The Effect of USA Monetary Policy on Energy Stock Markets: Evidence from European Union

Mohamed Amine Bernaoui

Submitted to the
Institute of Graduate Studies and Research
in partial fulfillment of the requirements for the degree of

Master of Science
in
Banking and Finance

Eastern Mediterranean University
August 2022
Gazimağusa, North Cyprus

Approval of the Institute of Graduate Studies and Research

Prof. Dr. Ali Hakan Ulusoy
Director

I certify that this thesis satisfies all the requirements as a thesis for the degree of Master of Science in Banking and Finance.

Prof. Dr. Nesrin Özataç
Chair, Department of Banking and Finance

We certify that we have read this thesis and that in our opinion it is fully adequate in scope and quality as a thesis for the degree of Master of Science in Banking and Finance.

Prof. Dr. Salih Katırcıoğlu
Supervisor

Examining Committee

1. Prof. Dr. Salih Katırcıoğlu

2. Assoc. Prof. Dr. Setareh Katırcıoğlu

3. Asst. Prof. Dr. Nigar Taşpınar

ABSTRACT

This thesis aims to forecast the effects of changes in the United States' monetary policy on energy stock prices in Europe. Based on data availability, quarterly figures are constructed for energy related firms operating in the European countries. Using alternative econometric methods and various monetary policy tools, results generally confirm the long-term effects of the Federal Reserve's monetary policy changes on energy stock variations in Europe. Policy implications and detailed discussions are provided results and conclusion sections of the thesis.

Keywords: Stock Price; Energy; Monetary Policy; Cointegration; GMM

ÖZ

Bu tez, Amerika Birleşik Devletleri para politikasındaki değişikliklerin Avrupa'daki enerji hisse senedi fiyatları üzerindeki etkilerini tahmin etmeyi amaçlamaktadır. Veri mevcudiyetine dayalı olarak, Avrupa ülkelerinde faaliyet gösteren enerji ile ilgili firmalar için üç aylık rakamlar oluşturulmuştur. Alternatif ekonometrik yöntemler ve çeşitli para politikası araçlarını kullanan sonuçlar, genel olarak Federal Rezerv'in para politikası değişikliklerinin Avrupa'daki enerji stoku değişimleri üzerindeki uzun vadeli etkilerini doğrulamaktadır. Politika çıkarımları ve ayrıntılı tartışmalar, tezin sonuç ve sonuç bölümlerinde verilmektedir.

Anahtar Kelimeler: Hisse Senedi Fiyatı; Enerji; Para Politikası; Eşbütünleşme; GMM.

DEDICATION

To my lovely mother

ACKNOWLEDGMENTS

I want to express my gratitude to Professor Dr. SALIH KATIRCIOGLU for his constant assistance and guidance during the writing of this research. Without his really helpful supervision, all of my efforts could have been ineffective.

I should also remind out that my family is very important to my research. I want to thank them for their lifetime of support and inspiration.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF ABBREVIATIONS

CPI	Consumer Price Index
DCP	Domestic Credit Price
DIR	Domestic Interest Rate
FFER	Federal Fund Effective Rate
GMM	Generalized Method Moment
LIR	Linear Interest Rate
L.S	Least Square
M2	Money Supply
OIL	Oil Price
RIR	Real Interest Rate
TSLS	Two Stage Least Square

Chapter 1

INTRODUCTION

1.1The Role of Monetary Policy in the Financial Markets

Globalization has been viewed as a dominating force in deepening trade relations and financial integration during the last twenty years. This demonstrates how the linkages connected with one market usually affect other markets, either favorably or adversely. As a result, the impact of shocks in other nations has become more important in the eyes of academics and legislators in terms of how such shocks in other areas will affect a particular region. International financial growth and circumstances, according to Bekaert, (Hoerova, & Duca 2013), are driven by a world's economic cycle, which appears to be significantly influenced by US monetary policy.

Local stock markets are essential for financial integration and are known for being responsive to shifts in monetary policy. On the other hand, their sensitivity may change over time and from one market to another. Diverse points of view from academics have been presented regarding how monetary policy affects stock markets. (See, for example, Chatziantoniou, Duffy, & Filis, 2013; Conover, Jensen, Johnson, & Mercer, 1999; Bjornland & Leitemo, 2009).

Numerous studies have found that raising the money supply raises prices, which in turn boosts activity on the stock market (Bjornland & Leitemo, 2009). Chatziantoniou et al. claim that (2013). Five key channels of monetary policy affect stock market

returns: Exchange rates, credit, interest rates as well as the wealth and monetary effects.

Some experts claim that an expansionary monetary policy increases asset values, reduces predicted returns, and subsequently reduces market activity for stocks (Laopodis,2013; Ivrendi1989 & Guloglu, 2012). This occurs as a consequence of a rise in stock prices, which compels the federal reserve to take action because they are thought to be a potential indication of imminent inflation. The world's stock markets have grown and became more interconnected over the past few decades. due to these higher degrees of integration. According to the Efficient Market Hypothesis (Rama & French,1989), The stock market is more sensitive to fluctuations in global economies. Markets are particularly susceptible to changes in U.S. monetary policy, which can have an impact on the stock markets of developed and developing countries alike.

U.S. monetary policy has a stronger impact on developing countries than it does on mature markets (Yang & Hamori, 2014). Stock market fluctuations, according to (Rigobon & Sack. 2003), may have a significant impact on the macro-economy, making them an important factor to take into account when formulating monetary policy. Using identification techniques based on the heteroscedasticity of stock market returns, (Rigobon & Sack, 2003) investigated how monetary responds to stock market changes. A large policy reaction was disclosed by (Rigobon & Sack. 2003), which demonstrated that a 5% increase (down) in the S&P 500 index increases the likelihood of a 25-basis point tightening (easing) by around half (Rigobon & Sack, 2003). U.S. interest rates had an opposite relationship with these markets during the boom, according to Yang & Hamori (2014), who also discovered that the U.S. monetary policy ripple effects only influenced these stock markets during the quiet phase (Yang

al., 2003). (Yang et al., 2003) also looked into how asset values are transmitted, particularly from the United States to smaller economies (Yang et al. 2014). In brief, (Yang et al., 2014) discovered that in a bull market, the Treasury bill rate has a greater impact on stock markets than in a bear market since a bull market has a longer duration than a declining market.

Using various econometric methods, numerous researches have been carried out to study the relation between monetary policy and stock prices in different locations over time. The majority of studies in the literature focused on how stock prices and American monetary policy affected developing and growing Asian countries. Changes in American monetary policy might have had an impact on developed European markets as well as European economies. As the stock market cycles between bull and bear, it's critical to consider how European nations react to adjustments in American monetary policy (Yang et al., 2014). This demonstrates that a change in interest rates in the US could provide an opportunity for firms to expand by making investments in the US or other European markets.

Prior to the crisis, the consensus was that central banks should focus on stabilizing inflation and the output gap while ignoring asset price, especially if it was thought to be caused by bubbles. The latest crisis has shattered that consensus, reinforcing the idea that central banks should monitor and eventually respond to asset market events. Supporters of this viewpoint say that monetary authorities should "lean against the wind," raising interest rates to combat any bubble-driven episode of asset price inflation, even if it means temporarily departing from their inflation or output gap objectives. It is maintained that any losses incurred as a result of these aberrations

would be more than repaid by the avoidance of the repercussions of a future bust. The assumption that raising interest rates will decrease the magnitude of an asset price bubble is a basic component of the justification for "leaning against the wind" monetary policy. While the assumption may have become common knowledge no empirical or theoretical justifications. Identifying the characteristics that define the risks associated in the acquisition of a certain asset is an essential topic in asset pricing models (Sharpe; Linter; Mossin; as quoted in Chiarella et al., 2013).

1.2 The Aim of the Study

The purpose of the study is to look at how American monetary policy and energy stock markets are related in a group of developed and developing European countries. In the influence of monetary policy on stock market prices, we consider the federal fund's effective rate and the discount interest rate.

The general problem addressed in this thesis was the elements that impact investors' decision-making in the equities market, as well as how this market achieves equilibrium. Many economists and financial experts believed that the financial and economic crisis of 2007-2008 indicated a gap in the classical and neoclassical approaches to comprehending financial difficulties in the economy (Kolozsi, 2013). Furthermore, the influence of monetary policy on the equities market has not been thoroughly explored in the literature (Abdymomunova & Morleyb, 2011; Alves, 2013; Berger, 2011; Febrian & Herwany, 2010; Levy, 2012). As a result, the specific subject under investigation in this study was the influence of monetary policy considerations on the equity market while controlling for macro and firm-specific factors. The effect of monetary policy on the economy and economic resource allocation via the equities market is important, hence this issue was critical to address.

This study is a supplement to the work of (Bernanke & Kuttner 2003). With the addition of the monetary aggregate M2 and the Federal Funds Rate, the current model improves on (Bernanke & Kuttner)'s model. As a result, this study contributes to the field by creating a model with five independent variables: M2, or the Federal Reserve's level of monetary easing; the Federal Funds Rate; Federal Funds Futures; firm size as firm-specific risk; and the expected rate of return on the overall stock market as systematic risk. Recent stock market performances have just a very small impact on how European stock markets will move in the future. In this study, we also evaluate how American interest rates affect European stock markets and come to the conclusion that while the impact of U.S. monetary policy varies by country, it is more significant for developed nations.

