FOREIGN EXCHANGE EURUSD FORECASTING: A TIME-SERIES FORECASTING THROUGH PERIODIC U.S. ECONOMIC EVENT ANNOUNCEMENTS

HENG XIN PENG
JESLYN CHAI
TAN ZHENG ZHI
WOO WEE-LIAM
YAP YANG

BACHELOR OF FINANCE (HONS)

UNIVERSITI TUNKU ABDUL RAHMAN

FACULTY OF BUSINESS AND FINANCE
DEPARTMENT OF FINANCE

APRIL 2019

CHAI, HENG, TAN, WOO, & YAP FOREX FORECASTING BFN (HONS) APRIL 2019

FOREIGN EXCHANGE EURUSD FORECASTING: A TIME-SERIES FORECASTING THROUGH PERIODIC U.S. ECONOMIC EVENT ANNOUNCEMENTS

BY

HENG XIN PENG

JESLYN CHAI

TAN ZHENG ZHI

WOO WEE-LIAM

YAP YANG

A final year project submitted in partial fulfillment of the requirement for the degree of

BACHELOR OF FINANCE (HONS)

UNIVERSITI TUNKU ABDUL RAHMAN

FACULTY OF BUSINESS AND FINANCE

DEPARTMENT OF FINANCE

APRIL 2019

DECLARATION

We hereby declare that:

(1) This undergraduate FYP is the end result of our own work and that due acknowledgement has been given in the references to ALL sources of information be they printed, electronic, or personal.

(2) No portion of this FYP has been submitted in support of any application for any other degree or qualification of this or any other university, or other institutes of learning.

(3) Equal contribution has been made by each group member in completing the FYP.

(4) The word count of this research report is _______19772 words__________.

Name of Student:	Student ID:	Signature:
1. HENG XIN PENG	1505668	_________________
2. JESLYN CHAI	1502297	_________________
3. TAN ZHENG ZHI	1501418	_________________
4. WOO WEE-LIAM	1505268	_________________
5. YAP YANG	1502808	_________________

Date: ________________________

ACKNOWLEDGEMENT

Before anything else, we would like to express our sincerest gratitude to Mr. Jireh Chan Yi-Le, the erudite and responsible research supervisor for this paper. Throughout the research period, he showed impressive knowledge in his expertise in the field of foreign exchange and patiently guide us all along the journey. Undeniably, the rest of us had flawed skills and knowledge in handling the project as mere undergraduates. Nonetheless, his enthusiasm absolutely motivated us to work harder and accomplish this very first research project in our lives.

Apart from Mr. Jireh, we would also like to convey our appreciation to all academic and administrative staffs from Universiti Tunku Abdul Rahman (UTAR) who provided such outstanding educations, facilities, and services which enabled us to experience various fruitful courses and eventually led to the completion of this research project.

Before summing up the section, a big thanks to all our families, friends, and course mates who generously supported us throughout our research period. Our earnest apologies to those inadvertently unmentioned parties, but you made who we are today.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

ADF	Augmented Dicker-Fuller
ADP	Automatic Data Processing
AHE	Average Hourly Earnings
ARCH	Autoregressive Conditional Heteroscedasticity
BP	Building Permit
CCI	Consumer Confidence Index
CPI	Consumer Price Index
EMH	Efficient Market Hypothesis
EU	European Union
EUR	Euro
FX	Foreign Exchange
GARCH	Generalized Autoregressive Conditional Heteroscedasticity
GLS	Generalized Least Squares
OLS	Ordinary Least Squares
PMI	Purchasing Managers' Index
PPI	Producer Price Index
USA	United States of America
USD	United States Dollar
WLS	Weighted Least Squares
WTO	World Trade Organization

LIST OF APPENDICES

PREFACE

The currency pair of EURUSD is most popularly traded throughout the globe. A huge fluctuation of US Dollar, especially, could bring significant losses or profits towards market participants. Hence, it would be more secured if we could forecast the significance of several notable macroeconomic data and the direction of foreign exchange rates after periodic announcements of their performance are reported timely.

This research could provide traceable traits of exchange rate upon the released of economic announcements to several parties such as traders, multinational companies and even policymakers who intend to understand more about the changes of EURUSD.

ABSTRACT

Foreign exchange rate would experience vigorous changes immediately after the announcement of macroeconomic data. The rates in the foreign exchange market tend to be varied corresponding to participants' perception of positive or adverse news. This research examines the significance periodic macroeconomic announcements and the direction of EURUSD post announcements from June 2013 to May 2018. We realized that most of the macroeconomic announcements could significantly affect foreign exchange rate few hours after the announcement but they eventually lost their significance in longer period. This showed that most traders would stay alert for the announcements and trade frequently according to the macroeconomic data released. However, foreign exchange rate quoting currency of two nations can actually be influenced by countless factors. Hence, it was reasonable if certain economic data lost its significance shortly after announcements as traders might be looking forward to observing other data. Lastly, it is also pivotal to take note that macroeconomic environment is ever-changing, so there will never be a sustainable sign or direction for foreign exchange rates. Certain news might be deemed positive in certain period of time but opposite in other timeframes.

CHAPTER 1: INTRODUCTION

1.1 Research Background

Foreign exchange transactions are deals wherein trade executers surrender functional currency of a nation to gain the one of another nation. They are generally carried out in the form currency pairs, quotations indicating the relative value of a currency unit against another in the foreign exchange market.

Foreign exchange transactions happen literally every second, and it is by far looked as the most liquid and volatile securities traded in financial markets. Based on the record of United Nations, there is a total of 180 recognized currencies used over 195 nations. With the trend of globalization going viral, cross border trades and foreign investments are gaining popularity, especially within nations that experience robust economic growth, currencies are traded more aggressively in financial markets nowadays. There are some currency quotations known as the Majors, which consists of currency from strong economies like the United States, the United Kingdom, the European Union, Japan and so forth. They are traded the most in the foreign exchange market.

Being one of the Majors, EURUSD serves as a trendy instrument in the financial markets, and it faces plenty of uncertainties along with variabilities given its vigorous activity. Due to this reason, EURUSD always captivates the attention from both academic and industrial sectors to observe, research, and forecast its price movements, not to mention that those are the functional currencies of two influential economies.

These apparent research values and opportunities are the inspirations for this paper to be written, and it is extremely important for finance learners to grasp the decisive factors behind the variation of foreign exchange rates. For sure, the foreign exchange rates are generally determined by economic activities of their underpinned nations, but the true source of impact remains erratic and arguable. Forasmuch as this unanswered question, announcements of various periodic economic event from the United States are identified and tested in this paper, to examine their impact on foreign exchange rate particularly on EURUSD. According to Ehrmann and Fratzscher (2004), economic news in the United States contribute larger impact on exchange rates than news originating from Eurozone, and this finding fortifies our rationale of studying announcements from the United States.

To realize this important research, we identify some current contexts which this paper fits into. These contexts serve as the supporting background, and they might be the influential determinants to differentiate this paper from any past studies.

First of all, the world is currently enjoying the ultimate convenience of digitalization in 21st century. This is a revolutionary era where informational materials such as text, pictures, or sound is transformed into a digital form processable by computer, and easily accessible by public via digital devices. Back to the time without this expediency, news received by the community was relatively slow from printed materials, for instance, newspapers and magazines. Even the fastest information cascaded from radio and television was still not as efficient as online publications nowadays. Besides that, the establishment of online trading platform enables investors and traders to perform their transactions online without visiting institutions like banks and brokerages. This innovation encourages dynamic transactions to take place, unlike the time-consuming age where they could not complete transaction without physically appearing at the financial institutions.

Studying the quotation of EURUSD leads us to observe the situation of the subject economies, the U.S. and EU. In the United States, some tremendous changes occurred as the presidency of Donald J. Trump commenced on January 20, 2017. Due to his unconstrained coarseness, he has aggressively revised plenty of political and economic policies to realize the vision of “Make America Great Again”. This slogan proposes that the United States has to be as dominant as it was to ensure a better living standard among U.S. citizens, and it serves as the promise to be kept by the president to its national residents. Since his philosophy is contradictory with many leftists (Gelernter, 2018), numerous internal conflicts happened within the United States cabinet itself, which frequently influence its entire financial market. This vulnerable stability is suspected to prompt fluctuation towards FX quotations relating U.S. dollar.

Next, connecting to the United States as well, the nation involves in a long-lasting dispute with the current second largest economy, China. President Donald Trump filed an application of consultation to the World Trade Organization (WTO) regarding China's violation of intellectual property rights. He claims this violation to be a "longtime abuse of the broken international system and unfair practices". Consequently, he imposed few rounds of tariffs on Chinese products starting from early July 2018, totaling $250 billion worth of imported goods up to date. Of course, China is not showing its weak side. After a few rallies of retaliation and negotiation, the problem is yet to be solved (Davis & Wei, 2018). It has caused severe inconsistency on U.S. dollar as no one knows the winner of this historic trade war. Thus, the study on EURUSD might be very unique given the unprecedented economic dispute, and people cannot have their eyes shifted away from any updating announcements from the United States and also China.

On the other hand, the EU is facing another extraordinary controversy with the United Kingdom (UK). In June 23, 2016, a referendum was held and the result for the U.K. to part away from the EU. The Prime Minister, Theresa May then triggered a two-year process leaving the EU. Few courses of negotiations were conducted between these two parties discussing on the terms of Brexit and the bargain is still ongoing (Colchester, 2019). It is one of the most impactful events that happen during the research period of this paper. Since the EU is where Euro functions, any announcement regarding Brexit enormously triggers the variation of value in Euro. For this reason, this paper covers another exclusive background that makes the investigation on EURUSD outstanding.

1.2 Problem Statement

As inferred in earlier parts, asset prices do react to macroeconomic announcements. The price discovery process is foundation to most of the researches in financial economics field. However, it is at the same time one of the least well-researched topics. In fact, past researchers have found out that for some financial assets, particularly foreign currency exchange, their prices and intrinsic values are always widely disconnected (Andersen, Bollerslev, Diebold & Vega, 2003). For instance, Meese and Rogoff (1983) once tried to examine the correlation between FX rates and various economic announcements. Unfortunately, they failed to find any substantial relationship and declared that asset prices and fundamentals do not have clear linkage.

Thirty years after the impactful publication by Meese and Rogoff (1983), only limited advancement has been made in understanding and forecasting FX rate fluctuations with macroeconomic information. Researches who try to predict short and medium-term movements in FX rates have obtained only a handful of success at this juncture. It has been widely argued that the low power of short and medium-term empirical models to predict exchange rate fluctuations is caused by econometric and human emotion issues (factors that are difficult to quantify), such as small sample bias, irrationality of investors, bubbles and herd behavior (Ehrmann & Fratzscher, 2005). Another key reason that renders econometric model inefficient is the chartist behavior of investors (modern traders who follow the rules of technical analysis that do not link to fundamentals) as this may cause large movements in currencies (Allen & Taylor, 1990; Cheung & Chinn, 1999; De Grauwe & Dewachter, 1993; Gehrig & Menkhoff, in press).

Another problem aroused is whether market participant can trace a systematic impact of newly announced economic information on the changes of the exchange rate. In other word, we are uncertain about the exact direction where news will shift the FX rates (Almeida, Goodhart & Payne, 1998). Generally, it will rely on the common market's belief about both the current model of exchange rate and how monetary authorities (U.S. Federal Reserve) will respond to the new macroeconomic information. Almeida et al. (1998) provided an illustration of a sudden rise in U.S. real activity. A Monetarist model suggests that the dollar should strengthen as local business is prospering, while a Keynesian model would suggest the opposite because of increasing demand of foreign good by U.S. citizens. However, both of these theories do not consider the possibility of macroeconomic policy alternation by the U.S. Federal Reserve (Fed). Assuming that the Fed wants to maintain a low inflationary environment, they should increase short-term interest rates in order to control inflation in domestic economy. The rise of interest rate would, however, result in an appreciation of U.S. dollar.

The effect of macroeconomic news on FX rates movement has previously been the focus of several researches. Prior to year 2000, there are several studies that found that only U.S. M1 money and non-farm employment announcement have positive impact to the daily changes of USD, but no significant influence from other type of economic news (Hardouvelis, 1988; Aggarwal & Schirm, 1992; Harris & Zabka, 1995; Edison, 1997). Besides, Hakkio and Pearce (1985), Ito and Roley (1987), Hogan, Melvin, and Roberts (1991), and Hogan and Melvin (1994) concluded that USD FX rate reacts quickly to sudden changes in U.S. money supply and trade balance, but no significant reaction to other types of economic news. Ito and Roley (1987) also concluded that the JPYUSD generally will not be affected by macroeconomic news from Japan. In short, a mutual outcome from researches above show that only few economic announcements have significant influences on FX rates when it is measured at relatively lower frequencies (daily frequency in their cases). Due to lacking of sophisticated computer to collect high-frequency data in the past, only monthly and daily data were available for the early researchers to carry out their study on the effects of news on FX market (Neely & Dey, 2010). However, based on some newer findings near and after year 2000 by Almeida et al. (1998), Anderson et al. (2003) and Ehrmann et al. (2005), we hypothesize that plenty of U.S. macroeconomic announcements might have strong impacts on FX rates but only when we examine them at a higher frequency setting. It was argued that the effect of macroeconomic announcement will drown in the random fluctuation of FX after few hours. That concluded why some older literatures found only a handful of macroeconomic announcements that can affect FX rates at daily frequency (lower frequencies).

In short, past studies have built some fundamentals for current researches. In modern world of today, many researchers have used advanced exchange rate modelling techniques to conduct similar research and they suggested a result different from the past (Neely & Dey, 2010).

1.3 Research Questions

(i) Do specific periodic economic announcements (consumer surveys, business surveys, housing, employment, and inflation) have the ability to forecast exchange rates?

(ii) Which of the data (high frequency data or low frequency data) is more significant in forecasting exchange rate?

(iii) Is there any short-run impact between the macroeconomic announcements and the EURUSD rate from 2013-2018?

(iv) Is GARCH test applicable to forecast exchange rates?

(v) Is our result comparable to the benchmark of past study?

1.4 Research Objectives

1.4.1 General Objective

The objective of this research is to investigate the impact of macroeconomic announcements on the EURUSD rate in United States from 2013-2018 in order to understand the correlation between the events and EURUSD rate.

1.4.2 Specific Objectives

(i) To observe the ability of the specific fundamental periodic economic announcements in forecasting exchange rates.

(ii) To examine whether the result from using high frequency data is more significant than low frequency data in forecasting exchange rate.

(iii) To investigate the short-run impact of macroeconomic announcements on EURUSD rate.

(iv) To identify whether GARCH test is applicable to predict exchange rates.

(v) To analyze whether our result is comparable to benchmark of past study.

1.5 Research Significance

To perfectly forecast FX rates are hard and near-impossible. However, many past researchers have conducted numerous studies to improve the probability of having the forecast results correct. Similarly, this study focuses on improving the ability to forecast FX rate.

The findings of this research will redound to the benefit of society, in particular, the participants (i.e. Traders) of FX currency. This is considering that the ability to forecast FX currency rate movements allows them to trade in the FX market with a higher probability of profiting from a transaction. The growth in number of participants in the FX market throughout the years had made the FX trading industry very competitive. This in turn increases the demand for greater knowledge and better forecasting models on FX rate, which justifies the need for more effective forecasting approaches. In short, users who adopt the approach derived from the results of this research can effectively increase the accuracy of their FX forecasting.

For researchers, this research helps in uncovering the direct effect of high impact macroeconomic announcements (i.e. Consumer Surveys, Business Surveys, Employment, Inflation and Housing) on the FX rate movement. To date and to our knowledge, only a few studies have been made to investigate the relationship between CCI, MPMI, Non-MPMI and BP with currency exchange rate. Other studies mainly focus on the relationship between CCI, MPMI, Non-MPMI and BP with GDP.

Our research which uses GARCH model to examine the effects of the macroeconomic announcements on the EURUSD exchange rate yields comparable results as explained by Ehrmann & Fratzscher, (2005). This is because GARCH models can give direct estimates on the conditional second moment equation. Erhman and Fratzscher in their study did not use GARCH model because of they have a large number of parameters. Since we have lesser parameters, we try to following the suggested model by them, we try to further extend their research, improving past researches' results.

Furthermore, to our best knowledge, the existing studies mostly investigate on the effect cause direction of currency exchange rate--unemployment, CCI, MPMI and Non-MPMI. However, only a few studies that investigates the cause direction of unemployment, CCI, MPMI and Non-MPMI--currency exchange rate.

Besides that, most studies on inflation with exchange rate are not direct. For example, past studies we find often use indirect variables, such as target inflation for inflation, exchange rate regime and exchange rate pass through as exchange rate.

Other than that, our variable, building permit is to our knowledge not use in any of the studies on exchange rate. Most of the studies use either construction spending, housing start, or leading indicator as the announcement indicator of construction activities (Almeida, Goodhart & Payne, 1998; Andersen, Bollerslev, Diebold & Vega, 2003; Cai, Joo & Zhang, 2009).

Our research also revisits the field of efficient market hypothesis, EMH, in the sense that, it can potentially prove whether the FX market for EURUSD is efficient, and if so, to what level does this efficiency go. Our assumptions, is that, the FX market for EURUSD is semi strong form EMH. But if none of our findings is significant, then the market exhibits strong form EMH. If all our findings are significant, then the market is weak form EMH.

Hence, to sum it up, our findings provides significant contribution by providing direct causation of macroeconomic announcements to exchange rate and specific variables, which will help future researchers to uncover new areas which many researchers failed to explore. Eventually, policy makers such as federal reserves (or equivalent) and even brokerage platforms can make use of our results and consider some humble suggestions in overcoming possible complications after material announcements are made.

On the other hand, we extend on other studies in a way that we construct the latest and high frequency data of exchange rate of EURUSD spanning from June 2013 to May 2018. Unlike past studies which uses low frequency data, ie. daily data (Hardouvelis, 1988; Aggarwal & Schirm, 1992; Harris & Zabka, 1995; Edison, 1997), we use frequency data of up to 6 hours before and after the announcement is made. This is to properly capture the effect of the announcements on the exchange rate.

With this database, we are able to confirm whether the findings by past studies can be implemented into the latest data (Almeida et al., 1998; Andersen et al., 2003; Cai, Joo & Zhang, 2009). If we are able to confirm the adoption of past study methods of famous journals which have been cited by over 1000 studies can forecast the current FX currency, then we believe the findings from this study will be very significant and can contribute tremendously on future researches.

1.6 Structure of Study

It has five sections to present in this research paper. Chapter 1 is the introduction of this whole paper. Chapter 2 is literature review, it mentioned the relationship between dependent variable and independent variables which supported by the related theory. Chapter 3 is the methodology that used in the research while Chapter 4 is the results obtained after carried out the various test. Lastly, Chapter 5 is about the conclusion of the research paper and suggesting the recommendation.

1.7 Conclusion

Totaling five chapters are included in this research. Chapter 1 indicates the background of study, which mentioned about periodical economic events from the United States (U.S.) are identified and tested to examine their impact on foreign exchange rates, particularly on EURUSD, as such popular investment instrument will normally be closely observed for maximizing profits as well as minimizing losses. Besides, the remaining chapter one will be followed by problem statement, research questions, research objectives, significance of study, and chapter summary. In addition, chapter 2 will cover detailed literature review, theoretical models as well as framework that are used to explain the relationship between those determinants. Moreover, chapter 3 will discuss the data and methodology, as well as the econometric framework, while chapter 4 will present and interpret the empirical results through graphs, tables and charts. Last but not least, chapter 5 will summarize overall findings of the research, along with the limitations.

CHAPTER 2: LITERATURE REVIEWS

2.1 Introduction

The chapter provides scrutiny on past studies done by other researchers attributed in our project, in order to examine the coherence between our chosen variables to be investigated further in the following chapters. Each variables and theories adopted also is brought up in this chapter together with their respective objectives.

2.2 Theoretical Reviews

2.2.1 Law of Supply and Demand

2.2.1.1 Implication of Supply and Demand

In economic transactions involving buyers and sellers, prices of traded goods and services tend to be determined by the forces behind demand and supply. This situation happens in financial market on financial securities, and also in FX market too. EURUSD represents a financial product to be exchanged in this research. The mechanism is set forth as the higher the demand on the currency, the stronger the currency will be; and the higher the supply of the currency in the market, the weaker the currency will be. Demand for the currency will be deemed by buyers on whether the currency is undervalued or overvalued based on the current and expected fundamentals of the nation's economy. If the current and expected fundamentals of the nation's economy is solid, and that the price of the currency appears to be attractive, demand for the currency will be high, thus the currency will be strong. On the other hand, when a nation imports more, supply of the nation's currency will be abundant in the market. Since the nation's currency is easily available to buyers, the value of their currency will drop.

2.2.1.2 Explanation of Supply and Demand

The theory of supply and demand is one of the most basic and important theory in economics. The theory was first brought up by Marshall, (1890) in his textbook Principle of Economics. Through his introduction of supply and demand, marginal utility and marginal cost to the economics, he became one of the most prominent economists at his time. The theory states that there are 2 important factors that affect the price of a good, demand and supply. Demand is the degree of willingness of a consumer to purchase a good. There are 2 factors that may contribute to this degree, taste and ability to buy. Taste is the need for good. It sets forth the willingness of buyers to purchase a good at a price they deemed is worth. Since the ability to buy is not important, it is placed constant in our research context.

On the other hand, supply is the degree of willingness of a producer to supply goods. The higher the price of a good, the higher the degree of willingness of a producer to supply the good. However, in our research context, price does not affect the supply of good. It is the inventory level of a good that affects the price. When the inventory of a good is high, supply of the good will be high, in order to decrease the inventory level. The sellers will then decrease the selling price, so that buyers will buy away the goods (Whelan & Msefer, 1996).

2.2.2 Efficient Market Hypothesis (EMH)

2.2.2.1 Implication of EMH

Generally, markets are only efficient to a certain degree within specific period. Short-term delay in price response on macroeconomic announcements happens, causing minor efficiency to occur. Titan (2015) predicts that the inattentive behavior of investors and traders is the possible reason of such delay. Fama (1998) also claims that market anomalies are resulted from luck and chance. In a longer period, market anomalies would be gradually neutralized.

Hereby, we reinstate that the objective of our research is not investigating surprise element of macroeconomic announcements or the existence of insider trading in FX market under strong efficiency EMH. This paper intends to extend the study done in Neely (1997) and Almeida, Goodhart and Payne (1998) in which a statement was stated that, an asset price is the representation of market's best guess, in relative to the available information, on the true value of the asset, under the circumstance of an efficient market. In short, this paper focuses on the reaction of investors and traders from macroeconomic announcements made in a semi-strong form EMH. To test this out, event study may be one of the possible ways as it examines abnormal returns prior and post release of new information affecting the intrinsic value of subject studied. The null hypothesis of efficient market is that investors should not be able to gain abnormal returns on average by trading based on macroeconomic announcement because prices will reflect all news instantaneously, or even prior to announcement released. On the other hand, if one can conclude that investors are generating abnormal returns, efficient market hypothesis is then forbidden.

2.2.2.2 Explanation of EMH

The researches done by investors and traders on macroeconomic announcement releases affecting the foreign exchange (FX) rate movements, and actions thereafter relate closely to the theory of EMH. An "efficient" market denies the possibility of investors and traders in obtaining assured incomes on a risk-adjusted basis after the announcements of macroeconomic news, since these reports are made publicly available (Neely & Weller, 2011). Nonetheless, studies show FX market is inefficient, in fact, and that is the solid reason behind the profitability of investors and traders. Hence, we will be scrutinizing the historical applications of EMH and discuss further on its validity in financial markets, especially in the FX market.

Samuelson (1965), one of the researchers who had pioneered the hypothesis, reviewed that in an efficient market, it is unlikely to generate abnormal profit because the price of financial securities itself contains all past information, besides discounting future information. Hence, the expected returns from investing in these instruments are risk premiums compensating investors for future uncertainties taken, since no one can outperform the market. Later on, Fama (1970) in his study defined EMH in a way that prices fully reflect publicly available information. In order words, EMH can be related to informational efficiency (Hallwood & MacDonald, 1994), too. An informationally efficient capital market is existent when the current price of financial securities completely, swiftly, and rationally reflects all available information representing the securities.

Fama (1970) has proposed three forms of market efficiency in his study: 1) Weak form. 2) Semi-strong form. 3) Strong form. First and foremost, weak market efficiency suggests that asset price in the market take past information into account only; whereas asset price in semi-strong market efficiency reflects all publicly available information besides historical information contained in weak form. Lastly, market efficiency in strong form brings out all past, public, as well as private information.

As soon as Fama (1970) reveals the impact of semi-strong market efficiency, many researchers started to study the relationship between FX rate and macroeconomic announcements of a nation, since they are considered as events recognized by the public and they might be a key component altering the movements of FX rate of currencies. For example, Jensen (1978) said that it is impossible to make economic profit by trading on general information obtainable by the public. In an efficient market, investors and traders will spend resources on collecting information as the inputs before deciding suitable market execution. As per conclusion, he assumed that the price should react instantaneously to any announcement made. However, the conclusion was not really accurate as opportunity to gain profit still exists, even though there should not be any such chance (Neely & Dey, 2010). High-frequency exchange rate data had even been applied by past researchers to forecast macroeconomic announcements to ascertain the response of price, with the intention of justifying market inefficiency.

Nevertheless, Azad (2009) stated that there are several factors which deny such efficiency. Firstly, new information does not factor into asset price instantly (Fama, 1970). Secondly, prices are never in parity, due to the fact that people value risk differently which distorts the pricing of assets (Smith et al., 2002). Thirdly, the existence of black/parallel market as a result of exchange rate control, separates the equilibrium rate and official rate (Diamandis et al., 2007).

According to research done by Grossman and Stiglitz (1980), EMH is said to be theoretically invalid, because if the theory was claimed to be true, number of trades will always be zero regardless the news and information received, because costs of trading are still incurred even though no profit is generated from the investment and trading in FX market. Shostak (1997) believes that EMH is unattainable, with an impossible assumption of all market participants to be rational at all times. FX market was then found to be inefficient with different empirical methods and currency measures (Ajiayi & Karemera, 1996; Aroskar et al., 2004; Liu & He, 1991; Zivot, 2000).

2.2.3 Random Walk Theory

2.2.3.1 Implication of Random Walk Theory

In contrast with efficient market theory, if the price movement of a financial market is traceable or in other words, non-random, after certain news announcements have been made, then the markets might not be perfectly efficient. It shows that new information will be incorporated into market price only after certain period of time. So, these investors and traders can predict the movement of price and generate return through speculation.

2.2.3.2 Explanation of Random Walk Theory

Another suggested theory to be adopted in this paper, is the random walk theory. This theory essentially explains the asset price movements, and it is usually incorporated to complement the stand of EMH. Hypothesis regarding the theory was primarily introduced in 1863 by Jules Regnault. His research has constructed the fundamental of random walk hypothesis that leads to the future studies of modern stochastic process of other asset prices (Preda, 2004). After poring over past literatures, Fama defined the meaning of random walk as a series of price fluctuation without memory from history, that is, no meaningful effort could have been done to predict future price movement by using past price data. Although many researchers argued that perfect random movement of time series data may not be realistic, Fama (1965) was of the opinion that random walk hypothesis might be onerous to be clarified theoretically, but it could be very practical when it is understood.

Azad (2009) said whilst there are plenty of existing literatures that cover random walk hypothesis to stock market, there is a limited coverage in the FX market. Both theories are pivotal and relevant to this research in the sense that if currency movements in the FX market are random and unpredictable, market participants can then assume perfect market efficiency. Hence, no one can gain excess returns in long run. In this situation, it is nearly impossible for currency investors and FX traders to consistently outperform the market over time through speculation as current asset prices had already incorporated all newly announced market information in short period of time (Belaire-Franch & Opong, 2005). On the contrary, if the price movement of a financial market is traceable or in other words, non-random, after certain news announcements have been made, then the markets might not be perfectly efficient. It shows that new information will be incorporated into market price only after certain period of time. So, these investors and traders can predict the movement of price and generate return through speculation.

There were some impressive publications examining the random walk and market efficiency hypothesis in the FX market written in 1980s. Out of them, Adler and Lehmann (1983), Darby (1983), Baillie and Selover (1987), Huizinga (1987), and Taylor (1988) concluded that the exchange rates of countries move unpredictably and randomly. Interestingly, most of the studies prior to year 2000 suggested that the movements of FX rates tend to adhere to random walk behavior. Among all these outstanding researches, Meese and Singleton (1982) and Baillie and Bollerslev (1989) concluded that FX rates are unpredictable and swing randomly. Besides them, Giddy and Dufey (1975), Logue and Sweeney (1977), Cornell and Dietrich (1978) and Hsieh (1988) even reported that exchange rates were totally uncorrelated with fundamental news.

After year 2000, groundworks that refuted most of the past studies were anyhow published, causing the theory to be argumentative. One of them was Jamaleh

(2002), an influential researcher who had concluded that the changes of macroeconomic fundamentals can significantly affect the movement and direction of EURUSD. His study demonstrated that the hypothesis of random walk movement of EURUSD return series should be rejected. He also suggested that since exchange rates could be significantly explained by macroeconomic news, random walk hypothesis no longer conforms.

2.2.4 Keynesian Theory of Employment

2.2.4.1 Implication of Keynesian Theory of Employment

The definition of aggregate demand is somewhat different from economic productive capacity under the Keynesian view. Aggregate demand could be influenced by a variety of factors such as total production, employment as well as inflation (Samuelson, 1948). Hence, these key macroeconomic variables might be significant in explaining aggregate demand which is an important determinant of the strength of domestic currency.

2.2.4.2 Explanation of Keynesian Theory of Employment

Keynesian theory was an economic theory that focuses on a closed economy which indicates total spending in an economy will give impacts towards national output as well as inflation (Davidson, 1990). In addition, it mentioned increase in government spending with lower taxes may help in stimulating demand and thus pulling global economy out of depression (Blinder, 1986). In other words of saying, both fiscal and monetary policies actions taken may raises the level of employment which in-turns, have positive impacts toward total aggregate demand and national economy. So, local currency value will strengthen (Blinder, 1987).

However, the definition of aggregate demand is somewhat different from economic productive capacity under the Keynesian view. It could be influenced by a variety of factors such as total production, employment as well as inflation (Samuelson, 1948). Hence, these key macroeconomic variables might be significant in explaining aggregate demand which is an important determinant of the strength of domestic currency.

On the other hand, past statistical results had actually shown that economic policy implemented by authority can affect value of currency (Grant, 1993). In particular, monetary policy actions will be implemented by the central bank during economic recession to increase money supply, decrease interest rate, and boost up investment amount (Keynes, 1971). Consequently, lifting up the total national income that helps in economic recovering, with that, better economic conditions strengthen the currency exchange value (Walters, 1988). In contrast, when nation is dealing with economic inflation, government should thus implement fiscal policy for the purpose of reducing money supply in the market in order to control national economy as well as to prevent highly volatile exchange rate movement occurred (Auerbach & Gale, 2009).

2.2.5 Purchasing Power Parity (PPP)

2.2.5.1 Implication of PPP

It is important for us to pay high attention to purchasing power parity as it might significantly influence exchange rate movements. With the presence of PPP, the increases in nation's domestic price level will cause its currency to depreciate, in other words of saying, when nation experiences inflation, its currency exchange rate will be weakened as of PPP (Aizenman, 1984). In reality, the adherence to PPP theory, however, might not be applicable, but it is important to be examined as it can help us to understand how exchange rate is going to reflect the newly announced inflation data (Darby, 1980).

2.2.5.2 Explanation of PPP

According to Dornbusch and Krugman (1976), there was always a deep-seated relationship between Purchasing Power Parity (PPP) theory and the exchange rate. According to Kindleberger, PPP that focuses on inflation-exchange rate relationship holds the theory of “The Law of One Price”. Law of One Price indicates that similar products should be equally priced even in different countries (Baffes, 1991). In short, PPP is an economic concept that comparing the value of one currency against another, by comparing the cost of a basket of goods in each nation being measured (Dornbusch, 1985). On the other hand, if there are mispricing between two different countries, arbitraging will take place. This kind of “zero-risk profit” will be continuously grabbed until prices in two markets equalize (Ghadhab & Hellara, 2015). In this sense, the chances of misprice will surely be reduced, hence strengthening the integration of economies as well as currency value of both countries (Malakhov, 2016).

It is important for us to pay high attention to purchasing power parity as it will significantly influence exchange rate movements. With the presence of PPP, the increases in nation’s domestic price level will cause its currency to depreciate, in other words of saying, when nation experiences inflation, it weakens the nation’s currency exchange rate as return to PPP (Aizenman, 1984). Even though PPP will not influence price level directly, but it is important to be examined as it can help us to understand how exchange rate is going to reflect the newly announced inflation data (Darby, 1980).

