



MACRO ECONOMIC EFFECTS OF THE EUROPEAN CENTRAL BANK'S ASSET PURCHASE PROGRAMS
OPINIONS OF TEACHER CANDIDATES ON THE USE OF ANALYTICAL STORY IN SOCIAL STUDY TEACHING

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ABSTRACT

The fact that the effects of the European Debt Crisis in the Eurozone countries in the period 2008/2009 were much greater than the previous financial and economic crises, forced the European Central Bank to take very different measures than the traditional monetary policies followed by increasing the amount of money and lowering interest rates. In this context, the European Central Bank tried to increase the efficiency of the monetary transmission mechanism by announcing asset purchase programs and to compensate for the negative consequences of the financial crisis on the real economy. In the study, the effects of asset purchase programs on the variables of average inflation, GDP growth, interest rates, unemployment, and employment rates in the Eurozone member countries for the period 2009:5-2020:11 were investigated. Accordingly, it was observed that the biggest macroeconomic effects of the European Central Bank's asset purchase programs in the Eurozone were unemployment rates, employment rates, GDP, interest rates and inflation rates in the long run, respectively. It was found that the unconventional monetary policies implemented by the European Central Bank through asset purchase programs were effective in reducing long-term unemployment rates and increasing employment rates and GDP in the Eurozone.

ÖZET

Euro bölgesi ülkelerinde 2008/2009 döneminde görülen Avrupa Borç Krizinin etkilerinin önceki finansal ve ekonomik krizlere göre çok daha büyük ve yaygın olması, Avrupa Merkez Bankasını para miktarını artırarak ve faiz oranlarını düşürerek izlenen geleneksel para politikalarından çok daha farklı önlemler almak zorunda bırakmıştır. Bu bağlamda Avrupa Merkez Bankası, varlık satın alma programları açıklarak parasal aktarım mekanizmasının etkinliğini artırmayı ve finansal krizin reel ekonomi üzerindeki olumsuz sonuçlarını telafi etmeye çalışmıştır. Çalışmada 2009:5-2020:11 dönemi için Euro Bölgesi üye ülkelerinde varlık alım programlarının ortalama enflasyon, GSYİH büyümesi, faiz oranları, işsizlik ve istihdam oranları değişkenleri üzerindeki etkileri araştırılmıştır. Buna göre Avrupa Merkez Bankası'nın varlık alım programlarının Euro bölgesindeki en büyük makroekonomik etkilerinin uzun vadede sırasıyla işsizlik oranları, istihdam oranları, GSYİH, faiz oranları ve enflasyon oranları üzerinde olduğu görülmüştür. Avrupa Merkez Bankası'nın varlık alım programları ile uyguladığı geleneksel olmayan para politikalarının, Euro bölgesinde uzun vadeli işsizlik oranlarının düşürülmesinde, istihdam oranlarının ve GSYİH'nin artırılmasında etkili olduğu bulunmuştur.

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INTRODUCTION

The global financial crisis that started as a mortgage crisis in the USA in July 2007 and spread on the EU countries through foreign trade and finance channels since 2008/2009, negatively affected the PIIGS (Portugal, Italy, Ireland, Greece and Spain) countries. In this process, while the total debts of PIIGS countries increased rapidly, debts became unsustainable especially in Ireland, Greece and Spain. Due to the increasing public debt of PIIGS countries, they become dependent on European banks from which they receive extensive loans. However, after a while, European banks started to declare huge losses due to the non-performing loans and excessive decreases in the prices of asset-backed securities they invested in the US financial market. The deterioration of bank balance sheets and financial shocks experienced by PIIGS countries have mobilized the European Central Bank (ECB). The ECB initially intervened in the economy with conventional monetary policy instruments by rapidly lowering interest rates and providing intensive liquidity to the market. On the other hand, upon broadening of the dimensions of the debt crisis, President Mario Draghi started to take measures other than conventional monetary policies with the instruction of "We will protect the Euro regardless of the cost to us". The most important of these unconventional monetary policies is "extended asset purchase programs". Thanks to this program, the ECB aimed to increase the efficiency of the credit channel of monetary transmission by purchasing the "toxic assets" of financial institutions in Eurozone countries. Thus, through the expansion of the credit volume in the Eurozone, it was tried to stimulate total consumption and investment expenditures and to get the economies out of the recession spiral. Before the debt crisis, the total size of the ECB balance sheet was below \$ 2 Trillion, but it reached around \$ 4 Trillion as of 2013, due to the intensive operations to purchase problematic assets (Acharya, et.al, 2018: 1-6).

Since the global financial crisis of 2008/2009, four major central banks- the Federal Reserve (FED), the European Central Bank (ECB), the Bank of England (BoE) and the Bank of Japan (BOJ)- have been promoting "quantitative easing"(QE) policies implemented in various sizes. Through these unconventional monetary expansion policies, central banks purchased a pre-determined amount of government bonds or other financial assets to inject liquidity into the economy. Thanks to quantitative monetary policies, also known as large-scale asset purchases, central banks tried to prevent economic recession and get out of deflation process by increasing aggregate demand (Sheard, 2018: 1).

