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Christian Drescher\*

## The Case of the ECB: Better to Lean Against the Wind than to Fight a Hurricane

In the light of the recent financial crisis, the ECB has announced a slight shift in the reading of its monetary policy strategy and acknowledges that the case for a “leaning against the wind” strategy has strengthened. This implies that now, more than ever, the ECB is willing to dampen asset bubbles in the early stage of their formation. This article explains what the ECB can learn from historical asset bubbles in EU eurozone member countries. The empirical analysis indicates that asset bubbles in some member countries are mostly followed by asset bubbles in further member countries, which supports the ECB’s current reading of its monetary policy strategy.

The ECB’s two-pillar strategy – economic and monetary analysis – is designed to take all influences into account that might bear risks for future consumer price stability; this includes developments in asset markets. The short- to medium-term horizon of the economic analysis incorporates asset prices as the leading indicator of consumer prices. For instance, asset prices affect consumer prices through wealth effects on the demand side<sup>1</sup> and Tobin-q effects on the supply side.<sup>2</sup> The medium- to long-term horizon of the monetary analysis even provides a conceptual framework that allows a response to the forming of asset bubbles<sup>3</sup>, since boom and bust cycles are closely related to developments in money and credit aggregates.<sup>4</sup> This relationship may result from a two-way causality and similar reactions to monetary and real shocks.<sup>5</sup> On the one hand, increases in credit aggregates are used – among other things – for investments in real and financial assets. On the other hand, increases in real and financial assets enhance the access to credit through the creditworthiness of their owners by raising the collateral value.<sup>6</sup>

In recent years the ECB has accomplished a slight shift in the reading of its monetary policy strategy with regard to asset bubbles. Looking at the February 2002 issue of its Monthly Bulletin, the ECB expresses doubts about, firstly, the detection of asset bubbles with a sufficient degree of certainty and, secondly, the effectiveness of monetary policies to stabilise corporate equity prices.<sup>7</sup> In contrast, the April 2005 issue of its Monthly Bulletin argues that, firstly, there are a number of tools to detect asset bubbles and, secondly, asset bubbles which are in the process of forming should be taken into consideration when making interest rate decisions.<sup>8</sup> In the light of the recent financial crisis and latest research results, the November 2010 issue of the ECB’s Monthly Bulletin acknowledges that the

case for cautious responses to asset bubbles in the process of forming has strengthened.<sup>9</sup> Firstly, the recent financial crisis has demonstrated that collapses in asset bubbles can lead to severe turmoil in the financial system and trigger deflation fears. And secondly, the latest research results show that the “risk-taking” channel accelerates monetary impulses, so that small changes in interest rates can cause significant changes in asset price dynamics. These revaluations imply that now, more than ever, the ECB is willing to dampen asset bubbles at the early stage of their formation.

### Monetary Policy and Asset Bubbles

In theory, central banks should respond quickly and appropriately to collapses of asset bubbles in order to reduce the damage to the economy.<sup>10</sup> But there is an ongoing de-

- 1 See A. Albert, F. Modigliani: The life cycle hypothesis of saving: aggregate implications and tests, in: *American Economic Review*, Vol. 53, No. 1, 1963, pp. 55-84.
- 2 See J. Tobin: A general equilibrium approach to monetary theory, in: *Journal of Money, Credit and Banking*, Vol. 1, No. 1, 1969, pp. 15-29.
- 3 See L. Bini Smaghi: Monetary policy and asset prices, Opening Address, University of Freiburg, 14 October 2009; J.-C. Trichet: Credible alertness revisited, Symposium on “Financial stability and macroeconomic policy”, Jackson Hole 2009.
- 4 See L. Alessi, C. Detken: ‘Real time’ early warning indicators for costly asset price boom/bust cycles: a role for global liquidity, in: Working Paper Series, No. 1039, ECB, 2009.
- 5 See European Central Bank: Asset price bubbles and monetary policy, in: *Monthly Bulletin*, April 2005, pp. 47-60.
- 6 See C. Borio, P. Lowe: Securing sustainable price stability: should credit come back from the wilderness?, in: *BIS Working Papers*, No. 157, 2004.
- 7 See European Central Bank: The stock market and monetary policy, in: *Monthly Bulletin*, February 2002, pp. 39-52.
- 8 See European Central Bank: Asset price bubbles and monetary policy, in: *Monthly Bulletin*, April 2005, pp. 47-60.
- 9 See European Central Bank: Asset price bubbles and monetary policy revisited, in: *Monthly Bulletin*, November 2010, pp. 71-83.
- 10 See, e.g., O. Issing: Asset Prices and Monetary Policy, in: *Cato Journal*, Vol. 29, No. 1, 2009, p. 46.