2.3 Empirical Reviews

2.3.1 EURUSD

2.3.1.1 USD

United States dollar (USD), is essentially the most traded currency on the planet. It can be found in a pair with all the other major currencies in FX market and often acts as the intermediary in triangular currency transactions. Notably, USD represented the unofficial global reserve currency, which is globally held by majority central banks and institutional investment entities. Due to this universal acceptance, dollarization, a practice of using USD as the official currency of a nation in lieu of local currency is implemented by some countries. In some cases, USD is welcomed as an alternative form of payments besides functional currency in that particular nation.

USD is looked as a crucial factor in the FX market with the reason that it is always acting as a benchmark or target rate for other countries in fixing or pegging their currencies according to floatation of USD. China, for instance, has long had its currency, the yuan or renminbi, pegged to USD, much to the disagreement of many economists and bankers of its central bank. It is one of the common methods for countries to stabilize their exchanges rates, since USA has a solid economic background which hinders its currency from unstable fluctuations.

USD is also applied as the standard currency or value for most commodities, for example, crude oil, precious metals, gold etc. It indicates that these commodities are subjected not only to value fluctuations from its basic economic principals of supply and demand, but also to the relative value of

USD. Thanks to this feature, their prices are immensely sensitive to inflation and interest rates in USA, which also directly influence the value of USD.

2.3.1.2 EUR

Despite being comparatively new to the world economy, Euro (EUR) has become the second most traded currency, ranked merely behind USD. Additionally, it is also the second largest reserve currency in the world. The official currency of the majority of the countries within the eurozone, EUR was introduced to the world markets on January 1, 1999, with banknotes and coinage entering the circulation three years after.

Along with being the official currency for most European countries, it is treated by plenty of countries as currency-pegging target, for much the same reason that currencies are pegged to USD – stabilizing the exchange rate.

With EUR being a widely used and trusted currency, it is very prevalent in the FX market and adds liquidity to any currency pair it trades within. Besides that, EUR is commonly traded by speculators as a play on the general health of eurozone and its member countries. Political events within the eurozone can often lead to large trading volumes of EUR, especially in relation to countries that see their local interest rates fall dramatically at the time of the EUR's inception, noticeably Italy, Greece, Spain, and Portugal. In brief, EUR may be the most "politicized" currency actively traded in FX market.

2.3.2 Inflation

A widely held view was created that inflation is always and everywhere a monetary phenomenon resulting from, and accompanied by a rise in quantity of money relative to output (Labonte, 2011). The mighty law of demand and supply from microeconomics applies, where price increases when demand increases and supply decreases, vice versa. Strong positive influence of money supply on price change exists, but not immediate, according to Paul, Bhanumurthy and Bapat (2001). This research tells the situation in which an increase in money supply in the economy will not be realized immediately, and hence the aftershock comes with lagged timing, but its positive influence towards general price level is certainly a fact.

Raza and Afshan (2017) claims that money supply and inflation bear significant negative relationship with exchange rate in the long run. In fact, this statement is undeniable. Money supply is officially proved to be one of the components varying inflation rate. If there is any impact of money supply towards exchange rate, the likelihood of inflation to have correlation with exchange rate is reasonably high. Next, Ijaz-ur-Rehman and Aftab (2015) suggests that the long run relationships between interest rate and exchange rate, as well as inflation and exchange rate are present, in which exchange rate experiences positive influence from interest and negative influence from inflation. Moreover, there is a unidirectional causality from inflation and interest rate towards exchange rate.

In another study, Hsing (2016a) provided support stating that higher interest rates, higher real GDP, higher stock market index, or lower inflation rate in Hungary would cause the forint (HUF) to appreciate. On the other hand, a higher interest rate, higher real GDP, higher stock market index, or lower inflation rate in the U.S. would cause USD to appreciate. A higher expected exchange rate would lead to higher exchange rate. Stronger economy is essential to support a stronger currency value. Stock market performance is expected to cause international capital inflows and outflows in Hungary and the U.S. and affect the exchange rates. This study firmly assures that relative inflation rate of two countries affect their exchange rates.

Macroeconomic variables contribute to the continuous depreciation of Ghanaian Cedi (GHS) against USD (Adusei & Gyapong, 2017). Fortunately, inflation rate is one of the macroeconomic variables covered in their research, which further ensured the existence of correlation between inflation and exchange rate.

Moreover, inflation rate in a nation affects its economic growth (GDP) as well, while economic growth affects foreign exchange rates (Ayyoub, Chaudhry & Farooq, 2011; Švigir & Miloš, 2017).

Most importantly, our anchor journals of Almeida, Goodhart and Payne (1998), Andersen, Tim Bollerslev, Diebold and Vega (2003), as well as Ehrmann and Fratzscher (2005) have supported these findings, stating significant relationship between inflation and exchange rate.

2.3.3 Business Surveys

Purchasing Managers' Index (PMI) is a monthly composite index of business conditions and economic activities in the manufacturing sector (Buro of Economic Research, 2015; Chien & Morris, 2016; Kuepper, 2018; Soni, 2014). It comprises of five diffusion indices, namely production index, new sales orders index, inventory index, supplier delivery index, and employment index (Buro of Economic Research, 2015; Lahiri & Monokroussos, 2013). These indices have been used to predict trends and activities in the industry of manufacturing. The composite index of PMI has a scale within 0 to 100. Institute for Supply Management specifies that when the overall index is above 50, the manufacturing sector is possibly in an expansion, while a reading below 50 indicates a possible contraction. Koenig (2002) stated that if PMI is above 41, the economy is expected to be in a robust status. Barnes (2015) added that if their reading falls below 50 towards 42, economy might be facing an unfortunate recession.

A lot of past papers indicated that PMI is a crucial indicator in forecasting economic growth and manufacturing activities (Banerjee & Marcellino, 2006;

Kuepper, 2018; Lindsey & Pavur, 2005; Tsuchiya, 2012). Besides that, Chien and Morris (2016) realized that a positive correlation between PMI and economic growth in the USA. Even data from China's economy also reported a strong positive correlation between PMI and economic growth. Koeing (2002) who looked into the relationship between PMI and GDP growth rounded up his investigation with the result that GDP growth will surge up when PMI increases. Similar estimates were adopted by Lahiri and Monokroussos (2012), using the observations on PMI and real-time GDP growth from March 1965 to January 2011. They claimed that PMI can assist in improving the nowcasting of current-quarter GDP growth as the latest information is published at the beginning of month. Soni (2014) reported that PMI has positive relationship with economic performance. Being a leading indicator for both the manufacturing sector and economic growth over the last four decades, PMI has a positive relationship with economic growth (Rodseth, 2016). In Spain, PMI had even been a vital forecaster of GDP from 2006 to 2017, which was proven by Harker (2017). Another dedicated study, Tsuchiya (2014) has proved that PMI becomes a useful indicator of monthly GDP only after January 2008, by using Fisher's Exact Test, Chi-squared test, Pesaran and Timmermann's (1992) test, and New Pesaran and Timmermann's (2009) test. That was much resulted from the weighting scheme that has been revised by ISM in January 2008, and the revised formula for PMI calculation was found to predict GDP even closer.

There are some thorough researches backing the influence of GDP towards FX rates. Therefore, an inference can be made where PMI is one of the sources behind FX rate changes. According to Adusei and Gyapong (2017), annual GDP growth rate is significantly affecting the exchange rate between Ghanaian Cedi (GHS) and USD. It possesses a positive relationship with exchange rate of the stated currency pair too. When GDP growth rate increases, the exchange rate of GHSUSD will also increase. In another research, a direct and strong correlation between GDP and EURRON was identified (Nucu, 2011). However, when Nucu (2011) investigated the relationship between GDP and USDRON, and insignificant test statistics proved GDP to have contributed no influence towards the exchange rate. Abbas, Iqbal and Ayaz (2012) did the same thing by choosing 10 African countries with 16 years of data from 1996 to 2010. Based on their Eviews results of p-values lesser than 0.05, they concluded that GDP could significantly affect the exchange rate fluctuation in Egypt, Kenya, Cameron, Comoros, Burundi, Gambia, and Cape Verde. Some sampling countries like Algeria, Ethiopia, and Angola had their p-values higher than the significant level of 0.05, though.

Nagarajan, Subburao and Lasya (2017) has looked into the relationship between PMI and exchange rate with USDINR, EURINR, as well as GBPINR. Out of them USDINR and EURINR recorded strong negative relationship with PMI. The remaining currency pair, GBPINR showed moderate negative correlation. They came to an agreement that PMI had a major role in influencing the exchange rate. Our primary reference, Almeida, Goodhart and Payne (1998) who tested DEMUSD with macroeconomic announcements from USA, applying high frequency data from January 1992 to December 1994. These scholars found that NPAM is significantly reactive towards the stated currency pair, only at the timeframe of 5 minutes, 15 minutes, 30 minutes, 45 minutes, and 1 hour after the announcements were made, indicating that impact of announcements did not last beyond this duration while having strong short-term impact towards DEMUSD spot rate. Andersen, Bollerslev, Diebold, and Vega (2003) also stated that there is a significant positive relationship between monthly NAPM and DEMUSD using weighted least squares (WLS) approach. This study was supported by Ehrmann and Fratzscher (2005) who did another research proving that NAPM affects USDEDM with the same method in Andersen et al. (2003).

The reason to include PMI in our research is because it is an important indicator for investors to trace economic growth. There are a lot of market participants who keep their eye on the PMI as it often leads GDP growth. It is commonly known that PMI can be used to measure the business confidence level in a nation. Once the business confidence level increases, it will bring positive impact to the economic growth. Therefore, strengthening of economic growth of a nation will attract more investors to hold that particular nation's currency, causing it to appreciate. Furthermore, the announcement of PMI is very timely. It often releases on the first working day of the month. So, we can capture its varying movement across months and determine whether its changes could affect FX rate.

2.3.4 Employment

There are two events happening when an economy plunges, employment rate within the economy drops critically, and the relative FX rates of its functional currency slumps drastically (Branson, 1981). Due to the similarity of occurrence timing, it has been long since researchers suspected the existence of correlation between both events (Branson, 1979). Unemployment, the loss of employment may certainly deteriorate the living standard of people living in that economy, and it is a macroeconomic issue that disastrously affects individuals (Mosikari, 2013).

A reduction in demand and output which caused by economic recession may lead to job losses, as businesses will intend to lay off employees for cost controlled normally (Sims, 1980). Nonetheless, unemployment status may be temporary or permanent which based on respective short or long-term impacts. Hence, exchange rate fluctuation is said to have multiplier effect towards economy (Branson, 1981). Unemployment status which with four major categories was determined by distinct economic conditions as well as its various situation (Frenkel, 1981).

Structural unemployment represents the situation in which manpower is getting replaced by technologies or other improvements that outmatch in efficiency, especially amid globalization and automation (Diamond, 2013). Besides, Keynes and John Maynard (2007) explained that cyclical unemployment was caused by reduction in workforce's demand during an economic downturn that results in discouraged production. Frictional unemployment on the other hand, occurs in the interval when people are spending time looking for a new job after leaving their original job position (Reder, 1969). Seasonal unemployment occurs on labor forces who work on the occasion of seasonal events, in which they do not have job at the same time as standing by for irregular seasonal events (Edebalk & Wadensjö, 1978).

Based on previous findings, employment is always an imperative component in determining the fluctuation in FX rates. Kim (2005), Colantone (2006), as well as Yanhui and Wang (2006) described that economy plunges drastically, mostly due to high degree of openness towards foreign labor, and eventually causes unemployment and deteriorates domestic currency value of that economy. Hua (2007) also indicated that the appreciation of one currency will create negative effects towards employment via three channels, namely technological channel, exporting volume channel, and efficiency channel.

Notably, the record of journal articles in examining employment towards FX rates is surprisingly constrained, which makes this project to be more valuable towards this field of study. In reality, we bravely infer that level of employment does have direct and indirect effects towards the FX rates. Schirm (1992), Harris and Zabka (1995), Edison (1997), and Almeida et al. (1998) traced dominant positive relationship between strengthening of USD and good news in terms of non-farm employment.

Furthermore, the result from Michael, Emeka and Emmanuel (2016) convinced readers with the indirect relationship between employment and FX rates, in the way that level of unemployment contributes significant negative effect on real gross domestic product, and as a mean of creating employment opportunities to unemployed labor force. Obviously, it varies the economic performance of a nation as well as its currency value. Numerous papers also mentioned that unemployment adversely affects a nation's economic growth in their targeted countries like Pakistan, the United Kingdom, and Nigeria (Okun, 1962; Kemi

& Dayo, 2014; Onwachukwu, 2015; Hussain et al., 2010; Zagler, 2006; Oluyomi & Ogunrinola, 2011; Stephen, 2012; Nwankwo, 2014; Swane & Vistrand, 2006). In Iran, unemployment pours dynamic effect on real GDP per capita instead (Meidani & Zabihi, 2011).

On the other hand, the Okun's Law, which is a known principle that describes an inverse connection between economic growth and unemployment rate had been taken into discussion. Noor, Nor and Ghani (2007) applied ADF and Philip-Perron tests, the basic econometric analysis of stationary testing to examine the Okun-type relation between output growth and unemployment in Malaysia. Their findings was then proved negative relationship exist between those two variables. Besides, other researchers having also beliefs in Okun's law, which in terms of there are nexus between growth and unemployment. Therefore, Sinclair (2004) engaged in a study to figure the interaction between them. As a result, the findings of the study revel that GDP and unemployment are more strongly linked.

In fact, there are some studies showing that GDP does affect the exchange rate. Therefore, it is make sense to link the impact of employment on exchange rate indirectly. According to Adusei & Gyapong (2017), annual GDP growth rate will dominantly affect the cedi-dollar exchange rate. Besides, it has also positive impact on the cedi-dollar exchange rate. In this sense, the increment in GDP growth rate will boost up the cedi-dollar exchange rate by a certain percentage.

Moreover, finding indicates there is a direct and strong correlation (0.729) between GDP and currency exchange rate in terms of EURRON in Romania (Nucu, 2011). Nucu (2011) examined also the relationship between GDP and the exchange rate of USD/RON, but the results showing that GDP was not able to reflect the change in the USD/RON, as the test statistics comes with insignificant result. Nevertheless, Abbas, Iqbal & Ayaz (2012) investigating relationship between GDP and exchange rate of 10 African countries with 15 years data ranging from 1996 to 2010. The Eviews results, however, showing that GDP having great impacts on determining exchange rate movements in countries like Egypt, Kenya, Cameron, Comoros, Burundi, Gambia, and Cape Verde.

All in all, there are both direct and indirect impacts of employment on exchange rate fluctuations. The indirect influences of employment to GDP and nation's economic growth will also significantly affect the currency exchange rate movement of a nation, as well as have impacts on dominant currency more severely (Almeida, 1998 and Adusei & Gyapong, 2017).

2.3.5 Consumer Surveys

Consumer confidence is always brought into arguments as a dynamic indicator of future growth of an economy. This is because an increased confidence level encourages domestic consumption. When people foresee a nation's future growth engine (such as consumer confidence) is highly intact, they will be more likely to hold currency of that particular nation and cause currency appreciation. We will try to prove this in our study by detecting whether the announcement of new CCI data will significantly move EURUSD.

Studies like Carroll, Fuhrer, and Wilcox (1994) and Acemoglu and Scott (1994) found that upsurge in consumer confidence has substantial impact on future consumption growth. Not only that, Garner (1991), Acemoglu and Scott (1994), Ludvigson (2004), and Dees and Brinca (2013) added their opinions that a statistically significant relationship between consumer confidence and consumer consumption is existent. Ergo, consumer confidence index, the indicator of consumer confidence plays an important referencing role in determining future domestic consumption (Carroll et al., 1994; Dees & Brinca, 2013; Eppright & Argues & Huth., 1998; Qiao, McAleer & Wong, 2009). On the contrary, Hymans (1970) denied their opinions, saying that consumer confidence is not decisive enough to force an impact on future consumption.

Moreover, Matsusaka and Sbordone (1995) and Utaka (2003) discovered a significant and positive relationship between consumer confidence and GDP growth in the Italian and Japanese economy. Also, Carroll et al. (1994), Batchelor and Dua (1998), Afshar (2007) and McNabb and Taylor (2007) has also identified similar results that CCI can significantly affect GDP. Likewise, Barro (1991), Knack and Keefer (1997) and Zak and Knack (2001), Vuchelen (2004) concluded that increase in the confidence level leads to an increase in economic growth. Results from most of the past literatures showed that changes in consumer confidence contribute significant influence on macroeconomic factors (Demirel & Artan, 2017).

Findings from Yusoff and Febrina (2014) implied that GDP can significantly alter the FX rates in short-run period. Next, GDP growth rate was found to be positively correlated with GHSUSD in Ghana from 1975-2014 (Adusei & Gyapong, 2017). Although there were plenty of researches suggested that the movement of FX rates can be influenced by macroeconomic fundamentals, there were also, on the other hand, several researches that yielded different results (Ramasamy & Abar, 2015; Flood & Rose, 1999; Ray, 2008).

Finally, the direct relationship between consumer confidence and exchange rate will be discussed, According to Sakir and Sevcan (2010), an upsurge in consumer confidence will cause significant and positive effect on real exchange rate as expected in the case of Turkey from January 2002 to December 2008. In brief, when consumer confidence grows, demand of exchanging domestic currency away decreases, and therefore the value of domestic currency increases. Çelik and Özerkek (2009) detected a significant relationship between consumer confidence and real exchange rates for 9 European Union (EU) countries using panel data analysis over the period of 1997-2006. Gulley and Sultan (1998) highlighted that announcements of consumer confidence index can provide substantial impact to the FX market in the U.S.

Based on the groundwork done by Andersen, Bollerslev, Diebold and Vega (2003), consumer confidence index in the USA from 1992-1998 was proved to significantly affect every different pair of currency with USD, which are GBP, JPY, DEM, CHF, and EUR, in a 5-minute timeframe after the announcements were made. Other than that, by examining the changes of DEMUSD at a very high frequency (5-minute onwards) from 1992-1994, Almeida, Goodhart and Payne (1998) deducted that consumer confidence index remain significant even 12 hours post-announcement whilst the significance of some other macroeconomic announcements only last for 2 hours post release. Lastly, Ehrmann and Fratzscher (2005) repeated the similar study by using daily changes of data, and came up with conclusion that higher consumer confidence index can result in an appreciation of USD from 1993-2003. Based on all these papers, we hypothesize that consumer confidence index is an impactful indicator to predict FX rates movement in short-term period.

2.3.6 Building Permit (BP)

Building permit is a form of authorization which is required when any type of construction is planned that will change or add structure to an existing property or land parcel (Eirinaki, Dhar, Mathur, Kaley, Patel, Joshi & Shah, 2018). Developers who interface with national, regional and district bureaucracies at all levels of a project are required to obtain building permits (Eyiah, 2004). It is one of the quality control measures in the construction industry (Kpamma & Adjei-Kumi, 2013). Therefore, an optimum building permit and inspection systems can enhance property rights which lead to the process of capital formation (Jovanovic, Aristovnik & Lugaric, 2016). Besides that, studies by Straus (2013) and Jovanovic, Aristovnik and Lugaric (2016) find that one of the effective leading indicator of state-level business cycles is building permit. They reflect consumer expectations of future economic activities.

The significance of building permit data and legislation was first studied almost 70 years ago by Cover (1932). He argues that “permits are an instrument to measure building activity…". This produce a linkage between building permits and construction activities. Park (1989) finds further evidence that the construction industry derives high multiplier effects through its extensive backward and forward linkages with other sectors of the economy. Since then, many studies started to focus on the relationship between construction activities with national economic performance.

The construction industry is one of the pillars of a nation's economy, and the industry's activities are vital to the achievement of national socio-economic development goals such as providing shelter, infrastructure and employment (Jovanovic, Aristovnik & Lugaric, 2016; Khan 2008; Anaman & Osei-Amponsah 2007; Field & Ofori 1988). The authors find that housing activity have positive relationship with employment. Hence, when unemployment rate is reduced, consumer spending will increase which will lead to higher GDP. For example, Japan increases its public housing development activities to generate output and increase employment during recession periods (Jackman, 2010).

A study done by Khan (2008) on the Pakistan's economy finds evidence that a nation's construction sector is considered to be one of the major sources of economic growth, development and economic activities. He shows that there exists a strong uni-directional causal relationship, with the construction sector of Pakistan affecting its aggregate economy. Another study done by Anaman and Osei-Amponsah (2007) on the aggregate economy of Ghana also find evidence that construction sector in Ghana granger-cause its real GDP. Further study on the effect of residential construction on the economic growth of Barbados by Jackman (2010) reveals that there is a bi-directional causality between the two variables. In support of this, another study on the relationship between construction sector and the aggregate economy of Saudi Arabia, Alhowaish (2015) finds evidence that there is a bi-directional relationship between construction and economic growth.

On the other hand, unlike the widespread belief that the construction sector plays a crucial role in Turkey's economic growth, Erol and Unal (2015) prove that construction industry is not a driver of GDP growth but a follower of fluctuations in the macro-economy. Further research on this by Berk and Bicen (2018) further proves that it is indeed the low-interest rate effect that boosted the construction spending and thus increasing the economic growth of Turkey.

By accordance to the literature above, it is safe to say that construction activities almost always affect a nation's economy and that the industry is essential to the sustainable growth of an economy. As stated in the previous sections, if economic growth does affect the movement of FX currency rate, is it safe to presume that building permits which indicate the degree of construction activities affects the movement of FX currency rate which is affected by the strength of an economy?

We then try to directly relate building permit announcements with FX currency. The amount of literature on this is relatively scarce, hence we widen our scope to include literature on leading indicator, construction spending and housing start[1].

In researching how macroeconomic announcement's surprises affect the movement of German Mark, British Pound, Japanese Yen, Swiss Franc, and the Euro, Andersen, Bollerslev, Diebold and Vega (2003) finds prove that conditional mean adjustments of exchange rates to news (ie. Housing starts) occur quickly and that an announcement's impact depends on its timing in relative to other related announcements, and on whether the announcement time is known to all. In another study by Almeida, Goodhart and Payne (1998), they find empirical prove that the DEMUSD exchange rate is affected by announcements (ie. Leading indicator[2]) in the first 15-minutes post announcement. Cai, Joo and Zhang (2009) also find evidence that US macroeconomic news (construction spending and leading indicators) do affect

[1] Housing starts are the number of new residential construction projects. Every project requires building permits to start. Hence it is logical to include housing start into our scope.

[2] Leading indicator is composed of 10 economic components which one of the components is the number of new building permits for residential buildings.

seven out of nine emerging countries' FX rate. In a master thesis by Ojstersek (2014), the thesis proves that macroeconomic announcements (housing start) do affect the EURUSD exchange rate at the 1-minute response mark. Similar to previous studies on macroeconomic announcements, a study by Omrane and Savaser (2017) finds extra evidence that in a financial crisis, currency market reaction to new home sales and housing starts announcements is most sensitive. However, only one study on the effect of Japanese macroeconomic announcement on the USDJPY exchange rate shows that housing starts do not affect exchange rate. Hashimoto and Ito (2009) finds evidence that certain indicators (housing starts) do not have impact on the returns of USDJPY exchange rate.

Further studies on the FX transaction finds prove that exchange rate is affected by order flow, which the latter is affected by macroeconomic announcements (ie. Construction spending) (Evans & Lyons, 2002, 2003, in press; Rime Sarno & Sojli 2008). According to Evans and Lyons (2002), participants generate different conclusions and deductions from common macroeconomic data announcement, hence affecting the liquidity of the FX currency thus increasing its price impact. Gradojevic and Neely (2009) also finds positive result on the effects of macroeconomic announcements (ie. Housing starts) on trading flows, which then significantly influence the CADUSD currency exchange rate.

Now we know that building permit is an indicator towards construction activities, and that construction activities almost always affect a nation's economic performance. The higher the construction activities, the higher the GDP produced. Besides, pass studies also showed that announcements on housing starts may have a positive effect on a nation's FX rate. In that case. we have reasons to believe that if the actual figure posted by the announcement of building permits is more than what the expected figure is, then the announcement may positively affect the movement of EURUSD. If the data affects the movement of EURUSD rate, then we can use building permit's data to forecast a nation's FX exchange rate movement, and to improve FX trading results.

2.4 Conclusion

Several relevant theories are elaborated to demonstrate the forces behind U.S. macroeconomic announcements and FX transactions. Also, five independent variables originated from economic notices are scrutinized, therefore comprehending the reason supporting traders' reaction towards mentioned announcements.

CHAPTER 3: METHODOLOGY

3.0 Introduction

In this chapter, we will investigate and discuss the factors that may impacts the currency exchange rate in terms of EURUSD. A linear regression analysis will be carried out to anticipate the value of the dependent variable, currency exchange rate, and various independent variables such as consumer survey, business survey, inflation, housing, and employment. Our analysis is based on low frequency monthly data, and high frequency hourly data ranging from year 2013 to 2018. Furthermore, source of data, definition of variables, research framework as well as hypotheses will also be discussed in this chapter.

3.1 Research Design

First of all, research design should be constructed in a way that different components of study would be integrated logically and coherently in order to well address the research problem. Here, quantitative research design was developed to examine the relationship between variables by using numbers and statistics for evaluating as well as explaining its findings. In addition, graphs and tables of raw data may be constructed in order to provide a clearer picture for visualization by adopting quantitative data. More particularly, our group was adopting experimental design research which is one of the sub-categories under quantitative research for better examination. Experimental design research examining a cause and effect relationship between or among variables by manipulating independent variables in order to observe its effect on the depended variable.

Nevertheless, there are some advantages in undergoing quantitative research. Firstly, quantitative data able to be interpreted with statistical analysis. Quantitative approach is seemed as scientifically objective and rational which due to its statistical result was based on the principles of mathematics (Carr, 1994; Denscombe, 2010). Secondly, numerical data which based on measured values can be easily interpreted, and hence it was available to be filtered and checked by more professions. Moreover, it is useful for testing and validating the theories which have been constructed formerly. Lastly, it was applicable for hypothesis testing due to the use of statistical analysis (Antonius, 2003). Therefore, our research studies will then base on quantitative data in order to address our research problems more distinctly. The variables that included in this model will be one dependent variable (EURUSD) and five–macroeconomic variables (consumer survey, business survey, inflation, housing, and employment).

3.2 Research Collection Method

Our exchange rate data for EURUSD covering the period from June 2013 to May 2018 was obtained from LMAX and Dukascopy which thus indicates the research data collection was categorised as secondary data. Unlike primary data, which is derived by investigator who was conducting the research (Mangan, 1989). Besides, the exchange rate data were received at an irregular spaced by default. We thus converted it into an equally spaced with calendar time series. Lastly, the basic quotation variable was derived by taking the bid quotations.

In addition, U.S. macroeconomic announcements associated with market expectation series which contained in our data set were obtained from Forex Factory and investing.com covering the identical time period with exchange rate data. For macroeconomic news analysis, the list of series employed was PMI for business survey, CCI for consumer survey, building permit for housing, ADP non-farm employment for employment, as well as Core CPI, PPI, CPI and average hourly earnings for inflation.

3.2.1 Definition of variable & Source of Data

Table 3.2.1: Details of Variable & Source of Data

Variables	Proxy	Units	Description	Data Source
Exchange Rate	EURUSD	Points	The direct quote of Euro per USD dollar	LMAX Dukascopy
Consumer Surveys	CCI	Index Points	Examination of consumer confidence, defined as the degree of optimism from consumers in spending and savings	Forex Factory
Business Surveys	PMI	Index Points	A measurement of business confidence, defined as the degree of economic health in private sector companies	Forex Factory
Inflation	CPI; Core CPI; PPI; Average Hourly Earnings	Percentage (%)	A sustained increase in the general price level of goods and services	Forex Factory Investing.com
Housing	Building Permit	Million	An Authorization granted before any construction project can be started	Forex Factory
Employment Rate	ADP Non-Farm Employment Change	Thousand	The labor force that contributes to most of the gross domestic product (GDP)	Forex Factory

3.3 Sampling Technique

3.3.1 E-views

We use Econometric Views (EViews) to run all the hypothesis testing and diagnostic checking in this research. This is because the main function of E-view is to carry out econometrical and statistical analysis. Other than that, it can handle and run the data efficiently as it is associated with the flexible and consumers oriented technology and interface. Therefore, EViews which normally be applied for time-series oriented econometric analysis (Robert, 1965) was implemented here to analyze the effects of macroeconomic news on foreign exchange rate.

3.3.2 Target Population

Our targeted readers for this research will be those investors and traders with financial interests. This paper will then help them in analyzing and evaluating how the news will give impacts towards exchange rate movements in order for them to make decision wisely.

On the other hand, multinational corporations which with dominant risk of foreign exchange have to be thus extremely clear with exchange rate fluctuation, as exchange rate will significantly affects organizations' net profit and loss. Besides, this research is applicable for future study. It is useful for investigators who have interests in exploring more in this particular field, ease the way for their further research.

3.4 Empirical Model

Economic model: $EURUSD_t = \beta_0 + \beta_1 X_t + \varepsilon_t$

X_t=PMI/ CCI/ CPI/ CORECPI/ PPI/ AHE/ BP/ ADP; t=2013-2018

Where,

EURUSD= Currency Exchange Rate in terms of EURUSD

PMI= Purchasing managers' index

CCI= Consumer confidence index

CPI= Consumer price index

CORECPI= Core consumer price index

PPI= Producer price index

AHE= Average hourly earnings

BP= Building permit

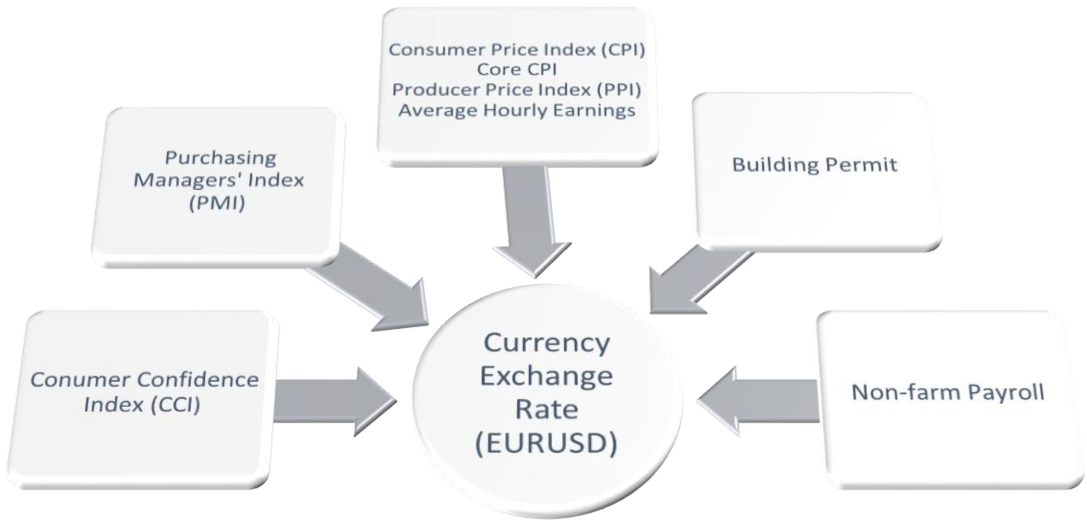
ADP= ADP non-farm employment change

ε= Error term obtained from the data collected

β_0= Intercept

3.4.1 Research Framework

Figure 3.4.1: Research Framework



In this research, we assume the existence of correlation between all the stated independent variables and dependent variable, based on journals studied.

3.4.2 Expected Sign

For employment, Apergis (2000), Ngandu (2008) and Broll and Sabine (2010) have concluded that the variable is significantly and positively correlated with the currency exchange rate. It means that when employment rate increased, the exchange rate for domestic currency will increase as well. According to Frenkel and Aros (2006), employment has positive impacts on exchange rate, which indicates higher employment will strengthen US Dollar. In addition, consumer survey should also have positive impacts on currency exchange rate. According to Afshar (2007), Barro (1991), Knack and Keefer (1997), Matsusaka and Sbordone (1995), and Utaka (2003), they have shown the higher the consumer confidence, the higher the exchange rate will be, which in turns will strengthen the dominant currency. Furthermore, business survey should be positively correlated with exchange rate movement, as the increase in business confidence intends to increase and strengthen the currency exchange rate. Moving forward, findings of Cai, Joo and Zhang (2009), Ojstersek (2014), Omrane and Savaser (2017) show that the demand for housing was also closely related to the exchange rate movement, which increase in housing indicates the increase in economic growth and in turns boosting up the currency exchange rate. On the other hand, the only variable that is expected to have negative impact on currency exchange rate will then be inflation rate. The higher the inflation rate lowering individuals' purchasing power and hence negatively affect exchange rate movement (Barro, 1995; Khan & Senhadji, 2001; Malik & Chowdhury, 2001; Sarel, 1996).

