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Financial Cycles and Business Cycles: Some Stylized Facts

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The opinions expressed in this paper are those of the authors and do not necessarily reflect the views of the Bank of Finland.

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1 Introduction[1]

The ongoing crisis has highlighted the need to understand the linkages between financial markets and the real economy. This paper uses turning point analysis to establish some stylized facts on financial cycles and business cycles. In particular, we want to find out, whether developments in financial markets lead developments in the real economy. The main focus of the analysis is on recessions: arguably financial frictions and constraints tend to bite more during economic downturns than during expansions.

We identify the peaks and troughs of real house prices, real stock prices, the loans-to-GDP ratio, the loans-to-deposits ratio and the spread between long and short term interest rates using the Bry-Boschan (1971) algorithm (see also Harding and Pagan 2002, and Mönch and Uhlig 2005). Quite intuitively, a downturn phase in a financial time series is a period between a peak and a trough, while an expansion phase is a period starting with a trough and ending with a peak.[2] We then study how the episodes of falling real house prices, real stock prices and loans-to-GDP ratios are related to recessions in the real economy.[3] While the loans-to-GDP ratio is the principle measure of loan market developments in this paper, as additional indicators we also consider the loans-to-deposits ratio and the spread between long and short term interest rates. (All three measures give rise to similar qualitative results.)

The main body of the paper consists of two parts. In Section 2, we analyze how financial cycles (in particular financial downturns) in 9 euro area countries (Belgium, Germany, Spain, Finland, France, Ireland, Italy, Luxembourg, the Netherlands)[4] are related to CEPR euro area

[1] This paper was written as a part of WGEM / eurosystem project on macro-financial linkages. I would like to thank Antonello D'Agostino, Marianna Cervená, Matteo Ciccarelli, Paolo Guarda, Kirstin Hubrich, Philippe Jeanfils, Caterina Mendicino, Eva Ortega, Maria Teresa Valderrama, Marianna Valentinyiné Endrész and Jouko Vilmunen for useful comments. The usual disclaimer applies.

[2] If the first turning point of the sample period is a peak, the sample begins with an expansion. It the first turning point is a trough, the early periods form a downturn phase.

[3] We do not analyze the relations between the turning points of different financial time series. These issues are addressed in the recent work on financial cycles by Claessens et al. (2011a).

[4] The choice of countries is motivated by two considerations. First, for most of our sample (till 1999Q1) the Euro Area Business Cycle Committee's mission was to establish the chronology of recessions and expansions of the EA12 countries (11 original euro area member countries plus Greece). Second, for the nine countries in the sample, we have data on house prices, stock prices and loans to households and non-financial corporation s for the whole sample period (1980–2010), while some data for the remaining EA12 countries (Austria, Greece and Portugal) are missing.

recessions. In Section 3, we then study financial cycles and business cycles in a larger set of countries (the 9 euro area countries + Denmark, Sweden, the UK, Switzerland, Australia, New Zealand, Japan and the US).[5] In this latter part, business cycles, as well as financial cycles, are indentified separately for each country, using the Bry-Boschan algorithm.

Throughout the paper, we use relatively simple analytical tools: graphical presentation, some simple summary statistics, and the concordance index (Harding and Pagan 2002) with slight modifications. The results reported in this study are empirical patterns and regularities observed in the data. We do not make any claims on the causal relationships between financial variables and real activity.

2 Financial cycles and euro area recessions

In this section the focus is on CEPR euro area recessions and their relationship to episodes of falling real house prices, real stock prices, or drops in the loans-to-GDP ratio. The sample period is 1980Q1–2010Q4. We structure the presentation around two questions:

(i) Do downward phases of the financial variables roughly coincide with euro area recessions? As a simple (initial) criterion we use overlap. We say that an episode of falling house prices (stock prices, loans-to-GDP ratio) overlaps with a euro area recession, if there is at least one quarter when real house prices are in downturn phase and the euro area is in recession.

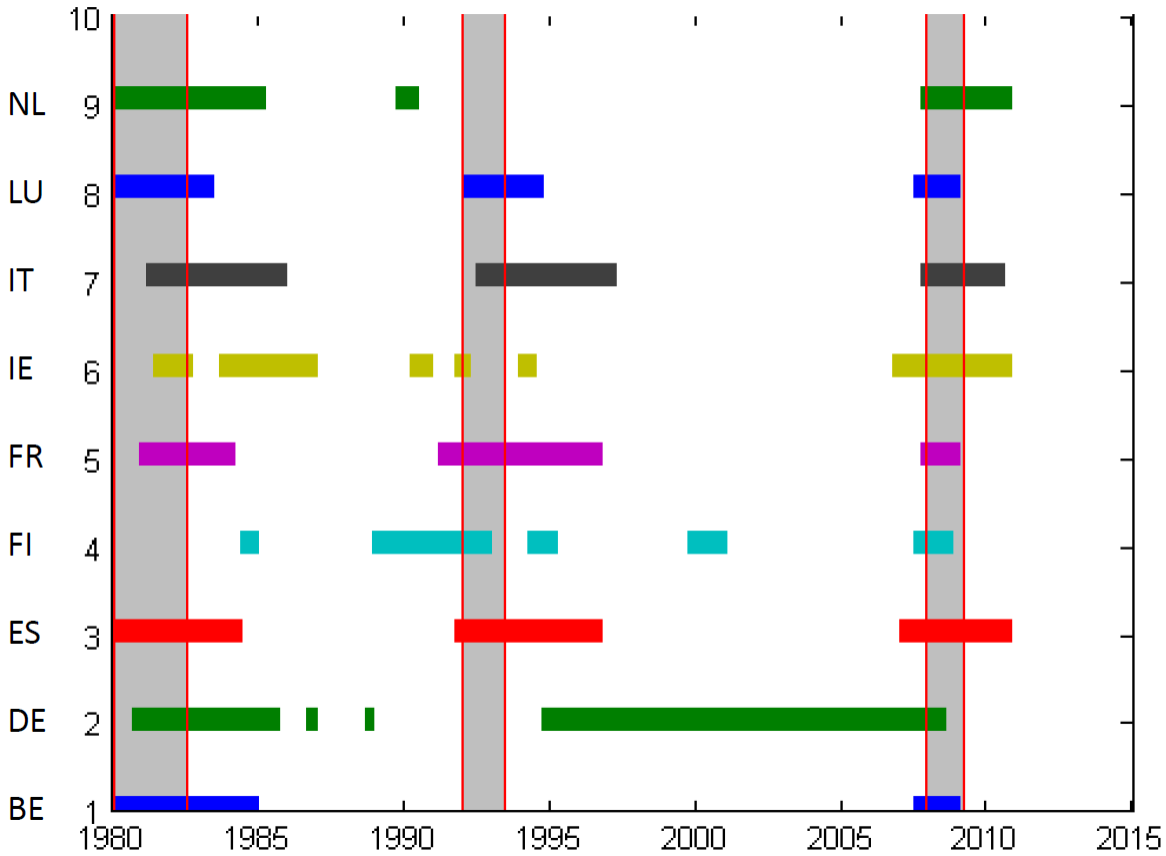
(ii) Do downturns of financial variables lead or lag euro area recessions? In particular, do the financial variables peak before euro area output starts contracting?