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bate on whether central banks should also respond to the formation of asset bubbles and if so, then to what extent. In praxis, the monetary policy strategies of major central banks – the Fed and the ECB – can essentially be distinguished with regard to their responses to the formation of asset bubbles into the “benign neglect” and the “leaning against the wind” strategies. The “benign neglect” strategy is an asymmetric approach. It postulates that asset bubbles should collapse naturally. In this case, monetary policy’s decisions on monetary conditions do not depend on whether an asset bubble exists or not. This strategy is followed by the Fed and is the core of the “Jackson Hole consensus”. In contrast, the “leaning against the wind” strategy is a symmetric approach. It claims that monetary policy should dampen asset bubbles which are in the process of forming. In this case, monetary policy would allow somewhat tighter monetary conditions in the presence of an asset bubble than it would in its absence. This approach is part of the ECB’s monetary policy strategy.

In general, the standard arguments for and against responses to asset bubbles boil down to six major problem areas.<sup>11</sup> In the following, the opponents of a response are denoted as the “passive view” and the proponents of a response are referred to as the “active view”.

Firstly, the problem of identification: the “passive view” argues that it is impossible to detect asset bubbles in real time with sufficient certainty.<sup>12</sup> The “active view” holds that even if the identification comes with some degree of uncertainty, the information should not be ignored.<sup>13</sup>

Secondly, the problem of information: the “passive view” argues that responses to asset prices require central bankers to have an information advantage over other market participants. The “active view” holds that central banks have different incentives and measures to act in the case of a similar assessment of the underlying asset price.<sup>14</sup>

Thirdly, the problem of destabilisation: the “passive view” argues that pricking asset bubbles can lead to panics.<sup>15</sup>

The “active view” holds that measures to dampen asset bubbles should occur during an early stage of their formation to avoid such unpredictable behaviour.<sup>16</sup>

Fourthly, the problem of effectiveness: the “passive view” argues that interest rate increases are not effective in preventing the formation of asset bubbles. The “active view” holds that changes in interest rates have stronger effects on investors than commonly expected. That is due to the accelerating effect of the “risk-taking” channel which influences preferences to take risks.<sup>17</sup>

Fifthly, the problem of focus: the “passive view” argues that the mere focus on consumer price stability reduces the potential of financial panics.<sup>18</sup> The “active view” holds that the focus on consumer price stability does not necessarily lead to a stable financial system. That is because asset bubbles indicate financial imbalances even though other indicators do not.<sup>19</sup>

Sixthly, the problem of economic costs: the “passive view” points out that pricking asset bubbles causes collateral damage to the real economy and other asset markets. The “active view” counters that the collateral damage of an early intervention should be seen as an insurance premium against even worse damage in the wake of a later collapse of asset bubbles.<sup>20</sup>

The debate on whether to respond to the formation of asset bubbles has not yet been conclusively discussed in the literature and is still open to further discourse.

### Detection of Rational Asset Bubbles

Asset bubbles can be distinguished into rational and irrational bubbles. In the case of rational bubbles, investors are aware of the bubble and hence demand a risk-compensating return. In the case of irrational bubbles, investors are unaware of the bubble since their behaviour is driven by “animal spirits”<sup>21</sup>, i.e. instincts and emotions. The following analysis focuses on rational asset bubbles,

11 See C. Drescher, A. Erler, D. Krizanac: The Fed’s TRAP: A Taylor-type Rule with Asset Prices, in: *Journal of Economics and Finance*, forthcoming.

12 See B. Bernanke, M. Gertler: Monetary policy and asset price volatility, in: *Federal Reserve Bank of Kansas City, Economic Review*, Q IV, 1999, pp. 17-51; B. Bernanke, M. Gertler: Should Central Banks Respond to Movements in Asset Prices?, in: *The American Economic Review*, Vol. 91, No. 2, 2001, pp. 253-257.

13 See N. Roubin: Why central banks should burst bubbles, in: *International Finance*, Vol. 9, No. 1, 2006, pp. 87-107.

14 See S. G. Cecchetti: The Brave New World of Central Banking: Policy Challenges posed by Asset Price Booms and Busts, in: *Working Paper Series*, No. 14/2005, Czech National Bank, 2005.

15 See A. S. Posen: Why central banks should not burst bubbles, in: *International Finance*, Vol. 9, 2006, pp. 109-126.

16 See C. Borio: Monetary and Financial Stability: So Close and Yet So Far, in: *National Institute Economic Review*, No. 192, 2005, pp. 84-101.

17 See European Central Bank: Asset Price Bubbles and Monetary Policy Revisited, in: *Monthly Bulletin*, November 2010, pp. 71-83.

18 B. Bernanke, M. Gertler: Monetary policy and asset price volatility, NBER Working Paper 7559, National Bureau of Economic Research, 2000.

19 See C. Borio, P. Lowe: Asset Prices, Financial and Monetary Stability: Exploring the Nexus, BIS Working Papers, No. 114, 2002.

20 See M. Bordo, O. Jeanne: Monetary Policy and Asset Prices: Does “Benign Neglect” Make Sense, in: *IMF Working Paper*, No. WP/02/225, 2002.

