

## B CAPTURING THE FINANCIAL CYCLE IN EURO AREA COUNTRIES<sup>1</sup>

*This special feature discusses ways of measuring financial cycles for macro-prudential policy-making. It presents some estimates and empirical characteristics of financial cycles. Existing studies on financial cycle measurement remain quite nascent in comparison with the voluminous literature on business cycles. In this context, two approaches – turning point and spectral analysis – are used to capture financial and business cycles at the country level. The results of the empirical analysis suggest that financial cycles tend to be more volatile than business cycles in the euro area, albeit with strong cross-country heterogeneity. Both aspects underscore the relevance of robust financial cycle estimates for macro-prudential policy design in euro area countries.*

### INTRODUCTION

Attenuating financial cycles is one of two fundamental goals of macro-prudential policy.<sup>2</sup> Indeed, the recent global financial crisis provided a vivid illustration of the time series dimension of systemic risk – namely, that recessions associated with the build-up of financial sector disruptions exhibit much higher output losses than “normal” recessions.

Despite the prominence of this goal in macro-prudential policy, there is no generally agreed definition of the financial cycle<sup>3</sup>, and existing measurement methods yield only preliminary and incomplete results. Existing analysis on characterising financial cycles remains scarce and is in many ways not yet suitable for policy use in the euro area. Measurement limitations include the geographic coverage of the analysis (in that it tends to focus on a limited number of countries) and a lack of consensus on the mechanics of measurement, such as the choice of indicators and the method used to construct them. Ideally, a unique synthetic measure of the financial cycle would summarise the (co-)movements over time of a range of financial sector variables, covering quantities and prices. In practice, however, over-reliance on a single composite measure is not advisable as each constituent variable contains relevant information for macro-prudential policy-making.

Measuring financial cycles for euro area countries has become more important in the context of ECB macro-prudential oversight and the launch of the Single Supervisory Mechanism (SSM). There is an urgent need to obtain a robust view on capturing financial cycles – balancing cross-country consistency with individual country relevance. This special feature presents the results of two different methodologies aimed at furthering the basis for country-specific macro-prudential policy-making in the euro area. One employs spectral methods for cycle extraction and characterisation for euro area countries, and the other characterises financial cycles on the basis of turning point analysis. Both approaches incorporate information from several macro-financial variables typically used in the growing body of literature to robustly capture the financial cycle across a diverse set of countries, and present relationships with business cycles extracted on a comparable methodological basis. In so doing, they provide information on differing properties of financial cycles across euro area countries, including their amplitude and persistence.

1 Prepared by Paul Hiebert, Benjamin Klaus, Tuomas Peltonen, Yves S. Schüller and Peter Welz.

2 The two commonly thought of goals are (i) attenuating the financial cycle and (ii) enhancing resilience of the financial system. See, for instance, the Group of Thirty, *Enhancing Financial Stability and Resilience: Macroprudential Policy, Tools, and Systems for the Future*, Working Group on Macroprudential Policy, October 2010 ([http://www.group30.org/images/PDF/Macroprudential\\_Report\\_Final.pdf](http://www.group30.org/images/PDF/Macroprudential_Report_Final.pdf)).

3 One appealing characterisation of financial cycles relates to the pro-cyclicality of the financial system inherent in “self-reinforcing interactions between perceptions of value and risk, attitudes towards risk and financing constraints, which translate into booms followed by busts”. See Borio, C., “The financial cycle and macroeconomics: What have we learnt?”, *Journal of Banking and Finance*, Vol. 45, August 2014, pp. 182-198.

*Need for measures of the financial cycle...*

*... to support macro-prudential policy-making*

Nascent literature on financial cycles (in contrast to business cycles)...

... including turning point analysis...

... and spectral analysis

No single indicator can capture the financial cycle...

## EXISTING STUDIES ON THE FINANCIAL CYCLE: POINT OF DEPARTURE

Whereas the business cycle has been studied extensively, the comparable body of literature on financial cycles remains nascent. In general, cycles can be measured as *classical cycles* considering the level of the underlying time series, as *growth cycles* by removing a permanent component from the series under study, and as *cycles in growth rates* where the underlying time series is first transformed into growth rates.<sup>4</sup> Of the studies which have been seminal in laying the ground work for a better understanding of financial cycles across major economies, two strands stand out as representative.