Real house prices. There are 32 episodes of falling house prices in our sample (see Figure 1). Of these episodes, 23 (or roughly 70%) overlap with euro area recessions. However, among these Germany 1995–2008, is arguably not related to euro area recessions. This episode largely coincided with a long period of expanding output in the euro area, and it

[5] For these 17 countries we have data on the financial variables for the whole sample period (1980–2010).

came to an end at the onset of the recession of 2008–2009.[6] Even when we exclude Germany 1995–2008, the remaining episodes that overlap with euro area recessions are, on an overage, considerably longer than the 9 episodes that do not overlap with euro area recessions.

Chart 1. Episodes of falling real house prices and euro area recessions (shaded areas)



To view the relationship between real house prices and euro area business cycles from a somewhat different angle, there are only four cases (out of 27[7]) in our sample, where a country went through a euro area recession without real house prices falling at some point.[8]

Typically, real house prices start falling before a euro area recession. In our sample, this happened in 17 of the 22 episodes that overlapped with a euro area recession[9] (and also in

[6] On the other hand, two of the non-overlapping episodes (Netherlands 1990 and Ireland 1990) occurred in a period leading to the euro area recession of 1992–1993, while one episode (Finland 1995) took place soon after the euro area recession of 1992–1993.

[7] 9 countries, 3 euro area recessions.

[8] Finland in 1980–1982, and Belgium, France and the Netherlands in 1992–1993.

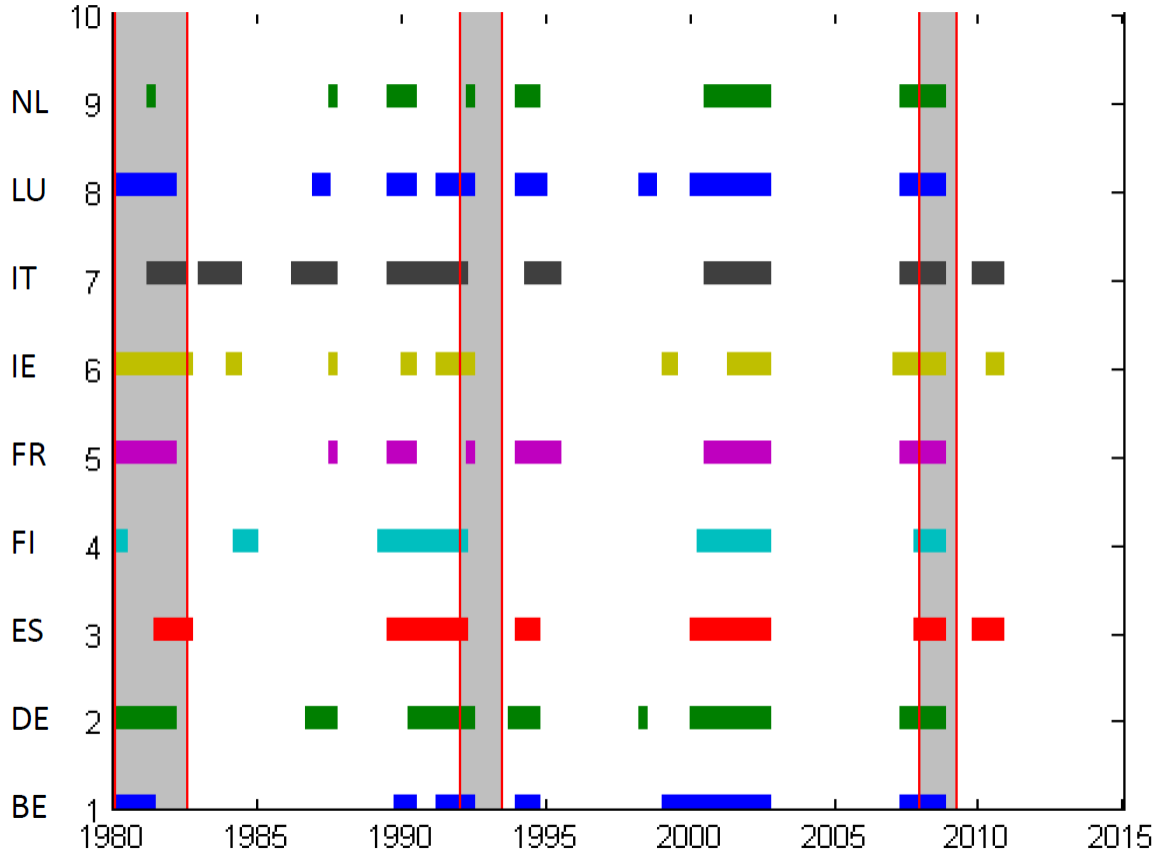
the Netherlands 1990), while there are only five cases where house prices peak during a euro area recession. Furthermore there are only two cases where real house prices peak in the aftermath (within 4 quarters) of a euro area recession, and 5 cases where house prices peak within 12 quarters after the end of a recession. Thus, based on these observations, we can say that peaks in real house prices tend to lead euro area recessions in our sample.