21 See G. A. Akerlof, R. J. Shiller: *Animal Spirits: How Human Psychology Drives the Economy, and Why It Matters for Global Capitalism*, Princeton and Oxford 2010, Princeton University Press.

since the demand for a risk-compensating return implies an empirically detectable statistical property for the asset price. Rational asset bubbles can be decomposed into two components, namely the fundamental value and the rational bubble value. The time series of each component has a different statistical property. These differences can be used to detect rational asset bubbles in asset price time series. That is because the relevance of the fundamental and bubble values for the asset price determines the statistical property of an asset price time series. If the asset price is close to its fundamental value, then the statistical property of the fundamental value should be predominant. In contrast, if the asset price is driven by a sizeable asset bubble, then the statistical property of the bubble value should outweigh the statistical property of the fundamental value. But what are the differences in the statistical properties of the fundamental and bubble values?

The fundamental value follows an unobserved process. But empirical stylised facts show that over long periods of time asset prices usually behave like a random walk with a drift.<sup>22</sup> Hence, the conditional expectations regarding the fundamental value should grow in a linear manner with the forecasting horizon.<sup>23</sup> In the short term the drift component is negligibly small, so that the asset price time series should have unit root characteristics in the absence of a sizeable rational asset bubble.<sup>24</sup>

The theory of rational asset bubbles claims that the bubble value should grow at a rate equal to the discount rate. The reason is that investors demand compensation for the additional risk caused by the deviation from the fundamental value. Hence, conditional expectations regarding the bubble value have to grow in a nonlinear manner with the forecasting horizon.<sup>25</sup> This nonlinearity implies that the asset price time series should have an explosive root in the presence of a sizeable rational asset bubble.<sup>26</sup>

In line with other literature, the analysis defines rational asset bubbles as being characterised by explosive autoregressive behaviour.<sup>27</sup> The applied dating algorithm uses right-sided forward recursive ADF tests to detect rational

asset bubbles.<sup>28</sup> The forward recursions focus on subsamples  $s$ , whose period length of analysis is incremented by one at every recursion step. The forward recursions are implemented in order to detect periodically collapsing bubbles. The initial sample size is set to be  $s_{initial} = 40$  to ensure estimation efficiency by incorporating sufficient observations. The autoregressive asset price process is:

$$\Delta p_t = \alpha + (\rho - 1)p_{t-1} + \sum_{i=1}^k \beta_i \Delta p_{t-i} + \varepsilon_t.$$

The italic letters  $p_t$  refer to the de-averaged logarithmic asset prices. The optimal lag length of the AR( $k$ )-process is chosen in every recursion step using the Akaike information criterion.<sup>29</sup> The maximum lag length is set to be 12 periods. The null hypothesis of each right-sided ADF test claims  $\rho_t$  to be a non-explosive process:<sup>30</sup>

$$H_0: \rho_t \leq 1 \quad \text{for } t = \{1, 2, \dots, s\}.$$

The null hypothesis is motivated by the efficient market hypothesis, which states that asset prices should follow a random walk.<sup>31</sup> Instead, the alternative hypothesis of each right-sided ADF test claims  $\rho_t$  to be an explosive process:

$$H_1: \rho_t > 1 \quad \text{for } t = \{1, 2, \dots, s\}.$$

The alternative hypothesis is motivated by the theory of rational asset bubbles, which claims that asset prices should be explosive in the presence of an asset bubble.<sup>32</sup>

The beginning of a rational asset bubble is dated to the point in time  $\hat{t}_{beginning}$  when the test statistic of asset price time series with sample size  $s$  intersects its corresponding critical value  $cv^{ADF}(s)$  from below:

22 See K. D. West: A specification test for speculative bubbles, in: *The Quarterly Journal of Economics*, Vol. 102, No. 3, 1987, pp. 553–580.

23 See G. W. Evans: Pitfalls in testing for explosive bubbles in asset prices, in: *The American Economic Review*, Vol. 81, No. 4, 1991, pp. 922.

24 See P. C. B. Phillips, J. Yu: Dating the timeline of financial bubbles during the subprime crisis, CoFIE Working Paper, Singapore Management University, No. 07-2009, 2009, p. 7.

25 See G. W. Evans, op. cit.

26 See P. C. B. Phillips, J. Yu, op. cit.

27 Ibid.

28 See also P. C. B. Phillips, Y. Wu, J. Yu: Explosive behaviour in the 1990s Nasdaq: When did exuberance escalate asset values?, Working Paper, Singapore Management University, No. 19, 2009; P. C. B. Phillips, J. Yu, op. cit.; C. Drescher: Bubblebuster: Chasing the ghost of global vagabonding bubbles, *Wirtschaftswissenschaftliche Diskussionspapiere*, University of Bayreuth, forthcoming.

29 H. Akaike: A new look at the statistical model identification, in: *IEEE Transactions on Automatic Control*, Vol. 19, No. 6, 1974, pp. 716–723.