With the support of the monetary expansion policies implemented by the ECB thanks to the support the governments provided including incentive packages containing extensive financial aid, the Eurozone countries started to achieve positive growth again by getting out of the debt crisis as of 2016. However, the decreasing national income and employment rates due to the deep financial crisis in the Eurozone could not increase to the pre-crisis periods. Political, social and economic stability has deteriorated in the Eurozone countries, which were the most affected by the debt crisis.

This study is very important and necessary to display macroeconomic effects on Eurozone countries of unconventional monetary policies followed through asset purchase programs such as providing unlimited funds support to banks, expanding list of acceptable collateral items, purchasing bonded bills, and purchasing troubled assets that the ECB adopted during European Debt Crisis. Because success and effectiveness of the said asset purchase programs that the EBC adopted later became guiding for other central banks in the world while fighting against financial crises. Thus, due to the Covid-19 crisis that was declared a pandemic by the World Health Organization in March 2020, central banks of many developed and developing countries, notably major central banks followed the path ECB took during the European Debt Crisis in 2008/2009 and adopted monetary expansion policies through asset purchases to support the real economy.

Sections of the study can be listed as: i-) Studying macroeconomic effects of asset purchase programs of only ECB among major central banks. ii-) Covering asset purchase programs of ECB

in only 2009:5-2020:11 periods. iii-) Scope of study being limited to those Eurozone countries in the Euro system instead of all European Union countries. iv-) Discussing only average inflation, GDP growth, interest rates, unemployment and employment rates variables of Eurozone countries instead of all macroeconomic data. v-) Using VAR and VECM models as econometric prediction methods.

The research questions that the study targets answering are: i-) Describing effects of asset purchase programs the ECB adopted in 2009:5-2020:11 periods on average inflation, GDP growth, interest rates, unemployment and employment rates variables. ii-) Manifesting consequences of asset purchase programs and monetary transmissions of ECB on processing of credit channel. iii-) Discussing whether asset purchases of ECB can compensate for losses in real economic activity observed in Eurozone countries due to European Debt Crisis.

1. LITERATURE REVIEW

In this section findings of prominent studies in the literature on the macroeconomic effects of the European Central Bank and the unconventional monetary policies it follows together with its asset purchase programs. The studies that were discussed were mostly chosen from countries that are in European Monetary Union. In terms of methods used, studies based on time series, regression analyses, and dynamic general equilibrium models were discussed.

Burlon et al. (2018) used the large-scale New Keynesian "Dynamic General Equilibrium Model (DSGE)" to estimate the macroeconomic effects of the ECB's asset purchase program on the Eurozone. Accordingly, the "Asset Purchase Program-APP", which the central bank made without an expiry date announced in advance or any limitation on the quantities to be purchased, greatly increased the effectiveness and efficiency of future purchases compared to asset purchases with a predetermined end date (Burlon et. al, 2018: 20-24).

Lewis and Roth (2017) analyzed the effects of the ECB's asset purchase programs on financial market variables such as the banking sector and lending in their study, where they analyzed the time series data between July 2009 and March 2016 using the VAR model. The balance sheet policies followed by the ECB with direct asset purchases have reduced financial dominance in the markets for the short term after shocks. However, the positive effects of asset purchases deteriorated in the medium term. While the ECB's asset purchases had a positive effect on production in the Eurozone and Germany, inflation rates did not significantly respond to asset purchases. It was also concluded that the liquidity provisions monitored by the ECB also mediated the limitation of the negative effects of financial shocks on production and prices. It could be argued that the ECB's asset purchases had only a short-term effectiveness in suppressing the increasing risks for financial stability, although the output effects for the Eurozone were positive (Lewis & Roth, 2017: 13-14).

Mouabbi and Sahuc (2019) analysed the macroeconomic effects of unconventional monetary policy, such as the European Central Bank's asset purchases and increased lending opportunities, using the DSGE model, which includes a range of shadow interest rates for the first quarter of 2014 and the second quarter of 2017. It could be argued that the unconventional monetary policies implemented by the ECB by providing asset purchase programs and financial conveniences play an important role in the exit of the Eurozone from the debt crisis and in preventing production losses. Analyzes made with standard DSGE models and the ECB example proved that unconventional monetary policies can mediate the increase of economic activity during periods of low or even negative interest rates (Mouabbi & Sahuc, 2019: 20-22).

Acharya et al. (2018) examined the real effects of the unconventional monetary policy implemented by the ECB through "Outright Monetary Transactions (OMT)" to combat the debt crisis, using the regression analysis of 2009-2014 data of 34 European countries. With the OMT program, the ECB has succeeded in reducing the problems in the loan supply and collecting deposits from private investors by supporting the financial institutions of the Eurozone countries in general and the PIIGS countries in particular in terms of capital. As the functioning of the banking sector was restored, the loan supply expanded and the quality of the loans increased. This restricted the access to loans of "zombie banks and zombie firms"¹, which had the highest responsibility for the process leading to the European Debt Crisis (Acharya, et. al, 2018: 25-26).

