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A less effective monetary transmission in the wake of EMU? Evidence from lending rates pass-through

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Abstract

This paper proposes an approach to search for structural breaks, in the wake of EMU, in retail lending rates pass-through. The results of the econometric investigation for Italy and Portugal show that the pass-through on short term lending is, in contrast with a widely held view, sizeably *lower* in the post break period, well below unity. The recently proposed distinction between monetary policy and cost-of-funds approaches in the passthrough analysis does not yield different breaking points. These findings results of between cointegrated relations. supports the widely held view of an enhanced and less heterogeneous across countries monetary transmission.. A strengthened relationship lending could at least partly explain the reduced passthrough in the Italian case.

JEL Codes: E43; E52; E58; F36

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1. Introduction*

The transmission of monetary policy hinges on how bank rates react to changes in the money market rates, especially in a bank-based economy. Several empirical studies investigate whether the size and the speed of the pass-trough (PT) of monetary policy impulses to retail banking interest rates in the euro zone have increased in the wake of the introduction of the euro, thus enhancing the effectiveness of the single monetary policy, and converged, thus rendering more uniform the transmission via the banking sector.

Structural changes, possibly linked to EMU, can be assessed if break-points in earlier PTs between bank and market rates are empirically detected. Angeloni and Ehrman (2003) argue that since January 1999 PTs have become on average larger and faster across the euro area and in most large countries, thus strengthening the transmission of monetary policy. Some papers however challenge this influential view, contesting first of all that break-points should not be exogenously assumed. A second debated issue, within the PT empirical literature, is the often arbitrary choice of the driving market rate, because it does not match the maturity of the loans the lending rate refers to. Thirdly, no structural break can be found when modelling an index of lending rates in an ECB monthly monetary model (Bruggeman-Donnay 2003).

The variety of results in the literature motivates the objectives of the paper, mostly methodological, of reassessing the evidence of structural breaks in the equilibrium PT for short term lending rates in two case studies - Italy and, though less thoroughly investigated, Portugal. These are the two EMU countries where according to earlier studies break-point dates are up to 4/5 years apart, when different driving market rates are chosen (Sander and Kleimeier 2004b, Table 1). This paper shows that instead in both countries recent break-points cluster in the second semester 1999, with sizably *reduced* PTs.

This paper is organized as follows. Section 2 surveys the recent literature on retail interest rates pass-through in the EMU, with special reference to Italy and Portugal. Section 3 presents a new methodology to search for break-points in cointegrated relations and implements it for Italy. Section 4 replicates more concisely the econometric exercise for Portugal. Section 5 offers a tentative interpretation of the findings for Italy. Section 6 concludes.

2. The pass-through in the wake of EMU

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The empirical literature on bank rates PT in the EMU shares the same theoretical framework but often produces conflicting results, owing to different approaches in the econometric analysis. In the standard Klein-Monti model of a monopolistic bank – easily extended in an oligopolistic structure of the banking industry (Freixas-Rochet 1997) - with risk neutrality, perfect information, no switching costs and no joint production of loans and deposits, the lending rate is determined as a mark-up over the marginal (opportunity) cost, identified with the money rate directly influenced by the central bank. Empirical analyses of PT adopting this framework differ on how to proxy the marginal cost, to match the maturity of the loan aggregate underlying the lending rate.

The estimates of the impact and equilibrium PT parameters are usually obtained, starting from the an ADL specification as originally proposed in Cottarelli-Kourelis (1994), through an Error Correction Mechanism (ECM) dynamic specification, following the Granger representation theorem for cointegrated variables.

Let a long run equilibrium or cointegrated relation between interest rates integrated of order one, or I(1):

$$r_t = \alpha + \beta rm_t + \varepsilon_t \qquad (1)$$

with I(0) OLS residuals, *ecm*, at the first stage of the Engle-Granger (1987) two steps procedure, where:

- r = bank rate;
- rm = driving market interest rate;
- *ecm* = stationary deviation ("error" in the ECM acronym) of the bank rate from its long run equilibrium value, assumed to be a linear transformation of rm.

In the second stage of the procedure the short term dynamics parameters are obtained estimating:

$$\Delta r_t = \theta ecm_{t-1} + \gamma_0 \Delta rm_t + \sum_{i=1}^{k} \gamma_i \Delta rm_{t-i} + \sum_{j=0}^{k'} \lambda_j \Delta r_{t-j} + u_t \qquad (2)$$

where Δ is the difference operator.

The key parameters, from an economic point of view, are γ_0 and β, that is the impact and equilibrium PTs, and θ, that is the speed the error is corrected. In the Klein-Monti framework, a β less than one can be interpreted as an index of monopoly power.

The empirical choice of the (weakly) exogenous driving market rate motivates the distinction between a "monetary policy approach" (MPA), with the overnight rate as a proxy for the monetary policy stance, and an industrial organization inspired "cost-of-funds approach" (CoFA), with the market interest rate better proxying the marginal cost of loaned funds (Sander - Kleimeier

2004b). The difference between the two approaches thus depends on how the monetary stance is thought to influence the very short end of the yield curve, possibly in relation with the agents' expectations. In general, the choice of a specific market rate or, alternatively, of a combination, to proxy the "true" marginal cost, as in De Bondt *et al* (2003), depends on the range of durations of the banking contracts underlying the lending rate. Apparently similar choices can in fact distort comparisons across countries, if lending practices have quite different repricing practices. This is one likely cause of the heterogeneity in the results in the literature on short term lending rates PT, the issue this paper focuses on.

The heterogeneity refers to the size of the impact and equilibrium PTs, as well as to the date of structural breaks, possibly associated with the advent of EMU. Angeloni and Ehrmann (2003) have argued that a single bank reserves market and the reduction in the interest rates volatility due to the operating procedures of the ECB have already produced faster bank rates PTs. As supporting evidence they show that both the impact and the maximum size of the PTs of changes in money market rates on a set of lending and deposit rates have on average sizably increased in the period 1999-2002, compared to 1990-1998, in four of the largest EMU countries, Germany being the exception, and in the euro area as a whole. In the euro area, business loans show the largest increase in the impact and peak coefficients between pre-1999 and the successive period, the latter reaching 1.1. The authors informally identify a break-point in January 1999 via rolling-window regressions.

These findings, in the case of short term lending (r^{ST} for Italy and r^{CB} for Portugal; on data definition see section 3) are however disputed in two recent studies (Tables 1-2).

De Bondt *et al.* (2003) *do not* detect a structural break in January 1999 in Italy, in an empirical framework with the distinguishing feature of a driving market rate proxied by a combination, with estimated weights, of the 3-months interbank and of the 10-years Government bond rates, under the assumption that the latter provides a signal on the persistence of changes of the short term rates. The finding notwithstanding, the paper provides estimates for the entire 1994.04-2002.12 period and for the subsample beginning January 1999. They show a small *reduction* in the impact PT and a larger one in the equilibrium PT with respect to the interbank rate (from 0.93 to 0.76), whereas the equilibrium parameter with respect to the 10-years rate reverses sign, from positive (0.12) to negative (-0.15). The estimation results are similar and even sharper – equilibrium PT falling from above to less than one - for Portugal.

Sander and Kleimeier (2004a) estimate Eq. (1) with alternative driving market rates - the overnight (rm^{ON}; MPA) and the one-month interbank (rm^{INT}; CoFA) - and empirically determine whether, between January 1993 and October 2002, a structural break would have occurred; once detected it, they provide a two step estimate of an ECM specification (Eq. 2) before and after the

break-point. Their findings for Italy are that *a*) according to the MPA, the breakpoint is February 1995 and the equilibrium PT remains the same, near unity, with a reduction of the impact parameter, whereas *b*) for the CoFA the break-point is July 1999, and a slight increase in the impact PT is associated with a sizable reduction for the long run PT (from 1 to 0.7). Considering r^{TOP} , namely the rate for top rated firms, only with the MPA a break-point occurs in February-95; the equilibrium PT remains however pretty unchanged, near unity (Tables 1-2; r^{TOP}).

The findings are more striking across the two approaches for Portugal. The break-points are more than 5 years apart - July-94 and October-99 – and the equilibrium PT varies very considerably, rising with the MPA (from 0.26 to 1.52) and falling with the CoFA (from 1.24 to 0.65) for the interest rate on commercial bills (r^{CB}). The same pattern in dating break-points and in estimating equilibrium PTs occurs When considering the short term lending rate to firms, r^{STF}.

[TABLES 1 AND 2 APPROXIMATIVELY HERE]

3 – The econometric investigation in the Italian case

3.1 - Methodology

To endogeneously search for structural breaks and, if they are detected, successively estimate the impact and equilibium PTs, as well as the speed of correction of the "error", the suggested methodology is as follows.

1) Endogeneous search for break-points in the long run model (Eq. 1), modifying the supremum F (supF) testing procedure proposed by Kleimeier and Sander (2004) and Toolsema *et al* (2002), where the date is associated with the largest of the standard rolling Chow F-statistics computed under the hypothesis of a break occurring in each subsequent period through the mid-70% sample period (Andrews 1993). The innovation, following Bai (1997), is that, with several local maxima, statistically significant[1], the procedure is repeated, starting from the earliest break-point, to pick up the latest one, presumably more interesting from a policy point of view.