Periods of falling house prices tend to last longer than periods of output contraction (see e.g. Claessen et al 2011a, see also Figure 14 in the appendix). Given this background, it is hardly surprising that in many cases real house prices continue to fall (and sometimes for quite a while), when the real economy is already recovering from a recession. In our sample this happened in 16 out of the 22 overlapping episodes; in 11 of these episodes the downward phase of house prices also started before the onset of the recession.

Real stock prices. There are far more turning points in real stock prices than in real house prices (Figure 2). The number of episodes of falling real stock prices in our sample (63 episodes) also vastly exceeds the number of episodes when a country lived through a euro area recession. Given this background, it not surprising that less than one half (27/62 = 43%) of the downturn phases in real stock prices overlap with euro area recessions.

[9] We exclude Germany 1995–2008. On the other hand, we include four episodes when house prices were falling at the beginning of our sample. In these four cases it would be more accurate to say that real house prices peaked no later than euro area output.

Chart 2. Episodes of falling real stock prices and euro area recessions (shaded areas)



The number of episodes (27) overlapping with euro area recessions is actually remarkably high in the sense that in all 9 countries in our sample real stock prices were falling at some point in each of the three euro area recessions in our sample period (3 recessions * 9 countries = 27). It also is worth noting that 9 episodes of falling real stock prices occurred at the turn of the millennium, coinciding with the bursting of the ICT bubble. While CEPR does not date this as a recession, it is a period of slow output growth in the euro area.

When an episode of falling stock prices overlaps with a euro area recession, real stock prices typically start falling before euro area output. In our sample there are 22 such episodes, while there are only 5 episodes where real stock prices peak during a euro area recession. Furthermore, at the turn of the millennium, real stock prices peaked in all 9 countries before output growth in the euro area slowed. Also, episodes of falling real stock prices that precede euro area recessions – or the period of slow output growth in the early 2000s – tend to be significantly longer than other episodes of falling stock prices. Finally notice that real stock prices often reach their trough already at the beginning of a recession,

so that in many cases real stock prices are rebounding while euro area output is still contracting.[10]

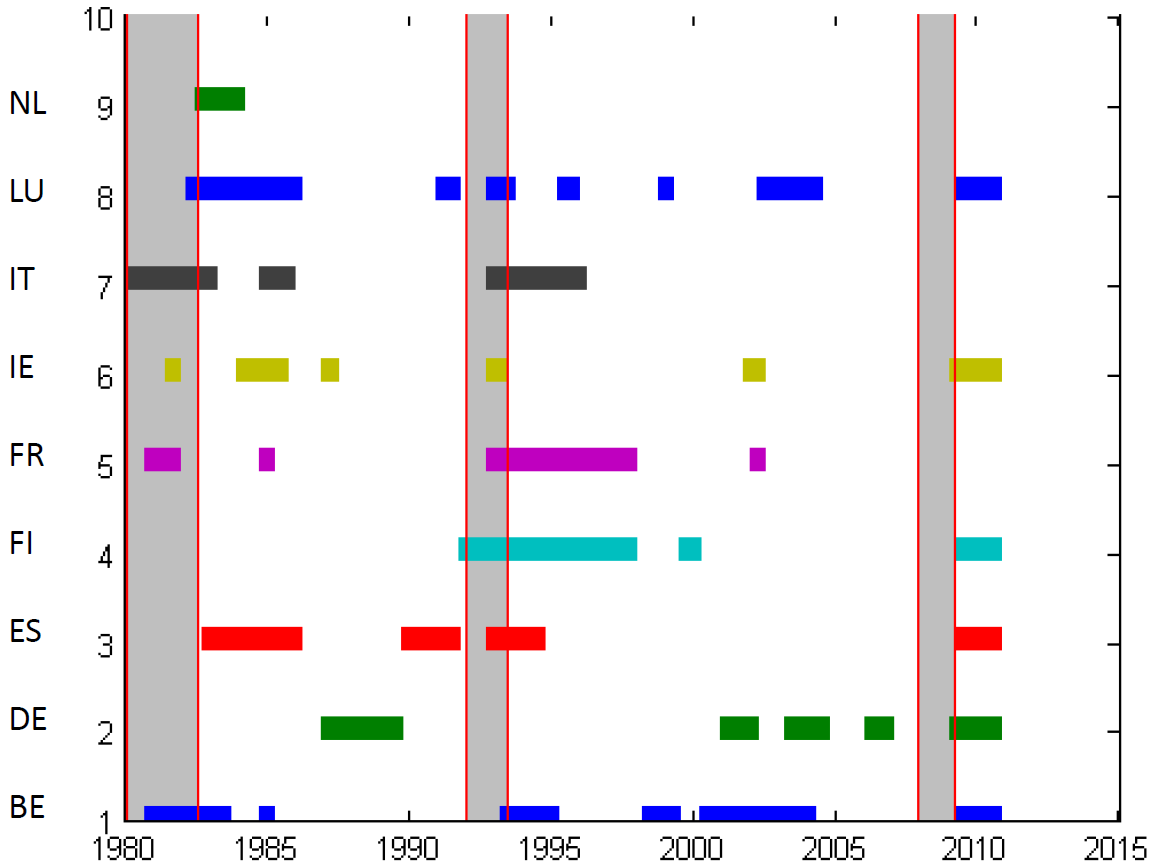
Loans-to-GDP ratio. There are 39 episodes of falling loans-to-GDP ratio in our sample. Among these episodes, 19 (49%) overlap with euro area recessions (Figure 3). The loans aggregate we use here consists of (bank) loans to households and non-financial corporations.