The first consists of turning point analysis applied to cycle extraction – examining key descriptive characteristics such as duration, amplitude and slope. An influential study in this respect is Claessens et al. (2012),<sup>5</sup> which examines the phases of business and financial cycles and the resulting impact on macroeconomic performance for a broad range of advanced and emerging economies. Their findings suggest that, while financial variables tend to exhibit more variability than those related to the business cycle, this differs across financial assets such as equity (which has the longest upturn duration) and real estate variables (with housing exhibiting the longest downturn duration). Furthermore, their findings show that there is a close link between business and financial cycles.

The second strand focuses on frequency-based filters, in some cases complemented by turning point analysis. A widely cited study in this respect is Drehmann et al. (2012),<sup>6</sup> which uses both frequency-based filters and turning point analysis to identify financial cycles for several advanced economies and compares them with business cycles. The study finds that financial cycles are considerably longer than business cycles and that financial cycle peaks tend to be associated with financial crises.<sup>7</sup> Looking specifically at credit, Aikman et al. (forthcoming) apply a frequency-based filter to extract cyclical dynamics using very long time series and find that financial cycles tend to be longer than their economic analogue.<sup>8</sup>

While the available literature has greatly contributed to developing key methodologies, there is less consensus regarding which variables best help to capture the cycle and how to combine multiple variables. Moreover, systematic analysis has been limited for euro area countries.

## WHICH VARIABLES COULD CAPTURE THE FINANCIAL CYCLE?

Absent a single summary measure for the state of the financial sector, a multivariate approach that relies on a range of macro-financial indicators seems to provide the best-suited method for obtaining a financial cycle estimate. Such an approach would map the methodology used in a large body of business cycle research that goes beyond using real GDP as a summary indicator and instead

4 For a classification of cycle measurement approaches, see Harding, D. and Pagan, A., “A suggested framework for classifying the modes of cycle research”, *Journal of Applied Econometrics*, Vol. 20, Issue 2, 2005, pp. 151-159.

5 See Claessens, S., Kose, M. and Terrones, M., “How do business and financial cycles interact?”, *Journal of International Economics*, Vol. 87, Issue 1, 2012, pp. 178-190.

6 See Drehmann, M., Borio, C. and Tsatsaronis, K., “Characterising the financial cycle: don’t lose sight of the medium term!”, *BIS Working Paper*, No 380, June 2012.

7 See Stremmel, H. and Zsámboki, B., “The relationship between structural and cyclical features of the EU financial sector”, *Banking Structures Report*, ECB, October 2014, where a frequency-based filter set up by Drehmann et al. (ibid.) is used to conduct a turning point analysis on the filtered series and map structural features of the banking sector on the financial cycle for EU Member States. Their findings suggest that structural banking sector characteristics influence the amplitude of the financial cycle.

8 See Aikman, D., Haldane, A. and Nelson, B., “Curbing the credit cycle”, *The Economic Journal* (forthcoming).

employs a broad set of indicators on economic activity.<sup>9</sup> For instance, additional variables such as prices of goods and services (*consumer price inflation*) and the price of intertemporal substitution of consumption and investment (*interest rates*) should contain important information for a more accurate measurement of business cycles than reliance on any single variable such as GDP.

In conceptualising the determinants of the financial cycle, studies to date have focused predominantly on a combination of various measures of *credit*, e.g. transformations of total or bank-based credit, either in growth rates or credit to GDP ratios, as well as *asset prices*, especially real estate and equity prices. Measures of credit can give an impression of financial flows that form a conceptual analogue to flows of goods and services in business cycle research.

According to Schularick and Taylor (2012), the entire bank balance sheet and its decomposition may have macroeconomic implications.<sup>10</sup> Notably, variation in leverage (proxied by credit) is related to asset price developments.<sup>11</sup> With regard to the latter, while there are numerous possible proxies to capture asset price movements, a combination of residential property price indices, equity price indices and a measure of benchmark bond yields can provide a basis for capturing all main asset market segments.

