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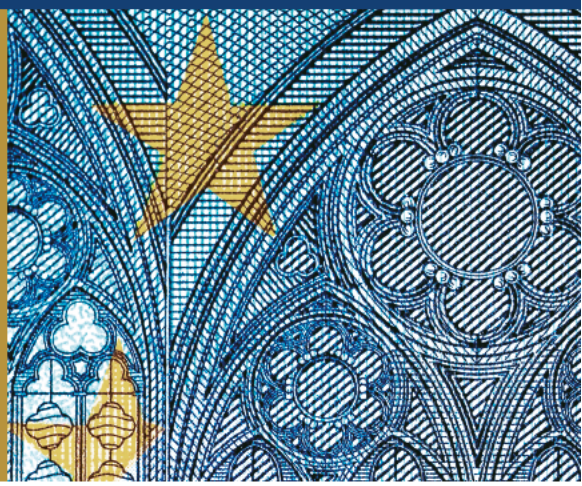

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ECONOMIC AND POLICY DEVELOPMENTS

I

PROJECTIONS FOR THE PORTUGUESE ECONOMY: 2013-2014

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SPECIAL ISSUE
HIRING, ROTATION AND JOB CREATION

PROJECTIONS FOR THE PORTUGUESE ECONOMY: 2013-2014[1]

1. Introduction

The projections for the Portuguese economy are surrounded by a high level of uncertainty, reflecting recent domestic developments, which adds to the demanding and necessary implementation of the economic and financial assistance programme. The external environment of the Portuguese economy will be characterized by a moderate recession in the euro area in 2013, with an expected gradual pick-up in activity from the second half of the year onwards. Further progress in the normalization of monetary and financial conditions in the euro area, as well as in the European institutional architecture, will strengthen the external environment of the Portuguese economy throughout the projection horizon.

Current projections point to a more subdued fall in economic activity in 2013, compared with 2012, followed by a slight increase in 2014 (Table 1.1). Gross domestic product (GDP) is expected to drop by 2.0 per cent in 2013 (-3.2 per cent in 2012), reflecting a marked fall in domestic demand and a substantial increase in exports. For 2014 a 0.3 per cent increase in GDP is expected, against a background of strong cuts in public expenditure, a slowdown in the pace of decline in private domestic demand and continued robust growth in exports. Inflationary pressures, both domestic and external, should remain low over the projection horizon, resulting in consumer price growth of less than 1 per cent.

The projection for the Portuguese economy is still characterized by the correction of macroeconomic imbalances. In particular, the projection is consistent with the reduction of the indebtedness levels of the private sector and with the maintenance of the process of gradual and orderly deleveraging of the banking sector. In the current projections, the Portuguese economy reinforces its financing capacity against the rest of the world, following a protracted period of high external deficits. This evolution is crucial to consolidate the return of the international investment position to a sustainable path, ensuring

Table 1.1

PROJECTIONS OF BANCO DE PORTUGAL: 2013-2014 | ANNUAL RATE OF CHANGE, PER CENT

	Weights 2012	EB Summer 2013			EB Spring 2013		
		2012	2013(p)	2014(p)	2012(p)	2013(p)	2014(p)
Gross Domestic Product	100.0	-3.2	-2.0	0.3	-3.2	-2.3	1.1
Private consumption	66.3	-5.6	-3.4	-1.4	-5.6	-3.8	-0.4
Public consumption	18.3	-4.4	-2.1	-3.2	-4.4	-2.4	1.5
Gross Fixed Capital Formation	15.8	-14.5	-8.9	1.1	-14.5	-7.1	1.9
Domestic demand	100.6	-6.7	-4.4	-1.2	-6.8	-4.2	0.4
Exports	38.8	3.2	4.7	5.5	3.3	2.2	4.3
Imports	39.3	-6.7	-1.7	2.1	-6.9	-2.9	2.7
Contribution to GDP growth (in p.p.)							
Net exports		3.8	2.4	1.4	3.9	1.9	0.7
Domestic demand		-7.0	-4.4	-1.1	-7.0	-4.2	0.4
of which: change in inventories		0.2	-0.3	0.2	0.2	-0.1	0.1
Current plus capital account (% of GDP)		0.8	4.5	6.4	0.8	3.6	4.8
Trade Balance (% of GDP)		0.1	3.0	4.9	0.1	2.8	3.8
Harmonised Index of Consumer Prices		2.8	0.4	0.8	2.8	0.7	1.0

Sources: *INE* and Banco de Portugal.

Notes: (p) projected. For each aggregate, this table shows the projection corresponding to the most likely value, conditional on the set of assumptions considered.

1 This section is based on information available up the end of June 2013.

the intertemporal sustainability of external debt and promoting a gradual normalization of the financing conditions of the Portuguese economy over the projection horizon.

In a context of high uncertainty, the risks associated with the projection for economic activity are balanced for 2013 and on the downside for 2014. These risks reflect the possibility of a higher than projected contraction in private consumption induced by the announced fiscal policy measures, as well as the possibility of a less favourable evolution of exports. The risks for inflation are slightly on the downside, reflecting the possibility of a lower than projected increase in profit margins, in a context of depressed domestic demand.

The current projection implies an upward revision of 0.3 p.p. in GDP growth in 2013 compared with the spring edition of the Economic Bulletin, reflecting, in particular, a more favourable evolution of exports of goods, which more than offset a slight downward revision in domestic demand, due to more negative developments in investment. In turn, the projection for 2014 is revised downwards by 0.8 p.p., reflecting mainly the impact of the incorporation of fiscal consolidation measures subsequently presented in greater detail; this impact is partially compensated by a stronger increase in exports, as well as a lower disaccumulation of stocks over the projection horizon. The projection for inflation in 2013 and 2014 was revised downwards by 0.3 p.p. and 0.2 p.p., respectively, reflecting a lower increase in unit labour costs in the private sector and in the imports deflator in 2013. Projections presented in this Economic Bulletin are globally in line with the latest projections published by the IMF and the European Commission (Table 1.2).

2. Conjunctural data and assumptions

The projections incorporate Quarterly National Accounts and Quarterly Accounts by institutional sectors published by INE (Statistics Portugal) for the first quarter of 2013 and conjunctural indicators available at the end of June.

Slower decline in economic activity in early 2013 and very favourable behaviour of exports

Conjunctural data available for the first half of the year point to a slower downward trend for economic activity in early 2013. These developments were due to the favourable behaviour of exports and the progressively lower pace of contraction in domestic demand. Available labour market information shows a marked fall in employment in early 2013.

Quarterly Accounts by institutional sectors published by INE at the end of March confirmed an increase in savings in 2012, particularly at the end of the year. These developments in the savings rate suggest a considerable change in agents' behaviour amid the ongoing adjustment process, marked by extraordinarily adverse financial conditions and a very marked deterioration in labour market conditions. Labour Force Survey data for the first quarter of 2013 point to a further deterioration in labour market conditions.

Table 1.2

INTERNATIONAL COMPARISON OF THE PROJECTIONS FOR THE PORTUGUESE ECONOMY

	Release date	2013		2014	
		GDP	HICP	GDP	HICP
Banco de Portugal	July 2013	-2.0	0.4	0.3	0.8
IMF	June 2013	-2.3	0.7	0.6	1.0
EC	May 2013	-2.3	0.7	0.6	1.0
OECD	May 2013	-2.7	0.0	0.2	0.2

Sources: European Commission (EC), International Monetary Fund (IMF), Organisation for Economic Co-operation and Development (OECD) and Banco de Portugal.
Notes: IMF - International Monetary Fund: Report of the 7ª review of the PAEF, EC - European commission: Spring forecast 2013, OECD - Organisation for Economic Co-operation and Development: OECD Economic Outlook (Preliminary Version).

Quarterly National Accounts for the first quarter of 2013 published by INE in early June point to a 0.4 per cent fall in GDP from the previous quarter, which correspond to a year-on-year decline of 4.0 per cent (-3.8 per cent in the previous quarter) (Table 2.1). However, this evolution should be analysed against a background of calendar effects related to the fact that Easter had fallen in the first quarter of 2013 (in 2012, it was in the second quarter) and to the impact of this event on external trade flows, which is estimated to have been particularly substantial.[2]

In the first quarter, domestic demand declined markedly from the previous quarter, which resulted in a year-on-year decrease of 6.3 per cent (-4.5 per cent in the fourth quarter of 2012). These developments were particularly influenced by the behaviour of the construction component of GFCF, which seems to have accelerated the pace of decline, in a scenario of persistent and rather uncertain demand prospects, aggravated by exceptionally adverse weather conditions. With regard to developments in exports, there was a very substantial increase in the energy goods component, associated with a rise in the installed refining capacity. This effect will likely entail a very significant contribution to export growth in the course of 2013, with a positive impact on market share developments.

Information available for the second quarter of 2013 points to an increase in economic activity compared with the first quarter of the year and to a lower decline in year-on-year terms. This was associated *inter alia* with a smaller drop in activity in the construction sector and with an acceleration in goods exports. It should be mentioned that economic activity developments in the second quarter have been positively affected by the above-mentioned calendar effects. Excluding the impact of these effects on goods exports, the projection has an implicit stabilisation of activity in the second quarter of 2013.

Table 2.1

GDP, MAIN COMPONENTS AND HICP | RATE OF CHANGE, PER CENT

		Weights 2012	2011	2012	2012				2013
					Q1	Q2	Q3	Q4	Q1
Gross Domestic Product	yoy	100.0	-1.6	-3.2	-2.3	-3.2	-3.6	-3.8	-4.0
	qoq				-0.1	-1.1	-0.9	-1.8	-0.4
Private consumption	yoy	66.3	-3.8	-5.6	-5.5	-5.7	-6.0	-5.3	-4.3
Public consumption	yoy	18.3	-4.3	-4.4	-3.3	-5.7	-4.7	-4.0	-4.0
Gross fixed capital formation	yoy	15.8	-10.6	-14.5	-13.1	-17.5	-14.6	-12.8	-16.8
Exports	yoy	38.8	7.1	3.2	8.2	3.5	1.7	-0.2	0.1
Imports	yoy	39.3	-5.9	-6.7	-5.4	-10.8	-8.1	-2.3	-6.0
Contribution to GDP growth (in p.p.)									
Net exports	(cont. yoy)		4.7	3.8	4.9	5.5	3.8	0.8	2.3
Domestic demand	(cont. yoy)		-6.3	-7.0	-7.2	-8.8	-7.4	-4.6	-6.4
of which: change in inventories	(cont. yoy)		-0.7	0.2	-0.3	-0.6	0.0	1.8	0.0
Harmonised Index of Consumer Prices	yoy		3.6	2.8	3.3	2.8	3.0	2.0	0.4

Sources: *INE* and Banco de Portugal.

Notes: yoy - year-on-year rate of change; qoq - quarter-on-quarter rate of change; cont. yoy - contribution to the year-on-year rate of change.

2 Available estimates for the calendar effect suggest an impact of around -3 p.p. on the rate of change of goods exports in the first quarter of 2013. This effect was fully reversed in the second quarter of 2013.

Slight drop in external demand in 2013, followed by a recovery in 2014

Current projections are based on a set of assumptions on future developments of some Portuguese economy conditioning variables released by the European Central Bank (ECB), particularly the external demand for Portuguese goods and services (Table 2.2). The projections for the euro area were published by the ECB in the June 2013 issue of the Monthly Bulletin.

Activity growth in a number of advanced economies will likely remain conditioned by fiscal consolidation needs, as well as the correction of other domestic imbalances, namely high household debt levels. Emerging economies should remain highly buoyant, significantly contributing to external demand growth. Projections for the euro area point to slightly negative changes in economic activity in 2013 and to a modest recovery in 2014. In this context, external demand for Portuguese goods and services in 2013 will likely fall more markedly than in the previous year. In 2014 external demand for Portuguese goods and services is expected to recover both from the euro area and extra-euro area markets.

The technical assumption for exchange rates (maintenance over the projection horizon of the average figures observed in the two weeks prior to the cut-off date) implies an appreciation of the euro in 2013, both in nominal effective terms and against the US dollar, and a relative stabilisation in 2014.

According to data from futures market, oil prices are expected to follow a downward path over the projection horizon, moving from levels close to 113 dollars (86 euros) per barrel in the first quarter of 2013 to 98 dollars (75 euros) per barrel at the end of the projection horizon.

Regarding the financing conditions of the economy, assumptions for the short-term interest rate (three--month EURIBOR) are based on the rate implied in futures contracts, which point to the maintenance in 2014 of historically low levels and close to those projected for 2013 (for an analysis of methodologies underlying these calculations, see "Box 1.1 *Formulating expectations about interest rates using financial derivatives*", in this Bulletin).

Assumptions for long-term interest rates are based on an estimate of the average cost rate of external financing from the European Union, the euro area countries and the International Monetary Fund, under the financial assistance programme, as well as on an assumption for interest rates underlying the issuance of government sovereign debt.[3] The State's gradual return to medium and long-term market financing (two long-term bonds have been already issued in 2013) should lead to an increase in financing costs in 2014.

Table 2.2

PROJECTION ASSUMPTIONS

		EB Summer 2013			EB Spring 2013		
		2012	2013	2014	2012	2013	2014
External demand	yoy	-0.2	-0.4	3.8	-0.2	-0.5	4.2
Interest rate							
Short-term (3-month EURIBOR)	%	0.6	0.2	0.4	0.6	0.2	0.4
State financing cost	%	2.6	2.3	3.8	2.6	2.3	3.8
Euro exchange rate							
Euro effective exchange rate	yoy	-5.4	3.0	0.1	-5.4	2.8	-0.1
Euro-dollar	aav	1.28	1.30	1.30	1.28	1.31	1.31
Oil price							
in dollars	aav	112.0	105.0	99.0	111.9	109.4	102.5
in euros	aav	87.1	80.4	76.2	87.1	83.4	78.3

Sources: Bloomberg, ECB, Thomson Reuters and Banco de Portugal calculations.

Notes: yoy - year-on-year rate of change, % - per cent, aav - annual average value. An increase in the exchange rate corresponds to an appreciation.

3 For a more detailed description of the sources and financing costs associated with the economic and financial adjustment programme, see http://www.bportugal.pt/en-US/OBancoeoEurosistema/ProgramaApoioEconomico-Financeiro/Pages/default.aspx

Continuation of the fiscal adjustment programme

As for public finance variables, projections take into account the procedures used in the Eurosystem projection exercises and, as such, reflect the measures already approved in the context of the State Budget for 2013, as well as information included in the Supplementary Budget for 2013 and the reports of the Seventh Review of the Economic and Financial Assistance Programme. These measures will likely result in a very marked fall in public consumption in 2014, given that the set of expenditure-cutting measures implies a substantial reduction in the number of government employees. Moreover, expenditure cuts across line ministries are expected, which should largely affect the acquisition of goods and services. It should also be mentioned that wage cuts in the government sector should have a non-negligible negative impact on the government expenditure deflator in 2014.

3. Supply, Demand and External accounts

Generalised contraction in economic activity and employment in 2013, followed by a slight recovery in activity in 2014 and a moderate decline in employment

Current projections point to a GDP contraction of 2.0 per cent in 2013 (-3.2 per cent in 2012), followed by a 0.3 per cent increase in 2014. Public sector activity is expected to continue to fall significantly over the projection horizon, particularly in 2014, amid a marked reduction in public expenditure. In turn, private sector activity is expected to present a decline in 2013, which is constrained by lower domestic demand and mitigated by export growth, and to expand by around 1 per cent in 2014.

The projections suggest a slight fall in Gross Value Added (GVA) in manufacturing in 2013, reflecting export growth and a further contraction in domestic demand. As such, some sectoral heterogeneity in manufacturing is expected, as seen over the past few quarters. Activity in construction is projected to continue to decline in 2013, similarly to recent years, in a scenario of structural adjustment in the sector and of marked fall in residential investment and public investment. The number of available dwellings and the endowment of certain types of public infrastructures suggest that activity in these segments is not expected to return to the levels observed in the late 1990s. In turn, GVA in the services sector is expected to decline markedly in 2013, for the third consecutive year, across most subsectors. For 2014, an increase in private sector activity is projected, particularly in manufacturing, while in the construction and services sectors activity is expected to stabilise.

Projections point to a 4.8 per cent fall in employment in 2013 (after a 4.2 per cent drop in 2012), followed by a 1.3 per cent decline in 2014. These developments reflect a very marked reduction in public and private sector employment. In this context, underlying the current projections is a drop in private sector employment of 5.1 per cent in 2013 and 0.3 per cent in 2014. As in 2012, the reduction in employment over the projection horizon should clearly exceed that in activity, which suggests that the adjustment is perceived by economic agents as being permanent. The likelihood of labour hoarding phenomena is therefore reduced and expected to worsen in a scenario of prolonged recession. This may pose additional challenges to the labour market if the decline in hiring is accompanied by a substantial increase in separations (see the "Special issue: *Hiring, rotation and job creation*", in this Bulletin). In turn, sectoral reallocation of employment, which is heightened by particularly adverse developments in activity in the relatively more labour-intensive sectors, such as construction, may give rise to persistent unemployment phenomena associated with a mismatch between employment supply and demand, which is typically seen in periods of strong sectoral reallocation.

As regards the composition of growth, projections point to a negative contribution of labour to GDP growth in 2013 and 2014 (-3.2 p.p. and -0.8 p.p. respectively) (Chart 3.1). With regard to capital, its contribution to output growth should remain negative over the projection horizon (-0.3 p.p. in 2013 and

2014), reflecting a drop in the capital stock of a little more than 1 per cent. These developments in the capital stock are of concern given that they may reflect the non-incorporation of technological innovation through new investments, which would have a negative impact on potential growth. Finally, underlying projections for output growth is a contribution of total factor productivity of 1.5 p.p. in 2013 and 1.4 p.p. in 2014, amid a structural reorganisation process of the production sector. This process has negative short-run impact on employment, as it implies job destruction and the shutdown of firms with lower productivity levels. However, the reallocation of resources is key for sustainable growth in the medium and long run, both through workers rotation and the reorientation of investments to tradable sectors. The projections do not include potential effects from the implementation of the ongoing structural reforms, due to the uncertainty about their magnitude and time profile and the fact that to a large extent they impact a longer time horizon than the one underlying the current projection.

Sharp reduction in domestic demand, in tandem with robust export growth

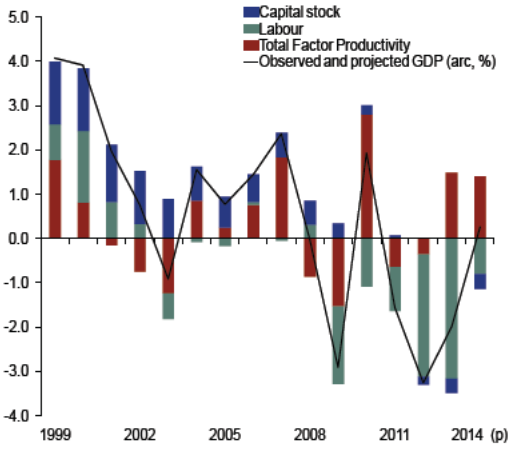
Developments projected for the Portuguese economy are characterised by a continued fall in domestic demand, contributing to GDP growth by -4.4 p.p. in 2013 and -1.1 p.p. in 2014. In this context, the cumulative fall in domestic demand projected for the 2011-14 period amounts to around 18 per cent and is broadly based across all its components. This is in line with a gradual reduction in the private sector's debt levels (Chart 3.2).

As in recent years, the weight of domestic demand in GDP is expected to continue to fall over the projection horizon, compensated by an increase in the weight of exports (from 28 per cent in 2009 to 43 per cent in 2014). Despite this increase, the weight of exports in GDP will remain relatively low compared with other small euro area economies.

Turning to domestic demand components, projections point to a continued decline in private consumption (-3.4 per cent in 2013 and -1.4 per cent in 2014). The projected fall in private consumption in 2013 is globally in line with developments in real disposable income (Chart 3.3). These developments largely reflect the impact of fiscal consolidation measures, in particular as regards direct taxes, as well as a reduction in compensation of employees in the private sector, amid a marked decline in employment. For 2014 a further decline is projected for real disposable income, albeit smaller, in a scenario of marked

Chart 3.1

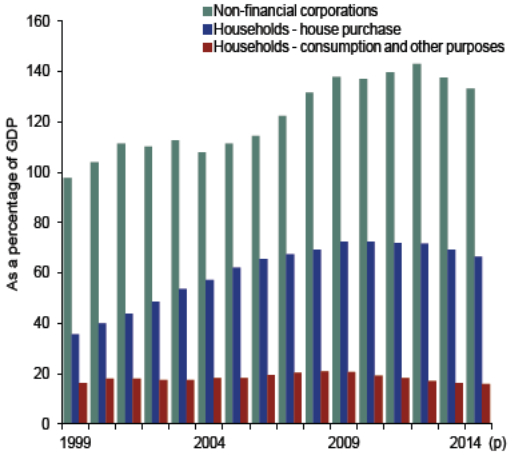
CONTRIBUTIONS TO GDP GROWTH | IN PERCENTAGE POINTS



Sources: *INE* and Banco de Portugal.
Note: arc: annual rate of change. (p) - projected.

Chart 3.2

DEBT OF NON-FINANCIAL PRIVATE SECTOR | END OF PERIOD FIGURES



Source: Banco de Portugal.
Note: (p) - projected.

fall in public sector employment and substantial cuts in transfers to households. The projections imply that, towards the end of the projection horizon, total private consumption will stand at levels close to those observed in 1999. At the same time, the savings rate is expected to reach historical highs since the beginning of the euro area, which indicates a more sustainable behaviour of households (Chart 3.4).

The absence of strong smoothing in household consumption expenditure is an important feature of the adjustment process started by the Portuguese economy in 2011, reflecting tight financing conditions and the permanent nature of the adjustment as perceived by economic agents. Current projections assume a gradual normalisation in financing conditions of the Portuguese economy, which is consistent with a slight decline in the savings rate in 2014, to close to 11 per cent of disposable income.

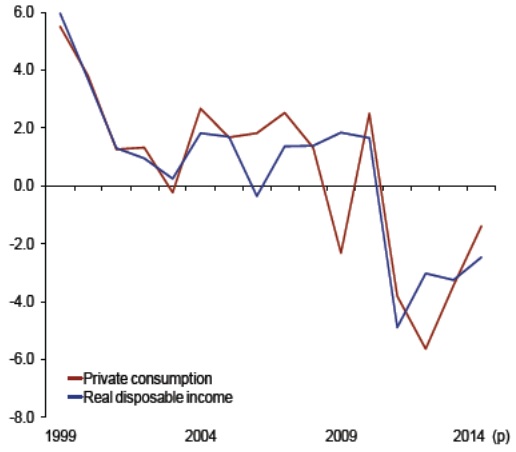
In terms of composition, projections suggest a very sharp decline in consumption of durable goods in 2013 and 2014, which is the private consumption component most responsive to the business cycle and to financing conditions. The non-durable goods component is also expected to decline, albeit more moderately, with a lower degree of smoothing than traditionally seen in this component over the business cycle, in a context where economic agents take into account in their decisions that the adjustment process will be protracted and structural.

The projections point to a contraction in GFCF of 8.9 per cent in 2013, common to all institutional sectors, followed by 1.1 per cent growth in 2014 (Chart 3.5).

Turning to the business component of investment, an 8.0 per cent drop is projected for 2013, following a marked decline in 2012 (-12.1 per cent). The sharp contraction in demand in the domestic market and the stagnation of external demand, in tandem with the maintenance of uncertain prospects, should prompt the postponement of investment decisions by the corporate sector, particularly given low capacity utilization levels in most productive subsectors. Moreover, the need to reduce the debt levels of Portuguese firms, which are among the highest in the euro area, and the continued tightening of financing conditions are also likely to constrain developments in corporate GFCF in the course of 2013. The cumulative fall in corporate GFCF between 2009 and 2013 is expected to amount to around 35 per cent, with implications for capital stock developments, which could jeopardise the incorporation of technological innovation and, consequently, affect potential output growth. For 2014, a growth rate of 1.7 per cent is projected, amid expectations of some improvement in financing conditions, a recovery in external demand and a less marked fall in domestic demand.

Chart 3.3

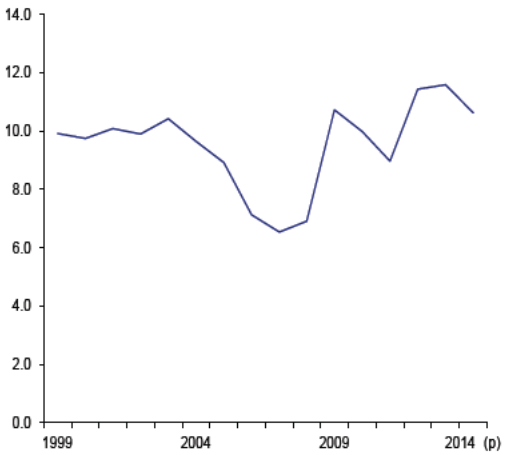
CONSUMPTION AND DISPOSABLE INCOME |
ANNUAL AVERAGE RATE OF CHANGE



Source: Banco de Portugal.
Note: (p) - projected.

Chart 3.4

SAVINGS RATE | IN PERCENTAGE



Source: Banco de Portugal.
Note: (p) - projected. The savings rate is expressed as a percentage of disposabale income.

Current projections point to a 15.9 per cent fall in residential GFCF in 2013, following the declining path seen in recent years. These developments reflect a gradual stabilisation of the housing stock at a new level after the substantial increase recorded in the 1990s. For 2014, a 1.8 per cent drop is projected, amid a less marked reduction in household disposable income.

Finally, public investment is projected to fall by 3.3 per cent in 2013 and to recover moderately in 2014, in line with assumptions on public finance variables.

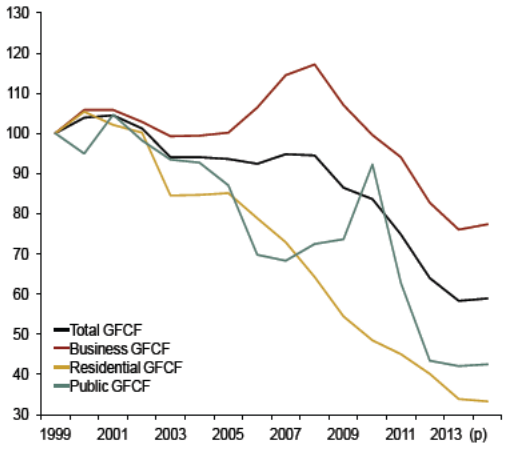
Projections point to a lower reduction in inventories than in the 2011-12 period and in line with the progressive stabilisation of economic activity from 2014 onwards (Chart 3.6). The contribution of the change in inventories to the GDP growth rate is projected to stand at -0.3 p.p. in 2013 and 0.2 p.p. in 2014. These developments in inventories are consistent with the pro-cyclical nature of this variable.

Exports of goods and services in 2013 are expected to grow by 4.7 per cent, which corresponds to an acceleration compared with 2012 (3.2 per cent) (Chart 3.7). This evolution of exports takes place amid a virtual stagnation in external demand for Portuguese goods and services, similarly to 2012, reflecting a marked slowdown in activity in euro area economies (which account for around two-thirds of destination markets for Portuguese exports) and some buoyancy in emerging economies. Therefore, underlying current projections is a substantial market share gain in 2013, in line with recent developments. These favourable developments in the market share should benefit significantly from the evolution of exports of energy goods, partly associated with an increase in the installed refining capacity.

The 2011-12 period was characterised by very substantial market share gains for Portuguese exports (around 7 p.p. in cumulative terms), among the highest in the euro area (Chart 3.8). This reflects some competitiveness gains, as well as greater efforts by Portuguese tradable goods firms in looking for new markets, in a context where the adjustment in domestic demand is perceived as permanent by resident agents. The favourable behaviour of exports in recent years shows the result of a diversification effort in

Chart 3.5

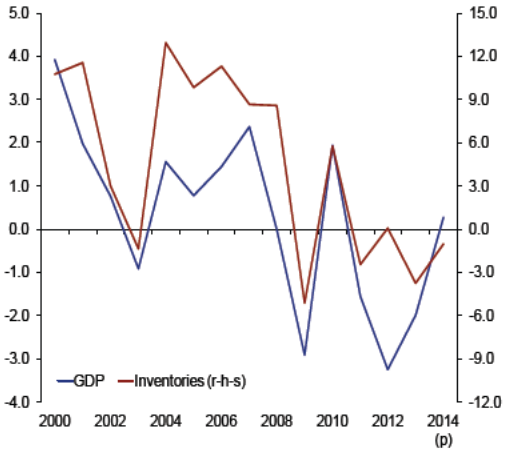
BRAKDOWN OF GFCF BY INSTITUTIONAL SECTOR | INDEX 1999=100



Sources: *INE* and Banco de Portugal.
Note: (p) - projected.

Chart 3.6

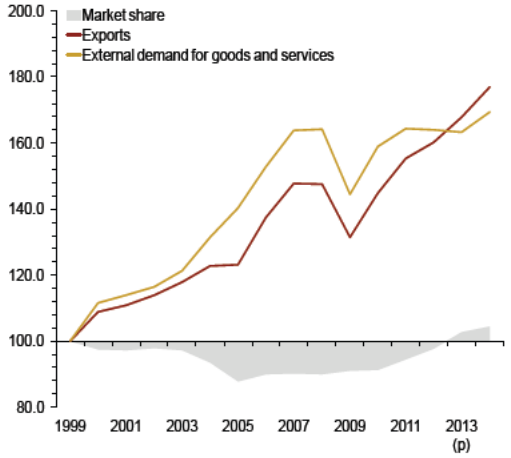
INVENTORIES AND ECONOMIC ACTIVITY | ANNUAL GROWTH CHANGE



Sources: ECB, *INE* and Banco de Portugal.
Notes: (p) – projected. The time-series "Inventories" was estimated using the permanent inventory approach. It was assumed that inventories were at around 60 per cent of GDP in 1953 (a level of inventories equivalent to 7 month of output). Using this initial level, inventories were estimated by accumulating stockbuilding data: based on the Banco de Portugal Historical Series for the period 1953-1995; on National Account figures from 1995 to 2012; on the Banco de Portugal projections for 2013 and 2014.

Chart 3.7

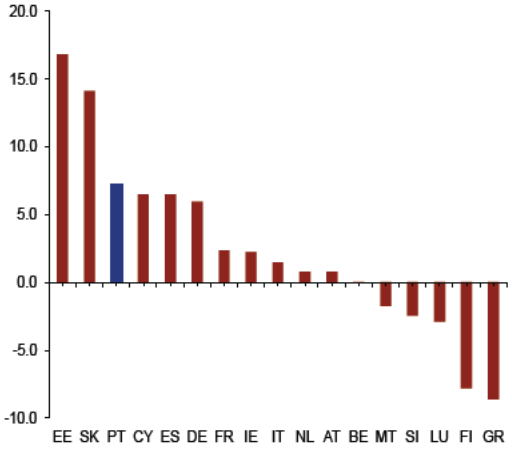
EXPORTS, EXTERNAL DEMAND AND MARKET SHARE | INDEX 1999=100



Sources: *INE* and Banco de Portugal.
Note: (p) - projected.

Chart 3.8

CHANGE IN THE EXPORTS MARKET SHARE | CUMMULATED VALUE 2011-2012



Sources: ECB and Banco de Portugal.

destination markets, particularly the reinforcement of extra-EU markets, which have recorded more buoyant growth (the weight of these markets increased from 25 per cent in 2010 to around 29 per cent in 2012). Also, exports to these markets have contributed significantly to recent substantial market share gains.

Projections point to 5.5. per cent growth in exports of goods and services in 2014, which would imply the maintenance of market share gains, albeit to a much smaller extent than that estimated for 2013. The materialisation of these projections will imply a recovery in the market share to levels slightly above those seen when Portugal joined the euro area. Recent and prospective developments in exports are set against a clearly more adverse external environment than in previous recessions, reflecting the synchronisation of economic adjustment efforts in several major trade partners, particularly at the fiscal level, as well as the nature and global scope of the current economic and financial crisis.

Current projections for imports point to a drop of 1.7 per cent in real terms in 2013 and 2.1 per cent growth in 2014, approximately in line with developments in overall demand weighted by import content. Aggregate demand components with the largest recovery (or smaller decline) in 2014 are those which typically have a higher import content.

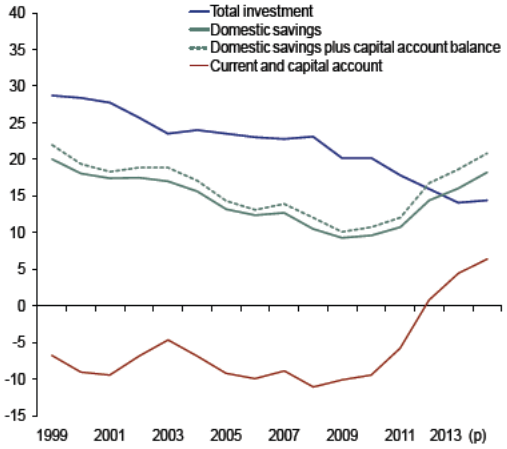
Increasingly higher external surplus of the Portuguese economy

One of the most striking aspects in the ongoing adjustment process of the Portuguese economy is the substantial reduction in external financing requirements (Chart 3.9). The combined current and capital account balance reached a surplus in 2012 (0.8 per cent of GDP), which is expected to increase to 4.5 and 6.4 per cent of GDP in 2013 and 2014 respectively. Underlying these developments is a significant improvement in the trade balance, which is projected to post a surplus of 3.0 and 4.9 per cent of GDP in 2013 and 2014 respectively, following a figure close to balance in 2012 (Chart 3.10).