3.5 Model Estimations

3.5.1 The GARCH Model

Under the financial market, researchers are facing several econometric problems such as leptokurtosis, heteroscedasticity and volatility clustering in empirical model (Bollerslev, 1986; Engle & Russell, 1998; Savickas, 2003). According to Engle and Russell (1998), it is impractical to always assume that financial data will fulfil traditional statistical assumption. In reality, variance of financial data might not be constant over time (model might suffer from heteroscedasticity problem). Besides, according to Adballa (2012), Tsay (2002) and Poon (2005), financial data like exchange rates and stock returns are very likely to possess stylized features such as leptokurtosis and volatility clustering effect which render OLS inefficient. Hence, when data suffers from such problem, OLS may not be the best choice for model estimation. The core reason for this is that OLS minimizes the residual sum of squares (RSS). The RSS depends only on the parameters in the conditional mean equation, but not the conditional variance, hence RSS minimization is no longer an appropriate objective.

According to Engle (2001) and Brooks (2008), leptokurtosis is very commonly observed in financial time series. It means the distribution is more peaked in the centre and thicker tailed than the normal distribution with the same mean and variance. Generally, leptokurtosis can be detected when the series has a kurtosis measure larger than 3 ($k > 3$). It also renders the equation not normally distributed.

Volatility clustering implies the tendency of large changes in asset prices (of either sign) to follow large changes and small changes (of either sign) to follow small changes (Brooks, 2008). That means the current level of volatility tends to be positively correlated with its past value.

According to Engle (1982), he proposed a volatility process with time varying conditional variance which is known as Autoregressive Conditional Heteroscedasticity (ARCH) process. Furthermore, Epaphra (2017) stated that the appearance of empirical regularities in FX rate such as clustering volatility, non-stationarity, non-normality and serial correlation have reinforced the application of ARCH methodology. However, a new problem aroused - possibly high ARCH order has to be included to factor in the dynamic of the conditional variance. This means that many parameters might have to be included and the degree of freedom lost might be high.

Moving forward, GARCH model is introduced by Tim Bollerslev (1986) to solve the problem with the high ARCH orders. This model is based on an infinite ARCH specification and it dramatically reduces the number of estimated parameters from an infinite number to just a few. Hence, in our research, we employ GARCH modelling in order to include the stylized feature of high frequency financial data.

Maximum likelihood (ML) method is used to estimate GARCH model. Basically, the method works by finding the most likely values of the parameters given the actual data. More particularly, a log-likelihood function is constructed and the values of the parameter that maximize it are sought. Maximum likelihood estimation can be applied to find parameter values for both linear and non-linear models.

Our research involves the study of hourly return (high-frequency) and monthly return (low-frequency) of FX after a macroeconomic announcement had been made. In practice, exchange rate data at different period will experience different level of volatility. Hence, the general assumption of constant variance cannot be satisfied. The model that will be adopted under this research is Generalized Autoregressive Conditional Heteroscedasticity (GARCH).

The simplest form of the GARCH is the GARCH (1, 1). It can be written as follows.

The Mean Equation:

$$Y_t = a+\beta' X_t + \mu_t$$

$$\mu_t \sim iid N(0,\ h_t)$$

GARCH model assumed that the error term, μ_t is not white noise and therefore should be modelled separately and thus a variance equation was formed.

It has the following variance equation:

$$h_t = \gamma_0 + \gamma_1 \sigma 2_{t-1} + \lambda h_{t-1}$$

Where:

h_t = Variance of error term

γ_0 = Intercept

h_{t-1} = 1 lagged period of dependent variable (GARCH effect)

$\sigma 2_{t-1}$ = 1 lagged period of squared of error term (ARCH effect)

3.6 Diagnostic Checking

3.6.1 Heteroscedasticity

Based on William (2002), heteroscedasticity occurs when the variance of error term differs with each particular observation. Model misspecifications, measurement error and nature of data is typically the causes of heteroscedasticity. There are three consequences on OLS estimators when heteroscedasticity occurs. First, the coefficients of OLS estimators will remain constant and unbiased. This is because both unbiasedness and consistency do not rely on the assumption of no heteroscedasticity. Second, it will cause the estimators of OLS to be incompetent due to higher variance. Last but not least, heteroscedasticity might underestimate the variances and standard errors. Therefore, none of the hypothesis testing, neither t statistics or F statistic is reliable (Long & Laurie, 1998).

According to Michael (2015), there are two methods, formal and informal, to detect econometrics problem of heteroscedasticity. Graphical method is one of the informal ways to detect hetero-problem. The formal ways include Glesjer test, Park test, White test, Breusch-Pagan-Godfrey test and Autoregressive Conditional Heteroscedasticity (ARCH) test. All of these tests are only applicable on cross-sectional data except ARCH test. ARCH test is applicable on time-series data. Since time-series data is being used in this research, hence ARCH-Test will be applied to examine the existence of heteroscedasticity. Furthermore, there are two types of remedial measures can be used to solve hetero-problem which are Weighted Least Squares (WLS) and Generalized Least Squares (GLS).

The hypotheses for this test are stated as below:

H_0: Heteroscedasticity problem does exist

H_1: Heteroscedasticity problem does not exist

Decision rule: Reject H_0 if p-value less than significance level (e.g. $\alpha = 0.05$). Otherwise, do not reject H_0.

3.6.2 Autocorrelation

Autocorrelation which is also called the serial correlation is a problem where the error terms in a time series is carried forward from one period to another. To further clarify this statement, the error for one-time period is linked to the error for a following time period. There are two types of autocorrelation which are pure serial correlation and impure serial correlation. Pure serial correlation occurs when the classical assumption in the independent variable which assumes uncorrelated observations of the error term is violated in a truly specified equation, while the impure serial correlation is caused by a model specification bias. The pure serial correlation cannot be changed by the researcher as it is caused by the underlying distribution of the error term of the correct specification of an equation. However, the impure serial correlation can always be corrected as it is caused by the specification error. For instance, the situation of variable omissions or an incorrect functional form.

Generally, there are several causes which gives rise to autocorrelation in the model. First is the omission of relevant explanatory variables. Second is the incorrect functional form of dependent and independent variables. Third is the measurement errors that may also cause serially correlated. Last but not least, the interpolation in the statistical observation will also lead to autocorrelation problem. Actually, most of the published time series data do involving some of the interpolation and smoothing process which do average the true disturbance over the successive time periods. As a result, the successive value of it are auto correlated.

There are three ways that can be used to detect the autocorrelation problem such as Durbin's h test, Breusch-Godfrey LM test and Ljung-Box test for the research which is using the time series data (Gujarati & Porter, 2009).

The hypotheses for this test are stated as below:

H_0: There is no autocorrelation problem

H_1: There is autocorrelation problem

Decision rule: Reject H_0 if p-value is smaller than significance level (0.05). Otherwise, do not reject H_0.

3.7 Normality Test

Normality test are tests of normality to determine whether the samples come from a normality distributed population or not (Oztuna, Elhan & Tuccar, 2006).

It is important to note that the model should be normally distributed. This is because a lot of the analysis methods make assumptions about normality. Including regression, t-test, correlation, and analysis of variance (Altman & Bland, 1995). If the assumption does not hold, the reality of the data would not be accurate and reliable (Oztuna, Elhan & Tuccar, 2006). Therefore, it is important to make sure that tests on normality should be done.

One of the main tests for normality test is the Jarqua-Bera test (Ghasemi & Zahediasl). The test first computes the skewness (the asymmetry of a probability distribution) and kurtosis statistic (measurement of the peak and tail heaviness of a distribution). For a normal distribution function, skewness is 0, and kurtosis statistic is 3 (Brys, Hubert & Struyf, 2004). The JB test statistic is

$$JB = \frac{n}{6}\left[s^2 + \frac{(k-3)^2}{4} \right]$$

Where n is the sample size, s is the skewness, K is the kurtosis statistic. The JB statistic is approximately a chi-squared distribution with 2 degrees of freedom. If a variable is normally distributed, the skewness and kurtosis statistic will also be 0, making the JB statistic to be 0. Consequently, if the variable is not normally distributed, then the JB statistic will be increasingly large. The largeness of the JB statistic will depend on the critical chi-square value at 2 degrees of freedom.

The hypotheses for this test are stated below:

H_0: Error terms are normally distributed

H_1: Error terms are not normally distributed

Decision rule: Reject H_0 if p-value is smaller than significance level (0.05). Otherwise, do not reject H_0.

3.8 Properties of Stationary and Non-stationary Data

"Stationary" or "Non-stationary" is used to differentiate the stability of the properties of time series data. It tests for the existence of unit root in a model. If unit root does appear, it allows us to determine the integrated order of the variables (Al Mukit, 2012; Atmadja, 2005; Hosseini, Ahmad & Lai, 2011; Mohammad et al., 2009). A model is said to be stationary when unit root is non-existence. Stationary series will tend to fluctuate around its mean value and will not deviate too far from its mean value. Hence, we can say that the mean and the variance for stationary data are consistent throughout examined period (Brooks, 2008; Gujarati, 2004; Libanio, 2005; Phillips & Xiao, 1999).

On the other hand, non-stationary time series will tend to have time varying mean, variance and covariance. Asteriou and Hall (2007) had stated that if the period examined is long, variance of the unit root model will fluctuate extensively and move close to infinity.

A few characteristics of stationary data are illustrated below:

Constant mean: $E(Y_t) = \mu$

Constant Variance: $Var(Y_t) = \sigma^2$

Constant Covariance: $Cov(Y_t, Y_{t-k}) = \sigma^2$

3.8.1 Unit root test

In order to check whether there is existence of unit root in our observed data, this research employs Augmented Dickey-Fuller (ADF). This research proceeds the testing of non-stationarity in the presence of constant and trend. This test should give a consistent and trustable conclusion regarding the stationarity of data.

3.8.1.1 Augmented Dickey-Fuller test (ADF) test is illustrated as follows:

The ADF method will be utilized to check for stationary. ADF tests whether a series is stationary. ADF test is a common stationary test employed by many researchers such as Hosseini et al. (2011), Mohammad et al. (2009), Maku and Atanda (2010), D. Singh (2010), P. Singh (2014) and Ozean (2012) to study financial data. ADF test is elaborated from Dickey- Fuller (DF) test to account for autocorrelation problem exist in the error terms (Gujarati, 2004; Libanio, 2005; Mahadeva & Robinson, 2004). According to Mahadeva and Robinson (2004), ADF test differs from Dickey-Fuller test by adding more lagged dependent variable to minimize the serial correlation problem in the error term.

The suitable lag length of ADF can be decided by looking at the data frequency or finding the smallest number of information criterion (Brooks, 2008). As stated by Hosseini et al. (2011), ADF test is restricted by the number of lags included. Including too much lags in ADF model will reduce the degree of freedom and the standard error. Both of these effects cause the value of test statistic to be unreliably lower.

ADF model:

$\Delta Y_t = \alpha + \beta_1 t + \beta_2 Y_{t-1} + \sum_{i=1}^{m} \delta_i \Delta Y_{t-1} + \varepsilon_t$; where ε_t is a white noise error term.

The hypotheses of ADF test:

$H_0 : \delta_i = 0$ (The data series has a unit root).

$H_1 : \delta_i < 0$ (The data series does not have a unit root).

Decision Rule: Reject H_0 if the probability value of ADF test is lesser than the significant level, $\alpha = 0.05$. Otherwise, do not reject H_0.

3.9 Conclusion

In this chapter, the source of data has been stated and thoroughly explained together with the tests chosen to study the relationship between the independent variables and the dependent variable. Besides, the purpose and specification of each test has been stated and hypotheses are made for each test along with the crucial decision rule. Lastly, the hypotheses will be tested with the specific methods and procedures in next chapter.

CHAPTER 4: DATA ANALYSIS

4.0 Introduction

We will be focusing on justifying the results obtained from different methodologies engaged in our paper. Several tests that have been carried out include GARCH, Normality test, Unit Root test namely Augmented Dickey Fuller (ADF) test and diagnostic checking which include Heteroscedasticity and Autocorrelation. To visualize and simplify examination of our data, we inserted our output into tables with interpretation and justification.

4.1 GARCH Model

We conducted the regression output using GARCH model. Using the GARCH model, almost all of the FX rate return was free of heteroscedasticity and autocorrelation problem as both ARCH LM test and Ljung-Box test failed to reject the null hypothesis. Table 4.1 contains the regression output of our model using the GARCH model.

Table 4.1 Regression result of Generalized Auto Regression Conditional Heteroskedasticity (GARCH)

The Effect of U.S. Announcement on EURUSD returns

	6 Hours	5 hours	4 hours	3 hours	2 hours	1 hour	Monthly
ADP	1.09E-05	5.14E-06	2.55E-06	-4.57E-07	1.82E-06	-2.23E-06	-0.000106
	(0.0021)***	(0.0000)***	(0.0000)***	(0.9593)	(0.6623)	(0.0000)***	(0.0001)***
AHE	0.047730	-0.277415	0.018313	0.049258	0.064756	0.058939	2.643131
	(0.8859)	(0.1972)	(0.9176)	(0.7892)	(0.6224)	(0.5696)	(0.0000)***

BP	-0.003839	-0.007837	-0.011678	-0.001151	-0.000234	-0.011482	-0.003261
	(0.5565)	(0.2424)	(0.1575)	(0.8539)	(0.9656)	(0.0026)***	(0.9650)
CCI	7.46E-05	-2.64E-05	-7.06E-05	2.19E-05	2.60E-05	-1.78E-05	0.000627
	(0.4511)	(0.7020)	(0.0000)***	(0.3077)	(0.2004)	(0.5568)	(0.2908)
CORE CPI	1.448594	1.550417	1.186431	1.267501	1.214884	0.966910	7.060895
	(0.0092)***	(0.0184)**	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.1679)
CPI	0.378435	0.018045	0.098793	0.297186	0.163610	0.003427	1.492139
	(0.0000)***	(0.9492)	(0.6944)	(0.0586)*	(0.2921)	(0.9838)	(0.3331)
PMI	-7.57E-05	6.24E-05	5.87E-05	1.94E-05	-1.46E-06	4.53E-05	0.002303
	(0.7360)	(0.1769)	(5.87E-05)	(0.5236)	(0.9819)	(0.0542)*	(0.3475)
PPI	0.166853	0.202181	-0.075969	-0.109336	-0.152797	-0.234097	0.697394
	(0.0037)***	(0.0000)***	(0.5075)	(0.4300)	(0.0560)*	(0.0000)***	(0.5885)

Note: The asterisks *, **, ***, indicate rejection of the null hypothesis at 10%, 5% and 1% significance level. P-value in parentheses.

4.1.1 Interpretation of result

As shown in our result above, there are many macroeconomic news that can significantly affect the return of FX rate within a month or within few hours. Among all 8 macroeconomic data releases, ADP, CORE CPI, CPI and PPI exhibit more than one period of strong correlation between changes macroeconomic news and changes in return of FX rate. On the other hand, AHE, BP, CCI and PMI exhibit at least one correlation.

4.1.1.1 ADP

ADP is one of the strongest macroeconomic news that can predict FX rate return. It is proved statistically significant in affecting monthly, 6-hourly, 5-hourly, 4-hourly and 1-hourly changes at 1% significance level. Its coefficient in monthly, 6 hourly, 5 hourly, 4 hourly and 1 hourly changes is -0.000106, 1.09E-05, 5.14E-06, 2.55E-06 and -2.23E-06 respectively. However, 3-hourly and 2-hourly changes are statistically insignificant in this case. To sum up, ADP released is quite an important information that many market participants put their attention on as most of the changes is significant to its release.

4.1.1.2 AHE

AHE news is relatively weaker in influencing return of FX rate. It is tested to be significant solely in monthly change with a coefficient of 2.643131 at 1% significance level. Other than monthly, there are no other high-frequency FX rate changes that can be predicted by the release of this news. Hence, we say that any changes in AHE fundamental can affect long-term direction of FX rate but not short-term fluctuation.

4.1.1.3 BP

BP release proves to be statistically significant only in factoring 1-hourly movement of FX rate as only 1-hourly changes is tested significant with a coefficient of -0.011482. We can say that the effect of changes in BP news drown subsequently after 1 hour as coefficient beyond 1 hour has all proved insignificant. In simple word, the release of BP news only has a very short-term impact on FX market.

4.1.1.4 CCI

CCI release is quite important in the FX market as it is statistically significant in 4-hourly changes with coefficient of -7.06E-05 (1% significance level). Its news announcement is said to affect FX rate changes only after a brief lag, which is 4 hours later. After that, FX rate again drown in a random movement in market.

4.1.1.5 CORE CPI

The release of CORE CPI has the strongest impact in FX market in short-term. It is proved to be statistically significant at 1% and 5% significance level in 6-hourly, 5-hourly, 4-hourly, 3-hourly, 2-hourly and 1-hourly changes with coefficient of 1.448594, 1.550417, 1.186431, 1.267501, 1.214884 and 0.966910 respectively. Its entire hourly (but not monthly) coefficient is positive and significant. This shows that CORE CPI announcement is closely watched by market participants short-term post release.

4.1.1.6 CPI

The release of CPI can only influence FX market at 6-hourly changes (at 1% significance level) with coefficient of 0.378435. Other than 6-hourly changes, CPI is tested insignificant. Hence, the effect of CPI announcement is a relatively weaker compare to another announcement. The changes in announced CPI data take few hours to be incorporated into FX rate changes.

4.1.1.7 PMI

The release of PMI can only affect FX market at 1-hourly changes with coefficient of 4.53E-05 at 10% significance level. Hence, PMI announcement only has significant relationship to FX rate return if we are more lenient on the significance level. It means that there are limited market participants that trade based on PMI announcement and they only depend on this announcement only for an hour.

4.1.1.8 PPI

The effect of PPI announcement is significant at 6-hourly, 5-hourly and 1-hourly changes (at 1% significance level) with coefficient 0.166853, 0.202181 and -0.234097 respectively. It is quite significant to affect FX rate changes. Any changes in PPI fundamental will be incorporated into FX rate changes in the first hour, but kind of lost track afterwards and finally be predictable again in 5 and 6 hours later.

Table 4.2 Benchmark Results

Release	6 hours	3 hours	2 hours	1 hour
ADP	0.00006*	0.00006*	0.00005*	0.00005*
BP	0.00597	0.01270*	0.00020	0.00510
CCI	0.00031*	0.00041*	0.00042*	0.00036*
CPI	0.00320	-0.00580	-0.00510	-0.00088
PMI	0.00012	0.00029	0.00025	0.00080*
PPI	-0.00290	-0.00360	-0.00220	0.00210

Note: The asterisks *, indicates rejection of the null hypothesis at 5% significance level. These results are adopted from Almeida & Goodhart & Payne (1998).

4.2 Diagnostic Checking

4.2.1 Heteroscedasticity

Heteroscedasticity is the problem raised when the error terms do not have a constant variance. The model may associate with a larger variance which is not tally with the values of dependent or independent variables. We employed Autoregressive Conditional Heteroscedasticity (ARCH) Test to capture the existence of this effect.

$\mathbf{H_0}$: There is no heteroscedasticity problem.

$\mathbf{H_1}$: There is heteroscedasticity problem.

Decision rule: Reject H_0 if p-value is less than significant level, α. Otherwise, do not reject H_0.

Table 4.2.1 Results of Autoregressive Conditional Heteroskedasticity (ARCH LM) Test

	6 Hours	5 hours	4 hours	3 hours	2 hours	1 hour	Monthly
ADP	0.6797	0.5652	0.9961	0.6781	0.8001	0.5007	0.7233
AHE	0.5318	0.2287	0.8784	0.3413	0.8132	0.6073	0.8138
BP	0.5320	0.2077	0.8608	0.3819	0.9973	0.4043	0.2961
CCI	0.3256	0.9167	0.0716	0.9515	0.6194	0.5137	0.5804
CORE CPI	0.8445	0.8675	0.6674	0.3641	0.4385	0.8589	0.7107
CPI	0.3793	0.7712	0.8181	0.4165	0.4796	0.6780	0.7948
PMI	0.5158	0.8755	0.6742	0.9589	0.2182	0.7344	0.3195
PPI	0.5835	0.5474	0.7357	0.9407	0.5528	0.7729	0.1812

The results in Table 4.3 shows that none of the variables is significant at 5% significant level. Therefore, there are no heteroscedasticity problem in these models.

4.2.2 Autocorrelation

Autocorrelation is a problem where the error terms in a time series are transferred from one period to another. In other words, the error for one-time period is correlated with the error for a subsequent time period. It can be tested by using Ljung-Box test in this research.

$\boldsymbol{H}_0$: There is no autocorrelation problem.

$\boldsymbol{H}_1$: There is autocorrelation problem.

Decision rule: Reject H_0 if p-value is less than significant level, α. Otherwise, do not reject H_0.

Table 4.2.2 Results of Ljung-Box Test

	6 Hours	5 hours	4 hours	3 hours	2 hours	1 hour	Monthly
ADP	Pass	Pass	Pass	Pass	Fail	Pass	Pass
AHE	Pass	Pass	Pass	Pass	Pass	Pass	Pass
BP	Pass	Pass	Pass	Pass	Pass	Pass	Pass
CCI	Pass	Pass	Pass	Pass	Pass	Pass	Pass
CORE CPI	Pass	Pass	Pass	Pass	Pass	Pass	Pass
CPI	Pass	Pass	Pass	Pass	Pass	Pass	Pass
PMI	Pass	Pass	Pass	Pass	Pass	Pass	Pass
PPI	Pass	Pass	Pass	Pass	Pass	Pass	Pass

The results in Table 4.4 shows that most of the variables do not have autocorrelation problem except ADP in 2 hours exists autocorrelation problem.

4.3 Normality test

To examine whether error terms adhere to normality assumption, we applied Jarque-Bera (JB) test.

Table 4.3 Results of Jarque-Bera Test

	6 Hours	5 hours	4 hours	3 hours	2 hours	1 hour	Monthly
ADP	0.488191	0.575742	0.002497*	0.000000*	0.343045	0.165210	0.276374
AHE	0.480521	0.294496	0.764194	0.000002*	0.154249	0.898265	0.299194
BP	0.503207	0.811689	0.000003*	0.976712	0.260525	0.000000*	0.001593*
CCI	0.510918	0.915901	0.641068	0.165762	0.059585	0.000012*	0.463054
CORE CPI	0.502143	0.208050	0.383284	0.167896	0.024218*	0.000000*	0.240039
CPI	0.729320	0.088443	0.113103	0.001408*	0.000001*	0.000000*	0.230575
PMI	0.322316	0.256404	0.336110	0.700091	0.195534	0.658161	0.313832
PPI	0.841241	0.885520	0.531253	0.000000*	0.000002*	0.000091*	0.144670

Note: The asterisks * indicates rejection of the null hypothesis at 5% significance level.

4.4 Unit Root Test

Table 4.4 Results of Augmented Dickey-Fuller (ADF) test

	6 hours	5 hours	4 hours	3 hours	2 hours	1 hour	Monthly

ADP	0.0000*	0.0000*	0.0000*	0.0000*	0.0000*	0.0000*	0.0000*
AHE	0.0000*	0.0000*	0.0000*	0.0000*	0.0000*	0.0000*	0.0000*
BP	0.0000*	0.0000*	0.0000*	0.0000*	0.0000*	0.0000*	0.0000*
CCI	0.0000*	0.0000*	0.0000*	0.0000*	0.0000*	0.0000*	0.0000*
CORE CPI	0.0000*	0.0000*	0.0000*	0.0000*	0.0000*	0.0000*	0.0000*
CPI	0.0000*	0.0000*	0.0000*	0.0000*	0.0000*	0.0000*	0.0000*
PMI	0.0000*	0.0000*	0.0000*	0.0000*	0.0000*	0.0000*	0.0000*
PPI	0.0000*	0.0000*	0.0000*	0.0000*	0.0000*	0.0000*	0.0000*

Note: The asterisks * indicates rejection of the null hypothesis at 5% significance level.

4.5 Discussion of Results

Refer to our research objectives, we have achieved our motive and reached several conclusions.

As shown in our result, most of the economic announcements have the ability to forecast FX rate in high frequency.

Most of the economic announcements are insignificant when examined in monthly except for ADP and AHE. Therefore, we move on to examine the impact of announcements on hourly movement. The result is satisfactory. It shows that result from using high frequency data is more significant than low frequency data in forecasting FX rates. In other word, there is short-run impact of economic announcement on FX rates.

Furthermore, our result is somewhat comparable to some popular past studies such as (Table 4.2) Almeida et al. (1998) and etc. This shows that using GARCH test to investigate FX rate movement prior and post announcement is applicable as suggested by Ehrmann et al. (2005).

4.5.1 Discussion of ADP

The relevancy between FX rate of EURUSD and ADP Non-farm employment announcement is high as our result showed that the relationship between FX rate and ADP announcement is statistically significant in 1-hour, 4-hours, 5-hours, 6-hours, and even 1 month after the macroeconomic news had been announced. Insignificant results are shown only in 2-hours and 3-hours after. Moreover, the strong significance obtained in our research was actually quite similar with the research proposed by Almeida, Goodhart and Payne (1998). According to Almeida, Goodhart and Payne (1998), non-farm payroll was significant in nearly all level of time length at 5% significant level. Besides, our statistically significant ADP was also consistent with Ehrmann and Fratzscher (2005) conclusions.

Next, the sign of ADP is mixed with positive and negative in different hour. However, most of the sign is positive. This tally with our expectation of positive relationship between non-farm employment and EURUSD as normally an increment in non-farm payroll employment will contribute to improvement in US real activities hence strengthening US dollar. Our research is consistent with the findings of Ehrmann and Fratzscher (2005) that an increment in non-farm payroll employment contributes to an appreciation the US dollar.

4.5.1.1 Public Perception

In short, there is a positive and significant relationship between ADP non-farm employment and EURUSD exchange rate quotation. Rises in non-farm payroll implies more people are able to find a job and this promotes greater economic strength. Thus, the value of United States dollar strengthens.

4.5.2 Discussion of AHE

Unlike other variables, inflation tends to have the most proxies indicating the general price level over a period of time. Out of all inflation proxies, average hourly earnings (AHE) shows the least statistical significance in GARCH test towards the dependent variable, EURUSD. According to the results, its relationship with EURUSD is only significant at monthly timeframe. Although it is not covered in Almeida et al. (1998), AHE is still declared as a leading indicator of consumer inflation, as the wages paid to labor might be passed on to consumers. In another way round, an increase in amount earned implies gain in spending ability that drives up the demand and price of goods and services too. The weak significance shown might be due to the reason that changes in labor cost and income are not immediately reflected into price of goods and services. Or else, the announcement of AHE might not be referred as frequently as other inflation indicators, which reduces its effect towards changes in EURUSD.

The outcomes produced are slightly contradicted with our expectation since AHE contributes to positive relationship with most of the quotation changes in EURUSD, excluding at the 5-hour timeframe.

4.5.2.1 Public Perception

Based on our understanding, the hike in U.S. AHE might enhance the spending power of its citizens as they receive more as they work. At the same time, production cost increases due to higher labor cost might lead to increase in general price level of products and services too. As an inflation indicator, it supposed to bear negative relationship with U.S. dollar. However, higher AHE also hints about optimistic economy that the employers are able to afford higher labor cost when labor pool is tight. Hence, it is explainable that higher AHE in the U.S. encourages higher U.S. dollar value.

4.5.3 Discussion of BP

The GARCH test suggests that the relationship between EURUSD rate and building permit is negatively significant in the first 1 hour after the announcement has been made. Otherwise, it is insignificant. Our results differ from the study of Almeida, Goodhart and Payne (1998) where they found that relationship of 1, 2, 4, and 6 hours are insignificant but only the result from the 3 hours is positively significant. Although our results and Almeida, Goodhart and Payne (1998) have some differences, it still points towards a similar direction, that the housing start indicator, building permit has limited influence on FX rate changes. Further studies by Hashimoto & Ito (2009) together with Chaboud, Chernenko, Howorka, Krishnasami Iyer, Liu and Wright (2004) also suggested that housing start and leading indicators announcements have small impacts on the immediate period of volume traded on FX rate after the announcement is made.

In addition, our results are different from our expectation of a positive relationship between building permit and EURUSD.

4.5.3.1 Public Perception

This might suggest that traders now have hetero interpretation of announcements as suggested by Chaboud et al. (2004). Mind set of people from the past and present are different. In the past, more construction activities may be interpret as having lower unemployment rate, higher consumer spending and thus higher economic growth. Presently, people look at many other variables as well. For example, one of the significant variables is the amount of a nation’s borrowing. The US currently has debt amounting to almost 20 trillion USD, as stated in The Bureau of The Fiscal Service, (2018). When there are more building permits issued, it would lead to higher borrowings to fund projects.

When borrowings are high, people would be worry about whether the citizens are able to bear these borrowings. Hence, this might explain why there appears to be a negative relationship between the building permit and the EURUSD exchange rate.

4.5.4 Discussion of CCI

Based on our output, CCI is tested to be significant to EURUSD only in 4 hours. Otherwise, it is insignificant. Our result is similar with several past studies such as Gulley and Sultan (1998), Andersen, Bollerslev, Diebold and Vega (2003), Çelik and Özerkek (2009), and Sakir and Sevcan (2010) who concluded a significant relationship between consumer confidence and exchange rate. However, our result deviates slightly from Almeida, Goodhart and Payne (1998) who concluded that US consumer confidence index remain significant even 12 hours post-announcement while our result shows only change in 4 hours is significance.

Moreover, our results of negatively signed coefficient contradict with our expectation, as we generally perceive higher consumer confidence in a nation to boost domestic economic activity that will lead to strengthening of domestic currency. It also contrasts with the findings of Ehrmann and Fratzscher (2005) and Sakir and Sevcan (2010) who mention that a positive relationship between US consumer confidence and US dollar.

4.5.4.1 Public Perception

A possible explanation to our contradictory result would be an appearance of structural break in the common market's belief of current exchange rate model, which will alter the direction of exchange rate (Almeida, Goodhart and Payne, 1998). Take an improvement in a nation's real activity for instance, a Monetarist model follower would expect the dollar to strengthen as local money demand increases, whilst a Keynesian model believer would expect the opposite because of rising import goods seeking by local people. Hence, our contradictory sign here could be explained by an adherence of Keynesian model.

4.5.5 Discussion of CPI

As shown in our result, consumer price index (CPI) has its relationship with EURUSD significant merely at 6-hour timeframe while the anchor journal showed complete insignificance. Notably, all the test results have positive relationship with the dependent variable despite their significance, conflicting with the results generated in Almeida et al. (1998). Similar with the understanding made above, components in basket of goods and services used to compute CPI may have been varied now, and it might be the decisive factor manipulating the relationship of CPI with FX rates from negative to positive. If we go one step ahead, rising inflation could be due to improved overall willingness and ability to spend in a nation, thus optimizing the growth of an economy in future. Therefore, EURUSD now increases when CPI value in the United States increases, as dollar appreciates following the rising demand of goods and services from the nation.

About the similar condition with AHE, CPI results in positive relationship with the studied exchange rate, unlike expectation. In AHE, there is still a negative coefficient appearing in the test results at 5-hour timeframe, which might be due to its ambiguous concurrent representations from the viewpoint of producer and consumer. Nevertheless, in CPI, the results are rather consistent.

4.5.5.1 Public Perception

However, CPI which entirely represents consumer inflation is able to reflect the expected impact of inflation towards FX, in which U.S. citizens orders more foreign goods and services given the increasing consumer inflation rates in the U.S. rates as understood in Hsing (2016a, 2016b). When CPI increases, it may imply that the economy is booming. It also provides more room for Federal Reserve of U.S. to continue with its interest rate normalization process. U.S. has been undergoing years of rising interest rate scenario since 2015 as inflation begins to rises. Consequently, a higher inflation rate which might lead to higher base rate which is be able to push up the value of U.S. dollar even though greater inflation rate supposed to devalue it.

4.5.6 Discussion of Core CPI

In the context of core consumer price index (core CPI), it presents to bring about the strongest impact towards EURUSD, given positive significant relationship in 6-hour, 5-hour, 4-hour, 3-hour, 2-hour, and 1-hour timeframes. This indicator is not introduced in Almeida et al. (1998) but the test results convincingly display impact of filtered CPI index which excludes high-price-volatility goods and services towards FX rate. It is believed that currency traders and investors might rely more on news released from a refined inflation indicator since core CPI has the same relationship direction with CPI. According to Bureau of Labor Statistics in the United States, people tend to study core CPI over CPI because it exempted food and energy consumptions that are too sensitive, volatile, as well as non-systemic to be covered in inflation measurements. With these results, news on inflation in a nation is expected to be applied by currency traders and investors that it triggers the variation of EURUSD.

4.5.6.1 Public Perception

Given the results identical to expectation in CPI, core CPI, the adjusted indicator of consumer inflation has positive relationship with USD strength too. As it reflects the increase in price more accurately, all the core components in a basket of goods and services are able to tell the public about the economic condition in the U.S. In spite of rising inflation, it signifies that economic well-being is solid. Hence, suppliers dare to price their products and services at higher price and optimistic business environment is assumed. Higher core CPI might also speed up Federal Reserve's pace of interest rate normalization leading to strengthening in USD.