Ultimately, it could be argued that a good starting point is an analysis of a parsimonious set of three or four variables for the financial cycle (credit, house prices, equity prices – as is standard in the literature to date – complemented by a country-specific benchmark interest rate as a proxy for bond market pricing) and three for the business cycle (GDP, consumer price inflation and the interest rate). Table B.1 summarises the key characteristics of these quarterly series in real terms for ten euro area countries since 1970.<sup>12</sup>

When looking at the characteristics of the series on a cross-country basis, it is clear that the indicators for the financial cycle tend to be more volatile than the indicators for the business cycle. This applies broadly to credit growth, house price growth and – in particular – equity price growth. By contrast, the mean growth rates of real GDP and inflation have been less volatile over approximately the last 40 years, albeit less stable in the early years for which data are available, mainly the 1970s.

Another important stylised fact relates to the considerable cross-country heterogeneity – arguably stronger for variables characterising the financial cycle (such as credit and asset prices) than those characterising the business cycle (such as GDP). Average total real *credit growth*, for instance, has been in the range of 4-5% per annum in most countries in the euro area since 1970, but rather low in Germany (at around 2.5%) and rather high in Ireland (in excess of 7%) over the same period. Similarly, while average real *house price growth* in these ten euro area countries has been around 1.5% since 1970, real house prices have actually fallen on average in Germany and nearly stagnated in Portugal. Likewise, average cross-country real *equity price growth* has been

... but credit and asset prices are key ingredients for financial cycle estimation

Key variables for euro area countries...

... suggest financial cycle determinants are relatively volatile...

... as well as considerable cross-country heterogeneity

9 For arguments in favour of using a variety of measures in the business cycle context, see, for example, Boehm, E., “A review of some methodological issues in identifying and analysing business cycles”, *Melbourne Institute Working Paper*, No 26/98, November 1998. See also Stock, J. and Watson, M.W., “Estimating Turning Points Using Large Data Sets”, *Journal of Econometrics*, Vol. 178, 2014, pp. 368-381.

10 See Schularick, M. and Taylor, A., “Credit Booms Gone Bust: Monetary Policy, Leverage Cycles, and Financial Crises, 1870–2008”, *American Economic Review*, Vol. 102, Issue 2, 2012, pp. 1029–1061.

11 Clearly, these variables represent a compromise to the ideal information set for financial cycle extraction. For example, it would be preferable to include key propagation mechanisms of systemic risk, such as actual *leverage* and *maturity mismatch*, but long time series at the country level for these series is unfortunately scarce for euro area countries.

12 Standard unit root tests suggest most variables in levels are integrated of order one in individual countries.



**Table B.1 Summary of data for selected euro area countries**

(annual percentage changes and percentage point changes)