Looked at the impact of the individual variables in this quantitative analysis. On the dependent variable, the projected rate of return of firms' equity, market return, change in money supply (M2), real interest rate, lending interest rate, domestic credit, change in the Federal Funds Rate, and change in Federal Funds Futures. I gathered time series of cross section data on the realized rate of return on equity of a sample of publicly listed U.S. firms in this ex post facto design. The data was obtained from publicly available sources and spanned the years 1970 to 21.

1.3 The Structure of the Study

The entirety of the research is organized as follows. chapter 2 The previous research on monetary policy and stock markets, chapter 3 data and methodology of the study, chapter 4 presents estimation results and discussion, and chapter 5 however still makes some recommendations based on the research's conclusions, analysis, and references.

Chapter 2

LITERATURE REVIEW

Numerous interactions between monetary policy and asset prices are explained by economic theory, particularly through stock prices. Forward-looking statements are used to evaluate stock prices, and it is known that changes to the Federal Reserve, a key component of monetary policy, may have an impact on stock values. Interest rate announcements can directly affect stock prices in a favorable or negative way and adversely affect stock return and dividend decisions. In general, asset prices can really have an influence on how much is consumed through asset channels and the capacity of a company to borrow, or credit channels. There are numerous perspectives. In order to control inflation or enhance investment opportunities in the nation, monetary policymakers are attempting to affect aggregate demand by raising or lowering the policy rate.

This strategy consequently has an impact on stock values. Changes in the monetary policy of the United States will have an impact on global stock prices in addition to U.S asset values. The size of the corporations in each nation actively participating in operations that have an impact on the American market indicates how significant an impact there will be on stock prices. The next paragraph presents some empirical information to help us better understand the link between monetary policy and stock prices. (Ivrendi & Guloglu, 2012) investigated in the volatility of the stock values in four Asian countries using a Markov regime switching auto regressive

heteroscedasticity approach (Malaysia, Singapore, South Korea, and Thailand). They found a distinct relationship between stock prices and currency values. All of the listed countries, excluding Thailand, have stock prices. (Ivrendi, 2012) and associates (Hussain, 2010) evaluated the stock market's volatility and return. France, Germany, Switzerland, and Spain are among the European countries. As a result of monetary policy actions, equities indexes in the Austria and the United States have risen. Additionally, macroeconomic news releases that featured daily data from the year 2000 until the year 2008. Hussain (2010) discovered that changes in monetary policy had an immediate and large impact on prices of stocks and market volatility in both the American and European markets (Hussain, 2010). (Fakra, 2009) studied how different American monetary policies have affected volatility levels and conditional volatility of using intraday data from 1994 to 2005. She used the GARCH approach and revealed that stock returns fell by 5.6% for every 1% increase in the policy rate (Fakra, 2009), In a brief, her results indicate that the nature and timing of monetary policy shocks have an impact on volatility (Fakra, 2009). Using a structural vector autoregressive approach, (Bjornland and Leitemo, 2009) investigated the dependency U.S. monetary policy Index (Bjornland and Leitemo, 2009) looked into the illustration of the relationship between interest rate policy and real stock prices (Bjornland et al., 2009). According to (Bjornland et al. 2009), a 100-basis point rise in the federal funds rate resulted in a 7%–9% instantaneous decline in real stock prices. Although, the prices of stocks shock that inflated real stock price by one percent resulted in a 4-basis point rise in the interest rate (Bjornland et al., 2009). (Chu, 2015) used the dynamic copula technique to examine the relationship between China's monetary policy and stock market liquidity from 2006 to 2012. His findings showed that contractionary monetary policy affects less liquid stock markets, whereas expansionary monetary

policy affects highly liquid stock markets (Chu, 2015). (Chu, 2015) also discovered that monetary shocks have an asymmetrical influence on stock market liquidity (Chu, 2015). Furthermore, during the post-crisis period, the intensity of lower-tail reliance between monetary and stock liquidity improves significantly (Chu, 2015). (Fischbacher, Hens & Zeisberger, 2013) studied how monetary policy affected trade activity and stock market bubbles in experimental asset markets, finding that interest rate policy had a significant impact on stock market liquidity but only a little impact on bubbles.

From 1990 to 2004, (Kurov, 2010) calculated how monetary policy affected investor mood as measured by the S&P 500 Index. (Kurov, 2010) said that monetary policy choices have a big impact on investor mood, and that in a bear market, monetary policy measures have a big impact on stock values, which are particularly susceptible to shifts in investor mood and credit market conditions (Kurov, 2010). (Georgiadis, 2015) employed a vector autoregressive model to investigate the causes of worldwide spillovers from U.S. monetary policy shocks, and found significant spillover effects over the whole world market. (Georgiadis, 2015) stated that changes in U.S. monetary policy have a stronger impact, implying that Interest rate changes in the United States have a greater impact on many economies than fluctuations in domestic interest rates. (Georgadis, 2015). Increased policy uncertainty can prevent firms from taking on new investment initiatives and drive consumers to be more conservative in their purchasing habits, which can have a variety of consequences for investors, corporations, and consumers (Rodrik, 1991; Handley & Limao, 2015; Converse, 2017). The same argument applies to lenders, since more uncertainty about government economic policies may cause them to take a more cautious approach to lending, resulting in

higher interest rates. One may argue that policy uncertainty has direct consequences on the economy, which eventually spread to financial markets. Most empirical studies in this strand of the literature, predictably, focus on the connections between EPU and stock markets (Arouri et al., 2014; Arouri et al., 2016; Arouri & Roubaud, 2016; Chang et al., 2015; Pástor & Veronesi, 2012, Pástor & Veronesi, 2013).

Despite the numerous studies linking uncertainty, oil, and currency markets in different settings, no empirical attempt has been made to see how policy uncertainty affects the interactions between these markets. If the influence of uncertainty on the currency market is state dependent, as (Han et al. 2019) claim, policy uncertainty may be seen as a conduit that facilitates interactions between different market sectors. In reality, multiple recent studies have shown minimal evidence of a major policy uncertainty influence on co-movement patterns in the oil and stock markets (Fang et al., 2018) and across commodities and stock markets in general (Fang et al., 2018). (Badshah et al., 2018). In light of this emerging evidence, as well as the aforementioned studies demonstrating that the Federal Reserve's monetary policy is a major driver of the global financial cycle, our research takes the literature on the impact of monetary policy on stock markets.

Chapter 3

DATA AND METHODOLOGY

3.1 Data and Sources

This thesis aims to forecast the effects of the U.S. monetary policy changes on energy stock returns for the European countries. Therefore, monthly data are used to carry out the econometric analysis. The data period up to December 2020 differs for each country, owing to its availability. Description of stock prices of the selected firms, the other variables, and monetary policy tools of the USA are presented in Table 1 and table 2, together with data periods. And descriptive statistics regarding these series are presented in Table 3.

Stock prices of firms are retrieved from Investing.com (2022) website, while the rest of the variables are obtained from World Bank (2022). It is important to note that all series obtained from World Bank (2022) are available only in annual figures; therefore, they are transformed into monthly figures using quadratic functions in EVIEWS 12.0 software.

Table 1: Energy firms selected in the study

Firm	Data Period	BIST Code	Observations
Bist Electricity	1997M02-2022M03	XELKT	286
Bist Chem Petrol Plastic	1997M02-2022M03	XKMYA	286
CECE Oil and Gas	2005M01-2022M03	CECEOIL	142
RDX Oil and Gas	2009M02-2022M03	RDOILUSD	142
RTX Energy USD	2007M08-2022M02	RXNRGUSD	142
Copenhagen Oil and Gas	2007M02-2022M03	CX60PI	166
Helsinki Oil and Gas	2012M02-2022M03	HX60PI	106
CAC Oil and Gas	1999M01-2022M03	FROG	263
DAX Financial Services Price	1999M04-2020M08	CXKVX	73
OTCKB Oil and Gas	2014M07-2022M03	OTCKB	73
FTSE Oil and Gas	2003M09-2022M03	FTATOIL	207
HTX (USD)	2003M09-2022M03	HTXUSD	207
FTSE Italia Oil and Gas	2009M07-2022M03	FTITLMS60	137
AEX Oil and Gas	2001M02-2022M03	NLOG	238
Oslo GICS 10 energy	2003M09-2020M11	OSESX	206
WIG ENERGY	2010M02-2022M03	ENER	130
WIG Oil and Gas	2006M02-2022M03	PALI	130
BCN ELECTRIC	1997M02-2020M06	BCENEC	232
Madrid Petrol and Power	2001M02-2022M03	IENEMA	232
BCN 5 ENERGY	1997M02-2020M06	IND40100	232
NASDAQ OMX Nordic Energy	2007M01-2022M03	NOMXNEN	162
Stockholm Oil and Gas Producers	2011M07-2022M03	SX601010PI	162