2) Check that lending and driving market rates are I(1) through ADF tests in the break-free periods.

3) Check that in the same periods the OLS estimation at the first stage of Eq. (1) generates I(0) residuals, thus rejecting the null hypothesis of no cointegration. This should help mitigate the well known problems of low power of tests for cointegration in the presence of breaks (Maddala-Kim 1998).

4) If the no cointegration hypothesis is rejected, estimation of the dynamic ECM specification (Eq. 2) following the two step Engle-Granger procedure. The optimal number of lags is determined according to the minimum AIC criterion allowing for a maximum of three lags. The first-stage β estimate is superconsistent, but biased in small samples, and the bias is inversely proportional to the fit (Banerjee *et al*., 1986). An alternative single-equation procedure is therefore also used, to jointly estimate short and long run PTs, in a dynamic ECM specification combining Eqs. (1) and (2) through suitable non-linear coefficient restrictions:

$$\Delta r_t = \theta(r_{t-1} - \alpha - \beta\, rm_{t-1}) + \gamma_0 \Delta rm_t + \sum_{i=1}^{k} \gamma_i \Delta rm_{t-i} + \sum_{j=1}^{k'} \lambda_j \Delta r_{t-j} + u_t \qquad (3)$$

This single-equation procedure, justified when the explanatory variable is (weakly) exogenous for β, as it is safe to assume for a driving market rate set in the integrated European money market, has two interesting features. First, an alternative check of a cointegrated relation can be implemented through the Ericsson-MacKinnon (2002; EM) test, specifically designed for this estimation procedure and adjusted for the degrees of freedom; second, it allows to assess the precision in estimating β, being the t-ratio at the first stage in the Engle-Granger procedure not interpretable as usual.

5) In a non-competitive market structure the PT can be potentially asymmetric for positive or negative changes in the driving rate: as a consequence, a robustness check of the results obtained for the basic symmetric specification is carried out introducing separate regressors, according to their sign, for the short term dynamics.

3.2 The data

The short term lending rates analyzed are, as in the literature so far considered, r^{ST} for the larger aggregate and r^{TOP}, both drawn from the ECB NRIR database (see Appendix). This paper adds r^{OD} for the overdraft component, because it may provide further insights to the PT empirical analysis, owing to the inclusion of contracts with homogeneous characteristics of maturity and interest rate fixation. As a consequence, the stocks outstanding are not the result of a stratification of old market conditions, being rather more similar to new businesses. This feature allows to overcome the limits in computing r^{ST}, affected by averaging market conditions for the past 18 months. In spite of the high correlation even of the differenced series r^{ST} and r^{OD} (see Table A1 in Appendix), the econometric investigation for the two rates produces quite different results.

[1] The critical asymptotic values of the supF with I(1) regressors are 16.2, 12.4 and 10.6, at the 1%, 5% and 10% significance levels, respectively (Hansen 1992, Table 1).

The sample period goes from January 1993[2] to February 2004, the last month the series are published (Figure 1).

[FIGURE 1 APPROXIMATIVELY HERE]

3.3 – Results

The results are reported following the sequence of steps of the suggested methodology.

1) The rolling Chow F-test statistics, after a local maximum at the beginning of 1995 for all bank rates, follow differentiated paths successively[3]. The statistics settle around a plateau between 1998 and 1999, and the results are invariant with the choice of the driving rate, for both r^{ST} and r^{OD}. The path is much smoother for r^{TOP}, signalling no structural change in the relation with the interbank rate after the first break, whereas with the overnight a statistically significant maximum is detected at end-1996 (Figures 2a-b).

Repeating the algorithm for the period after the earliest break the supF procedure indicates for each bank rate only one statistically significant absolute maximum (Figures 3a-b):

- r^{ST} and r^{OD} (CoFA): June 1999;
- r^{ST} (MPA): July 1999;
- r^{OD} (MPA): November 1999;
- r^{TOP} (MPA): October 1997.

It is worth remarking that the date of the most recent structural break for N4_1 is, following the MPA, more than 4 years later than in Sander-Kleimeier (2004b), while it almost coincides with the date suggested by the CoFA in the same study.

[FIGURES 2 E 3 APPROXIMATIVELY HERE]

2) Checking the order of integration of each interest rate series in the pre- and post-break periods shows that the null of integration of order one cannot be rejected, at high confidence levels, for the market interest rates; the same does not hold for the lending rates (Table A2 in Appendix). More precisely, using first the ADF test for the series in levels and, if satisfied, also in differences, the null is rejected in the pre-break period for each bank rate in level form, though the statistic is near the critical values; in the case of r^{OD} the confidence level reaches the 1% *p*-value. The test for

[2] Data for many EMU countries are available only since early 1990s. Following the literature, the sample period starts after the 1992 EMS crisis.

[3] In particular, the first local maxima occur in January 1995 for the model with the interbank as reference rate and in March with the overnight one. To search for the successive breaking point the sample starts at April 1995, to exclude the March outlier, with approximately 200 basis points increase in market rates.

the differenced series is instead always satisfied, at least at the 5% significance level. Due to the low power of these asymptotic tests for relatively small samples the two step estimation procedure is always implemented; it is stopped at the first stage when the no cointegration null fails to be rejected.

3) In the pre- and post-break periods Eq. (1) is estimated at the first stage associating each lending rate with either rm^{ON} or rm^{INT}; only one relation is estimated for the couple r^{TOP} and interbank rate. Standard CRDW e ADF tests are computed, under the null of non-stationary OLS residuals, meaning no cointegration if the statistics are smaller, in absolute values, than critical values.

These tests, with a well known low power in small samples, provide divergent outcomes and the statistics are generally close to critical values. The null is however almost always rejected at least by one test, at the 10% significance level. The exception is r^{OD} in the pre-break period, when the driver is rm^{INT}; not rm^{ON}. This result is interesting, because the earlier finding of the r^{OD} series failing the unit root test, even at the 1% significance level, would have led to expect an outcome of no cointegration with *any* I(1) market rate (Table 3).

4) The two step procedure of Eq. (2) for the three lending rates produces overall smaller and less precise estimates of the speed of error correction, θ, compared with the single-equation alternative. This is reassuring, because a persistent disequilibrium, if the cointegration relation is accepted, is implausible from an economic point of view. Though the long run relationship between r^{OD} and rm^{ON} passes the cointegration test in the pre-break period, the estimated θ in the second step is however not significantly different from zero; the same happens for r^{ST} in the pre-break period.

The EM test, computed as a t-ratio of the OLS estimate θ for Eq. (3), is useful because it focuses on the economic meaning of the parameter: considering again the r^{OD} case, only with rm^{INT} as a driving rate the test is passed and a plausibile θ is obtained (one fifth of the error is corrected in a month)[4]. The EM test turns out to be more severe, as it can be gathered from the several instances of failures with the overnight as driving rate. These results suggest that rm^{INT} is empirically preferable to rm^{ON}, despite of their high correlation, at least partly because of the lower variability of the first one[5].

[4] Because the cointegration test failed at the first stage of the Engle-Granger procedure, the single-equation estimate was obtained starting from an ADL specification up to three lags and, via a *general-to-specific* approach, reparametrizing it as an ECM model with a unitary β, imposed but not estimated. This explains why Table 3 does not reports the t-ratio.

[5] The standard error for the differenced series is however only slightly lower for the interbank compared to the overnight rate (0.22 vs 0.24, in the pre break period, and 0.17 vs 0.18, in the post break one).

Let us consider now the more interesting parameter for an analysis of the PT. The results of the two step procedure can be summarized as follows.

[TABLE 3 APPROXIMATIVELY HERE]

r^{ST} and r^{OD} . As expected, owing to the high correlation between the market rates and even more among the bank rates (Table A1 in Appendix), the results are similar with either driving rate. The estimate of β in the post-break period is sizably below unity and shrinks by at least one fourth compared to the previous period (from 0.95 to 0.7 for r^{ST}); in the EMU period, the β for r^{ST} is lower by about one sixth compared to r^{OD}, thus signalling how "special" are short-term loans with very low maturity (Table 3).

The main findings with the single-equation procedure do not differ greatly, though they provide some interesting integrations. β is significantly different from unity in the post break period: the largest estimate, at a 95% confidence level, is less than 0.8 for r^{ST} and even 0.7 for r^{OD}. The first stage estimates are systematically higher than those obtained with the single-equation procedure: for r^{ST}, the difference is of the order of magnitude of the 95% confidence interval, a clue to a small sample bias (Banerjee *et al* 1986). β is instead always above or equal to unity in the pre-break period[6]. The speed of the error correction, θ, doubles between the first and the second period.

