}_t$ and v_t are correlated.

Direct approach: using information on intra-annual regional governments' spending

This model is bivariate, exactly as the one shown after equation (6) above, with z_t^* composed of the annual AATT expenditure in NA terms and the sum of the quarterly BA expenditure indicators. Since the information for each one of the indicators is compiled at irregular time intervals (therefore subject to time aggregation) and is full of missing observations (see Table 1, Panel 1), it is necessary to initially proceed to the interpolation of the missing quarterly observations for the indicators. In a first step each one of the eight indicators is separately interpolated (individual models are fitted to avoid curse-of-dimensionality problems), while in a second step the eight so-interpolated indicators are added up to build the aggregate indicator used in the model. The interpolation is carried out on the basis of a univariate version of model (6), i.e.

$$\boldsymbol{\Phi}_t^* = \left[\begin{array}{c|cc|cccc} C_t & 0 & 0 & 0 & 0 & 0 & 0 \\ \hline 0 & 1 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 & 0 & 0 \\ \hline 0 & 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & -1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -1 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & -1 \end{array}\right], \quad \mathbf{E}^* = \left[\begin{array}{c|cc|cccc} 1 & 1 & 0 & 0 & 0 & 0 & 0 \\ \hline 0 & 1 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 & 0 & 0 \\ \hline 0 & 0 & 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 1 \end{array}\right],$$

$$\mathbf{H}^* = 1\left|\begin{array}{cc|cccc} 0 & 0 & 0 & 0 & 0 & 0 \end{array}\right., \quad \mathbf{w}_t^* = \varepsilon_t \quad \mathbf{w}_t \quad \text{and} \quad \mathbf{v}_t^* = 0.$$

Indirect approach, model 1: using information on regional and local governments' revenue and public debt

We first built up a model for the public deficit. This model is a bivariate model of type (6) above, with z_t^* composed of the annual AATT public deficit in NA terms and the first difference of the quarterly AATT public debt. The model is exactly the one shown after equation (6), with two step interventions for the indicator variable at the last quarters of 2008 and 2009 years. Similarly a model for AATT revenues is built up, with z_t^* composed of annual AATT revenues in NA terms and the quarterly revenue indicator ceded taxes with some taxing power (*Tributos Cedidos)* described in Table 1, Panel 2. On the basis of the quarterly outputs of the deficit and revenue models, a quarterly AATT expenditure indicator can be constructed by taking the difference of both.

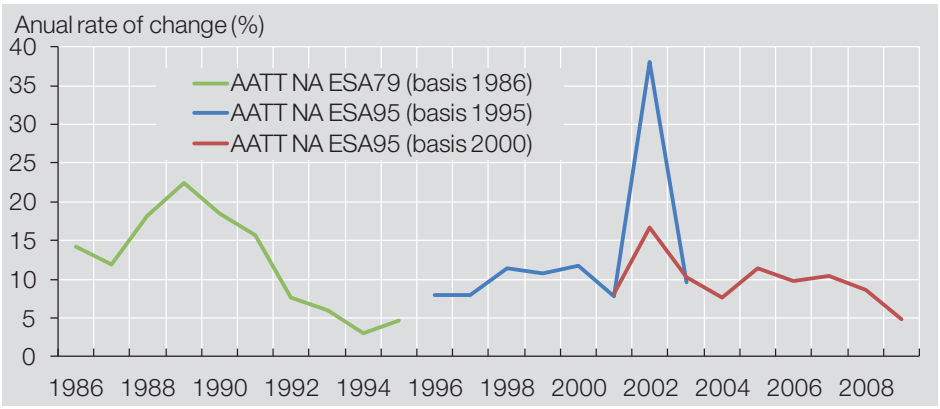
Indirect approach, model 2: using information for the general government, the central government and the social security sector

In order to interpolate annual NA AATT spending, this model incorporates the following indicators: (i) overall general government spending in NA terms (annual up to 2000 and quarterly afterwards); (ii) central government quarterly total expenditure in BA terms; (iii) Social Security total expenditure in BA terms (sum of the expenditure of the Social Security System and the expenses of the Public Employment Services).