Szczerbowicz (2015), using daily data of Eurozone countries between July 2, 2007 and September 27, 2012 (excluding Italy and Portugal's implicit bond issues), employed regression analysis to measure the effects of ECB's unconventional monetary policies on market borrowing costs of banks and governments. It was concluded that strategies followed by the ECB through unconventional monetary policies such as long-term government bond purchases (securities market program-SMP), short-term government bond purchases (open monetary transactions-OMT), collateral bond purchase programs (CBPP1 and CBPP2), three-year long-term refinancing operations (three-year LTROs), decreasing the deposit interest rate to 0% and unlimited liquidity provisions (flat rate full allocation procedure, FRFA) in the fight against the debt crisis eased the pressures on financial markets (Szczerbowicz, 2015: 91-95; 104-106; 120-122).

Brunetti et al. (2011) investigated with interbank market data whether central bank interventions improved liquidity in the interbank market during the 2008/2009 financial crisis. Central banks were required to publish stress tests for financial institutions, provide loan guarantees in the interbank market, and engage in direct asset purchases when systemic risks begin to rise in the market (Brunetti, et. al (2011)).

Abbassi and Linzert (2011), examining the effects of the debt crisis in the Eurozone on the functioning of the interest transfer channel of monetary policy, concluded that the money market yield curve was deeply affected by the said financial crisis. In their potential analysis using two basic criteria, they firstly focused on the monetary predictability of money market interest rates and policy expectations, and secondly, they investigated the effects of the ECB's monetary expansion measures on the money market. They found that there was a 12-month variation in money market interest rates after August 2007 compared to the period before the financial crisis. In addition, another result they reached is that the extraordinary expansionary monetary policies that the ECB started as of October 2008 caused a decrease of at least 100 basis points in the bond interest rates. Strong liquidity measures (three-year LTROs) monitored through exceptional refinancing operations in the money market for up to one year, significantly reduced the liquidity crunch in the interbank market (Abbassi & Linzert, 2011).

Angelini et al. (2011) observed that in the aftermath of the 2008/2009 European Debt Crisis, interbank interest rate spreads on secured and unsecured deposits for major currencies became extraordinarily large and volatile. At the heart of the problem were aggregate factors, especially risk aversion and accounting practices, rather than bank-specific factors. Funding liquidity, capital shortage and central bank interventions were other important determinants in this regard. Before August 2007, margins were largely insensitive to key borrowing characteristics, but later became more responsive to creditworthiness criteria (Angelini, et. al, 2011).

¹ The term zombie is used for banks and companies that invest their borrowing funds from the markets in high-risk areas and lose money and despite being in a bankrupt state, are "too big to fail" by the governments, trying to be kept alive with financial support. For detailed information on this subject, see. Ricardo J. Caballero, Takeo Hoshi and Anil K. Kashyap, "Zombie Lending and Depressed Restructuring in Japan", *The American Economic Review*, Vol.98, No.5, 2008, pp.1943-1977.

Eser and Schwaab (2013), examined the effects of the asset purchase programs of the ECB in the period 2010-2011 on the Eurozone countries Greece, Spain, Ireland, Italy and Portugal economies including the bond market interventions in the securities markets based on the time series and panel data analysis. The biggest impact of the ECB's asset purchase operations of 1 billion Euros in the said period was observed in Greece and the lowest in Italy. The yield effect of asset purchases has increased the yield of bonds, while the 5-year bond interest rates of Greece decreased by 17% to 21%, while the 5-year bond interest rates of Italy decreased by 1% to 2%. The proactive policies pursued by the ECB through its bond purchasing programs have significantly reduced the default risk in Eurozone countries. The volatility in the yield curve of the bonds issued by the Eurozone countries and the risk signals decreased (Eser & Schwaab, 2013).

Ferrando et al. (2015) concluded that the financial pressure exerted by firms' faulty financing models on financial markets before the debt crisis decreased both in terms of quantity and price, following the announcement of the ECB's asset purchase program. In addition, firms that were appointed based on bank loans were discouraged from excessive borrowing and government subsidies of debt securities and commercial loans, resulting in significant sharp declines in firms' debt (Ferrando, et.al, 2015).

Casiraghi et al. (2013) studied the impact of unconventional monetary policies the ECB adopted in 2011-2012 (SMP, 3-year LTROs, and OMTs) on Italian economy and assessed changes caused by revenues from interest and government bonds on credit availability within the framework of the quarterly data of the Italian economy. While the policies implemented by the ECB through SMPs and OMTs were highly effective in countering the increases in government bond yields, LTROs have also had a very positive effect on loan supply and money market conditions. It was also observed that the unconventional policies of the ECB had a positive effect of 7% and 2% cumulatively on the GDP growth in the period of 2012-2013 on the Italian economy through the credit channel (Casiraghi, et. al, 2013).