This reflects the continued buoyancy of exports, in tandem with a sharp decline in imports and a somewhat favourable terms of trade effect, amid a reduction in oil prices in euros. The income account deficit as a percentage of GDP should stabilise over the projection horizon, at around 3.8 per cent, reflecting an increase in financing costs together with favourable developments in the international investment position. The combined current transfers and capital account balance is expected to increase to slightly above 5 per cent of GDP over the projection horizon, reflecting the assumptions for the profile of European Union transfers and the impact of recent migration flows on the private current transfers balance.

Chart 3.9

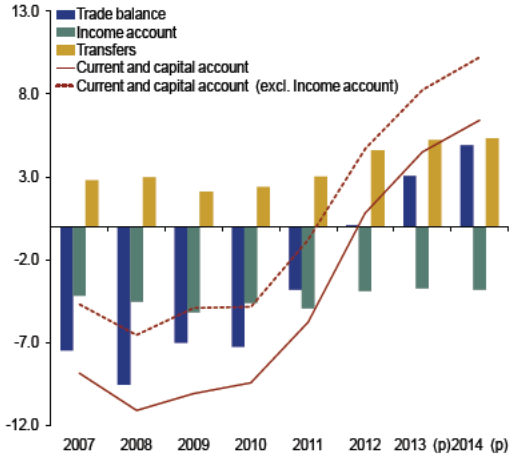
DEVELOPMENTS IN FINANCING REQUIREMENTS | AS A PERCENTAGE OF GDP



Source: Banco de Portugal.
Note: (p) - projected.

Chart 3.10

CURRENT AND CAPITAL ACCOUNT | AS A PERCENTAGE OF GDP



Source: Banco de Portugal.
Note: (p) - projected.

4. Prices and wages

Significant decrease in inflation to below 1 per cent

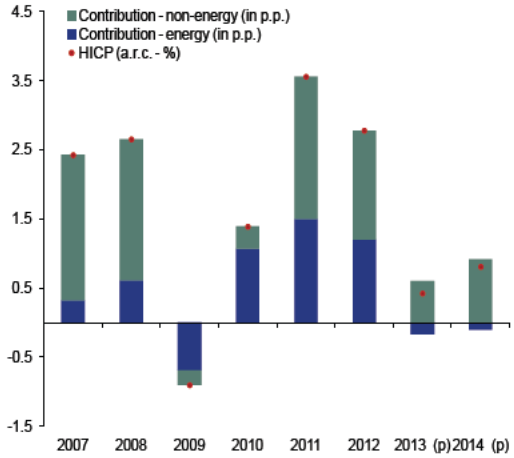
The inflation rate, as measured by the Harmonised Index of Consumer Prices (HICP), is expected to decline from an annual average of 2.8 per cent in 2012 to 0.4 per cent in 2013 and accelerate somewhat in 2014 to 0.8 per cent (Chart 4.1). The value recorded in 2012 largely reflected the impact of fiscal consolidation measures, in particular changes to indirect taxes and administered prices[4] (see "Box 1.2 *Recent dynamics of inflation in Portugal; disaggregated analysis of price developments*", in this Bulletin). Projections for 2013 are based on the unwinding of effects from the above-mentioned fiscal measures, against a background which assumes strong wage moderation, oil price declines, and a slight growth in the import deflator excluding energy goods.

Projections comprise a reduction in the HICP energy component in the 2013-14 period, chiefly reflecting a drop in euro-denominated oil prices. The non-energy component is expected to grow rather modestly over the projection horizon (0.7 per cent in 2013 and 1.0 per cent in 2014), reflecting very low inflationary pressures, both external and internal. The contraction in domestic demand and the marked deterioration in labour market conditions should contribute to the maintenance of wage moderation. According to the projections, unit labour costs in the private sector are expected to fall by 3.0 per cent in 2013 and 0.4 per cent in 2014. Import prices of non-energy goods are projected to grow by 0.3 per cent in 2013 and 1.3 per cent in 2014, reflecting developments in world economic activity. In this context, projections comprise the widening of profit margins over the projection horizon, similarly to 2012. These developments reflect inter alia the restructuring of the productive sector of the economy, which should lead to a composition effect associated with the closure of poorly performing firms with lower profit margins.

4 According to the estimates presented in the 2012 Annual Report ("Box 6.1 *The mechanical impact from indirect taxation and administered prices on the inflation rate*"), the mechanical impact on the inflation rate in 2012 due to changes to indirect taxes and the increase in administered goods prices stood at 2.2 p.p.

Chart 4.1

INFLATION | CONTRIBUTION TO THE ANNUAL RATE OF CHANGE OF THE HICP, IN PERCENTAGE POINTS



Sources: Eurostat and Banco de Portugal.
Note: arc: annual rate of change. (p) - projected.

5. Uncertainty and risks

Current projections represent the most likely scenario, based on a set of assumptions presented in Section 2. The non-materialisation of these assumptions or the occurrence of factors that, due to their idiosyncratic nature, have not been considered in current projections, may lead to a number of risks and uncertainty. This section presents a quantified analysis of such risks and uncertainty.[5]

High uncertainty about the national and international framework

Over the projection horizon, and particularly in 2014, a number of risk and uncertainty factors stem from both the international framework and domestic factors. At the international level, high uncertainty persists about the adjustment of economic imbalances in several advanced economies, particularly in euro area countries. This uncertainty may contribute to confidence deterioration among economic agents, with negative effects on expenditure decisions of households and firms and on the recovery prospects for the euro area. The materialisation of these risks would result in lower buoyancy in external demand compared to the central scenario, with negative effects on Portuguese exports. In this context, it was considered a 55 per cent probability of a smaller increase in external demand for Portuguese goods and services in 2014 (Table 5.1).

At domestic level, special mention should be made to high uncertainty stemming from recent developments, in tandem with two major risk factors.

The first risk factor is associated with recently announced fiscal consolidation measures for 2014, which may have a higher-than-projected impact on private consumption. Indeed, projections point to some smoothing of private consumption in view of the marked reduction in disposable income projected for 2014, against a background of progressive normalisation of financing conditions of the Portuguese economy. However, in a scenario of continued tightening in financing conditions and given the permanent nature of the adjustment as perceived by economic agents, consumption, particularly of non-durable

5 The methodology used in this section is based on the article published in Pinheiro, M. and Esteves, P. (2010), "On the uncertainty and risks of macroeconomic forecasts: Combining judgements with sample and model information", Empirical Economics, pp. 1-27.

goods, may present a lower-than-projected smoothing. The materialisation of this risk would imply a greater fall in private consumption, with implications for economic activity growth.

The second risk factor is associated with additional market share gains in Portuguese exports projected for 2014, albeit below those observed in 2011 and 2012 and those expected for 2013. The non-materialisation of these gains would imply less favourable developments than those projected for exports.

In this context, it was considered a 55 per cent probability of households' consumption spending being lower than currently projected for 2014 and a 60 per cent probability of exports in 2014 being lower than currently projected (Table 5.1).

Moreover, a downside risk for inflation projections for 2013 was considered, resulting from a possible smaller widening in profit margins, against a background of a strong contraction in domestic demand. This risk translates into a 55 per cent probability that the HICP will be lower than projected for 2013.

Risks of more adverse developments in economic activity in 2014 and slightly lower-than-projected inflation

This quantification points to risks of less favourable developments in economic activity in 2014, due to factors associated both with the external environment of the Portuguese economy and the domestic framework (Table 5.2 and Chart 5.1). As for consumer prices, this analysis suggests that there is a risk of inflation being slightly lower than projected for 2013 and 2014, due to a smaller increase in profit margins as well as more adverse developments in economic activity (Chart 5.2).

6. Conclusions

Projections for the Portuguese economy presented in this article point to a fall in economic activity in 2013 followed by a slight recovery in 2014, against a background of continued fiscal consolidation and private sector deleveraging, which will likely result in a substantial increase in the external financing capacity of the Portuguese economy. These projections rely heavily on fiscal policy developments, against a background of high uncertainty about the conditions necessary for their implementation. In a context of Portuguese economy restructuring, this adjustment process will continue to imply a fall in employment and the maintenance of high structural unemployment.

Developments in the Portuguese economy over the next few years will continue to be constrained by the need to ensure a balanced and sustainable growth pattern, which makes it possible to resume access to market financing by the financial system and the State in regular conditions. In this context, restoring macroeconomic balances implies a reallocation of resources to the tradable sector, which should be accompanied by an increase in productive investment, a key factor to ensure sustained job creation and

Table 5.1

RISK FACTOR PROBABILITIES | PER CENT

	2013	2014
Conditioning variables		
External demand	50	55
Endogenous variables		
Private consumption	50	55
Exports	50	60
HICP	55	50

Source: Banco de Portugal.

Table 5.2

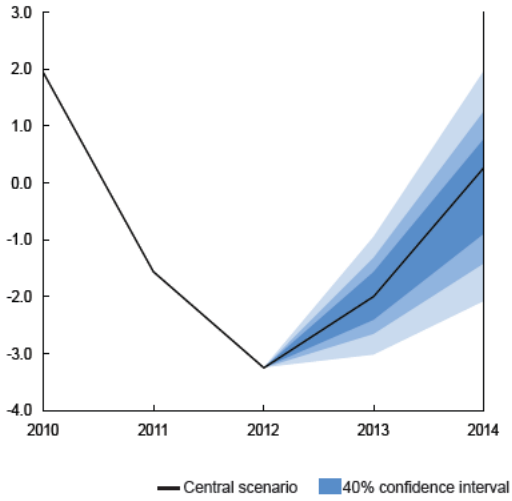
PROBABILITY OF AN OUTCOME BELOW THE PROJECTIONS | PER CENT

	Weights in 2012 (%)	2013	2014
Gross Domestic Product	100	51	59
Private consumption	66	50	58
GFCF	16	50	54
Exports	39	50	62
Imports	39	50	63
HICP		55	54

Source: Banco de Portugal.

Chart 5.1

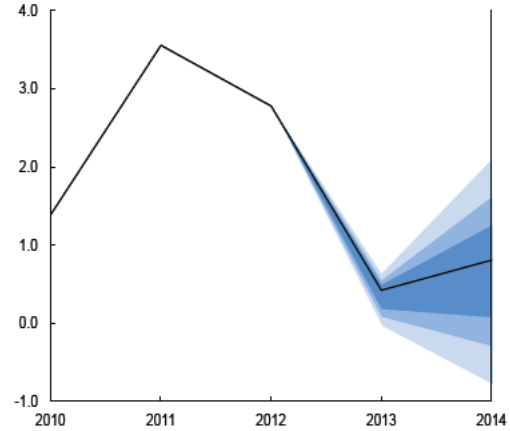
GROSS DOMESTIC PRODUCT | RATE OF CHANGE, PER CENT



Source: Banco de Portugal.

Chart 5.2

HARMONISED INDEX OF CONSUMER PRICES | RATE OF CHANGE, PER CENT



Source: Banco de Portugal.

to foster productivity and permanent income. Corporate investment buoyancy relies on a predictable institutional framework, conducive to innovation and the efficient reallocation of resources, as well as an inclusive process of institutional reforms (see "Box 1.3 *Consensus and institutional reform*", in this Bulletin).

BOX 1.1 | FORMULATING EXPECTATIONS ON INTEREST RATES USING FINANCIAL DERIVATIVES

This box is intended to show some aspects of formulating expectations about the evolution of interest rates. Despite the endogeneity between interest rates and the decision makers of monetary policy, there are methods to infer the most likely levels of interest rates for a certain period of time using market prices of financial derivatives. These methods are employed inter alia to establish hypotheses for money market interest rates under the Bank of Portugal's projections exercises. This box discusses three aspects of this issue: the prediction of an interest rate using financial derivatives, with detailed examples of the procedure, the possible distribution of this interest rate, in order to try to identify different scenarios, and, finally, the application of these approaches to the current situation.

An instrument commonly used in this context is the futures contract on interest rates, particularly the 3-month Euribor, empirically closely linked to the interest rate policy of the ECB. In a typical futures contract with maturity at time T at a given interest rate, a long position entitles the investor to buy a deposit paying that interest rate at time T and reimbursing 1 million euro at maturity. Conversely, a short position entitles the investor to sell this deposit. The interesting feature in this contract is that it entitles the investor to ensure a return exactly equal to the value of the future at the moment he assumes a long position, but in a later moment T. An example may be helpful to illustrate how these contracts work. Suppose an investor will have one million euro available in mid-December 2013 to deposit in a liquidity fund which pays the three-month Euribor for a three-month period. On April 25, 2013, the 3-month Euribor future for December 2013 was quoted at 99,785, which corresponded to an expectation for the 3-month Euribor in December 2013 of 100-99,785 = 0.215 per cent.[1] If, at that moment in time, an investor wants to lock in that interest rate, he can acquire a long position in a futures contract for December 2013. In fact, when assuming a long position the investor will receive the marginal gains of the daily changes of the futures contract in his margin account at the derivatives exchange. For example, on May 30, 2013 the same future was quoted at 99,745, i.e. an expectation of 0.255 per cent for the 3-month Euribor in December 2013. This change of -0.04 percentage points (p.p.) compared to April 25, 2013, for a notional amount of 1 million euro during 3 months, corresponds to a variation of -0.04/100/4 * 1000000 = -100 euro, which would be charged to the investor's marginal account.[2] If, hypothetically, the interest rate in December 2013 turned out to be the same as the implicit in the future on May 30, 2013, the investor will make the deposit of 1 million euro and receive at maturity of the deposit (in this case, after 3 months) the notional amount plus interest of 0.255/100/4 * 1000000 = 637.5 euro. Given that his account has a negative value of 100 euro, the gain on the futures contract will be 537.5 euro at the end of the operation. This is similar to benefit, in December 2013, of an interest rate equal to the implied futures contract on April 25, 2013, i.e., 0.215/100/4 * 1000000 = 537.5 euro.[3] Two observations are relevant at this point. The first is that, in most cases, investors do not actually intend to make the deposit underlying the future. In fact, before the maturity of the contract, they take a short position in the same future cancelling out their long position and keeping the difference in their account relative to the initial situation. The second observation is that, as the maturity date approaches, the price of the future tends to approach the spot price of the underlying asset; theoretically, at time T the 3-month Euribor rate and the interest rate implicit on the future with maturity at time T are identical.

1 Futures on interest rates are quoted as 100-R, where R is the relevant interest rate as an annual percentage. These futures contracts have maturity on the third Wednesday of the respective month.

2 The calculation presented corresponds to converting the change in percentage points for natural quarterly rates (by dividing by 100 and by 4 quarters) and multiplying by the notional value of the contract (one million euro).

3 This calculation ignores the interest lost or gained through the variations of the marginal investor's account with the derivatives market. However, this is a second round effect and does not change materially the results.

This example shows how agents will try to make the best possible forecast for the interest rate in future time T, otherwise they risk major losses. For this reason, the prices of futures are usually considered a good predictor for the prices of the underlying assets. For predictions on monetary policy rates, the 3-month Euribor rates should reflect the movements of interest rates of the ECB monetary policy.

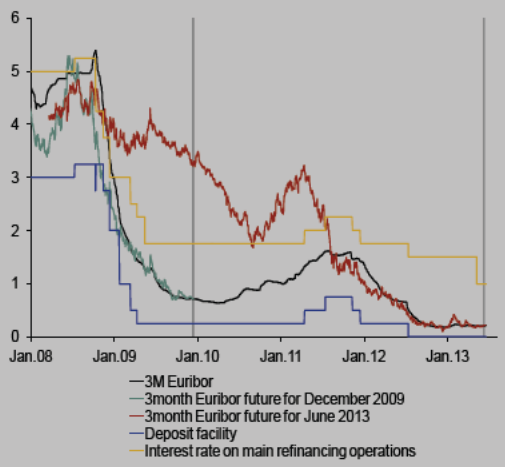
Chart 1 illustrates the relationship between futures prices and the prices of the underlying asset. It shows the evolution of the 3-month Euribor rate (the spot rate), as well as the prices of the respective futures for December 2009 and June 2013. The interest rates on the ECB's main refinancing operations and deposit facility are also represented. These two policy rates of the ECB strongly influence interest rates prevailing in the euro area interbank money market, the first being more relevant until the beginning of the ECB's policy of fixed rate tenders with full allotment on October 15, 2008, and the second becoming more relevant thereafter. Comparing the 3-month Euribor rates with the official rates, it is evident that there is a co-movement; this explains why futures on this spot rate are used to predict the evolution of monetary policy rates.

The chart shows that the implicit interest rate in the future will converge to the spot rate when approaching maturity, marked with vertical lines on the chart for the two examples considered. It is also evident that the interest rates implicit in the future are not in any way a guarantee that the market players hit their forecasts. This is most obvious in longer-term forecasts, for example about a year ahead of the maturity. In late December 2008 the 3-month future ending in December 2009 had an implicit interest rate of 2.245 per cent, but by the end of the contract the observed interest rate was 0.715 per cent. Likewise, on June 28, 2012 the estimated market interest rate using the 3-month Euribor future for June 2013 was 0.525 per cent, against the observed value of 0.212 per cent.

Futures prices allow for central estimates for the price of the underlying asset, but often economic agents also want to know the distribution of the asset price around that expected value. This can be done through the prices of options on such futures. A call option with strike price K and maturity T on a future gives the holder the right but not the obligation, to purchase up to maturity a long position in the future at the price K.[4] By using the market values of these options for the various values of the exercise price it is possible to estimate, through various methods, the probability density function of the

Chart 1

3 MONTH EURIBOR SPOT RATE AND 3 MONTH EURIBOR FUTURES FOR DECEMBER 2009 AND JUNE 2013



Sources: ECB, Bloomberg and Thomson Reuters

4 This is the case of American type options, the most commonly used when the underlying asset is a future on interest rate; in the European type options the right to purchase can only be exercised on the maturity date. There are also options to sell futures (put options). Generally, the maturity of the option is a few days before the maturity of the respective future.

underlying asset (the future) at the time T. It is beyond the scope of this box to provide a description of these methods. The one used in this case is based on the option pricing model of Black and Scholes together with the use of natural splines.

Chart 2 (panel a) represents the estimated distribution of the interest rate derived from the options on the future of June 2013, based on the prices of options on June 28, 2012 and May 30, 2013. Firstly, it turns out that the estimate is best when it is closer to maturity. This can be seen in the chart of the estimated probability density on May 30, 2013, which is concentrated around a central value of 0.205 per cent (against the observed value at maturity of 0.212 per cent), while about one year before maturity (on June 28, 2012) the distribution had an average 0.525 per cent. Secondly, it appears that the farther the maturity is, the more diffuse the distribution is, even if the central values are similar.

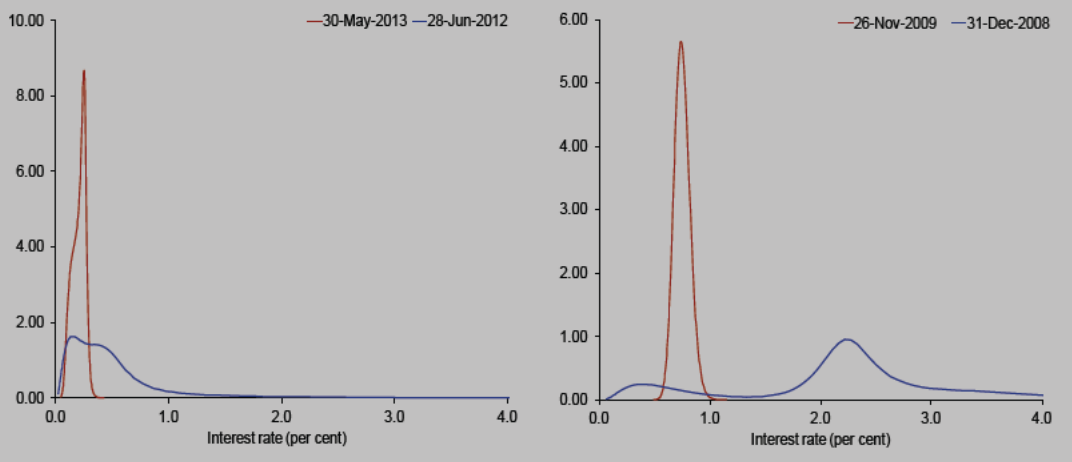
Chart 2 (panel b) illustrates an interesting case about the use of these methodologies. Two probability density functions are shown for the December 2009 futures contract, estimated at December 31, 2008 and November 26, 2009. A year before the maturity of the contract, the value of the future spot rate suggested a value clearly higher than what it turned out. However, the estimated density of probability of the spot rate at that time provided additional information, suggesting a non-negligible possibility of the spot rate falling much more than what it was implicit in the future, as can be seen in the estimated mass probability for the interval between 0 and 1 per cent.

The methods illustrated in this box are routinely used in the construction of macroeconomic scenarios for the Portuguese economy and the euro area and in the evaluation of agents' expectations. Chart 3 illustrates the situation on May 30, 2013. For December 2013, the expected value for the 3-month Euribor is 0.255 per cent, with the probability density concentrated around this value. For December 2014, the estimated probability density suggests a high probability of a value close to zero, and also a small probability mass closer to 1 per cent. These two possibilities could be used as two different macroeconomic scenarios.

In conclusion, this analysis suggests that (i) the markets have a limited ability to anticipate major changes in interest rates for an extended term, but that (ii) it is possible to predict movements in potentially important horizons up to one year, and the estimated probability densities can serve as a guide to the emergence of different scenarios from the ones expected.

Chart 2

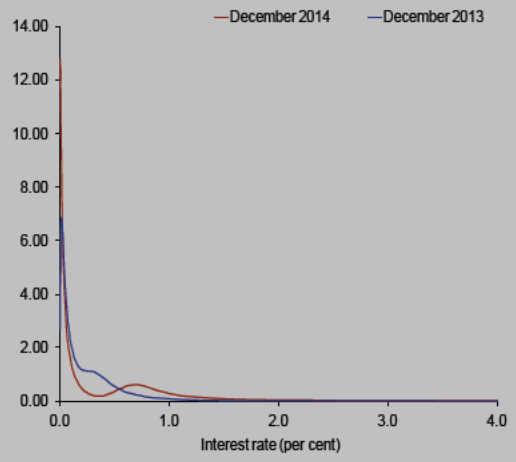
PROBABILITY DENSITY FUNCTION OF 3 MONTH EURIBOR



Sources: Bloomberg, LIFFE-NYSE Euronext and Banco de Portugal's calculations.

Chart 3

PROBABILITY DENSITY FUNCTION OF 3 MONTH EURIBOR



Sources: Bloomberg, LIFFE-NYSE Euronext and Banco de Portugal's calculations.

BOX 1.2 | THE RECENT DYNAMICS OF INFLATION IN PORTUGAL: DISAGGREGATED ANALYSIS OF PRICE DEVELOPMENTS

In 2012, inflation in Portugal showed a downward trend mirroring the dissipation of the impact of different measures associated with the fiscal consolidation process. These developments continued into the first months of 2013, with the year-on-year change in the Harmonised Index of Consumer Prices (HICP) standing close to zero (Chart 1). Underlying these developments is, as usual, a high heterogeneity in price behaviour at disaggregated level. This box analysis the recent trend of consumer prices in Portugal, using the HICP breakdown into 87 elementary components, comparing the results with those obtained for the euro area.

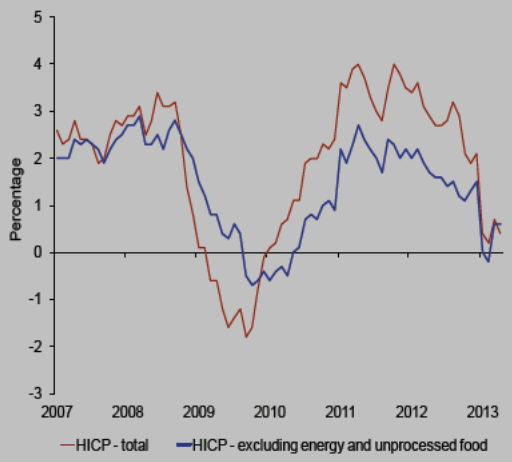
Available evidence for Portugal (Charts 2 and 3) reveals a gradual increase in the weight of the HICP components with negative year-on-year changes (41.4 per cent in April 2013).[1] Both values, however, stand below those registered in 2009, when the inflation rate in Portugal reached historical lows. Chart 4 illustrates developments in the distribution dispersion and asymmetry of the year-on-year changes in consumer prices. It should be noted that the mode of distribution of the rates of change in prices, albeit declining in recent months, continues to be positive.

An analysis based on the same information for the euro area reveals that, in contrast to the situation in Portugal, the frequency of components with negative changes (whether or not it is weighted by the respective share in the consumption basket) is in line with the average in recent years and clearly below the maximum values in early 2010 (Chart 5). The rise in the weight of the HICP components with negative year-on-year changes, however, is apparent in the case of the countries involved in economic adjustment programmes. In Greece, the weight of these components reached 66 per cent in April 2013.

In the context of a gradual increase in the weight of HICP components with negative changes in Portugal, it is important to appraise the extent to which such developments may be consistent with a deflation framework. The deflation economic concept is usually applied to a fall in price level which is broadly based across the different categories of prices and which lasts for a period of time sufficiently long to

Chart 1

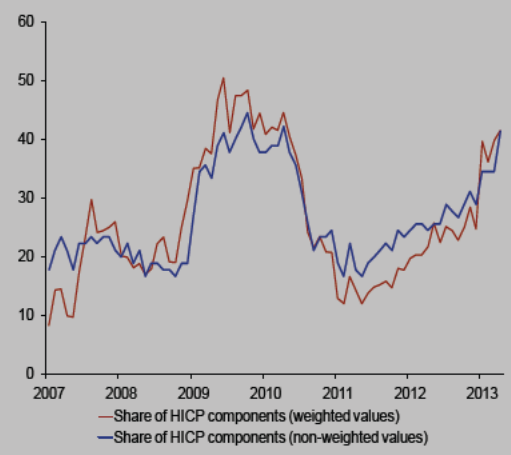
INFLATION BEHAVIOUR IN PORTUGAL | YEAR-ON-YEAR CHANGE



Source: Eurostat.

Chart 2

HICP COMPONENTS WITH NEGATIVE YEAR-ON-YEAR CHANGES

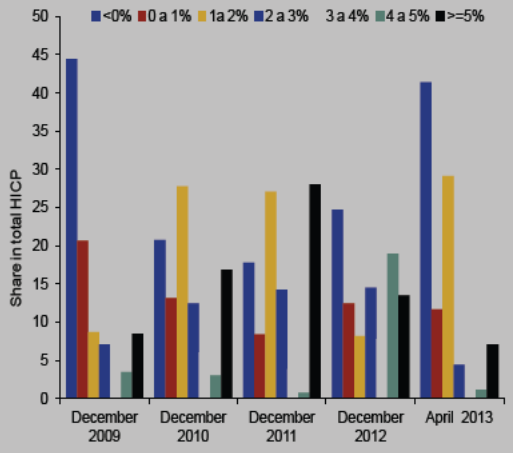


Source: Eurostat.

1 An analysis of the share of items in the HICP with negative year-on-year rates of change shows that this evidence is resilient to changes in weights introduced in January 2013.

Chart 3

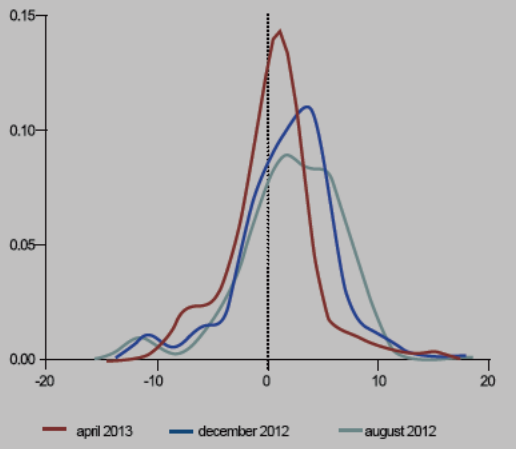
DISTRIBUTION OF THE YEAR-ON-YEAR CHANGE OF HICP COMPONENTS BY PRICE CATEGORIES



Sources: Eurostat and Banco de Portugal calculations.

Chart 4

EMPIRICAL DISTRIBUTION OF THE YEAR-ON-YEAR CHANGE OF HICP COMPONENTS



Source: Eurostat

Note: Empirical distribution computed using a Gaussian Kernel which takes into account the weight of the different components in total HICP.

change the players' expectations within the scope of price and wage setting. In this context, price falls in certain particular categories and/or a temporary fall in price levels do not correspond to deflation. In this regard, it is important to appraise the extent to which these falls are either broadly based or temporary.

A substantial part of price deceleration observed since mid-2012 is temporary, as it mirrors falls in some unprocessed food prices, which had grown significantly in 2012, as well as in energy prices, reflecting lower growth in oil prices in international markets. However, even when excluding energy and unprocessed food, the year-on-year change in the HICP has shown a downward profile. An important part of that trend reflects the dissipation of effects related to fiscal consolidation measures implemented in 2011 and 2012, such as some services whose VAT rates rose in 2012, as for instance coffee shops and restaurants, or other goods and services whose prices are regulated, as for instance electricity or transport services.[2]

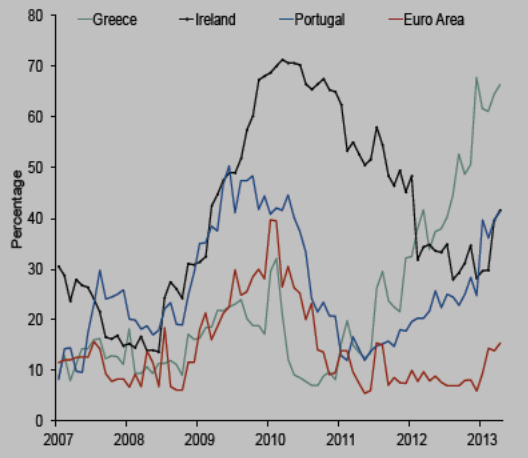
As regards the components that have registered price falls in Portugal, a significant part is related to "non-energy industrial goods", mainly durable and semi-durable goods (Chart 6). While in some cases, such as motor vehicles or furniture, price falls are relatively recent (since early de 2012), in other cases, especially clothing and footwear, prices have been on a downward trend since early 2009. In turn, some services with an important weight in the HICP registered price falls in the beginning of 2013, such as insurance and telephone services.

In conclusion, the recent increase in the weight of components with negative year-on-year changes is concentrated in some specific groups of goods, in particular energy goods and some unprocessed food, but also non-energy industrial goods. Moreover, an important part of the fall in the inflation rate is also due to the dissipating impact of the increase in indirect taxation on some goods and services. However, in the current context of macroeconomic adjustment, there is a high level of uncertainty, as regards both the magnitude and persistence of the current recessive framework, and their pass-through to consumer prices, which translates into downward risks on prices. The probability that a scenario of broadly based

2 See "Box 6.1 *The mechanical impact from indirect taxation and administered prices on the inflation rate*", *Annual Report 2012*, Banco de Portugal.

Chart 5

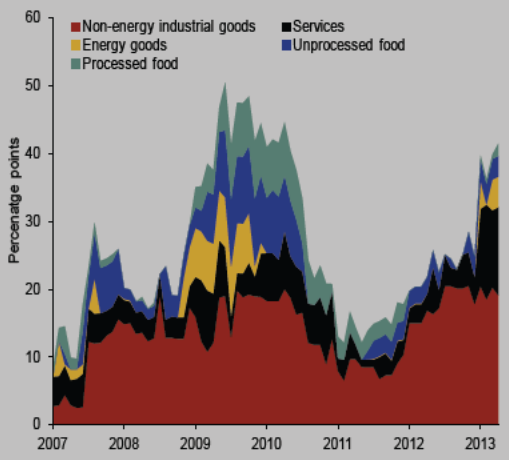
EURO AREA: HICP COMPONENTS WITH NEGATIVE YEAR-ON-YEAR CHANGES | AS PERCENTAGE OF THE TOTAL COMPONENTS; WEIGHTED VALUES



Source: Eurostat.

Chart 6

PORTUGAL: SHARE OF HICP COMPONENTS WITH NEGATIVE YEAR-ON-YEAR CHANGES | CONTRIBUTION FROM THE MAIN PRICE AGGREGATES



Sources: Eurostat and Banco de Portugal calculations.

price declines may occur depends, to a large extent, on the development of inflation expectations in the medium and long term. Against this background, it should be mentioned that, according to most recent information, expectations as to the evolution of the inflation rate in Portugal over a 12-month horizon declined significantly, but remained at positive values (Chart 7).

Chart 7

PORTUGAL: OBSERVED INFLATION AND ONE-YEAR AHEAD FORECAST | ANNUAL AVERAGE AS A PERCENTAGE

Sources: Eurostat and Consensus Forecast.

BOX 1.3 | CONSENSUS AND INSTITUTIONAL REFORM

Banco de Portugal, the Economic and Social Council and the Calouste Gulbenkian Foundation organised a Conference on the importance of consensus in institutional reform processes, which was held on 23 May.[1] The purpose of the Conference was to provide broad consideration on the need to make the institutional reform process more inclusive, in social terms. Some European examples of acknowledged success were reviewed: the Swedish, Dutch and German cases, as well as political and constitutional institutions requiring consensus.

The addresses and interventions of the participants in the Conference revolved around five main topics.

1. Need for broad consensus, based on social partners.

Consensus must be obtained from a plurality of opinions. Institutions must operate systemically, with strong concerns in terms of refining the relationships established among them, but also among the different social and economic players. The German case is paradigmatic given the importance of bringing all players to the negotiation table in a permanent and inclusive manner, at both the national level, a more centralised representation of social partners, and business level, where representation is made by workers' commissions.