While (peaks of) real asset prices tend to lead euro area recessions, periods of contracting credit, as measured by the loans-to-GDP ratio, lag the recessions. Of the 19 episodes overlapping with euro area recessions, only two begin before the onset of the recession, while in the remaining 17 cases, the loans-to-GDP ratio typically peaks towards the end of the recession. Moreover, most of the episodes that do not overlap with euro area recessions take place directly in their aftermath, or in the early 2000s (when output growth was slow).

We also used the loans-to-deposits ratio to analyze credit market developments. Periods of contracting credit lag euro area recessions even when this alternative measure is used; see Figure 10 in the appendix. See also Figure 11 on episodes of *rising* interest rate spreads and euro area recessions.

[10] While real stock prices typically start rising earlier than euro area real output, the prices may dip again soon after the end of a recession. In our sample there are 12 cases where real stock prices peak within 4 quarters after a recession.

Chart 3. Episodes of falling loans-to-GDP ratio and euro area recessions (shaded areas)



Summary. Overall our analysis indicates that real house prices and real stock prices often peak before euro area recessions. On the other hand, periods of contracting credit tend to lag euro area recessions.

Differences between countries (all financial variables). Although the exact timing of financial cycles varies between countries, in most countries the developments of financial markets, vis-à-vis the euro area business cycle, follow a roughly similar pattern. The only salient exception is Germany, where the dynamics of real house prices and the loans-to-GDP ratio have clearly differed from the financial developments in the other euro area countries in our sample.[11] Finland was also something of an outlier in the 1980s, in terms of real house prices and the loans-to-GDP ratio.

[11] One possible explanation is the structure of the German housing market. There is more rental housing and the owner-occupancy rate is lower than in the other countries in our sample.

3 Financial cycles and business cycles in a sample of 17 OECD countries

In this section we focus on national business cycles and their link to financial cycles in a sample of 17 OECD countries (the 9 euro area countries + Denmark, Sweden, the UK, Switzerland, Australia, New Zealand, Japan and the US). The sample period is 1980Q1-2010Q2.

We identify the turning points, and the phases, of real output, as well as financial variables, using the Bry-Boschan (1971) algorithm. In our sample, the unconditional probability (or the unconditional relative frequency) of a country being in recession in a given period is 0.12. The unconditional probability of the financial variables being in a downturn phase is 0.39, 0.37 and 0.28 for real house prices, real stock prices and the loans-to-GDP ratio, respectively. Furthermore, the downturn phases of the financial variables tend to last considerably longer than the downturn phases of real GDP. Nevertheless, the expansion phases of both financial variables and real GDP are longer than the downturn phases (see Figure 14 in the appendix). In the appendix we report some additional summary statistics on financial cycles and business cycles.

Concordance index. The concordance index CI (Harding and Pagan 2002) offers a relatively simple and flexible way to analyze the linkages between downturns in financial markets and the real economy. The concordance index provides a measure of the fraction of time the two time series are in the same phase (expansion or downturn) of their respective cycles. A (financial) variable is perfectly procyclical (countercyclical) if its concordance index with output is equal to unity (zero). As a further benchmark, consider a hypothetical case with independent cycles. If the phase of, say, real house prices were independent of the phase of output, the concordance index would take the value CI=0.125*0.37+(1–0.125)* (1–0.37) = 0.58 (given that the unconditional relative frequency of output contractions in our sample is 0.125, while the unconditional relative frequency of falling house prices is 0.37). The

concordance indices shown in Figure 4 indicate that, in our sample, real house prices and real stock prices are (mildly) procyclical[12] , while the loans-to-GDP ratio is acyclical[13].

Chart 4. Concordance of real activity and financial cycles

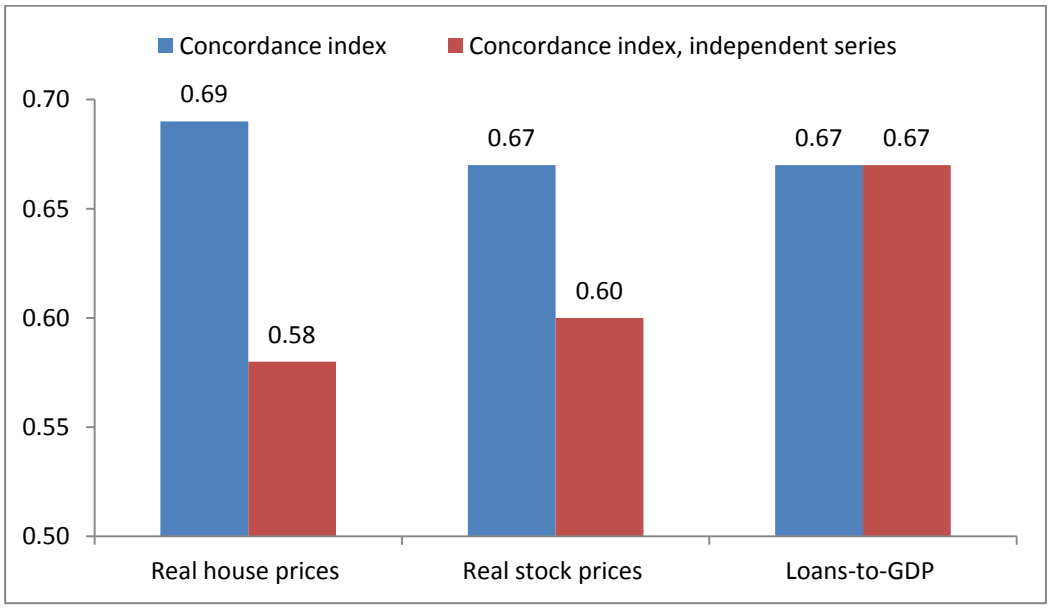
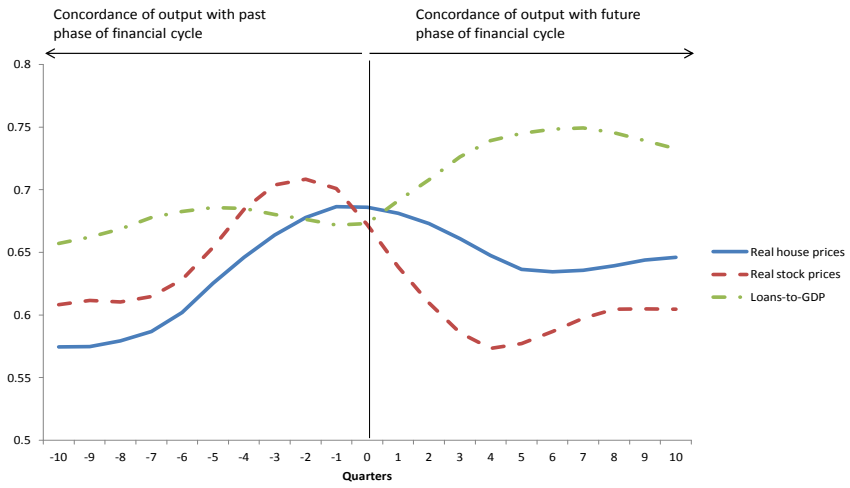