The estimates for the impact PT, γ_0, a typical index of rate stickiness, are almost identical between the two periods for r^{ST}, whatever the estimation procedure or the driving market rate. The results for r^{OD} are instead similar to the long run ones: for instance, with rm^{INT}, cointegration tests passed in both periods, γ_0 shrinks by almost a half (0.11 instead of 0.20) and is about one third of the corresponding parameter for r^{ST}.

r^{TOP}. The findings in the case of the lending rate for the top rated firms are similar across approaches for the equilibrium PT: close to unity for the extended period 95.04_04.02 in the CoFA; shrinking from unity to approximately four fifths in the MPA. The single-equation estimates of θ are again higher, though always reduced, in the post break-period, compared with the other bank rates; γ_0 is slightly higher than for r^{ST}.

5) Taking into account, to save space, only the single-equation procedure to investigate whether asymmetric effects can be detected for rm^{INT} positive and negative changes, the estimation of separate short run dynamics coefficients does not produce a better fit (Table 4). Two features are however worth mentioning. First, in spite of estimated coefficients for the short run PTs larger for positive changes in both periods, the null of symmetry cannot be rejected for r^{ST} and r^{OD} in the

recent period; it can be done, on the contrary, in the pre-break period for r^{ST} and, even though only at the 12% significance level, also for r^{OD}. Second, the null for r^{TOP} is rejected, with a *reverse* sign: PT is higher for negative changes in the driving rate.

To sum up, in the Italian case the equilibrium PT has sizably shrunk in the post-EMU period, with values sizably below unity, except for the most creditworthy borrowers. The findings differ from some recent research, with the partial exception of CoFA results of Sander-Kleimeier (2004a). The single-equation procedure estimation beside the widely used two step Engle-Granger one corroborates the econometric results, because it overcomes the critique of small sample bias for superconsistent estimates. The distinction between MPA and CoFA, linked to the choice of how to proxy the driving market rate, does not provide, in contrast to Sander-Kleimeier (2004b), a distinctive contribution to date structural breaks in equilibrium PTs, provided a suitable search methodology is adopted. Overall, the interbank as the driving market rate proves empirically more reliable than the overnight one.

The methodological approach implemented in the Italian case is corroborated when considering the Portuguese one (Section 4); a tentative interpretation based on banking structure considerations for Italy is put forward in Section 5.

[TABLE 4 APPROXIMATIVELY HERE]

4. The Portuguese case

Portugal is the other country, with Italy, that according to Sander-Kleimeier (2004b, Table 1) has, for r^{CB} and r^{STF} (Figure 4), very far apart, up to 5 years, breakpoints, according to the MPA or the CoFA (Table 2). Moreover, in contrast to Italy, the cointegration hypothesis at the first stage of the Engle-Granger procedure is sometimes rejected[7]; the range and the direction of changes in the equilibrium PTs between pre- and post-break periods are hardly plausible.

This section investigates whether, on a sample that includes two extra months in 2002, those findings are confirmed adopting the suggested methodological approach to search for structural breaks. The focus is on dating break-points and on estimating equilibrium PTs, because earlier studies do not provide benchmark estimates for γ_0 and θ. It is worth recalling that the results are not comparable from an economic point of view with the Italian ones, owing to the different content of underlying loan aggregates (see Appendix).

[6] See fn. 4 for r^{OD}.

[FIGURE 4 APPROXIMATIVELY HERE]

The supF testing procedure, using either driving market rate, detects a first local maximum at the beginning of 1995 (Figures 5a-b). Replicating the procedure for the subsequent period, starting as usual from April 1995, to remove the outlier of March with its rates spike, indicates a maximum, *common* to both bank rates and for either approach, in October 1999 (Figures 6a-b). The first stage estimates of Eq. (1) in the pre- and post-break periods reject the null of no cointegration (Table 5)[8]. This other example reinforces the proposition, suggested by the Italian case, that the distinction between MPA and CoFA is not empirically useful when searching for structural breaks.

It is worth noticing the almost halving of β across periods for both lending rates, and the very similar values of the parameter. An even larger reduction of the PT than in Italy, at least for short term lending to firms, adds further evidence against the Angeloni-Ehrman (2003) view for the euro area, though Portugal is not specifically analyzed. A lower PT on short term lending implies a less effective monetary transmission of the ECB impulses to the Italian and to the Portuguese credit markets and, plausibly, owing to the banking intermediation key role for bank dependent SMEs, to the real economy.

[FIGURES 5 AND 6 APPROXIMATIVELY HERE]
[TABLE 4 APPROXIMATIVELY HERE]

5. A tentative interpretation for the Italian case

The findings for Italy are, beyond doubt, of a sizable reduction in the equilibrium PT for the short term lending rates for most borrowers in the wake of EMU. An interpretation, within a static industrial organization scheme *à la* Klein- Monti, of a mark-up increase runs contrary to recent studies that document that the banking sector has become more competitive during the 90s (Panetta 2004) and to the evidence of reduced, and decreasing, lending margins comparing Italy to other big EMU countries (Cabral *et al* 2002, table 17[9]). The static industrial organization scheme can be at

[7] In these cases the estimation procedure relies on ADL specifications.
[8] The ADF tests, always passed, for the I(1) property of the bank and market rates series, in the pre- and post-break periods, are not reported, to save space (results available on request).
[9] Though the comparison is based on not harmonized national bank rates, considering the two periods May 1998-May 1999 and May 2001-May 2002, the margin of the short term lending rate to firms with respect to the reference market rate fell (on average data, from 250 to 177 bps) in Italy and rose in Germany (from 283 to 319) and France (from 112 to 145) or, if decreasing, remained higher in Spain (from 253 to 234). Caution in these international comparisons is as always necessary: checking how the averages are computed, the Italian data seem to refer to medium-long term (> 18 months) loans to consumer households, an aggregate including fixed and, increasingly, flexible rate mortgages.

any rate hardly applied to bank rates determination, especially in a period when, in the wake of EMU, bank-customer relationships undergo dramatic changes[10].

The econometric investigation in this paper provides a suggestive piece of evidence: the divergent pattern of equilibrium PTs for the minimum rate r^{TOP} in comparison with the lending rates to non-primary borrowers, r^{ST} and r^{OD}. This pattern is compatible with a credit market where top rated borrowers have kept exploiting their bargaining power with banks, with lending rates close to money market ones, whereas enhanced relationship lending with the bulk of customers has produced the expected intertemporal interest rates smoothing (Berlin-Mester 1998). Asymmetric effects for the short run PT lend additional support to this interpretation: while the parameter for r^{TOP} is in absolute terms lower when the market rate increases and viceversa, there is no such evidence in the post-break period for the other rates.

Two classical indicators of credit market structure – the extent of multiple lending relationships and the share of the main bank's loans – provide evidence of a stronger relationship lending, especially after the introduction of euro. According to the BIP database of Bank of Italy, the average number of banks per borrower between end-June 1999 and end-March 2004 decreased by one sixth for non financial enterprises with credit lines between 500,000 and one million euro and more than one fifth for larger amounts; the share of the main bank rose by about 5 to 9 percentage points. It is worth remarking that these indicators moved much more slowly between end-March 1998[11] and end-June 1999, when a break-point occurs in the equilibrium PT for r^{ST}: the first one decreased by about 5 per cent, the second did not change. Taking into account that the indicators did not appreciably differ from early 1994, it can be safely inferred that in a decade their changes overlap with the post-break period.

Additional factors, internal and external to the banking industry, support the hypothesis of intensified relationship lending:

i) the consolidation process helped reducing the average number of banks per borrower partly because of a mechanical effect - fewer banks -, partly because the increase of banks belonging to a group produces more uniformity in lending practices, thus mitigating arbitrage opportunities across lenders;

ii) the mutual convenience, for banks and firms, to reduce information asymmetries through more stable relationships may have been enhanced by the Basel Accord revision process,

[10] Between June 1999 and December 2000 the interbank rate rose by 236 basis points (bps), compared to 152 bps for N4_1. This seemingly underpricing of loans could be, according to anedoctal evidence underlying a control issues interpretation, the unintended aggregate outcome of individual strategies to maximize size, to avoid becoming an easy target in an expected consolidation process, spurred by EMU. This first period of reduced margins has been only partially reversed in the subsequent three years, when the interbank rate has slumped by 289 bps vs 212 for N4_1.

[11] The quarterly series on the BIP data base, though with a slight discontinuity in 2000, starts on March 1998.

started almost in coincidence with the advent of euro, that emphasize a better assessment of credit risk via external and internal ratings[12].

The intertemporal smoothing of lending rates is beneficial not only to borrowers, but also to banks. They can in fact stabilize their interest margin, which is affected by a low PT to market rates for about two fifths of their liabilities, namely demand and saving deposits. The equilibrium PT for demand deposits has considerably reduced in recent years, characterized by low money market rates and almost nil depositors' remuneration, down from 0.61 to 0.44 in the same break-free periods identified for the lending rates[13]. Such a pattern implies a greater risk of margin erosion on fund raising when market rates decline. A parallel reduction of the PT on short term lending rates, as in fact happened according to the evidence provided in this paper, could have helped to mitigate this risk.

6. Conclusion

The paper makes several contributions to the empirical literature on lending rates PT.

