1. INTRODUCTION

The coincident indicator of overall economic activity for Portugal developed by Dias (1993) has played an important role in the conjunctural analysis carried out by the Banco de Portugal. Considering that ten years have elapsed since its development — an unparalleled longevity for an indicator of this type — an assessment of its behaviour during this period is warranted which is the focus of this article.

To provide an assessment of recent conjunctural development, requires the analysis of a large amount of data on a variety of economic series, each of them reflecting developments on specific partial aspects of the economy. Some economic indicators often present mismatching signs, or at least not fully synchronised signals, rendering the identification of the broad trend of economic activity more difficult. Despite the “mixed” developments in some of these series, the majority of them present, however, synchronized evolutions. The development of synthetic indicators capable of summarizing the information contained in the large quantity of data available on the economic performance is thus justified. In this context, coincident or leading synthetic composite indicators started to be presented as instruments of analysis of the development of overall economic activity. These composite indicators attempt to synthesise data contained in several economic variables, capturing their dominant trend.

Mitchell and Burns (1938) were the first ones to develop synthetic indicator for short-term economic analysis for the United States. Since then, this type of indicators have played an important role in tracking and forecasting overall economic activity over the short-term horizons. Auerbach (1982), on this subject wrote: “if the success of a specific approach can be measured by its longevity and continued popularity under a variety of environments, then the use in business cycle tracking and forecasting of coincident and leading indicators must stand near the top of such success”.

The methodology for the elaboration of these indicators has evolved over time, having become more sophisticated, as new statistical instruments/models were developed. Simultaneously, the background statistical information used for their development became more comprehensive in terms of both the extension of the statistical series and their coverage, comprising new aspects of economic reality, not envisaged previously by national statistical systems. In the late 1980s Stock and Watson (S&W) (1989) developed a new statistical instrument/model for the elaboration of coincident and leading indicators for the economy.

Similarly to other institutions, the Banco de Portugal developed in 1993 (Dias, 1993) a coincident indicator of overall activity for the Portuguese economy, following the methodology proposed by S&W. In the same vein, the Bank also developed a coincident indicator of private consumption for Portugal (Gomes, 1995). The coincident indicator of economic activity, as well as the coincident indicator of private consumption, are important tools used in the assessment of the
conjunctural situation of the Portuguese economy developed by the Banco de Portugal. Considering that ten years have elapsed since its development, it seemed interesting to assess the long-term behaviour of this instrument of analysis, trying to highlight the most relevant features observed along this period. For practical reasons, the main methodological aspects of the elaboration of the indicator are reviewed in the following section.

2. SOME METHODOLOGICAL ASPECTS

The methodology used for the construction of the coincident indicator proposed by Stock and Watson (1989) is based on an explicit probabilistic model using recent concepts developed in the specialised time series literature. It is mainly a typical signal extraction model of the evolution of the business cycle, which tries to determine the dominant trend pattern of the various series included in the set of input indicators. For a description of the methodology, see the original article by Stock and Watson (1989) or Dias (1993).

Considering that the application of the underlying statistical model of this methodology is limited in terms of the total number of input series that may be used for the elaboration of the coincident indicator(1), special attention had to be paid to the degree of coverage of the various sectors of economic activity. As discussed below, the selected series capture quite satisfactorily the broad performance pattern of overall economic activity. However, it is evident that partial aspects of economic activity may be left out and, in that sense, the coincident indicator should not be confounded with gross domestic product (GDP), where every aspects of economic activity are exhaustively covered.

However, this limitation associated with the statistical model of the coincident indicator of S&W constitutes an important operational advantage, since the use of a reduced number of series diminishes the probability of discontinuity in the indicator brought about by possible breaks in the input series. In addition, the option of using predominantly series of a qualitative nature, which are identified below, avoid the introduction of revisions in the coincident indicator resulting from revised input series. Actually, these series are not subject to revisions, unlike most short-term statistical indicators of a quantitative nature. In addition, these qualitative series have the advantage of being published in advance to the reference variable, thus providing further practical usefulness for the coincident indicator.

The statistical series used for the elaboration of the coincident indicator of activity of the Banco de Portugal are the following: balance of respondents on the assessment of volumes of retail sales and balance of respondents on the assessment of wholesale trade volumes (Monthly Trade Survey); balance of respondents on the assessment of contemporaneous production in manufacturing (Monthly Manufacturing Survey); and sales of cement to the domestic market(2), the latter bring of a quantitative nature.

The first two series attempt to capture developments in the trade sector. Indeed, the inclusion of indicators of this sector in addition to capturing its direct contribution to the value added to the economy, is also intended to take advantage of its particular characteristic of linking domestic supply and demand in the economy – which comprises demand both by firms and households (a share of private consumption). The third series deals with information on developments in industrial production, which may also partly capture the behaviour of exports of goods. Finally, domestic cement sales, highly correlated with evolution in the construction sector, accommodates information on developments in gross fixed capital formation in construction (which currently accounts for approximately 12 per cent of GDP).