	Total credit	House prices	Equity prices	Interest rates	GDP	Inflation
AT	4.9 (3.6) [-2.4,13.9]	2.5 (7.5) [-8.2,27.8]	1.6 (25.4) [-88.9,88.6]	-0.1 (1.3) [-3.5,3.1]	2.4 (2.0) [-5.2,8.9]	-0.0 (0.5) [-1.6,1.9]
BE	4.5 (4.3) [-10.7,12.2]	2.3 (5.5) [-14.3,11.5]	1.8 (20.5) [-71.8,44.8]	-0.1 (1.9) [-7.7,6.0]	2.1 (2.0) [-4.4,7.0]	-0.0 (0.7) [-2.0,2.8]
DE	2.6 (2.6) [-3.7,9.1]	-0.2 (2.8) [-5.8,7.9]	2.3 (20.9) [-61.6,51.0]	-0.1 (1.2) [-3.7,3.4]	2.0 (2.2) [-7.0,7.2]	-0.0 (0.5) [-1.5,1.3]
ES	4.6 (6.2) [-9.1,18.3]	2.3 (9.7) [-14.0,31.0]	-1.0 (26.4) [-71.5,74.6]	0.0 (2.7) [-9.7,10.2]	0.7 (5.0) [-23.7,10.5]	-0.0 (1.0) [-3.4,5.1]
FI	4.3 (4.6) [-12.1,13.6]	1.3 (8.8) [-22.2,30.1]	4.5 (32.0) [-76.5,92.4]	-0.1 (2.3) [-8.3,6.4]	2.4 (3.4) [-10.2,10.1]	-0.0 (0.8) [-2.4,3.3]
FR	3.9 (3.2) [-2.1,11.9]	2.0 (5.2) [-9.3,13.0]	2.0 (22.7) [-56.3,51.3]	-0.0 (1.4) [-4.7,3.9]	2.1 (1.7) [-4.0,5.6]	-0.0 (0.6) [-2.4,2.8]
IE	7.5 (8.0) [-8.9,30.5]	2.0 (9.3) [-20.9,25.6]	1.8 (28.7) [-104.1,50.6]	0.1 (3.0) [-8.7,10.8]	1.7 (4.7) [-16.8,12.7]	-0.1 (1.3) [-4.9,3.8]
IT	3.3 (4.6) [-6.9,11.9]	1.6 (10.1) [-20.2,48.4]	-1.3 (29.0) [-66.6,89.2]	-0.0 (3.0) [-8.7,12.9]	1.7 (2.6) [-7.2,9.4]	-0.0 (1.0) [-3.9,3.5]
NL	5.5 (4.5) [-3.5,16.9]	1.9 (8.7) [-24.7,31.3]	1.7 (20.9) [-70.7,49.3]	-0.1 (1.4) [-6.2,3.2]	2.2 (2.2) [-4.8,7.9]	-0.0 (0.5) [-1.4,1.1]
PT	4.4 (6.2) [-13.1,18.3]	0.1 (3.0) [-5.6,8.2]	-0.6 (46.9) [-198.2,127.6]	0.2 (6.0) [-34.7,34.3]	2.5 (3.4) [-6.5,11.3]	-0.0 (2.4) [-11.8,14.2]
Avg. (Std.dev.)	4.6 (1.3)	1.6 (0.9)	1.3 (1.8)	-0.0 (0.1)	2.0 (0.5)	-0.0 (0.0)

Sources: Eurostat and ECB calculations.

Notes: The table reports the mean, standard deviation (round brackets) and minimum as well as maximum value (square brackets). Quarterly variables are transformed to year-on-year changes and are in real terms, except for inflation. Real total credit, real house prices, real equity prices and real GDP are in annual percentage changes. Real interest rates and inflation reflect percentage point changes. Real interest rates represent deflated rates of long-term government bond yields. "Avg." refers to the average of the country means and "Std.dev." to the standard deviation of means across countries. The sample covers the period Q2 1972 – Q1 2014 (real total credit: Q2 1972 – Q4 2013). Exceptions are real house prices in the case of AT (starting Q3 1987), ES (starting Q1 1972), PT (starting Q1 1981), and BE/DE/DK/IT (ending Q4 2013). BE and FI (starting Q4 1971) and IE (starting Q2 1972) are the exceptions for real total credit. Real GDP ends in Q4 2013 for FI and IE. For ES and IE, industrial production (excluding construction) is used rather than GDP given the unit root properties of the latter series, likely associated with the services sector (starting Q1 1975 and Q1 1980 respectively).

of a similar magnitude at 1.3%, but has declined in Spain, Italy and Portugal over the period. *Real interest rate changes* across the ten countries have been around zero on average since 1970, with less cross-country variation in averages, but a vast difference in terms of volatility or extremes. By contrast, real GDP growth and consumer price inflation rates have tended to be more homogeneous across the euro area countries over the past few decades.

## METHODS TO CAPTURE FINANCIAL CYCLES FOR SELECTED EURO AREA COUNTRIES

As financial cycles are not directly observable, they must be inferred. This gives rise to a potential for both data and model uncertainty and so the use of complementary analytical perspectives can enhance measurement and policy-making. Against this background, two commonly used types of methodology are presented below, which together provide a conceptually distinct but complementary means of cycle extraction.

