Ten Years of ECB Activity: Monetary Policy Reaction Functions in the Euro Area

by

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Abstract. We study the conduct of monetary policy in the euro area in the first ten years of activity of the European Central Bank (ECB). This task is accomplished by estimating monetary policy reaction functions. Results show that the central bank has paid attention to both real activity stabilization and control of the inflation rate. Nevertheless, contrary to some recent research, we also find that in the presence of an increase of inflation above the target rate the ECB has moved its nominal interest rates sufficiently enough to increase the real interest rate. These conclusions seem to be robust to alternative choices for the indicator of output gap.

JEL Classification: E5

Keywords: Monetary policy rules; ECB;
1. Introduction

Although the mandate of the European Central Bank (ECB), enshrined in the Maastricht Treaty, gives the central bank the main goal of preserving price stability, some recent studies aiming to estimate monetary policy reaction functions for the Euro area have found, rather unexpectedly, that in the first years of its activity the ECB has put more weight on the stabilization of the real activity with respect to the objective of price stability; also that the central bank has shown a weak reaction to upward movements of inflation above the target. A list of studies showing results along this line includes, among others, Belke and Pollet (2007), Gerdesmeier and Roffia (2003) and Ullrich (2003).

This conclusion appears to be consistent, at least prima facie, with the most recent experience since in the context of a rising rate of inflation, persistently above 2 percent in the euro area and also predicted above the target for the period 2008-2009, the central bank has left the policy rates unchanged. There is little doubt that concerns for the contemporaneous slowdown in economic activity have played a role in shaping the ECB’s conduct.

A well known problem concerning estimates of the reaction functions of monetary policy in the euro area relies on the short period of action of ECB: hence the possibility of curious results due to the small sample of observations available cannot be ruled out. Nevertheless, about ten years have now elapsed since the starting of the ECB’s activity and this period seems long enough to obtain reasonable estimations of monetary policy reaction functions.

In the present paper we assume a forward-looking approach to the conduct of monetary policy by the central bank and, indeed, such an approach has been repeatedly advocated by ECB’s members. In the context of forward-looking approaches, following the work of Clarida et. al. (1998, 2000) the parameters characterizing the monetary policy rule are often estimated by using the generalized method of moments (GMM). However, when using GMM one important problem to be tackled consists in choosing an appropriate set of instruments, where these instruments should reflect exogenous information which is useful for predicting future values of inflation or output gap and is available for the central bank at when the interest rate is set.

As far as the ECB is concerned, according to the emphasis on the role played by the rate of growth of money in shaping the long-run evolution of inflation, a natural candidate for inclusion in the set of instruments is the annual rate of growth of M3 and its lags.

The results obtained in the present paper show that the ECB in the first years of its activity has devoted attention to both the inflation rate and the business cycle of the euro area. However, in contrast with some recent studies we do not find a dominant weight attributed to the stabilization of the real activity with respect to control of the inflation rate. Moreover, and more important, the reaction of the policy rate to movements in inflation is consistent with the so-called Taylor principle i.e., given the estimated parameter, in the presence of an increase in the rate of inflation the ECB may have increased the nominal interest rate by more than one for one so as to induce an upward movement in the real interest rate.

These conclusions seem to exhibit some degree of robustness in relation to alternative measurements of output gap. For, we obtain qualitatively similar results both for an output gap indicator based on the widely used Hodrick-Prescott filter applied to the industrial production of the Euro zone and for a cyclical component of production based on the assumption of a quadratic trend characterizing output dynamics. This last measure of output gap has been used, among others, in Clarida et. al. (2000) in relation to US monthly data.

In section 2 we briefly present the theoretical framework underlying monetary policy rules. In section 3 some basic facts concerning the joint evolution of the short-term interest rate and some key macroeconomic variables, including inflation and output gap, are presented. Section 4 presents empirical estimates of the monetary policy reaction functions for the Euro area, concerning the sample period 1999:1 - 2007:12. Section 5 concludes.
2. Monetary Policy Reaction Functions

The operating instrument of ECB monetary policy is a short-term nominal interest rate. The general assumption concerning policy reaction of central banks is that they establish a target for the nominal interest rate in relation to the state of the economy synthesized, in turn, by a small set of macroeconomic variables. Indeed, in his seminal work Taylor (1993) related the policy rate to the inflation rate and to an indicator of the business cycle conditions (see also Taylor, 1999).

