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Effects of ECB Monetary Policy: Differences in Policy Interest Rates

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This article examines the effects of the European Central Bank's (ECB's) monetary policy on the economy in the Euro area. Existing studies have not conclusively determined whether the effects of the policy are large or small, effective or ineffective. Also, the difference between policy interest rate increases and decreases has not been fully studied. Using two types of VAR models, this article shows that, as expected, the ECB's monetary policy designed to boost the economy is effective in inflation stabilization, depreciation of the euro, and production improvement. Also, the impact of policy interest rate increases on inflation rate is negative (i.e., effective). However, the results of other cases are not clear empirically. To maintain price stability is the ECB's primary objective, so it can be concluded that the ECB in general has conducted monetary policy successfully.

Keywords: *ECB, Monetary Policy, Price, Shock*

Introduction

The goal of European Economic and Monetary Union (EMU), which was enacted in 1992 by the Maastricht Treaty, was to accomplish stage 3 of the currency unification process. Eleven countries introduced the euro initially while still using their national currency (e.g., the German marc and French franc). The successful adoption of the euro seemed to result from careful and sufficient preparation as well as economic convergence achieved by

economic policies and each country's efforts since the early 1990s. These policies could have achieved several economic conditions, including inflation, interest rate, exchange rate, and public deficit and debt. Since the introduction of the euro in 1999, the Euro area has sometimes experienced severe economic conditions. First, the Euro area was influenced significantly by contagion from the U.S. subprime problem with other areas and countries (e.g., Asian countries such as Japan in 1998). Next, large public deficits and debt, as in Greece, dampened output, created huge financial market tensions, and affected growth in the Euro area [1].

The ECB and national central banks together made the Euro area into the Eurosystem. The main mission of the Eurosystem is to maintain price stability. The ECB thinks that price stability achieves good economic performance and employment, which has been an important problem in some European countries. The ECB's governing council has defined price stability as a year-on-year increase in the Harmonized Index of Consumer Prices (HICP) of less than 2%.

In policy development, central banks should understand the transmission mechanism of monetary policy as having a desirable effect, including on inflation. However, the transmission mechanism should be sometimes examined for long, changeable, and uncertain lags, so it is difficult to manage this process in general. Also macroeconomic variables other than inflation should not be ignored.

According to the ECB homepage, that organization emphasizes transparency, which means that the central bank provides the general public and the markets with all relevant information about its strategy, assessments, and policy decisions as well as its procedures in an open, clear, and timely manner. Evaluations of economic performance related to monetary policy in the Euro area should take into account this transparency. This article focuses on the effects of the ECB's monetary policy on the real economy in the Euro area. Most studies have shown that the effects of so-called unexpected policy are relatively small [2,3,4,5,6,7]. However, [7] showed that effects of the Federal Open Market Committee (FOMC) monetary policy are larger than those shown in existing studies. [8] Showed empirically that anticipated and unanticipated monetary and fiscal shocks had no significant effect on real output in Nigeria. [9] Found that, in Canada, the impact of stock prices on domestic contractionary monetary

policy is both small and short, whereas in the United States, the impact of stock prices under a similar policy is relatively large and long.

[10] Used a structural vector autoregressive (SVAR) model and long-term restrictions for Romanian indicators. [11] Showed empirical results from the U.S. interest rate term structure that support the hypothesis that differing term structure responses are reactions to different types of monetary policy. [12] Showed that in the United States, monetary policy depends on the inflation level. [13] Showed that the effects of unanticipated monetary policy on real estate investment trust (REIT) are asymmetric between high- and low-variance cases. [14] Found that impulse responses of macroeconomic indicators of the economy produced the greatest changes in the transmission of unanticipated monetary policy occurred for GDP, investment, exchange rates, and money. [15] Showed that as much as half of the variability in output was caused by monetary policy. [16] Suggested that output responds negatively to monetary policy in Pakistan. [17] Showed that Cholesky-VARs may strongly dampen the welfare costs as a result of macroeconomic fluctuations. [18] Denoted that off-balance-sheet banking reduces the effectiveness of the bank lending process relative to monetary transmission. [19] Found with the use of high frequency identification, shocks that occurred as external instruments caused responses in output and inflation that were consistent with those obtained in the standard monetary VAR analysis. This study also found that monetary policy impacts typically produced modest movements in short rates that lead to large movements in credit costs and economic activity. [20] found that the impact of monetary policy on output varied disproportionately with the size of the monetary policy shock once the threshold was estimated. [21] showed that interest rates and market-based measures of monetary policy shocks responded simultaneously to news rather than simply news about monetary policy conductions. [22] found that a delayed overshooting pattern for three currency exchange rates examined (sterling/yen, yen/mark, and mark/sterling) showed an unexpected U.S. monetary policy change, which in turn produced excess returns. [23] showed that the typical size of a risk premium shock made it almost impossible for the interest rate policy to smooth the exchange rate with the aim of minimizing inflationary pressures. Low inflation may decrease the exchange rate pass-through, which allowed the monetary policy to ignore exchange rate shocks in the Czech Republic,