4.5.7 Discussion of PMI

Based on the result from our output, we found out that PMI is only positively significant to EURUSD rate in 1 hour. Otherwise, it is not significant at all. This finding is consistent with the research done by Almeida and Goodhart and Payne (1998) who had also carried out an investigation about the effect of PMI on EURUSD rate in 1, 2, 3 and 6 hours. They used the method of OLS with heteroscedasticity-consistent standard error to get this result; however, we managed to obtain similar result through GARCH test.

Moreover, this result is also aligned with our expectation where EURUSD rate will react positively towards PMI. This is supported by Andersen, Bollerslev, Diebold, and Vega (2003), Ehrmann and Fratzscher (2005) as well as Nagarajan, Subburao and R (2017) who reported that USD will experience at least a short-term significant appreciate when reported PMI is rising.

4.5.7.1 Public Perception

In general, PMI is commonly used by the investors to trace economic growth. An increase in PMI may indicate that the future economic growth of a nation is more visible. Therefore, this may increase the willingness of the investors from other countries to hold the particular nation's currency, leading it to appreciate.

4.5.8 Discussion of PPI

Probably an indicator that reflects inflation in terms of business costs more comprehensively than average hourly earnings, producer price index (PPI) shows significant relationship with EURUSD at 6-hour, 5-hour, and 1-hour timeframes, whereas it is not significant at all as in Almeida et al. (1998). To explain our significant result that differs from Almeida et al. (1998), PPI includes sales at numerous levels of output but not just finished good. Following the growing tendency of globalization, price received by producers may be affected not only by domestic clients but also foreign importers such as those who implement the policy of offshore production. It tends to be more accurate and reliable in measuring inflation, especially in this era with robust manufacturing yields thanks to the proliferation of cross-border transactions and technological advancement. This reason backs the significance of stated test results towards EURUSD to be different from Almeida et al. (1998), given both tests are conducted in dissimilar age, economic and technological conditions.

Unlike other inflation indicators, PPI shows mostly negative coefficients with EURUSD which adhere to our expectation. This is the only case that speaks an adverse environment for U.S. dollar out of all studied inflation indicators, since producers might be charging beyond the rational price onto consumers. If this situation is prolonged, the wealth distribution among U.S. residents might get imbalance and negatively affect U.S. economy and U.S. dollar.

4.5.8.1 Public Perception

After some careful reasoning, it is predicted that PPI, the price offered by producers to their consumers might oppose other statements as in AHE, CPI, and core CPI. In those earlier cases, the impacts of inflation are well covered by optimism in U.S. economy that the indicators boost the exchange rate of U.S. dollar. Nonetheless, the component in PPI might not be able to cover such effect and hence brings out the original impact.

4.6 Conclusion

Several diagnostic checking procedures such as normality test, stationary test, homoscedasticity test and autocorrelation test have been carried out. Empirical results have been exhibited in table form to ease the visualization of outcome. Results are first clearly interpreted, after which we move on to discussing the results and providing explanation. In Chapter 5, we will be summing up the overall conclusion for our research.

CHAPTER 5: CONCLUSION

5.0 Introduction

A summary will lead the ending of this paper in Chapter 5. The following part, policy implications will navigate the use of this sampling study on EURUSD, from micro- to macro-level considerations, which can be referred by academic, investing, or even regulatory bodies to deal with FX-related investigations. Lastly, the limitations faced in this paper will also be briefed together with suggestions for improvement.

5.1 Summary

According to the problem statement developed, to discover the asset price is the basis for most of the financial economics related researches, as it best reacts the macroeconomic announcements with the most accurate reflections. However, the major issue was the prices and intrinsic values of foreign currency exchange rate are highly disconnected (Andersen, Bollerslev, Diebold & Vega, 2003), and with limited researches showing that both with significant relationship (Meese & Rogoff, 1983). In addition, the dominant factor that trigger our group to conduct this research was mainly due to people are highly uncertain about the directions and movements of foreign exchange rate when latest economic data is being announced (Almeida, Goodhart & Payne, 1998).

Nevertheless, with the reference of recent years' findings by Almeida et al. (1998), Anderson et al. (2003) and Ehrmann et al. (2005), researches who focused on US economic, indicating that there are in fact plenty of the macroeconomic news which will significantly influence foreign exchange rate. However, the results may only obtainable when researching at a higher degree of frequency. To examine this, our major key direction is to investigate the impact of macroeconomic announcements on the EURUSD rate in United States from May 2013- June 2018. To further elaborate, we separate our aim into five specific objectives to examine the correlation between the news and foreign exchange rate movements.

Specifically, those more detailing objectives were first to observe the ability of the fundamental periodic economic announcements in affecting exchange rates. Next, to examine results differences in distinct level of frequency. Third, we try to investigate the short-run impact of macroeconomic announcements had on EURUSD rate. Besides, we attempt to identify and analyze whether GARCH test is applicable to capture exchange rates movements as recommended by Ehrmann et al. (2005). Finally, we want to check if our result is comparable to the benchmark of past study (Almeida et al., 1998).

The results indicated in our findings are mostly statistically significant and partly tally with our expectation. Firstly, there are positive relationship between non-farm employment and EURUSD, as an increase in non-farm payroll employment will normally contribute to an appreciation of US dollar (Ehrmann & Fratzscher, 2005). It thus shows that there is a positive and significant relationship between ADP non-farm employment and EURUSD exchange rate quotation. Besides, an increase in PMI generates positive impacts for currency value, as a more advance PMI indicates a more visible future economic growth of a nation (Andersen, Bollerslev, Diebold & Vega, 2003). In short, EURUSD rate will react positively towards a rise in PMI, based on the short-term significant appreciation shown when reported PMI is raising (Ehrmann & Fratzscher, 2005) and (Nagarajan, Subburao & R, 2017).

There is more than one proxy to explain the general price level over time under the macroeconomic issue of inflation. Among all inflation indicators, AHE shows the least statistical significance Although AHE has weak significance yet it could be indirectly important as the higher pay may have spillover effect towards consumers. However, CPI and Core CPI which served as key indicators for economic variation show contradictory results to our expectation. Normally, with rising CPI, higher inflation rate will eventually weaken the local currency (Hsing, 2016a, 2016b). But the sub-consequence of increasing CPI might also imply that economy is growing robustly, so Fed has more space to continue with their interest rate normalization, causing U.S. dollar to appreciate. At the same time, the only inflation indicator that contradicts to others is PPI, which indicates the price received by producers. The rising PPI leads to weakening of currency value because it might causes anxiety among investors and traders that sustained overpricing will lead to severe fiscal imbalance in the future.

An appearance of structural break in the common market's belief of currency exchange rate model may alter the direction of exchange rate movement (Almeida, Goodhart & Payne, 1998). The economic indicator of CCI here thus showing contradict result with our general expectation. The result suggests that an increase in consumer confidence lowering down the currency exchange value. This implies that Keynesian model may be adhered instead, which people may tend to seek for more imported products with raising consumer confidence. Last but not least, contradict sign for building permit and EURUSD has obtained, which showing that more construction projects developed would negatively affect the country's currency value. According to Chaboud (2004) who proposed different people will possess distinct perceptions and hence hetero interpretations. It thus indicates a greater amount of construction projects being developed may not necessarily reflecting a better economic wealth as construction projects could be financed through mounted borrowings.

5.2 Policy Implications

There are applicable policy implementations generated from this paper. First of all, macroeconomic announcements in the U.S. appear to disturb the movement of EURUSD at least at one timeframe out of all tested periods. To narrow down the focus, the periodic reports of consumer surveys, business surveys, employment, inflation, and housing factors in the U.S. tend to vary the value of U.S. dollar, and hence affecting the FX quotation of EURUSD.

In our humble opinion, government or monetary authority of a nation shall carefully handle the news release. Ideally, the reports shall not be expressed in impulsive words and sentences but the conservative ones instead. This measure assists in stabilizing the momentum in financial markets, especially when unusual announcements are reported. Next, these bodies shall also ensure that material information to be published is not leaked elsewhere before the official statement is presented. This also questions the ethical conducts of authorized personnel in handling the materials. The authority shall always govern its servants and make sure that they comply strictly to established code of ethics and standards of operation.

Moreover, as a secondary measure, Securities and Exchange Commission (SEC) shall also revise its policy in suspending trade or imposing trading halt in case the announcements still stimulate overwhelming change in asset price, specifically FX as it involves more pips and points than usual financial securities like stocks and bonds. Besides protecting the FX from currency attack, this method is also mandatory to shelter traders and investors from making huge losses from overreactions.

5.3 Limitations of Study

After conducting this research, we wish to address some of our problems encountered which we think that it is possible to be improved through future studies. The first problem is the nature of a GARCH test. GARCH test in nature is use to test for linear models. Our data which consists of forex rate and several important macroeconomic data are all time series data that are not linear in nature.

Secondly, the foreign exchange currency rate is fundamentally affected by the condition of a nation’s economy. Since a nation’s economy is ever-changing, future economic conditions may not be the same as the one’s we have presently. There will occur events that could potentially trigger structural breaks, for example, economic sanctions, trade wars and other major economic issues. As such, future extensive research may yield results different from ours.

Thirdly, the way we conduct our research does not factor in the effects of correlation between economic announcements. For example, we have 5 categories of macroeconomic news. Among all, two of them are inflation and unemployment. We run a test on the movement of EURUSD rate solely with the data of inflation. If the test is negatively significant, then the increase in inflation will decrease the rate of EURUSD rate, period. However, from the Philips curve theory, we know that unemployment and inflation is inversely related to each other. Normally, when unemployment decrease, inflation will increase (Philips, 1958). Thus, this shows that our data of inflation and unemployment are possibly correlated. Furthermore, it also does not involve any other factors that might further affect the EURUSD rate. Throughout the years, they have been instances where the Philips curve theory did not hold. For example, the oil embargo in 1970s saw the increase in inflation and unemployment which triggers a slowdown of economy (Covi, 2015). Also, the goldilock economy, which saw the decrease in both unemployment and inflation, resulted in a period of tremendous economic growth (Gordon, 1998). As such, does it mean that if inflation increase, unemployment increase, will result in a slowdown of economy, which then devalue a nation's currency, or vice versa? Since our research only tests one macroeconomic announcement on FX rate, we are unable to determine whether both of these announcements if tested together on the EURUSD exchange, have any relationship between them.

5.4 Recommendation for Future Investigation

Hereby, we suggest future researchers to extend our research by running test using more sophisticate model such as Artificial Neural Network Model. It is a newly developed model that is applied in the forecasting field. The model is capable of running complex non-linear data, which the GARCH model cannot. Basically, the model assumes the relationship between the dependent and independent variable as a network of neurons inside a system. It can classify patterns present inside a relationship, categorize neurons together by patterns, function approximation, optimize and find a solution that solve constraints present inside the relationship and give control to the system so that the system follows a pre-indicated direction (Jain, Mao & Mohiuddin, 1996).

Besides, it is advisable for future researchers to continuously revisit our research in order to capture future structural break of model. Structural break might happen especially when there occurs a significant economic change, such as the electorate of Donald Trump as the president of United States, or the departure of United Kingdom from the European Union without a deal. This kind of events would trigger structural break that may yield different forecasting significance and direction.

Aside from revisiting, there are still numerous potential variations and modifications from this paper by applying different macroeconomic factors and even changing the subject currency pairs. In fact, there are still plenty of decisive economic factors that may affect the currency value of hundreds of currencies pairs to be tested. Since money or currency is so crucial and widely utilized in daily life, we encourage more attempts to be done in researching this topic. After all, we would be able to comprehend the nature of currency and foreign exchange, and answer to all the disputes arguing their uncertainties and risks.

Take an example, one of our research limitations is the inability to factor in the effects of correlation between variables. When it is the fundamentals of economics we are studying, it is a known factor that often times, we cannot interpret an economy as good or bad based solely on one fundamental. We have to relate it with other fundamentals to determine the true condition of an economy. Future researchers can conduct researches on multiple predictors affecting a single currency to capture the effect of correlation.

REFERENCES

Abbas, Q., Iqbal, J., & Ayaz (2012). Relationship between GDP, inflation and real interest rate with exchange rate fluctuation of African countries. *International Journal of Academic Research in Accounting, Finance and Management Science, 2*(3), 132-141.

Abdalla, S. Z. S. (2012). Modeling exchange rate volatility using GARCH models: Empirical evidence from Arab countries. *International Journal of Economics and Finance*, *4*(1), 216-229.

Acemoglu, D., & Scott, A. (1994). Consumer confidence and rational expectations: Are agents' beliefs consistent with the theory? *Economic Journal*, *104*(422), 1–19.

Adusei, M., & Gyapong, E. Y. (2017). The impact of macroeconomic variables on exchange rate volatility in Ghana: The partial least squares structural equation modelling approach. *Research in International Business and Finance*, *42*(1), 1428-1444.

Afshar, T. (2007). Stock return, consumer confidence, purchasing manager's index and economic fluctuatios. *Journal of Business and Economics Research*, *5*(8), 97-106.

Aggarwal, R., & Schirm, D. (1992). Balance of trade announcements and asset price: Influence on equity prices, exchange rates and interest rates. *Journal of International Money and Finance*, *11*(1), 80-95.

Aggarwal, R., & Schirm, D. C. (1992). The predictive power of January returns and the political-business cycle. *International Review of Financial Analysis*, *1*(3), 237-245.

Aizenman, J. (1984). Testing deviations from purchasing power parity (PPP). *Journal of International Money and Finance, 5*(1), 25-35.

Al Mukit, D. M. (2012). Effects of interest rate and exchange rate on volatility of market index at Dhaka Stock Exchange. *Journal of Business and Technology, 9*(2), 1-18.

Alan, T. (2000). *A century of purchasing-power parity* (NBER Working Papers No.8012). Retrieved from National Bureau of Economic Research website: https://www.nber.org/papers/w8012

Alhowaish, A. K. (2015). Causality between the construction sector and economic growth: The case of Saudi Arabia. *International Real Estate Review*, *18*(1), 131-147.

Allen, H., & Taylor, M. (1990). Charts, noise and fundamentals in the London foreign exchange market. *Economic Journal*, *100*(4), 49–59.

Almeida, A., Goodhart, C., & Payne, R. (1998). The effects of macroeconomic news on high frequency exchange rate behaviour. *The Journal of Financial and Quantitative Analysis, 33*(3), 383-408.

Altman, D. G. & Bland, J. M. (1995). Statistic notes. *The normal distribution*. Retrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2548695/pdf/bmj00578-0032.pdf

Anaman, K. A., & Osei-Amponsah, C. (2007). Analysis of the causality links between the growth of the construction industry and the growth of the macro-economy in Ghana. *Construction Management and Economics, 25*(9), 951-961.

Andersen, T.G., Bollerslev, T., Diebold, F.X., &Vega, C. (2003). Micro effects of macro announcements: Real-time price discovery in foreign exchange. *The American Economic Review, 93*(1), 38-62.

Antonius, R. (2003). *Interpreting Quantitative Data with SPSS*. India: Sage Publications India Pvt Ltd.

Asteriou, D., & Hall, S. G. (2007). *Applied econometrics (2nd ed.)*. Basingstoke: Palgrave Macmillan.

Atmadja, A. S. (2005). The granger causality tests for the five ASEAN countries stock markets and macroeconomic variables during and post the 1997 Asian financial crisis. *Journal of Economics, 7*(1), 1-21.

Auerbach, A., & Gale, W. (2009). *Activist fiscal policy to stabilize economic activity* (NBER Working Paper No. 15407). Retrieved from National Bureau of Economic Research website: https://www.nber.org/papers/w15407

Ayyoub, M., Chaudhry, I. S., & Farooq, F. (2011). Does Inflation Affect Economic Growth? The case of Pakistan. *Pakistan Journal of Social Sciences (PJSS)*, *31*(1).

Azad, A. S. M. (2009). Random walk and efficiency tests in Asia-pacific foreign exchange markets: Evidence from the post-Asian currency crisis data. *Research in International Business and Finance*, *23*(3), 322-338.

Baffes, J. (1991). Some further evidence on the law of one price: The law of one price still holds. *American Journal of Agricultural Economics*, *73*(4), 1264-1273.

Baillie, R. T., & Bollerslev, T. (1989). Common stochastic trends in a system of exchange rates. *The Journal of Finance, 44*(1), 167–181.

Baillie, R. T., & Selover, D. D. (1987). Cointegration and models of exchange rate determination. *International Journal of Forecasting, 3*(1), 43-51.

Banerjee, A., & Marcellino, M. (2006). Are there any reliable leading indicators for the US inflation and GDP growth? *International Journal of Forecasting*, *22*(1), 137-151.

Barnes, R. (2015). *Economic indicators: Purchasing managers' index (PMI)*. Retrieved from https://abcdofupsc.files.wordpress.com/2015/05/economic-indicators.pdf

Barro, R. J. (1991). Economic growth in a cross section of countries. *The Quarterly Journal of Economics, 106*(2), 407-443.

Batchelor, R., & Dua, P. (1998). Improving macroeconomic forecast: The role of consumer confidence. *International Journal of Forecasting, 14*(1), 71-81.

Belaire-Franch, J., & Opong, K. K. (2005). A variance ratio test of the behavior of some FTSE equity indices using ranks and signs. *Review of Quantitative Finance and Accounting, 24*(1), 93-107.

Belaire-Franch, J., & Opong, K. K. (2005). Some evidence of random walk behavior of Euro exchange rates using ranks and signs. *Journal of Banking & Finance, 29*(1), 1631–1643.

Berk, N., & Bicen, S. (2017). Causality between construction sector and GDP growth in emerging countries: The case of Turkey. *Athens Journal of Mediterranean Studies*, *4*(1), 19-36.

Blinder, A. S. (1987). Keynes, lucas, and scientific progress. *American Economic Review*, *77*(2), 130–136.

Blinder, A.S. (1986). Keynes after lucas. *Eastern Economic Journal*, *12*(3), 209–216.

Bollerslev, T. (1986). Generalized autoregressive conditional heteroskedasticity. *Journal of Econometrics, 31*(3), 307-327.

Branson, W. (1983). Macroeconomic determinants of real exchange rates. In Herring,R.J. (Ed.), *Managing foreign exchange risk*. Cambridge: Cambridge University Press.

Branson, W. H., & Halttunen, H., & Masson, P. (1979). Exchange rates in the short run. *European Economic Review*, *12*(4), 395-402.

Brooks, C. (2008). *Introductory econometrics for finance (2nd Edition)*. New York: Cambridge University Press.

Brys, G., Hubert, M., & Stryuf, A. (2004). *A robustification of the jarque-bera test on normality*. Retrieved from https://wis.kuleuven.be/stat/robust/papers/2004/tailweightCOMPSTAT04.pdf

Bureau of the Fiscal Service. (2019). *Monthly statement of the public debt of the United States.* Retrieved from https://www.treasurydirect.gov/govt/reports/pd/mspd/2018/opds122018.pdf

Buro of Economic Research (BER). (2015). *Manufacturing purchasing managers' index*. Stellenbosch University, Stellenbosch.

Cai, F., Joo, H., & Zhang, Z. (2009). *The impact of macroeconomic announcements on real time foreign exchange rates in exchange markets* (International Finance Discussion Paper No. 973). Retrieved from Board of Governors of the Federal System website:https://www.federalreserve.gov/pubs/ifdp/2009/973/ifdp973.pdf

Carr, J. R. (1994). Book review. *Mathematical Geology*, *26*(4), 519-522.

Carroll, C.D., Fuhrer, J.C., & Wilcox, D.W. (1994). Does consumer sentiment forecasting household spending? If so, why? *American Economic Review, 84*(5), 1397–1408.

Celik, S., & Ozerkek, Y. (2009). Panel cointegration analysis of consumer confidence and personal consumption in the European Union. *Journal of Business Economics and Management*, *10*(2), 161-168.

Chaboud, A., Chernenko, S., Howorka, E., Krishnasami Iyer, R., Liu, D., & Wright, J. (2004). *The high-frequency effects of U.S. macroeconomic data releases on prices and trading activity in the global interdealer foreign exchange market* (International Finance Discussion Paper No. 823). Retrieved from Board of Governors of the Federal Reserve System website: https://www.federalreserve.gov /pubs/ifdp/2004/823/default.htm

Chang, H. (2007). Linear models for optimal test design. *Psychometrika*, *72*(2), 279-281.

Cheung, Y., & Chinn, M. (1999). *Macroeconomic implications of the beliefs and behavior of foreign exchange* traders (NBER Working Paper No. 7417).

Retrieved from National Bureau of Economic Research website: https://www.nber.org/papers/w7417

Chien, Y., & Morris, P. (2016). PMI and GDP: Do they correlate for the United States? For China? *Economic Synopses, 1*(6), 1-2. Retrieved from https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2756951

Colantone, I. (2006). Trade openness, real exchange rates and job reallocation: Evidence from Belgium. *Review of World Economics (Weltwirtschaftliches Archiv), 148*(4), 669-706.

Colchester, M. (2019, January 29). Britain's Theresa May Seeks to Renegotiate Brexit Deal. *The Wall Street Journal*, p. 1.

Cornell, W.B., & Dietrich, J.K. (1978). The efficiency of the market for foreign exchange under floating exchange rates. *Review of Economies and Statistics, 60*(1), 111- 120.

Cover, H. J. (1932). Building permits as a basis for analysing building activity. *Journal of American Association, 27*(177), 126-129.

Covi, G. (2015). Puzzling out the first oil shock: History, politics and the macroeconomy in a forty-year retrospective. *History of Economic Thought and Policy, 4*(2), 1-40.

Crowder, W. J. (2014). Real exchange rate persistence in US dollar PPP systems. *International Finance, 17*(2), 209-240.

Darby, M. R. (1983). Movements in purchasing power parity: The short and long runs. In Michael R. Darby (Ed), *The international transmission of inflation* (pp. 462-477). Chichago: The University of Chicago Press.

Darby, M. R. (1980). *Does purchasing power parity work* (NBER Working Paper No. 607)? Retrieved from National Bureau of Economic Research website: https://www.nber.org/papers/w0607

Davidson, P. (1990). A post keynesian positive contribution to 'theory'. *Journal of Post Keynesian Economics, 13*(2), 298-304.

Davis, B., & Wei, L. (2018, November 28). 'Bring Me Tariffs'- How Trump and Xi Drove Their Countries to the Brink of a Trade War. *The Wall Street Journal*, p. 1.

Dees, S., & Brica, P.S. (2013). Consumer confidence as a predictor of consumption spending: Evidence for the United States and the Euro area. *International Economics, 1*(134), 1-14.

Demirel, S.K., & Artan, S. (2017). The causality relationships between economic confidence and fundamental macroeconomic indicators: Empirical evidence from selected European Union countries. *International Journal of Economics and Financial Issues, 7*(5), 417-424.

Diamond, P. (2013). Cyclical unemployment, structural unemployment. *IMF Economic Review, Palgrave Macmillan, 61*(3), 410-455.

Dornbusch, R. (1985). *Purchasing power parity* (NBER Working Paper No. 1591). Retrieved from National Bureau of Economic Research website: https://www.nber.org/papers/w1591

Dornbusch, R., & Krugman, P. (1976). Flexible exchange rates in the short run. *Brookings Papers on Economic Activity*, *1976*(3), 537-584.

Edebalk, P. G., & Wadensjö, E. (1978). Unemployment insurance and seasonal unemployment. *Economy and History*, *21*(1), 3-12.

Edison, H. (1997). The reaction of exchange rates and interest rates to news releases. *International Journal of Finance and Economics, 2*(2), 87-100.

Ehrmann, M., & Fratzscher, M. (2005). Exchange rates and fundamentals: New evidence from real-time data. *Journal of International Money and Finance, 24*(2), 317-341.

Eirinaki, M., Dhar, S., Mathur, S., Kaley, A., Patel, A., Joshi, A., & Shah, D. (2018). A building permit system for smart cities: A cloud-based framework. *Computers, Environment and Urban Systems, 70*(1), 175-188.

Emmanuel, F. S., & Oluyemisi, E. H. (2016). A new approach for solving boundary value problem in partial differential equation arising in financial market. *Applied Mathematics, 7*(9), 840-851.

Engle, R. F. (2001). GARCH 101: The use of ARCH/GARCH models in applied econometrics. *Journal of Economic Perspectives, 15*(4), 157–168.

Engle, R. F., & Russell, J. R. (1998). Autoregressive conditional duration: A new model for irregularly spaced transaction data. *Econometrica, 66*(5), 1127-1162.

Ephaphra, M. (2017). Modeling exchange rate volatility: Application of the GARCH and EGARCH models. *Journal of Mathematical Finance, 7*(1), 121-143.

Eppright, D. R., Argues, N.M., & Huth, W.L. (1998). Aggregate consumer expectation indexes as indicators of future consumer expenditures. *Journal of Economic Psychology, 19*(2), 215-235.

Erol, I., & Unal, U. (2015). *Role of construction sector in economic growth: New evidence from Turkey* (MPRA Paper No. 68263). Retrieved from Munich Personal RePEc Archive website: https://mpra.ub.uni-muenchen.de/68263/1/MPRA_paper_68263.pdf

Evans, M., & Lyons, R. (2002). Order flow and exchange rate dynamics. *Journal of Political Economy, 110*(1), 170-180.

Evans, M., & Lyons, R. (2003). *How is macro news transmitted to exchange rates* (NBER Working Paper No. 9433)? Retrieved from National Bureau of Economic Research website: https://www.nber.org/papers/w9433.pdf

Eyiah, A. (2004). *Regulation and small contractor development: A case of Ghana* (IDPM Working Paper No. 80). Retrieved from Institute for Development Policy and Management, University of Manchester, Centre on Regulation and Competition website:

https://www.researchgate.net/publication/23512197_Regulation_and_Small_Contractor_Development_A_Case_of_Ghana

Fama, E. F. (1965). Random walks in stock market prices. *Financial Analysts Journal, 21*(5), 55-59.

Fama, E. F. (1970). Efficient capital markets: a review of theory and empirical work. *Journal of Finance, 25*(2), 383-417.

Fama, E. F. (1998). Market efficiency, long-term returns, and behavioral finance. *Journal of Financial Economics*, *49*(1), 283-306.

Field, B., & Ofori, G. (1998). Construction and economic development-a case study. *Third World Planning Review, 10*(1), 41-50.

Flood, R.P., & Rose, A. K. (1999). Understanding exchange rate volatility without the contrivance of macroeconomics. *Economic Journal, 109*(459), 660-672.

Frenkel, J., & Aizenman, J. (1981). Aspects of the optimal management of exchange rates. *Journal of International Economics*, *13*(1), 231-256.

Garner, C. A. (1991). Forecasting consumer spending: Should economists pay attention to consumer confidence surveys? *Economic Review 76*(3), 57-71.

Gehrig, T., & Menkhoff, L. (2006). Extended evidence on the use of technical analysis in foreign exchange. *International Journal of Finance & Economics, 11*(4), 327-338.

Ghadhab, I., & Hellara, S. (2015). The law of one price, arbitrage opportunities and price convergence: Evidence from cross-listed stocks. *Journal of Multinational Financial Management*, *31(1)*, 126-145.

Ghasemi, A., & Zahediasi, S. (2012, April 20). *Normality test for statistical analysis: A guide for non-statisticians*. Retrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3693611/#A3505R2

Giddy, I., & Duffey, G. (1975). The random behavior of flexible exchange rates implications for forecasting. *Journal of International Studies*, *6*(1), 1-30.

Glernter, D. (2018, October 21). The Real Reason They Hate Trump. *The Wall Street Journal*, p. 1.

Gordon, R. (1998). Foundations of the goldilock economy: Supply shocks and the time-varying NAIRU. *Brookings Papers on Economic Activity, 29*(2), 297-346.

Grauwe, P. D., & Dewachter, H. (1993). Chaos in the Dornbusch model: The role of fundamentalists and chartists. *Open Economies Review, 4*(4), 351–379.

Gujarati, D. N., & Porter, D. C. (2009). *Basic Econometrics* (5th ed.). United States, NY: McGraw-Hill Companies, Inc.

Gulley, O., & Sultan, J. (1998). Consumer confidence announcements: Do they matter? *Applied Financial Economics, 8*(2), 155–166.

Hakkio, C., & Pearce, D. (1985). The reaction of exchange rates to economic news. *Economic Inquiry, 23*(1), 621-635.

Hallwood, C., & Macdonald, R. (1994). *International money and finance* (EconomicsWorking Paper No. 2008-02). Retrieved from https://opencommons.uconn.edu/cgi/viewcontent.cgi?referer=https://www.google.com/&httpsredir=1&article=1172&context=econ_wpapers

Hardouvelis, G. (1988). Economic news, exchange rates and interest rates. *Journal of International Money and Finance, 7*(1), 23-35.

Hardouvelis, G. (1998). Economic news, exchange rates and interest rates. *Journal of International Money and Finance*, *7*(1), 23-25.

Harker, A. (2017). *Spain manufacturing jobs growth at 19 year high amid strong output expansion.* Retrieved from https://www.ft.com/content/7d3936f4-a735-3f9b-8ab7-26e240c912c3

Harris, E., & Zabka, N. (1995). The employment report and the dollar. *Current Issues in Economics and Finance*, *Federal Reserve Bank of New York*, *1*(8), 1-6.

Hashimoto, Y., & Ito, T. (2009). *Effects of Japanese macroeconomic announcements on the Dollar/Yen exchange rate: High-resolution picture* (NBER

Working Paper No. 15020). Retrieved from National Bureau of Economic Research website: https://www.nber.org/papers/w15020.pdf

Hogan, K., & Melvin, M. (1994). Sources of meteor showers and heat waves in the foreign exchange market. *Journal of International Economics, 37*(1), 239-247.

Hogan, K., Melvin M., & Roberts D. (1991). Trade balance news and exchange rates: Is there a policy signal? *Journal of International Money and Finance, 10*(1), 90-99.

Hosseini, S. M., Ahmad, Z., & Lai, Y. W. (2011). The role of macroeconomic variables on stock market index in China and India. *International Journal of Economics and Finance, 3*(6), 233-243.

Hsieh, D A. (1988). The statistical properties of daily foreign exchange rates 1974-1983. *Journal of International Economics, 24*(1), 129-145.

Hsing, Y. (2016a). Determinants of the Hungarian forint/US dollar exchange rate. *Theoretical and Applied Economics*, *23*(1), 163-170.

Hsing, Y. (2016b). Determinants of the ZAR/USD exchange rate and policy implications: A simultaneous-equation model. *Cogent Economics & Finance*, *4*(1), 1151131.

Huizinga, J. (1987). An empirical investigation of the long-run behavior of real exchange rates. In K. Brunner and A. Meltzer (Ed), *Carnegie-Rochester Conference Series on Public Policy, 27*(1), 149-214.

Hussain, T., Siddiqi, M. W. & Iqbal, A. (2010). A coherent relationship between economic growth and unemployment: An empirical evidence from Pakistan. *International Journal of Human and Social Science*, *4*(3), 288-295.

Hymans, S.H. (1970). Consumer durable spending: Explanation and prediction. *Brookings Papers on Economic Activity*, 2(1), 173-199.

Ijaz-ur-Rehman, & Aftab, M. (2015). On the Linkages between Exchange Rate, Inflation and Interest Rate in Malaysia: Evidence from Autoregressive Distributed Lag Modeling, *Pakistan Journal of Statistics, 31*(5), 609-622.

Imbs, J., Mumtaz, H., Ravn, M., & Rey, H. (2002). PPP strikes back: Aggregation and the real exchange rate. *The Quarterly Journal of Economics, 120*(1), 1-43.

Iqbal, Z., & Mirakhor, A. (2012). Financial inclusion: Islamic finance perspective. *Journal of Islamic Business and Management*, *2*(1), 35-64.

Ito, T., & Roley, V. V. (1987). News from the U.S. and Japan: Which moves the Yen/Dollar exchange rate? *Journal of Monetary Economics, 19*(1), 255-277.

Jackman, M. (2010). Investigating the relationship between residential construction and economic growth in a small developing country: The case of Barbados. *International Real Estate Review, 13*(1), 109-116.

Jain, A., Mao, J., & Mohiuddin, K. (1996). Artificial Neural Network. *Computer*, *29*(3), 31-44.

Jamaleh. (2002). Explaining and forecasting the Euro/dollar exchange rate through a non-linear threshold model. *The European Journal of Finance, 8*(4), 422-448.

Jensen, M. (1978). Some anomalous evidence regarding market efficiency. *Journal of Financial Economics*, *6*(2/3), 95-101.

Jovanovic, T., Aristovnik, A., & Lugaric, T. R. (2016). A comparative analysis of building permits procedures in Slovenia and Croatia: development of a simplification model. *Theoretical and Empirical Researches in Urban Management, 11*(2), 5-23.

Kemi, F. A. & Dayo, B. O. (2014). Unemployment and economic growth in Nigeria. *Journal of Economics and Sustainable Development*, *5*(4), 138-144

Keynes, J. M. (1971). *A treatise on money: The pure theory of money*. London: Macmillan; New York: St. Martin's Press.