Table 2: Selected stock prices in the natural logarithm

Variable	**Data**		**Descriptive statistics**			
Stock Prices	Shortcut	Source	Mean	Max	Min	Std.Dev
		TURKEY				
Stock price of XELKT	lnXELKT	Investing (2022)	0.00593	0.536629	-0.54893	0.121338
Stock price of XKMYA	lnXKMYA	Investing (2022)	0.01652	0.547163	-0.56058	0.110541
		AUSTRIA				
Stock price of CECEOIL	lnCECEOIL	Investing (2022)	0.00507	0.23	-0.18	0.061434
Stock price of RDOILUSD	lnRDOILUSD	Investing (2022)	0.00436	0.24	-0.31	0.087935
Stock price of RXNRGUSD	lnRXNRGUSD	Investing (2022)	0.00151	0.384	-0.38	0.118614
		DENMARK				
Stock price of CX60PI	lnCX60PI	Investing (2022)	0.00802	0.67	-0.34	0.141897
		FINLAND				
Stock price of HX60PI	lnHX60PI	Investing (2022)	0.02785	0.258089	-0.18389	0.085472
		FRANCE				
Stock price of FROG	lnFROG	Investing (2022)	0.001647	0.321779	-0.15946	0.058611
		GERMANY				
Stock price of CXKVX	lnCXKVX	Investing (2022)	0.00075	0.214375	-0.19182	0.086484
Stock price of OTCKB	lnOTCKB	Investing (2022)	-0.01033	0.203	-0.266	0.083493

GREECE						
Stock price of FTATOIL	lnFTATOIL	Investing (2022)	0.001449	0.35	-0.28	0.09074
HUNGARY						
Stock price of HTXUSD	lnHTXUSD	Investing (2022)	0.003816	0.23	-0.45	0.089336
ITALY						
Stock price of FTITLMS60	lnFTITLMS60	Investing (2022)	-0.00423	0.25	-0.17	0.062223
NETHERLAND						
Stock price of NLOG	lnNLOG	Investing (2022)	-0.00332	0.27	-0.2	0.062564
NORWAY						
Stock price of OSESX	lnOSESX	Investing (2022)	0.007176	0.23464	-0.24187	0.06864
POLAND						
Stock price of ENER	lnENER	Investing (2022)	-0.00439	0.29	-0.28	0.074999
Stock price of PALI	lnPALI	Investing (2022)	0.005923	0.28	-0.23	0.076733
SPAIN						
Stock price of BCENEC	lnBCENEC	Investing (2022)	-0.00061	1.674945	-1.49158	0.162813
IENEMA	lnIENEMA	Investing	0.002311	0.137817	-0.19014	0.051939
Stock price of IND40100	lnIND40100	Investing (2022)	0.004708	0.19523	-0.24419	0.059269
SWEDEN						
Stock price of NOMXNEN	lnNOMXNEN	Investing (2022)	0.006134	0.158734	-0.28426	0.071169

Stock price of SX6010PI	lnSX6010PI	Investing (2022)	0.001422	0.387161	-0.56394	0.114066
Stock price of SX601010PI	lnSX601010PI	Investing (2022)	-0.01141	0.188626	-0.51378	0.094794
Stock price of SX601010GI	lnSX601010GI	Investing (2022)	0.001841	0.387161	-0.56394	0.113857
Monetary Policy Proxies						
consumer price index	lnCPI	WorldBank (2022)	96.77949	119.1658	73.20027	13.94135
domestic credit	lnDC	WorldBank (2022)	219.9233	304.975	177.3105	21.02073
deposit interest rate	lnDR	WorldBank (2022)	2.525175	6.25	0.25	1.930764
federal fund effective rate	lnFFER	Fred (2022)	2.138706	6.54	0.05	2.123512
linear interest rate	lnLIR	Worldbank (2022)	5.205473	9.419548	2.12762	2.059867
real interest rate	lnRIR	Worldbank (2022)	3.289717	7.202616	1.027659	1.864052
money supply	lnM2	Worldbank (2022)	81.62098	123.9574	62.61102	11.33932

Table 3: Descriptive statistics

Series	Mean	Median	Maximum	Minimum	Std.Dev.	Obs
USA						
CPI_USA	96.779	98.52604	119.1658	73.20027	13.94135	286
DC_USA	219.923	220.705	304.975	177.3105	21.02073	286
DR_USA	2.525	2	6.25	0.25	1.930764	286
FFER_USA	2.138706	1.415	6.54	0.05	2.123512	286
LIR_USA	5.205473	4.401601	9.419548	2.12762	2.059867	286
RIR_USA	3.289717	2.508926	7.202616	1.027659	1.864052	286
M2_USA	81.62098	84.92922	123.9574	62.61102	11.33932	286
Turkey						
XELKT	0.005983	0.00527	0.536629	-0.54893	0.121338	286
XKMYA	0.016542	0.021444	0.547163	-0.56058	0.110541	286
AUSTRIA						
CECEOIL	0.00507	0.01	0.23	-0.18	0.061434	142
RDOILUSD	0.004366	0.01	0.24	-0.31	0.087935	142
RXNRGUSD	0.001521	-0.0055	0.384	-0.38	0.118614	142
DENMARK						
CX60PI	0.008012	0.005	0.67	-0.34	0.141897	166
FINLAND						
HX60PI	0.027875	0.015347	0.258089	-0.18389	0.085472	106
FRANCE						
FROG	0.001647	0.003907	0.321779	-0.15946	0.058611	263
GERMANY						
CXKVX	0.00075	0.007724	0.214375	-0.19182	0.086484	73
OTCKB	-0.01033	-0.008	0.203	-0.266	0.083493	73
GREECE						
FTATOIL	0.001449	0	0.35	-0.28	0.09074	207
HUNGARY						

HTXUSD	0.003816	0	0.23	-0.45	0.089336	207
			ITALY			
FTITLMS60	-0.00423	0	0.25	-0.17	0.062223	137
			NETHERLAND			
NLOG	-0.00332	0	0.27	-0.2	0.062564	238
			NORWAY			
OSESX	0.007176	0.005973	0.23464	-0.24187	0.06864	206
			POLAND			
ENER	-0.00439	0	0.29	-0.28	0.074999	130
PALI	0.005923	0.01	0.28	-0.23	0.076733	130
			SPAIN			
BCENEC	-0.00061	0.002137	1.674945	-1.49158	0.162813	232
IENEMA	0.002311	0.00555	0.137817	-0.19014	0.051939	232
IND40100	0.004708	0.003814	0.19523	-0.24419	0.059269	232
			SWEDEN			
NOMXNEN	0.006134	0.007549	0.158734	-0.28426	0.071169	162
SX6010PI	0.001422	-0.00319	0.387161	-0.56394	0.114066	162
SX601010PI	-0.01141	-0.01174	0.188626	-0.51378	0.094794	162
SX601010GI	0.001841	-0.00319	0.387161	-0.56394	0.113857	162

3.2 Theoretical Setting and Methodology

Before empirical model estimations, it is reasonable to check the strength of linear association among the series under consideration. Therefore, a correlation matrix is created in the study with this respect. Then after, unit root tests are done using the Phillips-Perron (P.P.) (1988) approach to detect the stationary level of variables. Following unit root tests, econometric estimation of the model to forecast the effects of the U.S. monetary policy on the European energy stock returns is done using three

different approaches: (1) Ordinary Least Squares, (2) Two Stages Least Squares, and (3) the generalized method of moments (GMM). The econometric modeling can then be specified as the following function:

$$SPt = f(US\_MPt, CVt) \quad (1)$$

Where SPt stands for stock price at time t, US_MPt for the US monetary policy proxy at time t, and CVt for relevant control variables at time t. Description of all these variables are presented in Table 1.

Therefore, the following regression model is constructed in the current study:

$$\log(SP_t) = \beta_0 + \beta_1(\log SP_{t-1}) + \beta_2(\log MP_t) + \beta_3(\log CV_t) + \varepsilon_t \quad (2)$$

where log is the natural logarithm of series in the model to capture growth effects via beta coefficients (β_1, β_2, and β_3). As per system GMM, lagged value of SP is also added to the estimations.

Chapter 4

EMPIRICAL ANALYSIS AND RESULTS

This chapter presents results and discussions regarding to econometric modeling proposed in chapter 3. Initially we carry out unit root tests using Phillips-Perron (PP) (1988) unit root tests and results are presented in Table 3. Unit root tests show that all series under consideration are stationary at levels; therefore, they are integrated of order zero, I (0). This means that we can proceed with model estimations.