Hungary, and Poland. [24] found that exchange rate shocks had an important role in explaining short-run fluctuations of prices and output.

This article examines the impacts of monetary policy of ECB on the real economy in the Euro area. Some articles have examined this relationship; however, only a few articles have focused specifically on the Euro area. One reason is that only a short time has passed since the introduction of the euro. Data availability may be one reason. On the other hand, the Euro area has experienced severe economic conditions and financial crisis. The number of the countries in the euro area has been expanding and there are some candidate countries for participation in the area. Examination of the ECB's monetary policy has become increasingly important. Among the monetary policies, this article focuses on the rise and fall of the policy interest rate. As far as I know, no articles have examined this specific issue; however, there may be some possibility of asymmetric effects on the economy.

This article is structured as follows. Following this section, section 2 reviews the ECB's monetary policy. Section 3 provides theoretical method to examine the monetary policy for the Euro area, provides an empirical analysis, and analyzes the results. Finally, this article ends with a brief summary.

ECB's monetary policy decisions

The ECB's governing council has sole responsibility for monetary policy in the Euro area. The Council determined that 11 EU countries had achieved the convergence criteria and could adopt the euro on 1 January 1999. In 1999, the ECB began to conduct monetary policy decisions.

The governing council of the ECB usually meets twice a month to make decisions. At its first meeting each month, the council examines the economic and monetary situation and makes policy decisions. Table 1 shows monetary policy decisions as of the year of 1999. Only the cases in which changes occurred are listed in the Table 1.

Table 1: Monetary policy decisions by the ECB

Date	Interest Rate on Main Refinancing Operations	Interest Rate on Marginal Lending Facility	Interest Rate Deposit Facility	Longer-Term Refinancing Operations
8 Apr 1999	↓	↓	↓	
21 Oct 1999				*
4 Nov 1999	↑	↑	↑	
20 Jan 2000				*
3 Feb 2000	↑	↑	↑	
27 Apr 2000	↑	↑	↑	
8 Jun 2000	↑	↑	↑	*
21 Jun 2000				*
31 Aug 2000	↑	↑	↑	
5 Oct 2000	↑	↑	↑	
4 Jan 2001				*
10 May 2001	↓	↓	↓	

30 Aug 2001	↓	↓	↓	
17 Sept 2001	↓	↓	↓	
8 Nov 2001	↓	↓	↓	
8 Nov 2001	↓	↓	↓	
5 Dec 2002	↓	↓	↓	
6 Mar 2003	↓	↓	↓	
5 Jun 2003	↓	↓	↓	
1 Dec 2005	↑	↑	↑	
2 Mar 2006	↑	↑	↑	
8 Jun 2006	↑	↑	↑	
3 Aug 2006	↑	↑	↑	
5 Oct 2006	↑	↑	↑	
7 Dec 2006	↑	↑	↑	
8 Mar 2007	↑	↑	↑	
6 Jun 2007	↑	↑	↑	
3 Jul 2008	↑	↑	↑	
8 Oct 2008	↓	↓	↓	

6 Nov 2008	↓	↓	↓	
4 Dec 2008	↓	↓	↓	
15 Jan 2009	↓			
5 Mar 2009	↓	↓	↓	
2 Apr 2009	↓	↓	↓	
7 May 2009	↓	↓		
7 Apr 2011	↑	↑	↑	
7 Jul 2001	↑	↑	↑	
3 Nov 2011	↓	↓	↓	
8 Dec 2011	↓	↓	↓	
5 Jul 2012	↓	↓	↓	
2 May 2013	↓	↓		
7 Nov 2013	↓	↓		

Note. ↑ denotes an increase; ↓ denotes a decrease. * means the conducted ones.