On the other hand, if we follow the statements of the ECB, the set of macroeconomic variables which is relevant for policy decisions in the euro area is not necessarily so small.

Following Clarida et al. (1998, 2000), the target for the short-term nominal interest rate can be expressed by:

\[ i_t = \beta \left( \pi_t + \gamma \left( E[\pi_{t+n}|\Omega_t] - \pi^* \right) \right) \]

where the sum, \( \pi_t + \pi^* \), on the right-hand side represents the nominal interest rate chosen by the central bank in the presence of an alignment for both inflation and output gap to the respective targets. The second term is the difference between expected inflation rate from \( t \) to \( t+n \) and the target rate, \( \pi^* \). At the time of interest rate decisions, i.e. the current period, the information set available for the central bank is given by \( \Omega_t \). The third term is the expected output gap from \( t \) to \( t+q \) and hence \( y \) is a measure of the difference between effective output and its potential level.

The implication of specification [1] is that the central bank sets the interest rate in relation to future values of inflation and output gap. It is worth noticing that this forward-looking strategy of monetary policy has been repeatedly advocated by ECB’s members. The rationale for this approach is founded on the idea that monetary policy interventions exert a lagging influence on the economic system. Moreover, Clarida et al. (2000) maintain that the monetary policy rule expressed by [1] well fits economic systems affected by the presence of nominal rigidities.

Equation [1] is interpreted in the literature as the target rate pursued by the central bank. However, it is also assumed that there is a partial adjustment of the actual rate towards the target. This tendency to smooth changes in interest rates is captured by the following specification of the monetary policy rule:

\[ i_t = \rho i_{t-1} + (1 - \rho) (\pi_t^* + \epsilon_t) \]

where the parameter \( \rho \), comprised between 0 and 1, measures the relevance of interest rate smoothing, whereas \( \epsilon_t \) is an exogenous policy shock.

The final step consists in eliminating the unobserved variables such that the policy rule becomes:

\[ i_t = \rho i_{t-1} + (1 - \rho) (\alpha + \beta \pi_{t+n} + \gamma y_{t+q}) + \eta_t \]

where the unobserved forecast variables are expressed in terms of realized variables and hence the error term \( \eta_t \) represents a linear combination of the forecast errors of the variables included in the monetary policy rule and the exogenous policy shock.

The parameters \( \rho, \alpha, \beta, \gamma \) are estimated by using the generalized method of moments (GMM). To this end, let us indicate with \( u_t \) a vector of variables that are orthogonal to \( \eta_t \) and such that \( u_t \in \Omega_t \). Thus, \( u_t \) may include variables that the central bank, at the time of setting its interest rates, considers useful in forecasting inflation and output (cf. Clarida et al. 2000).

Since the variables included in \( u_t \) are orthogonal to \( \eta_t \), it is therefore possible to exploit the following set of orthogonality conditions:

\[ E[u_t \cdot \left( i_t - \rho i_{t-1} - (1 - \rho) (\alpha + \beta \pi_{t+n} + \gamma y_{t+q}) \right)] = 0 \]

In the presence of a number of orthogonality conditions exceeding the number of parameters, the model is over-identified and it is then possible to test the validity of over-identifying restrictions (see, for example, Favero 2001 chapter 7).

Empirical estimates for the parameter \( \rho \) often show a high value, near one, which is usually interpreted as supporting the existence of a relevant monetary policy inertia in the behaviour of central banks. Following this interpretation, the partial adjustment
mechanism would reflect a deliberate strategy pursued by the central bank aiming to gradually distribute the target changes in the short-term nominal interest rates over a wide temporal horizon (see for example, Goodfriend, 1991).

An opposite view instead is based on the idea that the persistence of the central bank's interest rate is due to the influence of exogenous factors, which come mainly in the form of unexpected movements in the key macroeconomic variables, i.e. inflation and output.

As recently stressed by Rudebusch (2006), in the presence of inertia the policymaker facing an economic recession does not reduce the policy rate aggressively but induces a slow convergence towards the desired level. On the other hand, if a non-inertial behaviour characterizes the policymaker, the response of the interest rate in terms of size changes to the new economic conditions is immediate.

Nevertheless, there is a certain agreement on the existence of a short-run smoothing of interest rates at higher frequency, including monthly frequency. Instead, such a smoothing is questioned at quarterly frequency (cf. Rudebusch, 2006).