The precise structure of the system matrices is an extension to four variables of the bivariate example given after equation (6) with two aggregating variables for the first and second variables (annual NA AATT spending, and annual-quarterly NA general government spending), that need time aggregation. Additionally, an intervention step at the first quarter of year 2002 is necessary in order to take into account the level change in some of the indicator variables (due to the implementation of a new financial system between the central and the AATT sectors).

Figure 1. Sub-national (aggregate of regional and local) governments' spending. The variable plotted follows National Accounts' (NA) definitions (ESA79 and ESA95 vintages, for the subsequent statistical bases) in Panel 1, and is plotted against budgetary indicators in Panel 2.

Panel 1: Sub-national government spending in NA



Panel 2: Sub-national government spending in NA and budgetary statistics (initial budgets and liquidations)

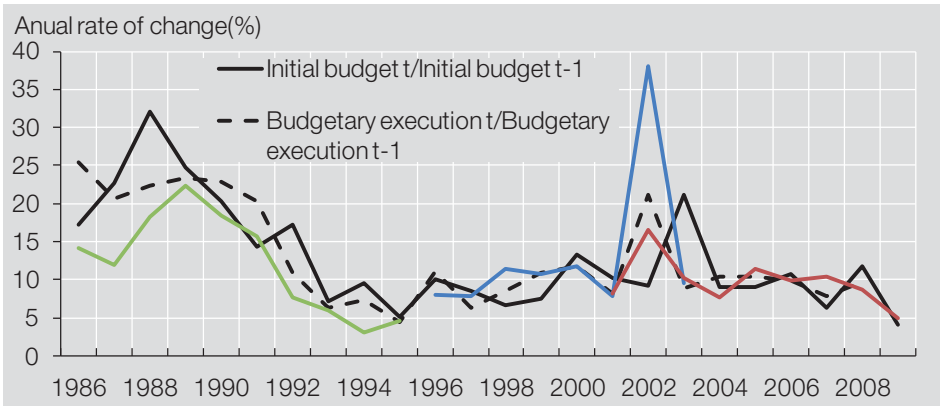


Figure 2: Variables of interest and their corresponding indicators. All variables are plotted at the annual frequency (quarterly and monthly series have been aggregated to the annual frequency).