Policy decisions are announced at a press conference held shortly after the first meeting of the month. This study uses these announcements as market shocks.

Estimation of the effects of monetary policy

ECB monetary policy

This article employs VARs to examine the nature and extent of the effects of ECB monetary policy on macroeconomic variables. Recently, VARs have been used for estimation in many cases. The method employed here is mainly used to forecast systems of interrelated time series and to analyze the dynamic impact of random disturbances on the employed variables. Empirical estimation and interface are complicated by the fact that endogenous variables may appear on both the left and right sides of equations. The simultaneous use of VAR can avoid these problems. The macroeconomic variables are structurally correlated with different possible lags. Therefore, a VAR model is used to examine the data to avoid this issue.
This article employs VAR, then assesses the effects of monetary policy shocks via regressions of each macroeconomic variable on lags of itself and lags of the policy shock based on [7].

$$\Delta xt = c + \sum_{i=1}^{I} \alpha i \Delta xt - i + \sum_{j=1}^{J} \beta j \varepsilon t - j + vt \qquad (1)$$

where x is the macroeconomic variable and ε is their measure of monetary policy shocks. The impulse responses of Harmonized Index of Consumer Prices (CPI), exchange rate (euro/dollar), industrial production, interest rate (main refinancing operations' fixed rate), unemployment, and prices to the policy are examined using equation (1).

Time lag is set to two because of AIC and SIC. The sample period is from 1999Q1 to 2013Q4. The data are quarterly. In 1999, the common currency (i.e., the euro) was introduced. All of the data are from International Financial Statistics (IMF). The results are shown in Table 2 and Fig. 1.

Table 2: VAR analysis of the ECB's monetary policy and the real economy

	CPI	EXC	IND	INT	UNE
CPI(-1)	0.402880	1.85E-05	0.278870	-0.006092	0.020280
	(0.11870)	(0.00819)	(0.34625)	(0.06579)	(0.03052)
	[3.39400]	[0.00226]	[0.80540]	[-0.09260]	[0.66445]

CPI(-2)	0.581715	-0.000816	-0.308286	-0.011340	-0.012317
	(0.11802)	(0.00814)	(0.34425)	(0.06541)	(0.03035)
	[4.92909]	[-0.10023]	[-0.89554]	[-0.17336]	[-0.40590]
EXC(-1)	0.237473	0.973578	-7.270535	-0.752073	0.703101
	(2.04261)	(0.14092)	(5.95816)	(1.13210)	(0.52521)
	[0.11626]	[6.90889]	[-1.22026]	[-0.66432]	[1.33869]
EXC(-2)	0.737357	-0.214406	9.692368	1.015822	-0.475723
	(1.82264)	(0.12574)	(5.31652)	(1.01018)	(0.46865)
	[0.40455]	[-1.70513]	[1.82306]	[1.00558]	[-1.01508]
IND(-1)	0.197632	-0.008441	1.192217	0.038128	-0.019859
	(0.07157)	(0.00494)	(0.20875)	(0.03966)	(0.01840)
	[2.76155]	[-1.70962]	[5.71116]	[0.96125]	[-1.07920]
IND(-2)	-0.117821	0.003981	-0.303381	-0.023963	0.021360
	(0.06516)	(0.00450)	(0.19007)	(0.03612)	(0.01675)
	[-1.80813]	[0.88546]	[-1.59614]	[-0.66351]	[1.27482]
INT(-1)	-0.554849	0.070188	-0.797508	1.132309	-0.015722
	(0.31582)	(0.02179)	(0.92122)	(0.17504)	(0.08121)
	[-1.75686]	[3.22141]	[-0.86571]	[6.46887]	[-0.19361]
INT(-2)	0.376275	-0.043151	-0.384040	-0.339578	0.013754
	(0.33271)	(0.02295)	(0.97049)	(0.18440)	(0.08555)
	[1.13094]	[-1.87997]	[-0.39572]	[-1.84151]	[0.16077]
UNE(-1)	0.176139	0.023750	-3.545062	-0.542329	1.632485
	(0.61514)	(0.04244)	(1.79432)	(0.34094)	(0.15817)
	[0.28634]	[0.55965]	[-1.97571]	[-1.59071]	[10.3211]
UNE(-2)	-0.196393	-0.004625	2.757438	0.498700	-0.676656
	(0.56843)	(0.03921)	(1.65806)	(0.31504)	(0.14616)
	[-0.34550]	[-0.11793]	[1.66305]	[1.58295]	[-4.62961]
C	-5.743150	0.486043	21.89038	1.019809	-0.734362
	(3.12882)	(0.21585)	(9.12656)	(1.73412)	(0.80451)
	[-1.83556]	[2.25174]	[2.39854]	[0.58809]	[-0.91281]
R-squared	0.997787	0.958983	0.933128	0.975557	0.992300