### Spectral analysis

A widely applied method of extracting cycles is spectral analysis, which, simply put, means applying filters that exploit information on dominant frequencies in variables that capture respective cycles. To account for specification uncertainty, a rich set of alternatives is proposed in the literature, ranging from univariate analysis (of a single series) through to extracting cycles based on commonality across several variables ("cohesion").

*Results from two methods to infer financial cycles*

*Multivariate spectral analysis...*

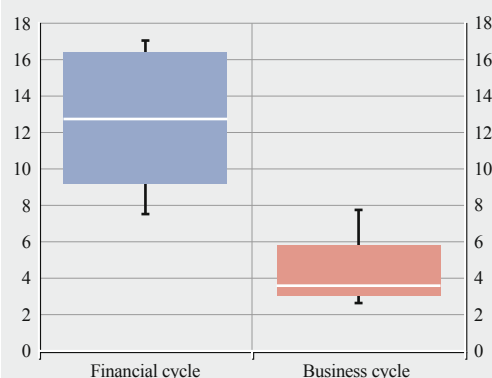
The results from a multivariate spectral approach for characterising financial cycles at the country level are presented below. The cycles are extracted using a three-step procedure combining spectral analysis with principal component analysis.<sup>13</sup> First, a cohesion measure capturing common movement regardless of the phase differences across variables is applied to capture the frequency range (or the length of cycles) with the highest co-movement across the set of indicators. Second, these country-specific frequency bands are used as an input into a band-pass filter to yield a continuous representation of country-specific cycles for each constituent indicator.<sup>14</sup> Third, these cycles constructed for each individual indicator are aggregated into a common country-specific financial cycle through principal component analysis, with normalised indicators rebased to an average volatility across all series.

A key finding from the first step of this analysis is that, while providing further evidence to support the finding that financial cycles tend to be longer than business cycles, there is considerable heterogeneity across euro area countries. As indicated in Chart B.1, financial cycles measured on this basis indeed appear to be just under three times as long as the average business cycle of the ten euro area countries analysed – around 13 years as opposed to five years.<sup>15</sup> But the dispersion of dominant country frequencies around this cross-country average is stark – with financial cycles lasting between seven and 17 years in contrast to business cycles lasting between three and eight years. Interestingly, the distribution of business cycle lengths seems to be skewed downwards compared with a relatively symmetric distribution for the financial cycle lengths, indicating a rather homogeneous cycle length for the business cycle. Clearly, there are some limitations to these data given structural changes over the last 40 years in many of the countries analysed, but the results are nonetheless illustrative.

Applying these dominant country frequencies can yield a composite estimate of a financial cycle for individual euro area countries, with a type of “concordance” across constituent explanatory variables around this principal signal. Specifically, filtering country credit, asset price (house and equity) and interest rate data using country-specific dominant frequencies yields a range for variables that are key underlying forces for the financial cycle – while the first principal component of these four variables yields a sort of “average financial cycle”, in the form of a linear combination of these individual cycles. Chart B.2 contains a representation of this output for an illustrative euro area country. The black line, representing the combination of cycles in individual variables at a given point in time, moves around a zero line representing deviations from a long-term historic average. The range of

**Chart B.1 Estimated length of financial and business cycles for selected euro area economies**

(years; maximum; minimum; inter-quartile range and median)



Source: ECB calculations.

Notes: Length of cycles refers to the point of maximum average cohesion across financial and real indicators along different frequencies. The sample includes data for ten euro area countries over Q1 1970 – Q1 2014, where available.

<sup>13</sup> For details, see Schüler, Y., Hiebert, P. and Peltonen, T., “Characterising financial cycles across Europe: one size does not fit all”, *Working Paper Series*, ECB (forthcoming).

<sup>14</sup> See Christiano, L. and Fitzgerald, T., “The band-pass filter”, *International Economic Review*, Vol. 44, Issue 2, May 2003, pp. 435-465.

<sup>15</sup> This broadly confirms the finding of Drehmann et al. (2012), who argue that the duration of the financial cycle is, on average, around 16 years, or 20 years when considering only cycles that peaked after 1998.

... as a basis for a three-step procedure to capture country financial cycles...