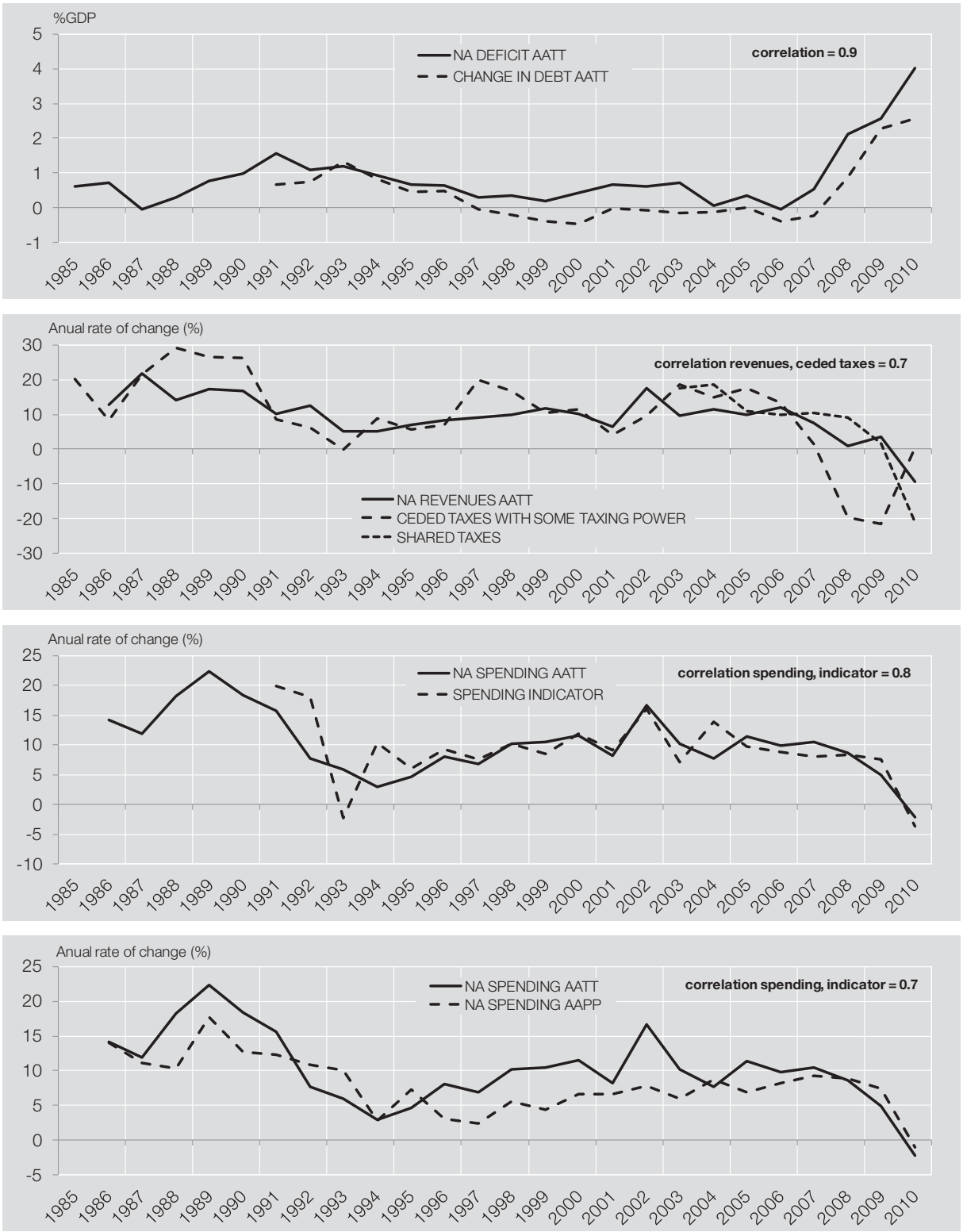
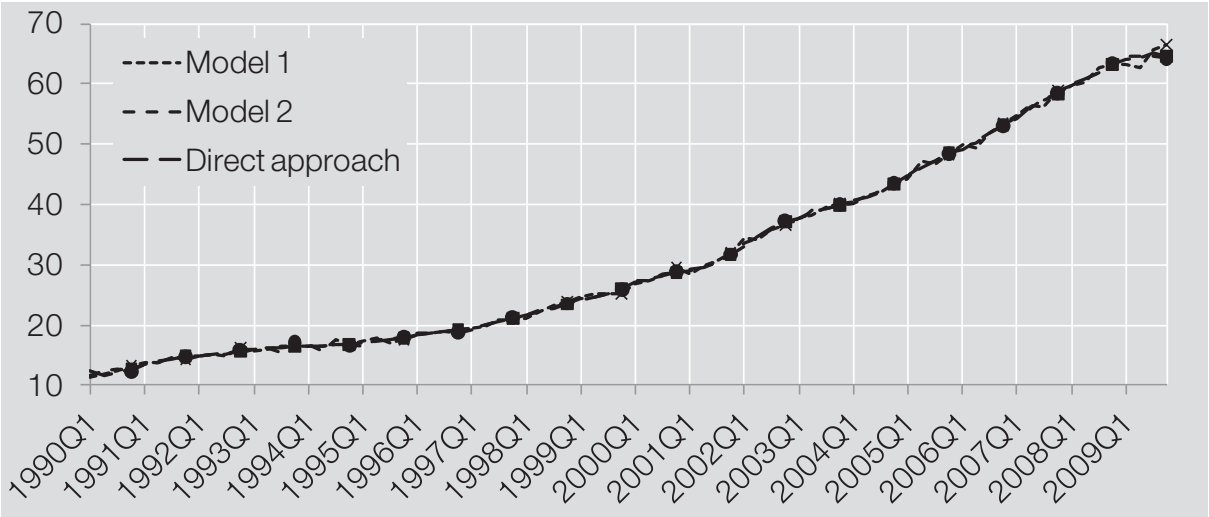


Figure 3. Interpolation of sub-national governments' spending with the alternative time-series models, for the period 1990-2009.