Peersman (2011) examined the macroeconomic effects of the ECB's unconventional monetary policy actions on the Eurozone with the help of the structural VAR model. A policy action that increases the monetary base or balance sheet size of the ECB has a multiplier effect on economic activities and leaves permanent effects on consumer prices. Thanks to the support provided by the ECB via Eurosystem, the credit multipliers gradually accelerate after the interest margins of the banks gradually decreased and the bank loans started to increase again. This mediates the reversal of fluctuation dimensions that indicate recession in the economic conjuncture (Peersman, 2011).

Sahuc (2016) used "a dynamic stochastic general equilibrium model (DSGE)" to measure the effects of the ECB's asset purchase program. Findings from the study show that the ECB program correlates interest rates with the correct guidance of future expectations and the macroeconomic effects of asset purchases are potentially significant (Sahuc, 2016: 136-140).

Saka et al. (2015) found that the ECB pursued a very effective policy in reducing the fragility in the Eurozone, emphasizing the austerity policies followed after the debt crisis and their role in preventing excessive borrowing in the Eurozone. Thus, the promise of the ECB President Mario Draghi in his press release on July 26, 2012 that "we will do whatever is necessary to protect the Euro" was realized thanks to the "OMT (Outright Monetary Transactions)" program followed by the ECB (Saka et. al., 2015).

Eser and Schwaab (2016) investigated the yield effect of the ECB's non-standard monetary policy and bond market interventions according to the time series data of the Eurozone countries (Greece,

Spain, Ireland, Italy and Portugal). According to the findings obtained, the securities markets programs (SMP) of the ECB have been very effective in improving the liquidity conditions and reducing the CDS risk premiums in the analyzed Eurozone countries. This contributed to the decrease in the volatility of national bond yields (Eser & Schwaab, 2016).

Kühl (2016) analyzed the data of companies and financial institutions operating in the Eurozone and estimated the decreases in the yields of long-term government bonds with the New Keynesian DSGE model. Bond purchase programs carried out by the ECB in the Eurozone had a positive effect on output and inflation rate. This is predominantly a result of the decrease in the borrowing conditions of non-financial firms and the credit risks of firms (Kühl, 2016).

Examining the monthly data of eight developed economies (Eurozone, Canada, Japan, Norway, Sweden, Switzerland, UK and USA) between January 2008 and June 2011 with a panel structural vector autoregressive (SVAR) model, Gambacorta et al. (2014) found that unconventional monetary policies led to expansion in central bank balance sheets, an increase in the level of real economic activity and consumer prices. On the other hand, the reaction of price levels to the shock decreases applied by central banks in interest policies remained lower than that of asset purchase operations (Gambacorta et.al, 2014).

Bluwstein and Canova (2016) investigated the macroeconomic effects of unconventional monetary policies of ECB on 9 Eurozone countries with the Bayesian VAR technique. Thanks to the unconventional monetary policies of the ECB, it has been possible to reduce financial risks, increase inflation rates from the negative region and reach a competitive exchange rate level (Bluwstein and Canova, 2016).

2. METHOD

Modern researchers propose the Vector Autoregressive Model (VAR) and the Vector Error Correction Model (VECM) to construct the relational model between economic variables in a non-structural way. In this study, the effects of the European Central Bank's asset purchase operations on the average inflation, GDP growth, interest rates, unemployment, and employment rates in the member countries of the European Monetary Union were analyzed with the VECM model for the period 2009:5-2020:11. Data on the variables were obtained from the European central bank database. All data, except the inflation rate, were percentage values and included in the study by taking their logarithms.

VAR model was created according to the statistical characteristics of the data. Each endogenous variable in the system was accepted as the lag value of all endogenous variables in the system. Thus, the univariate autoregressive model was generalized to a "vector" autoregressive model consisting of multivariate time series variables. In 1980, Christopher Sims introduced the VAR model to the economic field and encouraged widespread application in the dynamic analysis of the economic system.

Engle and Granger combined cointegration and error correction models to create the vector error correction model. Thus, as long as there is a cointegration relationship between variables, the error correction model can be derived from the autoregressive distributed lag model. However, since every equation in the VAR model is an autoregressive distributed delay model, the VECM model can also be considered as a VAR model with cointegration constraints.

3.1. ADF Unit Root Test

The first thing to do in the VAR model was to test the stationarity of the variables. The fact that the variables are not stationary affects the reliability of the analysis by causing spurious regression in

the model. If the series are not stationary, the series are stabilized by taking their differences and logarithms.

The unit root test is one of the tests commonly used to test whether a time series is fixed or not. Dickey and Fuller (1981) introduced the Dickey and Fuller (DF) tests and extended Dickey and Fuller (ADF) tests (Dinh, 2020: 221).