Chart 5. Concordance of real activity with past and future phases of financial cycles



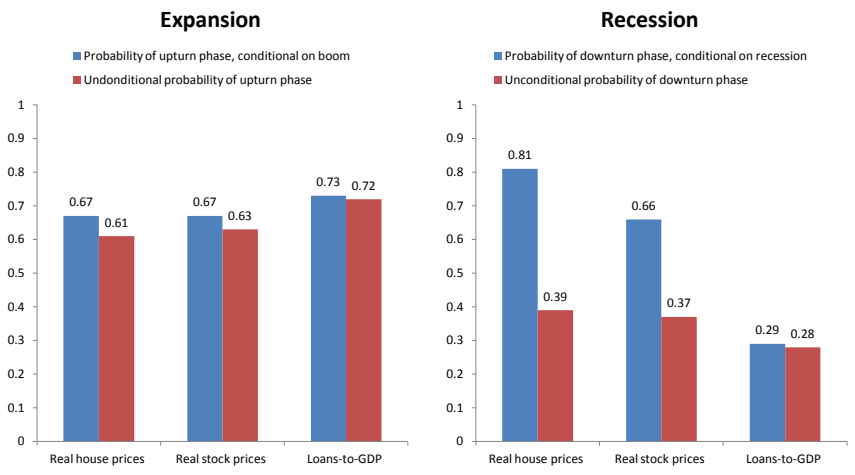
[12] The value of the concordance index is higher than the benchmark value corresponding to independent cycles.

[13] The value of the concordance index is equal to the benchmark value corresponding to independent cycles.

Concordance with lags and leads. We also compute concordance indexes of output with lags and leads of the financial variables; see Figure 5. This is a useful exercise, since our analysis of the euro area suggests that the current phase of the real economy may be related to the past phase (in the case of real stock prices) or to the future phase (in the case of the loans-to-GDP ratio) of financial variables. Indeed, the concordance of current output with the past phase of real stock prices (lagged by 2 quarters) is somewhat higher than concordance with the current phase of the stock market, while the concordance of output with the future phase of the loans-to GDP ratio (0.76 with an 8-quarter lead) is considerably higher than with the current phase (0.67). These findings indicate that stock markets tend to lead real activity, while developments in credit markets typically lag developments in the real economy.

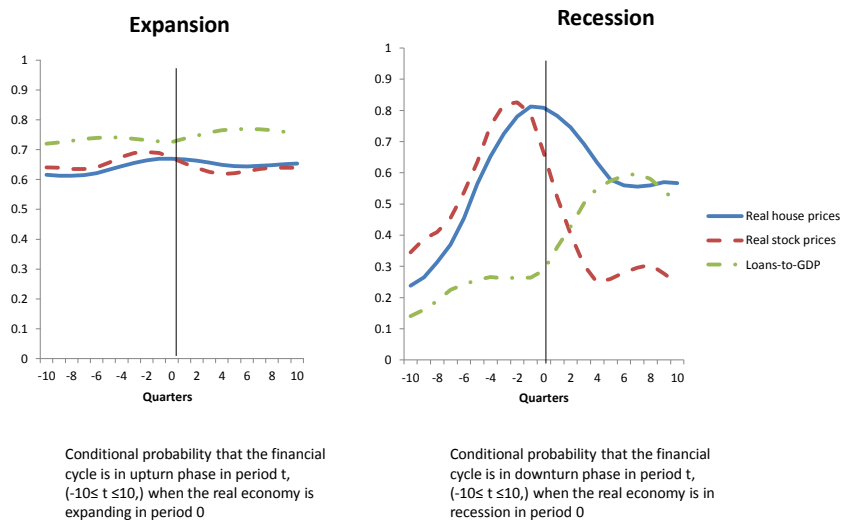
Conditional concordance. While the concordance index provides useful information about the interaction between financial cycles and business cycles, it masks the fact that, in our sample, the relationship between financial variables and real activity is considerably stronger during recessions than during expansions. To address this issue, we compute concordance indexes, conditional on output expanding, or contracting, in a given period. The conditional concordance index of, say, real house prices and output, is simply the conditional probability that house prices are rising during an output expansion, and falling during a contraction.

Chart 6. Conditional (contemporaneous) concordance of real activity and financial cycles in expansions and recessions



During an output expansion, the conditional probabilities that the financial variables are in an upturn phase do not differ much from the unconditional probabilities; see the left panel of Figure 6. During a recession, real output and real asset prices are much more tightly knit together; see the right panel of Figure 6. If real output is contracting in a certain period, say τ, then the conditional probability (or the conditional frequency in our sample) that also real house prices are falling in that period is 0.81, or roughly twice higher the unconditional frequency that house prices are in a downturn phase. The conditional frequency of real stock prices being in a downturn phase is 0.66; this is also clearly higher than the unconditional frequency (0.37). Remarkably, the conditional frequency of real stock prices being in a downward phase is still higher in periods preceding τ, with the highest value 0.8 reached in period τ-4; see the right panel of Figure 7.