Adj. R-squared	0.997316	0.950256	0.918900	0.970356	0.990661
Sum sq. resids	10.29966	0.049020	87.63461	3.163874	0.680965
S.E. equation	0.468126	0.032295	1.365491	0.259454	0.120369
F-statistic	2119.212	109.8875	65.58379	187.5838	605.6533
Log likelihood	-32.17680	122.9045	-94.26769	2.052297	46.59749
Akaike AIC	1.488855	-3.858776	3.629920	0.308541	-1.227500
Schwarz SC	1.879629	-3.468002	4.020694	0.699315	-0.836726
Mean dependent	102.8277	0.839755	98.76860	2.239968	9.235056
S.D. dependent	9.036357	0.144801	4.794894	1.506935	1.245566

Note. Standard errors are in parentheses and t-statistics are in square brackets.

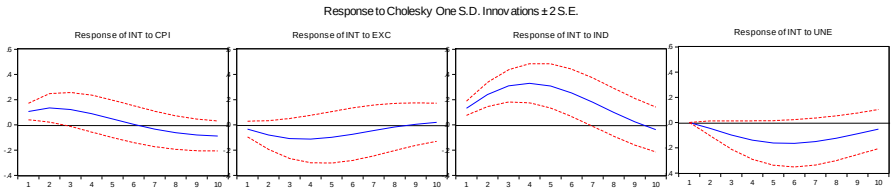

Figure 1: Impulse response of ECB's monetary policy and the real economy

If policy interest rates rise, inflation goes down after a one-quarter time lag. The main reason may be that serious deflation has been ongoing in the Euro area. The pressure of decreasing prices has been strong in the Euro area. That effect continues long and strongly after the change in interest rates. Also, the rise in policy interest rates causes appreciation of the euro as usual; however, depreciation occurs after some time passes, but the effect does not continue successfully for long. Most developed countries try to depreciate their own countries to promote exports and thus induce economic growth, so the effect weakens. The effects of interest rates on production are well understood; however, there are no notable effects on unemployment. The reason is ambiguous; however, there are large differences of economic conditions among countries, which cause unclear effects. The relationship between production and employment may exist; however, there appear to be differences among countries in time and term period.

In addition to this equation, [8] considered a hybrid approach. In place of the federal fund rate in the United States, the researchers substituted the cumulative sum of their monetary shocks. The advantage of

this method is increased ability to identify the effects of monetary policy than in the usual VARs, given that the measure controls were used in [8] for much of the endogenous fluctuations in the interest rate as well as the Fed's information set, while simultaneously estimating the joint dynamics of economic variables, including controlling for common prices.

However, the shocks overstate the degree of monetary policy changes by not controlling adequately for the endogenous market-based fluctuations in policy interest rates. To measure this possibility, monetary policy is regressed by current and lagged macroeconomic variables [25].

$$\varepsilon t = c + \sum_{i=1}^{I} \alpha i x t - i + vt \qquad (2)$$

Under the null that the monetary policies are endogenous [8], they should be unpredictable using lagged macroeconomic variables. Equation (2) includes contemporaneous values of macroeconomic variables to be consistent with the restrictions imposed in normal VARs and in single equations such as (1). Table 3 reports among the F-statistics for the null that all of the αs are equal to zero using the changes in industrial production, unemployment rate, and inflation rate as regressors. Over the sample period, I cannot reject the null of exogeneity of shocks. These results show that the shocks discussed in [8] do not contain elements of endogenous responses to macroeconomic conditions.