... suggesting relatively long (but heterogeneous) financial cycles...

... and enabling estimation of country-specific financial cycles...

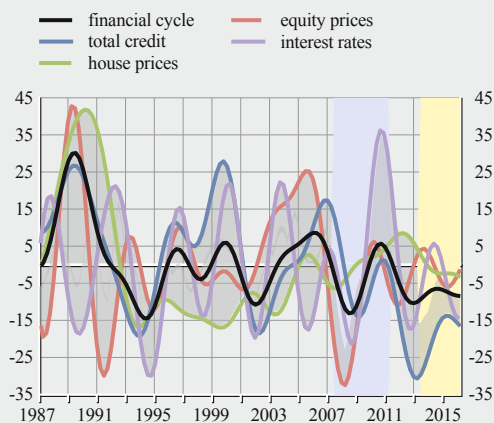
... with strong cross-country differences

cycles around this dominant signal then provides information on the concordance, or agreement, of these individual cycles. Clearly, this tends to differ across time. From a policy perspective, such a signal can be important to understand both where one may stand in a financial cycle at a given point in time and the level of uncertainty attached to such a signal.

Mirroring heterogeneity in the source data across the euro area countries, the ability of a dominant principal component to capture movement across those variables meant to capture the financial cycle varies considerably across countries. Indeed, financial cycle determinants across countries appear to be more heterogeneous than modelled business cycle determinants. As shown in Chart B.3, credit and house prices appear to be dominant explanatory factors in many but not all countries, while equity prices and interest rates appear to be, in all but one case, less important. Clearly, country-specific lead/lag relationships across variables may affect the degree to which contemporaneous low frequency co-movement is present.

**Chart B.2 Illustrative financial cycle and cycles of constituent indicators**

(quarterly data, standard deviation units from mean; rebased to series' variance)

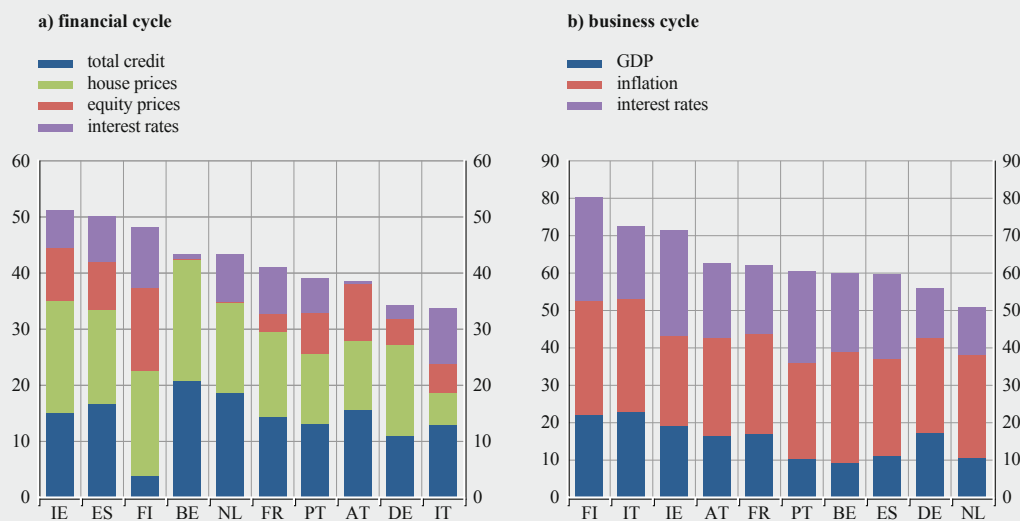


Source: ECB calculations.

Notes: The financial cycle is the first principal component of the four underlying smoothed and standardised indicators (coloured lines), namely interest rates, equity prices, residential property prices and total credit. Underlying indicators are smoothed using country-specific frequency windows as an input into a band-pass filter. The frequency window is determined via cohesion of indicators across cycle periods. The blue shaded area refers to banking crisis dates as specified in European Systemic Risk Board, "Operationalising the countercyclical capital buffer: indicator selection, threshold identification and calibration options", *Occasional Papers*, No 5, June 2014. The yellow shaded area refers to forecasted cycles. Dates refer to the third quarter of the indicated year.