30 Critical values are taken from C. Drescher: Bubblebuster: Chasing the ghost of global vagabonding bubbles, *Wirtschaftswissenschaftliche Diskussionspapiere*, University of Bayreuth, forthcoming.

31 See E. F. Fama: Efficient Capital Markets: A Review of Theory and Empirical Work, in: *Journal of Finance*, Vol. 25, No. 2, 1970, pp. 383–417.

32 See B. T. Diba, H. I. Grossman: On the inception of rational bubbles, in: *The Quarterly Journal of Economics*, Vol. 102, No. 3, 1987, pp. 697–700; B. T. Diba, H. I. Grossman: The Theory of Rational Bubbles in Stock Prices, in: *Economic Journal*, Vol. 98, No. 392, 1988, pp. 746–754.

**Table 1**  
**Corporate Equity Market Data**

Countries	Index	Original frequency	Period of analysis
Austria	ATX	Monthly	1989:06–2010:12
Belgium	General Index	Monthly	1983:06–2010:12
Cyprus	–	–	–
Estonia	General Index	Monthly	2000:02–2010:12
Finland	HEX General Index	Monthly	1990:06–2010:12
France	CAC 40 Index	Monthly	1990:12–2010:12
Germany	DAX 30	Monthly	1983:05–2010:12
Greece	Athens Stock Index	Monthly	1993:06–2010:12
Ireland	ISEQ overall Index	Monthly	1989:06–2010:12
Italy	BCI General Index	Monthly	1983:05–2010:12
Luxembourg	General Cours Index	Monthly	2003:05–2010:12
Malta	–	–	–
Netherlands	AEX 24 Index	Monthly	1992:05–2010:12
Portugal	BVL General Index	Monthly	1991:06–2010:12
Slovakia	SAX Index	Monthly	2000:01–2010:12
Slovenia	SBI Index	Monthly	2000:06–2010:09
Spain	Madrid General Index	Monthly	1983:05–2010:12

Source of data: World Market Monitor.

$$\hat{t}_{beginning} = \begin{cases} t < \hat{t}_{beginning} : ADF(s) < cv^{ADF}(s) \\ t \geq \hat{t}_{beginning} : ADF(s) > cv^{ADF}(s) \end{cases} .$$

Equivalently, the ending of a rational asset bubble is dated to the point in time  $\hat{t}_{ending}$  when the ADF test statistic of the asset price time series with sample size  $s$  intersects its corresponding critical value  $cv^{ADF}(s)$  from above:

$$\hat{t}_{ending} = \begin{cases} t < \hat{t}_{ending} : ADF(s) > cv^{ADF}(s) \\ t \geq \hat{t}_{ending} : ADF(s) < cv^{ADF}(s) \end{cases} .$$

The detection of rational asset bubbles is conducted using right-sided forward recursive ADF tests at the 1% significance level.

### Empirical Results

The empirical analysis for the period from 1986:01 to 2010:12 covers asset markets of EU eurozone member countries. The following analysis focuses on corporate equity and real estate markets since these asset classes make up a considerable portion of the economy's wealth. The developments in each asset class of a country are

**Table 2**  
**Real Estate Market Data**

Countries	Index	Original frequency	Period of analysis
Austria	Big cities (all types of dwellings)	Quarterly	2003:05–2010:10
Belgium	Whole country excluding capital city (all types of dwellings)	Quarterly	1983:05–2010:10
Cyprus	–	–	–
Estonia	Whole country (flats)	Quarterly	2006:11–2010:12
Finland	Whole country (all types of dwellings)	Quarterly	2009:05–2010:12
France	Whole country (all types of dwellings)	Quarterly	1999:05–2010:10
Germany	Whole country (all types of dwellings)	Annually	1999:02–2009:12
Greece	Whole country excluding capital city (all types of dwellings)	Quarterly	1997:05–2010:01
Ireland	Whole country (all types of dwellings)	Quarterly	2002:05–2010:03
Italy	Whole country (all types of dwellings)	Half-yearly	1994:04–2010:12
Luxembourg	–	–	–
Malta	–	–	–
Netherlands	Whole country (all types of dwellings)	Monthly	1998:05–2010:12
Portugal	Whole country (all types of dwellings)	Monthly	1991:05–2010:10
Slovakia	Whole country (all types of dwellings)	Quarterly	2008:05–2010:10
Slovenia	–	–	–
Spain	Whole country (all types of dwellings)	Quarterly	1998:05–2010:12

Source of data: BIS Property Prices.

approximated by national asset price indices. The periods of analysis may vary for each asset price index due to data availability (see Tables 1 and 2). To ensure estimation efficiency, the empirical estimations start earlier to satisfy the requirement for the initial sample size.