Table 3: Probability of [8] shocks (F-statistics)

Inflation	1.12
Changes in industrial production	1.05
Unemployment	1.02

The difference in policy interest rate up and down changes

The effects on the macro economy may not be asymmetry as indicated by increases and decreases in policy interest rates, which are examined separately. The results are shown in Table 4/Fig. 2 (up cases) and Table 5/Fig. 3 (down cases).

Table 4: The up case

	POLICY1	CPI	EXC	IND	UNE
POLICY1(-1)	0.720927	-0.451227	-0.009714	0.210807	-0.063460
	(0.15272)	(0.28042)	(0.01978)	(0.76403)	(0.06596)
	[4.72063]	[-1.60914]	[-0.49108]	[0.27592]	[-0.96210]
POLICY1(-2)	-0.050884	0.393736	-0.003811	1.708943	-0.129146
	(0.15651)	(0.28737)	(0.02027)	(0.78298)	(0.06760)
	[-0.32512]	[1.37013]	[-0.18799]	[2.18261]	[-1.91055]
CPI(-1)	-0.097206	0.411095	-0.001317	0.507979	-0.001272
	(0.06578)	(0.12078)	(0.00852)	(0.32909)	(0.02841)
	[-1.47775]	[3.40359]	[-0.15455]	[1.54360]	[-0.04478]
CPI(-2)	0.075132	0.565893	0.000683	-0.584337	0.013088
	(0.06619)	(0.12154)	(0.00857)	(0.33116)	(0.02859)
	[1.13503]	[4.65593]	[0.07969]	[-1.76453]	[0.45779]
EXC(-1)	0.389390	1.018075	0.995093	-8.360666	0.883601
	(1.13839)	(2.09027)	(0.14745)	(5.69521)	(0.49168)
	[0.34205]	[0.48705]	[6.74845]	[-1.46802]	[1.79711]
EXC(-2)	-0.679319	0.057450	-0.227441	9.763210	-0.547287
	(1.01033)	(1.85512)	(0.13087)	(5.05451)	(0.43637)
	[-0.67237]	[0.03097]	[-1.73796]	[1.93158]	[-1.25419]
IND(-1)	-0.017957	0.182252	-0.009778	1.354470	-0.037138
	(0.04062)	(0.07458)	(0.00526)	(0.20321)	(0.01754)
	[-0.44207]	[2.44359]	[-1.85854]	[6.66530]	[-2.11689]
IND(-2)	0.030913	-0.097628	0.005087	-0.416330	0.034290
	(0.03680)	(0.06758)	(0.00477)	(0.18412)	(0.01590)
	[0.83995]	[-1.44470]	[1.06715]	[-2.26118]	[2.15723]
INT(-1)	-0.007442	-0.538056	0.078788	-2.074460	0.110353
	(0.19019)	(0.34922)	(0.02464)	(0.95149)	(0.08214)
	[-0.03913]	[-1.54074]	[3.19819]	[-2.18022]	[1.34341]