**Chart B.3 Contributions to cyclical fluctuations across selected euro area countries**

(percentage of total variance)



Source: ECB calculations.

Notes: Figures reflect variance explained by a first principal component and the respective contributions of input variables. For the definitions and transformations of variables, see Table B.1. Variables have been standardised before obtaining the principal component.

### Turning point analysis

The second type of methodology for cycle inference is turning point analysis. The approach followed in this special feature applies classical cycle measurement focusing on the level of the series as in Bry and Boschan (1971) and Harding and Pagan (2002).<sup>16</sup> This type of turning point analysis has been mostly used to study the business cycle, but it has also been applied to financial series. Pagan and Sossounov (2003)<sup>17</sup>, for example, characterise the bull and bear market phases in equity prices; Claessens et al. (2012) analyse cycles in credit, house prices and equity prices; Drehmann et al. (2012) apply the algorithm to identify peaks and troughs in short-term and medium-term cycles of both GDP and financial series; and Bracke (2013) studies cycles in house prices.<sup>18</sup>

While a key advantage of turning point analysis is that it identifies the local minima and maxima in the levels of a series of interest, which is simple, transparent and robust to the inclusion of newly available data, a few parameters still need to be chosen. To ensure comparability with other studies, the analysis here uses for all series the common parameter settings as in Claessens et al. (2012). In particular, the initial turning points are searched within a window of two quarters and thereafter censoring rules of a minimum phase (complete cycle) length of two (five) quarters are applied.

The method is applied to investigate real credit, real residential property prices and real equity prices as the variables that may best capture information about the financial cycle from a macroeconomic perspective. In addition, turning points for the level of real GDP are determined to capture the business cycle. The sample includes the same ten euro area countries used in the spectral analysis.

Table B.2 summarises the results across the euro area countries of phase characteristics from turning point analysis, such as amplitude, duration and slope. The results reveal that, while the amplitude in the credit cycle is about twice as high as in the business cycle, they are roughly equally long. Property and equity price upturns tend to be shorter than those in credit and GDP. There is large country heterogeneity in real property price cycles, probably reflecting differing and complex

*Turning point analysis of financial variables in levels takes alternative view*

*Real credit, equity and housing prices are analysed separately and then compared*

**Table B.2 Summary of turning point analysis**

(number of years; percentage changes; percentage changes per year)

	Downturn				Upturn			
	Number of phases	Duration (years)	Amplitude	Slope	Number of phases	Duration (years)	Amplitude	Slope
Real total credit	51	1.3	-4.0	-0.8	50	5.7	34.9	1.3
Real equity prices	106	1.6	-40.9	-6.8	103	1.8	48.3	7.0
Real residential property prices	65	2.0	-12.1	-1.4	66	3.3	22.2	1.8
Real GDP	64	1.0	-2.8	-0.6	56	5.6	18.1	0.7

Sources: BIS, OECD, Eurostat and ECB calculations.

Notes: All statistics are computed over all countries included in the sample and separately for both cycle phases. Downturns (upturns) are defined as the phases between peak and trough (trough and peak). Duration measures the average length of a cycle phase in years. Amplitude refers to the average percentage change in a variable over upturns and downturns respectively. Slope refers to the ratio of amplitude to duration.

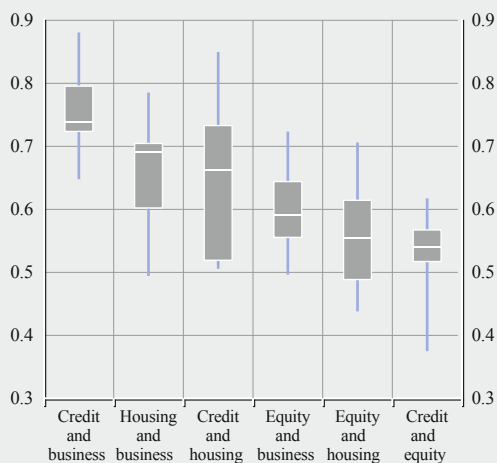
16 See Bry, G. and Boschan, C., *Cyclical analysis of time series: Selected procedures and computer programs*, National Bureau of Economic Research, Inc., 1971; and Harding, D. and Pagan, A., "Dissecting the cycle: a methodological investigation", *Journal of Monetary Economics*, Vol. 49, Issue 2, 2002, pp. 365-381, where the former developed the methodology for monthly data and the latter adapted it to quarterly data.