Panel 1: Levels in billions of euro.



Panel 2: Year-on-year growth rate of a 4-quarters moving sum

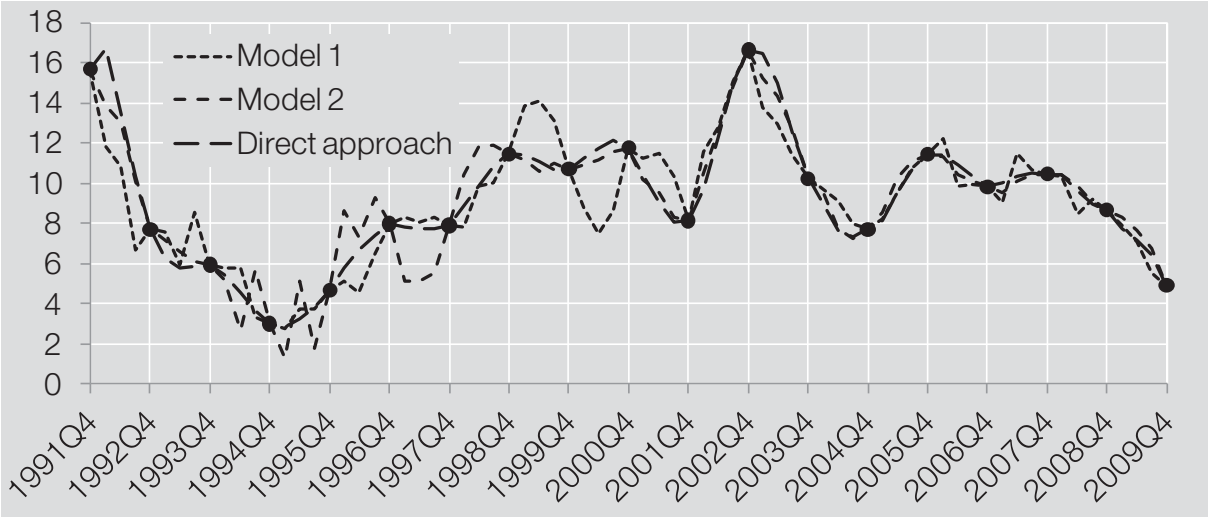