Data from the series of a qualitative nature, when compared with the historical average of the respective series, provide information on the cyclical position of the variable under review. In the case of cement, it was necessary to deal with the data previously, in order to obtain information of a similar nature. For this series year-on-year rates of change was used.

In addition to the methodological aspects of the formal model for the construction of the indicator

(1) New instruments for the construction of synthetic indicators, which allow for the use of a much wider range of information on economic activity were recently developed in the literature. See Stock and Watson (1998) and Forni et als. (2000).

(2) Including cement directly imported by companies that do not produce cement.
there are some specific technical aspects on its elaboration that should be highlighted in order to ease its interpretation. First, all the series chosen to calculate the coincident indicator proved to be highly volatile in the short run, i.e. they contained a lot of noise, even after being de-seasonalised. This implied an additional smoothing of the series, through the calculation of their trend, so as to provide useful information for the assessment of the economic conjuncture. Second, it was necessary to “homogenise” the volatility of the series, i.e. to standardise them prior to the calculation of the indicator, in order to avoid series with a higher intrinsic volatility from having an artificially important contribution to the synthetic indicators, thus dominating its evolution. Under these circumstances, the series of the synthetic indicator, which derives from the model, presents an average close to zero. In order to “attach” a scale with some meaning to that indicator, it is necessary to rescale the indicator through a linear transformation; for this purpose we used the scale of the year-on-year rates of change series of the trend of quarterly GDP of INE (National Statistical Office). This linear transformation does not change the time profile of the synthetic indicator series; it only shifts its position and changes its volatility, matching them with the correspondent values of the year-on-year rates of change of GDP.

Although the overall pattern of development of the coincident indicator is very similar to that of GDP (see Chart 1), due to the high degree of coverage of the different economic sectors envisaged in the set of input series, it should be noted, however, that the coincident indicator is not intended to measure year-on-year rates of change of GDP, “tout court” but to provide an assessment of the “state of the economy”. Its overall pattern of development seeks to capture chiefly the dominant trend of the economy proxied by the dominant evolution of the set of four series comprised in its elaboration. Thus, even if a scale has been attached to the indicator — of the year-on-year rates of change of GDP — the main information to be retained from its evolution should be limited to the acceleration, deceleration and turning points of the series, and not particularly to its level.

3. HISTORICAL ANALYSIS OF THE COINCIDENT INDICATOR

3.1. The main broad features of the behaviour of the indicator over the past ten years

The coincident indicator of economic activity of the Banco de Portugal was developed ten years ago. Given its longevity, it is therefore pertinent to assess its historical behaviour. Overall and regardless of the criteria used in this assessment, the performance of this indicator has been broadly remarkable in tracking developments in general economic conditions. It is possible to illustrate the historical behaviour of this indicator by comparing it with the time-profile of quarterly GDP(3) (Chart 1).

In this chart, the coincident indicator is deliberately presented in its original scale (right-hand side scale), i.e. prior to its rescaling according to the level of the year-on-year changes in quarterly GDP. The aim is to show that the linear transformation of the indicator does not change the pattern of development of the indicator. It only introduces a pre-defined scale for the indicator. From the chart, one can conclude that, overall, the synthetic coincident indicator has monitored rather robustly developments in overall activity of the economy.

(3) The charts in this text use the following general notation: “CI98Q2” to represent the version of the coincident indicator calculated in the second quarter of 1998.
Portuguese economy over the past ten years, and that therefore the set of series included in its elaboration, covers quite reasonably a significant share of total economic activity.

However, in the most recent period there has been a “discontinuity” in the magnitude of the change in the coincident indicator compared with developments in GDP, presenting a far more negative fall than that estimated for overall activity. This perceivable discrepancy is due to the marked negative behaviour recorded during this period by all input series (Chart 2). Looking at this group of charts, it is possible to conclude that, in the second quarter of 2003, all four series comprised in the coincident indicator recorded simultaneously, for the first time, historical low levels, which obviously translated into the historical low of the synthetic indicator, recorded in the second quarter of 2003.

3.2. Long-term historical revisions

As mentioned above, all input series are subject to prior treatment — calculation of the trend — prior to the calculation of the synthetic indicator. As new information gets available, the consequent re-estimation of the trend of any series introduces revisions to previous estimates. These revisions are mainly concentrated in the final observations of the sample and, in particular, are more signifi-
cant when close to a turning point (maximum/minimum). Therefore, the coincident indicator may be subject to revisions, particularly in its latest observations. This is extremely important, given that economic agents pay special attention to the latest information on the coincident indicator. Ignoring this fact can lead to a “less accurate” reading of revisions of the coincident indicator for the most recent period. However, one should stress that, overall, these revisions have not been very significant, from a long-term perspective, as can be seen in Chart 3, which shows the two versions of the indicator originally calculated and published in the first quarter of 1993 (CI93Q1) and in the fourth quarter of 2000 (CI00Q4).