Some addresses highlighted the existence of institutions that are sub-optimal at the individual level, but may have positive systemic effects. One example showed the high external rigidity of employment regulations in Germany (accounting for some recent reforms), which is accompanied by strong internal flexibility resting on management regulations of the labour input – working hours – and in-house representation of workers, facilitating the adoption of adjustment measures *vis-à-vis* the business cycle. Another example was the Swedish case, where the centralisation of collective bargaining operates in the context of strong representation and accountability of the unions and the social role of these unions that goes beyond their relevance in the world of work. More inclusive labour regulations, where investment in human capital is enhanced, are essential to increase productivity. Consensus around labour issues is a key aspect of the institutional reform process.

2. Need to reduce inequalities

European experiences show that it is easier to obtain consensus on institutional reforms when income is more evenly distributed. Players are then subject to similar economic conditions and develop similar attitudes towards the problems faced. In the German case, one of the reforms presently under consideration, to address the rise in inequalities that have been generated by the reform process over the last decade, is the introduction of a national minimum wage. Reducing inequalities should be associated with social mobility and these two virtuous dynamics in society depend on the development of a more inclusive educational system, where opportunities should be distributed more equally. Education is one of the main areas around which social consensus should be developed.

1 The detailed programme of the conference can be found in http://www.bportugal.pt/pt-PT/EstudosEconomicos/Conferencias/Paginas/Confer%C3%AAncia-Consensus-e-Reforma-Institucional-.aspx (Portuguese version only).

3. The governance model, either more adversarial or more consensual (with a checks and balances system as an interim solution), has consequences for the type of solutions developed.

The governance and political representation model has consequences for the manner of implementation of the options taken in elections and government efficiency, in particular for how voters acknowledge the political system in force. The governance model also affects the government timing. The models in which the government can act largely autonomously (cabinet system) tend to generate small shock reactions that have not been subject to advance commitments. The models based on the consensus, in turn, generate late reactions and wars of attrition that may be doubly penalising, as they give rise to protracted periods of failure to act. There are no ideal models, but adjustments are required, considering the size of the necessary reform.

4. Consensus needs the possibility of disagreement in order to be effective.

A plural debate is required in the process for obtaining consensus. Political alternatives are essential for the pluralism and renovation of political ideas. Poor consensuses, which do not consider the actual challenges of society and the economy, contribute to sub-optimal results in terms of sustained growth. One of the key points for sustainable success of a reform process is to make it inclusive and based on reforms resulting from an actual appropriation of the consensus results.

5. The reform process must be liable to ongoing refinement.

The break down of existing equilibria may lead to the disruption of the whole system, which should be understood as an integrated system of business relationships. The Dutch case is a good example of how the recent worsening of union representation may jeopardise the system stability resulting in the Wassenaar agreement of 1982.[2] The recent German case also draws attention to the systemic nature of the reform process and to the need to evaluate whether these reforms are a transformation of the model or merely adjustments in response to specific operation difficulties.

The reform and consensus generation process is an ongoing exercise. However, it is more intensive when the systems in force trigger disruptions and require a profound regeneration of existing share capital. Other European countries have experienced times of economic difficulties, requiring a review of the institutional framework, to the extent that it did not adjust to changes in the external environment or did not face the depleting of some institutions in place. An institutional reform privileging social and economic mobility mechanisms, with new inclusive institutions, has been widely identified as the path to be followed in the construction of consensus and institutional reform.

2 For further details on this agreement, see Tripartite responses to the economic crisis in the principal western European countries, International Labour Office, *Working Paper N°12/2010*.

HIRING, ROTATION AND JOB CREATION

1. Introduction

Changes in employment in an economy result from a set of entry and exit flows of workers in firms. At each moment, there are three groups of workers: in one workers maintain their jobs, in another they are hired by firms and in the other they separate from the employer. A significant number of hirings is designed to replace workers that voluntarily or involuntarily quit a firm. These exits, the so-called 'separations', together with hirings constitute two important labour market flows. Likewise, there is a group of firms that expands employment, another that hires and a third group where employment remains stable. The present Issue for Discussion aims to quantify these labour market flows in Portugal, using the data bases with the wage declarations to the Social Security in the 2000-2012 period.

2. Labour market flows: Definitions

Labour market (quarterly) flows can be measured following the concepts introduced in the pioneer work of Davis, Haltiwanger and Schuh (1996):

Hirings correspond to the pool of workers who, being in a firm in the last month of a given quarter, were not part of the workforce of that firm in the last month of the preceding quarter. This definition is too narrow, ignoring all hirings that took place during the quarter but did not last until the last month of that quarter.

Separations correspond to the pool of workers who, being in a firm in the last month of a given quarter, are not part of the workforce of that firm in the last month of the following quarter. This definition is also too narrow, ignoring all workers who, during the quarter, separate and are rehired by the firm.

Job creation is the sum of employment gains (hirings less separations) in firms that between the last month of a given quarter and the last month of the preceding quarter increased their workforce (known as expanding firms).

Job destruction is the sum of employment losses (separations less hirings) in firms that between the last month of a given quarter and the last month of the preceding quarter reduced their workforce (known as contracting firms).

Two hirings do not always give rise to an increase of two jobs. For instance, if in the same period, two workers change jobs, there are two hirings and two separations and the net employment gain is nil. In other situations, firms promote the simultaneous occurrence of hirings and separations until they find the most suitable worker for the job. The idea that there may be more workers involved than net employment gains or losses is defined as (excessive) workers rotation or churning. Formally,

Workers rotation is given by twice the number of separations in the case of expanding firms; by twice the number of hirings in the case of contracting firms; and by the sum of hirings and separations in the case of firms with stable employment.

An example helps to better understand this concept: if in a given period of time a firm increases its workforce by 50 workers, but during the same period has 20 separations, it had to hire 70 workers. Total entries and exits equal 90 workers. Churning equals 40, *i.e.* the number of workers who did not contribute to employment growth in that firm.

These labour market flows take place in firms that between two consecutive quarters keep their business, in new firms or in firms that shut down. In the present case, it is not possible to consider the legal concepts of new firms and firms that cease to exist.

Hence, we define:

New firm as an entity that having registered salaried employment in a given quarter had no employment in the preceding quarter.

Closed firm as an entity that having registered employment in a given quarter ceases to report employment in the following quarter.

Although these concepts do not correspond to the legal definitions, economically they capture quite closely the concepts of closure and new enterprise. Considering that labour is firms' most important asset, requiring investment and training, it is hard to imagine a firm that exists without workers. It is true that some of these closures can be seasonal; in periods in which revenue does not cover variable costs, firms rationally opt for a temporary closure. But, even these events are important to characterise the economy's flexibility and to measure job creation and job destruction flows.

3. When do firms need to hire new workers?

As it happens with any investment, hiring decisions boost the economic cycle. Therefore, a detailed analysis of this process is key to understanding labour market developments. Employment evolution in Portugal is chiefly determined by firms' hiring decisions and to a lesser degree by separation decisions.

Rotation is an important element of labour dynamics. It is crucial for firms to renovate their workforce. Rotation also enables workers to make more productive use of their human capital. These vacancy-chains improve the resource allocation in the economy (Akerloff, Rose and Yellen, 1988). Both situations translate the most important and unique investment that firms and workers should do: choosing how to best use the existing human capital. It is important to note that rotation does not directly lead to job growth, as for every worker that quits, another one is hired. However, labour market developments throughout the economic cycle are strongly related to this rotation. Worth noticing is also the fact that stopping the hiring, separation and rotation process can be a worrisome symptom of structural economic decline.

4. Labour market in Portugal: Hiring, separation and rotation

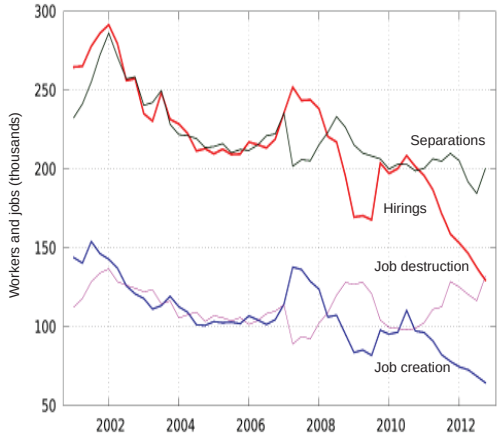
This Issue for Discussion presents an application of the definitions given above to the labour market in Portugal. To this end, for computing quarterly job and worker flows, use is made of the data base with the wages declared to the Social Security. This data base covers all salaried labour relationships, in which wages are reported to the public Social Security system.[1] Data cover the period from January 2000 through December 2012.

Until the outbreak of the 2008 financial crisis, employment gains were marginal; employment created by expanding firms (job creation) virtually equalled employment destroyed by contracting firms (job destruction) (Chart 1). From 2008, there was a shift with systematic job losses, which reached 14 per cent in cumulative terms.

1 The data base excludes only firms with individual pension funds and civil servants covered by the Portuguese civil servants retirement and survivor pensions funds (*Caixa Geral de Aposentações*). The computations exclude primary sector firms (where the number of salaried workers is negligible) as well as firms in the financial, general government, education and health sectors (as the respective workers have been gradually included in the general social security system; non-exclusion of these sectors would distort the computation of flows).

Chart 1

HIRINGS, SEPARATIONS, JOB CREATION AND DESTRUCTION



Sources: Social Security records (2001-2012) and Banco de Portugal.

However, this decline is not the result of an increase in workers separation, but of a marked fall in hirings. Between 2007 and 2012, the quarterly flow of hirings declined by 42 per cent, from an average level of 240 thousand new hirings to just 140 thousand (Table 1). Not only did the number of firms hiring fall from 65 thousand to 40 thousand, but also the average number of hirings per firm fell from 3.7 new hirings, in 2007, to 3.5, in 2012.

Developments in separations are quite different from those in hirings. Contradicting common sense, in firms with separations, the average number of exits remains stable, 3.4 workers per firm, despite the recessive phase of the economy. The share of firms that separate from workers remained also stable between 2007 and 2012; around one-quarter of total firms recorded exits. Thus, the reduction in the number of separations (equal to 8 per cent) reflects the reduction in the number of in Portuguese firms as a whole.

Compared with the gain of 31 thousand jobs in 2007, the job loss in 2012, equal to 54 thousand jobs, is explained by different driving forces behind job creation and destruction. Two-thirds of that difference results from the smaller buoyancy of expanding firms. In 2007 these firms created 130 thousand jobs, but only 71 thousand in 2012. The remaining one-third is justified by higher job losses in contracting firms, with job losses rising from 98 thousand to 125 thousand.

As referred to above, workers rotation plays an important role in resource allocation in the economy. Typically, firms involved in this process rotate around 8 workers each quarter. In Portugal, workers rotation is one of the highest in the European Union, not very far from that recorded in the United States (Centeno and Novo (2012) and Banco de Portugal, 2012). Hirings and separations dynamics resulted in a 38 per cent fall in rotation. This hints at the increased difficulty of workers and firms in building more productive labour relationships. These developments are justified by the fact that workers reduce voluntary quits, a typical behaviour in recessive phases (Anderson and Meyer, 1994), and firms do not promote the substitution of voluntary quits, nor of layoffs.

This reduction is all the more important as it is concentrated in expanding firms, whose rotation of workers fell by 58 per cent. Rotation remained unchanged in contracting firms. As a consequence, rotation in expanding firms accounted for 56 per cent of the total in 2007 and only 37 per cent in 2012 (Table 2).

Table 1

HIRINGS, SEPARATIONS AND ROTATION – TOTAL ECONOMY

	Total			
	2007	2012	2012 – 2007	Rate of change
Employment	2 427 401	2 093 135	-334 266	-13.8%
Hires	244 174	142 178	-101 996	-41.8%
Number of firms with hires	65 118	40 546	-24 572	-37.7%
Average hires per firm	3.7	3.5		
Separations	213 100	196 114	-16 986	-8.0%
Number of firms with separations	63 477	57 363	-6 114	-9.6%
Average separations per firm	3.4	3.4		
Job creation	129 294	70 605	-58 689	-45.4%
Number of firms with job creation	46 581	27 111	-19 470	-41.8%
Average job creation per firm	2.8	2.6		
Job destruction	98 220	124 541	26 322	26.8%
Number of firms with job destruction	41 687	44 770	3 084	7.4%
Average job destruction per firm	2.4	2.8		
Churning	229 761	143 146	-86 615	-37.7%
Number of firms with churn	29 163	18 638	-10 525	-36.1%
Workers churned per firm	7.9	7.7		
Churning in expanding firms	128 019	53 513	-74 506	-58.2%
Expanding firms with churn	10 626	5 203	-5 423	-51.0%
Workers churned in expanding firm	12.0	10.3		
Churning in contracting firms	69 665	68 896	-769	-1.1%
Contracting firms with churn	7 373	6 046	-1 327	-18.0%
Workers churned in contracting firm	9.4	11.4		
Churning in stable firms	32 077	20 737	-11 340	-35.4%
Stable firms with churn	11 164	7 389	-3 775	-33.8%
Workers churned in stable firm	2.9	2.8		

Sources: Social Security records (2001-2012) and Banco de Portugal.

Sectoral analysis

Between 2007 and 2012, all activity sectors lost jobs, but the most significant losses were seen in construction and to a lesser degree in industry. Reductions in hirings but also in separations were more marked in these two sectors.

In construction, the loss of 132 thousand jobs, 38 per cent of employment compared with 2007, results from the reduction of investment by private individuals (in housing and businesses) and in public works. In industry, the loss, albeit significantly smaller, hovered around 17 per cent in the same period, corresponding to a loss of 120 thousand jobs. Despite the export momentum in 2011 and 2012, the fact that industry depends on the domestic market, together with its structural weaknesses, induced a net job loss. Portuguese industry lost jobs over the whole of the last decade, and some of its subsectors underwent major restructurings in response to the low productivity levels and increasing external competition (textiles, clothing and footwear to mention but only a few). In 2012 services employed 75 thousand workers less than in 2007, i.e. a 6 per cent fall. The resilience of the services sector reflects its smaller sensitivity to the economic cycle, despite the stronger weight of temporary labour and the higher workers rotation.

Structurally, the services sector records higher rotation, involving on average 10 workers per firm with rotation. During the period under review, workers rotation decreased in all sectors, but more markedly in construction and in expanding services firms.

Table 2

HIRINGS, SEPARATIONS AND ROTATION – MANUFACTURING, CONSTRUCTION AND SERVICES

	Manufacturing				Construction				Services			
	2007	2012	Rate of change		2007	2012	Rate of change		2007	2012	Rate of change	
Employment	722 179	598 657	-123 523	-17.1%	353 215	217 979	-135 236	-38.3%	1 352 007	1 276 500	-75 507	-5.6%
Hires	39 938	23 367	-16 571	-41.5%	46 812	18 168	-28 643	-61.2%	157 425	100 643	-56 782	-36.1%
Number of firms with hires	12 526	7 782	-4 744	-37.9%	13 316	5 948	-7 368	-55.3%	39 276	26 816	-12 460	-31.7%
Average hires per firm	3.2	3.0			3.5	3.1			4.0	3.8		
Separations	37 469	33 543	-3 926	-10.5%	40 811	32 043	-8 768	-21.5%	134 820	130 528	-4 292	-3.2%
Number of firms with separations	12 898	10 703	-2 195	-17.0%	13 177	10 232	-2 945	-22.4%	37 402	36 428	-974	-2.6%
Average separations per firm	2.9	3.1			3.1	3.1			3.6	3.6		
Job creation	23 964	13 962	-10 002	-41.7%	27 554	10 243	-17 311	-62.8%	77 777	46 400	-31 377	-40.3%
Number of firms with job creation	8 580	4 986	-3 594	-41.9%	9 351	3 740	-5 611	-60.0%	28 651	18 385	-10 265	-35.8%
Average job creation per firm	2.8	2.8			2.9	2.7			2.7	2.5		
Job destruction	21 495	24 138	2 643	12.3%	21 553	24 118	2 565	11.9%	55 172	76 286	21 114	38.3%
Number of firms with job destruction	8 192	7 955	-237	-2.9%	8 551	8 356	-195	-2.3%	24 944	28 459	3 515	14.1%
Average job destruction per firm	2.6	3.0			2.5	2.9			2.2	2.7		
Churning	31 948	18 811	-13 138	-41.1%	38 516	15 851	-22 666	-58.8%	159 297	108 485	-50 812	-31.9%
Number of firms with churn	6 478	4 102	-2 376	-36.7%	6 510	3 070	-3 440	-52.8%	16 176	11 466	-4 709	-29.1%
Workers churned per firm	4.9	4.6			5.9	5.2			9.8	9.5		
Churning in expanding firms	15 435	7 268	-8 167	-52.9%	19 314	5 907	-13 407	-69.4%	93 271	40 339	-52 932	-56.8%
Expanding firms with churn	2 531	1 306	-1 226	-48.4%	2 544	862	-1 683	-66.1%	5 551	3 036	-2 515	-45.3%
Workers churned in expanding firm	6.1	5.6			7.6	6.9			16.8	13.3		
Churning in contracting firms	9 932	7 404	-2 528	-25.5%	12 891	6 998	-5 894	-45.7%	46 842	54 495	7 653	16.3%
Contracting firms with churn	1 772	1 355	-417	-23.5%	1 884	1 195	-689	-36.6%	3 718	3 497	-221	-5.9%
Workers churned in contracting firm	5.6	5.5			6.8	5.9			12.6	15.6		
Churning in stable firms	6 582	4 139	-2 443	-37.1%	6 312	2 947	-3 365	-53.3%	19 184	13 652	-5 533	-28.8%
Stable firms with churn	2 175	1 442	-733	-33.7%	2 082	1 014	-1 068	-51.3%	6 907	4 934	-1 974	-28.6%
Workers churned in stable firm	3.0	2.9			3.0	2.9			2.8	2.8		

Sources: Social Security records (2001-2012) and Banco de Portugal.

5. Conclusions

According to data on Social Security records, the job loss recorded since 2007 resulted from a decline in hirings, amid a reduction in workers rotation in expanding firms. In sectoral terms, the construction and industry sectors recorded the sharper reductions in hirings and separations.

The strong reduction in workers rotation conditions developments in the productivity of the national economy, as it mirrors a decrease in investment made by workers and firms in search for the most productive employer-employee pairs. In addition, these developments in rotation reflect the non-existence of new productive investment, as a rule associated with new hirings, even when the firm does not increase the overall number of workers.

By not investing in new labour relationships, firms jeopardise their main engine of growth – human capital. Contracting firms maintain the same rotation of workers, but expanding firms cease to hire new workers. By not having access to new jobs, workers' opportunities of getting the return on their own investment in human capital are curtailed, potentially leading to under-investment in education and training and/or to the promotion of emigration.

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ARTICLES

II

OIL PRICE SHOCKS AND THEIR EFFECTS ON ECONOMIC ACTIVITY AND PRICES: AN APPLICATION FOR PORTUGAL

SHORT-TERM FORECASTING OF INDIRECT TAX REVENUES: AN APPLICATION FOR PORTUGAL

THE WORLD TOURISM EXPORTS CYCLE

PREDICTING AGGREGATE RETURNS USING VALUATION RATIOS OUT-OF-SAMPLE

OIL PRICE SHOCKS AND THEIR EFFECTS ON ECONOMIC ACTIVITY AND PRICES: AN APPLICATION FOR PORTUGAL*

*Francisco Craveiro Dias***

ABSTRACT

In this article, effects of oil shocks on GDP, employment and inflation are estimated for the Portuguese economy, relying on a structural VAR model. In the ongoing period of domestic adjustment it is relevant to have a quantitative measure of these effects, especially since the international economic environment has been cooling sharply and a large uncertainty subsists around the adjustment process. The results of the estimations, for an increase in oil prices of approximately 13 percent in dollars, envisage a depressive effect on the level of GDP in the long run - after five years - of 0.7 percentage points with nearly half of the adjustment taking place in the second year after the shock. The profile of the effect on employment in the private sector is very similar, albeit somewhat smaller. As for the consumer prices, the results translate into higher inflation in the first two years subsequent to the shock (0.25 and 0.05 percentage point in the first and second year, respectively). However this effect shows to be temporary, since as from the third year, the impact reduces slowly, with a virtually nil long-term effect on the price level.

1. Introduction

During the recent years the Portuguese economy has been facing a demanding adjustment process of the macroeconomic imbalances accumulated over more than a decade. This adjustment, which is framed by the Economic and Financial Assistance Program (EFAP), has brought about a significant contraction in economic activity induced by the severe reduction in domestic demand. This reduction was triggered by the fiscal consolidation measures adopted by the authorities so as to meet the deficit targets set in the program. In turn, exports which have proved to be the only component of expenditure that posted positive growth rates during this period, have presented some slowdown recently, in line with the decline in external demand for Portuguese goods and services. This behavior has been triggered, in particular by the progressive slowdown of activity in a broad number of euro area countries, to which a significant share of exports of goods and services are directed. In this context, a quantitative measure of the impact of shocks with depressive effects on overall activity is a relevant piece of information for the projection exercises for the Portuguese economy.

As from the second quarter of 2009, the price of oil has risen significantly, which according to conventional knowledge exerts a contractionary effect on overall activity. This article intends to estimate the effects of oil shocks on economic activity and on inflation for the Portuguese economy. Furthermore, large fluctuations in the price of oil can also exert significant effects on the external balance, owing to the importance of energy goods in total imports.

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Regarding the shocks of this nature, the world economy has been confronted with large fluctuations in oil prices since the early 1970s, with more or less severe and sometimes protracted effects on major macroeconomic variables in various countries. Measuring the effects of oil price changes on the main economic variables, in particular on economic activity and inflation has been a topic of active empirical research for quite some time. The concern in the measurement of these effects was triggered primarily in the wake of the two political events that took place in the 1970s - the OPEC oil embargo during the Yom Kippur War in 1973 and the Iran/Iraq war in 1979. In the sequence of these events economies at a worldwide scale were confronted with significant increases in oil prices, which almost doubled. These sharp growths in prices were followed by significant surges in the rate of inflation and expressive and abrupt reductions in GDP and increases in unemployment at a worldwide scale.

Early important references on this topic in the literature are Rasche and Tatom (1977, 1981) and Tatom (1981). As from the 1980s, Hamilton (1983, 1985 and 1996) stands out as one of the main contributors to this literature. In fact, this author was the first to point out, in his article in 1983 that "almost all U.S. recessions since World War II had been preceded by increases in the price of crude oil." More or less simultaneously, Darby (1982), Burbidge and Harrison (1984) and Gisser and Goodwin (1986), among others, also had important contributions to this empirical literature. At the theoretical level the most relevant contribution was the seminal work of Bruno and Sachs (1985).

Most the empirical results in this area were derived relying either on single equation models focusing on the interaction of just a few variables or on vector autoregressive (VAR) models with the estimation of the corresponding impulse response functions. Since the very beginning, the estimated magnitude of the effect of rising oil prices on overall activity and on inflation intrigued economists, due to the reduced expression of oil in the production process and the share of oil in overall household expenditure

The effects of oil prices changes on major macroeconomic variables diminished significantly in the more recent period, casting doubt on the economic relations so far uncovered in the literature and even raising questions on the importance of oil price shocks on economic fluctuations. These new results stimulated further research aimed as answering several questions related with this topic. In particular, the stability of oil prices relationships with certain macroeconomic variables: Hooker (1996) and Hamilton (1996); the possibility of asymmetric effects of rising and falling oil prices on the economy: Mork (1989) and Hooker (2002); the possibility of the existence of nonlinear relationships between changes in oil prices and GDP growth: Lee, Ni and Ratti (1995) and Hamilton (2003 and 2011); the identification of additional factors, besides oil shocks that may have played a role in the pronounced impact on the economy in the 1970s, in particular the role of monetary policy: Bernanke, Gertler and Watson (1997) and Barsky and Kilian (2002).

At the theoretical level Rotemberg and Woodford (1996) and Finn (2000) articles stood out in this field, whose research was based on aggregate models for the economy based on simulated data. These papers try to identify conditions and channels through which these models provide results for the oil shocks similar in magnitude to those found in the empirical literature.

In the most recent period, particularly as from 1999, the world economy was confronted with oil price increases of a very similar magnitude to those observed in the 70s, which was followed by effects on output and inflation of a size incomparable to anything witnessed in the 70s. The effects of oil price increases caused very limited changes in the rate of growth of output and inflation. In the sequence of these observations Blanchard and Galli (2007) (B&G hereafter), try to identify possible explanatory factors underlying the changes in the effects of oil prices in the 1970s and in the 2000s. Besides measuring the effects of oil shocks on overall activity and prices for various countries, for two disjoint samples, these authors present possible explanations for the differences in the magnitudes of the estimated impacts for the two sub-periods. In their research they rely on a simple neo-Keynesian model identifying three channels that in the most recent period, may have contributed to more muted impact: (i) the observation of increased flexibility of real wages, (ii) greater commitment of central banks in keeping inflation under control and (iii) lower intensity of oil in the production process and in consumption. The authors

conclude that these three factors played a relevant role in reducing the effects of oil on GDP and inflation in the post-1970 period.

This paper intends to estimate the effects of oil shocks on economic activity and on inflation for the Portuguese economy, relying on a structural VAR model. For this purpose, we will follow closely the method used in B&G.

The paper is organized as follows. In the following section a brief summary of the methodology is presented, as well as the solutions adopted for some of the relevant issues that must be tackled in its formulation. In Section 3 description of the variables that are used in the model as well as references to the transformations to which they were subjected. The estimated results follow in section 4, and conclusions are presented in the final section.

2. Metodology

To estimate the effects of oil shocks on overall activity and prices for the Portuguese economy we use a structural VAR model.[1] These models have been used quite frequently in empirical applications to estimate the effects of changes in oil prices on the economy (Burbidge and Harrison (1984), Hooker (1996) and B&G among others), since they allow to derivate a time profiles of the impact of shocks on the set of variables included in the model.

In the design of any VAR model a first issue that arises is the choice of variables to include in its formulation. Due to the intrinsic characteristics of this type of instrument, these models comprise a limited number of variables in their specification. This hings on the fact that all the variables with a fixed number of lags are included in all the equations of the model, in its reduced form, and on the typically limited size of the macroeconomic time series that are usually available in empirical applications. In this application for Portugal, six variables were included in the model, namely the price of oil, three nominal variables (consumer prices index (CPI), GDP deflator and wages) and two variables in volumes related to overall activity (GDP and employment). The choice of these variables is justified in the light of the objective of the article: measurement of the effects of oil shocks on overall activity and prices. A more detailed description of the series will be presented in the next section.

A second issue that has to be tackled in the estimation phase is related with the number of lags of the variables to be included in the model. Usually, indicators are available, based on statistical tests for pinpointing the number of lags to be included in the model: Akaike information criterion (AIC) or Bayesian information criterion (BIC) among others. However, in this application and given the relative small size of the time series, we will rely on four lags, to avoid problems of over adjustment and to circumvent the degrees of freedom problem.

Finally there is the issue of the identification of shocks in structural VAR model. Since the aim of the study is to estimate the effect of oil shocks on overall activity and prices, it is necessary to identify the part of macroeconomic fluctuations associated with exogenous changes in oil prices. For this purpose, we confine ourselves to the partial identification of the model as in B&G and Rotemberg and Woodford (1996). This identification of the oil price shock is based on the assumption that the series of oil price is not contemporaneously affected by the changes in domestic price and quantity - the other variables included in the model. In other words unexpected changes in oil prices are exogenous with respect to contemporaneous fluctuations of the other variables in the model. This means that the residuals of the

1 The VAR model which was originally developed by Sims (1980), is a linear multivariate model, consisting of n-equations and n-variables, in which the current value of each variable is explained by its lagged values plus current and lagged values of the remaining (n-1) variables. This simple econometric tool allows one to uncover the dynamics between multivariate time series, forcing the imposition of a very limited number of constraints in its formulation, unlike the existing structural models at the time. For a detailed description of this model, see for instance Hamilton (1994).

oil price equation in the reduced form correspond to the oil shocks. This hypothesis, in the case of a small open economy such as the Portuguese, is uncontroversial, since it is relatively consensual to admit that change in domestic variables - indicators of activity and prices – do not affect contemporaneously (within a quarter) the evolution of the price of oil.

3. Information on the data

As mentioned previously, the model includes a total of six quarterly variables in its specification: oil price, consumer price index, gross domestic product deflator, wage index for the private sector, gross domestic product and private sector employment (excluding hospitals and the agricultural sector).

All the variables, with the exception of the price of oil, were collected from the National Statistics Institute (INE) and Banco de Portugal. The series of oil price comes from the ECB, although originally it was collected from publications from the International Monetary Fund (IMF). The series for the private sector wages had to be smoothed for the period 1995Q1-2012Q4, since the original series for this subsample presented large volatility. For this purpose we used a centered moving average of five quarters. Furthermore every variable were transformed in first differences of logarithms as is usual in the literature to overcome the non-stationary problem. One must mention, however, that in spite of this transformation the nominal variables still display some non-stationarity, with a similar profile in the initial part of the sample (Chart 1). This will not constitute a problem for the estimation as discussed below. For the estimation of the model a base sample covering the period 1984Q1-2012Q4 was considered, so to prevent the pre-1984 period from biasing the oil effects for the most recent period. This is a pretty common option in the literature. During the 1984Q1-2012Q4 period three major oil price shocks occured, defined as episodes where the accumulated changes in oil prices (in logs) exceeded 50 percent, sustained for a period of over a year. The first episode began in 1999Q2 and lasted six quarters with a cumulative price increase of about 120 percent. The second period of growth started in 2002Q1 and lasted for nearly five years with an overall increase, with minor variations, of almost 130 percent. Finally the last episode that lasted three years began in 2009Q2, with the price of oil increasing two folds (Chart 2). This last episode is distinct from the previous two as it was preceded by an abrupt and significant decline in oil prices.

The same estimation exercise was conducted for a shorter sample (1984Q1-2008Q4), thus excluding the recent period of internal adjustment of the Portuguese economy within the EFAP, in order to examine the robustness of the overall results. This exercise is intended to verify if the current process of adjustment affects the results obtained for the base sample. Thus, this subsample does not include the period of the third major oil shock that occurred as from 2009Q2.

4. Estimation results

The VAR in its reduced form can be specified as:

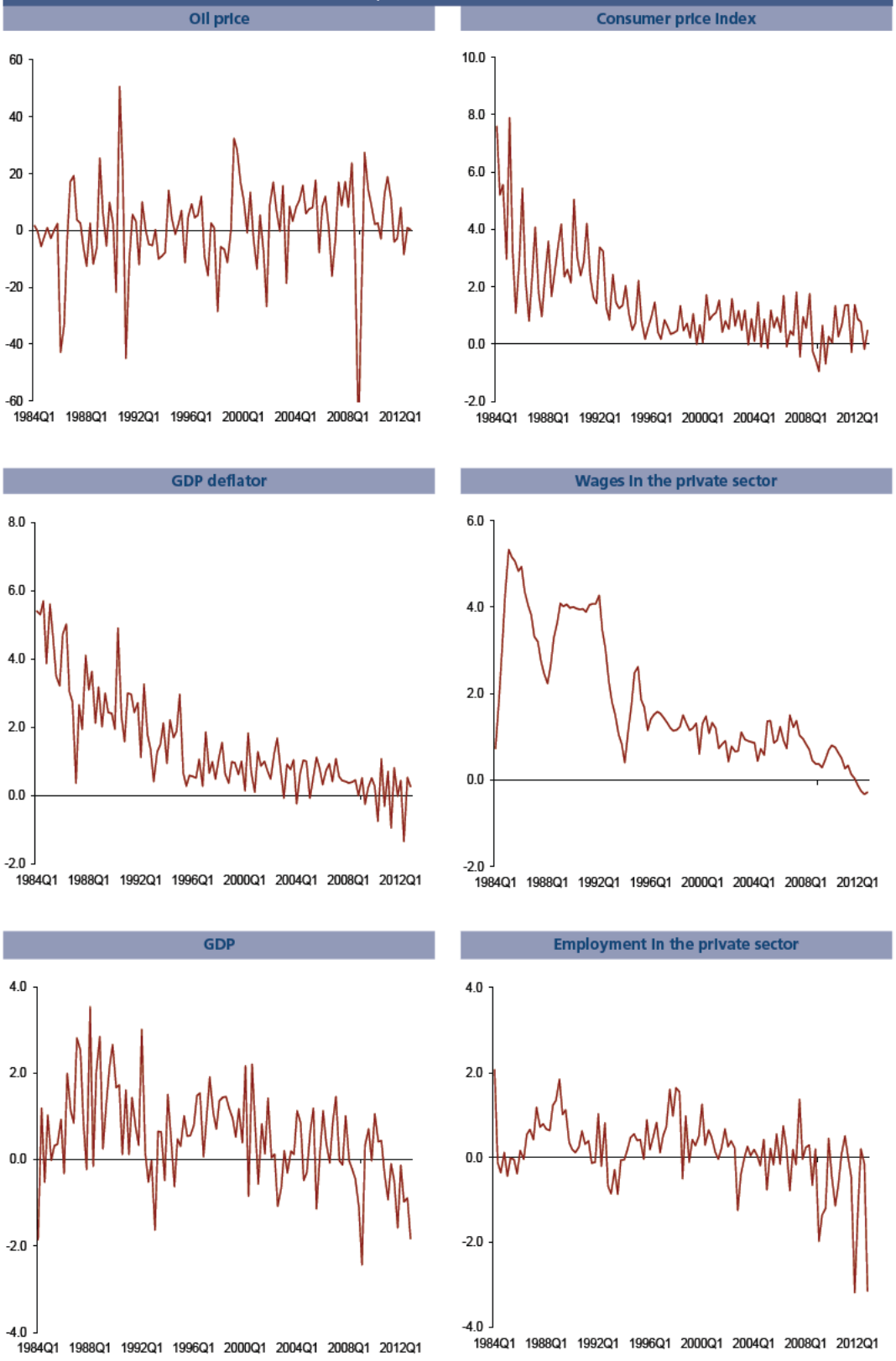
$$y_t = A(L)\, y_{t-1} + u_t$$

where the vector y_t includes the six variables mentioned previously. $A(L)$ is a 6x6 matrix of polynomials in the lag operator L. The polynomials are of a third degree so as to accommodate the four lags assumed for the reduced form. The residuals of the equations in the reduced form are approximately normally distributed and do not exhibit significant serial correlation.