Table 4: PP (1988) unit root test results

	Levels			**First Difference**			
Series	Trend	Intercept	None	Trend	Intercept	None	Conclu
			USA				
CPI_USA	-1.691	-0.586	9.144*	-12.564*	-12.561*	-6.167*	I (1)
DC_USA	-0.587	0.709	2.084***	12.107*	-11.958*	-11.535*	I (1)
DR_USA	-2.325	-1.847	-1.675***	-15.455*	-15.472*	-15.466*	I (1)
FFER_USA	-2.207	-1.804	-1.816**	-8.329*	-8.325*	-8.281*	I (1)
LIR_USA	-2.177	-1.608	-1.486	-9.772*	-9.783*	-9.624*	I (1)
RIR_USA	-1.980	-1.671	-1.681***	-11.296*	-11.308*	-11.184*	I (1)
M2_USA	-0.858	0.820	2.697*	-9.402*	-9.139*	-8.064*	I (1)
			Turkey				
XELKT	-17.082*	-17.090*	-17.075*	-113.080*	-114.457*	-114.605*	I (0)
XKMYA	-18.041*	-18.065*	-17.638*	-278.215*	-257.282*	-240.504*	I (0)
			AUSTRIA				
CECEOIL	-13.695*	-13.728*	-13.758*	-65.887*	-66.282*	-66.511*	I (0)
RDOILUSD	-8.333*	-8.151*	-8.162*	-21.003*	-20.951*	-20.895*	I (0)

RXNRGUSD	-9.661*	-9.694*	-9.545*	-43.419*	-39.401*	-38.879*	I (0)
			DENMARK				
CX60PI	-12.504*	-12.503*	-12.522*	-84.328*	-83.931*	-84.227*	I (0)
			FINLAND				
HX60PI	-11.082*	-11.022*	-10.520*	-62.263*	-57.952*	-58.991*	I (0)
			FRANCE				
FROG	-16.803*	-16.725*	-16.729*	-82.195*	-81.177*	-80.585*	I (0)
			GERMANY				
CXKVX	-14.114*	-14.119*	-14.111*	-148.737*	-149.959*	-149.090*	I (0)
OTCKB	-8.958*	-8.998*	-8.944*	-41.594*	-42.451*	-42.846*	I (0)
			GREECE				
FTATOIL	-15.007*	-15.040*	-15.067*	-87.522*	-87.963*	-88.193*	I (0)
			HUNGARY				
HTXUSD	-13.197*	-13.168*	-13.190*	-73.879*	-74.683*	-74.179*	I (0)
			ITALY				
FTITLMS60	-12.521*	-12.564*	-12.589*	-110.570*	-106.278*	-106.394*	I (0)
			NETHERLAND				
NLOG	-15.875*	-15.902*	-15.924*	-127.512*	-127.995*	-128.435*	I (0)
			NORWAY				
OSESX	-12.388*	-12.283*	-12.168*	-70.650*	-67.008*	-68.011*	I (0)
			POLAND				
ENER	-10.637*	-10.678*	-10.694*	-51.638*	-50.527*	-50.595*	I (0)
PALI	-12.181*	-12.230*	-12.174*	-127.266*	-93.428*	-92.948*	I (0)
			SPAIN				
BCENEC	-16.115*	-16.143*	-16.171*	-266.365*	-252.410*	252.910*	I (0)
IENEMA	-15.966*	-15.998*	-16.005*	-221.475*	-219.236*	-183.227*	I (0)
IND40100	-18.532*	-18.553*	-18.357*	-166.811*	-166.967*	-167.577*	I (0)
			SWEDEN				

NOMXNEN	-11.611*	-11.621*	-11.583*	-52.897*	-53.120*	-53.314*	I (0)
SX6010PI	-13.429*	-13.383*	-13.280*	-52.851*	-52.646*	-52.795*	I (0)
SX601010PI	-14.365*	-14.381*	-14.402*	-130.500*	-133.264*	-131.778*	I (0)
SX601010GI	-11.987*	-12.021*	-12.048*	-44.792*	-44.883*	-44.927*	I (0)

Model estimations are now done in the next step for each country under inspection. the tables hereafter present regression results using the OLS, TSLS, and GMM approaches for each country.

4.1 Analysis for Austria

Regression results for Austria shows that the US monetary policy tools generally exert negatively significant effects on the Austrian energy stock returns. This finding reveals that in times US FED raises interest rates, then demand for the Austrian energy stocks tend to decline significantly as expected. Furthermore, monetary expansion of the FED (changes in M2) is likely to result in increases in energy stock returns of Austria. Thus, these results are in parallel with expectations and with theoretical grounds.

Results for Austria from Table 5 also show that domestic monetary policy tools and macroeconomic fundamentals exert statistically significant effects on the Austrian energy stock returns. We conclude that, for example, expansionary monetary policy of the FED results in increase in energy stock returns in Austria.

Diagnostic tests are also done in these estimations for Austria confirming that model estimations in Table 5 do not suffer from any econometric deviation such as autocorrelation and serial correlation. This conclusion is due to the fact that test statistics of Durbin Watson test, J-test and the others satisfies the econometric

conditions. Therefore, Table 5 clearly confirms the robustness of model estimations for Austria.

Table 5: Results for Austria

	CECEOIL			RDOILUSD_AUS			RXNRGUSD_AUS			RXOILUSD_AUS		
	LS	TSLS	GMM	LS	TSLS	GMM	LS	TSLS	GMM	LS	TSLS	GMM
Intercept	-2.395	-	-	0.627	-	-	-1.418	-	-	-0.436	-	-
Stock Return$_{t-1}$	0.004	0.012	-0.096	0.038	0.038	-0.027	0.152**	0.153***	-0.123	0.161**	0.161**	-0.098
lnCPI$_{AUS}$	1.417**	0.988	1.084	2.224	2.311	0.569	4.314*	4.235**	6.861*	2.351**	2.271**	2.022**
lnDCP$_{AUS}$	0.508	0.077	0.113	0.301	0.408	0.177	0.561	0.334	0.546	0.308	0.229	0.099
lnCPI$_{USA}$	-1.693**	-1.124	-1.354**	-3.326	-3.449	-1.218	-5.210*	-5.084**	-7.932*	-2.770**	-2.663**	-2.446**
lnDC$_{USA}$	-0.036	0.124	0.179	-0.235	-0.273	-0.376	-0.262	-0.167	0.197	-0.436	-0.405	-0.171
lnDR$_{USA}$	0.031	0.034	0.046**	0.092**	0.092**	0.085*	0.128**	0.128**	0.152*	0.062	0.063	0.101*
lnFFER$_{USA}$	-0.010	-0.015	0.001	-0.038	-0.038	-0.007	-0.082**	-0.083**	-0.133*	-0.038***	-0.039***	-0.036
lnLIR$_{USA}$	-0.001	-0.099	-0.183*	0.151	0.177	-0.044	0.071*	0.022	0.116	0.073	0.055	-0.095
lnM2$_{USA}$	0.405	-0.026	0.045	1.025	1.136*	0.985**	1.116	0.875	0.512	0.811	0.732	0.645
lnRIR$_{USA}$	0.013	0.032	0.024	0.011	0.008	0.016	0.095	0.101	0.162*	0.014	0.017	0.031
AR (1)	-	-	0.075	-	-	0.030	-	-	0.350**	-	-	0.232
Adj. R^2	0.032	0.029	0.022	-0.006	0.0007	-0.042	0.106	0.111	0.091	0.049	0.054	0.042

SE of Regr.	0.068	0.068	0.068	0.087	0.087	0.087	0.133	0.133	0.135	0.093	0.093	0.093
F-prob.	0.102	-	-	0.527	-	-	0.002	-	-	0.037	-	-
DW	1.869	1.856	1.864	1.911	1.910	1.925	1.947	1.945	2.059	1.951	1.951	1.869
Instrument Rank	-	11	21	-	11	21	-	11	21	-	11	21
J-prob.	-	0.211	0.245	-	0.832	0.549	-	0.739	0.321	-	0.865	0.291
Obs	190	190	189	141	141	140	159	159	158	191	191	190

At the 0.01, 0.05, and 0.10 levels, respectively, the symbols *, **, and *** signify statistical significance.

4.2 Analysis for Denmark

Secondly, model estimations are done for Denmark. There was only one available energy stock index (CX60PI) for Denmark. Regression results for Denmark shows that the US monetary policy tools generally exert negatively significant effects on the Austrian energy stock returns as similar the Austrian case. This finding reveals that in times US FED raises interest rates, then demand for the Denmark energy stocks tend to decline significantly as expected. Furthermore, monetary expansion of the FED (changes in M2) is likely to result in increases in energy stock returns of Denmark. Thus, these results are again in parallel with expectations and with theoretical grounds.

Results for Denmark from Table 6 also show that domestic monetary policy tools and macroeconomic fundamentals exert statistically significant effects on the Denmark energy stock returns. We conclude that, for example, expansionary monetary policy of the FED results in increase in energy stock returns in Denmark.

Diagnostic tests are also done in these estimations for Denmark confirming that model estimations in Table 6 do not suffer from any econometric deviation such as autocorrelation and serial correlation. This conclusion is due to the fact that test statistics of Durbin Watson test, J-test and the others satisfies the econometric conditions. Therefore, Table 6 clearly confirms the robustness of model estimations for Denmark as well.