INT(-2)	-0.114804	0.269586	-0.052801	0.798507	-0.111668
	(0.20094)	(0.36896)	(0.02603)	(1.00528)	(0.08679)
	[-0.57133]	[0.73066]	[-2.02865]	[0.79432]	[-1.28668]
UNE(-1)	-0.236879	0.093132	0.010457	-1.733785	1.448027
	(0.35513)	(0.65208)	(0.04600)	(1.77667)	(0.15338)
	[-0.66702]	[0.14282]	[0.22733]	[-0.97586]	[9.44058]
UNE(-2)	0.227590	-0.154253	0.006027	1.236552	-0.524392
	(0.32359)	(0.59416)	(0.04191)	(1.61886)	(0.13976)
	[0.70333]	[-0.25961]	[0.14381]	[0.76384]	[-3.75210]
C	1.716222	-4.929086	0.516215	19.56191	-0.429966
	(1.72236)	(3.16254)	(0.22310)	(8.61671)	(0.74390)
	[0.99643]	[-1.55859]	[2.31387]	[2.27023]	[-0.57799]
R-squared	0.697626	0.997915	0.959601	0.945039	0.993930
Adj. R-squared	0.616993	0.997360	0.948828	0.930383	0.992311
Sum sq. resids	2.877766	9.702336	0.048282	72.02590	0.536823
S.E. equation	0.252884	0.464336	0.032756	1.265139	0.109222
F-statistic	8.651863	1795.190	89.07364	64.48003	613.9940
Log likelihood	4.801002	-30.44422	123.3444	-88.57933	53.49493
Akaike AIC	0.282724	1.498077	-3.804979	3.502736	-1.396377
Schwarz SC	0.744548	1.959900	-3.343156	3.964559	-0.934554
Mean dependent	0.206897	102.8277	0.839755	98.76860	9.235056
S.D. dependent	0.408619	9.036357	0.144801	4.794894	1.245566

Note. Standard error is given in parentheses and t-statistics are given in square brackets.

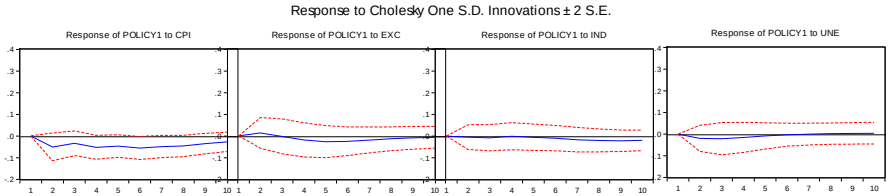

Figure 2: The up case

It is sufficient to conclude that the impact of policy interest rate rises on inflation rate is negative (i.e., effective). However, the results of other cases are not clear. For example, policy interest rate increases causes

exchange rate depreciations that are counter expectations; however, the impact does not continue.

Table 5: The down case

	POLICY2	CPI	EXC	IND	UNE
POLICY2(-1)	0.172653	-0.046740	0.012373	-1.020773	0.070413
	(0.15211)	(0.18154)	(0.01250)	(0.51265)	(0.04541)
	[1.13502]	[-0.25746]	[0.99008]	[-1.99115]	[1.55061]
POLICY2(-2)	-0.093274	-0.173289	0.003742	0.023238	0.045845
	(0.16252)	(0.19396)	(0.01335)	(0.54772)	(0.04852)
	[-0.57393]	[-0.89343]	[0.28025]	[0.04243]	[0.94495]
CPI(-1)	-0.019677	0.410045	-0.001696	0.418909	0.010416
	(0.10279)	(0.12267)	(0.00844)	(0.34641)	(0.03068)
	[-0.19144]	[3.34265]	[-0.20088]	[1.20929]	[0.33945]
CPI(-2)	0.057979	0.579566	0.000487	-0.421561	-0.005330
	(0.10154)	(0.12118)	(0.00834)	(0.34221)	(0.03031)
	[0.57099]	[4.78254]	[0.05836]	[-1.23188]	[-0.17584]
EXC(-1)	-1.253809	0.305649	0.983651	-8.323107	0.744038
	(1.74282)	(2.07998)	(0.14318)	(5.87364)	(0.52027)
	[-0.71941]	[0.14695]	[6.86999]	[-1.41703]	[1.43010]
EXC(-2)	1.960117	0.801407	-0.224204	10.44431	-0.535652
	(1.54964)	(1.84942)	(0.12731)	(5.22258)	(0.46260)
	[1.26489]	[0.43333]	[-1.76108]	[1.99984]	[-1.15791]
IND(-1)	-0.086426	0.197732	-0.007650	1.120540	-0.015835
	(0.06172)	(0.07366)	(0.00507)	(0.20800)	(0.01842)
	[-1.40035]	[2.68448]	[-1.50875]	[5.38720]	[-0.85947]
IND(-2)	0.063246	-0.122812	0.003770	-0.273975	0.021056
	(0.05576)	(0.06654)	(0.00458)	(0.18791)	(0.01664)
	[1.13430]	[-1.84558]	[0.82309]	[-1.45799]	[1.26502]
INT(-1)	0.373416	-0.691362	0.074776	-0.927513	0.028776
	(0.29437)	(0.35132)	(0.02418)	(0.99209)	(0.08788)