Methodology. First, a strategy is suggested to endogenously search for structural breaks in cointegrated relations, when the researcher's interest is for the latest break-point. Second, a single-equation estimation of an ECM specification complements the two step Engle-Granger procedure for cointegrated relations, and the Ericsson-MacKinnon test for cointegration, adjusted for degree of freedom, is implemented.

Data. The determination of short term lending rates in the Klein-Monti framework is related, following the literature, to two alternative driving market rates. In the Italian case the analysis is extended, aside from the sample period, to the overdrafts interest rate, because of an *ex ante* better maturity matching with the marginal cost proxy.

EMU. The econometric investigation shows that EMU has not implied in its wake a strengthened monetary transmission in the Italian case, at least considering size and speed of PT for short term lending rates. The equilibrium PT has shrunk to around 0.7 (0.6 for the overdraft component), down from almost unity, in the post-break period; the impact PT has remained basically unchanged; the adjustment speed has increased but still remains low. No structural change

[12] This is presumably more the case for SMEs, whose creditworthiness may be more sensitive to qualitative elements that need a deeper knowledge of their business and a closer monitoring or stronger relationships with their management. On the contrary, bigger firms, with presumably more reliable and market-disciplined official financial key-figures, may have their ratings driven mostly by quantitative elements.

[13] The single-equation estimated parameters are 0.67, with a standard error of 0.03, and 0.47, with a standard error of 0.01, respectively.

is detected in the equilibrium, slightly less than one, PT for the lending rate to the top rated borrowers. The equilibrium PT that fallen even more, by almost a half, in Portugal.

Interestingly, in this paper the latest break-points cluster around the second semester 1999 in both countries, irrespective of the driving market rate, in sharp contrast with structural changes occurring as early as 1994 and 1995, due to the impact of the run-up to EMU with inflation convergence, in Sander-Kleimeier (2004b).

The overall results of this work challenge the view, recently put forward by several authors, that EMU has in its wake enhanced the effectiveness of monetary transmission via the banking sector and made it more homogeneous across countries, because of rising and converging PTs. Should the PT increase in other countries after the introduction of euro be confirmed, the findings of this study uncover an as yet incomplete path to an even monetary transmission of ECB's impulses to national credit markets.

The claim that different driving market rates, following a monetary policy approach or a cost of funds approach, may yield different break-points is doubtful: once a suitable methodology of search is adopted, the dates are shown to cluster very closely.

Two research themes worth pursuing in future, in the light of these results are, first, to extend the econometric investigation to other EMU countries, and, second, to assess on micro data the suggested interpretation, for the Italian case, of a link between the PT reduction on short lending rates and the strengthening of relationship lending in coincidence with (and possibly owing to) the monetary unification.

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Appendix 1 – The data

The national, not harmonized, retail bank rates (*National Retail Interest Rates*, NRIR) collected by the ECB refer to types of loans and deposits representatives of a country banking industry and are grouped into 6 macro categories of lending rates and 5 of deposit rates[14].

Italy. The short term lending rates analysed in this paper for Italy[15] are:

- r^{ST} : average rate, weighted by stocks, on short term (maturity up to 18 months) loans, with lending to enterprises accounting for about a half (NRIR acronym: N4_1). The aggregate accounts for about half of total loans;
- r^{OD} : average rate, weighted by stocks, on overdrafts[16]. The aggregate amounts to slightly less than a half of short term loans (Figure A1 in Appendix);
- r^{TOP}: minimum rate, computed as a weighted average by stocks, on short term term loans to firms (NRIR acronym : N4_2)[17].

The sample period goes from January 1993[18] to February 2004, the last month the series are published. The discontinuity is due to the introduction of new harmonized interest rate series[19]. For instance, in the overlapping period (January 2003 – February 2004) of the new and old overdraft interest rate series[20] the levels are quite different, because of a new sample of reporting banks and of new methods to collect rates (end-of-month instead of an average of ten-days data).

Portugal. The short term lending rates analysed in this paper for Portugal are r^{CB} and r^{STF} , average rates for commercial bills (NRIR acronym: N4_1) and loans (NRIR acronym: N4_2) to private non-financial enterprises firms with 91 to 180 days maturity, respectively.

The sample period goes from January 1993[21] to December 2002, the last month the series are published

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[14] http://www.ecb.int/stats/money/interest/html/retail.en.html.

[15] Two other series, N2 and N5, average rates, weighted by new medium-long term (maturity beyond 18 months) businesses to firms and households, respectively, are not analyzed owing to the absence of a reliable market rate that could satisfactorily proxy their marginal cost throughout the entire time span. The financial characteristics of the aggregates (average maturity and interest rate fixation) have indeed changed during the period, spanning across a wide range of maturities and comprising fixed- and variable rate contracts, with time-varying proportions.

[16] Source: Banca Informativa Pubblica (BIP) of the Bank of Italy.

[17] The data refer to the first decile of short term loans to firms, ordered by increasing interest rates.

[18] Data for many EMU countries are available only since early 1990s. Following the literature, the sample period starts after the 1992 EMS crisis.

[19] As of January 2003 the ECB collects a new set of harmonized bank rates statistics, that relate to aggregates with common features across the EMU countries, such as, for instance, the initial horizon of rate determination, an aspect that provides a synthetic representation of the contract maturity and of the rate fixation. Though bound to be the ideal data base for PT empirical analysis across countries, the as yet short sample and the low variability of the money market rates in the reporting period hinder econometric exercises focused on long run parameters (see also Baele *et al*. 2004).

[20] In the period January 2003-February 2004 the levels of the interest rates in the new harmonized series were on average higher by 43 basis points.

[21] Data for many EMU countries are available only since early 1990s. Following the literature, the sample period starts after the 1992 EMS crisis.

For both countries, the driving money market rates are the one-month interbank (rm^{INT}) and the overnight (rm^{ON}) rates, for the Euro area since January 1999 and for Italy/Portugal before[22], chosen, as in Sander-Kleimeier (2004a), because they are the most correlated with the bank rates (see Figure 1 and Table A1 in Appendix for Italy).

[22] Both rates are computed averaging the weighted interest rates of daily transactions in the deposit interbank market.

Table 1 **Italy**: **Review of the literature on short term loan interest rates pass-through**

Study	**Sample period**	**Market rate**	**Breakpoint**	**Estimation procedure**	**Estimation sample**	**Short term pass-through (γ_0)**	**Equilibrium pass-through (β)**	**Adjustment speed (θ)**
Short term lending rate (r^{ST}) [a]								
De Bondt *et al.* (2003, Table 4)	1994.04 2002.12	• 3 months interbank; • Government 10 years yield.	NO (Chow test *p*-value with break at January-99 = 0.20)	ECM: single-equation	1994.04 2002.12	• 0.19 for 3 months interbank; • 0 for gov't yield	• 0.93 for 3 months interbank; • 0.12 for gov't yield	-0.15
					1999.01 2002.12	• 0.16 3 months interbank; • -0.07 for gov't yield	• 0.76 for 3 months interbank; • - 0.15 for gov't yield	-0.60
Sander-Kleimeier (2004a, Table B6)	1993.01 2002.10	Overnight (Monetary policy approach)	YES: February-95	ECM: Engle-Granger 2 steps	1993.01 1995.02	0.31	1.09	n.a.
					1997.03 2002.10	0.16	0.96	
Sander-Kleimeier (2004a, Table C6)	1993.01 2002.10	One-month interbank (Cost of funds approach)	YES: July-99		1993.01 1999.07	0.27	1.02	
					1999.08 2002.10	0.31	0.68	
Minimum short term lending rate to firms (r^{TOP})[a]								
Sander-Kleimeier (2004a, Table B6)	1993.01 2002.10	Overnight (Monetary policy approach)	YES: February-95	ECM: Engle-Granger 2 steps	1993.01 1995.02	0.43	0.94	n.a.
					1995.03 2002.10	0.21	0.92	
Sander-Kleimeier (2004a, Table C6)	1994.07 2002.10	One-month interbank (Cost of funds approach)	NO		1994.07 2002.10	0.31	0.95	

[a] For data description see Appendix.