In the following, the periods of analysis are split into 5-year windows. These windows are used to illustrate the empirical findings of rational asset bubbles using country maps for the eurozone. Black and grey coloured countries are subject to the analysis, whereas white coloured countries are not. Black coloured countries indicate the presence of a rational asset bubble, whereas grey coloured countries indicate that no rational asset bubble is found. The dates in brackets give the first and last indications of

Figure 1  
Corporate Equity Markets from 1986:01 to 1990:12

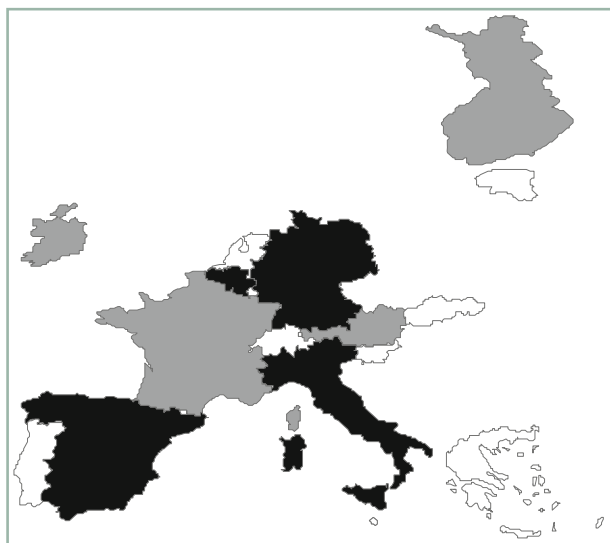


Figure 2  
Real Estate Markets from 1986:01 to 1990:12



Figure 3  
Corporate Equity Markets from 1991:01 to 1995:12

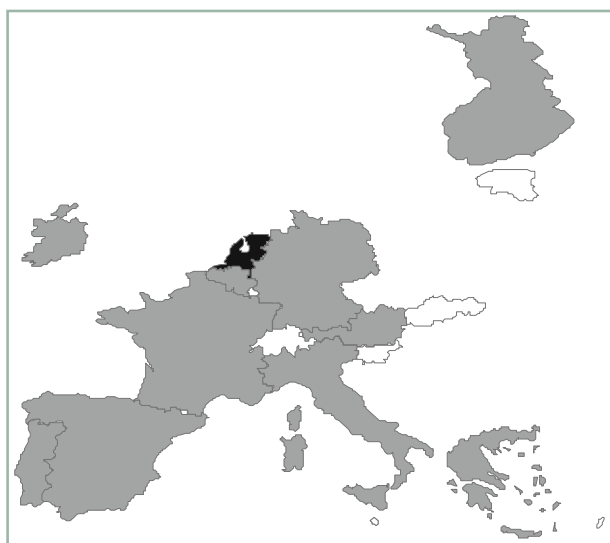
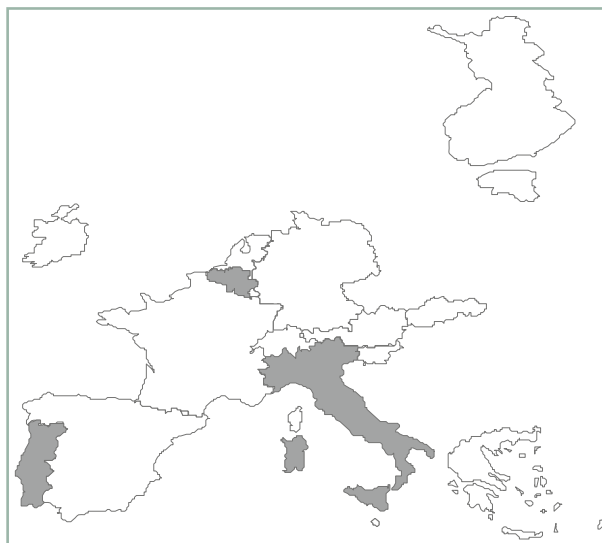


Figure 4  
Real Estate Markets from 1991:01 to 1995:12



explosive autoregressive behaviour within each window. The time span between these dates may contain some discontinuities in the indication of rational asset bubbles.

The first window of analysis for the period from 1986:01 to 1990:12 points to the presence of rational asset bubbles in corporate equity (see Figure 1) and real estate markets (see Figure 2). The analysis detects indications of rational asset bubbles in corporate equity markets for four eurozone member countries, namely Belgium (1985:10–

1990:01), Germany (1985:09–1986:08), Italy (1986:02–1986:08) and Spain (1986:02–1987:09). Evidence for real estate markets is limited due to constrained data availability. The real estate market in Belgium (1989:11) temporarily shows indications of explosive autoregressive behaviour.