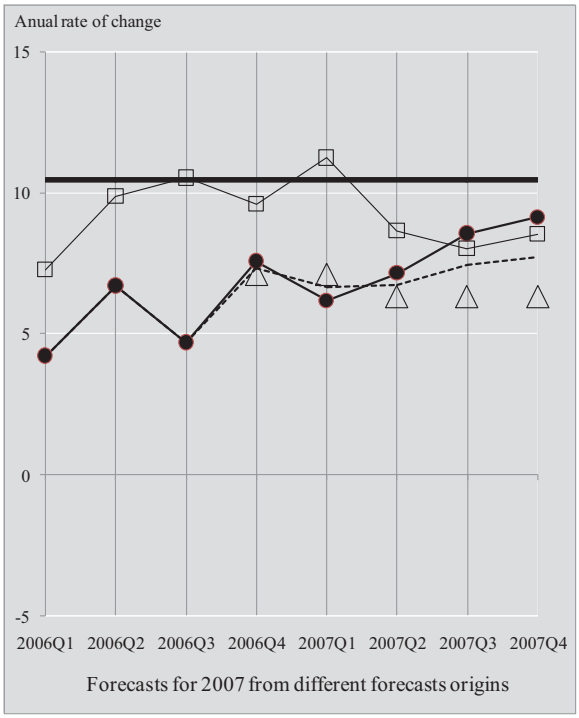
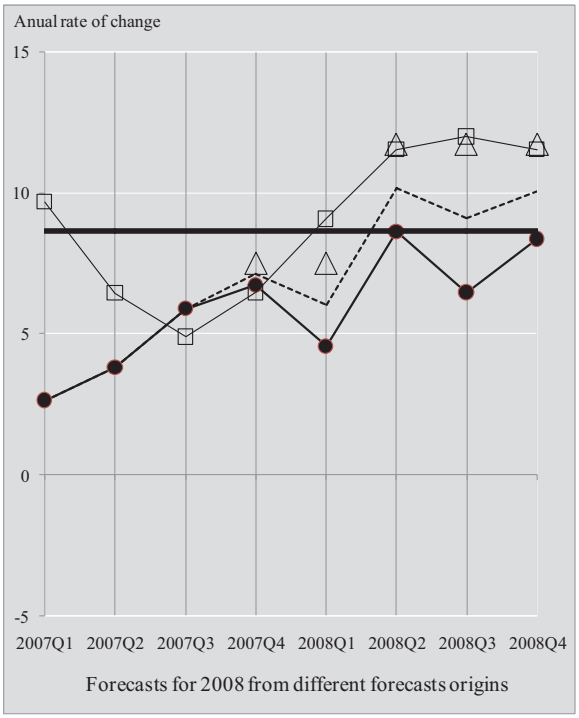
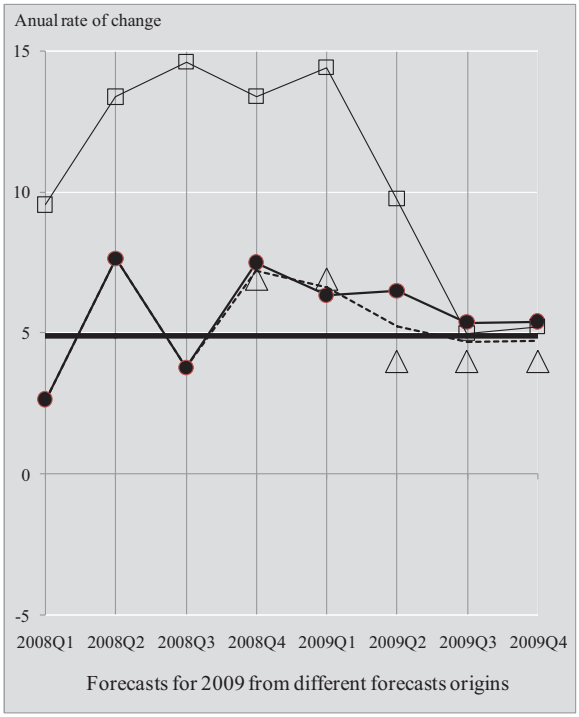