	[1.26851]	[-1.96789]	[3.09196]	[-0.93490]	[0.32745]
INT(-2)	-0.083998	0.549748	-0.052709	0.117949	-0.061826
	(0.32234)	(0.38470)	(0.02648)	(1.08634)	(0.09623)
	[-0.26059]	[1.42904]	[-1.99039]	[0.10857]	[-0.64252]
UNE(-1)	0.202080	0.183315	0.022362	-3.434614	1.624290
	(0.52184)	(0.62279)	(0.04287)	(1.75870)	(0.15578)
	[0.38725]	[0.29434]	[0.52162]	[-1.95293]	[10.4268]
UNE(-2)	-0.066658	-0.184069	-0.006027	2.858434	-0.685718
	(0.48225)	(0.57554)	(0.03962)	(1.62527)	(0.14396)
	[-0.13822]	[-0.31982]	[-0.15211]	[1.75875]	[-4.76320]
C	-3.828936	-6.094674	0.504063	20.99489	-0.588088
	(2.67135)	(3.18814)	(0.21946)	(9.00296)	(0.79746)
	[-1.43333]	[-1.91167]	[2.29679]	[2.33200]	[-0.73745]
R-squared	0.410037	0.997830	0.959961	0.938552	0.992855
Adj. R-squared	0.252714	0.997252	0.949284	0.922166	0.990950
Sum sq. resids	7.089724	10.09815	0.047851	80.52652	0.631806
S.E. equation	0.396925	0.473712	0.032609	1.337714	0.118491
F-statistic	2.606334	1724.678	89.90956	57.27746	521.1250
Log likelihood	-21.34633	-31.60380	123.6044	-91.81460	48.77043
Akaike AIC	1.184356	1.538062	-3.813944	3.614297	-1.233463
Schwarz SC	1.646180	1.999885	-3.352121	4.076120	-0.771640
Mean dependent	0.293103	102.8277	0.839755	98.76860	9.235056
S.D. dependent	0.459161	9.036357	0.144801	4.794894	1.245566

Note. Standard errors are shown in parentheses and t-statistics are shown in square brackets.

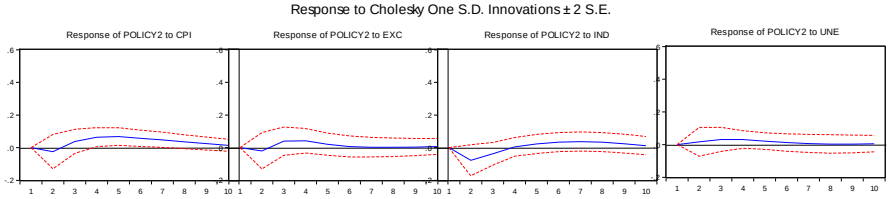

Figure 3: The down case

For inflation rate, the impact of policy rate decreases on inflation rate is positive as expected. The policy seems effective. Also, policy interest rate declines cause exchange rate depreciation as expected. The impact of

industrial production is positive as expected and the effect continues for some time. However, the effect on unemployment is unclear. For these cases, the impact of a policy interest rate decrease is more effective than fore increases in the policy interest rate.

Conclusions

This article examined the effects of the ECB's monetary policy on the real economy in the Euro area. The monetary policy of ECB to boost the Euro area has been somewhat effective in stabilizing inflation, causing depreciation of the euro, and improving industrial production as expected. Also interest rate increases caused inflation declines, so this measure has been effective. To maintain price stability is the primary objective of the ECB, so it is possible to conclude that the ECB has successfully conducted monetary policy.

Most European countries suffer deflation, which causes some serious problems, such as unemployment. Much more monetary easing may be necessary as strong fiscal policy would be impossible because of serious budget constraints. However, interest rates in the Euro area have been almost zero, so in reality, changes in monetary policy and their effect may have very little impact. Also, the monetary policy shock that differs from market expectations and the effects of monetary policy announcements on the economy should be taken into account. Moreover, the effects of the monetary policies of other countries may have affected the Euro area. Further study is necessary.

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