The second window of analysis for the period from 1991:01 to 1995:12 shows scarce indications of rational asset bubbles in corporate equity markets (see Figure

Figure 5  
Corporate Equity Markets from 1996:01 to 2000:12



Figure 6  
Real Estate Markets from 1996:01 to 2000:12

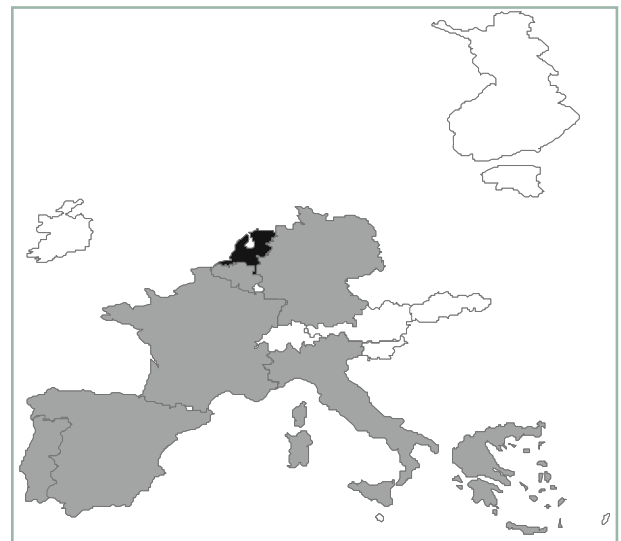


Figure 7  
Corporate Equity Markets from 2001:01 to 2005:12

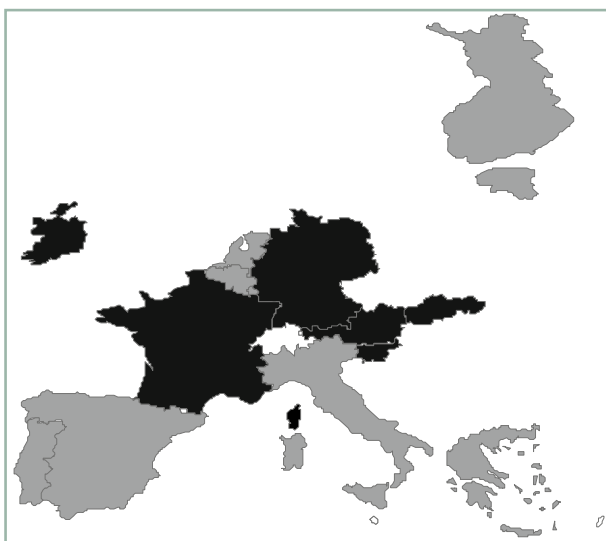
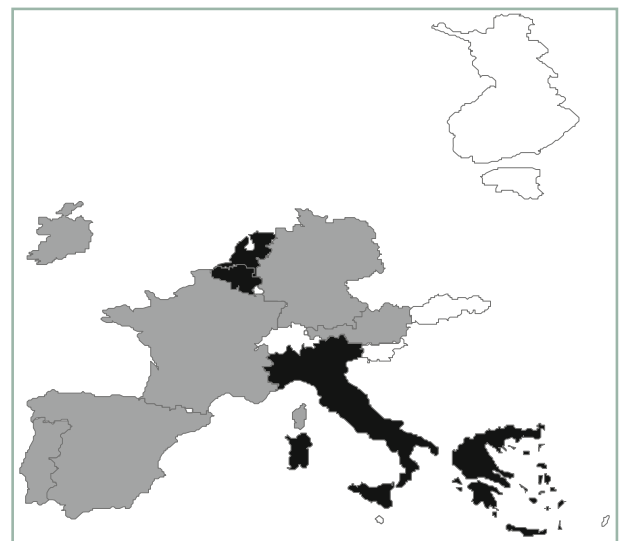


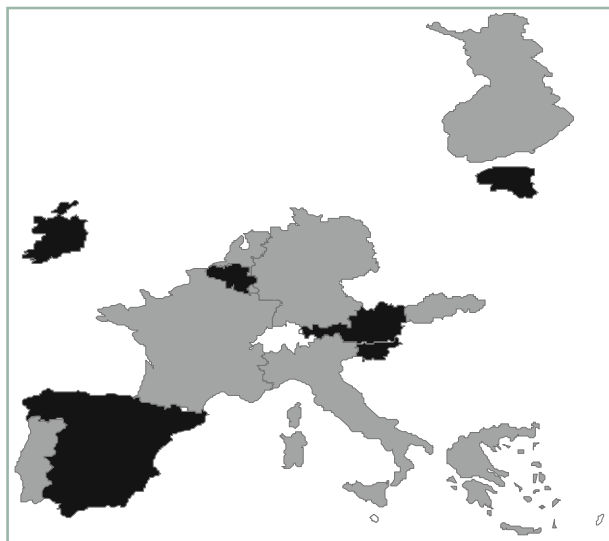
Figure 8  
Real Estate Markets from 2001:01 to 2005:12



3) and none in real estate markets (see Figure 4). In corporate equity markets, only the Netherlands (1993:10–1994:02) indicates explosive autoregressive behaviour. This should not come as a big surprise since the economic environment in most European countries was difficult at that time. For instance, in 1990 all economies were hit by an oil shock. In 1992 some member countries of the European exchange rate mechanism were forced to exit in the wake of speculative attacks. And in 1992/1993 most European economies suffered a recession. Thereafter these countries began to recover and to prosper again.