Impulse response functions can be obtained from the structural VAR models. These functions compare the time profile of the variables of the model variables subject to an oil price shock with the time profile in a baseline scenario without the oil shock. For a recent description of the virtues and limitations of the VAR model see Stock and Watson (2007). Impulse response functions provide estimates for the reactions of all the variables of the model to specific shocks. In our case they allow to calculate the effects of oil shocks – the sole shock identified in the model - on prices, activity and employment. These functions

Chart 1

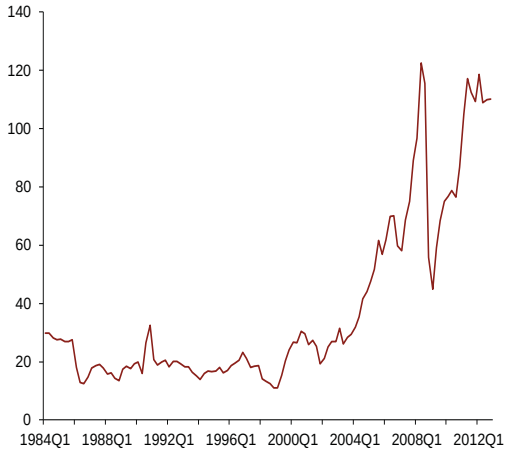
VARIABLES INCLUDED IN THE VAR MODEL | FIRST DIFERENCES IN LOGARITHM



Sources: ECB, IMF, *INE* and Banco de Portugal.

Chart 2

OIL PRICE



Sources: ECB and IMF.

were estimated as cumulative effects, and thus correspond to changes in the level of the variables (in logarithm).

The response functions, which are displayed in Chart 3, represent the effects of an oil price shock with a magnitude equal to one standard deviation of the innovations, and which correspond to an increase of about 13 percent in dollars. In the charts, together with the medians impulse responses, we present confidence intervals, with a standard deviation confidence band, which corresponds to a confidence level of approximately 68% (calculated using the bootstrap procedure based on 5000 ressamplings and the correction proposed by Kilian (1998)).

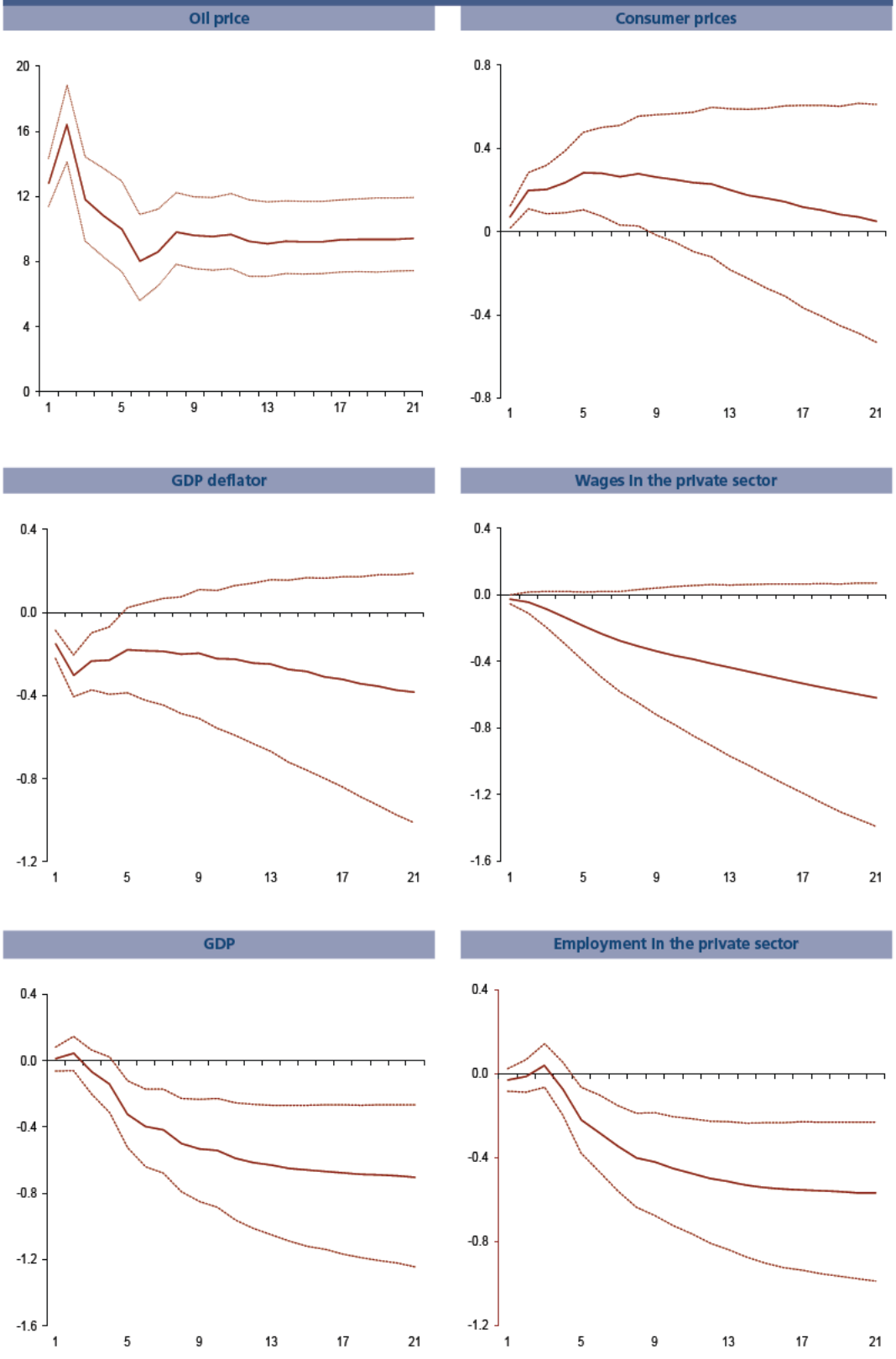
The estimates of the impulse responses follow, in general, the conventional pattern of the effects of oil shock - depressive impact on GDP and employment and inflationary effects on prices. The effect on CPI, points to a gradual rise in prices which extends for a period of two years, reaching a peak after eight quarters (0.3). Thereafter, the impact reduces slowly, with a virtually nil long-term effect – after five years – on the level of price. In terms of inflation, this result translates into a higher inflation rate in the first two years (0.25 and 0.05 percentage points in the first and second year, respectively).

The response patterns for GDP and employment in the private sector show a very similar profile with a negative effect on overall activity and the labor market. The estimates for overall activity convey a loss of about 0.7 percentage points in the level of GDP in the long run, with almost half of the adjustment taking place in the second year after the shock. The time profile of the impulse response function of employment is marginally smaller in magnitude, thus implying a virtually unchanged effect on productivity in the wake of the oil shock. The response of the GDP deflator is less conventional - a negative effect - though statistically non significant after four quarters as is the case of wages in the private sector. Negative effects for these two variables were also estimated for France and Germany by B&G.

For the United States and for the period 1984Q1-2005Q4, B&G obtained values for the impulse response functions for consumer prices, which point to an accumulated effect of the oil shock in the long run of 0.25 percentage points The effects on overall activity are somewhat more moderate, about one-third of those obtained for Portugal. Esteves and Neves (2004), relying on annual data and a sample that includes part of the 1970s got more significant estimates, in absolute terms, for Portugal, especially with respect to CPI.

Chart 3

IMPULSE RESPONSE FUNCTIONS TO AN OIL PRICE SHOCK | PERCENTAGE DEVIATION VERSUS A BASELINE SCENARIO (WITHOUT SHOCK)



Source: Author's calculations.
Note: Quarters in the horizontal axis.

As mentioned earlier, the same structural VAR model was also estimated for a shorter sample - 1984Q1-2008Q4 - to inquire about the sensitivity of the results to the recent adjustment period of the Portuguese economy within the EFAP.

For ease of comparison we display the impulse response functions for the two relevant variables only - CPI and GDP - for the two samples considered (Chart 4). Furthermore, the one standard confidence interval band for the base sample was also included. For the shorter sample the impulse response functions fall within the confidence bands estimated previously. Thus one can conclude that the two are statistically alike, with very similar temporal patterns. Regarding quantitative differences, the long-term effects are somewhat smaller in absolute terms mainly with respect to CPI. In turn, both the time profile and the magnitude of the effect on GDP over the five years period remain virtually unchanged, which ensures robustness to the results estimated with the base sample.

Finally, the same model was also estimated for the period 1993Q1-2012Q4 so as to exclude the period in which nominal variables present some non-stationary features. The results of the response functions did not change significantly, remaining within the confidence bands estimated for the longer sample. These results show that the non-stationary profile of the nominal variables at the beginning of the sample does not seem to be a problem for the estimation.

5. Conclusions

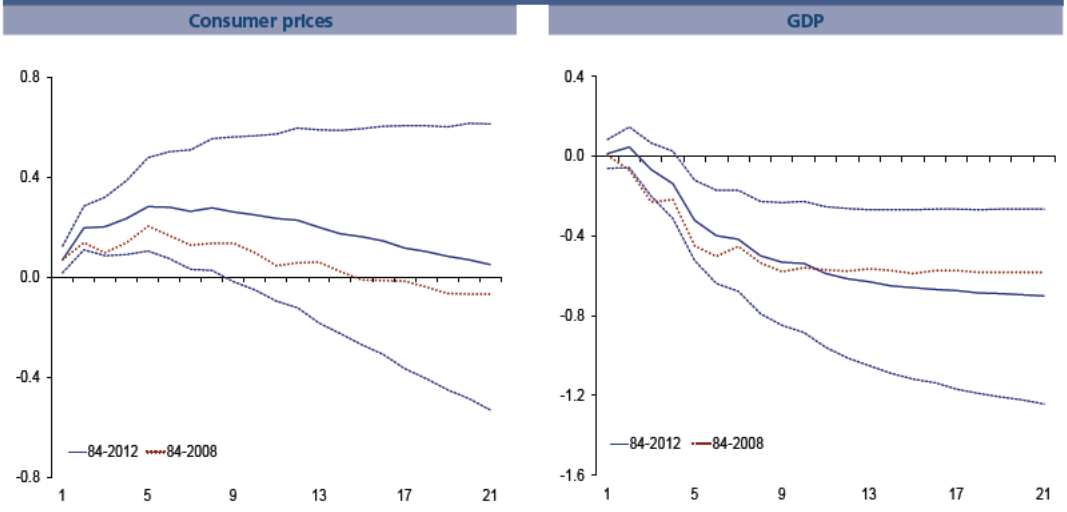
In this article, effects of oil price shocks on GDP and inflation are estimated for the Portuguese economy, relying on a structural VAR model. In the ongoing period of domestic adjustment it is relevant to have a quantitative measure of these effects, especially since the international economic environment has been cooling sharply and a large uncertainty subsists around the adjustment process.

In the structural VAR model, the partial identification strategy adopted allowed to isolate the oil shock and to estimate impulse response functions on the set of variables used in the model - prices, GDP and employment. The estimation exercise was carried out for a base sample covering the period 1984Q1-2012Q4.

The impulse responses functions follow, in general, the conventional pattern for the effects of oil shocks on overall activity and inflation - depressive effect on GDP and inflationary on prices. The increase in oil

Chart 4

IMPULSE RESPONSE FUNCTIONS TO AN OIL PRICE SHOCK | ESTIMATED FOR DIFFERENT SAMPLES



Source: Author's calculations.
Note: Quarters in the horizontal axis.

sprice of approximately 13 percent in dollars - causes, in comparison to a baseline scenario with no oil shock, a gradual rise in consumer prices over the first two years, concentrated predominantly in the first year, and reverses as from the third year. In terms of inflation, this result translates into a higher inflation rate in the first two years (0.25 and 0.05 percentage points in the first and second year, respectively).

The impulse response pattern for GDP and employment in the private sector follow a fairly similar depressive profile, implying a virtually nil effect on productivity in the wake of the oil shock. GDP growth is negatively affected, primarily in the second year after the shock - about a third of a percentage point, and more limited in the first. The estimate for overall activity envisages a loss of about 0.7 percentage points in the level of GDP in the long run, as against a scenario with no shock.

The same exercise for a shorter sample - 1984Q1-2008Q4 -, which excludes the recent period of adjustment of the Portuguese economy, delivered impulse response functions statistically equivalent to the base sample, which ensures robustness to the results herein presented.

These results, besides establishing a fair approximation to the effects of oil shocks on activity and prices for the Portuguese economy, may also serve as comparative benchmarks for impulse response functions derived from general equilibrium models for Portugal.

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SHORT-TERM FORECASTING OF INDIRECT TAX REVENUES: AN APPLICATION FOR PORTUGAL*

Paulo Soares Esteves ** | *Cláudia Rodrigues Braz****

ABSTRACT

In recent times the prompt assessment of the evolution of the fiscal situation has become increasingly important. This topic is even more relevant in the case of Portugal, which is currently subject to an Economic and Financial Assistance Programme. In this context, this paper aims to produce short-term forecasts at an infra-annual frequency for the general government deficit, on a national accounts basis, in Portugal. It focuses on indirect tax revenues and uses "short-term forecasting" techniques which, in the literature, are essentially geared to economic developments. The results vary in line with the considered taxes: VAT, tax on oil products and tax on vehicle sales.

1. Introduction

Access to prompt, reliable information on the economic situation is crucial for policy-makers, as the results of the actions taken depend on the quality of the evaluation. This concern has led to the production of extensive literature in the area of short-term forecasting, both eminently theoretical, focused on the development of new analytical techniques, and having an empirical nature, concerning the relative evaluation of methodologies. To-date, the focus of this type of analysis has been mainly geared to economic developments, both in terms of the evolution of activity and inflation.[1]

In the current context of the sovereign debt crisis in euro area countries, the concern of estimating the short term evolution of fiscal variables has become prominent. This topic is particularly relevant for a country such as Portugal, under an Economic and Financial Assistance Programme, which encompasses a quarterly evaluation process based on performance criteria that translate into quantitative targets set on a level of certain public finance variables.

The preparation of short-term budgetary estimates benefits from the recent developments in the production of public finance statistics at an infra-annual frequency. On a public accounts basis, reference should be made to the reduction of the time taken to produce information and greater level of detail included in the monthly Bulletin of the Directorate General of the Budget (DGO). Regarding the national accounts basis, on which the budgetary commitments on a European Union level are established, the quarterly national accounts, by institutional sector, compiled by Statistics Portugal (*INE*) play a crucial role.

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1 Bandura *et al.* (2011) present a discussion of the alternative methods in short-term forecasting, as well as the challenges that arise in this area of research.

This article aims to contribute to the production of short-term forecasts at an infra-annual frequency for the general government deficit on a national accounts basis in Portugal.[2] It focuses on indirect tax revenues[3], given their importance in the overall tax burden and the fact that these taxes are more directly related to macroeconomic variables whose evolution is monitored on a monthly basis by Banco de Portugal. The data for the 1998-2012 period relating to State subsector tax revenues on a public accounts basis was used for the public finances information. These data are currently published every month by DGO, three weeks from the end of the reference period.

The results vary in line with the taxes considered. The long-term evolution of Value Added Tax (VAT) has a unitary elasticity with respect to an indicator that takes into account the consumption structure by products, taxed at different rates. In the short-term, the elasticity in relation to the prices and tax rates components of this indicator is also unitary, while the elasticity with respect to the volume component is clearly higher than one (1.5). The evolution of the tax on oil products (TOP) is explained by an indicator based on the tax rates per litre and petrol and diesel sales, with a unitary long-run elasticity and a short--term elasticity of slightly more than one. The tax on vehicle sales (TVS) is estimated solely on the number of vehicles sold and does not consider the level of taxation, as its translation into a synthetic indicator is difficult to achieve. As such, in this case, it is not possible to establish a long-term association between the revenue and the indicator constructed. The estimated relation is based solely on the short-term elasticity between the evolutions of the two variables, which is slightly lower than one. The evolution of the other indirect taxes is characterised by significant volatility and does not appears to be linked with economic activity. Although its projection is not addressed in this article, it should, however, be based on the application of several technical assumptions and the introduction of specific information, namely related to tax changes.

The article is organised as follows Section 2 summarises the current structure of tax revenues. Section 3 describes the procedures used to estimate the evolution of revenue from the various indirect taxes. Section 4 presents an application to 2012. In order to analyse the robustness of the estimated results, an evaluation of the model in the last two years outside the period used for estimation, was also carried out. Finally, Section 5 presents the concluding remarks.

2. Tax revenue structure

General government tax revenues, defined as receipts from taxes on income and wealth (direct taxes) and taxes on production and imports (indirect taxes), have recorded an increase as a ratio to GDP in recent decades, particularly up to 2007. In 1995 the ratio of tax revenues to GDP stood at 20.8 per cent, rising to a peak of 24.0 per cent in 2007 and decreasing to 22.9 per cent in 2012. In this period, about half of the increase was explained by the behaviour of the revenue from taxes on production and imports.

In 2012, tax revenue stood at 37.8 billion euros, representing 56 per cent of total revenue. Indirect taxes in the same year represented around 60 per cent of total tax revenue. Special reference should be made to the importance of VAT, comprising 36 per cent of total tax revenue and around 70 per cent of indirect taxes (Chart 1). In terms of the proportion of indirect tax receipts VAT is followed by TOP (11 per cent), stamp duty and tobacco tax (both 7 per cent) and TVS (2 per cent).

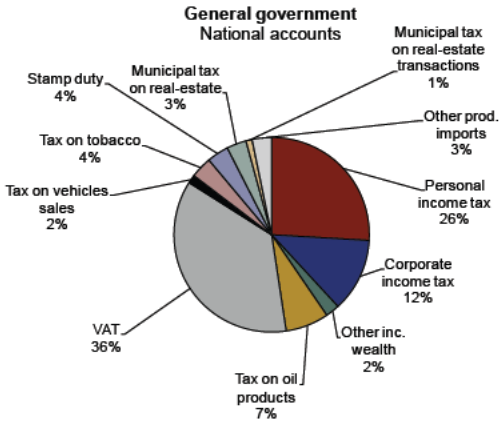
In terms of the public accounts, State subsector tax revenues stood at 32 billion euros in 2012. This difference is largely explained by tax receipts from other general government subsectors, in particular Social Security (VAT), local government (personal income tax, corporation tax surcharge, municipal taxes

2 References to applications of such methodologies on fiscal variables are very scarce in the literature, *e.g.* see Lamo and Camba-Mendez (2004), who estimated the quarterly values of the budget balance in Germany and Italy from relevant quarterly macroeconomic series or Leal *et al.* (2011), who constructed a multivariate mixed frequencies model for the short-term monitoring of the budget balance in Spain.

3 Indirect tax revenues are designated as taxes on production and imports in the national accounts.

Chart 1

STRUCTURE OF TAX REVENUE IN 2012



Source: *INE*.

on real-estate property and transaction)) and regional government (personal income tax, corporation tax and VAT). Additionally, in the national accounts, some of the amounts recorded in other items in the public accounts, such as sales of goods and services and/or other current and capital receipts, have been reclassified as taxes.

As regards the difference between the two types of accounting, it is worth noting that in the national accounts taxes are recorded both on a "cash" basis, as in the public accounts, and on a "cash-adjusted" basis. In the latter case, a time lag is considered in order to allocate the revenue to the respective financial year. Greater detail on these lags is given in the presentation of the models for each tax.

3. Estimation/projection of revenue from indirect taxes

3.1. Value Added Tax

The indicator for VAT receipts can be approximated by the product of the tax rate (t) by nominal private consumption prior to the application of the tax (C^*). It should be noted that this procedure does not enable the observed level of revenue to be replicated as it only considers VAT receipts on private consumption and particularly excludes revenue associated with the intermediate consumption of the private sector[4], public consumption (social benefits in kind and intermediate consumption components) and public investment. According to information provided by INE for the year 2010, the share of VAT revenue not covered by the procedure adopted was around 38 per cent.

The analysis assumed a time lag of 45 days between consumption expenditure and the collection of the tax, which is in line with the rule used to convert the data of the public accounts to the national accounts. 75 per cent of January and February revenue of the following year is added to and 75 per cent of January and February receipts of the same year is subtracted from the compilation of annual values of the current year. The relevant quarterly indicator for tax revenues on a public accounts basis can therefore be described as an average between the revenues associated with contemporary consumption $(t_t\ C_{t*})$ and those related with the previous quarter consumption $(t_{t-1}\ C_{t-1}*)$.

$$I(vat)_t = 1/2\ t_t\ C_t* + 1/2\ t_{t-1}\ C_{t-1}* \quad (1)$$

4 As it is the case of some exempt sectors like banking, health and education.

This indicator for VAT receipts has to be re-expressed in more detail to take into account the different VAT rates on the various private consumption components included in the short-term macroeconomic scenario.

The theoretical average rate of VAT for the consumption component j in period t (to_t^i) is calculated taking into account the tax rate i at time t (to_t^i) and the weight of the consumption component j which is subject to the tax rate i $(\alpha^{i,j})$.

$$\begin{aligned} & to_t^j = \sum_i to_t^i \alpha^{i,j} \\ & i = 1,2,3,4 \ \ (number\ of\ VAT\ rates) \\ & \sum_i \alpha^{i,j} = 1, \forall j \end{aligned} \tag{2}$$

These theoretical rates that reflect legislation are subsequently adjusted in order to achieve the actual rates (te_t^j) for each consumption component. The tax rate used for each consumption component is, therefore, given by:

$$t_t^j = \frac{te_t^j}{to_t^j} \sum_i to_t^i \alpha^{i,j} \tag{3}$$

National accounts data for VAT revenues associated with the different consumption components, based on the four digit COICOP (Classification of Individual Consumption According to Purpose) in the 2008-2010 period, were used in the calculation of actual rates.[5] As this difference varies between sectors, the use of actual rates may be particularly important in estimating the effects of changes in VAT rates. In this case, it was assumed as a hypothesis that the ratio between the actual and theoretical rates would remain unchanged at the levels observed.[6]

Three VAT rates were considered in the analysis (reduced, intermediate and standard), as well as consumption exempt from VAT. Consumer spending before VAT for each consumption component (C_t^{*j}) is also obtained from observed consumption expenditure (C_t^j) and the respective average tax rate (t_t^j), based on the following formula:

$$C_t^{*j} = \frac{C_t^j}{(1+t_t^j)} \tag{4}$$

Nominal expenditure can be split between quantity (Q) and price (P), assuming that the difference between spending with and without VAT is reflected at the deflator level.

$$C_t^{*j} = Q_t^j P_t^{*j} = Q_t^j \frac{P_t^j}{(1+t_t^j)} \tag{5}$$

It should be noted that the use of consumption before VAT as a tax base will enable a more accurate assessment of the effects on revenue resulting from changes in tax rates. The evolution of prices may not fully reflect the increase (decrease) in tax rates, particularly if there is a contraction (expansion) of profit margins. In this situation, the tax base decreases (increases) and receipts will accordingly be smaller (larger).

Considering four consumption expenditure components (j = consumption of vehicles, other durables, food and other non-durable goods), the VAT revenue indicator can be re-expressed as:

$$I(vat)_t = \frac{1}{2}\sum_{j=1}^{4} t_t^j Q_t^j P^{*j}_t + \frac{1}{2}\sum_{j=1}^{4} t_{t-1}^j Q_{t-1}^j P^{*j}_{t-1} \tag{6}$$

5 Given VAT developments in 2009, the average 2008 and 2010 values were used in the analysis.

6 The values of these ratios stood at 0.89 in the case of VAT on vehicles, 0.74 on food, 0.66 on the consumption of non-durables non-food and 0.62 on other durables.

This nominal indicator can be split into two components: an indicator based on quantities and tax rates $Iqt(vat)$ and a price indicator $Ip(vat)$.

The quantities and tax rates indicator is defined by applying the various actual tax rates to the respective quantities consumed, determined on the basis of consumption series expressed in constant prices of a given year.

$$Iqt(vat)_t = \frac{1}{2}\sum_{j=1}^{4} t_t^j Q_t^j + \frac{1}{2}\sum_{j=1}^{4} t_{t-1}^j Q_{t-1}^j \tag{7}$$

As such, this Iqt indicator reflects not only the consumption volume but also the impact of changes in VAT rates in which Iq is the expression that measures the volume effect:

$$Iq(vat)_t = \frac{1}{2}\sum_{j=1}^{4} Q_t^j + \frac{1}{2}\sum_{j=1}^{4} Q_{t-1}^j \tag{8}$$

The expression that measures the effect of the tax rates is therefore obtained by difference and corresponds to a weighted average of the different tax rates, whose weights reflect each component's share of total consumption.

$$It(vat)_t = \frac{Iqt(vat)_t}{Iq(vat)_t} = \sum_{j=1}^{4} t_t^j \left(\frac{Q_t^j}{\sum_{j=1}^{4} Q_t^j + Q_{t-1}^j} \right) + \sum_{j=1}^{4} t_{t-1}^j \left(\frac{Q_{t-1}^j}{\sum_{j=1}^{4} Q_t^j + Q_{t-1}^j} \right) \tag{9}$$

The price indicator is obtained from the ratio between the nominal indicator and the quantities and tax rates indicator defined above.

$$Ip(vat)_t = \frac{I(vat)_t}{Iqt(vat)_t} = \sum_{j=1}^{4} \left(\frac{t_t^j Q_t^j}{\sum_{j=1}^{4} t_t^j Q_t^j + \sum_{j=1}^{4} t_{t-1}^j Q_{t-1}^j} \right) P_t^{*j} + \sum_{j=1}^{4} \left(\frac{t_{t-1}^j Q_{t-1}^j}{\sum_{j=1}^{4} t_t^j Q_t^j + \sum_{j=1}^{4} t_{t-1}^j Q_{t-1}^j} \right) P_{t-1}^{*j} \tag{10}$$

The price indicator therefore reflects a weighted average of the prices of the various consumption components, whose weights are related to the importance of the respective component in the calculation of the quantities and tax rates indicator.

The occurrence of several changes in VAT rates during the period considered were taken into account in the construction of these indicators:

(i) June 2002:	increase in standard rate from 17% to 19%
(ii) July 2005:	increase in standard rate from 19% to 21%
(iii) July 2008:	decrease in standard rate from 21% to 20%
(iv) July 2010:	increase in standard rate from 20% to 21%
	increase in intermediate rate from 12% to 13%
	increase in reduced rate from 5% to 6%
(v) January 2011:	increase in standard rate from 21% to 23%
(vi) October 2011:	increase in the reduced rate of 6% on electricity and natural gas to the standard rate of 23%
(vii)January 2012:	increase in the intermediate rate of 13% on restaurants to the standard rate of 23%

Information on the weights of each VAT rate associated with the four consumption components is given in table 1. For the most recent period these weights were modified in order to incorporate the last two changes in the tax rates. According to these figures, the average actual VAT rate on private consumption rose from 8.7 per cent in 2010 to 10.1 per cent in 2012.

Chart 2 provides information on the evolution of the constructed indicator vis-à-vis the observed revenue from VAT, with both variables evaluated at levels and at rates of change from the first quarter of 1998 to the fourth quarter of 2012.[7]

It should firstly be noted that the level of the indicator is persistently below observed VAT receipts (935 million euros on average in the period considered). This difference may be related to the fact that, as already mentioned, the indicator does not consider components other than private consumption which are also taxed under VAT. Another aspect which should be highlighted is the fact that revenues from VAT are highly seasonal. The trend towards higher first quarter levels is related to the fact that February revenue reflects December consumption.[8] Finally, it should be noted that the quarter-on-quarter evolution of VAT revenue also tends to be significantly volatile.[9]

Unlike the tax revenue published by DGO and the general government quarterly national accounts, the constructed indicator is, by definition, seasonally adjusted as it is based on quarterly national accounts seasonally adjusted for private consumption. The estimation of the relationship between VAT revenue and the constructed indicator is based on rates of change, which reduces volatility and avoids the problems associated with the seasonality of the series.

Based on the same period, and considering the variables measured in logs, the estimated equations for the long-term evolution and the short-term dynamics by way of an error correction model are as follows (t-ratios in parentheses):

Long-term solution:

$$\underset{}{VAT^{*}} = \underset{(32.80)}{0.462} + 1.000\, I(vat) + \underset{(2.72)}{0.053}\, S1 - \underset{(-4.97)}{0.095}\, S2 - \underset{(1.20)}{0.023}\, S3 - \underset{(-7.57)}{0.118}\, Ds2009q2 \qquad (11)$$

Table 1

SHARE OF HOUSEHOLDS CONSUMPTION EXPENDITURE BY VAT RATES | AS A PERCENTAGE OF TOTAL

	Standard rate	Intermediate rate	Reduced rate	Exempt
Durables: vehicles	100.0	0.0	0.0	0.0
Durables: non-vehicles	100.0	0.0	0.0	0.0
Non-durables: food	22.9	11.7	65.5	0.0
Non durables: non-food	43.9	14.4	24.3	17.5
from October 2011[(1)]	48.0	14.4	20.2	17.5
from January 2012[(2)]	61.1	1.2	20.2	17.5

Source: Authors calculations based in national accounts data from the period from 2008 to 2010.
Notes: (1) In order to reflect the change of the VAT rate on the consumption of electricity and natural gas, from the reduced to the standard rate, assuming an unchanged consumption structure. **(2)** In order to reflect the change of the VAT rate on expenditure in restaurants, from the intermediate to the standard rate, assuming an unchanged consumption structure.

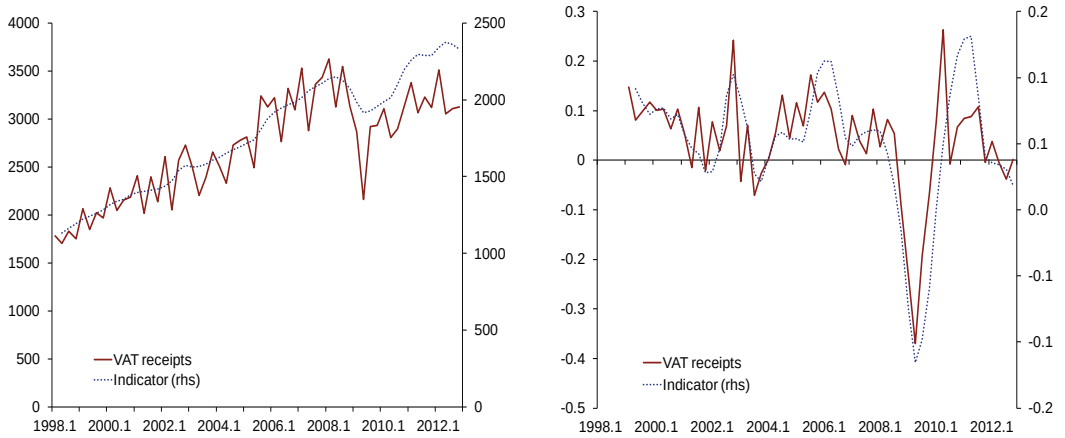
7 The series presented are adjusted for the effect of the sale of State tax credits to *Sagres* in December 2003. The amount of VAT totalled 808.5 million euros, according to information disclosed by DGO.

8 Based on available monthly data, the receipts were also particularly high in May, August and November, reflecting the fact that these are the months when VAT on a quarterly basis is collected.

9 The original series, measured in first difference of logarithms, has an average value of 1 per cent and a standard deviation of 13 per cent. The seasonally adjusted series (using procedure X11 ARIMA) allows a significant reduction in the standard deviation, which, however, still remains at a very high level (7 per cent).

Chart 2

NOMINAL INDICATOR *vs* VAT RECEIPTS



Source: Authors calculations.

in which the dummy variables $Si\ (i=1,2,3)$ capture seasonal effects, while the variable $Ds2009q2$ represents a permanent change from the second quarter of 2009.

Short-term evolution:

$$\Delta^4 VAT = \underset{(-1.66)}{-0.010} + \underset{(7.58)}{1.527}\,\Delta^4 Iq(vat) + 1.000\,\Delta^4 Ip(vat) + 1.000\Delta^4 It(vat)$$

$$\underset{(-5.56)}{-\ 0.701}\left[\mathrm{VAT}_{t-4}\text{-}\mathrm{VAT}^{*}_{t-4}\right]$$

$$\underset{(-4.90)}{-0.219}\ D2009q2 + \underset{(2.57)}{0.121}\ D2009q2_{t-4} \qquad (12)$$

$R^2 = 0.776248$ F(4,50) = 43.37 [0.000]

no. of observations = 55 no. of parameters = 5

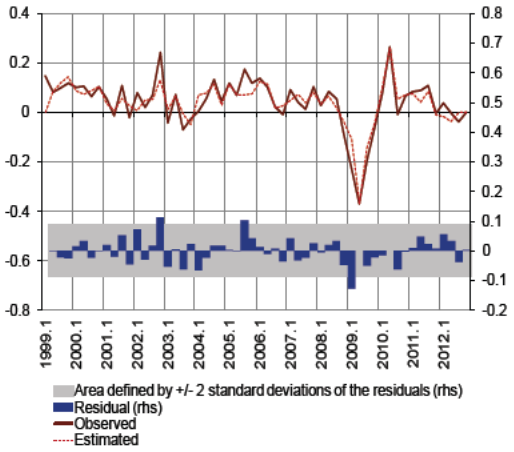
AR 1-4 test: F(4,46) = 0.31366 [0.8674]

Chart 3 shows the fit of the equation in the sample period considered. In the long run it was assumed that VAT revenue follows the indicator with a unit elasticity, although some preliminary results pointed to slightly lower elasticities. On the other hand, several results justify the possibility of an elasticity of more than one, reflecting the fact that goods with higher income elasticity tend to be taxed at higher rates (see Braz and Cunha, 2009). It was therefore decided to introduce the restriction of a unitary elasticity, an assumption which was not rejected in estimations in which the obtained coefficient was statistically similar to one.