Khan, R. A. (2008, August). *Role of construction sector in economic growth: Empirical evidence from pakistan economy*. Paper presented at the First International Conference on Construction in Developing Countries, Karachi, Pakistan.

Kim, W. (2005). Analyses of the relationship between exchange rates and employment in Korea. *Journal of Economic Development, 30*(2), 131.

Kindleberger, C. P. (1997). *Economic laws and economic history*. UK: Cambridge University Press.

Knack, S., & Keefer, P. (1997). Does social capital have an economic payoff? A cross country investigation. *The Quarterly Journal of Economics, 112*(4), 1251-1288.

Koenig, E. F. (2002). Using the purchasing managers' index to assess the economy's strength and the likely direction of monetary policy. *Economic & Financial Policy Review,1*(6), 1-14.

Kpamma, Z. E., & Adjei-Kumi, T. (2013, July). *Construction permits and flow of projects within the Sunyani municipality, Ghana*. Paper presented at the 21t00 International Group for Lean Construction Conference, Fortaleza, Brazil.

Kuepper, J. (2018). *What is the PMI?* Retrieved from https://www.thebalance.com/what-is-the-purchasing-managers-index-pmi-1978996

Labonte, M. (2011). Inflation: Causes. *In Costs, and Current Status, CRS Report for Congress RL30344, Congressional Research Service*.

Lahiri, K., & Monokroussos, G. (2013). Nowcasting US GDP: The role of ISM business surveys. *International Journal of Forecasting, 29*(4), 644-658.

Libanio, G. A. (2005). Unit roots in macroeconomic time series: Theory, implications, and evidence. *Nova Economia Belo Horizonte, 15*(3), 145- 176.

Lindsey, M.D., & Pavur, R. (2005). As the PMI turns: A tool for supply chain managers. *The Journal of Supply Chain Management, 41*(3), 30-39.

Logue, D., & Sweeney, R. (1977). "White noise" in imperfect markets the case of the franc/dollar exchange rate. *Journal of Finance, 32*(1), 761-8.

Long, J. S., & Laurie, H. E. (1998). *Correcting for heteroscedasticity with heteroscedasticity consistent standard errors in the linear regression model: Small sample considerations*. Retrieved from http://www.indiana.edu/~jslsoc/files_research/testing_tests/hccm/98TAS.pdf

Ludvigson, S.C. (2004). Consumer confidence and consumer spending. *Journal of Economic Perspectives, 18*(2), 29-50.

Mahadeva, L., & Robinson, P. (2004). *Unit root testing to help model building* (Report No. 22). London: Centre for Central Banking Studies, Bank of England.

Maku, O. E., & Atanda, A. A. (2010). Determinants of stock market performance in Nigeria: Long-run analysis. *Journal of Management and Organizational Behavior, 1*(3), 1-16.

Malakhov, S. V. (2016). Law of one price under equilibrium price dispersion: Arbitrage and optimization of search. *Journal of Institutional Studies, 8*(1), 85-99.

Mangan, P. (1989). Old times by the economic and social research council (ESRC) Old times by the economic and social research council (ESRC). *Nursing Standard, 3*(46), 55-55.

Marshall, A. (1890). *Principles of Economics* (8^{th} ed.). London: Macmillan and Co.

Matsusaka, J. G., & Sbordone, A. M. (1995). Consumer confidence and economic fluctuations. *Economic Inquiry, 33*(2), 296–318.

McNabb, B., & Taylor, K. (2007). Business cycles and the role of confidence: Evidence from Europe. *Oxford Bulletin of Economics and Statistics, 69*(2), 185-208.

Meese, R. A., & Rogoff, K. (1983). Empirical exchange rate models of the Seventies: Do they fit out of sample? *Journal of International Economics, 14*(1), 3–24.

Meese, R. A., & Singleton, K. J. (1982). On unit roots and the empirical modeling of exchange rates. *The Journal of Finance, 37*(4), 1029–1035.

Michael, C. (2015). *Econometrics*. Retrieved from http://pareto.uab.es/mcreel/Econometrics/econometrics.pdf

Mohammad, S. D., Hussain, A., Jalil, A., & Ali, A. (2009). Impact of macroeconomics variables on stock prices: Empirical evidence in case of KSE (Karachi Stock Exchange). *European Journal of Scientific Research, 38*(1), 96-103.

Mosikari, T. J. (2013). The Effect of Unemployment Rate on Gross Domestic Product: Case of South Africa. *Mediterranean Journal of Social Sciences, 4*(6), 429-434.

N., & Neely, C. (2009). *The dynamic interation of trading flows, macroeconomic announcements and the CAD/USD exchange rate: Evidence from disaggregated data* (FRB Working Paper No. 006C). Retrieved from Federal Reserve Bank of St. Louis website: https://core.ac.uk/download/pdf/6608194.pdf

Nagarajan, G., Subburao, N., & Lasya, K. R. (2017). An empirical analysis of the relationship between currency futures and currency exchange rate, economical formulas, prediction models and volatility in India with reference to US dollar, Great Britain Pound and Euro currency. *International Journal of Business and Administration Research Review, 3*(18), 169.

Nahuis, N.J. (2000). *Is survey indicator useful for monitoring consumption growth?* Evidence from European Countries, Working Paper, June, Monetary and Economic Policy Department, Nederland Bank.

Naji Meidani, A. A., Zabihi, M., & Ashena, M. (2011). House prices, economic output, and inflation interactions in Iran. *Research in Applied Economics*, *3*(1), 2-13.

Neely, C. J. (1997). Technical analysis in the foreign exchange market: A layman's guide. *Review*, *9*(10), 23-28.

Neely, C. J., & Weller, P. A. (2011). *Technical analysis in the foreign exchange market* (FRB Working Paper No. 011B). Retrieved from Federal Reserve Bank of St. Louis website https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1734836.

Neely, C., & Dey, S. R. (2010). A survey of announcement effects on foreign exchange returns. *Review*, *92*(5), 417-464.

Nor, N. M., Nor, N. G., Abdullah, A. Z., & Jalil, S. A. (2007). Flexibility and small firms' survival: Further evidence from Malaysian manufacturing. *Applied Economics Letters*, *14*(12), 931-934.

Nucu, A.E. (2011). The relationship between exchange rate and key macroeconomic indicators, case study: Romania. *The Romanian Economic Journal*, *14* (41), 127-145.

Nwankwo, C. A. (2014). Impact of unemployment on Nigerian economic development: A study of selected local government area in Anambra State, Nigeria. *European Journal of Business and Management*, *6* (35), 103-112.

Officer, L. H. (1982). The relationship between the absolute and the relative PPP theory of Cassel. *History of Political Economy*, *14*(2), 251-255.

Ojstersek, M. (2014). *The short-term effect of economic releases on the exchange rate movements* (Master's thesis, The University of Ljubljana, Ljubljana, Slovenia). Retrieved from https://bankaslovenije.blob.core.windows.net/uploaded/O%20nas%2FNagrade%20BS%2F15ojstrsek.pdf

Okun, A. M. (1963). *Potential GNP: Its measurement and significance*. Cowles Foundation Paper No. 190. (Reprinted from 1962 Proceedings of the Business and Economics Statistics Section of the American Statistical Association). New Haven: Cowles Foundation for Research in Economics at Yale University.

Oluyomi, A. & Ogunrinola, O. I. (2011). Employment and economic growth nexus in Nigeria. *International Journal of Business and Social Sciences, 2*(11), 12-17.

Omrane, W. B., & Savaser, T. (2017). Exchange rate volatility response to macroeconomic news during the global financial crisis. *International Review of Financial Analysis, 52*(1), 130-143.

Ozean, A. (2012). The relationship between macroeconomic variables and ISE industry index. *International Journal of Economics and Financial Issues, 2*(2), 184-189.

Oztuna, D., Elhan, A. H., & Tuccar, E. (2006). *Investigation of four different normality tests in terms of type 1 error rate and power under different distributions*. Retrieved from http://dergipark.gov.tr/download/article-file/129239

Park, S. H. (1989). Linkages between industry and services and their implications for urban employment generation in developing countries. *Journal of Development Economics, 30*(2), 359-79

Paul, M. T., Bhanumurthy, N. R., & Bapat, N. (2001). *A Re-examination of the Long-run Relationship between Money Supply and Inflation in India* (No. 83).

Phillips, A. W. (1958). The relation between unemployment and the rate of change of money wage rates in the United Kingdom, 1861-1957. *Economica, New Series, 25*(100), 283-299.

Phillips, P. C. B., & Xiao, Z. J. (1999). *A primer on unit root testing* (Cowles Foundation Paper No. 972). Retrieved from Cowles Foundation for Research in Economics at Yale University website: http://cowles.econ.yale.edu/P/cp/p09b/p0972.pdf.

Poon, S. (2005). *A practical guide to forecasting financial market volatility.* Hoboken: John Wiley & Sons, Inc.

Preda, A. (2004). Informative prices, rational investors: The emergence of the random walk hypothesis and the nineteenth-century "Science of Financial Investments". *History of Political Economy, 36*(2), 351-386.

Qiao, Z., McAleer, M. & Wong, W.K. (2009). Linear and nonlinear causality between changes in consumption and consumer attitudes. *Economic Letters, 102*(3), 161-164.

Ramasamy, R., & Abar, S. K. (2015). Influence of macroeconomic variables on exchange rates. *Journal of Economics, Business and Management, 3(2), 276-281*.

Ray, H. (2008). *Dynamic interactions of exchange rates, stock prices and macroeconomic variables in India.* The Icfai University Press, India.

Raza, S. A., & Afshan, S. (2017). Determinants of exchange rate in Pakistan: revisited with structural break testing. *Global Business Review*, *18*(4), 825-848.

Reder, M. W. (1969). The theory of frictional unemployment. *Economica*, *36*(141), 1-28.

Rime, D., Sarno, L., & Sojli, E. (2008, April 24-25). *Exchange rate forecasting, order flow, and macroeconomic information.* Paper presented at the International Macro-Finance Conference, Washington, D.C., United States of America. Gradojevic,

Rodseth, P. (2016). *The importance of manufacturing for SA's economic growth*. Retrieved from http://www.ee.co.za/article/the-importance-of-manufacturing-for-sas-economic-growth.html

Sakir, G., & Sevcan, G. (2010). Consumer confidence, stock prices and exchange rates: The case of Turkey. Applied Econometrics and International Development, 10(2).

Samuelson, P. A. (1965). Proof that properly anticipated prices fluctuate randomly. *Industrial Management Review, 6*(1), 41-49.

Samuelson, P. A. (1948). International trade and the equalisation of factor prices. *The Economic Journal*, *58*(230), 163-184.

Savickas, R. (2003). Event-induced volatility and tests for abnormal performance. *The Journal of Financial Research, 26*(2), 165-178.

Sims, C. A. (1980). Macroeconomics and Reality. *Econometrica*, *48*(1), 1-48.

Sinclair, R. V., & Pettibon, J. (2004). *Glider development*. Paper presented at Offshore Technology Conference, America, US.

Singh, D. (2010). Causal relationship between macro-economic variables and stock market: A case study for India. *Pakistan Journal of Social Sciences, 30*(2), 263-274.

Singh, P. (2014). An empirical relationship between selected Indian stock market indices and macroeconomic indications. *International Journal of Research in Business Management, 2*(9), 81-92.

Soni, P. (2014). *Why do key purchasing manager's index readings move markets?* Retrieved from http://marketrealist.com/2014/04/key-pmi-readings-move-markets

Strauss, J. (2013). Does housing drive state-level job growth? Building permits and consumer expectations forecast a state's economic activity. *Journal of Urban Economics, 73*(1), 77-93.

Švigir, M., & Miloš, J. (2017). Relationship between inflation and economic growth; comparative experience of Italy and Austria. *FIP-Financije i pravo, 5*(2), 91-101.

Swane, A., & Vistrand, H. (2006). *Jobless growth in Sweden? A descriptive study* (Master's thesis, Stockholm School of Economics). Retrieved from http://arc.hhs.se/download.aspx?mediumid=151

Taylor. M. P. (1988). An empirical examination of long run purchasing power parity using cointegration techniques. *Applied Economics, 20*(10), 1369-1381.

Titan, A. G. (2015). The efficient market hypothesis: Review of specialized literature and empirical research. *Procedia Economics and Finance, 32*(1), 442-449.

Tsay, R.S. (2002). *Analysis of financial time series.* New York: John Wiley & Sons, Inc.

Tsuchiya, Y. (2012). Is the purchasing managers' index useful for assessing the economy's strength? A directional analysis. *Economics Bulletin, 32* (2), 1302-1311.

Tsuchiya, Y. (2014). Purchasing and supply managers provide early clues on the direction of the US economy: An application of a new market-timing test. *International Review of Economics & Finance, 29*(1), 599-618.

Utaka, A. (2003). Confidence and the real economy-the Japanese case. *Applied Economics, 35*(3), 337-342.

Vuchelen, J. (2004). Consumer sentiment and macroeconomic forecasts. *Journal of Economic Psychology, 25*(4), 493-506.

Whelan, J., & Msefer, K. (1996). *Economic supply & demand* (MIT system Dynamics in Education Project Paper No. D-4388) Retrieved from MIT website https://ocw.mit.edu/courses/sloan-school-of-management/15-988-system-dynamics-self-study-fall-1998-spring-1999/readings/economics.pdf

William, H. G. (2002). *Econometric Analysis* (5th ed.). New Jersey, United States: Prentice Hall.

Yanhui, F. A. N., & Wang, S. O. N. G. (2006). The effect of changes in real exchange rates on employment: Evidence from manufacturing industries in China, 1980–2002. *Frontiers of Economics in China*, *1*(1), 126-139.

Yusoff, M.B., & Febrina, I. (2014). Trade openness, real exchange rate, gross domestic investment and growth in Indonesia. *The Journal of Applied Economic Research*, *8*(1), 1-13.

Zaglar, M. (2006). Does economic growth exhibit a different impact on job creation and job destruction? *Scottish Journal of Political Economy*, *53*(1), 672-683.

Zak, P.J., & Knack, S. (2001). Trust and growth. *The Economic Journal*, *111*(470), 295-321.

APPENDICES

APPENDIX 1: GENERALIZED AUTOREGRESSIVE CONDITIONAL HETEROSCEDASTICITY (GARCH) METHOD

- ADP (1 hour)

Dependent Variable: ONEHR
Method: ML ARCH - Normal distribution (BFGS / Marquardt steps)
Date: 01/22/19 Time: 15:25
Sample: 2013M06 2018M05
Included observations: 60
Failure to improve likelihood (non-zero gradients) after 199 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(3) + C(4)*RESID(-1)^2 + C(5)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
ADP	-2.23E-06	1.05E-08	-212.9351	0.0000
C	0.000292	2.30E-06	126.8042	0.0000
		Variance Equation		
C	-4.27E-08	9.16E-08	-0.466520	0.6408
RESID(-1)^2	-0.085926	0.018254	-4.707215	0.0000
GARCH(-1)	1.176594	0.065380	17.99618	0.0000

R-squared	0.002041	Mean dependent var	-0.000275
Adjusted R-squared	-0.015165	S.D. dependent var	0.001539
S.E. of regression	0.001550	Akaike info criterion	-10.43877
Sum squared resid	0.000139	Schwarz criterion	-10.26425
Log likelihood	318.1632	Hannan-Quinn criter.	-10.37051
Durbin-Watson stat	1.953282		

- ADP (2 hours)

Dependent Variable: TWOHR
Method: ML ARCH - Normal distribution (BFGS / Marquardt steps)
Date: 01/22/19 Time: 15:23
Sample: 2013M06 2018M05
Included observations: 60

Convergence not achieved after 500 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(3) + C(4)*RESID(-1)^2 + C(5)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
ADP	1.82E-06	4.16E-06	0.436721	0.6623
C	-0.000513	0.000848	-0.605273	0.5450
		Variance Equation		
C	5.71E-08	1.19E-07	0.479283	0.6317
RESID(-1)^2	-0.129389	0.032652	-3.962611	0.0001
GARCH(-1)	1.153316	0.043980	26.22378	0.0000

R-squared	-0.007352	Mean dependent var	-0.000296
Adjusted R-squared	-0.024720	S.D. dependent var	0.001848
S.E. of regression	0.001870	Akaike info criterion	-10.08351
Sum squared resid	0.000203	Schwarz criterion	-9.908979
Log likelihood	307.5052	Hannan-Quinn criter.	-10.01524
Durbin-Watson stat	2.490431		

- ADP (3 hours)

Dependent Variable: THREEHR
Method: ML ARCH - Normal distribution (BFGS / Marquardt steps)
Date: 01/22/19 Time: 15:22
Sample: 2013M06 2018M05
Included observations: 60
Convergence achieved after 30 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(3) + C(4)*RESID(-1)^2 + C(5)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
ADP	-4.57E-07	8.95E-06	-0.051057	0.9593
C	8.76E-05	0.001865	0.046981	0.9625
		Variance Equation		
C	1.01E-06	8.98E-07	1.123717	0.2611
RESID(-1)^2	-0.055313	0.040475	-1.366593	0.1718
GARCH(-1)	0.809316	0.194486	4.161302	0.0000

R-squared	-0.004198	Mean dependent var	-0.000126
Adjusted R-squared	-0.021512	S.D. dependent var	0.001992
S.E. of regression	0.002014	Akaike info criterion	-9.512229
Sum squared resid	0.000235	Schwarz criterion	-9.337700
Log likelihood	290.3669	Hannan-Quinn criter.	-9.443961
Durbin-Watson stat	1.947994		

- ADP (4 hours)

Dependent Variable: FOURHR
Method: ML ARCH - Normal distribution (BFGS / Marquardt steps)
Date: 01/22/19 Time: 15:20
Sample: 2013M06 2018M05
Included observations: 60
Failure to improve likelihood (non-zero gradients) after 62 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(3) + C(4)*RESID(-1)^2 + C(5)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
ADP	2.55E-06	3.67E-07	6.948274	0.0000
C	-0.001043	0.000176	-5.919888	0.0000
		Variance Equation		
C	-2.24E-07	1.21E-07	-1.854657	0.0636
RESID(-1)^2	0.032690	0.032002	1.021525	0.3070
GARCH(-1)	0.977346	0.025445	38.40989	0.0000

R-squared	-0.059507	Mean dependent var	3.72E-05
Adjusted R-squared	-0.077774	S.D. dependent var	0.002297
S.E. of regression	0.002385	Akaike info criterion	-9.349138
Sum squared resid	0.000330	Schwarz criterion	-9.174609
Log likelihood	285.4741	Hannan-Quinn criter.	-9.280870
Durbin-Watson stat	2.126678		

- ADP (5 hours)

Dependent Variable: FIVEHR
Method: ML ARCH - Normal distribution (BFGS / Marquardt steps)
Date: 01/22/19 Time: 15:19
Sample: 2013M06 2018M05
Included observations: 60
Failure to improve likelihood (non-zero gradients) after 57 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(3) + C(4)*RESID(-1)^2 + C(5)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
ADP	5.14E-06	7.50E-08	68.56804	0.0000
C	-0.001510	1.97E-05	-76.48863	0.0000
		Variance Equation		
C	-3.92E-08	2.58E-07	-0.152367	0.8789
RESID(-1)^2	-0.112060	0.048696	-2.301246	0.0214
GARCH(-1)	1.080379	0.043197	25.01063	0.0000

R-squared	-0.016389	Mean dependent var	-9.35E-05
Adjusted R-squared	-0.033913	S.D. dependent var	0.002780
S.E. of regression	0.002827	Akaike info criterion	-9.148941
Sum squared resid	0.000464	Schwarz criterion	-8.974412
Log likelihood	279.4682	Hannan-Quinn criter.	-9.080673
Durbin-Watson stat	2.009486		

- ADP (6 hours)

Dependent Variable: SIXHR
Method: ML ARCH - Normal distribution (BFGS / Marquardt steps)
Date: 01/22/19 Time: 15:16
Sample: 2013M06 2018M05
Included observations: 60
Failure to improve likelihood (non-zero gradients) after 481 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(3) + C(4)*RESID(-1)^2 + C(5)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
ADP	1.09E-05	3.55E-06	3.071784	0.0021
C	-0.002191	0.000583	-3.759079	0.0002
		Variance Equation		
C	1.43E-07	9.84E-07	0.145370	0.8844
RESID(-1)^2	-0.164527	0.091184	-1.804337	0.0712
GARCH(-1)	1.152889	0.090992	12.67016	0.0000

R-squared	0.012756	Mean dependent var	0.000215
Adjusted R-squared	-0.004265	S.D. dependent var	0.003571
S.E. of regression	0.003578	Akaike info criterion	-8.578625
Sum squared resid	0.000743	Schwarz criterion	-8.404096
Log likelihood	262.3587	Hannan-Quinn criter.	-8.510357
Durbin-Watson stat	1.860315		

- ADP (monthly)

Dependent Variable: MONTHLY_CHG
Method: ML ARCH - Normal distribution (BFGS / Marquardt steps)
Date: 01/24/19 Time: 11:54
Sample: 2013M06 2018M05
Included observations: 60
Failure to improve likelihood (non-zero gradients) after 42 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(3) + C(4)*RESID(-1)^2 + C(5)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.

ADP	-0.000106	2.76E-05	-3.829786	0.0001
C	0.013478	0.003426	3.933773	0.0001
		Variance Equation		
C	0.000354	0.000411	0.862001	0.3887
RESID(-1)^2	-0.179612	0.174314	-1.030394	0.3028
GARCH(-1)	0.615162	0.600777	1.023944	0.3059

R-squared	-0.030266	Mean dependent var	-0.002385
Adjusted R-squared	-0.048030	S.D. dependent var	0.026090
S.E. of regression	0.026709	Akaike info criterion	-4.483416
Sum squared resid	0.041377	Schwarz criterion	-4.308887
Log likelihood	139.5025	Hannan-Quinn criter.	-4.415148
Durbin-Watson stat	1.483466		

- AHE (1 hour)

Dependent Variable: ONEHR
Method: ML ARCH - Normal distribution (BFGS / Marquardt steps)
Date: 01/22/19 Time: 15:47
Sample: 2013M06 2018M05
Included observations: 60
Convergence achieved after 22 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(3) + C(4)*RESID(-1)^2 + C(5)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
AHE	0.058939	0.103653	0.568613	0.5696
C	-4.41E-05	0.000228	-0.193796	0.8463
		Variance Equation		
C	8.20E-08	1.11E-07	0.740854	0.4588
RESID(-1)^2	0.139593	0.147625	0.945593	0.3444
GARCH(-1)	0.805020	0.166939	4.822245	0.0000

R-squared	-0.002369	Mean dependent var	3.43E-05
Adjusted R-squared	-0.019651	S.D. dependent var	0.001101
S.E. of regression	0.001112	Akaike info criterion	-10.69839
Sum squared resid	7.17E-05	Schwarz criterion	-10.52386
Log likelihood	325.9516	Hannan-Quinn criter.	-10.63012
Durbin-Watson stat	1.616734		

- AHE (2 hours)

Dependent Variable: TWOHR
Method: ML ARCH - Normal distribution (BFGS / Marquardt steps)

Date: 01/22/19 Time: 15:46
Sample: 2013M06 2018M05
Included observations: 60
Convergence achieved after 19 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(3) + C(4)*RESID(-1)^2 + C(5)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
AHE	0.064756	0.131508	0.492413	0.6224
C	7.07E-06	0.000306	0.023097	0.9816
		Variance Equation		
C	1.08E-07	1.52E-07	0.712238	0.4763
RESID(-1)^2	0.159132	0.174498	0.911942	0.3618
GARCH(-1)	0.788434	0.238031	3.312314	0.0009

R-squared	0.005752	Mean dependent var	0.000142
Adjusted R-squared	-0.011390	S.D. dependent var	0.001235
S.E. of regression	0.001242	Akaike info criterion	-10.54512
Sum squared resid	8.95E-05	Schwarz criterion	-10.37059
Log likelihood	321.3535	Hannan-Quinn criter.	-10.47685
Durbin-Watson stat	1.933783		

- AHE (3 hours)

Dependent Variable: THREEHR
Method: ML ARCH - Normal distribution (BFGS / Marquardt steps)
Date: 01/22/19 Time: 15:45
Sample: 2013M06 2018M05
Included observations: 60
Failure to improve likelihood (non-zero gradients) after 47 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(3) + C(4)*RESID(-1)^2 + C(5)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
AHE	0.049258	0.184215	0.267392	0.7892
C	-8.35E-05	0.000301	-0.277015	0.7818
		Variance Equation		
C	1.55E-06	1.71E-06	0.907252	0.3643
RESID(-1)^2	-0.072970	0.106122	-0.687610	0.4917
GARCH(-1)	0.593633	0.423024	1.403308	0.1605

R-squared	0.002819	Mean dependent var	8.98E-05
Adjusted R-squared	-0.014374	S.D. dependent var	0.001779
S.E. of regression	0.001792	Akaike info criterion	-9.815464
Sum squared resid	0.000186	Schwarz criterion	-9.640935
Log likelihood	299.4639	Hannan-Quinn criter.	-9.747196

Durbin-Watson stat	1.958478

- AHE (4 hours)

Dependent Variable: FOURHR
Method: ML ARCH - Normal distribution (BFGS / Marquardt steps)
Date: 01/22/19 Time: 15:43
Sample: 2013M06 2018M05
Included observations: 60
Convergence achieved after 22 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(3) + C(4)*RESID(-1)^2 + C(5)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
AHE	0.018313	0.177015	0.103456	0.9176
C	0.000339	0.000414	0.820617	0.4119
		Variance Equation		
C	2.24E-07	2.56E-07	0.875969	0.3810
RESID(-1)^2	0.202683	0.130889	1.548506	0.1215
GARCH(-1)	0.765893	0.173780	4.407252	0.0000

R-squared	0.001866	Mean dependent var	0.000327
Adjusted R-squared	-0.015343	S.D. dependent var	0.001961
S.E. of regression	0.001976	Akaike info criterion	-9.660529
Sum squared resid	0.000226	Schwarz criterion	-9.486000
Log likelihood	294.8159	Hannan-Quinn criter.	-9.592261
Durbin-Watson stat	2.171067		

- AHE (5 hours)

Dependent Variable: FIVEHR
Method: ML ARCH - Normal distribution (BFGS / Marquardt steps)
Date: 01/22/19 Time: 15:42
Sample: 2013M06 2018M05
Included observations: 60
Convergence achieved after 23 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(3) + C(4)*RESID(-1)^2 + C(5)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
AHE	-0.277415	0.215126	-1.289547	0.1972
C	0.001388	0.000423	3.281507	0.0010
		Variance Equation		

C	2.90E-07	2.35E-07	1.235260	0.2167
RESID(-1)^2	0.154570	0.103934	1.487187	0.1370
GARCH(-1)	0.840316	0.112775	7.451254	0.0000

R-squared	-0.071810	Mean dependent var	0.000416
Adjusted R-squared	-0.090290	S.D. dependent var	0.002755
S.E. of regression	0.002877	Akaike info criterion	-8.938061
Sum squared resid	0.000480	Schwarz criterion	-8.763532
Log likelihood	273.1418	Hannan-Quinn criter.	-8.869793
Durbin-Watson stat	2.259906		

- AHE (6 hours)

Dependent Variable: SIXHR
Method: ML ARCH - Normal distribution (BFGS / Marquardt steps)
Date: 01/22/19 Time: 15:41
Sample: 2013M06 2018M05
Included observations: 60
Convergence not achieved after 500 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(3) + C(4)*RESID(-1)^2 + C(5)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
AHE	0.047730	0.332567	0.143521	0.8859
C	0.000699	0.000826	0.846837	0.3971
Variance Equation				
C	6.16E-07	1.07E-06	0.578103	0.5632
RESID(-1)^2	-0.200751	0.103525	-1.939152	0.0525
GARCH(-1)	1.156766	0.164544	7.030114	0.0000

R-squared	-0.009108	Mean dependent var	0.000432
Adjusted R-squared	-0.026506	S.D. dependent var	0.003598
S.E. of regression	0.003646	Akaike info criterion	-8.498944
Sum squared resid	0.000771	Schwarz criterion	-8.324415
Log likelihood	259.9683	Hannan-Quinn criter.	-8.430676
Durbin-Watson stat	2.111803		

- AHE (monthly)

Dependent Variable: MONTHLY_CHG
Method: ML ARCH - Normal distribution (BFGS / Marquardt steps)
Date: 01/24/19 Time: 10:53
Sample: 2013M06 2018M05
Included observations: 60
Failure to improve likelihood (non-zero gradients) after 118 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)

GARCH = C(3) + C(4)*RESID(-1)^2 + C(5)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
AHE	2.643131	0.180247	14.66392	0.0000
C	-0.006043	0.003422	-1.765832	0.0774
Variance Equation				
C	4.87E-05	3.33E-05	1.464847	0.1430
RESID(-1)^2	-0.241030	0.140192	-1.719285	0.0856
GARCH(-1)	1.189575	0.157394	7.557929	0.0000

R-squared	-0.001893	Mean dependent var	-0.001925
Adjusted R-squared	-0.019167	S.D. dependent var	0.026740
S.E. of regression	0.026995	Akaike info criterion	-4.522296
Sum squared resid	0.042265	Schwarz criterion	-4.347767
Log likelihood	140.6689	Hannan-Quinn criter.	-4.454028
Durbin-Watson stat	1.986094		

- BP (1 hour)

Dependent Variable: ONEHR
Method: ML ARCH - Normal distribution (BFGS / Marquardt steps)
Date: 01/22/19 Time: 14:29
Sample: 2013M06 2018M05
Included observations: 60
Convergence achieved after 19 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(3) + C(4)*RESID(-1)^2 + C(5)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
BP	-0.011482	0.003807	-3.015692	0.0026
C	0.000609	0.000284	2.146981	0.0318
Variance Equation				
C	4.32E-07	4.85E-07	0.889846	0.3735
RESID(-1)^2	0.285450	0.093870	3.040908	0.0024
GARCH(-1)	0.699446	0.063279	11.05341	0.0000

R-squared	-0.004242	Mean dependent var	0.000363
Adjusted R-squared	-0.021557	S.D. dependent var	0.003388
S.E. of regression	0.003425	Akaike info criterion	-8.570356
Sum squared resid	0.000680	Schwarz criterion	-8.395828
Log likelihood	262.1107	Hannan-Quinn criter.	-8.502089
Durbin-Watson stat	2.255175		

- BP (2 hours)

Dependent Variable: TWOHR
Method: ML ARCH - Normal distribution (BFGS / Marquardt steps)
Date: 01/22/19 Time: 14:27
Sample: 2013M06 2018M05
Included observations: 60
Convergence not achieved after 500 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(3) + C(4)*RESID(-1)^2 + C(5)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
BP	-0.000234	0.005416	-0.043116	0.9656
C	0.000343	0.000361	0.950035	0.3421
		Variance Equation		
C	1.09E-07	2.04E-07	0.532779	0.5942
RESID(-1)^2	-0.161705	0.045523	-3.552180	0.0004
GARCH(-1)	1.156933	0.056100	20.62255	0.0000

R-squared	-0.009320	Mean dependent var	0.000718
Adjusted R-squared	-0.026722	S.D. dependent var	0.003828
S.E. of regression	0.003879	Akaike info criterion	-8.906217
Sum squared resid	0.000873	Schwarz criterion	-8.731689
Log likelihood	272.1865	Hannan-Quinn criter.	-8.837950
Durbin-Watson stat	2.103689		

- BP (3 hours)

Dependent Variable: THREEHR
Method: ML ARCH - Normal distribution (BFGS / Marquardt steps)
Date: 01/22/19 Time: 14:26
Sample: 2013M06 2018M05
Included observations: 60
Convergence not achieved after 500 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(3) + C(4)*RESID(-1)^2 + C(5)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
BP	-0.001151	0.006252	-0.184135	0.8539
C	0.000683	0.000326	2.093580	0.0363
		Variance Equation		
C	4.20E-07	1.88E-07	2.237890	0.0252
RESID(-1)^2	-0.201777	0.049987	-4.036588	0.0001
GARCH(-1)	1.181537	0.063381	18.64187	0.0000

R-squared	-0.002624	Mean dependent var	0.000946
Adjusted R-squared	-0.019911	S.D. dependent var	0.003846
S.E. of regression	0.003884	Akaike info criterion	-8.851526
Sum squared resid	0.000875	Schwarz criterion	-8.676998
Log likelihood	270.5458	Hannan-Quinn criter.	-8.783259
Durbin-Watson stat	2.134265		

- BP (4hours)

Dependent Variable: FOURHR
Method: ML ARCH - Normal distribution (BFGS / Marquardt steps)
Date: 01/22/19 Time: 14:24
Sample: 2013M06 2018M05
Included observations: 60
Failure to improve likelihood (non-zero gradients) after 45 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(3) + C(4)*RESID(-1)^2 + C(5)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
BP	-0.011678	0.008262	-1.413434	0.1575
C	2.81E-05	0.000658	0.042666	0.9660
Variance Equation				
C	8.89E-06	3.25E-06	2.733171	0.0063
RESID(-1)^2	-0.072994	0.011616	-6.284223	0.0000
GARCH(-1)	0.589615	0.182496	3.230836	0.0012

R-squared	-0.066150	Mean dependent var	0.001120
Adjusted R-squared	-0.084532	S.D. dependent var	0.004343
S.E. of regression	0.004523	Akaike info criterion	-8.014520
Sum squared resid	0.001186	Schwarz criterion	-7.839991
Log likelihood	245.4356	Hannan-Quinn criter.	-7.946252
Durbin-Watson stat	2.052634		

- BP (5 hours)

Dependent Variable: FIVEHR
Method: ML ARCH - Normal distribution (BFGS / Marquardt steps)
Date: 01/22/19 Time: 14:23
Sample: 2013M06 2018M05
Included observations: 60
Convergence not achieved after 500 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(3) + C(4)*RESID(-1)^2 + C(5)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.