The third window of analysis for the period from 1996:01 to 2000:12 indicates rational asset bubbles in corporate equity markets across most EU eurozone member countries (see Figure 5). In particular, this is the case for Belgium (1997:01–1999:06), Finland (1998:04–2000:11), France (1998:03–2000:12), Germany (1997:03–2000:12), Greece (1998:04–2000:10), Ireland (1997:05–2000:03), Italy (2000:02–2000:08), the Netherlands (1996:05–2000:09), Portugal (1997:06–2000:02) and Spain (1998:02–2000:10). It is striking that most indications of rational asset bubbles in corporate equity markets begin (here: 1997/1998)

Figure 9  
Corporate Equity Markets from 2006:01 to 2010:12

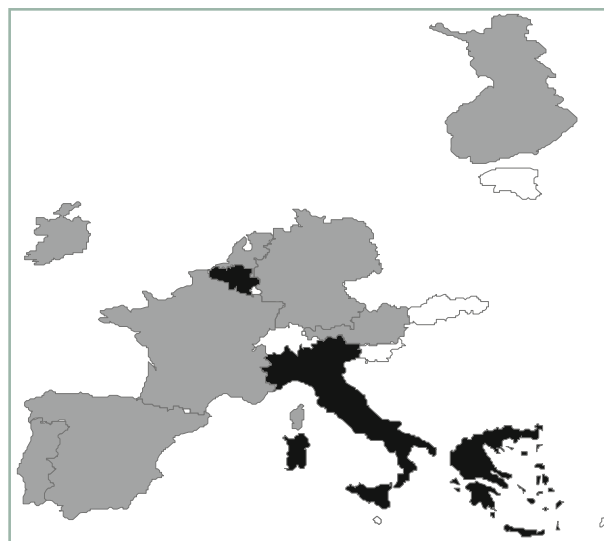


and end (here: 2000) around the same time. Moreover, rational asset bubbles seem to focus on corporate equity markets, whereas the analysis of real estate markets (see Figure 6) shows only explosive autoregressive behaviour in the Netherlands (1998:09–2000:09).

The fourth window of analysis for the period from 2001:01 to 2005:12 indicates rational asset bubbles in both corporate equity (see Figure 7) and real estate markets (see Figure 8). The analysis detects explosive autoregressive behaviour in corporate equity markets in Austria (2005:09–2005:12), France (2001:01), Germany (2001:01–2001:04), Ireland (2001:02–2001:06), Slovakia (2005:02–2005:03) and Slovenia (2002:10–2005:02). Most other corporate equity markets reached their peaks in 2000 and were then subjected to a downtrend to more sustainable fundamental levels. In the wake of these collapses, most European countries suffered a mild recession in 2001/2002. Following that, some indications of rational asset bubbles for real estate markets start to appear. This particularly applies to Belgium (2002:10–2005:02), Greece (2005:01–2005:12), Italy (2002:07–2005:12) and the Netherlands (2001:02).

The fifth window of analysis for the period from 2006:01 to 2010:12 shows rational asset bubbles in corporate equity (see Figure 9) and real estate markets (see Figure 10). The analysis detects explosive autoregressive behaviour in corporate equity markets in Austria (2006:01–2007:12), Belgium (2006:12–2007:06), Estonia (2006:12–2007:09), Ireland (2006:12–2007:05) and Slovenia (2007:01–2008:05). In real estate markets, Belgium (2006:02–

Figure 10  
Real Estate Markets from 2006:01 to 2010:12

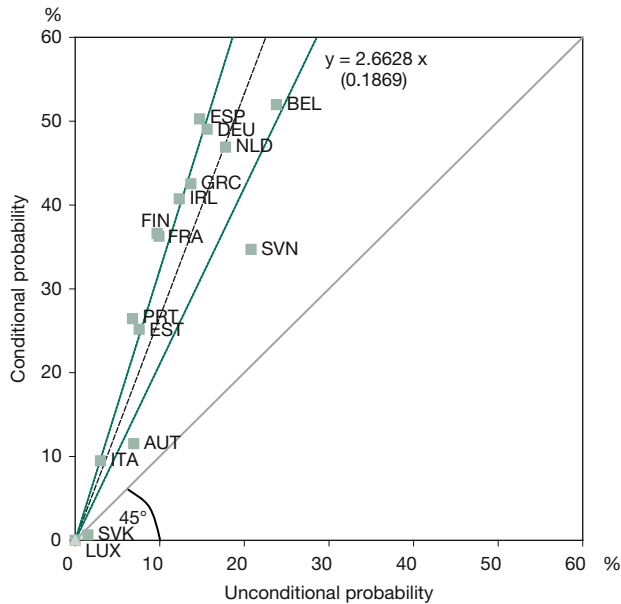


2007:09), Greece (2006:01–2007:03) and Italy (2006:01–2008:05) still show explosive autoregressive behaviour. From 2007 on, eurozone member states are characterised by the European financial crisis (2007–2009), deep recessions (2008–2010) and the EU debt crisis (2009–2011). For corporate equity and real estate markets, all indications of rational asset bubbles immediately disappear with the onset of the European financial crisis. The economic environment thereafter seems not to have built sufficient fundamentals for rational asset bubbles. Consequently, the empirical analysis of the remaining period detects indications of rational asset bubbles neither in corporate equity nor in real estate markets.