Chart 7. Conditional concordance of real activity with past and future phases of financial cycles



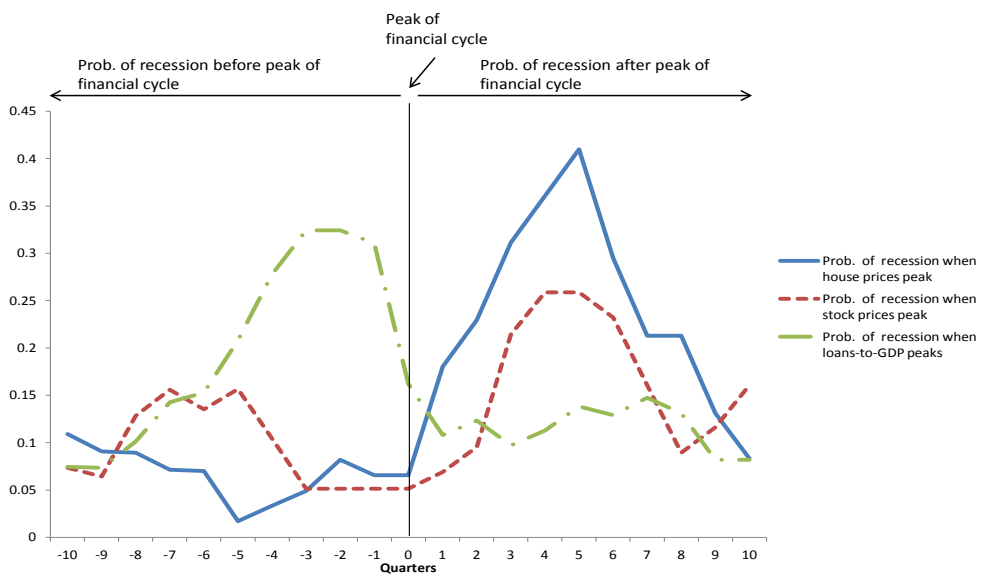
These findings echo our observations for the euro area. First, we observed that it is highly unlikely that a country goes through a (euro area) recession, without real asset prices falling at some point. This property also holds in the larger sample of countries. If we choose a time period, when output is contracting in an economy, it is likely that real asset prices are also falling during that period. Second, we saw that while in the euro area real stock prices tend to

fall before a downturn in real activity, they often recover already in the early stages of a recession. This finding also carries over to the larger set of countries. If we take an arbitrary recessionary period, it is quite likely that the downturn phase of real stock prices is already passed (see the right panel of Figure 7).

The findings for the loan-to-GDP ratio also make sense (see the right panel of Figure 6, and the right panel of Figure 7). If the economy is undergoing a period of contracting output, the downturn phase of credit is often still ahead.

The probability of recession when financial cycles peak. In our analysis of the euro area, we saw that peaks in real house prices and real stock prices tend to lead recessions. On the other hand, we also observed that the loans-to-GDP ratio often peaks towards the end of a recession, or sometime after a recession. Next we show that similar results also hold in the larger sample of countries. To do so, we study the conditional frequency of recessions during, and around, peaks in real house prices, real stock prices and the loans-to-GDP ratio.

Chart 8. The probability of a recession before and after the peak of a financial cycle



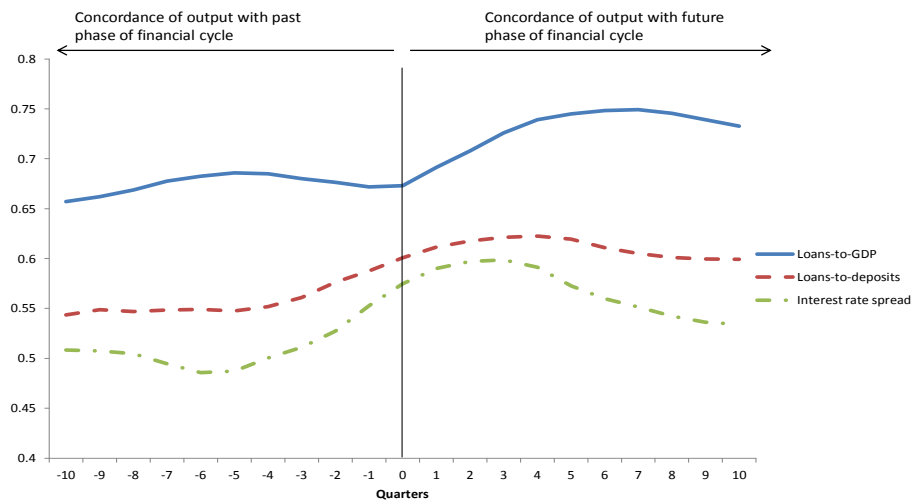
In a period when real house prices or real stock prices peak, the (conditional) probability that the economy is in recession is very low (see Figure 8):at 0.05 it is roughly one half the unconditional probability of recession (0.12). However, once asset prices are in a downturn phase, the probability of a recession increases sharply, reaching 0.4 (more than three times

the unconditional probability of 0.12) five quarters after the peak in house prices, and 0.25 (roughly twice the unconditional probability of 0.12) five quarters after a stock market peak.[14]

This observed time pattern reinforces the view that real asset prices lead real activity. This relationship is stronger for real house prices than for real stock prices.

In a period when the loans-to-GDP ratio peaks, the conditional probability of the economy being in recession is 0.15, or roughly equal to the unconditional probability of an output contraction. Here the pattern is a mirror image of what we saw for real asset prices. The conditional probability of a recession reaches its highest value (0.35 or roughly three times the unconditional probability) four quarters before the peak in the loan-to-GDP ratio. Once again this finding indicates that movements in the loans-to-GDP ratio tend to lag movements in real activity.