Table 2 Portugal: Review literature on short term loan interest rates equilibrium pass-through

Study	Sample period	Market rate	Breakpoint	Estimation procedure	Estimation sample	Equilibrium pass-through (β)
Commercial bill rate (r^{CB}) [a]						
De Bondt *et al*. (2003, Table 4)	1994.04 2002.12	3-months interbank[b]	NO (Chow test *p*-value with break at January-99 = 0.57)	ECM: single-equation	1994.04 2002.12	1.24
					1999.01 2002.12	0.93
Sander-Kleimeier (2004a, Table B4)	1993.01 2002.10	Overnight (Monetary policy approach)	YES: July-94	ECM: first stage of Engle-Granger 2 steps	1993.01 1994.07	0.26
				No cointegration; momentum threshold ADL	1994.08 2002.10	1.52[c]
Sander-Kleimeier (2004a, Table C4)	1994.10 2002.10	1-month interbank (Cost of funds approach)	YES: October-99	ECM: first stage of Engle-Granger 2 steps	1994.10 1999.10	1.24
					1999.11 2002.10	0.65
Short term lending rate to firms (r^{STF})[b]						
Sander-Kleimeier (2004a, Table B4)	1993.01 2002.10	Overnight (Monetary policy approach)	YES: February-95	ECM: first stage of Engle-Granger 2 steps	1993.01 1995.02	0.33
					1995.03 2002.10	1.51
Sander-Kleimeier (2004a, Table C4)	1994.10 2002.10	1-month interbank (Cost of funds approach)	YES: November-99	No cointegration; ADL	1994.10 1999.11	1.33[c]
				ECM: first stage of Engle-Granger 2 steps	1999.12 2002.10	0.77

[a] For data description see Appendix. [b] 10-years Government rate not statistically significant in equilibrium PT estimation. [c] Computed as the long run coefficient in an autoregressive distributed lags (ADL) specification.

Table 3 Italy: Alternative ECM estimation procedures

(constant and other short-run dynamics coefficients omitted; std error in brackets)

Market rate (estimation proc.)	Sample Period	β	θ	γ_0	Adj Rsq	DW	N[1]	LM[2]	Cointegration tests: CRDW[3], ADF[4] and EM[5]
r^{ST}: post-break									
1 month interbank (2 steps)	99.06-04.02	.70	-.32 (.08)	.21 (.05)	.75	2.06	.27	.52	CDRW = .52*** ADF = -2.97
1 month interbank (single-equation)		.75 (.02)	-.45 (.05)	.27 (.04)	.77	1.70	.68	.20	EM = -8.92***
Overnight (2 steps)	99.07-04.02	.70	-.22 (.08)	.26 (.04)	.75	2.01	.97	.96	CDRW = .85*** ADF = -3.88**
Overnight (single-equation)		.73 (.04)	-.22 (.08)	.30 (.04)	.73	1.74	.98	.23	EM = -2.68
r^{ST}: pre-break									
1 month interbank (2 steps)	95.04-99.05	.95	[-.03] (.04)	.24 (.05)	.73	2.14	.57	.30	CDRW = .33* ADF = -2.86
1 month interbank (single-equation)		1.07 (.03)	-.22 (.03)	.21 (.04)	.83	1.88	.07	.80	EM = -6.51***
Overnight (2 steps)	95.04-99.06	.95	[-.04] (.04)	.25 (.04)	.73	2.14	.65	.18	CDRW = .44** ADF = -3.00
Overnight (single-equation)		1.03 (.04)	-.11 (.05)	.23 (.04)	.84	2.18	.55	.50	EM = -2.35
r^{OD}: post-break									
1 month interbank (2 steps)	99.06-04.02	.61	-.34 (.08)	[.10] (.06)	.65	1.90	.01	.45	CDRW = .37* ADF = -2.36
1 month interbank (single-equation)		.64 (.03)	-.36 (.06)	.11 (.06)	.67	1.87	.15	.30	EM = -6.03 ***
Overnight (2 steps)	99.11-04.02	.60	-.34 (.09)	.19 (.05)	.68	1.57	.20	.03	CDRW = .53*** ADF = -2.76
Overnight (single-equation)		.62 (.03)	-.36 (.07)	.22 (.05)	.68	2.00	.85	.65	EM = -5.00***
r^{OD}: pre-break									
1 month interbank (2 steps)	95.04-99.05	.90	[-.04] (.04)	.22 (.05)	.64	.2.19	.54	.14	CDRW = .31 ADF = -2.84
1 month interbank (single-equation)		1	-.26 (.02)	.20 (.05)	.76	1.64	.56	.34	EM = -11.38***
Overnight (2 steps)	95.04-99.10	.91	[-.06] (.04)	.25 (.05)	.68	2.16	.77	.13	CDRW = .44** ADF = -3.00
Overnight (single-equation)		.90 (.06)	-.08 (.05)	.24 (.04)	.78	2.07	.92	.76	EM = -1.71
r^{TOP}									
1 month interbank (2 steps)	95.04-04.02	.93	-.14 (.03)	.19 (.03)	.87	2.22	.09	.08	CDRW = .42** ADF = -4.75***
1 month interbank (single-equation)		.93 (.01)	-.16 (.04)	.29 (.03)	.88	2.24	.10	.04	EM = -4**
r^{TOP}: post-break									
Overnight (2 steps)	97.10-04.02	.84	-.16 (.06)	.27 (.02)	.91	1.96	.04	.46	CDRW = .83*** ADF = -4.44***
Overnight (single-equation)		.81 (.02)	-.24 (.07)	.26 (.03)	.91	1.84	.08	.45	-3.52**
r^{TOP}: pre-break									
Overnight (2 steps)	95.04-97.09	.93	-.25 (.09)	.33 (.08)	.80	2.31	.48	.23	CDRW = .56*** ADF = -4.22***
Overnight (single-equation)		1.00 (.03)	-.36 (.07)	.30 (.08)	.87	2.09	.22	.66	-5.35***

[1] *p*-values for the Jarque-Bera test under the null of normality of residuals. [2] *p*-value for the Breusch-Godfrey test under the null of no first order correlation of residuals. [3] Critical values, computed for samples of 100 observations, under the null of I(1) first stage residuals, at the 1% (***), 5% (**) and 10% (*) significance: 0.51, 0.38, 0.32. [4] Asymptotic critical values under the null of I(1) first stage residuals at the 1% (***), 5% (**) and 10% (*) significance: -3.93, -3.36, -3.06 (MacKinnon 1991). [5] Critical values, adjusted for the degrees-of-freedom, in the single-equation ECM procedure (Ericsson-MacKinnon 2002). [.] : coefficients not significantly different from zero at the 10% significance level.

Table 4 Italy: Asymmetries in short term pass-throughs of one-month interbank rate (estimation procedure: single-equation ECM; std error in brackets)

Bankrates	Sample	β	θ	γ_0+	γ_0–	γ_1+	γ_1–	Adj Rsq	DW	N[1]	LM[1]	Symmetry test[2]
r^{ST}	99.06-04.02	.75 (.02)	-.45 (.05)	.31 (.07)	.24 (.07)	-	-	.76	1.73	.79	.24	.53
	95.04-99.05	1.08 (.03)	-.19 (.05)	.57 (.14)	.13 (.05)	.16 (.04)	.06 (.06)	.85	1.95	.76	.96	.00
r^{OD}	99.06-04.02	.64 (.03)	-.38 (.06)	.04 (.11)	.16 (.08)			.66	1.89	.23	.35	.42
	95.04-99.05	1	-.26 (.02)	.44 (.16)	.15 (.06)			.77	1.58	.84	.30	.12
r^{TOP}	95.04-04.02	.94 (.01)	-.21 (.04)	.18 (.06)	.32 (.04)	.04 (.04)	.19 (.04)	.89	2.19	.21	.12	.00

[1] see Table 3. [2] *p*-value for a Wald test under the null of equality between the sum of γ+'s and the sum of γ-'s.

Table 5 Portugal: Equilibrium lending rates pass-throughs (Engle-Granger procedure first stage)

Bankrates	Market rates	Sample	β	CRDW[1]	ADF[1]
post break					
r^{CB}	1 month interbank	1999:11 – 2002:12	.63	1.27***	-5.07***
	Overnight	1999:11 – 2002:12	.64	1.31***	-4.62***
r^{STF}	1 month interbank	1999:11 – 2002:12	.74	1.03***	-3.46**
	Overnight	1999:11 – 2002:12	.74	1.20***	-3.86**
pre break					
r^{CB}	1 month interbank	1995:04 – 1999:10	1.25	1.15***	-5.52***
	Overnight	1995:04 – 1999:10	1.30	1.15***	-4.57***
r^{STF}	1 month interbank	1995:04 – 1999:10	1.34	1.38***	-5.55***
	Overnight	1995:04 – 1999:10	1.39	1.40***	-5.35***

[1] See Table 3.