Overall, the empirical analysis detects many indications of rational asset bubbles in corporate equity and real estate markets for eurozone member countries. At first glance, rational asset bubbles in each asset class seem to be clustered along the time line. This intuition is cross-checked with empirical evidence by comparing the conditional and unconditional probabilities of rational asset bubbles. The conditional probability denotes the probability of a rational asset bubble if other member countries also experience a rational asset bubble within the same asset class at the same time. The unconditional probability denotes the probability of a rational asset bubble independent of the presence or absence of a rational asset bubble in the same asset class of another member country. Figure 11 and Figure 12 plot the conditional and unconditional probabilities for every eurozone member country in corporate equity and real estate markets respectively.



Figure 11  
Probability for Corporate Equity Markets



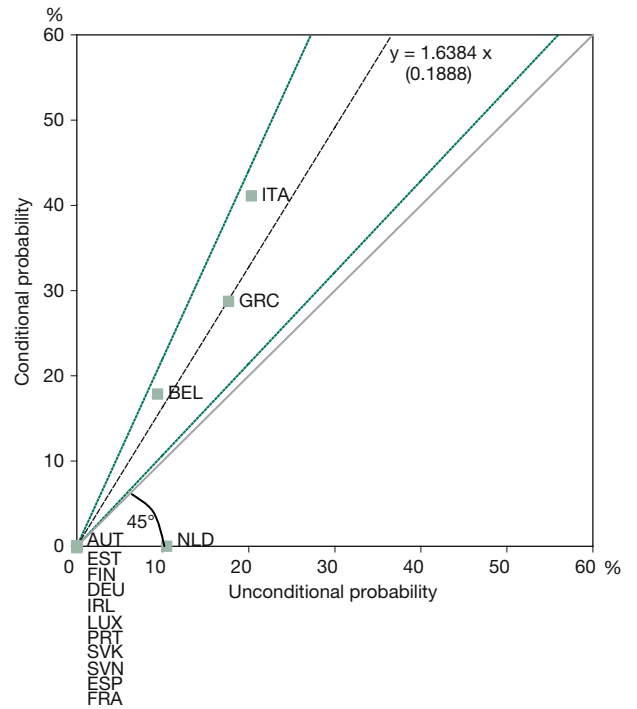
The 45-degree line (grey line) illustrates all points at which the conditional and unconditional probabilities of rational asset bubbles are identical. If rational asset bubbles tend to cluster within an asset class, then country points should be above this line. In the case of corporate equity markets, most country points are clearly above the 45-degree line. In the case of real estate markets, only a few country points are above the line. Nevertheless, the statistical significance of these tendencies is checked for each asset class by running regressions with no constant. Each regression line (black line) runs above the 45-degree line. In general, the tendency to cluster in an asset market is statistically significant at the 1% level if the 99%-confidence bands of each regression (green lines) also run above the 45-degree line. This is the case for both corporate equities and real estate. As a result, rational asset bubbles in corporate equity and real estate markets are more likely to exist if other eurozone member countries also experience a rational asset bubble within the same asset class at the same time.<sup>33</sup>

**Implications for the ECB**

The tendency of rational asset bubbles in corporate equity and real estate markets to cluster has implications for the ECB’s reading of its monetary policy strategy with respect to asset bubbles. The decision of monetary poli-

33 All data are available from the author on request.

Figure 12  
Probability for Real Estate Markets



cy whether to dampen asset bubbles at an early stage of their formation or to let them develop naturally depends on the expected opportunity costs of each strategy. On the one hand, the “leaning against the wind” strategy causes at least low collateral damage to the real economy and other asset markets with high probability, since these are depressed by a more restrictive monetary policy. On the other hand, the “benign neglect” strategy causes high collateral damage to the economy and other asset markets with low probability, since it puts financial market stability at risk. The empirical analysis shows that asset bubbles in member countries are mostly followed by asset bubbles in further member countries within the same asset class. That should not come as a surprise since European asset markets are highly integrated and also subject to a common monetary policy. The clustering of asset bubbles in asset markets bears additional risks for the financial market stability of eurozone member countries. The tendency of asset bubbles to build clusters puts the ECB in a position that more often calls for a “leaning against the wind” strategy at an early formation stage to avoid spillover effects among the asset markets of EU eurozone member countries. In the case of the ECB, it can be argued that leaning against the wind of a few asset bubbles might be better than probably having to fight against a hurricane of many asset bubbles.