Another important problem that we face in estimating reaction functions like [3] is the selection of an indicator for the output gap. The empirical estimates of the present paper are based on two different indicators of the business cycle conditions in the euro area. The first indicator is obtained by applying a quadratic trend to the logarithm of industrial production. More precisely, we select the output gap by extracting the residuals from an OLS regression of output on a constant, a linear trend and a quadratic trend. Although, this choice of the business cycle indicator is of course questionable, since we assume that a deterministic trend affects industrial production, it has become a widely diffused practice following the work by Clarida et al. (2000).

The second indicator selected is instead based on the Hodrick- Prescott trend applied to the series of industrial production. In this case, the output gap is thus obtained as the residual component when the Hodrick-Prescott trend is subtracted from overall output.

3. Basic Facts Concerning Some Key Macroeconomic Variables in the Euro Area

Our empirical investigation is based on monthly data for the Euro area. The sample period covered is 1999:1 - 2007:12. As an indicator of the monetary policy stance, we consider the European overnight rate (Eonia). This series was downloaded from the ECB site. The remaining series were obtained from Eurostat.

The rate of inflation is measured by the year-on-year rate of growth of the harmonized index of consumer prices (HICP). Both the HICP and the industrial production refer to the Euro area. We build two different measures of output gap: the first is based on the assumption of a quadratic trend for the industrial production (Output gap1); the second is a detrended measure of output based on the Hodrick-Prescott filter (Output gap2).

The money growth indicator is given by the annual rate of growth of M3. All monthly series are seasonally adjusted with the exception of the HICP.

Figure 1 and figure 2 show the evolution of the central bank interest rate in relation to some key macroeconomic variables. More precisely, Figure 1 shows the joint evolution of the policy rate (Eonia) and of two distinct indicators of output gap.

The two indicators of the business cycle are correlated and, as far as turning points are concerned, exhibit quite similar properties. Figure 1 also shows that the short-term interest rate has moved in coherence with the business cycle.

Some considerations are also stimulated by inspection of figure 2 in which the central bank interest rate and the inflation rate are displayed. The rate of inflation, measured by the annual rate of change of the HICP, after reaching a peak at the mid of 2001, experienced a decreasing pattern during the period 2002-2003. The short-term nominal interest rate was gradually reduced between the last quarter of 2001 and the end of 2003. This reduction may have reflected both a decrease of inflation below 2 percent and the downturn in the real economy which shows up in the evolution of
the output gap. However, despite an upward tendency shown by inflation from the second quarter of 2004, the ECB kept the interest rate steady for the next couple of years.

A possible explanation of this conduct by the central bank might lie in the bad performances of real economic activity which affected some countries in that period. In particular, it is well known that the German and Italian economies suffered a persistent stagnation after the 2001-2002 recession.

Insert Figure 2 about here

4. Estimated Monetary Policy Reaction Functions for the Euro Area

In the empirical investigation we have to make a choice concerning the forecast horizon for the variables included in the monetary policy rule. We take $n = 12$, the usual choice in the literature, for the inflation rate. As for the output gap we consider, alternatively, $q = 0$ and $q = 3$.

Results concerning the estimated parameters in the forward-looking monetary policy rule [3], when a quadratic trend is assumed for industrial production, are reported in Table 1.

The instrument set adopted includes the constant, the first five lags of the annual inflation rate, the first five lags of the output gap, the first five lags of the interest rate and the first five lags of the annual money growth. The null hypothesis for the validity of instruments is not rejected since the $J$-statistic is distributed as a $\chi^2$ with 17 degrees of freedom and gives a value of 13.9.

We find that the weight given to the output gap is wide and significant. Indeed, this is in line with results obtained in some recent works. As far as the weight attributed by the central bank to inflation is concerned, we find evidence of a stronger response of the short-term interest to an increase in the rate of inflation. Moreover, the estimated coefficient is above one and hence the Taylor principle is satisfied. This last result is, at least partially, in contrast with studies which have recently investigated the monetary policy reaction functions in the euro area. For example, Belke-Polleit (2007) and Gerdesmeier-Roffia (2003) find evidence of an inflation weight less than one and smaller than weight output gap$^1$.

Our estimation also shows that there is evidence of a wide degree of interest rate smoothing in the euro area.

The results presented in Table 2, where a different filter for the industrial production is used, largely confirm the previous conclusion. The Taylor principle is satisfied and the ECB reacts also to the business cycle conditions of euro zone. Choosing $q = 3$ and by using the Hodrick-Prescott trend for output, we have the sole case, among the four different estimations considered, in which a dominant weight to the output gap is attributed by the central bank.