Chart 9. Concordance of real activity with past and future phases of credit markets



Credit market developments are measured by (i) the loans-to-GDP ratio, (ii) the loans-to-deposits ratio and (iii) the spread between long term (10-year) and short term (3-month) interest rates. Notice that the concordance is between a) downturn phases of spreads and output expansions, and b) upturn phases of spreads and recessions.

[14] Work by Borio and Lowe (2002, 2004) and by Claessens et al. (2009, 2011b) suggests that it would be interesting to calculate the probability of recession based on the condition of several financial variables. However, we have too few episodes in our sample for this kind of analysis.

Credit markets: Some alternative measures. In this paper, we have used the loans-to-GDP ratio as the principal measure of loan market developments. Here we consider two alternative measures: the loans-to-deposits ratio and the spreads between long term and short term interest rates.[15]

Our main findings are robust to these measures: credit market developments tend to lag developments in the real economy, even when the loans-to-deposits ratio or spreads between long term and short term interest rates are used as credit market indicators. These observations are illustrated in Figure 9, that shows the concordance indexes of real output with lags and leads of the different measures of credit market cycles (c.f. Figure 5).

4 Concluding remarks

Overall, our findings indicate that financial prices often lead real activity. In particular, peaks in real asset prices tend to lead recessions. This pattern is stronger for real house prices than for real stock prices. On the other hand, loan market developments tend to lag developments in real activity. Our results also suggest that there is a tighter connection between financial variables and real activity during recessions than during periods of expanding output. These findings may be of interest to macro modelers, economic forecasters and policy makers.

[15] The spread is between ten-year and three-month interest rates. Notice that here the concordance is between i) expansions and episodes of falling interest rate spreads and ii) recessions and episodes of *rising* interest rate spreads.

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6 Appendix

Chart 10. Episodes of falling loans-to-deposits ratio and euro area recessions

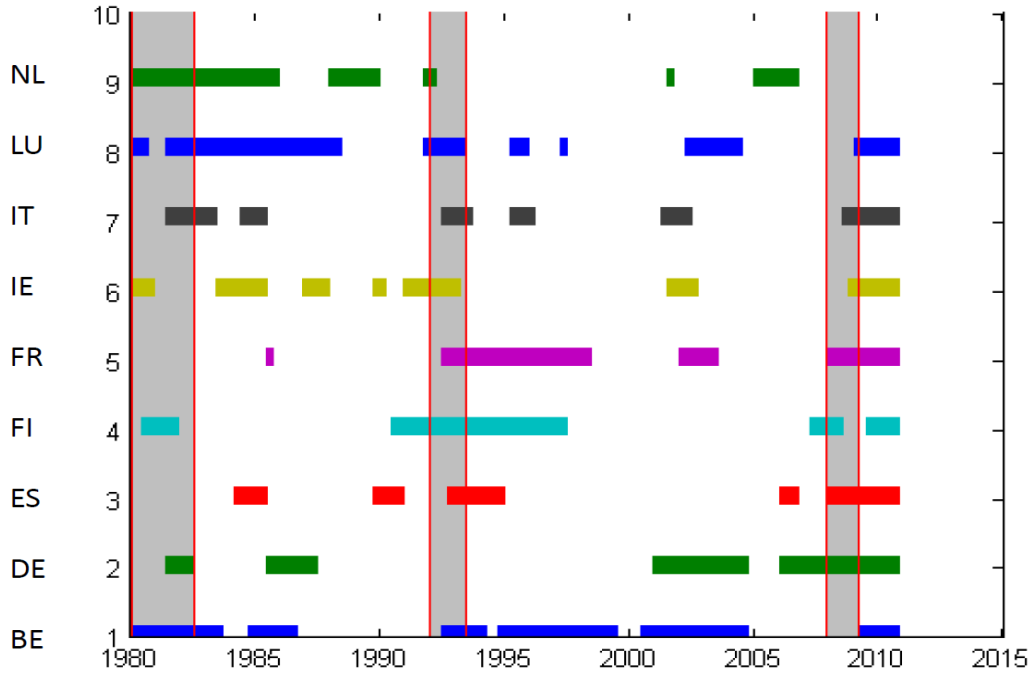

Chart 11. Episodes of rising interest rate spreads and euro area recessions

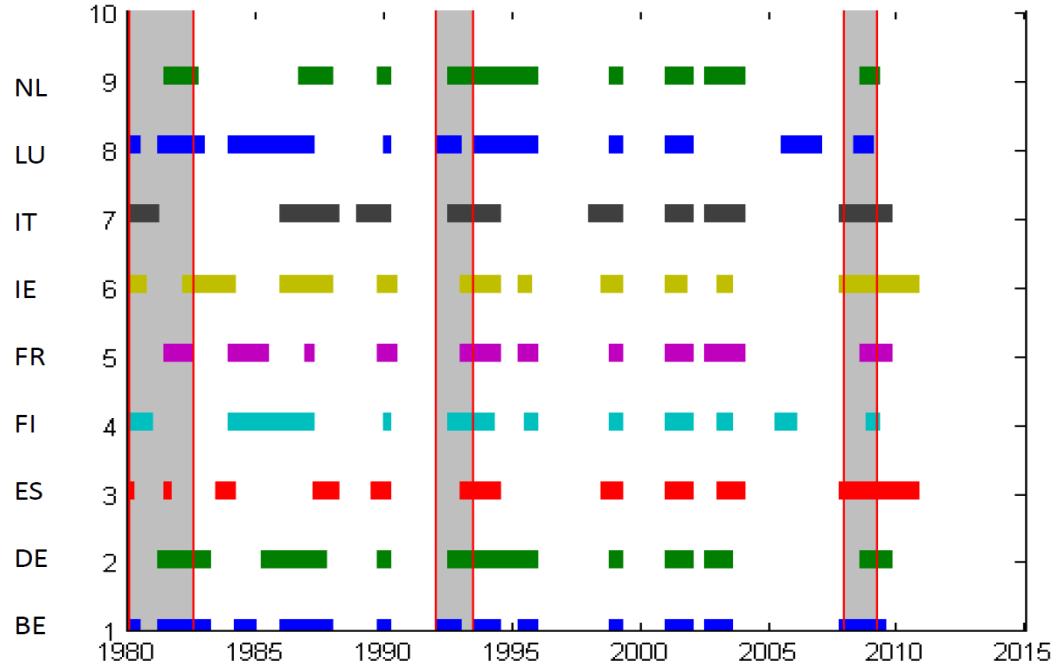

Chart 12. Unconditional probability of a downturn phase in the sample of 17 OECD countries