As regards the long-term evolution of VAT receipts, the data also suggest a permanent change in the relationship between revenue from VAT and the constructed indicator, which was taken into account through a dummy variable from the second quarter of 2009. Currently, there is no satisfactory explana-

Chart 3

FIT OF THE VAT RECEIPTS EQUATION | Y-O-Y RATES OF CHANGE (LOGS)



Source: Authors calculations.

tion for this phenomenon, but the unfavourable evolution of tax revenue in the said year was partially explained by an increase of refunds associated with a shortening of the deadlines for reimbursement. Finally, as revenues from VAT are subject to seasonal fluctuations, unlike private consumption in the quarterly national accounts, dummy variables to capture these seasonal effects were also considered (Si refers to the specific effect for quarter i). The results obtained point to the existence of a cointegration relationship between the levels of the indicator and VAT revenue.

Concerning short-term developments, reference should be made to the estimation of an elasticity of more than one (1.5) with respect to fluctuations in consumption in real terms. In the lower (higher) phases of the cycle the fact that lower (higher) revenue performance vis-à-vis the benchmark tends to be observed, can be explained by the higher (lower) propensity to tax evasion and fraud and changes in the consumption structure towards higher (lower) spending on goods with lower prices and/or taxed at reduced and intermediate rates, as well as other limitations in capturing non-linear effects. In the case of the reaction to changes in prices and tax rates a unit elasticity was assumed. Finally, in line with the observed long-term relationship, the results presented consider the existence of an outlier in the second quarter of 2009.

According to the results, a 1 per cent increase in nominal consumption, equally distributed between price and quantity and between the various expenditure components leads to a change of around 1.2 per cent in VAT revenue. If this increase were fully explained by a volume effect revenues would have grown 1.5 per cent. However, the importance of this impact differs depending on the consumption component affected. In this context, it is important to take into account the tax rates for each consumption component, as well as its proportion of total expenditure. Table 2 illustrates the sensitivity of VAT revenue to shocks in different consumption components. It is worth emphasising the importance of durable goods for VAT developments, particularly as regards the vehicle component. Despite its small proportion of total consumption, the high VAT rate and its significant volatility show its potential contribution to the evolution of tax revenues.

Table 2

SENSITIVITY OF VAT RECEIPTS TO THE DIFFERENT CONSUMPTION COMPONENTS

	VAT average rate[1]	Weights of the bases in 2012	Standard deviation of the bases[2]	% impact in VAT receipts: unit shock[3]	% impact in VAT receipts: one standard deviation shock[3]
Vehicles	20.4	2.6	18.6	0.04	0.74
Other durables	14.4	3.6	7.3	0.05	0.40
Food	7.9	21.0	1.0	0.32	0.32
Non-durables non-food	10.2	72.9	2.8	1.11	3.12

Sources: *INE* and authors calculations.
Notes: (1) Actual rate calculated by the authors. It encompasses the recent change in the VAT rate for expenditure in restaurants. **(2)** Calculated with the y-o-y rates of change for the 1999-2012 period. **(3)** Percentage change in total VAT receipts stemming from a one per cent shock in the volume of the various consumption components.

Incorporation of new monthly data

Given the quarterly frequency of the indicators calculated, it is important to study how the monthly information provided by DGO during the quarter under review should be incorporated. The availability of a new monthly observation, in addition to influencing the quarterly estimate resulting from the aggregation of the respective months, can also be used to correct the implicit forecast for the remaining months of the quarter that are not yet available. In this regard, an analysis showed that, on average in the past, the quarterly forecast errors would have been minimised if there had been no reaction to the monthly information that was being made public, either to extend or to compensate for the discrepancy between the monthly information and the projection obtained for the quarter as a whole. In any case, it is important to stress that at any point of time deviations may have a different nature and an analyst's real-time assessment of each specific case, when new monthly information is available, is fundamental.

Identification of base effects

One disadvantage of using models expressed in rates of change relates to their inability to capture effects related to the evolution of the variable in the corresponding period of the previous year (usually called base effects). The lagged term (same quarter of the previous year) is frequently deemed to be statistically significant. However, the interpretation thereof is not straightforward. The evolution of this term may reflect an unusual occurrence in the same period of the previous year - tending to cause a base effect on the annual rate of change this year - or the correction of a base effect which took place two years ago and, as such, not a base effect for the current year rate of change. In this context, based on the estimated equation, an analysis of the significance of the residuals in the same period of the preceding year, considering several criteria for the selection of observations capable of producing a base effect, was carried out. The results are presented in Table 3 and point to the absence of a significant negative correlation between the contemporary period and the same period of the previous year residuals, regardless of the criteria used. This result could stem from the fact that, although in the specification adopted the variables are expressed in rates of change, it was considered an error correction term in the same period of the previous year and expressed in levels, with a high and statistically significant coefficient.

Table 3

CORRELATION BETWEEN RESIDUALS | VAT

	k=0.0	k=0.5	k=1.0	k=1.5
$\rho\ (e_t, e_{t-4})$	-0.17	-0.32	-0.06	0.02

Source: Authors calculations.
Notes: "k" represents a scale factor to be applied to the standard deviation of the residuals in the identification of observations sufficiently significant to produce base effects. Thus, it is considered that the information is affected by base effects when the respective residual is outside the interval $\pm k\sigma$, with σ being the standard deviation of the estimated residuals.

3.2 Tax on oil products

TOP is a specific tax (cents/litre) on fuel sales. The natural indicator for the revenue associated with sales of fuels can therefore be expressed as,

$$I(top)_t = tp_t\ Cp_t + td_t\ Cd_t \tag{13}$$

in which tpt and tdt are the specific taxes in period t on petrol (Cp_t) and diesel (Cd_t) sales respectively.[10]

Chart 4 shows the evolution of the tax rates, with information on the consumption of petrol and diesel being shown in chart 5. These graphs illustrate the significant increase in taxation on fuel over the last decade, especially for petrol, where the tax rose from close to 30 cents/litre in 2000 to a current level of around 60 cents/litre. In terms of consumption, it should be noted that diesel sales showed some stability - at a level of approximately 450 tons per month - as opposed to a clear reduction of petrol sales over the last decade, currently corresponding to approximately ¼ of diesel consumption.

Chart 6 shows the evolution of the monthly constructed indicator vis-à-vis TOP receipts expressed either in levels or in rates of change. The structural change in TOP receipts from 2008 is evident as this was the period from which the State began to transfer revenues to the enterprise *Estradas de Portugal*.[11]

The analysis of rates of change shows a strong link between the benchmark indicator constructed and TOP revenues, with the exception of the change occurring in 2008, as mentioned above. The introduction of a time lag in the indicator is due to the fact that revenues collected in a given month relate to sales recorded in the previous month. This is the time lag considered by *INE* in its compilation of national accounts from public accounts data.

Based on a sample of monthly data from February 2000 to December 2012, the estimated equation with

Chart 4

TAX ON OIL PRODUCTS | CENTS/LITRE

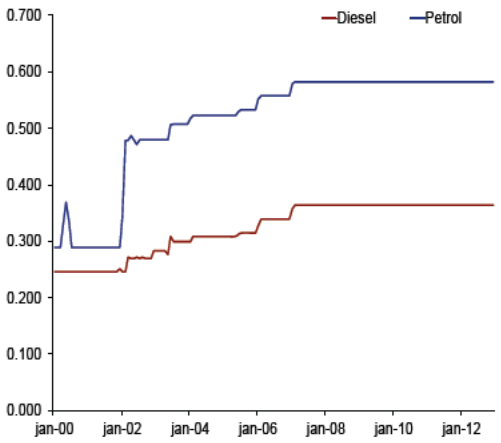
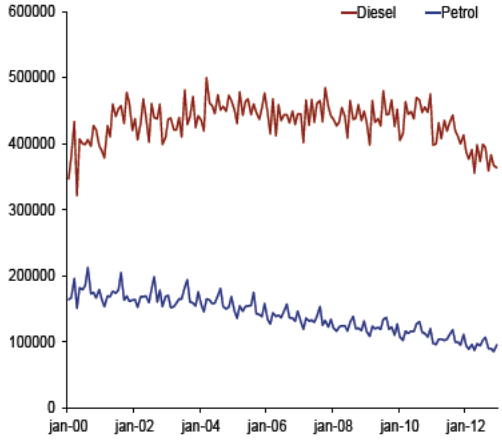


Chart 5

CONSUMPTION OF FUEL | TONS



Source: Directorate General for Energy and Geology.

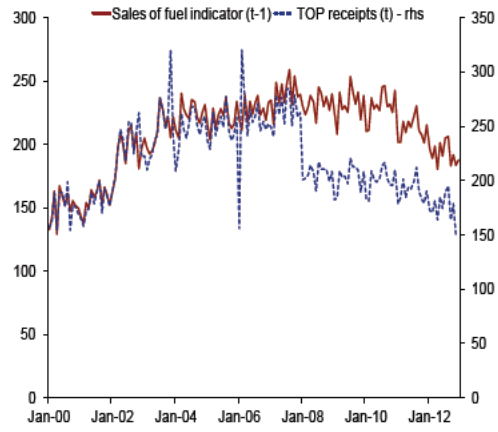
10 Although TOP is also charged on other fuels which are consumed or sold, in terms of revenue, its significance is residual.

11 Law no. 55/2007 of August 31. This change, although affecting State revenue on a public accounts basis, has no impact on the revenue of general government sector as a whole in terms of the national accounts.

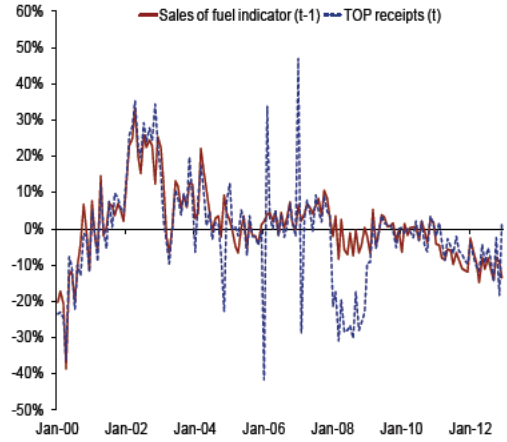
Chart 6

INDICATOR *vs* TOP RECEIPTS

Levels (millions of euros)



Y-o-Y rates of change



Sources: Directorate General of the Budget, Directorate General for Energy and Geology and authors calculations.

variables expressed in logarithms and an error correction term is as follows:

$$\Delta^{12}TOP_t = \underset{(1.38)}{0.010} + \underset{(3.93)}{0.239}\,\Delta^{12}I(top)_t + \underset{(13.20)}{0.796}\,\Delta^{12}I(top)_{t-1} - \underset{(-14.90)}{0.208}\,Dh2008_{t-1} + \underset{(14.10)}{0.336}\,Out_t$$

$$- \underset{(-3.58)}{0.157}\left[TOP_{t-12} - I(top)_{t-12}\right] - \underset{(-1.67)}{0.023}\,Ds2008_{t-12} \qquad (14)$$

$R^2 = 0.904103$ F(6,148) = 232.6 [0.000]**

no. of observations = 155 no. of parameters = 7

AR 1-7 test: F(7,141) = 0.65465 [0.7100]

In which the following was considered:

(i) two dummy variables to measure the permanent change verified since 2008: $Ds2008$ to measure the permanent change in the relationship between the indicator and the levels of tax revenue and $Dh2008$ to measure the temporary effect on the rates of change in 2008.

(ii) a variable to account for outliers (Out). In February 2006 there was a significant decrease in revenues, which was offset in the following month. These deviations were repeated in the following year with the opposite sign because the model is expressed in year-on-year rates of change. The value of this variable was -1 in February 2006 and March 2007 and 1 in March 2006 and February 2007.

The results show that the constructed indicator assessed in the previous month goes a long way towards explaining the developments in TOP revenue. However, the evolution of the indicator in the same month also contributes towards an explanation of tax receipts, owing to the fact that a proportion of the tax receipts at the beginning of each month is also recorded as revenue in the same month. Not unexpectedly, the sum of the two coefficients of the contemporary and lagged terms is close to one.

A unit elasticity between the constructed indicator and TOP revenues was considered over the long-term as an assumption which was not statistically rejected in preliminary estimates. As in the case of VAT, the

results do not reject the existence of a cointegration relationship between the levels of the indicator and tax revenues.

The results of the estimated coefficients for the dummy variables, correcting the break in the series in 2008, point to a reduction of around 20 per cent in the level of TOP, which is consistent with the amount transferred to *Estradas de Portugal* in the said year. Similarly, the variable introduced to capture outliers in the year-on-year rates of change in February and March 2006 and 2007 have a high statistical significance, contributing around 30 percentage points to the growth rates of these months. Chart 7 shows the fit of the estimated model.

There is no evidence of significant base effects, regardless of the degree of restrictiveness used in the identification of observations affected by base effects (Table 4). As in the case of VAT, the existence of an error corrector term evaluated in the same period of the previous year allows the estimated model to correct the base effects endogenously.

3.3 Tax on vehicle sales

TVS tax is characterised by a complex structure which has undergone several changes over time. Currently, TVS is based on tables in which the amount of the tax depends on a vehicle's engine size (cm^3) and emissions (CO_2). These tables also vary depending on whether a vehicle uses petrol or diesel. In this context, the construction of a direct indicator for the level of TSV revenue is a difficult task.

The obvious choice is to consider sales of light passenger vehicles as a benchmark to estimate the revenue performance of TVS.

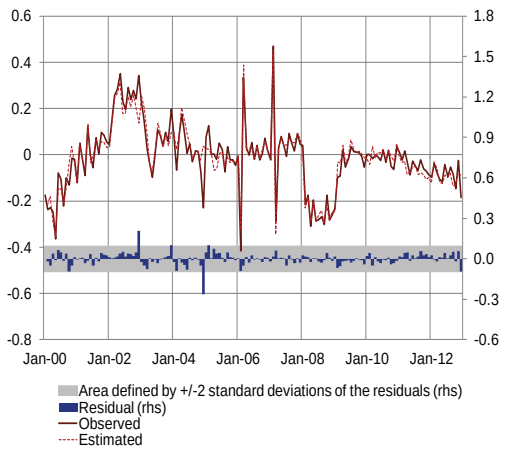
$$I(tvs)_t = (Qpas_t + 0.7Qcom_t)P_t \quad (15)$$

The variables $Qpas_t$ and $Qcom_t$ represent, respectively, sales of light passenger vehicles and light commercial vehicles in period t. The variable P_t measures the evolution of the price of vehicles on the basis of sub-section 7.11 of the Consumer Price Index designated "Acquisition of vehicles".

A first difficulty relates to how to aggregate the sales of the two types of vehicles considered. It was decided to attach greater importance to the sales of passenger vehicles. The coefficient of 0.7 applied to

Chart 7

FIT OF THE TOP RECEIPTS EQUATION | Y-O-Y RATES OF CHANGE (LOGS)



Source: Authors calculations.

Table 4

CORRELATION BETWEEN RESIDUALS | TOP

	k=0.0	k=0.5	k=1.0	k=1.5
$\rho\ (e_t, e_{t-12})$	0.08	0.11	0.13	0.07

Source: Authors calculations.
Notes: "k" represents a scale factor to be applied to the standard deviation of the residuals in the identification of observations sufficiently significant to produce base effects. Thus, it is considered that the information is affected by base effects when the respective residual is outside the interval $\pm k\sigma$, with σ being the standard deviation of the estimated residuals.

light commercial vehicles aims to reflect the quality effect related to the difference between the average price of the two types of vehicles, based on INE data for 2005. This assumes that, in general, the most expensive vehicles tend to pay more tax, in particular via the component of the tax related to engine size.

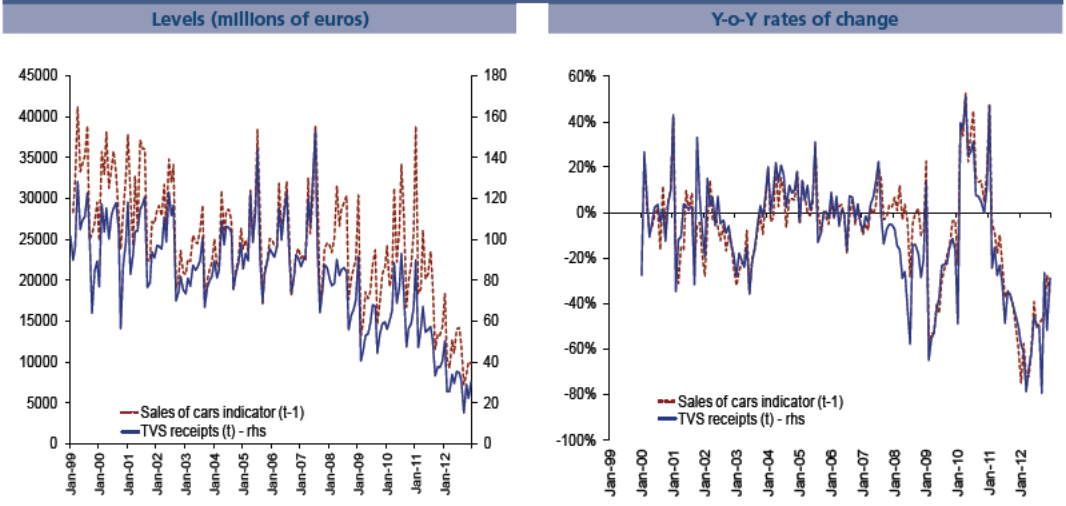
Chart 8 compares the evolution of the constructed indicator and TVS revenue, evaluated with the variables in levels and rates of change. Several legislative amendments occurred during the sample period and may have influenced the relationship between vehicle sales and TVS revenues. These changes were taken into account in the estimation process, by introducing dummy variables.

- 2007/Jan: coming into force of a set of measures to simplify the tax incentive programme for scrappage of vehicles at the end of life (more details on this change are presented in a box published in the Annual Report of Banco de Portugal, 2007).
- 2007/July: coming into force of the new tax, in replacement of the previous car tax.
- 2009/Jan: i) increase in taxation through TVS tables ii) elimination of the tax credit of 500 euros on the purchase of diesel vehicles with particle emissions not exceeding 5 milligrams per kilometre, and iii) change in the tax incentive programme for scrappage of vehicles at the end of life, eliminating the possibility of encompassing the purchase of vehicles with carbon dioxide emissions of more than 140 grams per kilometre.

As mentioned above, the existence of different tax tables and the successive changes in taxation over the past few years make it difficult to construct a benchmark indicator to measure the level of TVS receipts. Therefore, as it is not possible to estimate a long-term stable relationship between the variables expressed in levels, it was decided to estimate a model evaluated solely on rates of change. Based on a sample of monthly data from February 2000 to December 2012 and considering the variables expressed

Chart 8

INDICATOR *vs* TVS RECEIPTS



Sources: *ACAP*, Directorate General of the Budget and authors calculations.

in logarithms, the following equation was estimated:

$$\Delta^{12}TVS_t = \underset{(0.63)}{0.005} + \underset{(2.15)}{0.102}\,\Delta^{12}I(tvs)_t + \underset{(18.00)}{0.889}\,\Delta^{12}I(tvs)_{t-1} - \underset{(-6.99)}{0.195}\,Dh(2007Jul\_2008Jun)_{t-1} - \underset{(-1.92)}{0.056}\,Dh(2009Jan\_2009Dec)_{t-1} \quad (16)$$

$R^2 = 0.866864$ F(4,150) = 244.2 [0.000]**

no. of observations = 155 no. of parameters = 5

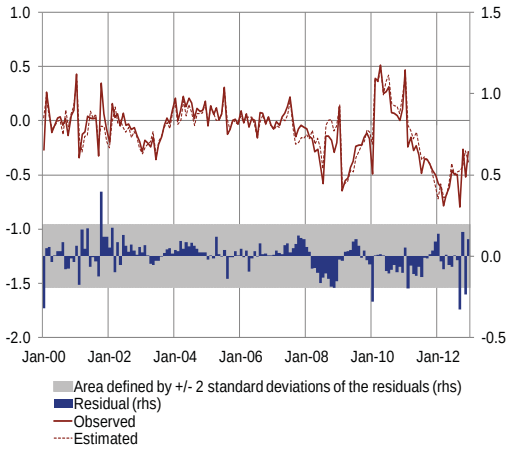
AR 1-7 test: F(7,143) = 5.5235 [0.0000]***

The results show the strong explanatory power of the indicator, particularly of the one period lagged term, although it should be noted that, as was the case for TOP, the contemporary term also appears to be significant.[12] The sum of these two terms is slightly less than one. Of the dummy variables tested, those related to the changes in July 2007 and, to a smaller extent, in January 2009 proved to be statistically significant, both negatively affecting the rates of change of TVS revenue. Chart 9 shows the fit of the estimated model.

Table 5 shows the results obtained with the procedure for evaluating the importance of base effects. In this case, regardless of the degree of tightness used for identification purposes, the procedure suggests the importance of base effects, which means that its use may improve the performance of the model presented above. This result should be related to the absence of an error correction term expressed in levels in the same period of the previous year.

Chart 9

FIT OF THE TVS RECEIPTS EQUATION | Y-O-Y RATES OF CHANGE (LOGS)



Source: Authors calculations.

12 In the national accounts no adjustment is made to this tax revenue from data on a public accounts basis.

Table 5

CORRELATION BETWEEN RESIDUALS | TVS

	k=0.0	k=0.5	k=1.0	k=1.5
ρ (e_t,e_{t-12})	-0.41	-0.48	-0.50	-0.34

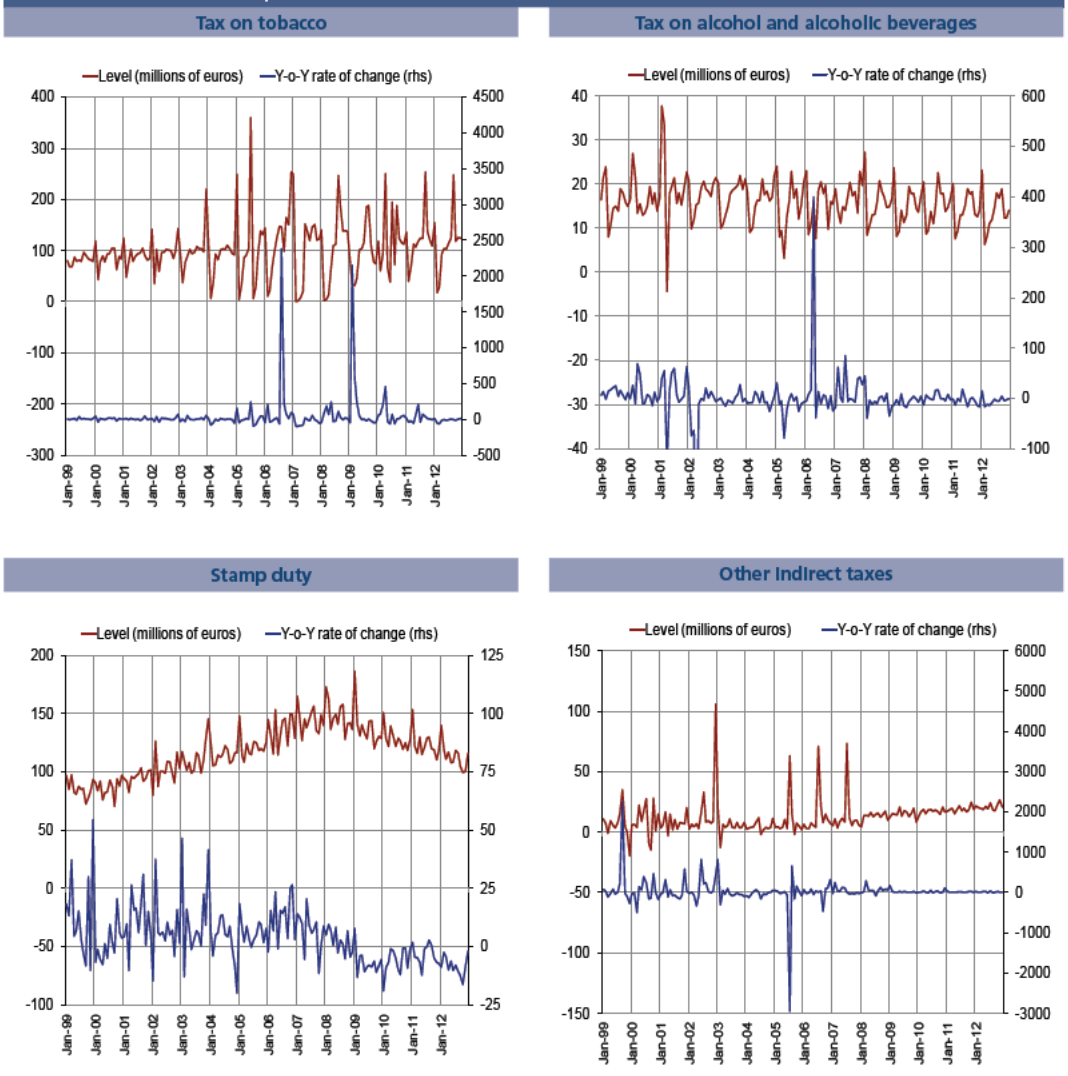
Source: Authors calculations.
Notes: "k" represents a scale factor to be applied to the standard deviation of the residuals in the identification of observations sufficiently significant to produce base effects. Thus, it is considered that the information is affected by base effects when the respective residual is outside the interval $\pm$ k σ, with σ being the standard deviation of the estimated residuals.

3.4 Other indirect taxes

The evolution of the remaining indirect taxes is characterised by significant volatility, appearing to lack any link with economic activity (Chart 10). The projection of these components should be based on the application of several technical assumptions together with the introduction of specific information related to changes in legislation. These taxes as a whole represented around 17 per cent of total State revenue from indirect taxes in 2012.

Chart 10

OTHER INDIRECT TAXES | Y-O-Y RATES OF CHANGE (LOGS)



Source: Directorate General of the Budget.

4. An application to the year 2012

Table 6 shows the evolution of the macroeconomic scenario variables required to implement the procedure described above. In general, consumer indicators contracted sharply in 2012. Based on this information, the procedure described above was applied to the last year available, without any adjustment of the forecast concerning the residuals observed in the recent past (Table 7).

Total TOP, TVS and VAT revenue, in 2012, was 40 million euros (0.2 per cent) higher than what would have been estimated by the application of the procedure. This result reflects the positive deviation in revenues from TOP and TVS and negative deviation in VAT receipts.

In the case of TOP, it should be noted that the positive deviation may, inter alia, reflect the Special Tax on the Consumption of Electricity introduced in the State Budget for 2012 (with an estimated impact of 45 million euros), which is not related to the evolution of fuel sales.

VAT receipts, in 2012, as mentioned above were significantly affected by the remaining effect of the VAT increase on electricity in the last quarter of 2011 and the impact of the VAT increase on restaurants from the beginning of the year. The results show that the observed tax revenue for the year as a whole was lower than would have been estimated based on the relationship with the macroeconomic scenario, but only by 0.5 per cent, after taking into account the effects of changes in legislation in the actual rates of VAT. The direct effect of the measures behind this exercise is clearly lower than that considered in the preparation of the State Budget for 2012, by around 1 billion euros. It should also be noted that the

Table 6

ECONOMIC SCENARIO | Y-O-Y RATES OF CHANGE

	Quarterly variables Private consumption														
	Total			Vehicles			Other durables			Food			Non-durables non-food		
	non	vol	pr	non	vol	pr	non	vol	pr	non	vol	pr	non	vol	pr
2012Q1	-2.9	-5.5	2.8	-42.7	-42.2	-0.9	-17.1	-11.7	-6.1	2.4	-0.7	3.2	-0.9	-3.7	2.9
2012Q2	-4.0	-5.7	1.9	-35.5	-34.4	-1.7	-17.1	-12.0	-5.8	2.4	-0.5	2.9	-3.4	-5.0	1.7
2012Q3	-4.0	-6.0	2.1	-34.4	-33.1	-1.9	-18.5	-14.5	-4.7	3.1	-0.2	3.3	-3.7	-5.5	1.9
2012Q4	-3.9	-5.3	1.5	-29.8	-28.7	-1.4	-16.5	-14.9	-1.9	2.9	-0.2	3.2	-4.1	-4.9	0.8
2012	-3.7	-5.6	2.1	-36.1	-35.2	-1.5	-17.3	-13.2	-4.7	2.7	-0.4	3.1	-3.0	-4.8	1.8

	Monthly variables Sales of light vehicles		Sales of fuel	
	Passenger	Commercial	Petrol	Diesel
Jan-12	-47.4	-14.0	-2.8	-2.6
Feb	-48.6	-68.5	-7.8	-5.6
Mar	-49.1	-66.0	-8.1	-9.5
Apr	-41.7	-63.1	-16.5	-12.8
May	-27.5	-55.9	-5.7	-8.4
Jun	-37.0	-53.4	-9.6	-11.0
Jul	-35.1	-54.8	-8.1	-7.7
Aug	-33.1	-58.1	-9.2	-10.9
Sep	-30.9	-54.1	-10.2	-14.2
Oct	-19.2	-45.2	-9.7	-6.8
Nov	-25.3	-49.9	-9.6	-8.2
Dec	-43.5	-57.0	-14.5	-12.0
2012	-37.9	-54.2	-9.4	-9.2

Sources: *ACAP*, Directorate General for Energy and Geology, Statistics Portugal and Banco de Portugal.

Table 7

PROJECTION ERRORS IN 2012								
	Total	TOP	VAT	TVS	Total	TOP	VAT	TVS
	Observed values							
	Millions of euros				Y-o-Y rates of change			
2012Q1	4 144	534	3 509	101	-4.6	-7.0	-1.9	-47.5
2012Q2	3 681	531	3 052	99	-3.7	-8.5	-0.5	-44.4
2012Q3	3 747	559	3 107	81	-5.7	-7.5	-3.8	-42.8
2012Q4	3 699	492	3 126	81	-2.4	-11.0	0.1	-29.4
2012	15 272	2 116	12 794	362	-4.1	-8.4	-1.5	-42.2
	Estimated values							
	Millions of euros				Y-o-Y rates of change			
2012Q1	4 129	532	3 537	61	-5.0	-7.3	-1.2	-68.2
2012Q2	3 554	516	2 960	77	-7.1	-11.0	-3.5	-56.3
2012Q3	3 855	540	3 241	74	-3.0	-10.6	0.4	-47.9
2012Q4	3 694	497	3 124	73	-2.5	-10.1	0.1	-36.3
2012	15 232	2 085	12 862	286	-4.4	-9.8	-1.0	-54.4
	Difference: observed - estimated							
	Millions of euros				Y-o-Y rates of change			
2012Q1	15	2	-27	40	0.3	0.4	-0.8	20.8
2012Q2	128	15	92	21	3.3	2.5	3.0	11.9
2012Q3	-108	19	-134	7	-2.7	3.1	-4.1	5.1
2012Q4	5	-5	2	8	0.1	-0.9	0.1	6.9
2012	40	31	-67	76	0.2	1.3	-0.5	12.2

Source: Authors calculations.

State VAT revenue in 2012 was negatively affected by the transfer to Social Security of 173 million euros under the Social Emergency Programme and the Extraordinary Social Support to Energy Consumers. Finally, as regards the quarterly values of the deviations, it should be noted that the negative deviation in VAT revenue in the third quarter of the year is likely to be due, to a large extent, to a highly significant increase in refunds (10.7 per cent). Gross revenues increased by 0.2 per cent in this quarter, in line with the very slight projected rise. The opposite was observed in the fourth quarter, i.e., the negative deviation was negligible because it was affected by a significant decrease in refunds (-11.7 per cent).

Real time analysis

It is important to highlight the illustrative nature of this application. It is not an assessment of the procedure in real time as an estimation of equations for evaluating their performance outside the sample period was not performed. The 2012 observations were taken into account in the estimation of the equations used and, as such, may have influenced the assessment of the results of applying the procedure to the year 2012.

In order to examine this effect, an evaluation exercise on the procedure in real time was carried out both on 2012 and 2011. In this context, the equations used were re-estimated using only information available up to the beginning of 2011 and 2012, with a latter projection of each of the two years and an evaluation of the deviations from the observed values. The results are shown in Table 8.

In the case of VAT, the results indicate an underestimation of the out-of-sample projection, with the deviation being particularly significant for 2011 (about 4.1 per cent). This deviation arises from the fact that the revenue elasticity regarding the evolution of the volume indicator of consumption is higher when the most recent years are excluded (2.02 in the forecast for 2011 and 1.72 for 2012).[13] This would

13 As the sample period is relatively small, the elimination of two full years can significantly affect the estimated coefficients.