Figure 4. Recursive forecasts of sub-national governments' spending in 2007, 2008, 2009 and 2010, using alternative forecasting methods.

Legend of the chart:
Thick solid line: ex-post **actual** growth rate of sub-national governments' NA spending
Triangles: NA spending forecast based on public accounts **budgetary plans of regions**
Solid-dotted line: NA spending – "**direct approach**" forecast
Dotted line: NA spending – **combination of direct approach and budgetary plans of regions** (equal weights)
Thin line with squares: NA spending – "**indirect approach 2**" forecast (other subsectors' spending indicators)







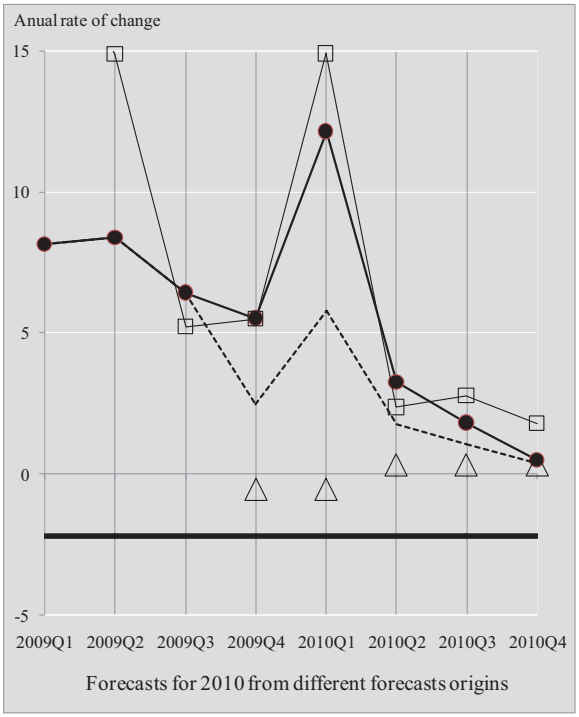


Table 1. Data on annual and intra-annual regional/local government variables used in the paper.

Panel 1: Non-financial expenditure (budgetary execution)

Subsector	Periodicity	Methodology	Sample period	Source	Units
Madrid	Monthly	BA (1)	1998M10-2011M02	Official Gazette	Mlls € (2)
Madrid	Yearly	BA	1990-1998	Regional MEH	Mlls €
Andalusia	Quarterly	BA	2008Q1-2010Q4	CHAP (3)	Mlls €
Andalusia	Yearly	BA	1990-2007	Regional MEH	Mlls €
Catalonia	Monthly	BA	2007M01-2011M03	DEF (4)	Mlls €
Catalonia	Yearly	BA	1990-2006	Regional MEH	Mlls €
Galicia	Quarterly	BA	2002Q1-2010Q3	BO y IX (5)	Mlls €
Galicia	Yearly	BA	1990-2001	Regional MEH	Mlls €
Castile-La Mancha	Quarterly	-	1999Q1-2010Q4	IE (6)	Mlls €
Castile-La Mancha	Yearly	BA	1990-1998	Regional MEH	Mlls €
Castile-León	Quarterly (7)	BA	1991Q1-2011Q1	SIE (8)	Mlls €
Castile-León	Monthly (7)	BA	2009M11-2011M01	BO (8)	Mlls €
Castile-León	Yearly	BA	1990-2010	Regional MEH	Mlls €
Cantabria	Twice a year (9)	BA	2001Q2-2006Q3	Official Gazette	Mlls €
Cantabria	Monthly	BA	2007M01-2011M03	Official Gazette	Mlls €
Cantabria	Yearly	BA	1990-2000	Regional MEH	Mlls €
Canary Islands	Q/M (10)	-	1991Q1-2011Q1	Official Gazette	Mlls €
Canary Islands	Yearly	BA	1990-2010	Regional MEH	Mlls €

Panel 2: Other variables

Variable	Subsector	Periodicity	Methodology	Sample period	Source	Units
Non financial revenues (total revenues)	Local Government	Yearly	NA-ESA79 (11)	1990-1995	BADESPE (12)	Millions of euros
Non financial revenues (total revenues)	Regional Government	Yearly	NA-ESA95 (13)	1995-2010	MEH (14)	Millions of euros
Non financial revenues (total revenues)	Local Entities	Yearly	NA-ESA95	1995-2010	MEH	Millions of euros
Public debt	Regional Government	Quarterly	EDP	1990Q4-2010Q3	MEH	Thousand of euros
Public debt	Local Entities	Quarterly	EDP	1990Q4-2010Q3	MEH	Thousand of euros
Shared taxes (15)	Regional Government	Weekly	Cash	2001M12-2011M04	IGAE (16)	Millions of euros
Ceded taxes with some taxing power (17)	Regional Government	Monthly	Cash	1990M1-2010M9	IG (MEH) (18)	Millions of euros