BP	-0.007837	0.006705	-1.168931	0.2424
C	0.000946	0.000413	2.290744	0.0220
Variance Equation				
C	4.36E-07	4.66E-07	0.933821	0.3504
RESID(-1)^2	-0.190160	0.055031	-3.455475	0.0005
GARCH(-1)	1.176516	0.070190	16.76193	0.0000

R-squared	0.027554	Mean dependent var	0.000857
Adjusted R-squared	0.010787	S.D. dependent var	0.004548
S.E. of regression	0.004524	Akaike info criterion	-8.395171
Sum squared resid	0.001187	Schwarz criterion	-8.220642
Log likelihood	256.8551	Hannan-Quinn criter.	-8.326903
Durbin-Watson stat	2.183945		

- BP (6 hours)

Dependent Variable: SIXHR
Method: ML ARCH - Normal distribution (BFGS / Marquardt steps)
Date: 01/22/19 Time: 14:20
Sample: 2013M06 2018M05
Included observations: 60
Failure to improve likelihood (singular hessian) after 127 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(3) + C(4)*RESID(-1)^2 + C(5)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
BP	-0.003839	0.006529	-0.588044	0.5565
C	0.001606	9.25E-06	173.6693	0.0000
Variance Equation				
C	1.23E-06	2.90E-07	4.242023	0.0000
RESID(-1)^2	-0.178352	0.045611	-3.910297	0.0001
GARCH(-1)	1.140742	0.059621	19.13330	0.0000

R-squared	-0.014778	Mean dependent var	0.000890
Adjusted R-squared	-0.032274	S.D. dependent var	0.004723
S.E. of regression	0.004799	Akaike info criterion	-8.164240
Sum squared resid	0.001336	Schwarz criterion	-7.989711
Log likelihood	249.9272	Hannan-Quinn criter.	-8.095972
Durbin-Watson stat	2.109782		

- BP (monthly)

Dependent Variable: MONTHLY_CHG
Method: ML ARCH - Normal distribution (BFGS / Marquardt steps)

Date: 01/24/19 Time: 11:19
Sample: 2013M06 2018M05
Included observations: 60
Convergence achieved after 21 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(3) + C(4)*RESID(-1)^2 + C(5)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
BP	-0.003261	0.074220	-0.043935	0.9650
C	-0.001487	0.004606	-0.322857	0.7468
		Variance Equation		
C	0.000223	0.000528	0.421444	0.6734
RESID(-1)^2	0.065119	0.113173	0.575393	0.5650
GARCH(-1)	0.650665	0.753697	0.863298	0.3880

R-squared	0.000082	Mean dependent var	-0.001792
Adjusted R-squared	-0.017158	S.D. dependent var	0.028548
S.E. of regression	0.028792	Akaike info criterion	-4.141701
Sum squared resid	0.048079	Schwarz criterion	-3.967172
Log likelihood	129.2510	Hannan-Quinn criter.	-4.073433
Durbin-Watson stat	1.713384		

- CCI (1 hour)

Dependent Variable: ONEHR
Method: ML ARCH - Normal distribution (BFGS / Marquardt steps)
Date: 02/13/19 Time: 09:48
Sample: 2013M06 2018M05
Included observations: 60
Convergence achieved after 17 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(3) + C(4)*RESID(-1)^2 + C(5)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
CCI	-1.78E-05	3.02E-05	-0.587535	0.5568
C	-2.50E-05	0.000166	-0.150562	0.8803
		Variance Equation		
C	2.38E-07	4.67E-07	0.508416	0.6112
RESID(-1)^2	0.119063	0.211807	0.562130	0.5740
GARCH(-1)	0.638100	0.642938	0.992475	0.3210

R-squared	0.010690	Mean dependent var	-1.30E-05
Adjusted R-squared	-0.006367	S.D. dependent var	0.000987
S.E. of regression	0.000991	Akaike info criterion	-10.87038
Sum squared resid	5.69E-05	Schwarz criterion	-10.69586
Log likelihood	331.1115	Hannan-Quinn criter.	-10.80212

Durbin-Watson stat	1.919593

- CCI (2 hours)

Dependent Variable: TWOHR
Method: ML ARCH - Normal distribution (BFGS / Marquardt steps)
Date: 02/13/19 Time: 09:46
Sample: 2013M06 2018M05
Included observations: 60
Convergence achieved after 35 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(3) + C(4)*RESID(-1)^2 + C(5)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
CCI	2.60E-05	2.03E-05	1.280374	0.2004
C	-9.06E-05	0.000142	-0.637154	0.5240
		Variance Equation		
C	7.03E-07	3.14E-07	2.237858	0.0252
RESID(-1)^2	1.943186	0.487860	3.983084	0.0001
GARCH(-1)	-0.001791	0.059308	-0.030202	0.9759

R-squared	0.007292	Mean dependent var	6.12E-05
Adjusted R-squared	-0.009824	S.D. dependent var	0.002058
S.E. of regression	0.002068	Akaike info criterion	-10.04387
Sum squared resid	0.000248	Schwarz criterion	-9.869338
Log likelihood	306.3160	Hannan-Quinn criter.	-9.975599
Durbin-Watson stat	1.809990		

- CCI (3 hours)

Dependent Variable: THREEHR
Method: ML ARCH - Normal distribution (BFGS / Marquardt steps)
Date: 02/13/19 Time: 09:45
Sample: 2013M06 2018M05
Included observations: 60
Convergence achieved after 28 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(3) + C(4)*RESID(-1)^2 + C(5)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
CCI	2.19E-05	2.15E-05	1.020041	0.3077
C	-0.000354	0.000133	-2.658919	0.0078
		Variance Equation		

C	2.25E-07	1.46E-07	1.537889	0.1241
RESID(-1)^2	1.268426	0.390487	3.248320	0.0012
GARCH(-1)	0.153808	0.131776	1.167193	0.2431

R-squared	-0.039325	Mean dependent var	-2.40E-05
Adjusted R-squared	-0.057245	S.D. dependent var	0.001650
S.E. of regression	0.001696	Akaike info criterion	-10.24058
Sum squared resid	0.000167	Schwarz criterion	-10.06605
Log likelihood	312.2173	Hannan-Quinn criter.	-10.17231
Durbin-Watson stat	1.734394		

- CCI (4 hours)

Dependent Variable: FOURHR
Method: ML ARCH - Normal distribution (BFGS / Marquardt steps)
Date: 02/13/19 Time: 09:43
Sample: 2013M06 2018M05
Included observations: 60
Convergence not achieved after 500 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(3) + C(4)*RESID(-1)^2 + C(5)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
CCI	-7.06E-05	3.11E-06	-22.69084	0.0000
C	-0.000182	0.000301	-0.605002	0.5452
Variance Equation				
C	1.04E-07	3.36E-07	0.310470	0.7562
RESID(-1)^2	-0.172743	0.060116	-2.873505	0.0041
GARCH(-1)	1.182071	0.111540	10.59774	0.0000

R-squared	-0.030128	Mean dependent var	3.23E-05
Adjusted R-squared	-0.047889	S.D. dependent var	0.002292
S.E. of regression	0.002346	Akaike info criterion	-9.597434
Sum squared resid	0.000319	Schwarz criterion	-9.422905
Log likelihood	292.9230	Hannan-Quinn criter.	-9.529166
Durbin-Watson stat	1.913974		

- CCI (5 hours)

Dependent Variable: FIVEHR
Method: ML ARCH - Normal distribution (BFGS / Marquardt steps)
Date: 02/13/19 Time: 09:41
Sample: 2013M06 2018M05
Included observations: 60
Convergence not achieved after 500 iterations
Coefficient covariance computed using outer product of gradients

Presample variance: backcast (parameter = 0.7)
GARCH = C(3) + C(4)*RESID(-1)^2 + C(5)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
CCI	-2.64E-05	6.91E-05	-0.382611	0.7020
C	-7.56E-05	0.000326	-0.231627	0.8168
		Variance Equation		
C	2.53E-07	6.39E-07	0.395969	0.6921
RESID(-1)^2	-0.204144	0.072765	-2.805534	0.0050
GARCH(-1)	1.198116	0.136910	8.751092	0.0000

R-squared	-0.015767	Mean dependent var	0.000146
Adjusted R-squared	-0.033280	S.D. dependent var	0.002757
S.E. of regression	0.002803	Akaike info criterion	-9.262565
Sum squared resid	0.000456	Schwarz criterion	-9.088036
Log likelihood	282.8769	Hannan-Quinn criter.	-9.194297
Durbin-Watson stat	1.995787		

- CCI (6 hours)

Dependent Variable: SIXHR
Method: ML ARCH - Normal distribution (BFGS / Marquardt steps)
Date: 02/13/19 Time: 09:39
Sample: 2013M06 2018M05
Included observations: 60
Failure to improve likelihood (non-zero gradients) after 97 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(3) + C(4)*RESID(-1)^2 + C(5)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
CCI	7.46E-05	9.90E-05	0.753608	0.4511
C	9.89E-05	1.38E-05	7.184078	0.0000
		Variance Equation		
C	2.29E-06	1.24E-06	1.845215	0.0650
RESID(-1)^2	-0.157288	0.070293	-2.237600	0.0252
GARCH(-1)	0.956700	0.075157	12.72938	0.0000

R-squared	-0.014630	Mean dependent var	0.000399
Adjusted R-squared	-0.032123	S.D. dependent var	0.003271
S.E. of regression	0.003323	Akaike info criterion	-8.742641
Sum squared resid	0.000640	Schwarz criterion	-8.568112
Log likelihood	267.2792	Hannan-Quinn criter.	-8.674373
Durbin-Watson stat	1.680546		

- CCI (monthly)

Dependent Variable: MONTHLY_CHG
Method: ML ARCH - Normal distribution (BFGS / Marquardt steps)
Date: 02/13/19 Time: 09:53
Sample: 2013M06 2018M05
Included observations: 60
Convergence achieved after 19 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(3) + C(4)*RESID(-1)^2 + C(5)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
CCI	0.000627	0.000593	1.056439	0.2908
C	0.001017	0.003799	0.267671	0.7890
		Variance Equation		
C	0.000109	0.000186	0.586192	0.5577
RESID(-1)^2	0.246043	0.233738	1.052646	0.2925
GARCH(-1)	0.656008	0.354530	1.850359	0.0643

R-squared	-0.016497	Mean dependent var	-0.002193
Adjusted R-squared	-0.034022	S.D. dependent var	0.027102
S.E. of regression	0.027559	Akaike info criterion	-4.265996
Sum squared resid	0.044050	Schwarz criterion	-4.091467
Log likelihood	132.9799	Hannan-Quinn criter.	-4.197728
Durbin-Watson stat	1.694850		

- CORE CPI (1 hour)

Dependent Variable: ONEHR
Method: ML ARCH - Normal distribution (BFGS / Marquardt steps)
Date: 01/22/19 Time: 16:09
Sample: 2013M06 2018M05
Included observations: 60
Failure to improve likelihood (non-zero gradients) after 316 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(3) + C(4)*RESID(-1)^2 + C(5)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
CORECPI	0.966910	0.236482	4.088728	0.0000
C	-0.001227	0.000629	-1.949558	0.0512
		Variance Equation		
C	3.26E-06	4.38E-06	0.744516	0.4566
RESID(-1)^2	-0.059970	0.082987	-0.722645	0.4699
GARCH(-1)	0.620297	0.525583	1.180209	0.2379

R-squared	0.092310	Mean dependent var	-0.000107
Adjusted R-squared	0.076660	S.D. dependent var	0.002933
S.E. of regression	0.002819	Akaike info criterion	-8.997629
Sum squared resid	0.000461	Schwarz criterion	-8.823100
Log likelihood	274.9289	Hannan-Quinn criter.	-8.929361
Durbin-Watson stat	2.100589		

- CORE CPI (2 hours)

Dependent Variable: TWOHR
Method: ML ARCH - Normal distribution (BFGS / Marquardt steps)
Date: 01/22/19 Time: 16:08
Sample: 2013M06 2018M05
Included observations: 60
Failure to improve likelihood (non-zero gradients) after 50 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(3) + C(4)*RESID(-1)^2 + C(5)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
CORECPI	1.214884	0.241052	5.039925	0.0000
C	-0.001398	0.000656	-2.130000	0.0332
Variance Equation				
C	5.20E-06	7.84E-06	0.663441	0.5070
RESID(-1)^2	-0.094421	0.112311	-0.840713	0.4005
GARCH(-1)	0.578032	0.705113	0.819773	0.4123

R-squared	0.069239	Mean dependent var	0.000238
Adjusted R-squared	0.053191	S.D. dependent var	0.003655
S.E. of regression	0.003557	Akaike info criterion	-8.523993
Sum squared resid	0.000734	Schwarz criterion	-8.349465
Log likelihood	260.7198	Hannan-Quinn criter.	-8.455725
Durbin-Watson stat	2.156743		

- CORE CPI (3 hours)

Dependent Variable: THREEHR
Method: ML ARCH - Normal distribution (BFGS / Marquardt steps)
Date: 01/22/19 Time: 16:06
Sample: 2013M06 2018M05
Included observations: 60
Failure to improve likelihood (non-zero gradients) after 144 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(3) + C(4)*RESID(-1)^2 + C(5)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.

CORECPI	1.267501	0.274266	4.621437	0.0000
C	-0.000936	0.000527	-1.776017	0.0757
		Variance Equation		
C	8.17E-06	6.73E-06	1.213569	0.2249
RESID(-1)^2	-0.136729	0.108696	-1.257900	0.2084
GARCH(-1)	0.587757	0.387357	1.517354	0.1292

R-squared	0.068443	Mean dependent var	0.000299
Adjusted R-squared	0.052382	S.D. dependent var	0.004165
S.E. of regression	0.004055	Akaike info criterion	-8.232008
Sum squared resid	0.000954	Schwarz criterion	-8.057479
Log likelihood	251.9602	Hannan-Quinn criter.	-8.163740
Durbin-Watson stat	1.969476		

- CORE CPI (4 hours)

Dependent Variable: FOURHR
Method: ML ARCH - Normal distribution (BFGS / Marquardt steps)
Date: 01/22/19 Time: 16:05
Sample: 2013M06 2018M05
Included observations: 60
Failure to improve likelihood (non-zero gradients) after 41 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(3) + C(4)*RESID(-1)^2 + C(5)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
CORECPI	1.186431	0.172156	6.891592	0.0000
C	-0.000951	0.000358	-2.655109	0.0079
		Variance Equation		
C	1.44E-05	1.05E-05	1.363539	0.1727
RESID(-1)^2	-0.136221	0.036417	-3.740568	0.0002
GARCH(-1)	0.343495	0.578718	0.593545	0.5528

R-squared	0.086236	Mean dependent var	0.000920
Adjusted R-squared	0.070481	S.D. dependent var	0.004687
S.E. of regression	0.004519	Akaike info criterion	-7.978174
Sum squared resid	0.001184	Schwarz criterion	-7.803645
Log likelihood	244.3452	Hannan-Quinn criter.	-7.909906
Durbin-Watson stat	2.286944		

- CORE CPI (5hours)

Dependent Variable: FIVEHR
Method: ML ARCH - Normal distribution (BFGS / Marquardt steps)

Date: 01/22/19 Time: 16:04
Sample: 2013M06 2018M05
Included observations: 60
Convergence achieved after 30 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(3) + C(4)*RESID(-1)^2 + C(5)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
CORECPI	1.550417	0.657907	2.356589	0.0184
C	-0.001856	0.001152	-1.611447	0.1071
Variance Equation				
C	1.97E-05	1.98E-05	0.992581	0.3209
RESID(-1)^2	-0.148401	0.062015	-2.392970	0.0167
GARCH(-1)	0.227944	0.889634	0.256222	0.7978

R-squared	0.080314	Mean dependent var	0.000846
Adjusted R-squared	0.064458	S.D. dependent var	0.004865
S.E. of regression	0.004705	Akaike info criterion	-7.806829
Sum squared resid	0.001284	Schwarz criterion	-7.632300
Log likelihood	239.2049	Hannan-Quinn criter.	-7.738561
Durbin-Watson stat	2.284282		

- CORE CPI (6 hours)

Dependent Variable: SIXHR
Method: ML ARCH - Normal distribution (BFGS / Marquardt steps)
Date: 01/22/19 Time: 16:02
Sample: 2013M06 2018M05
Included observations: 60
Failure to improve likelihood (non-zero gradients) after 50 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(3) + C(4)*RESID(-1)^2 + C(5)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
CORECPI	1.448594	0.556261	2.604162	0.0092
C	-0.001018	0.001001	-1.017955	0.3087
Variance Equation				
C	1.72E-05	8.90E-06	1.934814	0.0530
RESID(-1)^2	-0.267840	0.063383	-4.225753	0.0000
GARCH(-1)	0.590876	0.382598	1.544378	0.1225

R-squared	0.055535	Mean dependent var	0.000258
Adjusted R-squared	0.039251	S.D. dependent var	0.005461
S.E. of regression	0.005352	Akaike info criterion	-7.764668
Sum squared resid	0.001662	Schwarz criterion	-7.590139
Log likelihood	237.9400	Hannan-Quinn criter.	-7.696400

Durbin-Watson stat	2.039937

- CORE CPI (monthly)

Dependent Variable: MONTHLY_CHG
Method: ML ARCH - Normal distribution (BFGS / Marquardt steps)
Date: 01/24/19 Time: 11:48
Sample: 2013M06 2018M05
Included observations: 60
Convergence achieved after 21 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(3) + C(4)*RESID(-1)^2 + C(5)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
CORECPI	7.060895	5.120469	1.378955	0.1679
C	-0.013703	0.008061	-1.699812	0.0892
Variance Equation				
C	0.000214	0.000523	0.408888	0.6826
RESID(-1)^2	0.056778	0.215686	0.263244	0.7924
GARCH(-1)	0.619309	0.844107	0.733686	0.4631

R-squared	0.039884	Mean dependent var	-0.001612
Adjusted R-squared	0.023331	S.D. dependent var	0.027093
S.E. of regression	0.026775	Akaike info criterion	-4.285665
Sum squared resid	0.041581	Schwarz criterion	-4.111136
Log likelihood	133.5700	Hannan-Quinn criter.	-4.217397
Durbin-Watson stat	1.745776		

- CPI (1 hour)

Dependent Variable: ONEHR
Method: ML ARCH - Normal distribution (BFGS / Marquardt steps)
Date: 01/24/19 Time: 11:26
Sample: 2013M06 2018M05
Included observations: 60
Failure to improve likelihood (non-zero gradients) after 37 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(3) + C(4)*RESID(-1)^2 + C(5)*GARCH(-1) + C(6)*GARCH(-2)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
CPI	0.003427	0.168950	0.020285	0.9838
C	-0.000247	4.04E-05	-6.112446	0.0000
Variance Equation				

C	3.87E-06	4.85E-06	0.798043	0.4248
RESID(-1)^2	-0.037385	0.039486	-0.946792	0.3437
GARCH(-1)	0.473790	1.000305	0.473646	0.6358
GARCH(-2)	-0.021859	0.955211	-0.022884	0.9817

R-squared	-0.002137	Mean dependent var	-0.000107
Adjusted R-squared	-0.019415	S.D. dependent var	0.002933
S.E. of regression	0.002962	Akaike info criterion	-8.862556
Sum squared resid	0.000509	Schwarz criterion	-8.653122
Log likelihood	271.8767	Hannan-Quinn criter.	-8.780635
Durbin-Watson stat	2.068289		

- CPI (2 hours)

Dependent Variable: TWOHR
Method: ML ARCH - Normal distribution (BFGS / Marquardt steps)
Date: 01/22/19 Time: 15:57
Sample: 2013M06 2018M05
Included observations: 60
Failure to improve likelihood (non-zero gradients) after 57 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(3) + C(4)*RESID(-1)^2 + C(5)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
CPI	0.163610	0.155288	1.053591	0.2921
C	-0.000328	0.000334	-0.981854	0.3262
		Variance Equation		
C	5.86E-06	1.20E-05	0.487832	0.6257
RESID(-1)^2	-0.070782	0.101406	-0.698009	0.4852
GARCH(-1)	0.584398	0.917148	0.637191	0.5240

R-squared	0.009956	Mean dependent var	0.000238
Adjusted R-squared	-0.007114	S.D. dependent var	0.003655
S.E. of regression	0.003668	Akaike info criterion	-8.516403
Sum squared resid	0.000780	Schwarz criterion	-8.341875
Log likelihood	260.4921	Hannan-Quinn criter.	-8.448136
Durbin-Watson stat	2.036998		

- CPI (3 hours)

Dependent Variable: THREEHR
Method: ML ARCH - Normal distribution (BFGS / Marquardt steps)
Date: 01/22/19 Time: 15:55
Sample: 2013M06 2018M05
Included observations: 60
Failure to improve likelihood (non-zero gradients) after 61 iterations

Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(3) + C(4)*RESID(-1)^2 + C(5)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
CPI	0.297186	0.157131	1.891328	0.0586
C	9.69E-05	0.000248	0.391327	0.6956
		Variance Equation		
C	7.59E-06	9.56E-06	0.794076	0.4272
RESID(-1)^2	-0.081388	0.109586	-0.742686	0.4577
GARCH(-1)	0.581394	0.549325	1.058378	0.2899

R-squared	0.017610	Mean dependent var	0.000299
Adjusted R-squared	0.000673	S.D. dependent var	0.004165
S.E. of regression	0.004164	Akaike info criterion	-8.242704
Sum squared resid	0.001006	Schwarz criterion	-8.068175
Log likelihood	252.2811	Hannan-Quinn criter.	-8.174436
Durbin-Watson stat	1.981450		

- CPI (4hours)

Dependent Variable: FOURHR
Method: ML ARCH - Normal distribution (BFGS / Marquardt steps)
Date: 01/22/19 Time: 15:54
Sample: 2013M06 2018M05
Included observations: 60
Failure to improve likelihood (non-zero gradients) after 45 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(3) + C(4)*RESID(-1)^2 + C(5)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
CPI	0.098793	0.251474	0.392858	0.6944
C	0.000127	0.000736	0.172046	0.8634
		Variance Equation		
C	1.14E-05	3.52E-06	3.244818	0.0012
RESID(-1)^2	-0.117353	0.024819	-4.728297	0.0000
GARCH(-1)	0.593000	0.156434	3.790735	0.0002

R-squared	-0.013324	Mean dependent var	0.000920
Adjusted R-squared	-0.030795	S.D. dependent var	0.004687
S.E. of regression	0.004759	Akaike info criterion	-7.913503
Sum squared resid	0.001313	Schwarz criterion	-7.738975
Log likelihood	242.4051	Hannan-Quinn criter.	-7.845236
Durbin-Watson stat	2.150772		

- CPI (5 hours)

Dependent Variable: FIVEHR
Method: ML ARCH - Normal distribution (BFGS / Marquardt steps)
Date: 01/22/19 Time: 15:53
Sample: 2013M06 2018M05
Included observations: 60
Convergence achieved after 22 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(3) + C(4)*RESID(-1)^2 + C(5)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
CPI	0.018045	0.283446	0.063664	0.9492
C	0.000508	0.000759	0.669156	0.5034
		Variance Equation		
C	1.63E-05	1.55E-05	1.050179	0.2936
RESID(-1)^2	-0.105769	0.077686	-1.361502	0.1734
GARCH(-1)	0.404609	0.624434	0.647960	0.5170

R-squared	-0.003879	Mean dependent var	0.000846
Adjusted R-squared	-0.021187	S.D. dependent var	0.004865
S.E. of regression	0.004916	Akaike info criterion	-7.706456
Sum squared resid	0.001402	Schwarz criterion	-7.531927
Log likelihood	236.1937	Hannan-Quinn criter.	-7.638188
Durbin-Watson stat	2.152028		

- CPI (6 hours)

Dependent Variable: SIXHR
Method: ML ARCH - Normal distribution (BFGS / Marquardt steps)
Date: 01/22/19 Time: 15:51
Sample: 2013M06 2018M05
Included observations: 60
Failure to improve likelihood (non-zero gradients) after 49 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(3) + C(4)*RESID(-1)^2 + C(5)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
CPI	0.378435	0.027707	13.65823	0.0000
C	0.000495	0.000515	0.961700	0.3362
		Variance Equation		
C	1.63E-05	4.15E-06	3.930576	0.0001

RESID(-1)^2	-0.296209	0.108373	-2.733237	0.0063
GARCH(-1)	0.742238	0.148184	5.008910	0.0000

R-squared	0.013112	Mean dependent var	0.000258
Adjusted R-squared	-0.003904	S.D. dependent var	0.005461
S.E. of regression	0.005471	Akaike info criterion	-7.650314
Sum squared resid	0.001736	Schwarz criterion	-7.475785
Log likelihood	234.5094	Hannan-Quinn criter.	-7.582046
Durbin-Watson stat	1.970604		

- CPI (monthly)

Dependent Variable: MONTHLY_CHG
Method: ML ARCH - Normal distribution (BFGS / Marquardt steps)
Date: 01/24/19 Time: 11:01
Sample: 2013M06 2018M05
Included observations: 60
Convergence achieved after 18 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(3) + C(4)*RESID(-1)^2 + C(5)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
CPI	1.492139	1.541558	0.967942	0.3331
C	-0.003782	0.004243	-0.891215	0.3728
Variance Equation				
C	0.000263	0.000931	0.282357	0.7777
RESID(-1)^2	-0.012137	0.168555	-0.072005	0.9426
GARCH(-1)	0.624037	1.346180	0.463561	0.6430

R-squared	0.014481	Mean dependent var	-0.001612
Adjusted R-squared	-0.002511	S.D. dependent var	0.027093
S.E. of regression	0.027127	Akaike info criterion	-4.257828
Sum squared resid	0.042681	Schwarz criterion	-4.083299
Log likelihood	132.7348	Hannan-Quinn criter.	-4.189560
Durbin-Watson stat	1.845927		

- PMI (1 hours)

Dependent Variable: ONEHR
Method: ML ARCH - Normal distribution (BFGS / Marquardt steps)
Date: 01/22/19 Time: 15:12
Sample: 2013M06 2018M05
Included observations: 60
Failure to improve likelihood (non-zero gradients) after 432 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)

GARCH = C(3) + C(4)*RESID(-1)^2 + C(5)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
PMI	4.53E-05	2.35E-05	1.925588	0.0542
C	-3.39E-05	7.45E-05	-0.455723	0.6486
		Variance Equation		
C	3.54E-07	2.38E-07	1.488353	0.1367
RESID(-1)^2	0.477482	0.331583	1.440009	0.1499
GARCH(-1)	-0.316465	0.449191	-0.704522	0.4811

R-squared	-0.004060	Mean dependent var	6.00E-05
Adjusted R-squared	-0.021371	S.D. dependent var	0.000642
S.E. of regression	0.000649	Akaike info criterion	-11.90855
Sum squared resid	2.44E-05	Schwarz criterion	-11.73402
Log likelihood	362.2565	Hannan-Quinn criter.	-11.84028
Durbin-Watson stat	2.152260		

- PMI (2 hours)

Dependent Variable: TWOHR
Method: ML ARCH - Normal distribution (BFGS / Marquardt steps)
Date: 01/22/19 Time: 15:10
Sample: 2013M06 2018M05
Included observations: 60
Convergence not achieved after 500 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(3) + C(4)*RESID(-1)^2 + C(5)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
PMI	-1.46E-06	6.45E-05	-0.022653	0.9819
C	9.93E-06	0.000106	0.093849	0.9252
		Variance Equation		
C	1.85E-08	1.07E-07	0.173269	0.8624
RESID(-1)^2	-0.251166	0.259707	-0.967114	0.3335
GARCH(-1)	1.222608	0.324654	3.765878	0.0002

R-squared	-0.000399	Mean dependent var	-4.33E-06
Adjusted R-squared	-0.017648	S.D. dependent var	0.000766
S.E. of regression	0.000773	Akaike info criterion	-11.51685
Sum squared resid	3.46E-05	Schwarz criterion	-11.34232
Log likelihood	350.5055	Hannan-Quinn criter.	-11.44858
Durbin-Watson stat	1.899032		

- PMI (3 hours)

Dependent Variable: THREEHR
Method: ML ARCH - Normal distribution (BFGS / Marquardt steps)
Date: 01/22/19 Time: 15:08
Sample: 2013M06 2018M05
Included observations: 60
Failure to improve likelihood (non-zero gradients) after 71 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(3) + C(4)*RESID(-1)^2 + C(5)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
PMI	1.94E-05	3.05E-05	0.637802	0.5236
C	-9.59E-05	9.60E-05	-0.998710	0.3179
		Variance Equation		
C	1.60E-07	9.17E-08	1.745684	0.0809
RESID(-1)^2	-0.244362	0.099245	-2.462211	0.0138
GARCH(-1)	1.088931	0.056836	19.15915	0.0000

R-squared	0.001246	Mean dependent var	-0.000183
Adjusted R-squared	-0.015974	S.D. dependent var	0.001078
S.E. of regression	0.001086	Akaike info criterion	-10.93203
Sum squared resid	6.84E-05	Schwarz criterion	-10.75751
Log likelihood	332.9610	Hannan-Quinn criter.	-10.86377
Durbin-Watson stat	1.676282		

- PMI (4 hours)

Dependent Variable: FOURHR
Method: ML ARCH - Normal distribution (BFGS / Marquardt steps)
Date: 01/22/19 Time: 15:06
Sample: 2013M06 2018M05
Included observations: 60
Failure to improve likelihood (non-zero gradients) after 484 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(3) + C(4)*RESID(-1)^2 + C(5)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
PMI	5.87E-05	0.000138	0.426404	0.6698
C	-0.000424	3.93E-07	-1078.546	0.0000
		Variance Equation		
C	-3.54E-08	1.04E-07	-0.341317	0.7329
RESID(-1)^2	-0.142579	0.056749	-2.512431	0.0120
GARCH(-1)	1.182960	0.108691	10.88370	0.0000

R-squared	-0.037843	Mean dependent var	-1.67E-07
Adjusted R-squared	-0.055737	S.D. dependent var	0.001983
S.E. of regression	0.002038	Akaike info criterion	-9.928559

Sum squared resid	0.000241	Schwarz criterion	-9.754030
Log likelihood	302.8568	Hannan-Quinn criter.	-9.860291
Durbin-Watson stat	2.063451		

- PMI (5 hours)

Dependent Variable: FIVEHR
Method: ML ARCH - Normal distribution (BFGS / Marquardt steps)
Date: 01/22/19 Time: 15:04
Sample: 2013M06 2018M05
Included observations: 60
Failure to improve likelihood (non-zero gradients) after 83 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(3) + C(4)*RESID(-1)^2 + C(5)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
PMI	6.24E-05	4.62E-05	1.350448	0.1769
C	-0.000399	0.000104	-3.832590	0.0001
Variance Equation				
C	8.42E-07	4.18E-07	2.016197	0.0438
RESID(-1)^2	1.782246	0.533180	3.342675	0.0008
GARCH(-1)	-0.027646	0.061315	-0.450879	0.6521

R-squared	-0.129529	Mean dependent var	0.000294
Adjusted R-squared	-0.149003	S.D. dependent var	0.001986
S.E. of regression	0.002129	Akaike info criterion	-9.818726
Sum squared resid	0.000263	Schwarz criterion	-9.644197
Log likelihood	299.5618	Hannan-Quinn criter.	-9.750458
Durbin-Watson stat	1.803631		

- PMI (6 hours)

Dependent Variable: SIXHR
Method: ML ARCH - Normal distribution (BFGS / Marquardt steps)
Date: 01/22/19 Time: 15:02
Sample: 2013M06 2018M05
Included observations: 60
Failure to improve likelihood (singular hessian) after 158 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(3) + C(4)*RESID(-1)^2 + C(5)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
PMI	-7.57E-05	0.000225	-0.337121	0.7360
C	0.000496	0.000361	1.372330	0.1700

Variance Equation				
C	5.48E-07	1.15E-06	0.474424	0.6352
RESID(-1)^2	-0.245520	0.147702	-1.662267	0.0965
GARCH(-1)	1.122102	0.238769	4.699533	0.0000