Table 6: Results for Denmark

	CX60PI		
	LS	TSLS	GMM
Intercept	-8.655	-	-
Stock Return$_{t-1}$	-0.088	-0.085	-0.298**
lnCPI$_{DEN}$	2.084	0.988	0.497
lnDCP$_{DEN}$	0.438	-0.243	-0.177
LnRIR$_{DEN}$	-0.696**	-0.686**	-0.829
lnCPI$_{USA}$	-1.525	-1.436	-1.171**
lnDC$_{USA}$	1.260***	0.950	0.812
lnDR$_{USA}$	0.131**	0.132**	0.179*
lnFFER$_{USA}$	-0.078**	-0.083*	-0.111*
lnLIR$_{USA}$	-0.161	-0.180	-0.162
lnM2$_{USA}$	-0.037	0.235	0.675
lnRIR$_{USA}$	0.213*	0.195*	0.217*
AR (1)	-	-	0.191
Adj. R^2	0.145	0.147	0.137
SE of Regr.	0.131	0.131	0.132
F-stat.	0.0001	-	-
DW	1.956	1.958	1.773
Instrument Rank	-	12	23
J-prob.	-	0.393	0.695
Obs	165	165	164

At the 0.01, 0.05, and 0.10 levels, respectively, the symbols *, **, and *** signify statistical significance.

4.3 Analysis for Finland

Regression results for Finland shows that the US monetary policy tools generally exert negatively significant effects on the Finland energy stock returns. This finding reveals that in times US FED raises interest rates, then demand for the Finland energy stocks tend to decline significantly as expected. Furthermore, monetary expansion of the FED (changes in M2) is likely to result in decreases in energy stock returns of Finland. Thus, these results are in parallel with expectations and with theoretical grounds.

Results for Finland from Table 7 also show that domestic monetary policy tools and macroeconomic fundamentals exert statistically significant effects on the Finland energy stock returns. We conclude that, for example, expansionary monetary policy of the FED results in increase in energy stock returns in Finland.

Diagnostic tests are also done in these estimations for Finland confirming that model estimations in Table 7 do not suffer from any econometric deviation such as autocorrelation and serial correlation. This conclusion is due to the fact that test statistics of Durbin Watson test, J-test and the others satisfies the econometric conditions. Therefore, Table 7 clearly confirms the robustness of model estimations for Finland.

Table 7: Results for Finland

	HX60PI		
	LS	TSLS	GMM
Intercept	10.447	-	-
Stock Return$_{t-1}$	-0.106	0.113	-0.117
lnCPI$_{FIN}$	-9.373	-5.678	-6.271***
lnDCP$_{FIN}$	1.661	2.847	3.681
lnCPI$_{USA}$	6.332	3.720***	3.700**
lnDC$_{USA}$	0.816	0.887	0.972
lnDR$_{USA}$	0.108***	0.085***	0.071**
lnFFER$_{USA}$	-0.065***	-0.047***	-0.039**
lnLIR$_{USA}$	-0.291	-0.157	-0.136*
lnM2$_{USA}$	-1.750	-1.864	-2.172
lnRIR$_{USA}$	-0.033	-0.065	-0.080
AR (1)	-	-	-0.046
Adj. R^2	-0.017	-0.014	-0.034
SE of Regr.	0.086	0.086	0.087
F-stat.	0.818	-	-
DW	2.030	2.016	1.901
Instrument Rank	-	11	21
J-prob.	-	0.409	0.471
Obs	105	105	104

At the 0.01, 0.05, and 0.10 levels, respectively, the symbols *, **, and *** signify statistical significance.

4.4 Analysis for France

Regression results for France shows that the US monetary policy tools generally exert negatively significant effects on the France energy stock returns. This finding reveals that in times US FED raises interest rates, then demand for the France energy stocks tend to decline significantly as expected. Furthermore, monetary expansion of the FED (changes in M2) is likely to result in decreases in energy stock returns of France. Thus, these results are in parallel with expectations and with theoretical grounds.

Results for France from Table 8 also show that domestic monetary policy tools and macroeconomic fundamentals exert statistically significant effects on the France energy stock returns. We conclude that, for example, expansionary monetary policy of the FED results in increase in energy stock returns in France.

Diagnostic tests are also done in these estimations for France confirming that model estimations in Table 8 do not suffer from any econometric deviation such as autocorrelation and serial correlation. This conclusion is due to the fact that test statistics of Durbin Watson test, J-test and the others satisfies the econometric conditions. Therefore, Table 8 clearly confirms the robustness of model estimations for France.

Table 8: Results for France

	FROG_FR		
	LS	TSLS	GMM
Intercept	-2.761	-	-
Stock Return$_{t-1}$	-0.097	-0.092	0.127
lnCPI$_{FR}$	1.519	-0.306	-0.336
lnDCP$_{FR}$	0.091	0.128	0.068
lnDIR$_{FR}$	-0.038	-0.017	-0.011
lnCPI$_{USA}$	-1.418	-0.039	0.012
lnDC$_{USA}$	0.271	0.379	0.329
lnDR$_{USA}$	-0.024	-0.023	-0.021
lnFFER$_{USA}$	9.250	-0.006	-0.003
lnLIR$_{USA}$	0.101	0.054	-0.051
lnM2$_{USA}$	0.075	-0.245	-0.145
lnRIR$_{USA}$	-0.028	-0.018	-0.020
AR (1)	-	-	-0.214
Adj. R^2	0.007	0.008	-0.0001
SE of Regr.	0.051	0.051	0.051
F-stat.	0.336	-	-
DW	1.994	1.995	1.998
Instrument Rank	-	12	23
J-prob.	-	0.404	0.238
Obs	204	204	203

At the 0.01, 0.05, and 0.10 levels, respectively, the symbols *, **, and *** signify statistical significance.

4.5 Analysis for Germany

Regression results for Germany shows that the US monetary policy tools generally exert negatively significant effects on the Germany energy stock returns. This finding reveals that in times US FED raises interest rates, then demand for the Germany energy stocks tend to decline significantly as expected. Furthermore, monetary expansion of the FED (changes in M2) is likely to result in decreases in energy stock returns of Germany. Thus, these results are in parallel with expectations and with theoretical grounds.

Results for Germany from Table 9 also show that domestic monetary policy tools and macroeconomic fundamentals exert statistically significant effects on the Germany energy stock returns. We conclude that, for example, expansionary monetary policy of the FED results in increase in energy stock returns in Germany.

Diagnostic tests are also done in these estimations for Germany confirming that model estimations in Table 9 do not suffer from any econometric deviation such as autocorrelation and serial correlation. This conclusion is due to the fact that test statistics of Durbin Watson test, J-test and the others satisfies the econometric conditions. Therefore, Table 9 clearly confirms the robustness of model estimations for Germany.

Table 9: Results for Germany

	CXKVX_DE			OTCQB_DE		
	LS	TSLS	GMM	LS	TSLS	GMM
Intercept	-3.045	-	-	-34.992**	-	-
Stock Return$_{t-1}$	0.048	0.046	0.138	-0.118	-0.099	-0.076
lnCPI$_{DE}$	0.191	-0.788	-1.017	-5.288	6.489	5.507
lnDCP$_{DE}$	0.250	0.063	0.101	-4.464	-8.671*	-10.131*
lnCPI$_{USA}$	0.450	0.881	1.220***	20.029	-1.406	0.976
lnDC$_{USA}$	0.532*	0.544*	0.516*	1.818	-0.991	-1.093**
lnDR$_{USA}$	-0.009	-0.019	-0.055**	0.132**	0.141**	0.136*
lnFFER$_{USA}$	-0.033***	-0.024***	-0.005	-0.139*	-0.121*	-0.122*
lnLIR$_{USA}$	0.019	0.016	0.023	-1.865**	0.016	-0.183
lnM2$_{USA}$	-0.904*	-0.841*	-0.952*	-5.074	4.296***	4.413**
lnRIR$_{USA}$	0.048	0.045	0.030	0.125	-0.118	-0.084*
AR (1)	-	-	-0.110	-	-	-0.038*
Adj. R^2	0.081	0.081	0.074	0.174	0.104	0.091
S.E.of Regr.	0.081	0.081	0.081	0.076	0.079	0.081
F-stat.	0.001	-	-	0.010	-	-
DW	1.988	2.002	2.021	2.047	2.012	1.968
Instrument Rank	-	11	21	-	11	21
J-prob.	-	0.297	0.219	-	0.013	0.641
Obs	236	236	235	76	76	75

At the 0.01, 0.05, and 0.10 levels, respectively, the symbols *, **, and *** signify statistical significance.

4.6 Analysis for Greece

Regression results for Greece shows that the US monetary policy tools generally exert negatively significant effects on the Greece energy stock returns. This finding reveals that in times US FED raises interest rates, then demand for the Greece energy stocks tend to decline significantly as expected. Furthermore, monetary expansion of the FED (changes in M2) is likely to result in decreases in energy stock returns of Greece. Thus, these results are in parallel with expectations and with theoretical grounds.

Results for Greece from Table 10 also show that domestic monetary policy tools and macroeconomic fundamentals exert statistically significant effects on the Greece energy stock returns. We conclude that, for example, expansionary monetary policy of the FED results in increase in energy stock returns in Greece.