Notes:
(1) Cash; (2) Millions of euros; (3) Consejería de Hacienda y Administración Pública; (4) Departament d'Economia i Finances; (5) Boletín Oficial e Intervención Xeral; (6) Instituto de Estadística de Castilla La Mancha; (7) Quarterly from 1991 in Instituto de Estadística. Monthly from November 2009 in BOCYL; (8) Sistema de Información Estadística y Boletín Oficial; (9) Before 2007 data was published twice a year with the following calendar: 2001S1, 2001Q3, 2002S1, 2002Q3, 2003Q1, 2003S1, 2004Q1, 2004S1, 2005S1, 2005Q3, 2006S1, 2006Q3. From 2007 on monthly data is available; (10) Quarterly from 1990. First publications only include budgetary execution for revenues; (11) National Accounts System. ESA79 (basis 1986); (12) Fiscal database by the Ministry of Economy and Finance; (13) National Accounts System. ESA95 (basis 2000); (14) Ministry of Economy and Finance; (15) Ceded/shared taxes but centrally managed; (16) Intervención General de la Administración del Estado; (17) Ceded/shared taxes but stately/regionally/locally managed; (18) Inspección General del MEH (753100).

Table 2. Data on annual and intra-annual general and central government, and social security sector variables used in the paper.

Variable	Subsector	Periodicity	Methodology	Sample period	Source	Units
Non financial expenditures (total expenditures)	General Government	Yearly	NA-ESA95 (1)	1995-2009	IGAE (2)	Millions of euros
Non financial expenditures (total expenditures)	General Government	Yearly	NA-ESA79 (3)	1990-1995	BADESPE (4)	Millions of euros
Non financial revenues (total revenues)	General Government	Yearly	NA-ESA95	1995-2009	IGAE	Millions of euros
Non financial revenues (total revenues)	General Government	Yearly	NA-ESA79	1990-1995	BADESPE	Millions of euros
Non financial expenditures (total expenditures)	General Government	Quarterly	NA-ESA95	2000Q1-2010Q3	IGAE	Millions of euros
Non financial expenditures (total expenditures)	General Government	Quarterly	NA-ESA79	1990Q1-1994Q4	INE	Millions of euros
Non financial expenditures (total expenditures)	State	Monthly	NA-ESA95	1990M1-2010M11	IGAE	Millions of euros
Non financial expenditures (total expenditures)	SPEE (5)	Monthly	Cash	1990Q1-2010Q3	MEH	Millions of euros
Non financial expenditures (total expenditures)	Social Security System	Monthly	Cash	1990Q1-2010Q3	IGS	Millions of euros

Notes:

(1) National Accounts System. ESA95 (basis 2000).

(2) Intervención General de la Administración del Estado.

(3) National Accounts System. ESA79 (basis 1986).

(4) Fiscal database by the Ministry of Economy and Finance.

(5) The Social Security subsector is composed by the Social Security System and the Public Employment System.

Table 3. Quantitative forecasting exercise: forecasts for the growth rate of National Accounts (NA) aggregate Regional and Municipal (AATT) spending with alternative models. Period for evaluation purposes: 1999Q1-2010Q4.