In this study, "Augmented Dickey Fuller Test (ADF)" was used as the stationarity analysis. The results obtained from the ADF test are shown in Table 1.

Table 1: ADF Test Results

	FIXED	FIXED AND TRENDED	UNFIXED	2nd Degree Difference Values UNFIXED
Inflation (prob)	-2.21(0) (0.20)	-2.19(0) (0.48)	-1.18(0) (0.18)	-6.02(3) (0.000)
Ln GDP (prob)	2.62(7) (1)	-1.12(7) (0.91)	1.57(8) (0.96)	-3.35(7) (0.003)
Interest (prob)	-1.70(4) (0.41)	-1.48(3) (0.81)	-2.19(4) (0.06)	-6.43(9) (0.000)
Ln Unemployment (Prob)	-0.48(4) (0.88)	-4.17(9) (0.01)	1.41(8) (0.95)	-1.95(8) (0.004)
Ln Employment	-0.27(1) (0.91)	-1.21(2) (0.89)	-1.47(1) (0.12)	-7.64(0) (0)
Ln Monthly Asset Purchase	-1.55(0) (0.49)	-1.11(0) (0.91)	-016(0) (0.62)	-2.86(7) (0.005)
Significance Levels				
1%	-3.59	-4.19	-2.62	
5%	-2.93	-3.52	-1.94	
10%	-2.60	-3.19	-1.61	

Note 1: The numbers in parentheses show the appropriate internal delay values for the ADF test, and the Akaike information criterion was used in the study.

As can be understood from Table 1, it was seen that the series were not stationary. First, the logarithms of GDP, monthly asset intake and employment variables were taken, and then the variables were stabilized by taking the differences from the 2nd degree.

3.2. Johansen Cointegration Test

Although cointegration tests define stable, long-term relationships between variable sets, it states that if the test does not find such a relationship, this suggests that there is no evidence that one does not exist, but simply cannot exist (Rao, 2007). Commonly used tests for the existence of long-term relationship are Engle-Granger, Phillips-Ouliaris and Johansen test. The Johansen test is used more than other tests because it can test more than one cointegrating vector. However, in order to apply the cointegration test, the series must be stationary at the same level (Dao, 2013: 62). Cointegration test results are shown in Table 2.

H0: $r = 0$ no cointegration

H1: $r \neq 0$ has cointegration

Table 2.: Johansen Cointegration Results

Basic Hypothesis Trace Test (Trace Statistics)	Statistics	5% Critical Value
r=0	298.64	117.70
r<1	181.17	88.80
r<2	115.83	63.87
r<3	68.06	42.91
r<4	33.88	25.87
Maximal Eigenvalue(λ-max) Test	Statistics	5% Critical Value
r=0	117.47	44.49
r<1	65.34	38.33
r<2	47.76	32.11
r<3	34.18	25.82
r<4	23.71	19.38

In the study, the appropriate delay number was determined with Lr and Schwarz information criterion and the appropriate delay length was found to be 5. In order to investigate the relationship between variables, Johansen cointegration test was conducted for equations containing constant terms and trends. When the Trace test and Maximal Eigenvalue values were examined, it was seen that the test statistics values were greater than the critical value. This situation showed that there was a long-term relationship between variables. The existence of a long-term relationship between variables indicated that the situation of deviation from equilibrium in the short run should be handled with vector error correction model. VECM estimation results are shown in Table 3.

Table 3: VECM Forecast Results

Independent Variable	Coefficient	T-Statistics	Probability Values
Error Term (-1)	-0.825670	-4.008523	0.0003
Unemployment	-31.17308	-1.892256	0.0675
Employment	-7.125276	-0.408182	0.6859
GDP	-2.955555	-0.880848	0.3850
Interest	2.571053	4.933049	0.0000
Inflation	-0.052520	-0.264726	0.7929
C	-0.070438	-0.441972	0.6615
R ² : 0.693298 F _(p) :12.05594 (0.000) DW: 2.73			
Dependent Variable: Monthly Asset Purchase			

In the model, the error term coefficient should be negative and significant. When Table 3 was examined, it was seen that the error term coefficient was negative and significant. This showed that the error term works, that is, it would stabilize in the long term. According to this result, the error

correction mechanism would reduce deviations from balance by approximately 83%. The significance of the error terms parameter indicated that there was a causality relationship between variables. When the coefficients related to the variables were analyzed, it was seen that unemployment negatively affected monthly asset purchases in the short term and positively affected the interest rate. Values for other variables were not interpreted as they were insignificant.

3.3. Granger Causality Analysis

Granger states that when there is a cointegration relationship between variables, at least one directional causality relationship should be found in the analysis. As a matter of fact, cointegration analysis does not provide information about the direction of the relationship between variables. Therefore, Granger causality analysis based on Vector Error Correction Model (VECM) was performed. Granger causality analysis results are shown in Table 4.