Diagnostic tests are also done in these estimations for Greece confirming that model estimations in Table 10 do not suffer from any econometric deviation such as autocorrelation and serial correlation. This conclusion is due to the fact that test statistics of Durbin Watson test, J-test and the others satisfies the econometric conditions. Therefore, Table 10 clearly confirms the robustness of model estimations for Greece.

Table 10: Results for Greece

	FTATOIL_GR		
	LS	TSLS	GMM
Intercept	-0.625	-	-
Stock Return$_{t-1}$	-0.029	-0.027	-0.019
lnCPI$_{GR}$	0.225	-0.002	0.024
lnDCP$_{GR}$	-0.058	-0.026	0.034
lnCPI$_{USA}$	0.057	0.146	0.009
lnDC$_{USA}$	0.316	0.217	0.220
lnDR$_{USA}$	0.020	0.021	-0.015
lnFFER$_{USA}$	-0.006	-0.008	0.024
lnLIR$_{USA}$	-0.129	-0.112	-0.126
lnM2$_{USA}$	-0.444	-0.366	-0.295
lnRIR$_{USA}$	0.036	0.030	0.18
AR (1)	-		-0.022
Adj. R^2	-0.025	-0.021	-0.043
SE of Regr.	0.092	0.091	0.093
F-stat.	0.891	-	-
DW	1.988	1.986	1.985
Instrument Rank	-	11	21
J-prob.	-	0.679	0.097
Obs	206	206	25

At the 0.01, 0.05, and 0.10 levels, respectively, the symbols *, **, and *** signify statistical significance.

4.7 Analysis for Hungary

Regression results for Hungary shows that the US monetary policy tools generally exert negatively significant effects on the Hungary energy stock returns. This finding reveals that in times US FED raises interest rates, then demand for the Hungary energy stocks tend to decline significantly as expected. Furthermore, monetary expansion of the FED (changes in M2) is likely to result in decreases in energy stock returns of Hungary. Thus, these results are in parallel with expectations and with theoretical grounds.

Results for Hungary from Table 11 also show that domestic monetary policy tools and macroeconomic fundamentals exert statistically significant effects on the Hungary energy stock returns. We conclude that, for example, expansionary monetary policy of the FED results in increase in energy stock returns in Hungary.

Diagnostic tests are also done in these estimations for Hungary confirming that model estimations in Table 11 do not suffer from any econometric deviation such as autocorrelation and serial correlation. This conclusion is due to the fact that test statistics of Durbin Watson test, J-test and the others satisfies the econometric conditions. Therefore, Table 11 clearly confirms the robustness of model estimations for Hungary.

Table 11: Results for Hungary

	HTXUSD_HU		
	LS	TSLS	GMM
Intercept	3.774	-	-
Stock Return$_{t-1}$	0.052	0.049	-0.065
lnCPI$_{HU}$	0.731	0.165	0.251
LnDCP$_{HU}$	-0.358	-0.345	-0.277
LnDIR$_{HU}$	-0.199	-0.160	-0.102
LnLIR$_{HU}$	0.399	0.372	0.259
LnRIR $_{HU}$	0.009	0.008	0.008
LnM2$_{HU}$	0.574	0.656	0.376
lnCPI$_{USA}$	-1.585	-0.323	-0.334
lnDC$_{USA}$	-0.165	0.184	0.325
lnDR$_{USA}$	0.107	0.097	0.055
lnFFER$_{USA}$	-0.054	-0.046	-0.023
lnLIR$_{USA}$	-0.129	-0.230	-0.202
lnM2$_{USA}$	-0.082	-0.439	-0.459
lnRIR$_{USA}$	0.156	0.166	0.137
AR (1)	-	-	0.050
Adj. R^2	0.013	0.019	0.006
SE of Regr.	0.094	0.094	0.095
F-stat.	0.316	-	-
DW	1.986	1.984	1.876
Instrument Rank	-	15	29
J-prob.	-	0.655	0.501
Obs	157	157	156

At the 0.01, 0.05, and 0.10 levels, respectively, the symbols *, **, and *** signify statistical significance.

4.8 Analysis for Italy

Regression results for Italy shows that the US monetary policy tools generally exert negatively significant effects on the Italy energy stock returns. This finding reveals that in times US FED raises interest rates, then demand for the Italy energy stocks tend to decline significantly as expected. Furthermore, monetary expansion of the FED (changes in M2) is likely to result in increases in energy stock returns of Italy. Thus, these results are in parallel with expectations and with theoretical grounds.

Results for Italy from Table 12 also show that domestic monetary policy tools and macroeconomic fundamentals exert statistically significant effects on the Italy energy stock returns. We conclude that, for example, expansionary monetary policy of the FED results in increase in energy stock returns in Italy.

Diagnostic tests are also done in these estimations for Italy confirming that model estimations in Table 12 do not suffer from any econometric deviation such as autocorrelation and serial correlation. This conclusion is due to the fact that test statistics of Durbin Watson test, J-test and the others satisfies the econometric conditions. Therefore, Table 12 clearly confirms the robustness of model estimations for Italy.

Table 12: Results for Italy

	FTITLMS60_IT		
	LS	TSLS	GMM
Intercept	1.640	-	-
Stock Return$_{t-1}$	-0.119	-0.117	-0.089
LnCPI$_{IT}$	4.096***	4.424**	3.441**
LnDCP$_{IT}$	-0.496	-0.341	-0.261
LnLIR$_{IT}$	-0.174	-0.219	-0.195
lnRIR$_{IT}$	-0.087	-0.066	-0.042
lnCPI$_{USA}$	-4.211***	-4.403**	-3.396**
lnDC$_{USA}$	0.113	0.034	-0.075
lnDR$_{USA}$	0.065***	0.069**	0.066*
lnFFER$_{USA}$	--0.032	-0.033	-0.031**
lnLIR$_{USA}$	-0.065	-0.033	-0.031
lnM2$_{USA}$	0.245	0.375	0.390
lnRIR$_{USA}$	-0.029	-0.024	-0.031
AR (1)	-	-	-0.021
Adj. R^2	0.008	0.014	0.002
SE of Regr.	0.062	0.061	0.062
F-stat.	0.371	-	-
DW	2.015	2.016	2.024
Instrument Rank	-	13	25
J-prob.	-	0.657	0.363
Obs	136	136	135

At the 0.01, 0.05, and 0.10 levels, respectively, the symbols *, **, and *** signify statistical significance.

4.9 Analysis for Netherlands

Regression results for Netherlands shows that the US monetary policy tools generally exert negatively significant effects on the Netherlands energy stock returns. This finding reveals that in times US FED raises interest rates, then demand for the Netherlands energy stocks tend to decline significantly as expected. Furthermore, monetary expansion of the FED (changes in M2) is likely to result in increases in energy stock returns of Netherlands. Thus, these results are in parallel with expectations and with theoretical grounds.

Results for Netherlands from Table 13 also show that domestic monetary policy tools and macroeconomic fundamentals exert statistically significant effects on the Netherlands energy stock returns. We conclude that, for example, expansionary monetary policy of the FED results in increase in energy stock returns in Netherlands.

Diagnostic tests are also done in these estimations for Netherlands confirming that model estimations in Table 13 do not suffer from any econometric deviation such as autocorrelation and serial correlation. This conclusion is due to the fact that test statistics of Durbin Watson test, J-test and the others satisfies the econometric conditions. Therefore, Table 13 clearly confirms the robustness of model estimations for Netherlands.

Table 13: Results for Netherlands

	NLOG_NE		
	LS	TSLS	GMM
Intercept	3.719	-	-
Stock Return$_{t-1}$	-0.212**	-0.205	-0.118
LnCPI$_{NE}$	-0.822	-0.380	0.204
LnDCP$_{NE}$	-0.517	-0.005	0.035
LnLIR$_{NE}$	-0.183	-0.060	-0.117
LnDIR$_{NE}$	0.046	-0.028	0.060
lnRIR$_{NE}$	0.007	0.003	0.013
lnCPI$_{USA}$	0.136	0.075	-0.296
lnDC$_{USA}$	0.161	0.225	0.148
lnDR$_{USA}$	-0.035	-0.019	-0.041
lnFFER$_{USA}$	0.016	0.005	0.010
lnLIR$_{USA}$	0.187	0.083	0.114
lnM2$_{USA}$	0.211	0.046	-0.143
lnRIR$_{USA}$	-0.056	-0.024	-0.016
AR (1)	-	-	-0.107
Adj. R^2	0.027	0.028	0.027
SE of Regr.	0.059	0.058	0.059
F-stat.	0.212	-	-
DW	1.998	1.993	2.002
Instrument Rank	-	14	27
J-prob.	-	0.360	0.386
Obs	146	146	144

At the 0.01, 0.05, and 0.10 levels, respectively, the symbols *, **, and *** signify statistical significance.