Forecast errors of growth rates. RMSE ratios: model vs annual random walk	Current year forecast errors						Next year forecast errors					
	Random walk with drift	Direct approach	Indirect approach: model 1	Indirect approach: model 2	Official budgetary indicator	Combin.: Direct & Official	Random walk with drift	Direct approach	Indirect approach: model 1	Indirect approach: model 2	Official budgetary indicator	Combin.: Direct & Official
All forecast origins: Q1, Q2, Q3 and Q4	0.55	0.36	0.53	0.47	0.35	0.31	0.54	0.33	0.39	0.44	-	0.32
Number of available forecast errors	*40*	*40*	*40*	*40*	*40*	*40*	*36*	*36*	*36*	*36*		*36*
Memo: excluding forecasts for 2010	0.53	0.31	0.43	0.42	0.35	0.29	0.57	0.33	0.40	0.51	-	0.33
Number of available forecast errors	*36*	*36*	*36*	*36*	*36*	*36*	*32*	*32*	*32*	*32*		*32*
First half of the year: forecast origins Q1 and Q2	0.58	0.36	0.52	0.52	0.31	0.29	0.57	0.33	0.40	0.51	-	0.33
Number of available forecast errors	*20*	*20*	*20*	*20*	*20*	*20*	*18*	*18*	*18*	*18*		*18*
Second half of the year: forecast origins Q3 and Q4	0.52	0.38	0.64	0.36	0.48	0.41	0.49	0.34	0.38	0.29	-	0.31
Number of available forecast errors	*20*	*20*	*20*	*20*	*20*	*20*	*18*	*18*	*18*	*18*		*18*
Forecast origin Q1	0.57	0.33	0.48	0.54	0.25	0.22	0.57	0.29	0.41	0.53	-	0.29
Number of available forecast errors	*10*	*10*	*10*	*10*	*10*	*10*	*9*	*9*	*9*	*9*		*9*
Forecast origin Q2	0.61	0.46	0.66	0.43	0.48	0.44	0.57	0.39	0.39	0.47	-	0.39
Number of available forecast errors	*10*	*10*	*10*	*10*	*10*	*10*	*9*	*9*	*9*	*9*		*9*
Forecast origin Q3	0.61	0.40	0.68	0.36	0.48	0.41	0.57	0.34	0.40	0.29	-	0.34
Number of available forecast errors	*10*	*10*	*10*	*10*	*10*	*10*	*9*	*9*	*9*	*9*		*9*
Forecast origin Q4	0.42	0.36	0.59	0.36	0.48	0.41	0.39	0.35	0.35	0.29	0.25	0.27
Number of available forecast errors	*10*	*10*	*10*	*10*	*10*	*10*	*9*	*9*	*9*	*9*	*9*	*9*

Table 4. Qualitative forecasting exercise. Percentage of correctly predicted changes in the growth rate (accelerations or decelerations) of NA AATT spending. Period for evaluation purposes: 1999Q1-2010Q4.

	Current year forecast errors						Next year forecast errors					
	Random walk with drift	Direct approach	Indirect approach: model 1	Indirect approach: model 2	Official budgetary indicator	Combin.: Direct & Official	Random walk with drift	Direct approach	Indirect approach: model 1	Indirect approach: model 2	Official budgetary indicator	Combin.: Direct & Official
All forecast origins: Q1, Q2, Q3 and Q4	40%	40%	33%	40%	40%	45%	61%	61%	47%	56%	33%	56%
Number of available forecast errors	*40*	*40*	*40*	*40*	*40*	*40*	*36*	*36*	*36*	*36*	*9*	*36*
First half of the year: forecast origins Q1 and Q2	50%	45%	35%	45%	40%	50%	50%	50%	50%	50%	-	50%
Number of available forecast errors	*20*	*20*	*20*	*20*	*20*	*20*	*18*	*18*	*18*	*18*		*18*
Second half of the year: forecast origins Q3 and Q4	30%	35%	30%	35%	40%	40%	60%	60%	35%	50%	33%	50%
Number of available forecast errors	*20*	*20*	*20*	*20*	*20*	*20*	*18*	*18*	*18*	*18*	*9*	*18*
Forecast origin Q1	70%	60%	40%	50%	40%	60%	40%	40%	60%	60%	-	40%
Number of available forecast errors	*10*	*10*	*10*	*10*	*10*	*10*	*9*	*9*	*9*	*9*		*9*
Forecast origin Q2	30%	30%	30%	40%	40%	40%	60%	60%	40%	40%	-	60%
Number of available forecast errors	*10*	*10*	*10*	*10*	*10*	*10*	*9*	*9*	*9*	*9*		*9*
Forecast origin Q3	30%	40%	20%	30%	40%	40%	60%	50%	30%	50%	-	50%
Number of available forecast errors	*10*	*10*	*10*	*10*	*10*	*10*	*9*	*9*	*9*	*9*		*9*
Forecast origin Q4	30%	30%	40%	40%	40%	40%	60%	70%	40%	50%	33%	50%
Number of available forecast errors	*10*	*10*	*10*	*10*	*10*	*10*	*9*	*9*	*9*	*9*	*9*	*9*

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