The parameters of the formal model that support the elaboration of the coincident indicator were re-estimated in the first quarter of 2001\(^{(4)}\), when simultaneously the quarterly series of opinion surveys on wholesale and retail trade were replaced with the corresponding monthly series. This change permitted to anticipate by approximately one month the regular update of the coincident indicator. This operation gave rise to an overall revision the historical series of the coincident indicator, given that the “contribution” of each series that are included in the construction of the indicator were revised after the re-estimation of the model (Chart 4).

However, it should be mentioned that although these revisions gave rise to some changes in the general level of the synthetic indicator series, they have not brought about significant changes in its overall development pattern, particularly as to indications of acceleration/deceleration and positioning of turning points. This fact is confirmed by the high linear correlation coefficient between these two series (+0.97).

Chart 5 presents the coincident indicator of 2001Q1 and the most recent version available, for

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(4) See Annex 2 of the January 2001 issue of the Monthly Economic Indicators of Banco de Portugal.
2003Q3, in order to show, once again, that the long-term revisions are negligible, indicating the robustness of this indicator from a long-term perspective.

3.3. Historical revisions between two consecutive versions of the coincident indicator

Although the revisions have proved to be negligible in the long-term perspective, revisions between two consecutive versions may not be necessarily so, particularly near turning points. In order to show the magnitude of these revisions in the neighbourhood of turning points, Chart 6 displays the final section of several “versions” of the coincident indicator calculated/published in real time by Banco de Portugal.

The first panel presents the revisions during an upward phase of the indicator, while the second panel contains the revisions observed at two turning points, which were followed by a downward phase. In these charts, the last observation released in each real time are marked with a full circle and the second-last observations are marked with a full triangle. The distance between any circle and triangle situated on the same vertical line illustrates the magnitude of the revisions of the last observations made available in the immediately preceding quarters. This shows that, during the upward phase of the cycle, revisions are dominantly positive, while they are mostly negative during the downward phase of the cycle. It is therefore possible to conclude that the most recent values of the indicator-2003Q3—will likely be revised upwards as soon as the economic recovery resumes.

Chart 7 presents, in a panel of figures, the revisions to the last three observations of each “version” of the coincident indicator occurring in the following update.

Besides the revisions, each of the three panels include the latest version of the coincident indicator (2003Q3). The same right-hand scale was deliberately chosen for the revisions, in order to show

Table 1

<table>
<thead>
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<th></th>
<th>Last observations</th>
<th>Second-last observations</th>
<th>Ante-penultimate observations</th>
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<td>0.10</td>
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<tr>
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<tr>
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<tr>
<td>Maximum . . . . .</td>
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<td>0.42</td>
<td>0.31</td>
</tr>
<tr>
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<tr>
<td>Standard deviation . .</td>
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<td>0.11</td>
<td>0.08</td>
</tr>
</tbody>
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Note:

(a) These statistics were calculated, except for the maximum and the minimum, on the basis of the absolute values of the revisions; the values for 2000Q4 were not considered for this calculation for the reasons mentioned earlier.
that the magnitude of revisions decreases over time, being more significant only for the last observations and ceasing to be relevant for the other two. The first panel confirms the fact that revisions are dominantly positive during the upward phase of the cycle, while they are mostly negative during the downward phases. The anomalous revisions presented in the chart for the 2000Q4 period are related to the previously mentioned discontinuity in the coincident indicator, which was caused by the re-estimation of the model, during the first quarter of 2001, in parallel with the simultaneous replacement of the two quarterly trade series with corresponding monthly series.

Table 1 lists some descriptive measures regarding the series of revision.

4. CONCLUSIONS

The coincident indicator of overall economic activity of the Banco de Portugal has been used for the conjunctural analysis since 1993. Although its calculation, for methodological reasons, is based on only four series — three qualitative series and one quantitative series (namely sales of cement to the domestic market) —, its behaviour over the last decade has been remarkable. The overall pattern of the coincident indicator have followed quite satisfactorily developments in production, as measured by the year-on-year rate of change in quarterly GDP, both in terms of acceleration/deceleration and in terms of the identification of turning points. Its “resemblance” to quarterly
GDP obviously derives from the high coverage of economic activity made possible by the set of series used in its elaboration.

It should be noted that three out of the four series that are included in the composition of the coincident indicator are based on data from qualitative business surveys. Thus one may conclude that opinion surveys contain highly relevant information for the assessment of economic developments, if properly treated.

Due to the procedures used in its elaboration, the coincident indicator is subject to revisions over time. Historical analysis allows for the conclusion that these revisions have been relevant only in the short-term prospective, i.e., when the indicator released in one quarter is compared with the one released in the immediately preceding quarter, and particularly when we are in the presence of turning points. Over a longer-term time perspective revisions are virtually negligible, indicating that the information provided by the coincident indicator proves to be quite robust.

REFERENCES