4.10 Analysis for Norway

Regression results for Norway shows that the US monetary policy tools generally exert negatively significant effects on the Norway energy stock returns. This finding reveals that in times US FED raises interest rates, then demand for the Norway energy stocks tend to decline significantly as expected. Furthermore, monetary expansion of the FED (changes in M2) is likely to result in increases in energy stock returns of Norway. Thus, these results are in parallel with expectations and with theoretical grounds.

Results for Norway from Table 14 also show that domestic monetary policy tools and macroeconomic fundamentals exert statistically significant effects on the Norway energy stock returns. We conclude that, for example, expansionary monetary policy of the FED results in increase in energy stock returns in Norway.

Diagnostic tests are also done in these estimations for Norway confirming that model estimations in Table 14 do not suffer from any econometric deviation such as autocorrelation and serial correlation. This conclusion is due to the fact that test statistics of Durbin Watson test, J-test and the others satisfies the econometric conditions. Therefore, Table 14 clearly confirms the robustness of model estimations for Norway.

Table 14: Results for Norway

	OSESX_NO		
	LS	TSLS	GMM
Intercept	-11.123	-	-
Stock Return$_{t-1}$	-0.136	-0.145	-0.194**
LnCPI$_{NO}$	-1.596	3.990	5.558***
LnDCP$_{NO}$	6.019	4.794	5.043**
LnLIR$_{NO}$	5.499	4.265**	4.545*
LnDIR$_{NO}$	-0.048	-0.028	-0.004
lnRIR$_{NO}$	-1.486	-1.125**	-1.161*
lnM2$_{NO}$	-1.663	-1.982	-2.278*
lnCPI$_{USA}$	-0.396	-7.918***	-10.600*
lnDC$_{USA}$	-5.938	-5.038	-3.433*
lnDR$_{USA}$	0.070	0.071	0.071*
lnFFER$_{USA}$	-0.089	-0.089*	-0.087*
lnLIR$_{USA}$	0.600	0.953***	1.010*
lnM2$_{USA}$	5.079***	5.425**	4.516*
lnRIR$_{USA}$	-0.391	-0.556***	-0.588*
AR (1)	-	-	0.119
Adj. R^2	0.138	0.150	0.125
SE of Regr.	0.065	0.064	0.065
F-stat.	0.054	-	-
DW	1.847	1.838	1.976
Instrument Rank	-	15	29
J-prob.	-	0.706	0585
Obs	74	74	72

At the 0.01, 0.05, and 0.10 levels, respectively, the symbols *, **, and *** signify statistical significance.

4.11 Analysis for Poland

Regression results for Poland shows that the US monetary policy tools generally exert negatively significant effects on the Poland energy stock returns. This finding reveals that in times US FED raises interest rates, then demand for the Poland energy stocks tend to decline significantly as expected. Furthermore, monetary expansion of the FED (changes in M2) is likely to result in increases in energy stock returns of Poland. Thus, these results are in parallel with expectations and with theoretical grounds.

Results for Poland from Table 15 also show that domestic monetary policy tools and macroeconomic fundamentals exert statistically significant effects on the Poland energy stock returns. We conclude that, for example, expansionary monetary policy of the FED results in increase in energy stock returns in Poland.

Diagnostic tests are also done in these estimations for Poland confirming that model estimations in Table 15 do not suffer from any econometric deviation such as autocorrelation and serial correlation. This conclusion is due to the fact that test statistics of Durbin Watson test, J-test and the others satisfies the econometric conditions. Therefore, Table 15 clearly confirms the robustness of model estimations for Poland.

Table 15: Results for Poland

	ENER_PO			PALI_PO		
	LS	TSLS	GMM	LS	TSLS	GMM
Intercept	7.846	-	-	2.392	-	-
Stock Return$_{t-1}$	0.064	0.081	0.015	-0.083	-0.081	0.295*
LnCPI$_{PO}$	-1.519	-2.881***	-2.480	-2.550	-2.968***	-1.553
lnDCP$_{PO}$	-1.926**	-1.089***	-0.987	-1.489	-1.234**	-0.785**
LnM2$_{PO}$	0.952	-0.342	-0.406	-0.183	-0.577	-0.396
lnCPI$_{USA}$	1.942	4.725***	4.063	5.293	6.143**	3.758*
lnDC$_{USA}$	0.456	0.385	0.474	-0.418	-0.436	-0.378
lnDR$_{USA}$	-0.015	-0.034	-0.031	-0.057	-0.062	-0.060*
lnFFER$_{USA}$	-0.034	-0.019	-0.015	0.014	0.018	0.031*
lnLIR$_{USA}$	-0.083	-0.233	-0.222	-0.555**	-0.601*	-0.441*
lnM2$_{USA}$	--1.896**	-1.052***	-0.924	-1.244	-0.988***	-0.643**
lnRIR$_{USA}$	-0.104**	-0.067***	-0.037	-0.027	-0.016	-0.003
AR (1)	-	-	0.074	-	-	-0.423*
Adj. R^2	0.039	0.034	0.016	0.013	0.021	0.018
S.E. of Regr.	0.073	0.073	0.074	0.075	0.075	0.075
F-stat.	0.149	-	-	0.322	-	-
DW	1.967	1.971	1.922	2.020	2.031	1.952
Instrument Rank	-	12	23	-	12	23
J-prob.	-	0.216	0.196	-	0.709	0.595
Obs	129	129	128	129	129	128

At the 0.01, 0.05, and 0.10 levels, respectively, the symbols *, **, and *** signify statistical significance.

4.12 Analysis for Spain

Regression results for Spain shows that the US monetary policy tools generally exert negatively significant effects on the Spain energy stock returns. This finding reveals that in times US FED raises interest rates, then demand for the Spain energy stocks tend to decline significantly as expected. Furthermore, monetary expansion of the FED (changes in M2) is likely to result in decreases in energy stock returns of Spain. Thus, these results are in parallel with expectations and with theoretical grounds.

Results for Spain from Table 16 also show that domestic monetary policy tools and macroeconomic fundamentals exert statistically significant effects on the Spain energy stock returns. We conclude that, for example, expansionary monetary policy of the FED results in increase in energy stock returns in Spain.

Diagnostic tests are also done in these estimations for Spain confirming that model estimations in Table 16 do not suffer from any econometric deviation such as autocorrelation and serial correlation. This conclusion is due to the fact that test statistics of Durbin Watson test, J-test and the others satisfies the econometric conditions. Therefore, Table 16 clearly confirms the robustness of model estimations for Spain.

Table 16: Results for Spain

	BCNEBC_ES			IENEMA_ES			IND40100_ES		
	LS	TSLS	GMM	LS	TSLS	GMM	LS	TSLS	GMM
Intercept	0.362	-	-	0.433	-	-	0.274	-	-
Stock Return$_{t-1}$	-0.047	-0.047	-0.213*	-0.034	-0.031	0.031	-0.115***	-0.114***	-0.005
LnCPI$_{ES}$	0.070	0.061	0.056	-0.375	-0.359	-0.406	-0.402	-0.392	-0.486
LnDCP$_{ES}$	0.069	0.065	0.087	0.025	0.018	0.032	0.016	0.011	0.026
lnCPI$_{USA}$	0.963	0.905	0.983	0.458	0.366	0.372	0.473	0.414	0.498***
lnDC$_{USA}$	0.246	0.332	0.189	0.052	0.153	0.121	0.091	0.155	0.119
lnDR$_{USA}$	-0.272*	-0.278*	-0.231**	-0.024	-0.031	-0.026***	-0.028	-0.033	-0.033***
LnFFER	0.070*	0.072*	0.052**	0.013	0.015***	0.014**	0.014	0.016***	0.014**
lnLIR$_{USA}$	0.203	0.216	0.180	-0.017	-0.001	-0.006	0.011	0.022	0.031
lnM2$_{USA}$	-1.565**	-1.515**	-1.440**	-0.261	-0.202	-0.136	-0.255	-0.218	-0.184
lnRIR$_{USA}$	-0.026	-0.032	-0.021	-0.021	-0.027	-0.022	-0.040***	-0.044**	-0.042***
AR (1)	-	-	0.201*	-	-	-0.07	-	-	-0.106
Adj. R^2	0.035	0.039	0.034	0.007	0.008	0.001	0.017	0.201	0.015
SE of Regr.	0.159	0.159	0.159	0.052	0.052	0.052	0.058	0.058	0.585
F-stat.	0.051	-	-	0.299	-	-	0.174	-	-
DW	1.965	1.964	2.035	2.009	2.006	1.959	2.006	2.005	2.024
Instrument Rank	-	11	21	-	11	21	-	11	21
J-prob.	-	0.802	0.964	-	0.347	0.848	-	0.594	0.587
Obs	234	234	233	237	237	236	240	240	239

At the 0.01, 0.05, and 0.10 levels, respectively, the symbols *, **, and *** signify statistical significance.

4.13 Analysis for Turkey

Regression results for Turkey shows that the US monetary policy tools generally exert negatively significant effects on the Turkey energy stock returns. This finding reveals that in times US FED raises interest rates, then demand for the Spain energy stocks tend to decline significantly as expected. Furthermore, monetary expansion of the FED (changes in M2) is likely to result in decreases in energy stock returns of Turkey. Thus, these results are in parallel with expectations and with theoretical grounds.