Figure 1 **Italy: Short term lending and market rates**

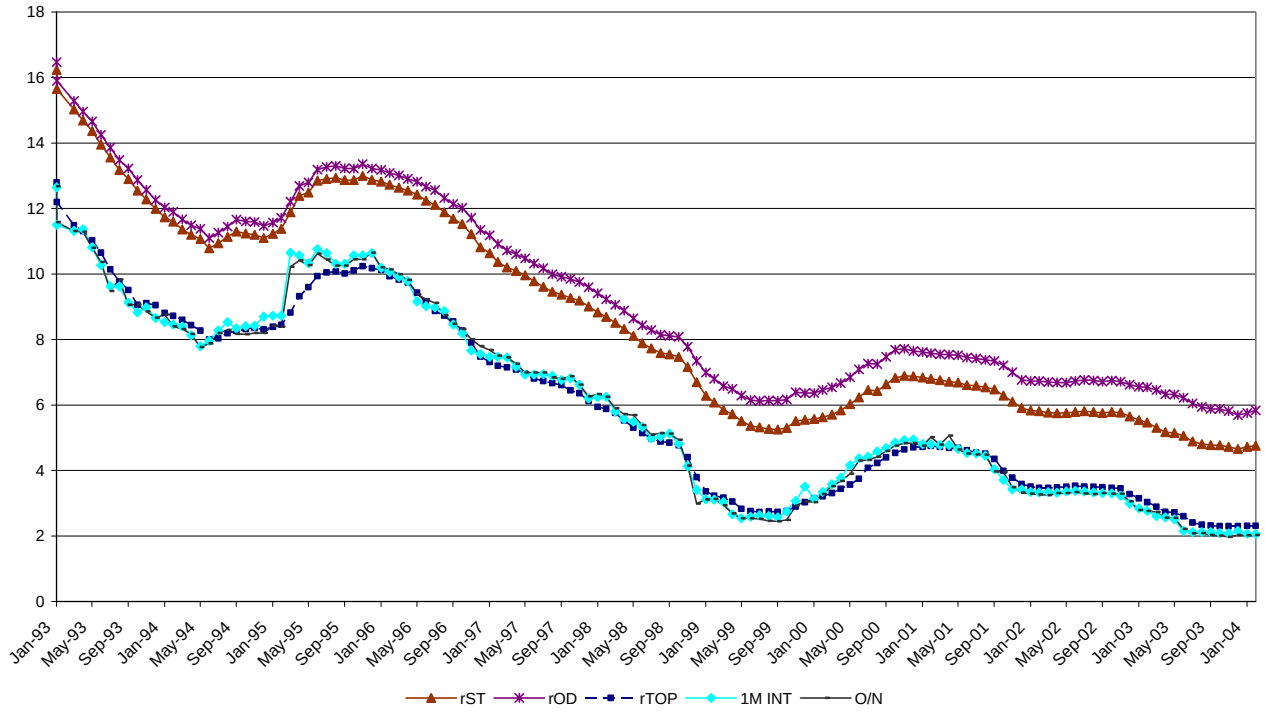
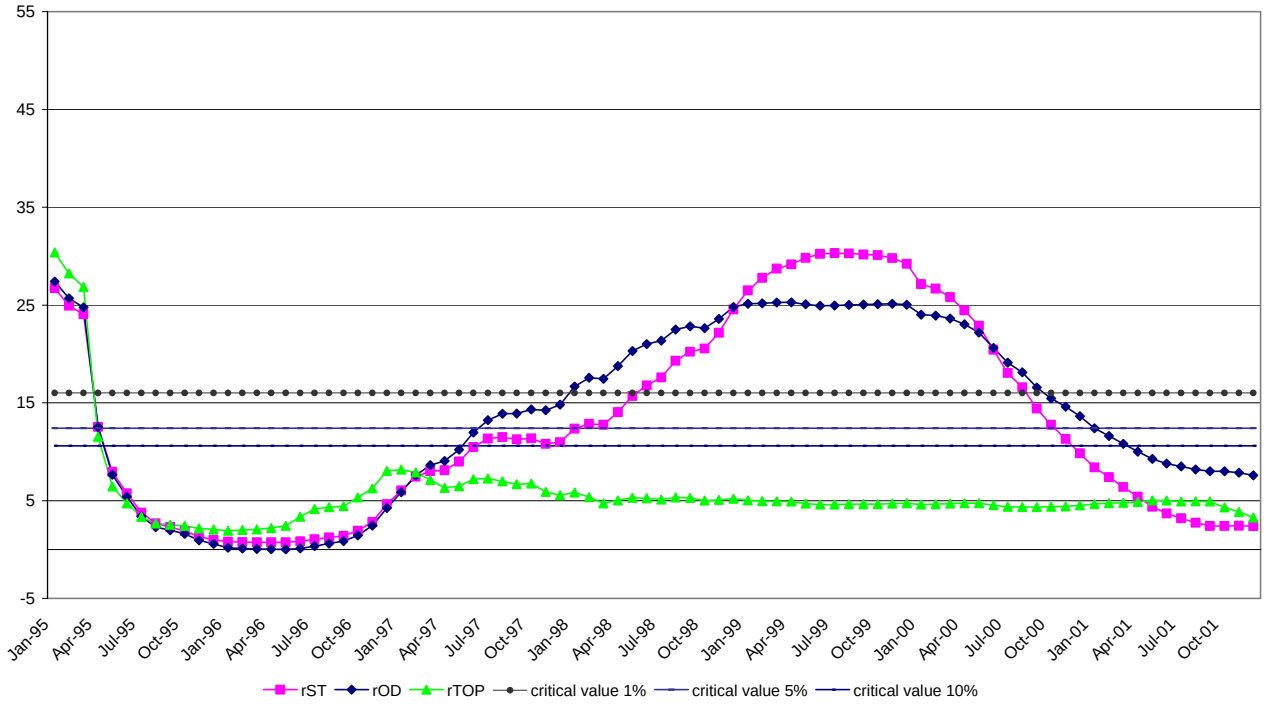


Figure 2 **Italy: Rolling Chow tests**

(sample period: 93.01-04.02)

a) Market rate: one-month interbank



b) Market rate: overnight

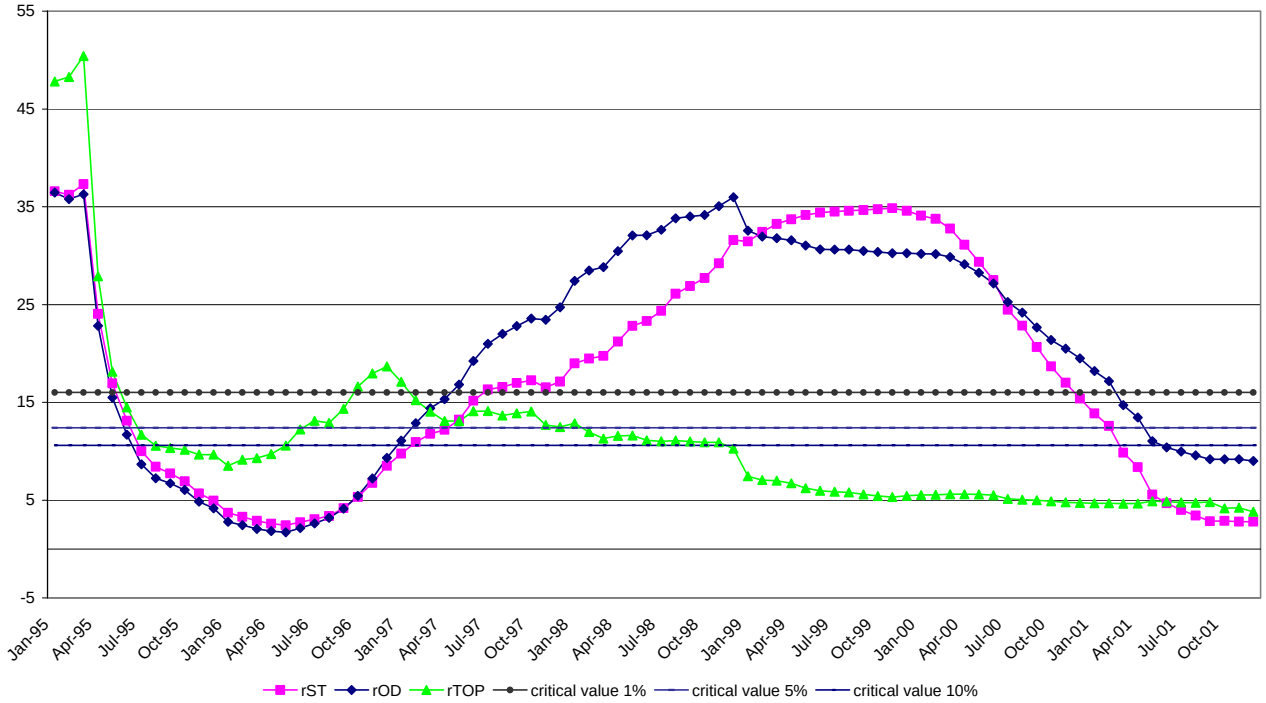
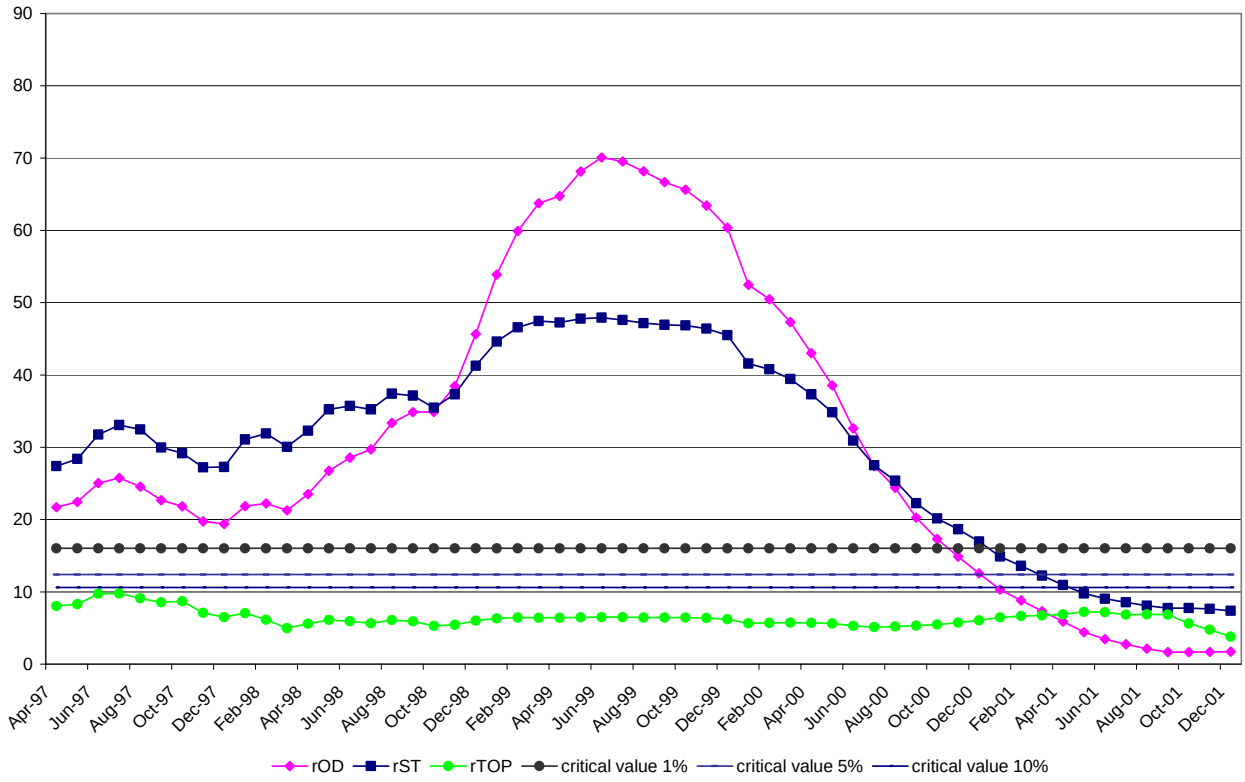