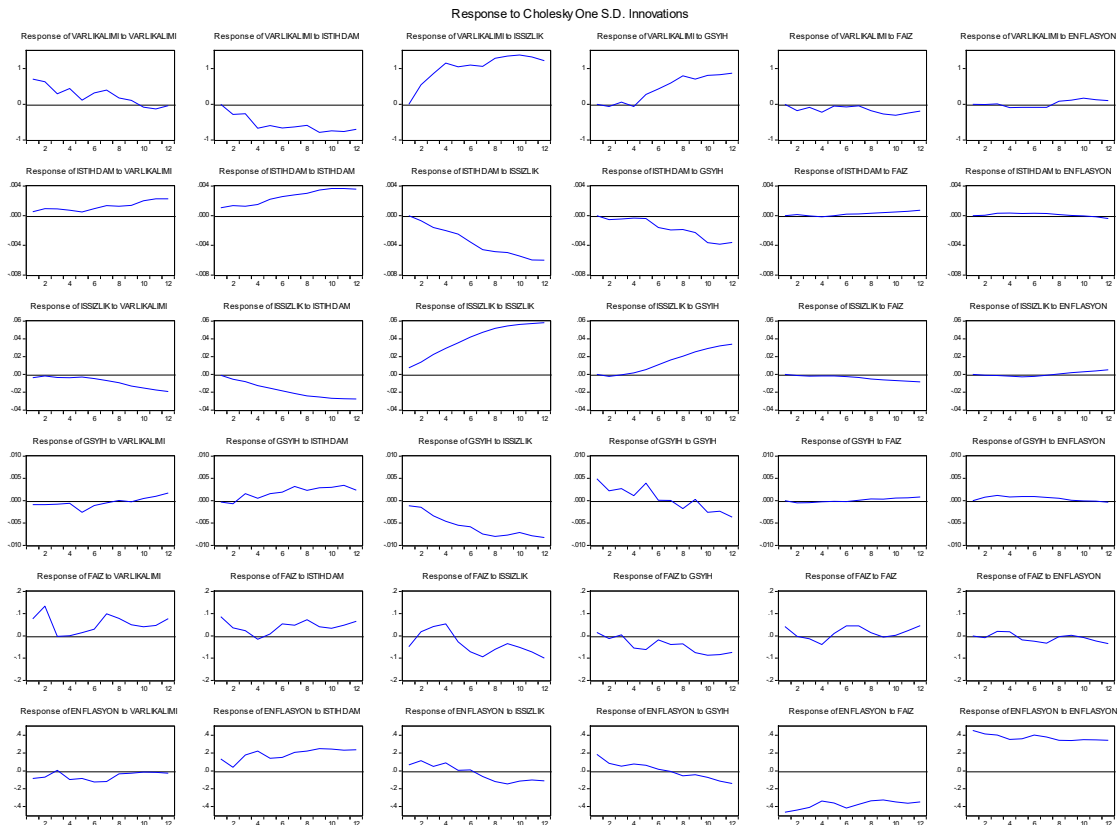
Table 4: Granger Causality Analysis

Direction of Causation	Sd	Prob	Decision
Unemployment->AVA	3	0.0014	H ₀ rej
Employment->AVA	3	0.5195	H ₀ acc
GDP->AVA	3	0.2913	H ₀ acc
Interest->AVA	3	0.0022	H ₀ rej
Inflation->AVA	3	0.9684	H ₀ acc
AVA-> Unemployment	3	0.0011	H ₀ rej
AVA-> Employment	3	0.5391	H ₀ acc
AVA-> GDP	3	0.4357	H ₀ acc
AVA-> Interest	3	0.0017	H ₀ rej
AVA-> Inflation	3	0.6512	H ₀ acc

When the results in Table 4 were examined, it was seen that unemployment and interest rate and monthly asset purchases were mutually caused by each other. Apart from this, no causality relationship was observed between monthly asset purchases and inflation, GDP and employment rates. The results were found to support the error correction model.

3.4. Impact Response Functions and Decomposition of Variance

Impact-response functions express the effect of a unit shock occurring in random error terms on variables. While the effect size of the variables used in the model on each other was determined by decomposition of variance, whether the effect would be used as a policy tool or not was determined by impact-response analysis. The Impact-response analysis results are shown in Graphic 1.



Graphic 1: Impact-Response Analysis

When the Impact-Response analysis results were examined, it was seen that monthly asset purchases gave a fluctuating but negative response to the shock of 1-unit of standard error in employment. Monthly asset purchases reacted increasingly positively for 12 periods in the face of a 1-unit shock in unemployment. Monthly asset purchases gave stable reactions to a 1-unit shock in GDP stable for the first 4 periods and positive reactions for the fourth period. Finally, it was seen that monthly asset purchases followed a horizontal course against the shock in inflation. After the Impact Response analysis, the variance decomposition method was applied to find out what percentage of the changes in monthly asset purchases were caused by that and other variables. Variance decomposition results are shown in Table 5.