Insert Table 1 about here

Insert Table 2 about here

What is the explanation for the different results obtained in this paper, with respect to some recent studies? A first and natural answer is that we are considering a different sample period which covers around the first ten years of ECB activity. On the other hand, Gerdesmeier and Roffia (2003) estimate alternative monetary policy rules for the period 1985-2002 and hence the specific sub-sample concerning the ECB attains the period 1999-2002. A similar sample period is considered in Ullrich (2003). Instead, the effective period covered by the estimations of Belke and Polleit (2007), who use quarterly data, is 1999:1-2005:2. Thus we were able to include in our estimations the most recent period of action by ECB, which was characterised by a monetary tightening and a persistent increase in the short-term interest rates.

Moreover, we have already stressed that a possible interpretation of the small value of the estimated parameter measuring the reaction of ECB to inflation changes, which

$^1$Nevertheless, it is worth noticing that, given the estimated standard errors, we cannot completely rule out the possibility that the parameter is smaller than one.
is found for the first years of activity, might reflect the willingness of the central bank
to support the real activity in the period 2004-2005.

However, it is worth stressing, that other published works on ECB monetary pol­
icy, including Fourçans and Vranceanu (2004) or Hayo and Hofmann (2006), which
cover the first five years of activity, conclude that the central bank conduct is con­sist­
ent with the Taylor principle since the estimated inflation reaction coefficient is
above one. In particular, Hayo and Hofmann find that on the side of inflation the
ECB monetary policy reaction is similar to that of Bundesbank.2

Notice that all these studies share the conclusion that the output gap reaction
coefficients are significant.

Thus we are led to the second explanation for our results: by inserting in the
instrument set lags of the monetary aggregate, M3, we are considering information
that the central bank regards as useful for predicting the long-term evolution of
inflation and hence in setting the monetary policy interest rate.

5. Conclusion

In this study we have found that a monetary policy rule may characterize the con­
duct of monetary policy in the euro zone. More precisely, in the first ten years of its
activity the ECB, according to the parameter estimates, has attributed importance
to both the stabilization of real activity and to control of inflation. Although estima­tions
show that a pre-eminent role has been given to the stabilization of inflation, a
significant weight to the business cycle emerges.

Contrary to some recent studies concerning the ECB, we have also found that
the central bank has reacted to increases in the inflation rate by moving the nominal
interest rate so as to induce an increase in the real interest rate and hence the conduct
of monetary policy in the euro zone seems to be consistent with the Taylor principle.

The importance attributed to the business cycle is a common conclusion of recent
researches concerning the ECB’s monetary policy conduct. Thus it seems that there
is a gap between the rhetoric, i.e. the continuous emphasis laid by ECB’s members
on the struggle for price stability and the reality, i.e. a close attention which is also
paid to the business cycle conditions. In our opinion this is a question which calls for
further investigation. A possible interpretation for this conduct by the ECB is that the
Governing Council pays a particular attention to the overall economic conditions of
Germany, the most important economy of the euro area, and since Germany suffered
a period of stagnation between 2003 and 2004 the central bank left the policy rate
unchanged, over the period, despite an increase in the inflation rate of the euro zone.

Another, but not completely alternative interpretation, is that for a central bank
stabilization of the real activity is an inevitable component of its activity. Although
the ECB is an independent and authoritative institution, there is a quite natural
dialectical interaction with other institutions of the Euro area. In particular, some
governments have clearly revealed preferences which are skewed towards a dominant
weight given to the fight against recession rather than control of inflation. This likely
reflects the preferences of their citizens. Hence, one might wonder if it is a realistic
possibility for a central bank to ignore such pressures. After all, national governments
have a primary role in selecting the Governing Council’s members.

2 Fourçans and Vranceanu’s estimations cover the period 1999.4 - 2003.10. The authors use, as
indicator of the business cycle conditions, deviations of industrial output growth from an average
growth of 1.4 per cent. As for n they choose n = 6.