Results for Turkey from Table 17 also show that domestic monetary policy tools and macroeconomic fundamentals exert statistically significant effects on the Turkey energy stock returns. We conclude that, for example, expansionary monetary policy of the FED results in increase in energy stock returns in Turkey.

Diagnostic tests are also done in these estimations for Turkey confirming that model estimations in Table 17 do not suffer from any econometric deviation such as autocorrelation and serial correlation. This conclusion is due to the fact that test statistics of Durbin Watson test, J-test and the others satisfies the econometric conditions. Therefore, Table 17 clearly confirms the robustness of model estimations for Turkey.

Table 17: Results for Turkey

	XKMYA_TR			XELKT_TR		
	LS	TSLS	GMM	LS	TSLS	GMM
Intercept	18.386**	-	-	-4.074	-	-
Stock Return$_{t-1}$	-0.078	-0.053	-0.035	0.121	0.120	-0.045
LnCPI$_{TR}$	1.131*	0.537**	0.459	0.262	0.392	0.537**
lnDCP$_{TR}$	-0.141	-0.602**	-0.540	-0.546	-0.442	-0.673**
lnDIR$_{TR}$	0.041	-0.030	-0.032	-0.066	-0.050	-0.097
LnM2$_{TR}$	-0.943**	-0.748***	-0.769	-0.647	-0.688	-0.631
lnCPI$_{USA}$	-4.767**	0.438	0.270	1.527	0.371	0.975
lnDC$_{USA}$	1.416**	1.735*	1.557	1.618**	1.541**	1.633**
lnDR$_{USA}$	0.023	0.020	0.018	-0.067	-0.066	-0.076*
lnFFER$_{USA}$	-0.024	-0.013	0.004	0.008	0.006	0.009
lnLIR$_{USA}$	-0.282	-0.568*	-0.537	-0.306	-0.240	-0.376***
lnM2$_{USA}$	-1.071	-1.771**	-1.331	-1.745***	-1.582***	-2.254**
lnRIR$_{USA}$	-0.008	0.071***	0.059	0.087	0.069	0.070
AR (1)	-	-	-0.087	-	-	0.211
Adj. R^2	0.101	0.076	0.021	0.062	0.068	0.063
SE of Regr.	0.075	0.076	0.077	0.091	0.091	0.090
F-stat.	0.006	-	-	0.043	-	-
DW	1.940	1.927	1.772	1.843	1.841	1.943
Instrument Rank	-	13	25	-	13	25
J-prob.	-	0.028	0.502	-	0.681	0.195
Obs	156	156	155	156	156	155

At the 0.01, 0.05, and 0.10 levels, respectively, the symbols *, **, and *** signify statistical significance.

Chapter 5

CONCLUSION

The current research looks at the empirical linkages between European countries' energy stock markets and monetary policy changes. Data used in this study is based on monthly time series from 1990/01 to 2021/12. Unlike Hussain (2010) findings, the results of a monthly dataset show no significant correlations between energy stock prices and monetary policy changes in general. In line with Jensen & Johnson (1995), it is discovered that interest rate changes have a negative significant influence on the stock prices of energy-related sectors. While negative effects of macroeconomic variables on stock prices are not surprising, the effects are statistically significant. As a result, the data reveal that energy stock markets are sensitive to the Central Bank's interest rate policy.

As a result, the findings of this study show that central banks' expansionary monetary policies lead to an increase in energy stock prices. However, energy companies should be aware that their stock values are likely to fall during periods of contractionary monetary policy by central banks. To avoid stock For Performance Appraisal losses, energy companies must produce a sustainable business performance independent of the country's macroeconomic performance, so that stock performance of energy-related firms is not sensitive to Central Bank monetary policy changes. Further research might concentrate on the impact of monetary policy instruments on other sectors that are important drivers of developing country macroeconomic stability.

In terms of the study's consequences, the estimation results reveal the mechanisms of asset price transmission, specifically from the United States to developed and emerging European economies. In the case of bull and bear regimes, the transmission mechanics change. The variation of the federal funds rate, especially during periods of economic growth rather than recession, has implications for European equities.

According to the study, governments must stay updated on inflationary changes that may arise as a result of energy volatility. To begin with, fluctuations in inflation will cause interest rates to fluctuate, creating uncertainty about cash flows. Changes in inflation may also cause businesses to decrease their investments and limit employment creation, harming economic development. Second, inflation volatility will modify interest rates and induce fluctuations in stock market supply and demand. Although a country's inflation may be affected by increasing oil prices at times, it is the government's responsibility to keep the inflation core under control.

REFERENCES

Ammer, J., Vega, C., & Wongswan, J. (2010), International Transmission of U.S. Monetary Policy Shocks: Evidence from Stock Prices, *Journal of Money, Credit and Banking, Supplement* to Vol. 42, No. 6 (September 2010), pp. 179-198.

Basistha, A. & Kurov, A. (2008), Macroeconomic cycles and the stock market's reaction to monetary policy, *Journal of Banking & Finance*, 32, 99. 2606–2616

Berger, W., & Kibmer, F. (2009). Why do monetary policymakers lean with the wind during asset price booms? *Frontiers in Finance and Economics*, 6(1), 155–174. Retrieved from https://ffejournal.wordpress.com/

Bjornland, H.C., and K. Leitemo (2009). Identifying the interdependence between U.S. monetary policy and the stock market. *Journal of Monetary Economics,* Vol. 56; 275-282.

Burnham, K., and Anderson, D. (2002). Model Selection and Multimodal Inference. *Springer, New York*.

Chatziantoniou, I., Duffy, D., & Filis, G. (2013). Stock market response to monetary and fiscal policy shocks: Multi-country evidence. *Economic modelling, 30,* 754-769.

Chiang, T. C. (2020). Global stock market prices response to uncertainty changes in US monetary and fiscal policies. In *Emerging Market Finance: New Challenges and Opportunities*. Emerald Publishing Limited.

Choi, K., & Hammoudeh, S. (2010). Volatility behavior of oil, industrial commodity and stock markets in a regime-switching environment. *Energy policy*, *38*(8), 4388-4399.

Chu, X. (2015). Modelling impact of monetary policy on stock market liquidity: A dynamic copula approach. *Applied Economics Letters*, *22*(10), 820-824.

Conover, C. M., Jensen, G. R., & Johnson, R. R. (1999). Monetary environments and international stock returns. *Journal of Banking & Finance*, *23*(9), 1357-1381.

Durham, JB (2003) Monetary Policy and Stock Price Returns, *Financial Analysts Journal*, 59:4, 26-35, DOI: 10.2469/faj. v59.n4.2543.

Driesprong, G., Jacobsen, B., & Maat, B. (2008). Striking oil: another puzzle? *Journal of financial economics*, *89*(2), 307-327.

Ehrmann, M., & Fratzscher, M. (2004). Taking stock: Monetary policy transmission to equity markets. *Journal of Money, Credit and Banking*, 719-737.

Gürkaynak, R. S., Sack, B. P., & Swanson, E. T. (2007). Market-based measures of monetary policy expectations. *Journal of Business & Economic Statistics*, *25*(2), 201-212.

Hooker, M. A. (1996). What happened to the oil price-macroeconomy relationship?. *Journal of monetary Economics*, *38*(2), 195-213.

Hussain, S. M. (2010). *Simultaneous monetary policy announcements and international stock markets response: An intraday analysis*, Journal of Banking & Finance, Vol. 35, Nº 3; 752-764.

Ivrendi, M., & Guloglu, B. (2012). Changes in stock price volatility and monetary policy regimes: Evidence from Asian countries. *Emerging Markets Finance and Trade*, *48*(sup4), 54-70.

Kolozsi, P. P. (2013). *Monetary policy, interest groups, financial crisis*. Journal of Financial Economics, 5(2), 35-55. Retrieved from http://jfe.rochester.edu.

Kurov, A. (2010). Investor sentiment and the stock market's reaction to monetary policy. *Journal of Banking & Finance*, *34*(1), 139-149.

Laopodis, N. T. (2013). Monetary policy and stock market dynamics across monetary regimes. *Journal of International Money and Finance*, *33*, 381-406.

Levy, H. (2010). The CAPM is alive and well: A review and synthesis. European Financial Management, 16(1) 43–71. doi:10.1111/j.1468-036X.2009. 00530.x .

Levy, H. (2012). Two paradigms and Nobel Prizes in economics: A contradiction or coexistence? *European Financial Management*, 18(2), 163–182.

doi:10.1111/j.1468-036X.2011. 00617.x.

McSweeney, E. J., & Worthington, A. C. (2008). A comparative analysis of oil as a risk factor in Australian industry stock returns, 1980-2006. *Studies in economics and finance*.

Pagan, A. R., & Sossounov, K. A. (2003). A simple framework for analysing bull and bear markets. *Journal of applied econometrics*, *18*(1), 23-46.

World Bank (2022). World Development Indicators, https://databank.worldbank.org/source/world-development-indicators (Retrieved on March 21, 2022).