Table 8

OUT OF SAMPLE ESTIMATION																
	Total	TOP	VAT	TVS	Total	TOP	VAT	TVS	Total	TOP	VAT	TVS	Total	TOP	VAT	TVS
	Estimated values								Estimated values, adjusted by the previous year error							
	Millions of euros				Y-o-Y rates of change				Millions of euros				Y-o-Y rates of change			
2011Q1	4 310	598	3 508	203	11.4	4.4	12.6	12.2	4 215	601	3 425	189	8.9	5.0	9.9	4.2
2011Q2	3 656	603	2 851	202	2.3	-1.1	4.4	-13.5	3 576	606	2 783	187	0.1	-0.6	2.0	-19.7
2011Q3	3 901	631	3 115	155	-3.8	-0.2	-3.0	-27.0	3 819	634	3 041	144	-5.9	0.3	-5.3	-32.2
2011Q4	3 711	577	3 019	116	-4.4	-3.1	-2.7	-36.3	3 634	579	2 947	107	-6.3	-2.6	-5.0	-40.8
2011	**15 578**	**2 408**	**12 493**	**676**	**1.3**	**0.0**	**2.7**	**-16.4**	**15 245**	**2 420**	**12 196**	**628**	**0.5**	**0.5**	**0.3**	**-22.4**
2012Q1	4 106	536	3 470	100	-5.5	-6.6	-3.0	-48.0	4 237	550	3 592	95	-2.5	-4.1	0.4	-50.8
2012Q2	3 539	544	2 891	104	-7.4	-6.1	-5.7	-41.4	3 576	559	2 919	98	-6.5	-3.7	-4.8	-44.5
2012Q3	3 701	577	3 035	89	-6.9	-4.4	-6.0	-36.8	3 865	592	3 189	84	-2.7	-1.9	-1.2	-40.3
2012Q4	3 650	488	3 081	82	-3.7	-11.8	-1.3	-29.1	3 669	500	3 091	77	-3.2	-9.5	-1.0	-32.9
2012	**14 996**	**2 145**	**12 476**	**375**	**-5.6**	**-7.2**	**-4.0**	**-40.1**	**15 347**	**2 201**	**12 790**	**355**	**-3.4**	**-4.7**	**-1.6**	**-43.4**

	Difference: observed - estimated								Difference: observed - estimated							
	Millions of euros				Y-o-Y rates of change				Millions of euros				Y-o-Y rates of change			
2011	354	-98	502	-50	2.3	-4.1	4.1	-6.2	687	-110	799	-2	4.5	-4.6	6.6	-0.2
2012	276	-29	318	-13	1.7	-1.3	2.4	-2.1	-75	-86	4	7	-0.5	-3.7	0.0	1.1

Source: Authors calculations.

involve predicting major effects of the recession in the evolution of VAT revenue. Compared to 2012 this deviation is less significant (2.4 per cent), and becomes virtually nil when the projection is adjusted by the average error observed in 2011. Regarding TOP and TVS, the real-time exercise generates deviations that, in broad terms, are not particularly significant.

5. Final remarks

This work illustrates the possibility of predicting the quarterly evolution of several public finances variables, benefiting from recent developments in the statistical domain. It focuses on indirect tax revenues and aims to help achieve the goal of producing short-term forecasts for the general government deficit in Portugal on a national accounts basis.

As usual, the creation of a procedure for regular use to enable the continuous monitoring and projection of short-term public finances variables implies its enhancement in terms of permanent research for data sources and alternative statistical methods. In addition to improving the methodology presented in this article, the challenge is broader and is particularly difficult in other areas of public finances in which the evolution of variables is more volatile and less related to the economic situation.

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THE WORLD TOURISM EXPORTS CYCLE*

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ABSTRACT

Considering that tourism is an important industry on a global scale, this study analyses and compares the deviations cycles from the long-term trend of tourism exports for all regions of the world with the cycle of the European Union with 27 member states (EU27). In this context, the approach followed allows us to analyse and determine the synchronization between tourism exports cycles of various regions of interest. In parallel, lagged concordance indices of cycles are identified which can play an important role in forecasting and used as an important tool to support decision making of public and private entities associated to the tourism industry. In methodological terms, this paper is based on work originally developed in the literature by Gouveia and Rodrigues (2005), who analyse the tourism demand cycle following the method proposed by Harding and Pagan (2001) and obtain evidence of a strong degree of synchronization between the economic and the tourism cycle. This paper is innovative in the approach used to investigate the relationship between tourism exports cycles and in the identification of the trend and cycle components through the application of state-space methods and the Kalman filter (Kalman 1960, Kalman and Bucy, 1961).

1. Introduction

A characteristic of industrialized economies is the transition between periods of expansion and recession. The understanding of such fluctuations has received particular attention in economic literature since the pioneering work of Burns and Mitchell (1946). Recently there has been a growing interest in the study of tourism exports in terms of its growth and its relationship with the economic cycle.

The economic dependence of some countries on the tourism sector may have implications on the behavior of the economy and in particular on its economic growth and development (see, *inter alia*, Eugenio-Martin, Morales and Scarpa, 2004 and Andraz, Gouveia and Rodrigues, 2009).

According to the World Travel and Tourism Council [WTTC] (2013), the direct contribution of Travel & Tourism to global GDP in 2012 was 2.1 trillion USDollars. However, its total contribution, which includes direct, indirect and induced effects, reached 6.6 trillion USDollars, representing around 9.3% of world GDP. Additionally, this contribution can also be quantified in terms of generated employment. Indeed, taking into account the direct, indirect and induced effects, this sector is associated with 9.1% of total employment in 2012 (WTTC, 2013).

Given the importance of tourism as a major industry and its importance for a wide range of other activity

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sectors, this paper analyzes and compares the tourism exports cycles from all regions of the world. In this context, the approach considered allows us to analyze and determine the synchronization between tourism exports cycles of various regions of interest and identify the lagged concordance index of cycles. Identification of these characteristics play an important role in anticipating/predicting tourism exports cycles and are an important tool to support the decision making process of public and private tourism-related organizations.

Over the past decades business cycle behaviour has been implicitly taken into account in tourism demand models. The explanatory variables commonly used are *e.g.* disposable income, price levels, and exchange rates and their dynamics (see, *inter alia*, Collins and Tisdell, 2004, Lim and McAleer, 2002 and Andraz, Gouveia and Rodrigues, 2009).

Despite of the extensive literature on tourism demand in terms of growth and main determinants, little can be found on the approaches for the decomposition of tourism exports in trend and cycle and identification of turning points, the study of synchronization and the identification of possible lag effects between cycles.

Available research has been based on the original work of Gouveia and Rodrigues (2005), who address tourism demand cycles following the method proposed by Harding and Pagan (2001), who introduced the concordance and the recursive concordance indices. Based on this methodology, Gouveia and Rodrigues (2005) provide strong evidence of synchronization between the tourism and the economic cycles, and identify delay effects between the two. A recent study of Guizzardi and Mazzocchi (2010), which uses unobserved components models, also concludes that tourism demand has a lagged relationship with the global economic cycle.

The methodology used in this article follows the approach of Gouveia and Rodrigues (2005) and is based on the decomposition of tourism exports time series in trend and cycle components. In contrast with the approach taken by Gouveia and Rodrigues (2005), the trend and cycle are identified through the application of state-space methods and the Kalman filter (Kalman 1960, Kalman and Bucy, 1961).

The main objective of this study is to understand and analyze the synchronization of tourism exports cycles of various regions (and countries) of the world with the tourism exports cycle of the European Union with 27 member states (hereafter EU27). It is interesting to note that the methodology followed in this paper allows us to characterize the various tourism exports cycles in terms of synchronization, to identify lags between cycles, and to study the correlation between the cyclical components of several pairs of regions and / or countries. In this sense, we considered the five most important countries in terms of tourism exports in each region of the world[1] (these countries and their respective weights are identified below in Table 2).

The series analyzed refer to annual tourism exports data, expressed in billions of USDollars at constant 2011 prices. The regions considered are the Caribbean, the European Union, Latin America, the Middle East, North Africa, North America, North-East Asia, Oceania, South Asia, South East Asia and sub-Saharan Africa.

The reference variable considered in the empirical analysis of the tourism exports cycles' synchronization was the EU27 tourism exports cycle. This choice stems from the fact that the EU27 corresponds to the main region in terms of tourism exports worldwide (WTTC, 2013).

Although traditionally cyclical analysis is developed based on quarterly (or monthly) data, in this article annual data is considered (see also Giannone, Lenza and Reichlin, 2008). The recurring pattern of ups

1 Note that in the case of EU27 besides the 5 countries with the highest weights in terms of tourism exports, we have also considered the tourism exports for Portugal.

and downs in annual data is less intense than that observed in quarterly (or monthly) data. However, the use of annual data has the advantage of allowing for an historical perspective of the cycle analysis. Indeed, the use of annual data avoids measurement errors and, despite the short-term information loss, data at an annual frequency seems more reliable when the purpose is to establish robust facts about the real economic activity.

The remainder of this paper is organised as follows. Section 2 describes the methodology used in the data analysis; Section 3 presents a brief review of the events that affected tourism exports in the period under analysis as well as a discussion of synchronization, correlation and lag effects between cycles. Finally, Section 4 presents the main conclusions.

2. Cycle Synchronization

2.2. The concordance index and the correlation coefficient

The methodology proposed by Harding and Pagan (2001) allows for the measurement of the degree of synchronization between two cycles based on the concordance index. This index measures the percentage of time that two cycles are in the same phase. The level of agreement between two regions x and y $\left(\mathrm{CI}_{x\,y}\right)$ is given by the following expression:

$$\mathrm{CI}_{x\,y} = \frac{1}{T}\left\{\sum_{t=1}^{T} I_{x,t} I_{y,t} + \sum_{t=1}^{T}\left(1 - I_{x,t}\right)\left(1 - I_{y,t}\right)\right\} \tag{1}$$

where the indicator function of the tourism demand cycle in a particular region or country is defined from the cycle's turning points, *i.e.*,

$$I_{j,t} = \begin{cases} 1 & if \quad \text{recession} \\ 0 & if \quad \text{expansion} \end{cases} \tag{2}$$

with j = region x or region y.

The method proposed by Harding and Pagan (2001) ensures cycle phases with a minimum duration of τ periods, taking in this way the persistence property of the economic cycle into consideration. The maximum delay order can be viewed as a censoring rule to ensure a duration and amplitude of the phases of the cycles. Harding and Pagan (2001) apply this algorithm for business cycle dating using US GDP data and the results reached are similar to those obtained by the NBER and Hamilton (1989). This non-parametric method is a simple procedure, which has the advantage of being transparent and reproducible, and represents therefore a useful tool for obtaining information about cycles.

With the purpose of obtaining additional information about the contemporary relationship between the cyclical components of tourism exports, we also used Pearson's correlation coefficient,

$$\rho_{x\,y} = \frac{\sum_{t=1}^{T}\left(C_{x,t} - \overline{C}_x\right)\left(C_{y,t} - \overline{C}_y\right)}{\sqrt{\sum_{t=1}^{T}\left(C_{x,t} - \overline{C}_x\right)^2 \sum_{t=1}^{T}\left(C_{y,t} - \overline{C}_y\right)^2}}.$$

In this case, when this coefficient is close to 1 it indicates perfect cyclical convergence, while when it is close to -1 cycle divergence is suggested.

2.2. The recursive concordance index

The CI_{xy} introduced in Section 2.1 allows us to analyze the synchronization of tourism exports cycles between regions and countries. However, it does not allow for an analysis of the evolution of the synchronization over time. This limitation led to the development of a complementary indicator, which was designated by Gouveia and Rodrigues (2005) as recursive concordance index. This index allows us to obtain the percentage of time that two cycles coexist in the same phase until time t $\left(t = 1, ..., T\right)$ and is given by the following expression:

$$\mathrm{R}_{\mathbf{CI}_{x,y,t}} = \frac{1}{t}\left\{\sum_{i=1}^{t} I_{x,i} I_{y,i} + \sum_{t=1}^{t}\left(1 - I_{x,i}\right)\left(1 - I_{y,i}\right)\right\} \tag{3}$$

where $I_{j,i}$ was previously defined in (2).

2.3. The lagged concordance index

In order to complement the $CI_{x,y}$, in the context of the possible existence of non-contemporaneous relationships between cycles, the lagged concordance index is introduced. This index is given by the expression,

$$\mathbf{L}_{\mathbf{CI}_{x,y,d}} = \frac{1}{T}\left\{\sum_{t=1}^{T} I_{x,t}\left(I_{y,t-d}\right) + \sum_{t=1}^{T}\left(1 - I_{x,t}\right)\left(1 - I_{y,t-d}\right)\right\} \tag{4}$$

where d represents the lag order of C_t (the variable representative of the cycle).

The importance of this index lies in the fact that it allows for the quantification of the percentage of time that two cycles are in the same phase, one of which is lagged d time periods. This version of the concordance index allows us to identify advanced tourism demand cycles by comparison with cycles in other regions or countries.

3. Empirical Analysis

3.1. The world tourism cycle and its crises

The tourism industry is often described as a "fragile" industry, susceptible to various types of disturbances (shocks), such as wars, disease outbreaks, terrorist attacks, economic fluctuations, currency instability and energy prices, which unfortunately arise with some frequency all over the world (Neumayer, 2004).

During the period under analysis in this text (1985 - 2011) many of these negative events occurred, some of them more focused in a particular region or in several regions, and others with a more global impact, resulting therefore in different influences on the global evolution of the tourism exports cycle.

In Chart 1 we identify three major periods of crisis: 1) between 1990 and 1995, 2) between 2000 and 2005 (with roots in the second half of the 90s), and 3) from 2007 to the present day. We will briefly describe the main events of each of these sub-periods below.

It is important to note that the impact of these crises was heterogeneous across regions and countries. This may be seen in Chart 2, where one can observe the cyclical developments of regional tourism exports, and in Chart A.1 in the Appendix the cyclical changes in the EU27 reference countries' tourism exports cycles.[2]

2 Relatively to the other countries considered, their respective cycles can be obtained from the authors.

Chart 1

WORLD TOURISM EXPORTS CYCLE

Source: Authors' Calculations.

Note: For a graphical comparison of the cycles we opted for the normalization of the values of the series. In this study, the normalized values, x^*_t, are defined within the closed interval from -1 to 1, *i.e.*, $x^*_t = \frac{2(x_t - x_{\min imum})}{x_{\max imum} - x_{\min imum}} - 1, \quad t = 1,\ldots,T$

As a complement to the cyclical developments of the regional tourism exports cycles presented in Chart 2, we can further analyze in Table 1 the rates of annual tourism exports growth for the three aforementioned periods (1990-1995, 2000-2005 and 2007-2011).

3.1.1. 1990 – 1995

The period between 1985 and 1989 was a period of expansion, partly due to a positive supply shock which occurred in 1985, resulting from the decline in oil prices. However, as can be seen from Chart 1, in the early 90s there was a decline in the world tourism exports cycle, which suffered two recessions between 1990 and 1995.

This period coincides with the first Gulf War (August 1990 - February 1991), which played an important role in the decline of tourism demand, especially in the Middle East and North Africa (Neumayer, 2004). From Table 1 it is observed that these two regions recorded negative growth rates in 1991, and that in general (with the exception of Northeast Asia) all other regions experienced a significant slowdown.

However, Europe was at this time also entering a difficult period. In 1992, one of the worst crises of the European Monetary System took place. This crisis resulted in the expulsion of the pound and the lira from the Exchange Rate Mechanism (ERM), and the devaluation of the peseta and other currencies.

In 1993, negative growth rates of tourism exports in the EU27 and in Europe (Table 1) are observed. This negative growth is particularly important in Portugal in 1994 (-8.8%) and in Spain in 1993 (-5.1%).

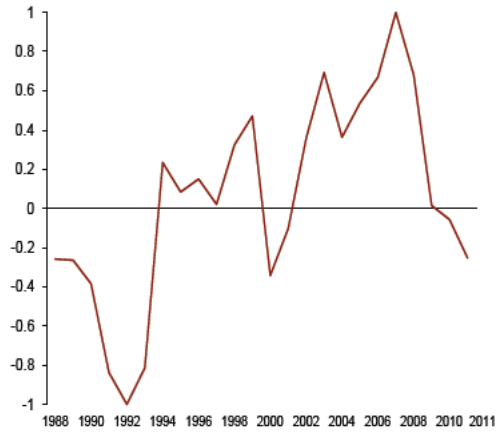
Although we have only focused on the first half of the 1990s, this decade will also be remembered for the severity of the crises that have affected Mexico in 1994, East Asia in 1997, and Brazil and the Russian Federation in 1999. In particular, the second half of the 1990s marked the beginning of a long decline of the world tourism exports cycle (Chart 1).

The Asian financial crisis, which appeared to be a regional event, with time proved to be the "first great crisis of the global markets." Asia was affected by a decrease of demand and of confidence throughout the region. In 1997 and 1998, Northeast Asia, Oceania and Southeast Asia exhibited negative rates of annual tourism exports growth.

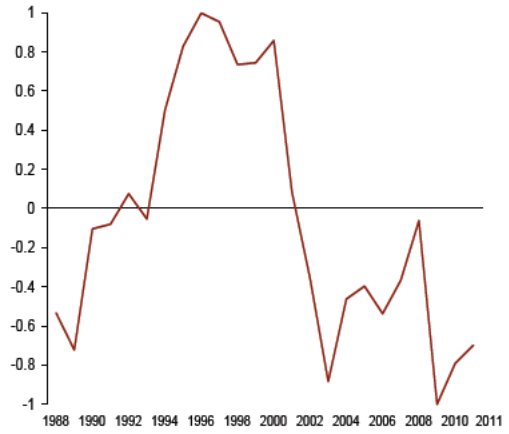
Chart 2 (to be continued)

TOURISM EXPORTS CYCLES BY REGION

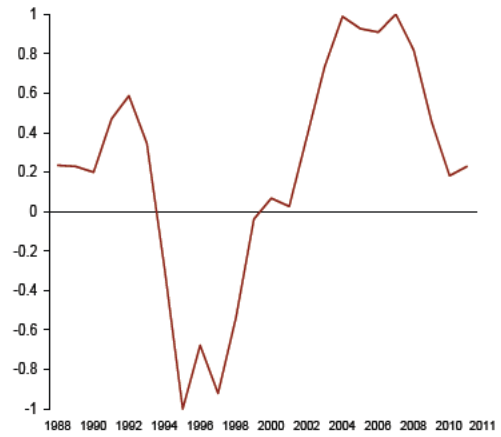
Sub-Saharan Africa



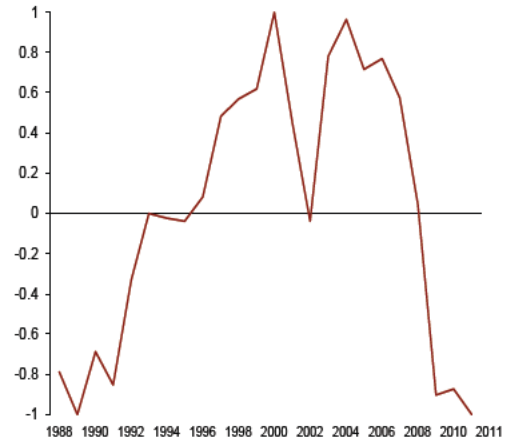
North America



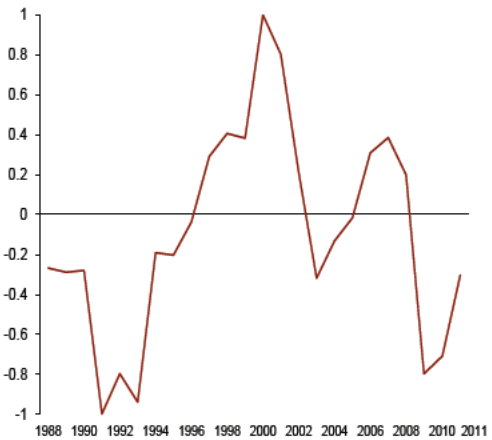
Latin America



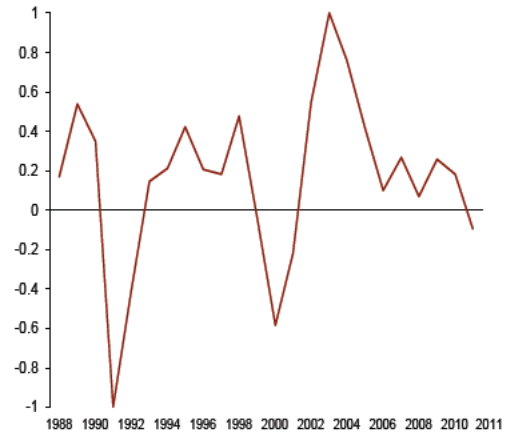
Caribbean



Europe



Middle East

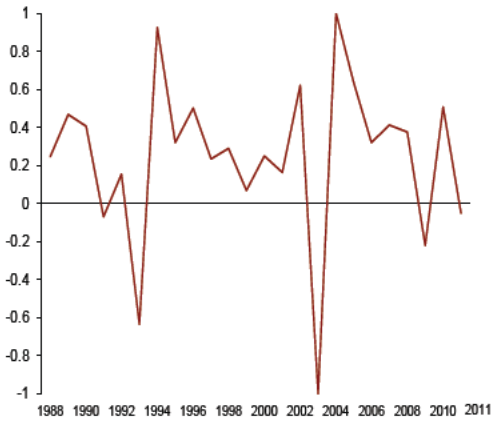


Sources: World Travel and Tourism Council and Authors' Calculations.

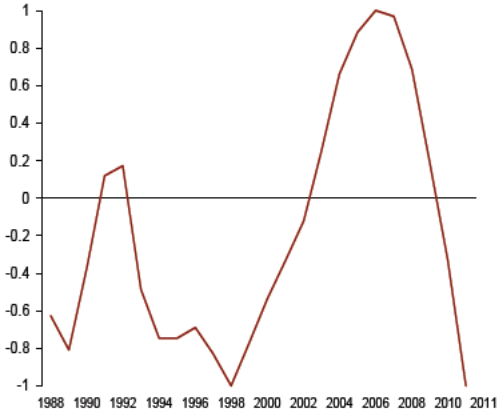
Chart 2 (continued)

TOURISM EXPORTS CYCLES BY REGION

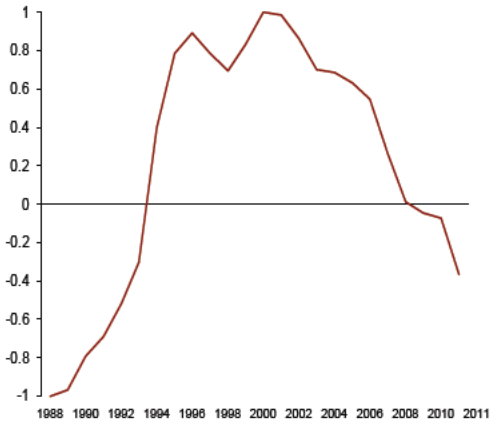
Northeast Asia



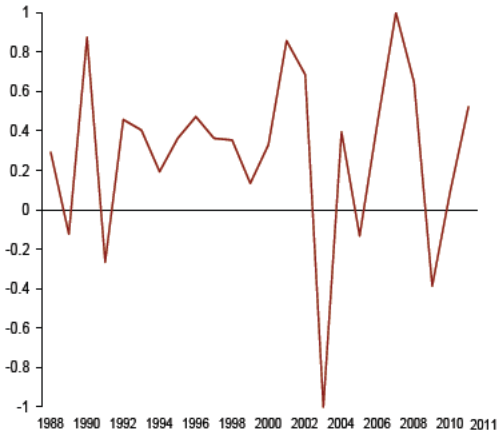
North Africa



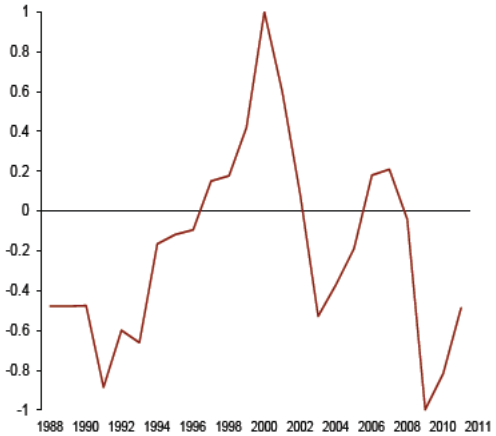
Oceania



Southeast Asia



EU27



Sources: World Travel and Tourism Council and Authors' Calculations.

Table 1

TOURISM EXPORTS GROWTH BY REGION OF THE WORLD

Regions	1990	1991	1992	1993	1994	1995	2000	2001	2002	2003	2004	2005	2007	2008	2009	2010	2011
Caribbean	11.00%	2.70%	8.90%	10.80%	6.10%	7.00%	7.70%	-1.10%	-1.60%	7.90%	8.00%	8.50%	4.50%	1.40%	-7.70%	6.30%	5.20%
Europe	29.20%	0.90%	12.10%	-5.00%	13.60%	17.30%	-1.10%	-0.70%	5.60%	17.60%	16.90%	6.60%	14.80%	9.60%	-13.60%	0.80%	12.30%
EU27	31.40%	1.70%	13.70%	-5.60%	12.90%	17.30%	-2.30%	-2.20%	5.40%	15.90%	16.40%	5.80%	13.90%	7.50%	-13.90%	0.00%	11.80%
Latin America	18.30%	9.90%	11.30%	5.40%	-3.90%	6.70%	5.30%	-3.10%	-8.70%	14.40%	18.70%	17.10%	17.90%	12.40%	-5.60%	11.10%	13.50%
Middle East	8.40%	-12.20%	24.30%	18.00%	12.70%	19.10%	7.70%	7.80%	22.40%	22.10%	9.70%	12.00%	19.30%	20.30%	-1.30%	12.90%	11.60%
North Africa	2.70%	-10.40%	35.60%	-24.60%	17.90%	18.00%	4.80%	2.60%	1.60%	13.90%	29.00%	15.50%	20.60%	14.30%	-7.50%	8.30%	-14.20%
North America	23.00%	9.00%	9.50%	3.60%	16.40%	8.60%	8.80%	-10.20%	-4.70%	-3.50%	16.40%	9.70%	10.80%	12.60%	-15.30%	10.80%	8.10%
Northeast Asia	2.20%	5.80%	14.50%	12.20%	17.90%	17.00%	10.40%	3.70%	11.60%	-0.50%	35.20%	11.50%	14.20%	14.80%	-0.20%	18.30%	8.70%
Oceania	11.80%	6.50%	5.90%	4.50%	42.20%	21.50%	1.80%	-3.10%	6.70%	16.70%	17.30%	7.70%	6.20%	-1.80%	-5.60%	20.50%	4.40%
Southeast Asia	29.40%	0.10%	26.60%	12.40%	12.40%	19.60%	9.10%	3.00%	5.50%	-10.40%	28.60%	4.80%	28.40%	7.00%	-12.60%	22.50%	19.90%
Sub-Saharan Africa	15.20%	2.20%	9.90%	2.00%	28.10%	16.40%	-10.50%	4.10%	10.50%	41.60%	17.00%	14.10%	17.80%	3.50%	-8.20%	14.00%	8.10%

Sources: World Travel and Tourism Council and Authors' Calculations.

In August 1998, Russia replaced the Asian markets in the centre of the crisis. The Russian economy came under increasing pressure since the intensification of the Asian crisis in October 1997. These pressures reflect, among other factors, the financial contagion in Asia and the adverse implications of falling oil prices on Russia's external balance.

In 1999, Argentina also began an economic decline due to a combination of factors: a) internal - high unemployment and fiscal imbalances, and b) external - the Russian crisis in 1998, the impact of the devaluation of the Brazilian currency in 1999, and the large risk aversion in international financial markets.

The effects of tourism exports contraction resulting from these crises are observable at the beginning of the XXI century in Latin American countries (Table 1).

3.1.2. 2000 – 2005

This period is marked by a series of major events that have had significant negative impacts on international tourism. Among these are the terrorist attacks of September 11, 2001 in the US. The negative growth rates of tourism exports seen in Table 1, particularly in 2001 and 2002, may be a reflection on tourist flows of the fears associated with terrorism. These fears proved to be particularly strong in North America, the Caribbean and the EU27.

The contribution of Travel and Tourism in industrialized and developing countries is now so great that any slowdown in the level of activity is a cause for concern. The repercussions extend beyond activities directly related to tourism, including airlines, hotels and catering, to sectors that provide intermediate or final goods. This means that all sectors of the economy are affected to a greater or lesser extend (see, among others, Araña and León, 2008).

Additionally, other events had different impacts on different regions and countries of the world and hindered the growth of tourism in the countries directly affected, as well as in neighbouring countries and regions (see Edmonds and Mak, 2005). Among these events it is important to highlight the invasion of Afghanistan (October 2001), the Bali bombings (October 2002), the Severe Acute Respiratory Syndrome (SARS) (November 2002), the war in Iraq (Spring 2003), the attacks in Madrid (March 2004), the Indian Ocean tsunami (December 2004) and the London bombings (July 2005). The consequences of these events had different magnitudes and occurred in various regions and countries. These results are documented in Chart 1. An interesting result that can be observed from Chart 1 is that the joint impact of these events on the world tourism demand cycle, seems to have been more severe than the current financial crisis.

During this period, the air transport sector was severely affected. The global economic crisis and rising oil prices led to the bankruptcy of major airlines, with consequent impact on other tourism businesses. Terrorism has been understood as a psychological warfare, and has consequently generated short distances tourist flows. The second Gulf War contributed to the worsening of the situation and led to a drastic rationalization of the tourism industry. In this context, there is a change in behaviour of western tourists who present this time a lower propensity to travel long distance fearing the consequences of the Iraq war, and the months of unrest and repeated terrorist attacks against tourists (*e.g.* in Bali, Kenya and Tunisia). Simultaneously there was an opposite effect in countries like Switzerland, Vietnam and New Zealand, which were considered safe and which benefited from substitution effects from affected regions.

Besides the Gulf War and the terrorist attacks, the SARS outbreak, which began in China in November 2002, and quickly spread around the world (in August 2003 reached 29 countries and three regions) aggravated the situation. The areas most affected were China, Hong Kong, Taiwan and Singapore, countries with a significant weight in the region in terms of tourism exports (Table 2). The impact was so strong that the World Bank predicted that output growth in East Asia would fall by 1 percentage point in 2003.

3.1.3. 2007 – 2011

Countries around the world have been severely affected by the economic and financial crisis that originated in the summer of 2007. This crisis also had a strong impact on the tourism industry (Smeral, 2009, 2010, and Barda and Sardianou, 2010), and it can be observed that many tourist destinations have shown negative growth rates and overall world tourism was severely affected (Chart 1), forcing countries and regions to make changes in this sector (Hall, 2010 Pizan, 2009, 2010, Papatheodorou, Rosselló, and Xiao, 2010, Song and Lin, 2010, 2011).

During 2008 the world economy was faced with a volatile and unstable situation. The tourism sector which seemed to resist the crisis in comparison to other sectors, such as, construction, real estate or automotive industry, recorded an overall slowdown in growth. According to *INE* (2008), the performance was also conditioned by other factors, such as,

- the military conflicts in Iraq, Afghanistan, Pakistan, Palestine, Sri Lanka and India, highlighting the Mumbai terrorist attacks in November 2008;
- the climatic problems, such as the floods in China, Myanmar, Brazil, Mexico and the UK, the heat waves and fires in Greece and Italy; the cyclones and tornadoes, especially in the Caribbean and surrounding countries, the earthquakes in China, and the volcanic eruptions in Chile;
- the high international prices of oil over six months of the year and the consequent difficulties experienced by airlines.

On the other hand, and especially from the second half of 2008, the growth scenario of unemployment, with direct consequences on the confidence of consumers and businesses, as well as on domestic demand, started a downward cycle in Europe, the US and Japan, reflecting a contraction of world tourism and taking, especially Europeans, to choose less distant destinations.

The year of 2008 was also characterized by a high volatility level of the exchange rates of major world currencies. According to data from the Eurostat and the IMF, the dollar and the euro registered significant gains against the currencies of many emerging markets. On the one hand, these valuations have made these markets more attractive in terms of tourist destinations, on the other, Europe and the U.S. lost competitiveness as destinations. The significant gains of the dollar and the euro eventually also reduced the propensity of the British, a major source market, to travel particularly to Europe.

The worsening of the economic and financial crisis in 2009 led to a comprehensive public intervention in the economy, trying to mitigate the fall in demand, as well as the risk and uncertainty of financial markets. The tourism sector in 2009 registered a contraction in activity, which according to the WTO, caused widespread reduction in tourism revenue. This is clear in Table 1, which shows that in 2009 all regions analyzed recorded negative annual rates.

To aggravate this situation, the continued increase in unemployment, conditioned by the success of state aid, limited access to credit and wage freezes, led to a reduction in the propensity of tourists from the main source markets, particularly Europeans, to travel. Therefore, the economic recovery of the main source markets, as well as the reduction of the high levels of unemployment are taken since that date, as the main constraints of the sector's recovery.

During 2009 significant fluctuations continued to be registered (*INE*, 2009). Many of the currencies of emerging countries (in terms of tourism), which in 2008 had depreciated against the dollar and the euro partly appreciated, although without reaching previous levels (IMF, 2010), but enough to allow Europe and the US to regain competitiveness as tourism destinations.

In 2010 there was a reversal of the downward trend of the world economy observed since 2008 (*INE*, 2010) and all major economic powers recorded a real GDP growth (IMF, 2011).

According to the UNWTO, the tourism sector in 2010, registered a significant recovery from the fall in 2009. However, the effects of the global economic crisis were still visible in this activity, to the extent that the recovery of tourist revenue was more modest than that observed in the number of tourists.

The amplitude of the variations in the recovery of tourism revenue in 2010, differs in the various economies. Very significantly in 2010 was the growth observed in this industry in China, which improved its rankings in all major industry indicators, assuming an important position in terms of tourism, both as receiver and as a provider (Li & Blake, 2010).

According to the WTTC, 2011 was marked by a deadlock since the world economy grew less in 2011 than in 2010, observing a slowdown in the rate of real GDP growth in all major economic powers, especially Japan, whose economy suffered heavily from the effects of the earthquake of March 2011. Among the various parts of the world, the EU27 recorded the lowest slowdown between 2010 and 2011. In emerging and developing economies, although wealth has grown less than in the previous year, progress was made at a rate that was more than triple than that of the EU and the US (*INE*, 2011).