In Hayo and Hofmann the output gap is, instead, based on the assumption of a quadratic trend for
industrial production and the sample period covered is 1999.1 - 2003.5. The authors choose n = 12
for the inflation rate and their instrument sets also include the growth rate of M3.
References


Table 1. Monetary policy reaction functions for the euro area. Deterministic trend for industrial production

<table>
<thead>
<tr>
<th>Variable</th>
<th>Parameter</th>
<th>$q = 0$</th>
<th>$q = 3$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lagged interest rate</td>
<td>$\rho$</td>
<td>0.86 (0.03)</td>
<td>0.94 (0.02)</td>
</tr>
<tr>
<td>Constant</td>
<td>$\alpha$</td>
<td>0.83 (0.08)</td>
<td>0.90 (0.09)</td>
</tr>
<tr>
<td>Inflation rate</td>
<td>$\beta$</td>
<td>1.03 (0.26)</td>
<td>1.36 (0.38)</td>
</tr>
<tr>
<td>Output gap</td>
<td>$\gamma$</td>
<td>0.57 (0.10)</td>
<td>0.81 (0.10)</td>
</tr>
<tr>
<td>$R^2$</td>
<td></td>
<td>0.98</td>
<td>0.97</td>
</tr>
<tr>
<td>J-statistic</td>
<td></td>
<td>$x^2_{(17)} = 13.92$</td>
<td>$x^2_{(17)} = 12.47$</td>
</tr>
<tr>
<td>(H0: validity of instruments)</td>
<td></td>
<td>$p &gt; 0.50$</td>
<td>$p &gt; 0.75$</td>
</tr>
</tbody>
</table>

Notes: The numbers in parentheses are standard errors. GMM for estimation is utilized. The sample period covered is 1999:1 - 2007:12. The instrument list includes the constant, the first five sample lags of the short-term interest rate, the inflation rate, the output gap and the annual rate of growth of money. Thus, the effective sample used for estimation is 1999:6 - 2006:12. Output gap is the business cycle indicator obtained by extraction of residuals from the application of a quadratic trend to industrial production.
Table 2. Monetary policy reaction functions for the euro area. Hodrick-Prescott trend for industrial production.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Parameter</th>
<th>$q = 0$</th>
<th>$q = 3$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lagged interest rate</td>
<td>$\rho$</td>
<td>0.95 (0.02)</td>
<td>0.93 (0.01)</td>
</tr>
<tr>
<td>Constant</td>
<td>$\alpha$</td>
<td>-1.20 (2.20)</td>
<td>0.02 (1.57)</td>
</tr>
<tr>
<td>Inflation rate</td>
<td>$\beta$</td>
<td>2.04 (0.82)</td>
<td>1.28 (0.71)</td>
</tr>
<tr>
<td>Output gap2</td>
<td>$\gamma$</td>
<td>1.21 (0.22)</td>
<td>1.65 (0.17)</td>
</tr>
<tr>
<td>$R^2$</td>
<td></td>
<td>0.98</td>
<td>0.97</td>
</tr>
<tr>
<td>J-statistic</td>
<td></td>
<td>$\chi^2_{(30)} = 12.74$</td>
<td>$\chi^2_{(30)} = 11.83$</td>
</tr>
</tbody>
</table>

(Notes: The numbers in parentheses are standard errors. GMM for estimation is utilized. The sample period covered is 1999:1 - 2007:12. The instrument list includes the constant, the first four lags of the output gap, the first five lags of the short-term interest rate, the inflation rate and the annual rate of growth of money. The effective sample used for estimation is 1999:6 - 2006:12. Output gap2 is a business cycle indicator obtained from application of the Hodrick-Prescott trend to industrial production.)

Figure 1. Euro area economic data: short-term nominal interest rate and alternative indicators of output gap.
Figure 2. Euro area economic data: short-term nominal interest rate and HICP inflation.
183. Luigi Biagi [1995] “Demand and presented macroeconomic” pp. 21
201. Luigi Biagi [1995] “Demand and presented macroeconomic” pp. 21
206. Luigi Biagi [1995] “Demand and presented macroeconomic” pp. 21
210. Luigi Biagi [1995] “Demand and presented macroeconomic” pp. 21
211. Mario Forni e Laura Rischiati [1996] “Risk and potential insurance in Europe” pp. 35
214. Luigi Biagi [1995] “Demand and presented macroeconomic” pp. 21
218. Luigi Biagi [1995] “Demand and presented macroeconomic” pp. 21
222. Luigi Biagi [1995] “Demand and presented macroeconomic” pp. 21
397
pp. 38
Modena
delle relazioni tra le imprese metalmeccaniche nella provincia di Elena
Distribuzioni degli addetti e pesi per le stime dei Anna Maria Sala (2001]
Claudio Marra (2001]
Paolo dell'allargamento dell'unione europea ad Est
Italian Luca Gambetti e Barbara
Screening: A
all'infanzia in
reddito di impresa: una valutazione delle recenti innovazioni Silvia
Giuseppe Marotta
ed assistenza: riforme in
di sussistenza nelle carte dell'archivio di Antonio Ribba
Antonella
Fattori "Marchio Magiulli Moggia (2001)
pp. 46
di Modena. Margherita Russo e Elena