17 See Pagan, A. and Sossounov, K., "A simple framework for analysing bull and bear markets", *Journal of Applied Econometrics*, Vol. 18, Issue 1, 2003, pp. 23-46.

18 See Bracke, P., "How long do housing cycles last? A duration analysis for 19 OECD countries", *Journal of Housing Economics*, Vol. 22, Issue 3, 2013, pp. 213-230.

**Chart B.4 Synchronisation of cycles within countries**

(share of quarters; maximum; minimum; inter-quartile range and median)



Sources: BIS, OECD, Eurostat and ECB calculations.

Notes: The chart shows the degree of synchronisation of cycles within countries. Synchronisation is measured as the concordance between two series (e.g. real credit and real GDP) in each country.

**Chart B.5 Synchronisation of cycles across countries**

(share of quarters; maximum; minimum; inter-quartile range and median)



Sources: BIS, OECD, Eurostat and ECB calculations.

Notes: The chart shows the degree of synchronisation of cycles across countries. Synchronisation is measured as the concordance using a particular series (e.g. real credit) for two countries.

structural characteristics in regional housing markets, such as tax treatment of housing, macro-prudential and mortgage market features, and land and rental regulation.<sup>19</sup>

Based on the identified turning points, the extent to which cycles are synchronised, both within a given country and across countries, can also be determined. In particular, a useful measure is the concordance index proposed by Harding and Pagan (2002), which measures the fraction of quarters that two cycles are in the same phase.

Within countries, credit, business and housing cycles are the most strongly correlated, while equity cycles are much less synchronised with the other cycles (see Chart B.4), partly reflecting the close relationship observed between the business cycle and loans to the non-financial private sector. Specifically, this seems to be in line with the stylised fact observed for euro area aggregates that growth in loans to households, of which loans for house purchase constitute the largest fraction, is roughly coincident with growth in real GDP.<sup>20</sup> As shown in Chart B.5, business, credit and equity cycles are more strongly correlated across countries than housing cycles, which also display a substantial variation in the degree of synchronisation, again owing to the diverse structure of housing markets across countries.

## CONCLUDING REMARKS

One of the key goals of the new macro-prudential mandates around the world is to attenuate financial cycles. In the euro area, there is a need for *country-level* financial cycle estimates to provide a clear and consistent yardstick to guide forward-looking macro-prudential policy.

<sup>19</sup> See, for example, “Institutional features and regulation of housing and mortgage markets” in European Commission, *Quarterly report on the euro area*, Vol. 13, Issue 2, June 2014.

<sup>20</sup> See, for example, the box entitled “Stylised facts of money and credit over the business cycle” *Monthly Bulletin*, ECB, October 2013.

*Strong correlation between credit, housing and business cycles within countries*

*Estimating financial cycles for euro area countries...*



This special feature presented two methodologies to measure financial cycles for euro area countries and benchmarked these against business cycles obtained on a comparable basis. The methodologies are in many ways complementary – the turning point analysis considered in this special feature focuses on the levels of the underlying series, while spectral analysis looks at growth rates, thereby incorporating important information contained in stocks and flows.

Results suggest that the features of financial cycles tend to differ considerably from their business cycle counterparts. Both methodologies confirm the higher amplitude in the cycles of financial variables compared with the business cycle. The findings differ with regard to the length of the financial cycle, however, which can be attributed to the different definitions of cycles inherent to both methodologies. The relevance of measures of credit and asset prices in effectively capturing a synthetic financial cycle appears to vary at the country level, reflecting cross-country heterogeneity and idiosyncrasies in underlying driving forces.

*... suggests financial  
and business cycles  
differ strongly*