Figura 3 **Italy: Rolling Chow tests**

(period after first breakpoint: 95.04-04.02)

a) Market rate: one-month interbank



b) Market rate: overnight

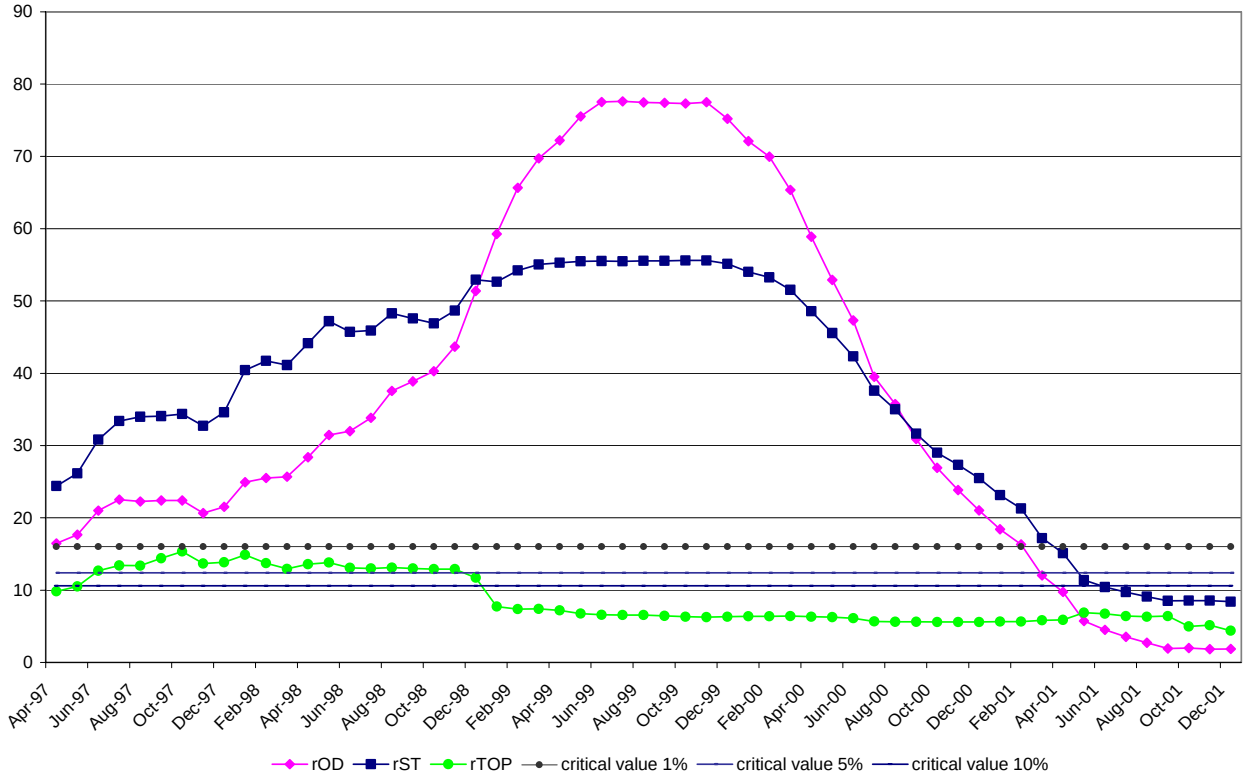


Figure 4 **Portugal: Short term lending and market rates**

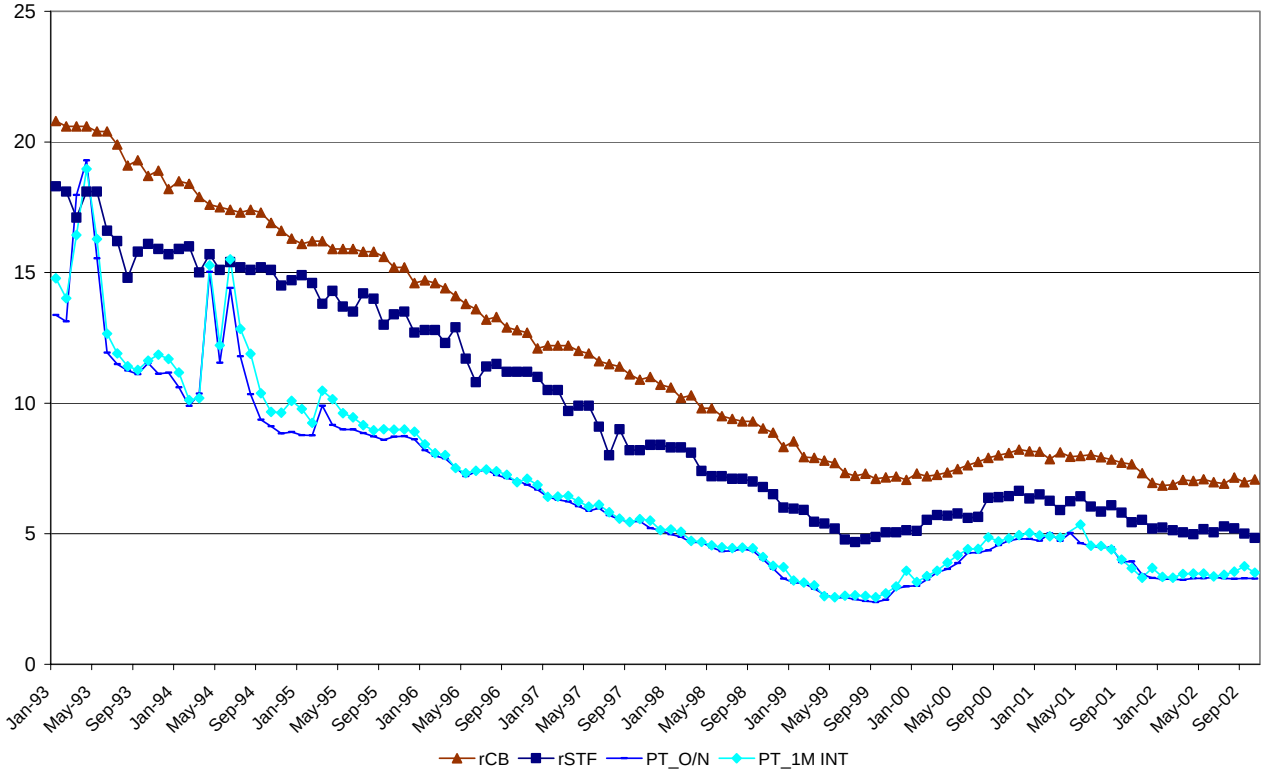


Figure 5 **Portugal: Rolling Chow tests with one-month interbank and overnight rates (sample period: 93.01-02.12)**