R-squared	-0.000113	Mean dependent var	0.000395
Adjusted R-squared	-0.017356	S.D. dependent var	0.002344
S.E. of regression	0.002364	Akaike info criterion	-9.271422
Sum squared resid	0.000324	Schwarz criterion	-9.096893
Log likelihood	283.1426	Hannan-Quinn criter.	-9.203154
Durbin-Watson stat	1.883345		

- PMI (monthly)

Dependent Variable: MONTHLY_CHG
Method: ML ARCH - Normal distribution (BFGS / Marquardt steps)
Date: 01/24/19 Time: 11:43
Sample: 2013M06 2018M05
Included observations: 60
Failure to improve likelihood (singular hessian) after 349 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(3) + C(4)*RESID(-1)^2 + C(5)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
PMI	0.002303	0.002452	0.939432	0.3475
C	-0.001336	0.004070	-0.328381	0.7426
Variance Equation				
C	1.92E-05	4.52E-05	0.425169	0.6707
RESID(-1)^2	-0.242047	0.214434	-1.128770	0.2590
GARCH(-1)	1.223467	0.263191	4.648586	0.0000

R-squared	0.026325	Mean dependent var	-0.001978
Adjusted R-squared	0.009537	S.D. dependent var	0.026072
S.E. of regression	0.025947	Akaike info criterion	-4.573758
Sum squared resid	0.039050	Schwarz criterion	-4.399230
Log likelihood	142.2127	Hannan-Quinn criter.	-4.505490
Durbin-Watson stat	1.828897		

- PPI (1 hour)

Dependent Variable: ONEHR
Method: ML ARCH - Normal distribution (BFGS / Marquardt steps)
Date: 01/22/19 Time: 16:16
Sample: 2013M06 2018M05
Included observations: 60

Failure to improve likelihood (non-zero gradients) after 61 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(3) + C(4)*RESID(-1)^2 + C(5)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
PPI	-0.234097	0.051630	-4.534140	0.0000
C	0.000255	0.000190	1.341626	0.1797
		Variance Equation		
C	6.57E-07	7.02E-07	0.935583	0.3495
RESID(-1)^2	-0.060469	0.015963	-3.788072	0.0002
GARCH(-1)	0.593027	0.480250	1.234831	0.2169

R-squared	0.176972	Mean dependent var	0.000146
Adjusted R-squared	0.162782	S.D. dependent var	0.001416
S.E. of regression	0.001295	Akaike info criterion	-10.51657
Sum squared resid	9.73E-05	Schwarz criterion	-10.34205
Log likelihood	320.4972	Hannan-Quinn criter.	-10.44831
Durbin-Watson stat	2.191179		

- PPI (2 hours)

Dependent Variable: TWOHR
Method: ML ARCH - Normal distribution (BFGS / Marquardt steps)
Date: 01/22/19 Time: 16:15
Sample: 2013M06 2018M05
Included observations: 60
Convergence achieved after 21 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(3) + C(4)*RESID(-1)^2 + C(5)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
PPI	-0.152797	0.079941	-1.911380	0.0560
C	0.000265	0.000228	1.165380	0.2439
		Variance Equation		
C	1.22E-06	6.60E-07	1.841076	0.0656
RESID(-1)^2	1.167880	0.259871	4.494078	0.0000
GARCH(-1)	0.104200	0.114080	0.913395	0.3610

R-squared	0.090269	Mean dependent var	0.000147
Adjusted R-squared	0.074584	S.D. dependent var	0.002483
S.E. of regression	0.002389	Akaike info criterion	-9.439317
Sum squared resid	0.000331	Schwarz criterion	-9.264788
Log likelihood	288.1795	Hannan-Quinn criter.	-9.371049
Durbin-Watson stat	2.302533		

- PPI (3 hours)

Dependent Variable: THREEHR
Method: ML ARCH - Normal distribution (BFGS / Marquardt steps)
Date: 01/22/19 Time: 16:15
Sample: 2013M06 2018M05
Included observations: 60
Failure to improve likelihood (non-zero gradients) after 36 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(3) + C(4)*RESID(-1)^2 + C(5)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
PPI	-0.109336	0.138550	-0.789149	0.4300
C	0.000787	0.000308	2.551236	0.0107
		Variance Equation		
C	3.98E-06	1.02E-05	0.390922	0.6959
RESID(-1)^2	-0.031892	0.084347	-0.378101	0.7054
GARCH(-1)	0.582933	1.067039	0.546309	0.5849

R-squared	0.012704	Mean dependent var	0.000175
Adjusted R-squared	-0.004318	S.D. dependent var	0.002969
S.E. of regression	0.002975	Akaike info criterion	-8.864361
Sum squared resid	0.000513	Schwarz criterion	-8.689832
Log likelihood	270.9308	Hannan-Quinn criter.	-8.796093
Durbin-Watson stat	1.935768		

- PPI (4 hours)

Dependent Variable: FOURHR
Method: ML ARCH - Normal distribution (BFGS / Marquardt steps)
Date: 01/22/19 Time: 16:14
Sample: 2013M06 2018M05
Included observations: 60
Convergence not achieved after 500 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(3) + C(4)*RESID(-1)^2 + C(5)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
PPI	-0.075969	0.114625	-0.662765	0.5075
C	0.000557	0.000393	1.417700	0.1563

Variance Equation

C	2.10E-07	3.84E-07	0.547724	0.5839
RESID(-1)^2	-0.170446	0.063708	-2.675400	0.0075
GARCH(-1)	1.164777	0.081039	14.37313	0.0000

R-squared	0.021518	Mean dependent var	0.000200
Adjusted R-squared	0.004648	S.D. dependent var	0.003138
S.E. of regression	0.003131	Akaike info criterion	-9.042448
Sum squared resid	0.000569	Schwarz criterion	-8.867919
Log likelihood	276.2734	Hannan-Quinn criter.	-8.974180
Durbin-Watson stat	2.005616		

- PPI (5 hours)

Dependent Variable: FIVEHR
Method: ML ARCH - Normal distribution (BFGS / Marquardt steps)
Date: 01/22/19 Time: 16:14
Sample: 2013M06 2018M05
Included observations: 60
Failure to improve likelihood (non-zero gradients) after 213 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(3) + C(4)*RESID(-1)^2 + C(5)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
PPI	0.202181	0.001218	165.9267	0.0000
C	0.000558	0.000443	1.260375	0.2075
		Variance Equation		
C	1.87E-07	3.10E-07	0.604795	0.5453
RESID(-1)^2	-0.175796	0.075361	-2.332732	0.0197
GARCH(-1)	1.180719	0.111987	10.54333	0.0000

R-squared	-0.084047	Mean dependent var	0.000447
Adjusted R-squared	-0.102737	S.D. dependent var	0.003245
S.E. of regression	0.003408	Akaike info criterion	-8.874136
Sum squared resid	0.000674	Schwarz criterion	-8.699607
Log likelihood	271.2241	Hannan-Quinn criter.	-8.805868
Durbin-Watson stat	2.008577		

- PPI (6 hours)

Dependent Variable: SIXHR
Method: ML ARCH - Normal distribution (BFGS / Marquardt steps)
Date: 01/22/19 Time: 16:13
Sample: 2013M06 2018M05
Included observations: 60
Failure to improve likelihood (singular hessian) after 184 iterations

Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(3) + C(4)*RESID(-1)^2 + C(5)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
PPI	0.166853	0.057475	2.903073	0.0037
C	0.000379	0.000482	0.786562	0.4315
		Variance Equation		
C	4.11E-07	6.55E-07	0.627332	0.5304
RESID(-1)^2	-0.188886	0.071578	-2.638889	0.0083
GARCH(-1)	1.154383	0.105470	10.94513	0.0000

R-squared	-0.040988	Mean dependent var	4.02E-05
Adjusted R-squared	-0.058936	S.D. dependent var	0.003720
S.E. of regression	0.003828	Akaike info criterion	-8.510163
Sum squared resid	0.000850	Schwarz criterion	-8.335635
Log likelihood	260.3049	Hannan-Quinn criter.	-8.441896
Durbin-Watson stat	2.057822		

- PPI (monthly)

Dependent Variable: MONTHLY_CHG
Method: ML ARCH - Normal distribution (BFGS / Marquardt steps)
Date: 01/24/19 Time: 10:57
Sample: 2013M06 2018M05
Included observations: 60
Convergence achieved after 16 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(3) + C(4)*RESID(-1)^2 + C(5)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
PPI	0.697394	1.289195	0.540953	0.5885
C	-0.001599	0.004377	-0.365430	0.7148
		Variance Equation		
C	0.000155	0.000188	0.824590	0.4096
RESID(-1)^2	0.158149	0.150871	1.048241	0.2945
GARCH(-1)	0.665469	0.315654	2.108221	0.0350

R-squared	0.011001	Mean dependent var	-0.001728
Adjusted R-squared	-0.006051	S.D. dependent var	0.029829
S.E. of regression	0.029919	Akaike info criterion	-4.103069
Sum squared resid	0.051918	Schwarz criterion	-3.928540
Log likelihood	128.0921	Hannan-Quinn criter.	-4.034801
Durbin-Watson stat	1.844019		

APPENDIX 2: HETEROSCEDASTICITY (ARCH TEST)

- ADP (1 hour)

Heteroskedasticity Test: ARCH

F-statistic	0.441396	Prob. F(1,57)	0.5091
Obs*R-squared	0.453373	Prob. Chi-Square(1)	0.5007

Test Equation:
Dependent Variable: WGT_RESID^2
Method: Least Squares
Date: 01/22/19 Time: 15:25
Sample (adjusted): 2013M07 2018M05
Included observations: 59 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.420822	0.322242	4.409177	0.0000
WGT_RESID^2(-1)	-0.087476	0.131666	-0.664377	0.5091

R-squared	0.007684	Mean dependent var	1.307447
Adjusted R-squared	-0.009725	S.D. dependent var	2.089488
S.E. of regression	2.099624	Akaike info criterion	4.354704
Sum squared resid	251.2799	Schwarz criterion	4.425129
Log likelihood	-126.4638	Hannan-Quinn criter.	4.382195
F-statistic	0.441396	Durbin-Watson stat	2.039776
Prob(F-statistic)	0.509128		

- ADP (2 hours)

Heteroskedasticity Test: ARCH

F-statistic	0.062020	Prob. F(1,57)	0.8042
Obs*R-squared	0.064126	Prob. Chi-Square(1)	0.8001

Test Equation:
Dependent Variable: WGT_RESID^2
Method: Least Squares
Date: 01/22/19 Time: 15:24
Sample (adjusted): 2013M07 2018M05
Included observations: 59 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.

C	1.214971	0.279119	4.352879	0.0001
WGT_RESID^2(-1)	-0.032899	0.132105	-0.249038	0.8042

R-squared	0.001087	Mean dependent var	1.176582
Adjusted R-squared	-0.016438	S.D. dependent var	1.772820
S.E. of regression	1.787331	Akaike info criterion	4.032635
Sum squared resid	182.0895	Schwarz criterion	4.103060
Log likelihood	-116.9627	Hannan-Quinn criter.	4.060126
F-statistic	0.062020	Durbin-Watson stat	2.011099
Prob(F-statistic)	0.804227		

- ADP (3 hours)

Heteroskedasticity Test: ARCH

F-statistic	0.166911	Prob. F(1,57)	0.6844
Obs*R-squared	0.172263	Prob. Chi-Square(1)	0.6781

Test Equation:
Dependent Variable: WGT_RESID^2
Method: Least Squares
Date: 01/22/19 Time: 15:22
Sample (adjusted): 2013M07 2018M05
Included observations: 59 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.942783	0.341542	2.760372	0.0078
WGT_RESID^2(-1)	0.053995	0.132163	0.408547	0.6844

R-squared	0.002920	Mean dependent var	0.996288
Adjusted R-squared	-0.014573	S.D. dependent var	2.405436
S.E. of regression	2.422900	Akaike info criterion	4.641118
Sum squared resid	334.6152	Schwarz criterion	4.711543
Log likelihood	-134.9130	Hannan-Quinn criter.	4.668609
F-statistic	0.166911	Durbin-Watson stat	1.992433
Prob(F-statistic)	0.684403		

- ADP (4 hours)

Heteroskedasticity Test: ARCH

F-statistic	2.31E-05	Prob. F(1,57)	0.9962
Obs*R-squared	2.39E-05	Prob. Chi-Square(1)	0.9961

Test Equation:
Dependent Variable: WGT_RESID^2

Method: Least Squares
Date: 01/22/19 Time: 15:21
Sample (adjusted): 2013M07 2018M05
Included observations: 59 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.246035	0.308609	4.037585	0.0002
WGT_RESID^2(-1)	0.000634	0.132074	0.004803	0.9962

R-squared	0.000000	Mean dependent var	1.246816
Adjusted R-squared	-0.017543	S.D. dependent var	1.997412
S.E. of regression	2.014856	Akaike info criterion	4.272283
Sum squared resid	231.3999	Schwarz criterion	4.342708
Log likelihood	-124.0324	Hannan-Quinn criter.	4.299774
F-statistic	2.31E-05	Durbin-Watson stat	1.952919
Prob(F-statistic)	0.996184		

- ADP (5 hours)

Heteroskedasticity Test: ARCH

F-statistic	0.321320	Prob. F(1,57)	0.5730
Obs*R-squared	0.330730	Prob. Chi-Square(1)	0.5652

Test Equation:
Dependent Variable: WGT_RESID^2
Method: Least Squares
Date: 01/22/19 Time: 15:19
Sample (adjusted): 2013M07 2018M05
Included observations: 59 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.223101	0.262875	4.652786	0.0000
WGT_RESID^2(-1)	-0.074620	0.131640	-0.566851	0.5730

R-squared	0.005606	Mean dependent var	1.139244
Adjusted R-squared	-0.011840	S.D. dependent var	1.659307
S.E. of regression	1.669101	Akaike info criterion	3.895758
Sum squared resid	158.7962	Schwarz criterion	3.966183
Log likelihood	-112.9249	Hannan-Quinn criter.	3.923249
F-statistic	0.321320	Durbin-Watson stat	1.977421
Prob(F-statistic)	0.573041		

- ADP (6 hours)

Heteroskedasticity Test: ARCH

F-statistic	0.165142	Prob. F(1,57)	0.6860
Obs*R-squared	0.170443	Prob. Chi-Square(1)	0.6797

Test Equation:
Dependent Variable: WGT_RESID^2
Method: Least Squares
Date: 01/22/19 Time: 15:18
Sample (adjusted): 2013M07 2018M05
Included observations: 59 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.021361	0.198510	5.145147	0.0000
WGT_RESID^2(-1)	-0.053895	0.132624	-0.406377	0.6860

R-squared	0.002889	Mean dependent var	0.970294
Adjusted R-squared	-0.014604	S.D. dependent var	1.171829
S.E. of regression	1.180355	Akaike info criterion	3.202818
Sum squared resid	79.41460	Schwarz criterion	3.273243
Log likelihood	-92.48315	Hannan-Quinn criter.	3.230310
F-statistic	0.165142	Durbin-Watson stat	2.010220
Prob(F-statistic)	0.685987		

- ADP (monthly)

Heteroskedasticity Test: ARCH

F-statistic	0.121350	Prob. F(1,57)	0.7289
Obs*R-squared	0.125341	Prob. Chi-Square(1)	0.7233

Test Equation:
Dependent Variable: WGT_RESID^2
Method: Least Squares
Date: 01/24/19 Time: 11:54
Sample (adjusted): 2013M07 2018M05
Included observations: 59 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.137266	0.243715	4.666373	0.0000
WGT_RESID^2(-1)	0.045848	0.131614	0.348353	0.7289

R-squared	0.002124	Mean dependent var	1.191231
Adjusted R-squared	-0.015382	S.D. dependent var	1.434175
S.E. of regression	1.445163	Akaike info criterion	3.607632
Sum squared resid	119.0443	Schwarz criterion	3.678057
Log likelihood	-104.4251	Hannan-Quinn criter.	3.635123
F-statistic	0.121350	Durbin-Watson stat	1.984772
Prob(F-statistic)	0.728858		

- AHE (1 hour)

Heteroskedasticity Test: ARCH

F-statistic	0.256296	Prob. F(1,57)	0.6146
Obs*R-squared	0.264102	Prob. Chi-Square(1)	0.6073

Test Equation:
Dependent Variable: WGT_RESID^2
Method: Least Squares
Date: 01/22/19 Time: 15:48
Sample (adjusted): 2013M07 2018M05
Included observations: 59 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.933538	0.217614	4.289875	0.0001
WGT_RESID^2(-1)	0.066985	0.132314	0.506257	0.6146

R-squared	0.004476	Mean dependent var	1.000753
Adjusted R-squared	-0.012989	S.D. dependent var	1.315859
S.E. of regression	1.324377	Akaike info criterion	3.433072
Sum squared resid	99.97658	Schwarz criterion	3.503497
Log likelihood	-99.27563	Hannan-Quinn criter.	3.460563
F-statistic	0.256296	Durbin-Watson stat	1.977435
Prob(F-statistic)	0.614629		

- AHE (2 hours)

Heteroskedasticity Test: ARCH

F-statistic	0.054007	Prob. F(1,57)	0.8171
Obs*R-squared	0.055849	Prob. Chi-Square(1)	0.8132

Test Equation:
Dependent Variable: WGT_RESID^2
Method: Least Squares
Date: 01/22/19 Time: 15:46
Sample (adjusted): 2013M07 2018M05
Included observations: 59 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.030312	0.263492	3.910219	0.0002
WGT_RESID^2(-1)	-0.030721	0.132194	-0.232394	0.8171

R-squared	0.000947	Mean dependent var	0.999820
Adjusted R-squared	-0.016581	S.D. dependent var	1.740764
S.E. of regression	1.755137	Akaike info criterion	3.996281
Sum squared resid	175.5887	Schwarz criterion	4.066706
Log likelihood	-115.8903	Hannan-Quinn criter.	4.023772

F-statistic	0.054007	Durbin-Watson stat	2.011749
Prob(F-statistic)	0.817065		

- AHE (3 hours)

Heteroskedasticity Test: ARCH

F-statistic	0.888510	Prob. F(1,57)	0.3499
Obs*R-squared	0.905570	Prob. Chi-Square(1)	0.3413

Test Equation:
Dependent Variable: WGT_RESID^2
Method: Least Squares
Date: 01/22/19 Time: 15:45
Sample (adjusted): 2013M07 2018M05
Included observations: 59 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.884637	0.329516	2.684659	0.0095
WGT_RESID^2(-1)	0.123838	0.131378	0.942608	0.3499

R-squared	0.015349	Mean dependent var	1.013574
Adjusted R-squared	-0.001926	S.D. dependent var	2.300464
S.E. of regression	2.302678	Akaike info criterion	4.539333
Sum squared resid	302.2327	Schwarz criterion	4.609758
Log likelihood	-131.9103	Hannan-Quinn criter.	4.566824
F-statistic	0.888510	Durbin-Watson stat	1.969131
Prob(F-statistic)	0.349860		

- AHE (4 hours)

Heteroskedasticity Test: ARCH

F-statistic	0.022613	Prob. F(1,57)	0.8810
Obs*R-squared	0.023397	Prob. Chi-Square(1)	0.8784

Test Equation:
Dependent Variable: WGT_RESID^2
Method: Least Squares
Date: 01/22/19 Time: 15:44
Sample (adjusted): 2013M07 2018M05
Included observations: 59 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.019001	0.234630	4.343016	0.0001
WGT_RESID^2(-1)	-0.019940	0.132599	-0.150375	0.8810

R-squared	0.000397	Mean dependent var	0.999602
Adjusted R-squared	-0.017140	S.D. dependent var	1.492631
S.E. of regression	1.505368	Akaike info criterion	3.689263
Sum squared resid	129.1696	Schwarz criterion	3.759688
Log likelihood	-106.8332	Hannan-Quinn criter.	3.716754
F-statistic	0.022613	Durbin-Watson stat	1.997694
Prob(F-statistic)	0.881000		

- AHE (5 hours)

Heteroskedasticity Test: ARCH

F-statistic	1.435312	Prob. F(1,57)	0.2359
Obs*R-squared	1.449183	Prob. Chi-Square(1)	0.2287

Test Equation:
Dependent Variable: WGT_RESID^2
Method: Least Squares
Date: 01/22/19 Time: 15:43
Sample (adjusted): 2013M07 2018M05
Included observations: 59 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.150896	0.240803	4.779414	0.0000
WGT_RESID^2(-1)	-0.156478	0.130611	-1.198045	0.2359

R-squared	0.024562	Mean dependent var	0.995806
Adjusted R-squared	0.007449	S.D. dependent var	1.565476
S.E. of regression	1.559634	Akaike info criterion	3.760090
Sum squared resid	138.6501	Schwarz criterion	3.830515
Log likelihood	-108.9226	Hannan-Quinn criter.	3.787581
F-statistic	1.435312	Durbin-Watson stat	1.938992
Prob(F-statistic)	0.235857		

- AHE (6 hours)

Heteroskedasticity Test: ARCH

F-statistic	0.380134	Prob. F(1,57)	0.5400
Obs*R-squared	0.390865	Prob. Chi-Square(1)	0.5318

Test Equation:
Dependent Variable: WGT_RESID^2
Method: Least Squares
Date: 01/22/19 Time: 15:41
Sample (adjusted): 2013M07 2018M05
Included observations: 59 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.065178	0.193129	5.515362	0.0000
WGT_RESID^2(-1)	-0.081022	0.131412	-0.616550	0.5400

R-squared	0.006625	Mean dependent var	0.986244
Adjusted R-squared	-0.010803	S.D. dependent var	1.104726
S.E. of regression	1.110677	Akaike info criterion	3.081127
Sum squared resid	70.31542	Schwarz criterion	3.151552
Log likelihood	-88.89326	Hannan-Quinn criter.	3.108618
F-statistic	0.380134	Durbin-Watson stat	2.006120
Prob(F-statistic)	0.539986		

- AHE (monthly)

Heteroskedasticity Test: ARCH

F-statistic	0.053617	Prob. F(1,57)	0.8177
Obs*R-squared	0.055446	Prob. Chi-Square(1)	0.8138

Test Equation:
Dependent Variable: WGT_RESID^2
Method: Least Squares
Date: 01/24/19 Time: 10:54
Sample (adjusted): 2013M07 2018M05
Included observations: 59 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.178074	0.211192	5.578217	0.0000
WGT_RESID^2(-1)	-0.030584	0.132083	-0.231553	0.8177

R-squared	0.000940	Mean dependent var	1.143921
Adjusted R-squared	-0.016588	S.D. dependent var	1.151526
S.E. of regression	1.161038	Akaike info criterion	3.169816
Sum squared resid	76.83646	Schwarz criterion	3.240241
Log likelihood	-91.50956	Hannan-Quinn criter.	3.197307
F-statistic	0.053617	Durbin-Watson stat	2.000277
Prob(F-statistic)	0.817714		

- BP (1 hour)

Heteroskedasticity Test: ARCH

F-statistic	0.679986	Prob. F(1,57)	0.4130
Obs*R-squared	0.695547	Prob. Chi-Square(1)	0.4043

Test Equation:
Dependent Variable: WGT_RESID^2
Method: Least Squares
Date: 01/22/19 Time: 14:29
Sample (adjusted): 2013M07 2018M05
Included observations: 59 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.212944	0.362535	3.345724	0.0015
WGT_RESID^2(-1)	-0.108490	0.131565	-0.824612	0.4130

R-squared	0.011789	Mean dependent var	1.095373
Adjusted R-squared	-0.005548	S.D. dependent var	2.553223
S.E. of regression	2.560296	Akaike info criterion	4.751433
Sum squared resid	373.6417	Schwarz criterion	4.821858
Log likelihood	-138.1673	Hannan-Quinn criter.	4.778925
F-statistic	0.679986	Durbin-Watson stat	2.026426
Prob(F-statistic)	0.413029		

- BP (2 hours)

Heteroskedasticity Test: ARCH

F-statistic	1.14E-05	Prob. F(1,57)	0.9973
Obs*R-squared	1.18E-05	Prob. Chi-Square(1)	0.9973

Test Equation:
Dependent Variable: WGT_RESID^2
Method: Least Squares
Date: 01/22/19 Time: 14:28
Sample (adjusted): 2013M07 2018M05
Included observations: 59 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.012937	0.250673	4.040871	0.0002
WGT_RESID^2(-1)	0.000448	0.132343	0.003382	0.9973

R-squared	0.000000	Mean dependent var	1.013390
Adjusted R-squared	-0.017544	S.D. dependent var	1.614065
S.E. of regression	1.628162	Akaike info criterion	3.846091
Sum squared resid	151.1020	Schwarz criterion	3.916516
Log likelihood	-111.4597	Hannan-Quinn criter.	3.873582
F-statistic	1.14E-05	Durbin-Watson stat	2.001518
Prob(F-statistic)	0.997314		

- BP (3 hours)

Heteroskedasticity Test: ARCH

F-statistic	0.748414	Prob. F(1,57)	0.3906
Obs*R-squared	0.764634	Prob. Chi-Square(1)	0.3819

Test Equation:
Dependent Variable: WGT_RESID^2
Method: Least Squares
Date: 01/22/19 Time: 14:26
Sample (adjusted): 2013M07 2018M05
Included observations: 59 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.182762	0.240247	4.923100	0.0000
WGT_RESID^2(-1)	-0.113645	0.131365	-0.865109	0.3906

R-squared	0.012960	Mean dependent var	1.064148
Adjusted R-squared	-0.004357	S.D. dependent var	1.512062
S.E. of regression	1.515352	Akaike info criterion	3.702483
Sum squared resid	130.8886	Schwarz criterion	3.772908
Log likelihood	-107.2232	Hannan-Quinn criter.	3.729974
F-statistic	0.748414	Durbin-Watson stat	1.987382
Prob(F-statistic)	0.390605		

- BP (4 hours)

Heteroskedasticity Test: ARCH

F-statistic	0.029729	Prob. F(1,57)	0.8637
Obs*R-squared	0.030756	Prob. Chi-Square(1)	0.8608

Test Equation:
Dependent Variable: WGT_RESID^2
Method: Least Squares
Date: 01/22/19 Time: 14:24
Sample (adjusted): 2013M07 2018M05
Included observations: 59 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.130444	0.359334	3.145941	0.0026
WGT_RESID^2(-1)	-0.022810	0.132294	-0.172421	0.8637

R-squared	0.000521	Mean dependent var	1.105376
Adjusted R-squared	-0.017013	S.D. dependent var	2.502898
S.E. of regression	2.524099	Akaike info criterion	4.722956
Sum squared resid	363.1514	Schwarz criterion	4.793381
Log likelihood	-137.3272	Hannan-Quinn criter.	4.750447
F-statistic	0.029729	Durbin-Watson stat	2.003100
Prob(F-statistic)	0.863718		

- BP (5 hours)

Heteroskedasticity Test: ARCH

F-statistic	1.576105	Prob. F(1,57)	0.2144
Obs*R-squared	1.587511	Prob. Chi-Square(1)	0.2077

Test Equation:
Dependent Variable: WGT_RESID^2
Method: Least Squares
Date: 01/22/19 Time: 14:23
Sample (adjusted): 2013M07 2018M05
Included observations: 59 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.295113	0.241789	5.356379	0.0000
WGT_RESID^2(-1)	-0.163977	0.130614	-1.255430	0.2144

R-squared	0.026907	Mean dependent var	1.112760
Adjusted R-squared	0.009835	S.D. dependent var	1.492103
S.E. of regression	1.484747	Akaike info criterion	3.661676
Sum squared resid	125.6550	Schwarz criterion	3.732101
Log likelihood	-106.0194	Hannan-Quinn criter.	3.689167
F-statistic	1.576105	Durbin-Watson stat	1.979421
Prob(F-statistic)	0.214445		

- BP (6 hours)

Heteroskedasticity Test: ARCH

F-statistic	0.379807	Prob. F(1,57)	0.5402
Obs*R-squared	0.390531	Prob. Chi-Square(1)	0.5320

Test Equation:
Dependent Variable: WGT_RESID^2
Method: Least Squares
Date: 01/22/19 Time: 14:21
Sample (adjusted): 2013M07 2018M05
Included observations: 59 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.475387	0.285402	5.169501	0.0000
WGT_RESID^2(-1)	-0.080990	0.131417	-0.616285	0.5402

R-squared	0.006619	Mean dependent var	1.366168

Adjusted R-squared	-0.010809	S.D. dependent var	1.709150
S.E. of regression	1.718362	Akaike info criterion	3.953931
Sum squared resid	168.3078	Schwarz criterion	4.024356
Log likelihood	-114.6410	Hannan-Quinn criter.	3.981422
F-statistic	0.379807	Durbin-Watson stat	1.991019
Prob(F-statistic)	0.540160		

- BP (monthly)

Heteroskedasticity Test: ARCH

F-statistic	1.074593	Prob. F(1,57)	0.3043
Obs*R-squared	1.091716	Prob. Chi-Square(1)	0.2961

Test Equation:
Dependent Variable: WGT_RESID^2
Method: Least Squares
Date: 01/24/19 Time: 11:20
Sample (adjusted): 2013M07 2018M05
Included observations: 59 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.109255	0.270944	4.094040	0.0001
WGT_RESID^2(-1)	-0.138971	0.134060	-1.036626	0.3043

R-squared	0.018504	Mean dependent var	0.977248
Adjusted R-squared	0.001284	S.D. dependent var	1.838153
S.E. of regression	1.836972	Akaike info criterion	4.087424
Sum squared resid	192.3445	Schwarz criterion	4.157849
Log likelihood	-118.5790	Hannan-Quinn criter.	4.114916
F-statistic	1.074593	Durbin-Watson stat	1.870700
Prob(F-statistic)	0.304288		

- CCI (1 hour)

Heteroskedasticity Test: ARCH

F-statistic	0.415163	Prob. F(1,57)	0.5219
Obs*R-squared	0.426623	Prob. Chi-Square(1)	0.5137

Test Equation:
Dependent Variable: WGT_RESID^2
Method: Least Squares
Date: 02/13/19 Time: 09:48
Sample (adjusted): 2013M07 2018M05
Included observations: 59 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.058603	0.324561	3.261644	0.0019
WGT_RESID^2(-1)	-0.084546	0.131214	-0.644331	0.5219

R-squared	0.007231	Mean dependent var	0.972427
Adjusted R-squared	-0.010186	S.D. dependent var	2.260012
S.E. of regression	2.271493	Akaike info criterion	4.512062
Sum squared resid	294.1017	Schwarz criterion	4.582487
Log likelihood	-131.1058	Hannan-Quinn criter.	4.539553
F-statistic	0.415163	Durbin-Watson stat	1.971909
Prob(F-statistic)	0.521945		

- CCI (2hours)

Heteroskedasticity Test: ARCH

F-statistic	0.239378	Prob. F(1,57)	0.6265
Obs*R-squared	0.246741	Prob. Chi-Square(1)	0.6194

Test Equation:
Dependent Variable: WGT_RESID^2
Method: Least Squares
Date: 02/13/19 Time: 09:47
Sample (adjusted): 2013M07 2018M05
Included observations: 59 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.066481	0.281224	3.792279	0.0004
WGT_RESID^2(-1)	-0.064700	0.132240	-0.489262	0.6265

R-squared	0.004182	Mean dependent var	1.001287
Adjusted R-squared	-0.013288	S.D. dependent var	1.889737
S.E. of regression	1.902251	Akaike info criterion	4.157263
Sum squared resid	206.2578	Schwarz criterion	4.227688
Log likelihood	-120.6393	Hannan-Quinn criter.	4.184754
F-statistic	0.239378	Durbin-Watson stat	2.004005
Prob(F-statistic)	0.626534		

- CCI (3 hours)

Heteroskedasticity Test: ARCH

F-statistic	0.003580	Prob. F(1,57)	0.9525
Obs*R-squared	0.003705	Prob. Chi-Square(1)	0.9515

Test Equation:

Dependent Variable: WGT_RESID^2
Method: Least Squares
Date: 02/13/19 Time: 09:45
Sample (adjusted): 2013M07 2018M05
Included observations: 59 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.007561	0.257715	3.909596	0.0002
WGT_RESID^2(-1)	0.007924	0.132441	0.059831	0.9525

R-squared	0.000063	Mean dependent var	1.015607
Adjusted R-squared	-0.017480	S.D. dependent var	1.674084
S.E. of regression	1.688652	Akaike info criterion	3.919049
Sum squared resid	162.5381	Schwarz criterion	3.989474
Log likelihood	-113.6119	Hannan-Quinn criter.	3.946540
F-statistic	0.003580	Durbin-Watson stat	1.944653
Prob(F-statistic)	0.952500		

- CCI (4 hours)

Heteroskedasticity Test: ARCH

F-statistic	3.318645	Prob. F(1,57)	0.0737
Obs*R-squared	3.246095	Prob. Chi-Square(1)	0.0716

Test Equation:
Dependent Variable: WGT_RESID^2
Method: Least Squares
Date: 02/13/19 Time: 09:44
Sample (adjusted): 2013M07 2018M05
Included observations: 59 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.238966	0.221695	5.588599	0.0000
WGT_RESID^2(-1)	-0.235129	0.129070	-1.821715	0.0737