Table 5: Variance Decomposition

Term	S.E.	Asset purchase	Employment	Unemployment	Gdp	Interest	Inflation
1	0.706434	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000
2	1.144798	68.37153	6.046389	22.81990	0.296162	2.461529	0.004492
3	1.490037	44.25604	6.782858	46.81259	0.322869	1.818127	0.007520
4	2.065093	27.57663	14.15317	55.65350	0.265725	2.132322	0.218648
5	2.412981	20.43114	16.44525	59.75337	1.468950	1.606698	0.294592
6	2.787820	16.62195	18.04679	60.25349	3.488450	1.272205	0.317119
7	3.133783	14.74487	18.37759	59.15197	6.375133	1.025313	0.325116
8	3.540289	11.79698	17.18600	59.61399	10.02370	1.068218	0.311114
9	3.945722	9.572251	17.81453	59.70809	11.23553	1.336414	0.333194
10	4.337856	7.956893	17.67913	59.52526	12.78976	1.622795	0.426160
11	4.682679	6.906946	17.83196	59.06814	14.08255	1.674380	0.436022
12	4.971396	6.134251	17.80146	58.43939	15.56207	1.634601	0.428228

When Table 5 was analyzed, it was understood that the change in monthly asset purchases was entirely due to itself in the first period. Looking at the last period, it was seen that 6% of the change was due to itself, 58% to unemployment, 17% to employment, 15% to GDP, about 2% to the interest rate and 0.4% to inflation.

DISCUSSION AND CONCLUSIONS

The fact that the effects of the European Debt Crisis observed in the Eurozone countries in 2008/2009 were greater and more widespread than the previous financial crises, led the European Central Bank to take different measures than the conventional monetary policies pursued to reduce interest rates by increasing the money supply.

In this context, the European Central Bank has adopted a fixed rate allocation policy by starting asset-based bond purchase programs since 2008 in order to strengthen the collateral ratios of financial institutions and reduce their liquidity risks. It has initiated refinancing operations, removed funding limits, and began accepting foreign currency asset-backed instruments. Also, met the funding needs of financial institutions with its collateralized bond purchase programs, instrument markets program and long-term refinancing operations, and managed to prevent the deepening of the debt crisis over time.

The effects of the European Central Bank's asset purchasing operations on average inflation, GDP growth, interest rate, unemployment and employment rates in countries affiliated with the European Monetary Union were analyzed with the help of the VAR model.

According to the results of Granger causality analysis, it was seen that unemployment and interest rate and monthly asset purchases were mutually caused by each other. The results were found to support the error correction model.

The impulse response analysis results showed a fluctuating but negative response of monthly asset purchases to the shock of 1-unit of standard error in employment. Monthly asset purchases gave an increasingly positive response for 12 periods against a 1-unit shock in unemployment. Monthly asset purchases gave a stagnant reaction to a 1-unit shock in GDP for the first 4 periods and a positive reaction after the fourth period. It was observed that monthly asset purchases followed a horizontal course against the shock in inflation.

All of the change in monthly asset purchases originated from itself in the first period. Looking at the last period, it was seen that 6% of the change was due to itself, 58% to unemployment, 17% to employment, 15% to GDP, 2% to interest rate and 0.4% to inflation.

Accordingly, it was found that among the variables examined, the largest macroeconomic effects of the ECB's asset purchase programs in the Eurozone were observed on unemployment rates, employment rates, GDP, interest rates and inflation rates in the long term, respectively.

The empirical results obtained were consistent with the monetary theory and policy literature. It could be argued that the unconventional monetary policies implemented by the ECB with asset purchase programs were effective in lowering the unemployment rates in the Eurozone in the long term, increasing employment rates and GDP.

At the same time, asset purchase programs of the ECB positively affected processing of credit channel in monetary transmission and increased effectiveness of credit channel. Thus, ECB

provided significant support to the real economy and compensated losses in real economic activities caused by the Debt Crisis in Eurozone countries to a great extent.

Findings of this study are in line with other studies in the literature. The agreement in the literature on long-term effective results created by asset purchase programs adopted by the ECB on decreasing national risk premiums of Eurozone countries, lowering interest rates in the market, increasing economic growth and employment rates, and fight against unemployment are supported by findings of our study.

Macroeconomic effects of unconventional monetary policies the EBC followed through asset purchase programs must be further developed with further studies. The authors hope that this study will be guiding for studies in the said area. The authors believe that focusing on especially medium and long term effects of the ECB's asset purchase programs and determining number of observations of macroeconomic variables studied with wider intervals depending on the country samples to be selected, and using the time series methodology will result in more rational results.