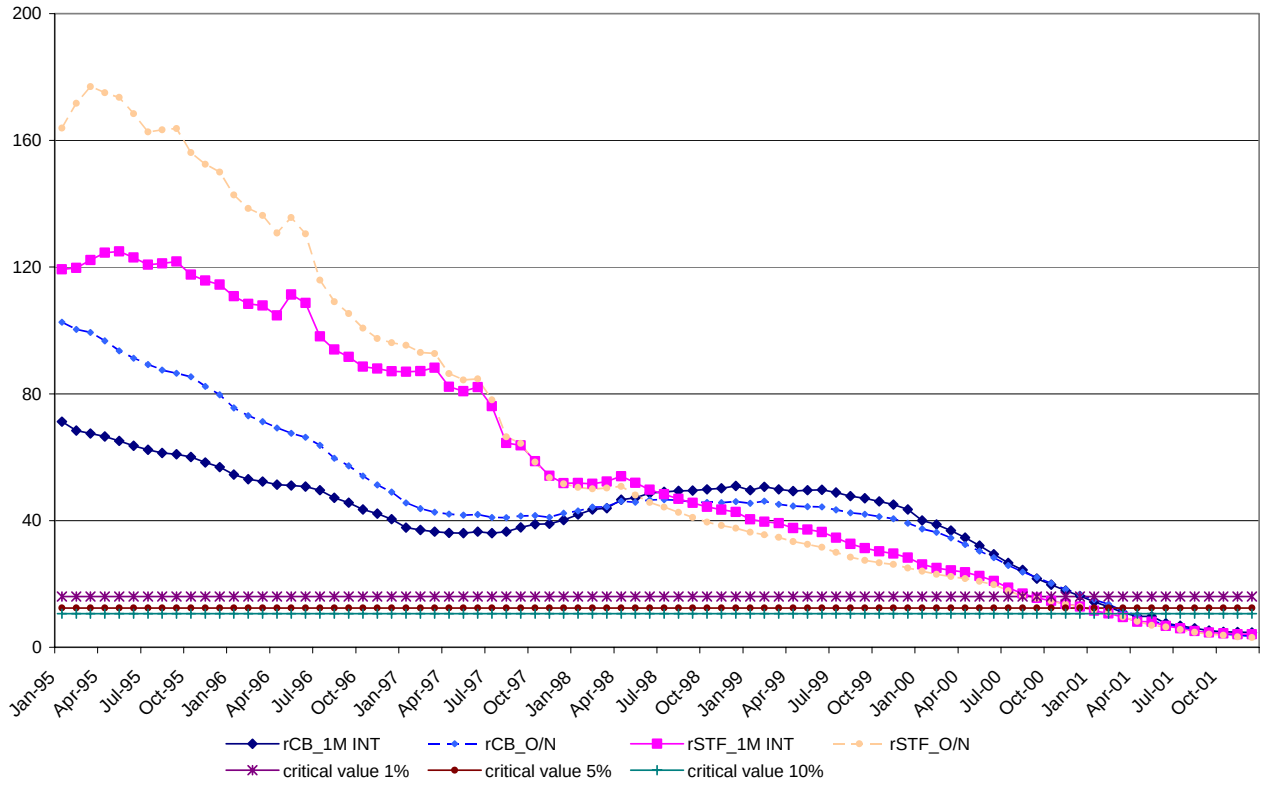
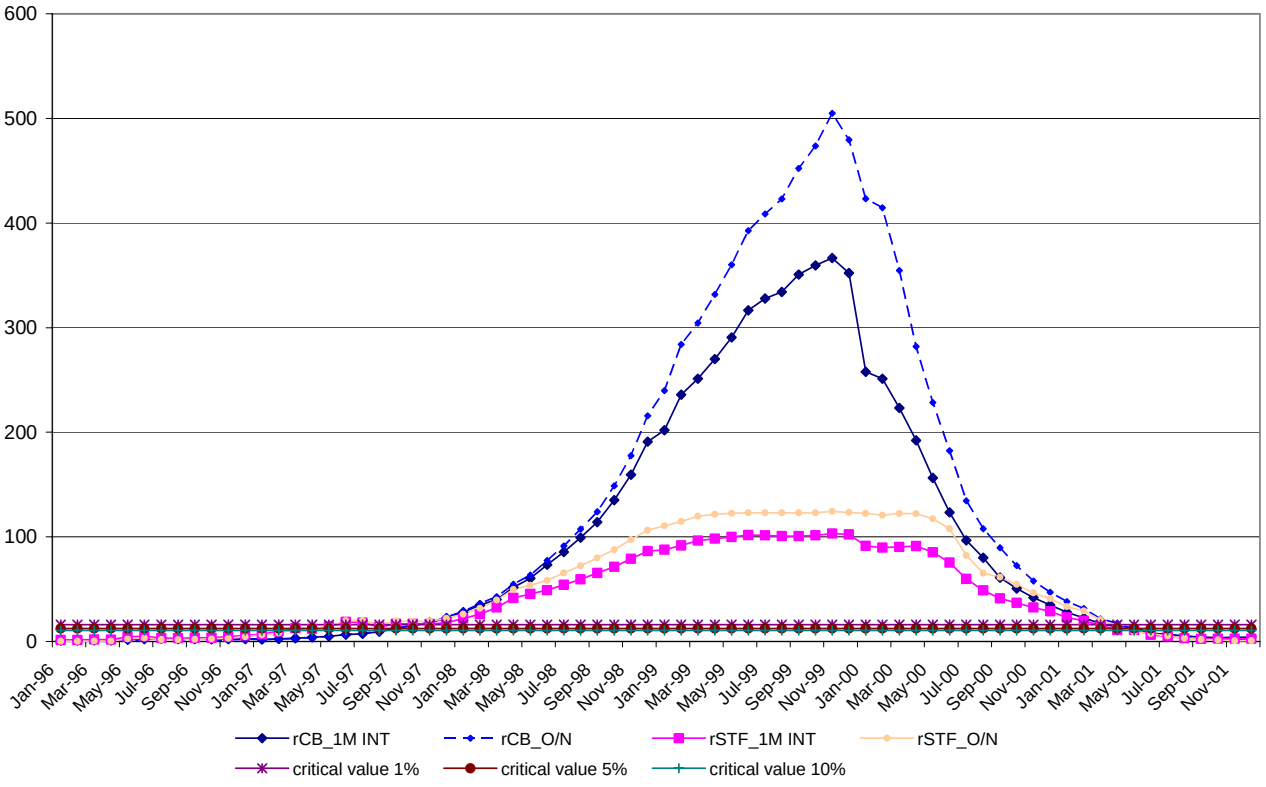


Figure 6 **Portugal: Rolling Chow tests with one-month interbank and overnight rates (period after first breakpoint: 95.04-02.12)**



Appendix – Tables and Figures

Table A1 Italy: Correlations between (first differenced) lending (r^{OD}, r^{ST} and r^{TOP}) and market (overnight, 1-, 3-, 6-, 12-months interbank) rates

	rm^{ON}	rm^{INT}	rm^{INT3}	rm^{INT6}	rm^{INT12}	r^{OD}	r^{ST}
rm^{INT}	0.88						
rm^{INT3}	0.77	0.94					
rm^{INT6}	0.68	0.87	0.96				
rm^{INT12}	0.57	0.75	0.87	0.95			
r^{OD}	0.60	0.58	0.54	0.48	0.40		
r^{ST}	0.61	0.61	0.56	0.51	0.42	0.99	
r^{TOP}	0.59	0.62	0.58	0.53	0.45	0.87	0.90

Table A2 Italy: Unit root tests for lending and market rates

Break-free periods	**Lending and market rates**	**ADF[1]**	
		Levels	**Differences**
	rm^{INT}		
95.04-99.05	r^{ST}; r^{OD}	-2.03	-8.72***
99.06-04.02		-0.81	-3.68***
95.04-04.02	r^{TOP}	-2.31	-9.16***
	rm^{ON}		
95.04-99.06	r^{ST}	-2.49	-7.72***
99.07-04.02		-0.54	-3.07**
95.04-97.09	r^{TOP}	-2.49	-7.58***
97.10-04.02		-1.97	-4.80***
95.04-99.10	r^{OD}	-2.72	-7.89***
99.11-04.02		-0.54	-2.92**
	r^{ST}		
95.04-99.05	rm^{INT}	-3.96**	-3.42**
99.06-04.02		-1.19	-2.99**
95.04-99.06	rm^{ON}	-4.10**	-3.48**
99.07-04.02		-1.18	-2.92**
	r^{OD}		
95.04-99.05	rm^{INT}	-4.45***	-3.42**
99.06-04.02		-1.37	-3.50**
95.04-99.10	rm^{ON}	-3.91**	-3.45**
99.11-04.02		-1.18	-3.10**
	r^{TOP}		
95.04-04.02	rm^{INT}	-1.81	-4.13***
95.04-97.09	rm^{ON}	-3.36*	-7.25***
97.10-04.02		-2.50	-3.39**

[1] With constant and trend in the pre-break period for the level series; with constant only, otherwise.
*,**,***: rejection of the unit root null hypothesis at 10%, 5%, 1% (asymptotic) significance levels.

Figure A1 Italy: Bank Overdrafts as a percentage of Short Term Loans