Although the economic recovery has been heterogeneous all over the world, in 2011 tourism revenue maintained a positive performance, with the exception of North Africa and the Middle East which continued to recover from the breaks occurred in 2009, where Europe stands as the region of the globe that concentrated the largest proportion of tourism revenue worldwide.

With the economic downturn many challenges have emerged for tourism destinations and enterprises. After the significant contraction in 2009, the tourism sector recovered in 2010 and 2011 and international tourism exports increased (Table 1). The crisis has had a particularly strong impact and negative consequences in terms of employment and GDP in many countries. Despite the recent recovery, uncertainty about the length, depth and implications of the global economic crisis persists and this is transmitted to the tourism industry.

After the severe decline in real GDP in 2008, estimates for 2009 pointed to a stabilization of the world production at a lower level, but unemployment continued to rise in major tourism source markets, exchange rates and oil prices continued to fluctuate, and restrictions on bank credit remained. From the analysis of the average growth of tourism exports of the five most representative countries in each region of the world, it is observed that of the 59 countries considered in this study, 20 (33.9%) observed a negative average growth for the period 2007 -2011. According to the WTO, international tourism increased by about 4% in 2012 compared to 2011. In 2012, for the first time, a billion travellers crossed the borders, and in 2013 this organization predicts growth between 3% and 4% in international tourism (UNWTO, 2013).

3.2. The cycle synchronization

In the analysis of the synchronization of tourism exports cycles we have chosen the EU27 as the reference region, since this corresponds to the leading region in the world in terms of exports. The EU27 tourism exports generated in 2012, 412.0 billion dollars (about 5.6% of total exports); see WTTC (2012). The direct contribution of Travel & Tourism corresponded to 3.0% of total GDP and their total contribution represented about 8.4% of GDP. In addition, Travel and Tourism directly generated 3.6% of total employment, and their total contribution, including jobs indirectly supported by the industry accounted for 9.1% of total employment.

Table 3 presents cycle statistics for different regions of the world and compares them with the cycle of the EU27. We note that in terms of the CI, the concordance is stronger between the EU27 and Europe (91.30%), followed by North America (78.26%) and Southeast Asia (73.91%), and the lowest CI is observed for the Middle East (30.43%).

Concerning Pearson's correlation we found that the strongest correlation is with Europe (0.96), followed

Table 2

WEIGHT OF COUNTRY SPECIFIC TOURISM EXPORTS IN REGIONAL TOTAL											
Sub-Sah. Africa	**1990-1995**	**2000-2005**	**2007-2011**	**North (and Central) America**	**1990-1995**	**2000-2005**	**2007-2011**	**Middle East**	**1990-1995**	**2000-2005**	**2007-2011**
South Africa	35.60%	47.80%	42.60%	United States	80.00%	77.00%	82.60%	U. Arab Emirates	31.80%	38.40%	42.20%
Mauritius	8.30%	7.10%	6.90%	Canada	10.10%	14.30%	9.50%	Saudi Arabia	15.20%	16.10%	13.40%
Kenya	16.00%	4.90%	5.50%	Mexico	9.90%	8.70%	7.90%	Lebanon	7.60%	11.20%	12.10%
Ethiopia	1.80%	2.70%	4.60%					Israel	19.20%	10.30%	8.20%
Tanzania	3.20%	3.90%	4.80%					Syria	6.50%	5.10%	5.80%
EU27				**Northeast Asia**				**North Africa**			
Spain	15.40%	16.50%	15.40%	China	30.50%	47.70%	39.10%	Egypt	35.60%	47.80%	42.60%
France	12.70%	15.30%	13.70%	Macau	11.10%	9.40%	16.40%	Morocco	8.30%	7.10%	6.90%
Germany	7.80%	9.70%	11.20%	Hong Kong	20.10%	11.60%	16.50%	Tunisia	16.00%	4.90%	5.50%
Italy	14.40%	11.90%	10.50%	Japan	15.60%	13.00%	10.60%	Algeria	1.80%	2.70%	4.60%
UK	11.10%	8.60%	8.90%	South Korea	16.00%	12.30%	10.50%	Libya	3.20%	3.90%	4.80%
Portugal	2.80%	2.50%	3.00%								
Europe				**Oceania**				**Southeast Asia**			
Turkey	2.10%	4.50%	4.80%	Australia	63.50%	68.10%	61.40%	Thailand	25.70%	31.90%	32.40%
Switzerland	5.20%	3.70%	4.10%	New Zealand	23.50%	19.80%	20.40%	Malaysia	13.60%	21.30%	25.90%
Russia	1.80%	3.30%	3.10%	Other Oceania	10.10%	9.80%	15.00%	Singapore	25.30%	12.70%	17.00%
Croatia	1.40%	1.90%	2.10%	Fiji	2.30%	1.70%	2.30%	Indonesia	24.20%	21.10%	11.30%
Norway	1.80%	1.20%	1.10%	Vanuatu	0.50%	0.40%	0.70%	Vietnam	1.80%	3.90%	5.10%
Latin America				**Caribbean**				**South Asia**			
Brazil	21.60%	26.50%	21.70%	Dom. Republic	10.50%	17.10%	18.60%	India	61.20%	69.60%	78.90%
Argentina	14.20%	13.60%	17.20%	Puerto Rico	18.90%	16.70%	16.00%	Pakistan	16.80%	10.40%	6.50%
Colombia	10.80%	10.10%	8.90%	Cuba	6.70%	9.30%	9.40%	Sri Lanka	11.10%	10.50%	5.50%
Peru	3.50%	5.90%	8.20%	Jamaica	13.40%	9.40%	9.60%	Maldives	4.00%	4.60%	3.50%
Panama	2.30%	3.60%	7.10%	Bahamas	9.90%	8.50%	8.70%	Nepal	6.60%	4.20%	2.40%

Sources: World Travel and Tourism Council and Authors' Calculations.

by Oceania (0.69), North America (0.59) and Southeast Asia (0.45). The lowest are observed for North Africa (-0.08), the Middle East (-0.12), Latin America (-0.23) and Northeast Asia (0.26).

We also observe that the regions with the highest correlation with the EU27 (Europe, Oceania and North America) have also tourism export cycles with strong coincident indices with this region, with the exception of Southeast Asia, which has a cycle that lags by about 3 years. Northeast Asia, the Middle East and sub-Saharan Africa have advanced cycles when compared to the EU27, of 3, 3 and 1 year, respectively.

Regarding the concordance index (CI) between the EU27 and the countries considered in this analysis, as well as the evolution of other indices, it is observed from Table A.1 of Appendix II, that the CI is strongest between cycles of the EU27 and Spain (82.61%), which is closely followed by Germany, the UK, the U.S., Singapore and Mauritius, all presenting CIs exceeding 70% with the cycle of the EU27. The country with the lowest CI with the EU27 is Lebanon (26.09%).

From the analysis of the evolution of synchronization an interesting phenomenon is observed, *i.e.*, 24 of the 59 countries have positive growth and 35 of the 59 countries negative growth (Table 4). Table 4 shows the annual variation of the CI for the period between 1993 and 2011. The values in this table are based on the recursive concordance index, that is, the average of the annual first difference of the recursive concordance Index (RCI). Countries with positive growth synchronization with the EU27 have generally a relatively low degree of synchronization (Table A.1).

Countries with positive growth of synchronization with the EU27 are generally developing countries where tourism has been of growing interest in recent decades (particularly sub-Saharan Africa and Latin America). These countries have, in some cases, historical and commercial links with EU27 countries, as well as, possibly, common source markets. Thus, the increased synchronization may possibly also be explained by the presence of such underlying cycles. On the other hand, countries with negative CI growth rates are generally located in regions where synchronization with the EU27 is relatively high (Table A.1). In this context, the growth margin in terms of synchronization is relatively low. These countries belong to North (and Central) America, North Africa, Middle East and Asia. The decrease in synchronization with the EU27 may be associated with a decreased in the dependence from European source markets, in favor of new origin markets.

The correlation coefficient and concordance index allow us to observe the effects of persistence and co-movement of tourism exports cycles (Table A.1). In several cases, we observed that the lags indicate that the EU27 tourism exports cycle anticipates 1-2 periods the tourism exports cycles from other regions or countries. The results also indicate that the number of lags identified is not indifferent to the indicator used (correlation coefficient or concordance index).

Indeed, the correlation coefficient compares the differences in the variations of the cyclical components, while the lagged concordance index is an indicator of the phases of the cycle. This indicator gives the percentage of time that the export cycles of two countries or regions are in the same phase. That is, the percentage of time in which both cycles are in expansion or recession. This indicator is sensitive to the persistence of the cycle, that is, changes in the phases of the cycle which do not occur in the short-run, but only over a more prolonged period of time.

The results for the CI between the EU27 and each of the remaining ten regions considered, suggest the existence of a delay of two periods in 30% of cases. In particular, for the Middle East, Northeast Asia and sub-Saharan Africa. At the disaggregated level (by country) the maximum CI also occurs at two periods in 47.5% of the countries considered. The results for the CI by country are between 91.3% (Europe except EU27) and 51.17% (Middle East).

These discrepancies may suggest that there are causal relations between the cyclical components of tourism exports in the various countries and regions considered.

Table 3

THE EU27 CYCLE STATISTICS AND THOSE OF SEVERAL REFERENCE REGIONS

Regiões	$\rho_{x,y}$	(+)/(-)	IC(%)	L_{IC1}(%)	L_{IC2}(%)	L_{IC3}(%)	SD	$\frac{SD_i}{SD_{UE27}}$	AR(1)	AR(2)	AR(3)
EU27	-	-	-	-	-	-	0.49	1	0.7	0.31	0
Caribbean	0.71	0	69.57*	45.45	52.38	50	0.68	1.39	0.76	0.48	0.26
Europe	0.96	0	91.30*	50	57.14	54.55	0.52	1.07	0.7	0.36	0.09
Latin America	-0.23	-3	56.52*	50	52.38	50	0.58	1.18	0.86	0.61	0.36
Middle East	-0.12	3	30.43	36.36	57.14*	54.55	0.42	0.87	0.41	-0.21	-0.32
North Africa	-0.08	-3	56.52*	50	47.62	45.45	0.65	1.33	0.82	0.53	0.28
North America	0.59	0	78.26*	54.55	42.86	40.91	0.64	1.3	0.79	0.57	0.37
Northeast Asia	0.26	3	60.87	31.82	61.9*	59	0.44	0.89	-0.41	0.09	-0.14
Oceania	0.69	0	52.17*	50	47.62	45.45	0.67	1.36	0.85	0.66	0.46
Southeast Asia	0.45	-3	73.91*	50	47.62	45.45	0.44	0.9	-0.21	-0.2	-0.13
Sub-Saharan Africa	0.39	1	47.83	59.09	61.9*	59.09	0.52	1.06	0.7	0.4	0.22

Sources: World Travel and Tourism Council and Authors' Calculations.
Note: * denotes the maximum concordance lag. South Asia was omitted due to lack of data.

Table 4

ANNUAL SYNCHRONIZATION GROWTH WITH THE EU27 TOURISM CYCLE (1993-2011)

Country	Ranking	S.G.R.	Country	Ranking	S.G.R.
Germany	1	4.09%	Italy	31	-1.75%
Morocco	2	3.51%	Caribbean	32	-1.75%
Hong Kong	3	3.51%	Israel	33	-1.75%
Thailand	4	3.51%	Mexico	34	-1.75%
Bahamas	5	3.22%	Singapore	35	-1.75%
Kenya	6	3.22%	Cuba	36	-2.05%
Dominican Republic	7	2.92%	United Arab Emirates	37	-2.05%
Switzerland	8	2.92%	Maldives	38	-2.05%
Argentina	9	2.92%	China	39	-2.34%
Panama	10	2.92%	France	40	-2.34%
Portugal	11	2.63%	Jamaica	41	-2.34%
Turkey	12	2.63%	Puerto Rico	42	-2.34%
Brazil	13	2.34%	Russia	43	-2.34%
Japan	14	2.34%	Peru	44	-2.34%
South Korea	15	2.34%	Egypt	45	-2.34%
Solomon Islands	16	2.34%	Canada	46	-2.34%
Vanuatu	17	2.34%	Australia	47	-2.34%
South Africa	18	2.34%	Syria	48	-2.63%
Macau	19	2.05%	India	49	-2.63%
Pakistan	20	2.05%	New Zealand	50	-2.63%
Croatia	21	1.46%	Nepal	51	-2.63%
Saudi Arabia	22	1.46%	Indonesia	52	-2.63%
Lebanon	23	1.17%	Tanzania	53	-2.63%
Ethiopia	24	1.17%	Vietnam	54	-2.92%
Spain	25	-1.17%	Sri Lanka	55	-2.92%
Tunisia	26	-1.17%	Algeria	56	-2.92%
United States	27	-1.17%	Libya	57	-3.51%
Mauritius	28	-1.46%	Colombia	58	-3.51%
UK	29	-1.46%	Fiji	59	-3.51%
Malaysia	30	-1.46%			

Sources: World Travel and Tourism Council and Authors' Calculations.
Note: S.G.R. refers to Synchronization Growth Rate.

3.3. Granger causality between cyclical components

In order to investigate the interaction between cycles in greater detail a Granger causality analysis was also performed. The tests applied allow us to conclude whether a variable corresponding to a region or country's lagged tourism export cycle presents significant information to explain the EU27 tourism exports cycle and vice versa.

The results in Table 5 indicate that, in aggregate terms (regions), the tourism export cycle in the EU27 influences the cycles of three of the 10 regions considered (North (and Central) America, Oceania and Southeast Asia). However, evidence of causality in both directions in the relationship between the EU27 and North America (and Central) is also found.

At a disaggregated level, *i.e.*, between the EU27 and the 59 countries considered, there is evidence of causality in 24% of cases (Italy, Portugal, UK, Dominican Republic, Croatia, Libya, UAE, US, Japan, Macau,

India, Singapore, Thailand, and Kenya). There is also evidence of Granger causality of some countries in relation to the EU27 cycle, in particular the US, Portugal, Spain, Bahamas, Cuba, Russia, UAE, Morocco, Hong Kong, Macau, Australia, Maldives and Thailand.

Table 5

GRANGER CAUSALITY TESTS (STATISTICALLY SIGNIFICANT AT 10% LEVEL)	
Null Hypothesis:	**p-value**
North America does not Granger Cause EU27	0.0252
EU27 does not Granger Cause North America	0.0319
Oceania does not Granger Cause EU27	0.0958
EU27 does not Granger Cause Southeast Asia	0.0935
EU27 does not Granger Cause Italy	0.0141
EU27 does not Granger Cause Portugal	0.0844
Portugal does not Granger Cause EU27	0.0977
Spain does not Granger Cause EU27	0.0808
EU27 does not Granger Cause UK	0.0067
Bahamas does not Granger Cause EU27	0.0921
Cuba does not Granger Cause EU27	0.0549
EU27 does not Granger Cause Dominican Republic	0.0153
EU27 does not Granger Cause Croatia	0.0978
Russia does not Granger Cause EU27	0.0528
United Abarb Emirates does not Granger Cause EU27	0.0419
EU27 does not Granger Cause United Arab Emirates	0.0837
EU27 does not Granger Cause Libya	0.0107
Morocco does not Granger Cause EU27	0.0808
EU27 does not Granger Cause USA	0.0149
Hong Kong does not Granger Cause EU27	0.0895
EU27 does not Granger Cause Japan	0.0293
EU27 does not Granger Cause Macau	0.0935
Australia does not Granger Cause EU27	0.0288
EU27 does not Granger Cause India	0.0740
Malaysia does not Granger Cause EU27	0.0736
EU27 does not Granger Cause Singapore	0.0077
Thailand does not Granger Cause EU27	0.0867
EU27 does not Granger Cause Thailand	0.0412
EU27 does not Granger Cause Kenya	0.0261

Source: Authors' Calculations.

4. Conclusion

In times of crisis tourism becomes of prominent interest in public and political debates; however it decreases drastically during years of economic growth (Jóhannesson, 2010). These discussions seem to suggest the need for a better understanding of how the various countries (or regions) interact with each other and how they affect the tourism industry (Cohen and Neal, 2010).

The results of this study show that the tourism exports cycle in the EU27 anticipates by 1-2 periods the tourism export cycle from other regions or countries. This evidence of delay between the cycles of the EU27 and the other regions and countries considered, can be used as a decision support tool for economic agents associated with this activity.

The results for the recursive concordance index also suggest a change in the behavior of the synchronization between cycles. This dynamics is characterized by positive growth of synchronization in developing countries where tourism has been growing in recent decades (particularly in sub-Saharan Africa and Latin America), with the EU27. Conversely, it appears that in regions where synchronization with the EU27 is relatively high (Table A.1) and the tradition in tourism greater, these countries/regions tend to have lower synchronization growth. In terms of synchronization, countries with negative growth rates in terms of the CI, are located, in general, in North (and Central) America, North Africa, Middle East and Asia. The decrease in synchronization with the EU27 may be associated with a decrease in dependence from European origin markets in favour of new markets.

Finally, the description and analysis of economic crises and other socio-economic disturbances that took place in the period under study highlight the fragility of the tourism industry. These phenomena are documented in tables and graphs of tourism exports with negative growth in various regions and countries for most crisis periods identified and analyzed in Section 3.1.

The analysis in greater detail of the synchronization, causality and the relationship between business cycles and the cycles of global tourism demand are currently an on-going line of research by the authors.

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Appendix I – Methodology Used for the Decomposition of the Time Series

Consider the following structural additive model,

$$y_t = \Gamma_t + C_t + \varepsilon_t \tag{A.1}$$

where the dependent variable, $\{y_t\}$, represents the observed values of the time series of interest, Γ_t represents the trend function, C_t the cyclical component, and ε_t the noise component. Thus, model (A.1) corresponds to the decomposition of the $\{y_t\}$ time series. The non-stationary component (trend), Γ_t and the stationary cycle, C_t, are considered as unobserved variables.

According to Clark (1987), Wada and Perron (2006) and Guerreiro, Rodrigues and Andraz (2012) the most frequently used model in studies involving the deviation cycle, using the Kalman filter is,

$$\begin{cases} y_t = T_t + C_t + \varepsilon_t \\ T_t = T_{t-1} + \beta_{t-1} + \delta_t \\ \beta_t = \beta_{t-1} + \theta_t \\ C_t = \theta_t\, C_{t-1} + \theta_2\, C_{t-2} + \omega_t \end{cases} \tag{A.2}$$

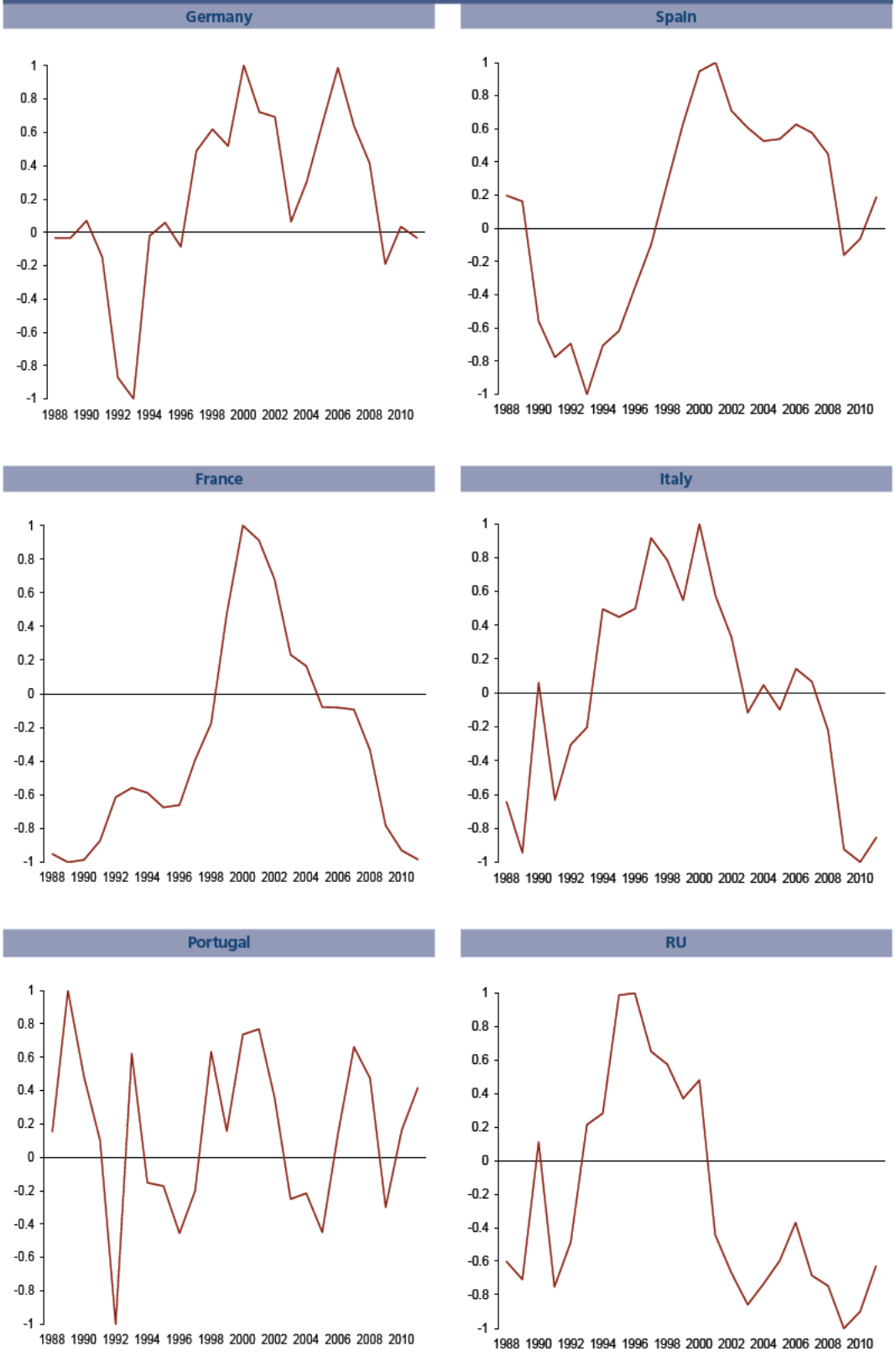
The trend, β_t, represented in (A.2) uses the known formulation of Wega and Theil (Crato 1990), in which the variable follows an expected linear growth, both the trend β_t and the level $\left(T_t\right)$ evolve according to a random walk (Gilchrist, 1976), and the cyclical component, C_t, follows a second-order autoregressive process (Wada and Perron, 2006 and Guerreiro, Rodrigues and Andraz, 2012).

Based on the state space formulation in (A.2) subsequent application of the Kalman filter can be considered to obtain the signals (values) of the unobserved variables, Γ_t and C_t, from the signal provided by the observed time series $\left\{y_t\right\}$ (see *e.g.*, Harvey, 1989 and Ogata, 2002). The initialization technique of the Kalman filter used in this study was diffuse initialisation (Durbin and Koopman, 2001 and Guerreiro, 2010). Therefore, the main variable for the study of the cycle, after extracted by the method suggested by Kalman (1960) and Kalman and Bucy (1961) will be the stationary variable (the deviation cycle) C_t.

Appendix II - EU27 Tourism Exports Cycle

Chart A.1

EU27 TOURISM EXPORTS CYCLES



Source: Authors' Calculations.

Table A.2 (to be continued)

EU27 AND COUNTRY CYCLE SYNCHRONIZATION AND OTHER STATISTICS

Region	Country	$\rho_{x,y}$	(+)/(-)	IC(%)	L_{IC1}(%)	L_{IC2}(%)	L_{IC3}(%)	SD	$\frac{SD_i}{SD_{UE27}}$	AR(1)	AR(2)	AR(3)
EU27 Countries	France	0.77	0	56.52	59.09	57.14	54.55	0.62	1.27	0.86	0.62	0.36
	Germany	0.77	0	73.91*	45.45	42.86	40.91	0.5	1.02	0.69	0.38	0.21
	Italy	0.82	0	69.57*	45.45	52.38	50	0.6	1.22	0.71	0.51	0.31
	Portugal	0.35	-3	56.52	63.64*	47.62	45.45	0.48	0.98	0.15	-0.11	-0.29
	Spain	0.63	1	82.61*	68.18	61.9	59.09	0.59	1.2	0.88	0.7	0.5
	UK	0.46	-2	78.26*	45.35	33.33	31.82	0.64	1.31	0.77	0.59	0.4
Other European Countries	Croatia	0.16	3	39.13	54.55*	47.62	45.45	0.47	0.96	0.78	0.56	0.39
	Russia	0.5	-3	56.52	59.09	71.43*	68.18	0.55	1.14	0.76	0.5	0.19
	Switzerland	0.12	-2	52.17	68.18*	61.9	59.09	0.52	1.07	0.47	0.07	0.03
	Turkey	0.08	-1	43.48	50	61.90*	59.09	0.49	1	-0.28	-0.23	0.02
	Norway	0.57	-1	60.87*	54.55	47.62	45.45	0.62	1.28	0.79	0.48	0.18
Norh (Central) America	Canada	0.8	0	65.22*	50	42.86	40.91	0.57	1.16	0.54	0.31	0.1
	Mexico	0.13	-1	60.87*	45.45	52.38	50	0.54	1.1	0.72	0.34	0.1
	US	0.5	3	78.26*	54.55	42.86	40.91	0.61	1.24	0.72	0.5	0.3
Oceania	Australia	0.72	0	60.87*	45.45	42.86	40.91	0.72	1.47	0.85	0.65	0.44
	Fiji	-0.15	3	43.48	40.91	47.62*	45.45	0.59	1.2	0.9	0.7	0.47
	New Zea.	0.63	0	52.17	54.55	57.14*	54.55	0.68	1.39	0.76	0.43	0.16
	Sol. Islands	-0.37	3	39.13	54.55	57.14*	54.55	0.61	1.24	0.78	0.58	0.34
	Vanuatu	-0.11	3	43.48	40.91	47.62*	45.45	0.62	1.27	0.92	0.77	0.6
Latin America	Argentina	-0.48	-2	56.52*	45.45	47,62	45.45	0.59	1.2	0.83	0.59	0.37
	Brazil	-0.22	-3	43.48	40.91	57.14*	54.55	0.52	1.06	0.83	0.49	0.1
	Colombia	0.1	1	39.13	59.09*	52.38	50	0.45	0.92	0.21	-0.46	-0.21
	Panama	-0.3	-2	47.83	63.64*	38.1	36.36	0.56	1.14	0.8	0.55	0.34
	Peru	0.43	-1	56.52*	50	38.1	36.3	0.43	0.88	0.61	0.21	-0.02
Caribbean	Bahamas	0.24	-3	65.22*	54.55	38.1	36.36	0.52	1.06	0.54	0.01	-0.08
	Cuba	0.49	-1	60.87*	54.55	33.33	31.82	0.69	1.42	0.68	0.24	0
	Dom. Rep.	0.3	3	52.17	40.91	61.90*	59.09	0.46	0.95	0.52	0.03	0.01
	Jamaica	-0.13	3	52.17	36.36	61.9*	59.09	0.53	1.08	0.56	0.14	-0.09
	Puerto Rico	0.66	0	60.87	63.64*	33.33%	32.82	0.55	1.13	0.64	0.16	-0.06

Sources: World Travel and Tourism Council and Authors' Calculations.
Note: * denotes the maximum concordance lag.

Table A.2 (continued)

EU27 AND COUNTRY CYCLE SYNCHRONIZATION AND OTHER STATISTICS

Region	Country	$\rho_{x,y}$	(+)/(-)	IC(%)	L_{IC1}(%)	L_{IC2}(%)	L_{IC3}(%)	SD	$\frac{SD_i}{SD_{UE27}}$	AR(1)	AR(2)	AR(3)
North Asia	China	0.64	0	56.52*	36.36	52.38	50	0.62	1.27	0.78	0.45	0.12
	Hong Kong	-0.57	0	60.87	68.18*	52.38	50	0.55	1.12	0.72	0.45	0.29
	Japan	-0.19	3	47.83*	36.36	42.86	40.19	0.56	1.14	0.84	0.66	0.44
	Macau	-0.76	0	39.13	52.38*	52.38*	50	0.6	1.22	0.87	0.67	0.48
	South Korea	0.21	1	39.13	54.55*	38.1	36.36	0.48	0.98	0.59	0.24	0.01
South Asia	India	-0.24	2	56.52	50	33.33	31.82	0.43	0.88	0.6	0.15	-0.01
	Maldives	0.13	1	65.22	22.73	54.14	54.55	0.41	0.84	-0.24	-0.24	-0.08
	Nepal	0.07	-3	43.48	45.45	42.86	40.91	0.6	1.22	0.6	0.24	0.17
	Pakistan	-0.62	-1	34.78	40.91	47.62	45.45	0.53	1.08	0.86	0.58	0.3
	Sri Lanka	-0.08	1	56.52	31.82	38.1	36.36	0.53	1.08	0.51	0.17	-0.15
Southeastern Asia	Indonesia	0.31	-3	56.52	59.09*	52.38	50	0.53	1.08	0.86	0.62	0.42
	Malaysia	0.5	1	69.57*	54.55	61.9	59.09	0.62	1.27	0.39	-0.05	-0.22
	Singapore	-0.04	2	73.91*	50	28.57	27.27	0.5	1.02	0.66	0.36	0.19
	Thailand	0.49	-3	65.22*	45.45	52.3	50	0.58	1.18	-0.23	-0.12	-0.16
	Vietnam	0.67	0	47.83*	40.91	38.1	36.36	0.6	1.22	0.78	0.47	0.18
Norh Africa	Algeria	0.33	3	47.83	50	52.38*	50	0.6	1.22	0.8	0.57	0.36
	Egypt	-0.2	-1	60.87*	27.27	42.86	40.91	0.51	1.04	0.32	-0.13	-0.18
	Libya	0.1	3	34.78	45.45	60.67	63.64*	0.62	1.27	0.88	0.72	0.54
	Morocco	-0.09	-3	65.22*	54.55	57.14	54.55	0.55	1.12	0.83	0.66	0.5
	Tunisia	0.39	-3	69.57	72.73	76.19*	72.73	0.5	1.02	0.79	0.61	0.42
Sub-Saharan Africa	Ethiopia	-0.25	1	26.09	31.82	42.86*	40.91	0.49	1	0.31	-0.13	-0.15
	Kenya	-0.13	2	65.22*	54.55	42.86	40.91	0.6	1.22	0.69	0.43	0.26
	Mauritius	0.66	0	78.26*	45.45	52.38	50	0.5	1.02	0.57	0.23	0.01
	South Africa	0.25	2	43.48	50	61.90*	59.09	0.48	0.98	0.65	0.43	0.16
	Tanzania	0.34	0	52.17*	45.45	42.86	49.91	0.46	0.94	0.66	0.32	0.1
Middle East	Israel	0.46	-1	65.22*	50	42.86	40.91	0.51	1.04	0.62	0.19	-0.06
	Lebanon	-0.61	0	26.09	40.91	47.62*	45.45	0.51	1.04	0.67	0.27	-0.08
	Saudi Arabia	-0.23	3	30.43	54.55	47.62*	45.45	0.66	1.35	0.73	0.5	0.31
	Syria	0.25	-2	52.17	56.36	38.1	36.36	0.53	1.08	0.69	0.41	0.19
	UA Emirates	-0.02	-3	52.17	54.55	61.90*	59.09	0.56	1.14	0.82	0.53	0.27

Sources: World Travel and Tourism Council and Authors' Calculations.
Note: * denotes the maximum concordance lag.

PREDICTING AGGREGATE RETURNS USING VALUATION RATIOS OUT-OF-SAMPLE*

*Ana Sequeira***

ABSTRACT

It is well established that valuation ratios (indicators of the financial market situation) provide, in-sample, relevant signals regarding future returns on assets. Specifically, periods of high prices, relative to dividends, are proceeded by years of low returns; and periods of low prices, relative to dividends, precede years of high returns. This pattern of predictability is pervasive across financial markets. In this paper, we assess the ability of valuation ratios to predict out-of-sample aggregate returns for the stock and the housing markets in the U.S.. We find that there is statistical evidence supporting the extension of the in-sample results to an out-of-sample framework. The dividend-price ratio and the rent-price ratio display a significant ability for predicting in real-time stock and housing returns, respectively. Nevertheless, we note that these findings may be sample dependent. Especially for the stock market, the sample's ending data, including the recent financial crisis, may be responsible for the good results.

1. Introduction

Predicting returns is one of the most discussed topics in the academic financial world. Cochrane (2011) summarizes the evidence that shows the existence of a pattern of predictability that is pervasive across markets (stocks, bonds, houses, foreign exchange and sovereign debt) and concludes (in-sample) that valuation ratios predict excess returns, instead of future cashflows.[1] In this context, for the stock market, one concludes that the dividend-price ratio predicts returns and does not predict dividend growth. Moreover, low dividend-price ratios signal low future returns; and high dividend-price ratios signal high future returns. For the housing market, the argument is similar: high prices, relative to rents, imply low returns; do not signal the permanent increase of rents or prices.

In this paper, we intend to verify whether this pervasive phenomenon holds out-of-sample, that is, whether a forecaster would be able to predict excess returns systematically, if he stood at the forecast moment without further information (simulating the production of forecasts in real-time). We focus on the housing market (there are relatively few studies about predicting the housing returns) and use the stock market analysis as an important reference.