Antenore Pizzolo (2002) "Un approccio macromacronomico ad uno
zaino di vitale mole" pp.
Patrizia Rossi (2003) "Polizia dei redditi e riforma del Wellness" pp. 18
Silvia Lella (2003) "Strategia di ripetizione dei fondi di investimento e teoria del lancio" pp.27
Carlo Alboni Maga (2003) "Cost, Quality and Counterfeiting Conditionabilities" pp. 30
Silvia Lella (2003) "Il diritto dell'indagine nelle condizioni economiche e sociali della famiglia nella Provincia di Modena" pp. 47
Gian Rici e Silvia Lella (2003) "Organizzazione e valorizzazione della ditta nella Facoltà di Economia e Commercio" pp. 40
Paolo di Bari (2003) "La politica e la gestione dei fondi di trasferimento della tecnologia. L'esempio di Case Study" pp. 31
Antonio Rinaldi e Michelangelo Picchio (2002) "Un recente sviluppo dell'architettura dei modelli finanziari per il settore agricolo" pp. 26
Michele Mazzaferro (2003) "L'applicazione dell'Ise nell'erogazione di prestazioni sociali agevolate" pp. 15
Silvia Muzzioli (2002) "Opzione Fulfilled" pp. 44

Mario Marotta, Silvia Muzzioli (2002) "La prevenzione di infezioni tra i lavoratori extracomunitari" pp.45

Maria Rita Celatello e Anna Maria Sala (2002) "Riforme in
economia e politica pubblica" pp. 16
Gian Rici e Silvia Lella (2003) "Organizzazione e valorizzazione della ditta nella Facoltà di Economia e Commercio" pp. 40
Paolo di Bari (2003) "La politica e la gestione dei fondi di trasferimento della tecnologia. L'esempio di Case Study" pp. 31
Antonio Rinaldi e Michelangelo Picchio (2002) "Un recente sviluppo dell'architettura dei modelli finanziari per il settore agricolo" pp. 26
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Gian Rici e Silvia Lella (2003) "Organizzazione e valorizzazione della ditta nella Facoltà di Economia e Commercio" pp. 40
Paolo di Bari (2003) "La politica e la gestione dei fondi di trasferimento della tecnologia. L'esempio di Case Study" pp. 31
Antonio Rinaldi e Michelangelo Picchio (2002) "Un recente sviluppo dell'architettura dei modelli finanziari per il settore agricolo" pp. 26
Michele Mazzaferro (2003) "L'applicazione dell'Ise nell'erogazione di prestazioni sociali agevolate" pp. 15
Silvia Muzzioli (2002) "Opzione Fulfilled" pp. 44

Mario Marotta, Silvia Muzzioli (2002) "La prevenzione di infezioni tra i lavoratori extracomunitari" pp.45

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economia e politica pubblica" pp. 16
Gian Rici e Silvia Lella (2003) "Organizzazione e valorizzazione della ditta nella Facoltà di Economia e Commercio" pp. 40
Paolo di Bari (2003) "La politica e la gestione dei fondi di trasferimento della tecnologia. L'esempio di Case Study" pp. 31
Antonio Rinaldi e Michelangelo Picchio (2002) "Un recente sviluppo dell'architettura dei modelli finanziari per il settore agricolo" pp. 26
Michele Mazzaferro (2003) "L'applicazione dell'Ise nell'erogazione di prestazioni sociali agevolate" pp. 15
Silvia Muzzioli (2002) "Opzione Fulfilled" pp. 44

Mario Marotta, Silvia Muzzioli (2002) "La prevenzione di infezioni tra i lavoratori extracomunitari" pp.45

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economia e politica pubblica" pp. 16
Gian Rici e Silvia Lella (2003) "Organizzazione e valorizzazione della ditta nella Facoltà di Economia e Commercio" pp. 40
Paolo di Bari (2003) "La politica e la gestione dei fondi di trasferimento della tecnologia. L'esempio di Case Study" pp. 31
Antonio Rinaldi e Michelangelo Picchio (2002) "Un recente sviluppo dell'architettura dei modelli finanziari per il settore agricolo" pp. 26
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