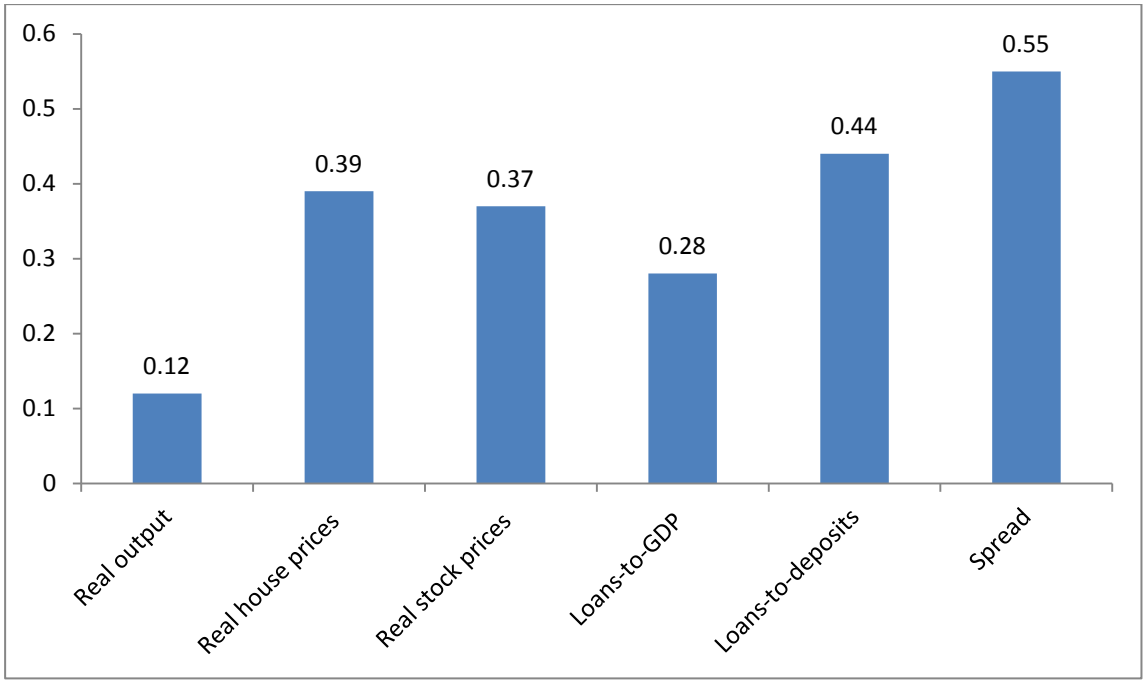

Chart 13. Average number of downturn and upturn phases per country (sample of 17 OECD countries)

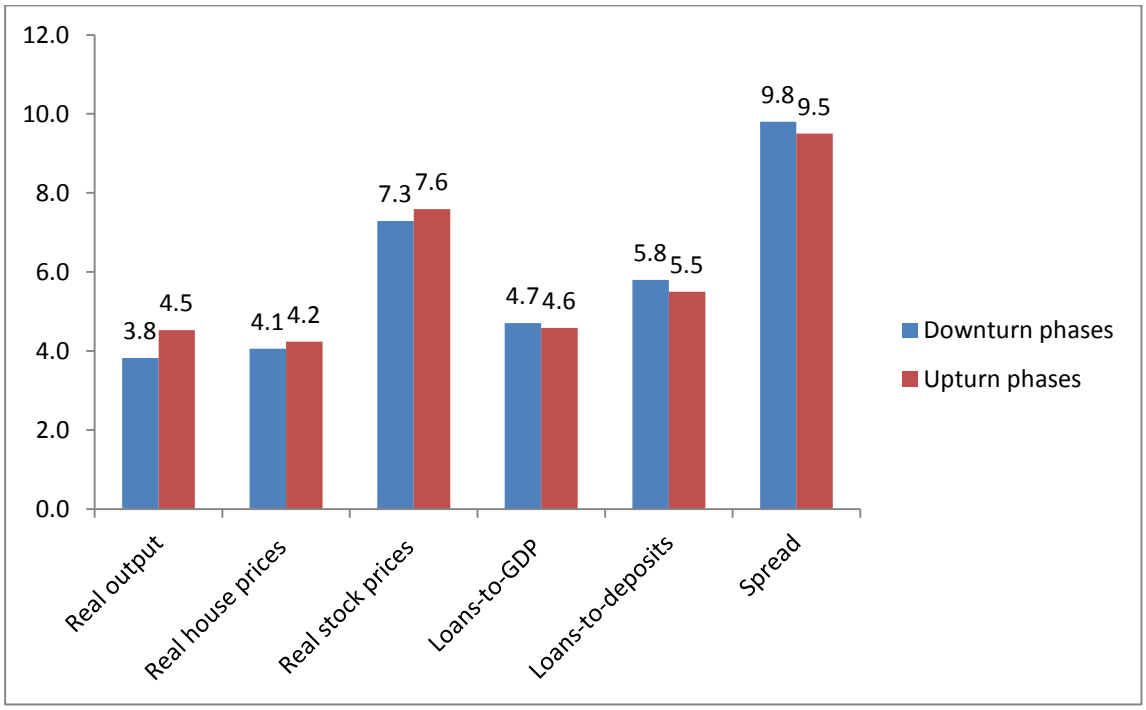

Chart 14. Average length of downturn and upturn phases, quarters (17 OECD countries)