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EXTENDED SUMMARY

Purpose

The fact that the effects of European Debt Crisis observed in 2008/2009 in Eurozone countries were more significant and widespread compared to previous financial crisis, led the European Central Bank to adopt more different measures than conventional monetary policies towards decreasing interest rates. The ECB decreased interest rates rapidly in the beginning and provided intense liquidity to the market to intervene in the economy using conventional monetary policy tools. On the other hand, due to intensifying debt crisis, the President Mario Draghi started to take measures outside conventional monetary policies with "we will do whatever is necessary to protect the Euro" instruction. The most important one of these unconventional monetary policies is the "expanded asset purchase programs". Thanks to this program, the ECB purchased the "toxic assets" of financial institutions of Eurozone countries and aimed at increasing effectiveness of monetary transmission credit channel. Thus, credit volume was expanded in the Eurozone to reinvigorate total consumption and investment spendings and rescue the EU economies from stagnation spiral.

In this context, the study aims to assess macroeconomic effects of "asset purchase programs" applied by the European Central Bank period in order to fight against the "European Debt Crisis" that started in 2008/2009.

Methodology

Modern researchers propose the Vector Autoregressive Model (VAR) and the Vector Error Correction Model (VECM) to construct the relational model between economic variables in a non-structural way. In this study, the effects of the asset purchase operations of the European Central Bank on average inflation, GDP growth, interest rates, unemployment and employment rates in the countries affiliated to the European Monetary Union were investigated by VECM model. The first thing to do in the VAR model was to test the stationarity of the variables. The fact that the variables are not stationary affects the reliability of the analysis by causing spurious regression in the model. If the series are not stationary, the series are stabilized by taking their differences and logarithms.

Findings

The unit root test is one of the tests commonly used to test whether a time series is fixed or not. Results of unit root test (ADF) demonstrated that the series achieved in the study were not stable. Thus, the logarithms of GDP, monthly asset intake and employment variables were taken, and then the variables were stabilized by taking the differences from the 2nd degree. Later, in order to investigate the relationship between variables, Johansen cointegration test was conducted for equations containing constant terms and trends. Although cointegration tests define stable, long-term relationships between variable sets, it states that if the test does not find such a relationship, this suggests that there is no evidence that one does not exist, but simply cannot exist. Commonly used tests for the existence of long-term relationship are Engle-Granger, Phillips-Ouliaris and Johansen test. The Johansen test is used more than other tests because it can test more than one cointegrating vector. However, in order to apply the cointegration test, the series must be stationary at the same level.

Trace test and Maximal Eigenvalue values demonstrate a long-term relationship between the variables. Thus, vector error correction model is used to reveal a deviation from equilibrium in the short run in addition to a long-term relationship between variables. VECM demonstrates that the error correction mechanism would reduce deviations from balance by approximately 83%. When the coefficients related to the variables were analyzed, it was seen that unemployment negatively affected monthly asset purchases in the short term and positively affected the interest rate. Granger states that when there is a cointegration relationship between variables, at least one directional causality relationship should be found in the analysis. As a matter of fact, cointegration analysis

does not provide information about the direction of the relationship between variables. Therefore, Granger causality analysis based on Vector Error Correction Model (VECM) was performed.

According to the results of Granger causality analysis, it was seen that unemployment and interest rate and monthly asset purchases were mutually caused by each other. The results were found to support the error correction model. Impact-response functions express the effect of a unit shock occurring in random error terms on variables. While the effect size of the variables used in the model on each other was determined by decomposition of variance, whether the effect would be used as a policy tool or not was determined by impact-response analysis. When the Impact-Response analysis results were examined, it was seen that monthly asset purchases gave a fluctuating but negative response to the shock of 1-unit of standard error in employment. Monthly asset purchases gave a stagnant reaction to a 1-unit shock in GDP for the first 4 periods and a positive reaction after the fourth period. It was observed that monthly asset purchases followed a horizontal course against the shock in inflation. All of the change in monthly asset purchases originated from itself in the first period. Looking at the last period, it was seen that 6% of the change was due to itself, 58% to unemployment, 17% to employment, 15% to GDP, 2% to interest rate and 0.4% to inflation. Accordingly, it was found that among the variables examined, the largest macroeconomic effects of the ECB's asset purchase programs in the Eurozone were observed on unemployment rates, employment rates, GDP, interest rates and inflation rates in the long term, respectively.

Results and Discussion

The empirical results obtained were consistent with the monetary theory and policy literature. It could be argued that the unconventional monetary policies implemented by the ECB with asset purchase programs were effective in lowering the unemployment rates in the Eurozone in the long term, increasing employment rates and GDP. At the same time, asset purchase programs of the ECB positively affected processing of credit channel in monetary transmission and increased effectiveness of credit channel. Thus, ECB provided significant support to the real economy and compensated losses in real economic activities caused by the Debt Crisis in Eurozone countries to a great extent.

Macroeconomic effects of unconventional monetary policies the EBC followed through asset purchase programs must be further developed with further studies. The authors hope that this study will be guiding for studies in the said area. The authors believe that focusing on especially medium and long term effects of the ECB's asset purchase programs and determining number of observations of macroeconomic variables studied with wider intervals depending on the country samples to be selected, and using the time series methodology will result in more rational results.