Among the studies that examine the predictability of housing returns, Case and Shiller (1990) show

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1 See, Fama and French (1988, 1989) for stocks; Fama and Bliss (1987), Campbell and Shiller (1991) and Piazzesi and Swanson (2008) for Treasuries; Fama (1986) for Bonds; Hansen and Hodrick (1980) and Fama (1984) for foreign exchange; Gourinchas and Rey (2007) for foreign debt.

that the rent-price ratio has a good performance when used to predict (in-sample) the housing excess returns. Lately, Plazzi *et al*. (2010) conclude (also, in-sample) that the rent-price ratio predicts expected returns for apartments, retail properties and industrial properties (but does not predict expected returns of office buildings).

For the stock market, the literature is voluminous. Goyal and Welch (2003, 2008) explore the existence of gains when one uses the financial variables with a reasonable in-sample performance to forecast (out-of-sample) the equity premium (stock returns over the return of a short-term risk-free interest rate) and conclude that almost all models produce poor results out-of-sample. On the other hand, Rapach and Wohar (2006) find that several financial variables have a good in-sample and out-of-sample ability to predict stock returns. Rapach *et al*. (2010) also find significant out-of-sample gains using forecast combining methods.

Our results show that there is statistical evidence supporting the extension of the in-sample results to an out-of-sample framework in both markets. Especially for the housing market, we conclude that the rent-price ratio has a huge ability for predicting returns. Given the lack of out-of-sample studies for the housing market, these findings are a contribution to the literature.

As Rapach and Wohar (2006), our purpose is testing for the existence of return predictability in population. As for this paper, we are not interested in exploring "whether a practitioner in real-time could have constructed a portfolio that earns extra-normal returns".

The remainder of this paper is organized as follows. In Section 2 we describe the data used to obtain the empirical results. Section 3 reports the in-sample results while Section 4 exposes the econometric methodology. In Section 5 we discuss our main findings and in Section 6 we present the conclusions and ideas for future research.

2. Data

Stock Market:[2]

As Lettau and Ludvigson (2001), we use quarterly data for the U.S. stock market. Our sample covers the period 1947:Q1 – 2010:Q2 (sample with $T = 254$ observations) and our dependent variable is the equity premium from holding stocks (represented in an index) from period t to $t+h$. As usual, we define equity premium as the return on the stock market minus the return on a short-term risk-free interest rate. In our case, we use the Center for Research in Security Prices (CRSP) value-weighted return and the 3-month Treasury bill (as a proxy for the risk-free rate). The dividend-price ratio is the financial variable which potentially predicts the equity premium.

Housing Market:

In our applications for the housing market, we use quarterly data from 1960:Q1 to 2010:Q1 (sample with $T = 201$ observations). We consider two house price indexes: the price index computed by Case, Shiller and Weiss and the "purchase-only" price index released by the Office of Federal Housing Enterprise Oversight (OFHEO).[3] Since the results were very similar, we chose to present only the conclusions for the data from Case, Shiller and Weiss. Our dependent variable is the log return from holding the house from t until $t+h$ and the predictor is the respective rent-price ratio.

2 The stock market data and the housing market data are available at http://faculty.chicagobooth.edu/john.cochrane/research/index.htm. The housing market data is also available at http://www.lincolninst.edu/subcenters/land-values/rent-price-ratio.asp.

3 See Calhoun (1996) for detailed information.

3. In-Sample Fit

In this section, we discuss the results obtained through the in-sample regressions which motivate the out-of-sample exercise.

Let us consider the following regression model:

$$y_{t+h} = \alpha + \beta x_t + u_{t+h},\ t = 1,\ldots,T \tag{1}$$

where y_{t+h} is the return from holding the financial asset from t until $t+h$, $h > 0$ is the forecast horizon, x_t is the financial variable used to predict y_{t+h} and u_{t+h} is a disturbance term.

To assess the predictive ability of x_t in-sample, we can estimate the equation (1) using the available $T-h$ observations and then, examine the t-statistic associated to the OLS estimate of β and the goodness-of-fit measure (R^2).[4] When there is evidence to reject the null hypothesis of $\beta = 0$ and the R^2 is high, we can conclude that x_t has predictive power over y_{t+h}.

There are some problems related to this perspective, specifically the small-sample bias (see Stambaugh 1986, 1999) and the dependence between the observations for the regressand in (1) (see Richardson and Stock, 1989). The serial correlation induced in the disturbance term should be taken into consideration when conducting inference.

For each market in question, we estimate equation (1) by OLS and use the Newey and West (1987) standard errors to compute the usual t-statistic. Table 1 provides the results.

Analyzing the results, we detect a common pattern across the two markets. The estimate of β and the R^2 are higher for longer forecast horizons, and the observed t-statistics always reject the null hypothesis of no predictability. In addition, the signal of the estimates is positive, which confirms the conclusions presented in Cochrane (2011): high prices relative to dividends (or rents, for the housing market) can be a sign of low returns.

We must therefore investigate whether the in-sample predictability is kept when subject to a simulation exercise of forecasts in real time (out-of-sample).

Table 1

IN-SAMPLE REGRESSIONS (HORIZONS OF 1, 4, 8, 12, 18 AND 24 QUARTERS)

	Stock Market Sample period 1947:Q1-2010:Q2				Housing Market Sample period 1960:Q1-2010:Q1							
					Case-Shiller-Weiss				OFHEO data			
Horizon (quarters)	$\hat{\beta}$	*t-stat*	R^2 %	Adj. R^2 %	$\hat{\beta}$	*t-stat*	R^2 %	Adj. R^2 %	$\hat{\beta}$	*t-stat*	R^2 %	Adj. R^2 %
1	3,80	(2,89)	2,85	2,46	1,27	(5,24)	22,30	21,91	1,21	(8,47)	32,95	32,61
4	16,57	(3,14)	11,23	10,88	5,90	(2,88)	38,80	38,48	5,39	(4,73)	45,47	45,19
8	32,08	(3,38)	19,97	19,64	12,86	(3,49)	54,85	54,61	11,41	(5,52)	59,06	58,84
12	46,35	(3,97)	25,38	25,07	18,84	(4,62)	64,31	64,12	16,67	(6,81)	67,00	66,82
18	74,17	(5,17)	33,05	32,76	25,27	(5,73)	67,05	66,87	22,73	(7,98)	69,76	69,60
24	121,28	(6,52)	44,47	44,23	29,68	(5,44)	61,46	61,24	27,18	(7,63)	66,90	66,71

Source: Author's calculations.

Notes: The regression equation is $y_{t+h} = \alpha + \beta x_t + u_t$, where y_{t+h} and x_t are the equity premium and the dividend-price ratio, respectively, for the stock market; and the log returns and the rent-price ratio for the housing market. t-stat denotes the Newey and West (1987) adjusted t-statistic.

4 The null hypothesis ($H_0 : \beta = 0$) reflects the lack of ability of x_t to forecast y_{t+h}.

4. Econometric Procedure

In this section, we discuss the regression models used to produce the out-of-sample forecasts and the statistic tests applied to analyze the results.

4.1 Out-of-sample analysis

An out-of-sample analysis implies the simulation of forecasts for y_{t+h}, in period t. Given the sample in study, we should determine a value for the sample-split parameter (R), which will match with the period of the first prediction (there is no criterion that defines how to choose R; one should make a compromise between the number of observations used to estimate the coefficients of the models and the number of available observations to assess the forecasts performance). We use the sample that includes the first $R-h$ observations to estimate the model and produce the predictions for $t=R$. Then, the next observation (which corresponds to the period $t=(R+1)-h$), is added to the sample, the model is re-estimated and a new forecast (for period $t=R+1$) is generated. This process is repeated until the end of the sample.

4.2. Predictive regression models

We select several methods to generate the set of predictions. In what follows, $\hat{y}_{t+h|t}$ denotes the forecast of y_{t+h} (the return from holding the financial asset from t to $t+h$), given the information up to period t, and x_t is the valuation ratio that might have predictive power for y_{t+h}.

- **Historical mean**: $\hat{y}_{t+h|t}=\frac{1}{t}\sum_{s=1}^{t}y_s$, $t=R,\ldots,T$. As Goyal and Welch (2003, 2008) and Campbell and Thompson (2008), we use the historical mean as a benchmark forecasting model, since it represents the hypothesis of no predictability, consistent with the most common interpretation of the efficient markets hypothesis.
- **Direct autoregressive model**: $\hat{y}_{t+h|t}=\hat{\alpha}+\sum_{j=0}^{p-1}\hat{\beta}_j y_{t-j}$. In our empirical applications, we consider a version with a fix lag order ($p=2$) and a version with the lag order determined using the AIC Criterion ($p\ integer \in [1,4]$).[5] The coefficients are estimated by OLS.
- **Direct augmented autoregressive model**: $\hat{y}_{t+h|t}=\hat{\alpha}+\sum_{j=0}^{p_1^*-1}\hat{\beta}_j y_{t-j}+\sum_{j=0}^{p_2^*-1}\hat{\delta}_j x_{t-j}$, p_1^*, $p_2^*\ integers \in [1,4]$. The lag orders (p_1^* and p_2^*) are determined using the AIC Criterion and coefficients are estimated by OLS.
- **Direct regression model with or without lags**: $\hat{y}_{t+h|t}=\hat{\alpha}+\sum_{i=0}^{p-1}\hat{\beta}_i x_{t-i}$. Here, we also consider a fix lag order ($p=2$) and a lag order determined using the AIC Criterion ($p\ integer \in [1,4]$). The coefficients are estimated by OLS.
- **Univariate and multivariate low-pass filters**: Following the argument presented in Valle e Azevedo and Pereira (2012), we use this method to generate our forecasts when it is useful to predict only the low frequencies of y_t ($w_t=B(L)y_t$, where $B(L)$ is a band-pass filter eliminating the fluctuations with period smaller than 32 quarters, as is usual in business cycle studies) . Thus, we consider the predictions of the low frequencies of aggregate returns as forecasts of aggregate returns itself. Since the available sample is finite ($\{y_t\}_{t=1}^{T}$) and supposing that there are c series of covariance-stationary covariates ($z_1,\ldots,z_c$) available, we approximate the low frequencies of y_t (that is, we approximate w_t) through a weighted sum of elements of y_t and $z_1,\ldots,z_c$:

$$\hat{w}_t=\sum_{j=-f}^{p}\hat{B}_j^{p,f}y_{t-j}+\sum_{s=1}^{c}\sum_{j=-f}^{p}\hat{R}_{s,j}^{p,f}z_{s,t-j} \qquad (2)$$

5 See Akaike (1974).

p and f denote the number of observations in the past and in the future, respectively, that are considered. The coefficients are estimated solving a minimization problem.[6] To extract the signal $w_{t+h} = B(L)y_{t+h}$ for $h > 0$, we should set $f = -h$ in the solution of the mentioned problem (as a result, only the available information up to period t is employed). We obtain the univariate filter when we drop the covariates $z_1,\ldots,z_c$ from equation (2).

4.3 Forecast evaluation

As an evaluation metric to compare the sets of forecasts obtained through the models described before, we chose the ratio between the mean squared forecast error of the competing model and those of the benchmark model ($MSFE\,ratio$). When the $MSFE\,ratio$ is lower than 1, the competing model generates better predictions (according to the mentioned criteria) than the benchmark model (historical mean).

We also use a graphical analysis to examine the relative performance of the forecasting models over the sample. As proposed in Goyal and Welch (2003), we construct charts with the difference between the cumulative squared forecast errors of the benchmark model and the cumulative squared forecast errors of the competing model (hereafter, we will refer to this difference as $Net - SSE$). When this difference is positive, the competing model outperforms the benchmark model in the sample between the first prediction and the date in the x – axis.

4.4 Out-of-sample tests

We assess the statistical significance of the obtained results considering equal accuracy tests and forecast encompassing tests.

The equal accuracy test allows testing whether the $MSFE\,ratio$ is statistically equal to 1, against the alternative that the forecasts produced by the competing model are better (have a lower $MSFE$). We apply the test statistics $modified\ \ MSFE - t$ and $MSFE - F$ to test this null hypothesis (see Diebold and Mariano, 1995; Harvey *et al*. 1997, 1998 and McCracken, 2007). Excluding the multivariate filter, all our models are nested, therefore the critical values for these statistics were generated by simulation.[7,8]

According to Harvey *et al*. (1997), a set of forecasts encompasses a rival set if the latter does not contribute to a statistically significant reduction in $MSFE$ when used in combination with the original set of forecasts. So, with the forecast encompassing test, we assess whether a given set of forecasts generated by a simpler model embody all the useful predictive information contained in another set of forecasts. Applying this concept to our study, if the historical mean forecast encompasses the forecast produced by the model with the valuation ratio, the financial variable does not contain useful additional information for predicting the aggregate returns. The test statistics employed, $modified\,ENC - t$ and $ENC - F$, result from an adaptation to this problem of the Diebold and Mariano (1995) test statistic. Again, since the test statistics considered do not have a standard distribution, the critical values were generated using a bootstrap procedure.

6 More detailed explanations about the multivariate filter can be found in Valle e Azevedo (2011) and Valle e Azevedo and Pereira (2012).

7 Two models are nested when there is a set of regressors that is common between them (see Clark and McCracken, 2005). In our studies, we have nested models due to the constant term in most models.

8 We rely on methods provided by Kilian (1999) and Mark (1995) for developing the bootstrap procedure used to generate the critical values.

5. Empirical Results

In this section, we discuss the main results obtained using the methodology described before.

Stock Market:

We conclude that only the direct regression generates forecasts that can beat the benchmark for all horizons (see Table 2). The $MSFE\,ratios$ are statistically lower than 1 at conventional significance levels, which means that the forecasts from the competing model have more predictive power than those from the historical mean model. The $MSFE\,ratios$ decrease with the forecast horizon, which suggests that the dividend–price ratio ability to predict the aggregate returns improves when we use longer horizons. These findings are consistent with the in-sample results exposed in Section 3, where we note that the in-sample predictability increases with the horizon.

The univariate filter model failed to outperform the benchmark model for all horizons, but the multivariate filter has $MSFE\,ratios$ lower than 1 for $h=20$ and $h=24$ (despite not being statistically lower than 1 when we use the $modified\,MSFE-t$ statistic to apply the test).

Similar conclusions can be drawn when we analyze the forecast encompassing results (Table 3). In particular, when we use the $ENC-F$ to perform the test, we have statistical evidence to reject the null hypothesis (the historical mean forecasts encompass those produced by direct regression model) at a 5% significance level.

The following analysis rests on the evaluation of the $Net-SSE$ charts which display the cumulative squared forecast errors of the benchmark model (from 1985:Q1 through the date in the $x-$axis) minus the cumulative squared forecast errors of the competing model (from 1985:Q1 trough the date in the $x-$axis), for each horizon. A positive value means that the competing model has outperformed the benchmark model and a positive slope indicates that the competing model had a lower forecasting error than the historical mean model, in a given quarter.

In Chart 1 we plot the mentioned curves for $h=1$ and $h=24$, considering as competing models the direct regression model (without lags) and the multivariate filter (which uses the dividend-price ratio). Considering the shorter forecast horizon (1 quarter), we note that the direct regression curve exhibits a volatile pattern. This competing model had a good performance in 1987:Q4 – 1995:Q4, 2002:Q2 – 2003:Q3 and 2008:Q2 – 2010:Q2 and had its poorest performance from 1997:Q3 to 2001:Q1 (although it begins to recover – the curve has a positive slope – from 2000:Q1). For $h=1$, the multivariate filter consistently has a worse performance than the direct regression model.

For longer forecast horizons ($h=24$; see figure 1), the curves are smoother and we can identify three distinct periods (which have become more apparent as the horizon increases). Namely: an initial period

Table 2

MSFE RATIOS AND EQUAL ACCURACY TEST RESULTS FOR THE STOCK MARKET

Horizon (quarters)	1	4	6	8	12	18	20	24
Direct regression model *(p=0)*	0.988*	0.984**	0.976**	0.987*	0.969***	0.909***	0.883***	0.883***
Direct regression model *(p=2)*	0.991	1.001	0.999	1.008	0.996	0.946	0.934	0.934
Direct regression model *(pmax=4)*	1.001	1.005	1.006	1.011	1.009	0.985	0.977	0.977
Multivariate filter								
without indicators	1.028	1.122	1.140	1.168	1.230	1.152	1.099	1.099
with dividend-price ratio	1.020	1.082	1.070	1.080	1.140	1.034	0.983	0.983

Source: Author's calculations.
Notes: For the direct regression (nested model), we use the test statistic $MSFE\text{-}F$ and critical values generated using a bootstrap procedure; for the multivariate filter (non-nested model), we consider the test statistic *modified* $MSFE\text{-}t$ and critical values from the Student's *t* distribution with $(N\text{-}1)$ degrees of freedom (N is the number of forecast errors; see Clark and McCracken, 2001 and McCracken, 2007). Predictions were generated for the period 1985:Q1 – 2010:Q2. Significance levels at 10%, 5% and 1% are denoted by one, two, and three stars, respectively.

Table 3

FORECAST ENCOMPASSING TEST RESULTS FOR THE STOCK MARKET

Horizon (quarters)	1	4	6	8	12	18	20	24
Direct regression model ($p=0$)								
$ENC\text{-}F$	0,813	2,224**	1,870**	0,471	-0,361	2,615***	4,375***	5,892***

Source: Author's calculations.
Notes: The test was applied assuming that the forecasts are biased and inefficient (more general case). The critical values are generated using a bootstrap procedure. Predictions were generated for the period 1985:Q1 – 2010:Q2. Significance levels at 10%, 5% and 1% are denoted by one, two, and three stars, respectively.

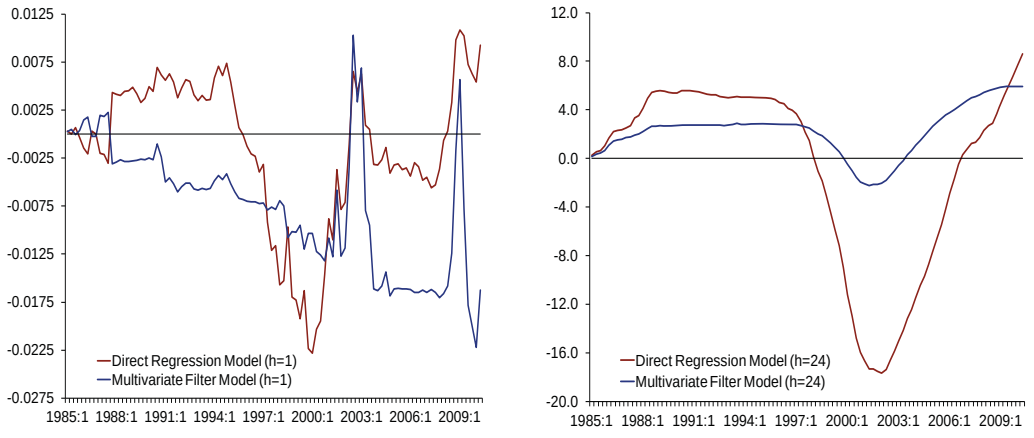
when the forecasts produced by the competing models are better, an intermediate period when the models had a negative performance and a final period of recovery. We note that this final period may be responsible for the good results out-of-sample, meaning that if we dropped the last observations of the sample, the direct regression model probably could not beat the benchmark.

Additionally, we decide to plot, in the same chart, the Cumulative SSE Difference curve (the competing model selected only contains the dividend-price ratio as regressor – direct regression model without lags) and a price index curve (for the stock market, we chose the $SP500$ Index). With this exercise, we intend to note how the curves are related and discuss the reasons for this relationship.

The key point to emphasize is that the curves exhibit a symmetrical behaviour: the peaks in $SP500$ Index correspond to the troughs in the $Net - SSE$ curve (see Chart 2). This means that the model with the dividend price-ratio produces less accurate predictions for the period in which the stock price is increasing, while its good performance is associated with a period in which there is a fall in prices. We note these phenomena when, for example, we analyze the exuberant period associated with the Dot-com, in the late nineties. During the pre-crash period, the $SP500$ Index rises and the $Net - SSE$ decreases (the historical average is a better predictor than direct regression model over this period). Nevertheless, after the fall in prices, we identify the reverse performance: the direct regression forecasts are closer to the observed value (the $Net - SSE$ curve has a positive slope). How can we explain this relation? Resuming the introductory discussion – low dividend-price ratios signal low future returns – we can deduce that when prices increase, relative to dividends, it can be expected a reduction of returns in subsequent periods. Thus, we understand that when the price increases (and the dividends remain stable), our model that is predicting a fall in returns exhibits a worse performance. This translates into a negative

Chart 1

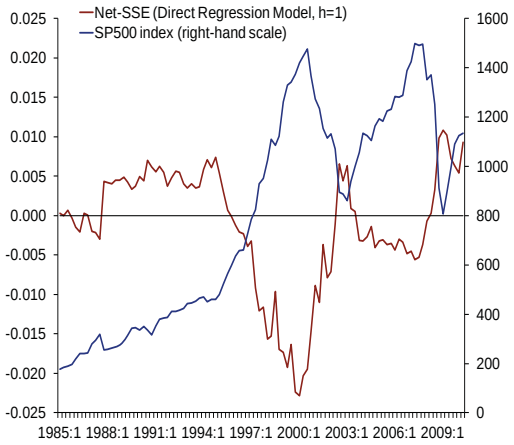
CUMULATIVE SSE DIFFERENCE CONSIDERING TWO COMPETING MODELS, FOR H=1 AND H=24.



Source: Author's calculations.

Chart 2

RELATIONSHIP BETWEEN THE NET-SSE AND THE SP500 INDEX



Sources: Federal Reserve Bank of St. Louis (FRED) and author's calculations.

inclination for the $Net-SSE$ curve and, simultaneously, a positive inclination for the $SP500$ curve. In the post-crash period, the returns descend steeply. At this time, the competing model produces good predictions (relatively to the historical mean forecasts), and therefore the $Net-SSE$ slope is positive (whereas it is negative for the $SP500$).[9]

Housing Market:

For forecast horizons shorter than 3 years (12 quarters), we find that all the competing models produce better forecasts than the benchmark model. However, and importantly, for longer horizons (over 3 years), only the models that contain the rent-price ratio exhibit $MSFE\,ratios$ lower than 1 (see Table 4). In particular, the $MSFE\,ratio$ between the direct regression and the benchmark model decreases as the horizon increases (all the values are statistically lower than 1, at 1% significance level). Comparing with the results obtained in Section 3, we verify that the predictability pattern identified in-sample holds out-of-sample for the housing market.

Table 5 displays the forecast encompassing statistics which allow the conclusion that the historical mean forecasts never encompass the forecasts generated by the direct regression model (the null hypothesis is always rejected at a significance level of 1%).

Figure 3 contains the charts with the $Net-SSE$ (for $h=1,\ 12,\ 18\ and\ 24$), considering three competing models and the Case, Shiller and Weiss data. The direct regression model had mild underperformance from 1998:Q1 to 2006:Q4, conversely it had a superior performance in the rest of the sample (considering $h=1$). The other two models exhibit a really good performance from 2006:Q1 to 2010:Q1 (before that, the $Net-SSE$ is almost zero for both models).

When we consider the forecast horizon of 12 quarters, the competing models only beat the historical mean model from 2008:Q1 (approximately) and the models that include the rent-price ratio start to exhibit a better performance than the model with only the autoregressive component. This pattern is obvious when we analyze the horizons of 18 and 24 quarters, where the cumulative SSE difference between the autoregressive model and the benchmark model is constantly negative. From 2008:Q1, the

9 We did the same exercise for the housing market and the conclusions are similar.

Table 4

MSFE RATIOS AND EQUAL ACCURACY TEST RESULTS FOR THE HOUSING MARKET

Horizon (quarters)	1	4	6	8	12	18	20	24
Direct autoregressive model $(p=2)$	0.453	0,358	0.448	0.572	0.864	1.024	1.085	1.085
Direct augmented AR $(pmax=4)$	0.342	0,315	0.344	0.414	0.561	0.401	0.373	0.373
Direct regression model $(p=0)$	0.785***	0,738***	0.724***	0.697***	0.579***	0.417***	0,401***	0.401***
Direct regression model $(p=2)$	0.466	0,465	0.397	0.488	0.559	0.409	0.386	0.386
Multivariate filter								
without indicators	0.554**	0,602	0.684	0.794	0.945	1.025	1.038	1.038
with rent-price ratio	0.541**	0,553	0.627	0.716	0,824	0.829	0.827	0.827

Source: Author's calculations.
Notes: See Table 2. Predictions were generated for the period 1998:Q1 – 2010:Q1. Significance levels at 10%, 5% and 1% are denoted by one, two, and three stars, respectively.

Table 5

FORECAST ENCOMPASSING TEST RESULTS FOR THE HOUSING MARKET

Horizon (quarters)	1	4	6	8	12	18	20	24
Direct regression model $(p=0)$	3.248***	3.055***	2.492***	3.620***	11.272***	28.392***	27.639***	20.581***
Multivariate filter								
with rent-price ratio	3.715***	2.053**	1.696**	1.607*	1.441*	1.212	1.160	1.101

Source: Author's calculations.
Notes: See Table 3. Predictions were generated for the period 1998:Q1 – 2010:Q1. Significance levels at 10%, 5% and 1% are denoted by one, two, and three stars, respectively.

direct regression curve grows almost exponentially, evidencing the predictive power of the rent-price ratio. Again, it is important to underline the importance of the observations corresponding to the end of the sample to the good results out-of-sample.

6. Conclusion

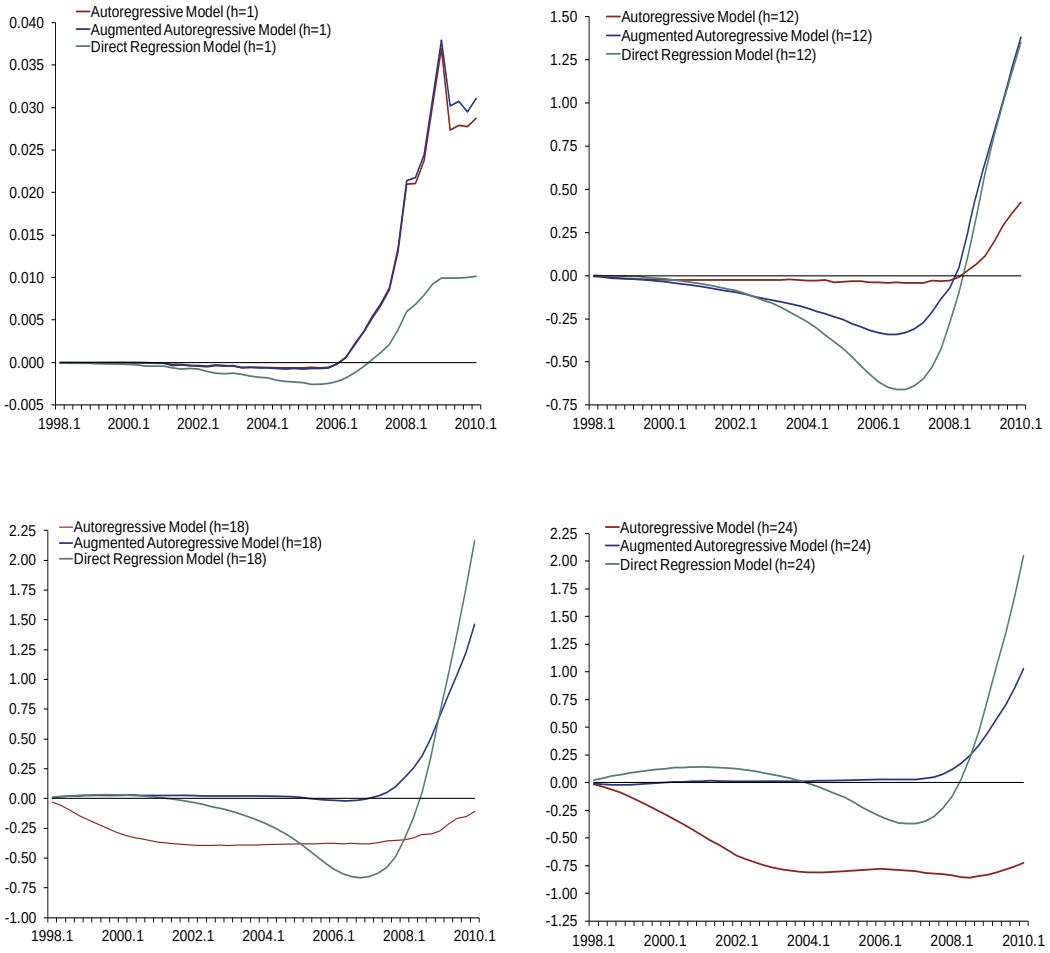
In this paper, we found evidence that the known in-sample pattern of return predictability (using valuation ratios) holds out-of-sample for the stock market and, especially, for the housing market. Considering the stock market, we show that a simple regression model that includes a valuation ratio outperforms the benchmark (which represents the hypothesis of no predictability of returns), for all horizons. Additionally, we note that the ability of dividend–price ratio to predict the aggregate returns improves at longer horizons. For the housing market, all the models that contain the rent-price ratio consistently exhibit $MSFE\,ratios$ lower than 1, for all horizons.

The sample dependence (significance of the last observations for the good results out-of-sample) identified for both markets deserves further attention. It will be interesting to investigate this issue in detail, notably by examining the stability of the forecast function while linking it to specific events affecting these markets or, more generally, the U.S. economy.

Additionally, it would be interesting to extend this research to other markets, namely bonds and treasuries since there are relatively few studies about predicting returns on these markets, out-of sample. Another suggestion would be to reproduce this study using data for European markets, aiming the development of overvaluation indicators.

Chart 3

CUMULATIVE SSE DIFFERENCE CONSIDERING THREE COMPETING MODELS (HORIZONS OF 1, 12, 18 AND 24 QUARTERS).



Source: Author's calculations.

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SERIES III

QUARTERLY SERIES FOR THE PORTUGUESE ECONOMY: 1977-2012

ANNUAL SERIES ON HOUSEHOLD WEALTH: 1980-2012

QUARTERLY SERIES FOR THE PORTUGUESE ECONOMY: 1977-2012

As has been the case since 2004, this section of the *Summer Economic Bulletin* contains updated quarterly long series for the Portuguese economy. The update released in this Bulletin has the same breakdown as in previous series and includes, for the first time, quarterly figures for 2012.[1]

Data now released incorporate the latest series of quarterly national accounts as well as quarterly national accounts for institutional sectors published by Statistics Portugal (*Instituto Nacional de Estatística – INE*) in June 2013 and closely follow the methodological procedures adopted in *Economic Bulletin – Summer 2011*.

In what concerns the main expenditure components, data released for the period from 1995 onwards are consistent with quarterly data from *INE*, both at current prices and in volume (chain-linked volume using 2006 as benchmark).

In turn, series on disposable income for the period starting in the first quarter of 1999 differ from figures published by *INE* in the quarterly national accounts for institutional sectors, due to the fact that they are seasonally adjusted in cases where a seasonal pattern is discernible (while figures published by *INE* are unadjusted). As a rule, the X12-ARIMA procedure was used for seasonal adjustment purposes. Series with an unstable seasonal pattern (making it difficult to use the X12-ARIMA procedure) were adjusted by breaking down annual figures data published by *INE* into quarterly figures using the corresponding quarterly indicator on the basis of a four-quarter moving average.

Regarding the period not covered by current publications of *INE* (prior to 1995 as regards expenditure components and 1999 for disposable income components) as well as labour market data, the methodology underlying the construction of these series did not undergo significant changes compared to those detailed in the article "Quarterly series for the Portuguese economy: 1977-2003" published in the June 2004 issue of the *Economic Bulletin*. Basically, the procedure consists in previously backdating annual figures in the quarterly national accounts on the basis of rates of change in the Long Series published by Banco de Portugal, which are then broken down into quarterly figures, using related indicators where possible and in compliance with the methodology detailed in the article mentioned above.

1 Quarterly figures for the period 1977-2012 are only presented in electronic version of the series on Banco de Portugal's website.

ANNUAL SERIES ON HOUSEHOLD WEALTH: 1980-2012

This section releases annual series on household wealth for the period 1980-2012, which correspond to an update to estimates published in *Economic Bulletin – Summer 2012*. These wealth estimates include the financial component (assets and liabilities) and housing (the main component of non-financial wealth).[1] The underlying concepts and methodology are identical to those described in Cardoso, Farinha and Lameira (2008).[2]

As the previous estimates, the financial series (assets and liabilities) presented here are consistent with the financial national accounts published by Banco de Portugal (see "Box 5.1 *Updating of household wealth estimates: 1980-2010*" in the 2010 *Annual Report* of Banco de Portugal about the procedure used to backdate series due to the revision of financial accounts occurred in 2009).

The methodology used to calculate housing wealth is based on a method normally used to calculate capital stock estimates – the perpetual inventory method. This method consists of, first, successively accumulating fixed capital investment (in this case, in housing), and then, postulating reasonable hypotheses for its service life and depreciation method. The resultant series on housing wealth was adjusted, taking the new estimate derived from the Survey of Household Finances (*Inquérito à Situação Financeira das Famílias – ISFF*), as benchmark for 2010. The procedure used in this instance was similar to that described by Cardoso, Farinha and Lameira (2008) as regards the incorporation of Household Wealth Survey (*Inquérito ao Património das Famílias*) data for 2006/2007. Therefore, survey data provide a one-off estimate for the reference year (in this case, 2010), while the remaining years are calculated in compliance with rates of change implicit in the series updated with the usual methodology, based on long series of Housing GFCF. It should be noted that the series thus obtained does not correspond to a significant change from those figures that would be obtained solely by updating the previous estimates (using 2007 as benchmark), since the value of the previous series updated to 2010 was very close to the resulting estimate of the new ISFF.

1 The series are only available in electronic format on Banco de Portugal's website.

2 Cardoso, F., Farinha, L. and Lameira, R. (2008), "Household wealth in Portugal: revised series", Banco de Portugal, *Occasional Paper 1*.