R-squared	0.055019	Mean dependent var	1.001237
Adjusted R-squared	0.038440	S.D. dependent var	1.403849
S.E. of regression	1.376602	Akaike info criterion	3.510425
Sum squared resid	108.0170	Schwarz criterion	3.580850
Log likelihood	-101.5575	Hannan-Quinn criter.	3.537916
F-statistic	3.318645	Durbin-Watson stat	1.946522
Prob(F-statistic)	0.073747		

- CCI (5 hours)

Heteroskedasticity Test: ARCH

F-statistic	0.010581	Prob. F(1,57)	0.9184
Obs*R-squared	0.010950	Prob. Chi-Square(1)	0.9167

Test Equation:
Dependent Variable: WGT_RESID^2
Method: Least Squares
Date: 02/13/19 Time: 09:41
Sample (adjusted): 2013M07 2018M05
Included observations: 59 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.930318	0.208955	4.452242	0.0000
WGT_RESID^2(-1)	0.013632	0.132523	0.102864	0.9184

R-squared	0.000186	Mean dependent var	0.943008
Adjusted R-squared	-0.017355	S.D. dependent var	1.284298
S.E. of regression	1.295395	Akaike info criterion	3.388818
Sum squared resid	95.64870	Schwarz criterion	3.459243
Log likelihood	-97.97014	Hannan-Quinn criter.	3.416309
F-statistic	0.010581	Durbin-Watson stat	1.992639
Prob(F-statistic)	0.918432		

- CCI (6 hours)

Heteroskedasticity Test: ARCH

F-statistic	0.949156	Prob. F(1,57)	0.3341
Obs*R-squared	0.966368	Prob. Chi-Square(1)	0.3256

Test Equation:
Dependent Variable: WGT_RESID^2
Method: Least Squares
Date: 02/13/19 Time: 09:40
Sample (adjusted): 2013M07 2018M05
Included observations: 59 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.773485	0.211378	3.659249	0.0006
WGT_RESID^2(-1)	0.127716	0.131092	0.974246	0.3341

R-squared	0.016379	Mean dependent var	0.885279
Adjusted R-squared	-0.000877	S.D. dependent var	1.362956
S.E. of regression	1.363554	Akaike info criterion	3.491377
Sum squared resid	105.9789	Schwarz criterion	3.561802
Log likelihood	-100.9956	Hannan-Quinn criter.	3.518868
F-statistic	0.949156	Durbin-Watson stat	1.975502
Prob(F-statistic)	0.334051		

- CCI (monthly)

Heteroskedasticity Test: ARCH

F-statistic	0.296762	Prob. F(1,57)	0.5880
Obs*R-squared	0.305583	Prob. Chi-Square(1)	0.5804

Test Equation:
Dependent Variable: WGT_RESID^2
Method: Least Squares
Date: 02/13/19 Time: 09:54
Sample (adjusted): 2013M07 2018M05
Included observations: 59 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.071200	0.240310	4.457578	0.0000
WGT_RESID^2(-1)	-0.084386	0.154905	-0.544758	0.5880

R-squared	0.005179	Mean dependent var	0.995756
Adjusted R-squared	-0.012274	S.D. dependent var	1.499330
S.E. of regression	1.508503	Akaike info criterion	3.693424
Sum squared resid	129.7082	Schwarz criterion	3.763849
Log likelihood	-106.9560	Hannan-Quinn criter.	3.720915
F-statistic	0.296762	Durbin-Watson stat	1.730548
Prob(F-statistic)	0.588045		

- CORE CPI (1 hour)

Heteroskedasticity Test: ARCH

F-statistic	0.030528	Prob. F(1,57)	0.8619
Obs*R-squared	0.031582	Prob. Chi-Square(1)	0.8589

Test Equation:
Dependent Variable: WGT_RESID^2
Method: Least Squares
Date: 01/22/19 Time: 16:10
Sample (adjusted): 2013M07 2018M05
Included observations: 59 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.057031	0.416114	2.540243	0.0138
WGT_RESID^2(-1)	-0.023155	0.132522	-0.174722	0.8619

R-squared	0.000535	Mean dependent var	1.032732
Adjusted R-squared	-0.016999	S.D. dependent var	2.987160

S.E. of regression	3.012443	Akaike info criterion	5.076690
Sum squared resid	517.2643	Schwarz criterion	5.147115
Log likelihood	-147.7624	Hannan-Quinn criter.	5.104181
F-statistic	0.030528	Durbin-Watson stat	1.996725
Prob(F-statistic)	0.861917		

- CORE CPI (2 hours)

Heteroskedasticity Test: ARCH

F-statistic	0.585866	Prob. F(1,57)	0.4472
Obs*R-squared	0.600253	Prob. Chi-Square(1)	0.4385

Test Equation:
Dependent Variable: WGT_RESID^2
Method: Least Squares
Date: 01/22/19 Time: 16:08
Sample (adjusted): 2013M07 2018M05
Included observations: 59 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.365426	0.322723	4.230956	0.0001
WGT_RESID^2(-1)	-0.100897	0.131819	-0.765419	0.4472

R-squared	0.010174	Mean dependent var	1.240176
Adjusted R-squared	-0.007192	S.D. dependent var	2.128950
S.E. of regression	2.136591	Akaike info criterion	4.389611
Sum squared resid	260.2062	Schwarz criterion	4.460036
Log likelihood	-127.4935	Hannan-Quinn criter.	4.417102
F-statistic	0.585866	Durbin-Watson stat	2.009339
Prob(F-statistic)	0.447180		

- CORE CPI (3 hours)

Heteroskedasticity Test: ARCH

F-statistic	0.807168	Prob. F(1,57)	0.3727
Obs*R-squared	0.823823	Prob. Chi-Square(1)	0.3641

Test Equation:
Dependent Variable: WGT_RESID^2
Method: Least Squares
Date: 01/22/19 Time: 16:07
Sample (adjusted): 2013M07 2018M05
Included observations: 59 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.

C	1.202109	0.258555	4.649328	0.0000
WGT_RESID^2(-1)	-0.118459	0.131852	-0.898425	0.3727

R-squared	0.013963	Mean dependent var	1.073442
Adjusted R-squared	-0.003336	S.D. dependent var	1.650763
S.E. of regression	1.653514	Akaike info criterion	3.876992
Sum squared resid	155.8441	Schwarz criterion	3.947417
Log likelihood	-112.3713	Hannan-Quinn criter.	3.904484
F-statistic	0.807168	Durbin-Watson stat	1.985864
Prob(F-statistic)	0.372738		

- CORE CPI (4 hours)

Heteroskedasticity Test: ARCH

F-statistic	0.179011	Prob. F(1,57)	0.6738
Obs*R-squared	0.184712	Prob. Chi-Square(1)	0.6674

Test Equation:
Dependent Variable: WGT_RESID^2
Method: Least Squares
Date: 01/22/19 Time: 16:05
Sample (adjusted): 2013M07 2018M05
Included observations: 59 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.094777	0.276694	3.956626	0.0002
WGT_RESID^2(-1)	0.055846	0.131992	0.423097	0.6738

R-squared	0.003131	Mean dependent var	1.159127
Adjusted R-squared	-0.014358	S.D. dependent var	1.762838
S.E. of regression	1.775448	Akaike info criterion	4.019293
Sum squared resid	179.6763	Schwarz criterion	4.089718
Log likelihood	-116.5691	Hannan-Quinn criter.	4.046784
F-statistic	0.179011	Durbin-Watson stat	1.996603
Prob(F-statistic)	0.673817		

- CORE CPI (5 hours)

Heteroskedasticity Test: ARCH

F-statistic	0.026917	Prob. F(1,57)	0.8703
Obs*R-squared	0.027849	Prob. Chi-Square(1)	0.8675

Test Equation:
Dependent Variable: WGT_RESID^2
Method: Least Squares

Date: 01/22/19 Time: 16:04
Sample (adjusted): 2013M07 2018M05
Included observations: 59 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.034765	0.246946	4.190249	0.0001
WGT_RESID^2(-1)	-0.021719	0.132379	-0.164065	0.8703

R-squared	0.000472	Mean dependent var	1.012787
Adjusted R-squared	-0.017064	S.D. dependent var	1.580043
S.E. of regression	1.593467	Akaike info criterion	3.803011
Sum squared resid	144.7307	Schwarz criterion	3.873436
Log likelihood	-110.1888	Hannan-Quinn criter.	3.830502
F-statistic	0.026917	Durbin-Watson stat	2.002998
Prob(F-statistic)	0.870260		

- CORE CPI (6 hours)

Heteroskedasticity Test: ARCH

F-statistic	0.037213	Prob. F(1,57)	0.8477
Obs*R-squared	0.038493	Prob. Chi-Square(1)	0.8445

Test Equation:
Dependent Variable: WGT_RESID^2
Method: Least Squares
Date: 01/22/19 Time: 16:03
Sample (adjusted): 2013M07 2018M05
Included observations: 59 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.239313	0.241667	5.128191	0.0000
WGT_RESID^2(-1)	-0.025564	0.132521	-0.192906	0.8477

R-squared	0.000652	Mean dependent var	1.208385
Adjusted R-squared	-0.016880	S.D. dependent var	1.377374
S.E. of regression	1.388950	Akaike info criterion	3.528284
Sum squared resid	109.9634	Schwarz criterion	3.598709
Log likelihood	-102.0844	Hannan-Quinn criter.	3.555775
F-statistic	0.037213	Durbin-Watson stat	1.993911
Prob(F-statistic)	0.847718		

- CORE CPI (monthly)

Heteroskedasticity Test: ARCH

F-statistic	0.133213	Prob. F(1,57)	0.7165

Obs*R-squared	0.137565	Prob. Chi-Square(1)	0.7107

Test Equation:
Dependent Variable: WGT_RESID^2
Method: Least Squares
Date: 01/24/19 Time: 11:49
Sample (adjusted): 2013M07 2018M05
Included observations: 59 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.938667	0.238199	3.940690	0.0002
WGT_RESID^2(-1)	0.048272	0.132260	0.364983	0.7165

R-squared	0.002332	Mean dependent var	0.986299
Adjusted R-squared	-0.015171	S.D. dependent var	1.519115
S.E. of regression	1.530595	Akaike info criterion	3.722501
Sum squared resid	133.5351	Schwarz criterion	3.792926
Log likelihood	-107.8138	Hannan-Quinn criter.	3.749992
F-statistic	0.133213	Durbin-Watson stat	1.957799
Prob(F-statistic)	0.716475		

- CPI (1 hour)

Heteroskedasticity Test: ARCH

F-statistic	0.167035	Prob. F(1,57)	0.6843
Obs*R-squared	0.172391	Prob. Chi-Square(1)	0.6780

Test Equation:
Dependent Variable: WGT_RESID^2
Method: Least Squares
Date: 01/24/19 Time: 11:27
Sample (adjusted): 2013M07 2018M05
Included observations: 59 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.335431	0.602430	2.216740	0.0306
WGT_RESID^2(-1)	-0.054065	0.132285	-0.408700	0.6843

R-squared	0.002922	Mean dependent var	1.266741
Adjusted R-squared	-0.014571	S.D. dependent var	4.411601
S.E. of regression	4.443625	Akaike info criterion	5.854128
Sum squared resid	1125.511	Schwarz criterion	5.924553
Log likelihood	-170.6968	Hannan-Quinn criter.	5.881620
F-statistic	0.167035	Durbin-Watson stat	2.004949
Prob(F-statistic)	0.684292		

- CPI (2 hours)

Heteroskedasticity Test: ARCH

F-statistic	0.486949	Prob. F(1,57)	0.4881
Obs*R-squared	0.499765	Prob. Chi-Square(1)	0.4796

Test Equation:
Dependent Variable: WGT_RESID^2
Method: Least Squares
Date: 01/22/19 Time: 15:57
Sample (adjusted): 2013M07 2018M05
Included observations: 59 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.148629	0.338932	3.388962	0.0013
WGT_RESID^2(-1)	-0.092029	0.131881	-0.697817	0.4881

R-squared	0.008471	Mean dependent var	1.051864
Adjusted R-squared	-0.008925	S.D. dependent var	2.364997
S.E. of regression	2.375527	Akaike info criterion	4.601626
Sum squared resid	321.6582	Schwarz criterion	4.672051
Log likelihood	-133.7480	Hannan-Quinn criter.	4.629117
F-statistic	0.486949	Durbin-Watson stat	2.012967
Prob(F-statistic)	0.488129		

- CPI (3 hours)

Heteroskedasticity Test: ARCH

F-statistic	0.645101	Prob. F(1,57)	0.4252
Obs*R-squared	0.660263	Prob. Chi-Square(1)	0.4165

Test Equation:
Dependent Variable: WGT_RESID^2
Method: Least Squares
Date: 01/22/19 Time: 15:56
Sample (adjusted): 2013M07 2018M05
Included observations: 59 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.234182	0.314888	3.919429	0.0002
WGT_RESID^2(-1)	-0.105890	0.131839	-0.803182	0.4252

R-squared	0.011191	Mean dependent var	1.115519
Adjusted R-squared	-0.006157	S.D. dependent var	2.129409
S.E. of regression	2.135954	Akaike info criterion	4.389015
Sum squared resid	260.0512	Schwarz criterion	4.459440
Log likelihood	-127.4759	Hannan-Quinn criter.	4.416506

F-statistic	0.645101	Durbin-Watson stat	1.991590
Prob(F-statistic)	0.425206		

- CPI (4 hours)

Heteroskedasticity Test: ARCH

F-statistic	0.051129	Prob. F(1,57)	0.8219
Obs*R-squared	0.052875	Prob. Chi-Square(1)	0.8181

Test Equation:
Dependent Variable: WGT_RESID^2
Method: Least Squares
Date: 01/22/19 Time: 15:55
Sample (adjusted): 2013M07 2018M05
Included observations: 59 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.019387	0.274730	3.710504	0.0005
WGT_RESID^2(-1)	0.029883	0.132159	0.226117	0.8219

R-squared	0.000896	Mean dependent var	1.050580
Adjusted R-squared	-0.016632	S.D. dependent var	1.809935
S.E. of regression	1.824924	Akaike info criterion	4.074264
Sum squared resid	189.8298	Schwarz criterion	4.144689
Log likelihood	-118.1908	Hannan-Quinn criter.	4.101755
F-statistic	0.051129	Durbin-Watson stat	1.998724
Prob(F-statistic)	0.821919		

- CPI (5 hours)

Heteroskedasticity Test: ARCH

F-statistic	0.081804	Prob. F(1,57)	0.7759
Obs*R-squared	0.084553	Prob. Chi-Square(1)	0.7712

Test Equation:
Dependent Variable: WGT_RESID^2
Method: Least Squares
Date: 01/22/19 Time: 15:53
Sample (adjusted): 2013M07 2018M05
Included observations: 59 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.049157	0.257807	4.069544	0.0001
WGT_RESID^2(-1)	-0.037857	0.132360	-0.286014	0.7759

R-squared	0.001433	Mean dependent var	1.010887
Adjusted R-squared	-0.016086	S.D. dependent var	1.679204
S.E. of regression	1.692655	Akaike info criterion	3.923785
Sum squared resid	163.3097	Schwarz criterion	3.994210
Log likelihood	-113.7516	Hannan-Quinn criter.	3.951276
F-statistic	0.081804	Durbin-Watson stat	2.005667
Prob(F-statistic)	0.775904		

- CPI (6 hours)

Heteroskedasticity Test: ARCH

F-statistic	0.756624	Prob. F(1,57)	0.3880
Obs*R-squared	0.772912	Prob. Chi-Square(1)	0.3793

Test Equation:
Dependent Variable: WGT_RESID^2
Method: Least Squares
Date: 01/22/19 Time: 15:52
Sample (adjusted): 2013M07 2018M05
Included observations: 59 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.947641	0.224810	4.215299	0.0001
WGT_RESID^2(-1)	0.114582	0.131727	0.869841	0.3880

R-squared	0.013100	Mean dependent var	1.070581
Adjusted R-squared	-0.004214	S.D. dependent var	1.340033
S.E. of regression	1.342853	Akaike info criterion	3.460781
Sum squared resid	102.7855	Schwarz criterion	3.531206
Log likelihood	-100.0930	Hannan-Quinn criter.	3.488272
F-statistic	0.756624	Durbin-Watson stat	1.998797
Prob(F-statistic)	0.388036		

- CPI (monthly)

Heteroskedasticity Test: ARCH

F-statistic	0.065453	Prob. F(1,57)	0.7990
Obs*R-squared	0.067672	Prob. Chi-Square(1)	0.7948

Test Equation:
Dependent Variable: WGT_RESID^2
Method: Least Squares
Date: 01/24/19 Time: 11:02
Sample (adjusted): 2013M07 2018M05
Included observations: 59 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.952597	0.232750	4.092791	0.0001
WGT_RESID^2(-1)	0.033921	0.132586	0.255838	0.7990

R-squared	0.001147	Mean dependent var	0.985980
Adjusted R-squared	-0.016377	S.D. dependent var	1.468449
S.E. of regression	1.480424	Akaike info criterion	3.655845
Sum squared resid	124.9244	Schwarz criterion	3.726270
Log likelihood	-105.8474	Hannan-Quinn criter.	3.683336
F-statistic	0.065453	Durbin-Watson stat	1.957498
Prob(F-statistic)	0.798997		

- PMI (1 hour)

Heteroskedasticity Test: ARCH

F-statistic	0.111448	Prob. F(1,57)	0.7397
Obs*R-squared	0.115134	Prob. Chi-Square(1)	0.7344

Test Equation:
Dependent Variable: WGT_RESID^2
Method: Least Squares
Date: 01/22/19 Time: 15:13
Sample (adjusted): 2013M07 2018M05
Included observations: 59 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.179786	0.246965	4.777138	0.0000
WGT_RESID^2(-1)	-0.044106	0.132116	-0.333839	0.7397

R-squared	0.001951	Mean dependent var	1.130103
Adjusted R-squared	-0.015558	S.D. dependent var	1.502219
S.E. of regression	1.513860	Akaike info criterion	3.700513
Sum squared resid	130.6310	Schwarz criterion	3.770938
Log likelihood	-107.1651	Hannan-Quinn criter.	3.728004
F-statistic	0.111448	Durbin-Watson stat	2.007312
Prob(F-statistic)	0.739726		

- PMI (2 hours)

Heteroskedasticity Test: ARCH

F-statistic	1.503668	Prob. F(1,57)	0.2251
Obs*R-squared	1.516424	Prob. Chi-Square(1)	0.2182

Test Equation:
Dependent Variable: WGT_RESID^2
Method: Least Squares
Date: 01/22/19 Time: 15:11
Sample (adjusted): 2013M07 2018M05
Included observations: 59 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.777185	0.165870	4.685511	0.0000
WGT_RESID^2(-1)	0.161021	0.131313	1.226241	0.2251

R-squared	0.025702	Mean dependent var	0.927290
Adjusted R-squared	0.008609	S.D. dependent var	0.863476
S.E. of regression	0.859751	Akaike info criterion	2.568963
Sum squared resid	42.13281	Schwarz criterion	2.639388
Log likelihood	-73.78441	Hannan-Quinn criter.	2.596454
F-statistic	1.503668	Durbin-Watson stat	1.834943
Prob(F-statistic)	0.225150		

- PMI (3 hours)

Heteroskedasticity Test: ARCH

F-statistic	0.002566	Prob. F(1,57)	0.9598
Obs*R-squared	0.002656	Prob. Chi-Square(1)	0.9589

Test Equation:
Dependent Variable: WGT_RESID^2
Method: Least Squares
Date: 01/22/19 Time: 15:09
Sample (adjusted): 2013M07 2018M05
Included observations: 59 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.014502	0.213548	4.750693	0.0000
WGT_RESID^2(-1)	0.006845	0.135144	0.050652	0.9598

R-squared	0.000045	Mean dependent var	1.021259
Adjusted R-squared	-0.017498	S.D. dependent var	1.269807
S.E. of regression	1.280869	Akaike info criterion	3.366265
Sum squared resid	93.51560	Schwarz criterion	3.436690
Log likelihood	-97.30480	Hannan-Quinn criter.	3.393756
F-statistic	0.002566	Durbin-Watson stat	1.951648
Prob(F-statistic)	0.959780		

- PMI (4 hours)

Heteroskedasticity Test: ARCH

F-statistic	0.171305	Prob. F(1,57)	0.6805
Obs*R-squared	0.176785	Prob. Chi-Square(1)	0.6742

Test Equation:
Dependent Variable: WGT_RESID^2
Method: Least Squares
Date: 01/22/19 Time: 15:07
Sample (adjusted): 2013M07 2018M05
Included observations: 59 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.830682	0.219787	3.779480	0.0004
WGT_RESID^2(-1)	0.054751	0.132284	0.413890	0.6805

R-squared	0.002996	Mean dependent var	0.880105
Adjusted R-squared	-0.014495	S.D. dependent var	1.407154
S.E. of regression	1.417315	Akaike info criterion	3.568717
Sum squared resid	114.5006	Schwarz criterion	3.639142
Log likelihood	-103.2771	Hannan-Quinn criter.	3.596208
F-statistic	0.171305	Durbin-Watson stat	1.969217
Prob(F-statistic)	0.680508		

- PMI (5 hours)

Heteroskedasticity Test: ARCH

F-statistic	0.023718	Prob. F(1,57)	0.8781
Obs*R-squared	0.024540	Prob. Chi-Square(1)	0.8755

Test Equation:
Dependent Variable: WGT_RESID^2
Method: Least Squares
Date: 01/22/19 Time: 15:05
Sample (adjusted): 2013M07 2018M05
Included observations: 59 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.024471	0.231795	4.419726	0.0000
WGT_RESID^2(-1)	-0.020439	0.132716	-0.154007	0.8781

R-squared	0.000416	Mean dependent var	1.003506
Adjusted R-squared	-0.017121	S.D. dependent var	1.428911
S.E. of regression	1.441091	Akaike info criterion	3.601989
Sum squared resid	118.3744	Schwarz criterion	3.672414
Log likelihood	-104.2587	Hannan-Quinn criter.	3.629480
F-statistic	0.023718	Durbin-Watson stat	1.985707
Prob(F-statistic)	0.878148		

- PMI (6 hours)

Heteroskedasticity Test: ARCH

F-statistic	0.410973	Prob. F(1,57)	0.5240
Obs*R-squared	0.422347	Prob. Chi-Square(1)	0.5158

Test Equation:
Dependent Variable: WGT_RESID^2
Method: Least Squares
Date: 01/22/19 Time: 15:03
Sample (adjusted): 2013M07 2018M05
Included observations: 59 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.742958	0.162060	4.584471	0.0000
WGT_RESID^2(-1)	0.084549	0.131888	0.641071	0.5240

R-squared	0.007158	Mean dependent var	0.813035
Adjusted R-squared	-0.010260	S.D. dependent var	0.914307
S.E. of regression	0.918986	Akaike info criterion	2.702218
Sum squared resid	48.13849	Schwarz criterion	2.772643
Log likelihood	-77.71544	Hannan-Quinn criter.	2.729709
F-statistic	0.410973	Durbin-Watson stat	1.994989
Prob(F-statistic)	0.524046		

- PMI (monthly)

Heteroskedasticity Test: ARCH

F-statistic	0.973783	Prob. F(1,57)	0.3279
Obs*R-squared	0.991020	Prob. Chi-Square(1)	0.3195

Test Equation:
Dependent Variable: WGT_RESID^2
Method: Least Squares
Date: 01/24/19 Time: 11:43
Sample (adjusted): 2013M07 2018M05
Included observations: 59 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.996828	0.166662	5.981141	0.0000
WGT_RESID^2(-1)	-0.129318	0.131048	-0.986805	0.3279

R-squared	0.016797	Mean dependent var	0.885016
Adjusted R-squared	-0.000452	S.D. dependent var	0.938575

S.E. of regression	0.938788	Akaike info criterion	2.744855
Sum squared resid	50.23536	Schwarz criterion	2.815280
Log likelihood	-78.97324	Hannan-Quinn criter.	2.772347
F-statistic	0.973783	Durbin-Watson stat	2.027089
Prob(F-statistic)	0.327909		

- PPI (1 hour)

Heteroskedasticity Test: ARCH

F-statistic	0.080549	Prob. F(1,57)	0.7776
Obs*R-squared	0.083257	Prob. Chi-Square(1)	0.7729

Test Equation:
Dependent Variable: WGT_RESID^2
Method: Least Squares
Date: 01/22/19 Time: 15:35
Sample (adjusted): 2013M07 2018M05
Included observations: 59 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.051675	0.341962	3.075412	0.0032
WGT_RESID^2(-1)	0.037472	0.132032	0.283811	0.7776

R-squared	0.001411	Mean dependent var	1.093618
Adjusted R-squared	-0.016108	S.D. dependent var	2.349861
S.E. of regression	2.368711	Akaike info criterion	4.595879
Sum squared resid	319.8151	Schwarz criterion	4.666304
Log likelihood	-133.5784	Hannan-Quinn criter.	4.623370
F-statistic	0.080549	Durbin-Watson stat	1.994489
Prob(F-statistic)	0.777583		

- PPI (2 hours)

Heteroskedasticity Test: ARCH

F-statistic	0.342447	Prob. F(1,57)	0.5607
Obs*R-squared	0.352346	Prob. Chi-Square(1)	0.5528

Test Equation:
Dependent Variable: WGT_RESID^2
Method: Least Squares
Date: 01/22/19 Time: 15:33
Sample (adjusted): 2013M07 2018M05
Included observations: 59 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.

C	1.064706	0.301233	3.534491	0.0008
WGT_RESID^2(-1)	-0.077297	0.132089	-0.585190	0.5607

R-squared	0.005972	Mean dependent var	0.986120
Adjusted R-squared	-0.011467	S.D. dependent var	2.059391
S.E. of regression	2.071165	Akaike info criterion	4.327410
Sum squared resid	244.5143	Schwarz criterion	4.397835
Log likelihood	-125.6586	Hannan-Quinn criter.	4.354901
F-statistic	0.342447	Durbin-Watson stat	1.983776
Prob(F-statistic)	0.560730		

- PPI (3 hours)

Heteroskedasticity Test: ARCH

F-statistic	0.005352	Prob. F(1,57)	0.9419
Obs*R-squared	0.005540	Prob. Chi-Square(1)	0.9407

Test Equation:
Dependent Variable: WGT_RESID^2
Method: Least Squares
Date: 01/22/19 Time: 15:32
Sample (adjusted): 2013M07 2018M05
Included observations: 59 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.975819	0.552498	1.766194	0.0827
WGT_RESID^2(-1)	-0.009693	0.132485	-0.073160	0.9419

R-squared	0.000094	Mean dependent var	0.966391
Adjusted R-squared	-0.017448	S.D. dependent var	4.091208
S.E. of regression	4.126746	Akaike info criterion	5.706166
Sum squared resid	970.7118	Schwarz criterion	5.776591
Log likelihood	-166.3319	Hannan-Quinn criter.	5.733657
F-statistic	0.005352	Durbin-Watson stat	1.999994
Prob(F-statistic)	0.941935		

- PPI (4 hours)

Heteroskedasticity Test: ARCH

F-statistic	0.110300	Prob. F(1,57)	0.7410
Obs*R-squared	0.113950	Prob. Chi-Square(1)	0.7357

Test Equation:
Dependent Variable: WGT_RESID^2
Method: Least Squares

Date: 01/22/19 Time: 15:30
Sample (adjusted): 2013M07 2018M05
Included observations: 59 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.002879	0.217066	4.620160	0.0000
WGT_RESID^2(-1)	-0.043800	0.131883	-0.332115	0.7410

R-squared	0.001931	Mean dependent var	0.961207
Adjusted R-squared	-0.015579	S.D. dependent var	1.350054
S.E. of regression	1.360529	Akaike info criterion	3.486935
Sum squared resid	105.5093	Schwarz criterion	3.557360
Log likelihood	-100.8646	Hannan-Quinn criter.	3.514426
F-statistic	0.110300	Durbin-Watson stat	2.008031
Prob(F-statistic)	0.741021		

- PPI (5 hours)

Heteroskedasticity Test: ARCH

F-statistic	0.351810	Prob. F(1,57)	0.5554
Obs*R-squared	0.361921	Prob. Chi-Square(1)	0.5474

Test Equation:
Dependent Variable: WGT_RESID^2
Method: Least Squares
Date: 01/22/19 Time: 15:28
Sample (adjusted): 2013M07 2018M05
Included observations: 59 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.917075	0.193137	4.748303	0.0000
WGT_RESID^2(-1)	-0.079202	0.133531	-0.593136	0.5554

R-squared	0.006134	Mean dependent var	0.852385
Adjusted R-squared	-0.011302	S.D. dependent var	1.217487
S.E. of regression	1.224348	Akaike info criterion	3.276004
Sum squared resid	85.44457	Schwarz criterion	3.346429
Log likelihood	-94.64212	Hannan-Quinn criter.	3.303495
F-statistic	0.351810	Durbin-Watson stat	1.983296
Prob(F-statistic)	0.555436		

- PPI (6 hours)

Heteroskedasticity Test: ARCH

F-statistic	0.291888	Prob. F(1,57)	0.5911

Obs*R-squared	0.300591	Prob. Chi-Square(1)	0.5835

Test Equation:
Dependent Variable: WGT_RESID^2
Method: Least Squares
Date: 01/22/19 Time: 15:25
Sample (adjusted): 2013M07 2018M05
Included observations: 59 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.916264	0.192704	4.754787	0.0000
WGT_RESID^2(-1)	-0.071995	0.133258	-0.540267	0.5911

R-squared	0.005095	Mean dependent var	0.856020
Adjusted R-squared	-0.012360	S.D. dependent var	1.199806
S.E. of regression	1.207198	Akaike info criterion	3.247792
Sum squared resid	83.06765	Schwarz criterion	3.318217
Log likelihood	-93.80985	Hannan-Quinn criter.	3.275283
F-statistic	0.291888	Durbin-Watson stat	1.971791
Prob(F-statistic)	0.591118		

- PPI (monthly)

Heteroskedasticity Test: ARCH

F-statistic	1.781486	Prob. F(1,57)	0.1873
Obs*R-squared	1.788108	Prob. Chi-Square(1)	0.1812

Test Equation:
Dependent Variable: WGT_RESID^2
Method: Least Squares
Date: 01/24/19 Time: 10:58
Sample (adjusted): 2013M07 2018M05
Included observations: 59 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.161348	0.254497	4.563316	0.0000
WGT_RESID^2(-1)	-0.177181	0.132747	-1.334723	0.1873

R-squared	0.030307	Mean dependent var	0.990898
Adjusted R-squared	0.013295	S.D. dependent var	1.702254
S.E. of regression	1.690901	Akaike info criterion	3.921710
Sum squared resid	162.9713	Schwarz criterion	3.992135
Log likelihood	-113.6905	Hannan-Quinn criter.	3.949201
F-statistic	1.781486	Durbin-Watson stat	1.852898
Prob(F-statistic)	0.187274		

APPENDIX 3: AUTOCORRELATION (LJUNG-BOX TEST)

- ADP (1 hour)

Date: 01/22/19 Time: 15:26
Sample: 2013M06 2018M05
Included observations: 60

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
. | . |	. | . |	1	-0.018	-0.018	0.0206	0.886
.*| . |	.*| . |	2	-0.072	-0.072	0.3541	0.838
.*| . |	.*| . |	3	-0.074	-0.077	0.7107	0.871
**| . |	**| . |	4	-0.241	-0.252	4.5629	0.335
. |*. |	. |*. |	5	0.164	0.146	6.3724	0.272
.*| . |	**| . |	6	-0.181	-0.242	8.6255	0.196
.*| . |	.*| . |	7	-0.150	-0.184	10.210	0.177
. | . |	.*| . |	8	0.012	-0.083	10.220	0.250
. | . |	. | . |	9	-0.027	-0.033	10.274	0.329
. |*. |	. | . |	10	0.122	-0.060	11.374	0.329
. | . |	. | . |	11	0.014	-0.032	11.389	0.411
. | . |	. | . |	12	0.042	0.035	11.524	0.485
. | . |	.*| . |	13	-0.019	-0.104	11.553	0.565
. | . |	.*| . |	14	-0.063	-0.086	11.878	0.616
. |** |	. |** |	15	0.264	0.279	17.624	0.283
.*| . |	.*| . |	16	-0.100	-0.112	18.465	0.297
.*| . |	.*| . |	17	-0.068	-0.073	18.861	0.337
.*| . |	.*| . |	18	-0.105	-0.071	19.839	0.342
.*| . |	. | . |	19	-0.122	-0.002	21.192	0.326
. |** |	. | . |	20	0.248	0.066	26.912	0.138
.*| . |	. | . |	21	-0.066	-0.029	27.323	0.160
. | . |	. |*. |	22	0.072	0.149	27.825	0.182
. | . |	.*| . |	23	-0.049	-0.129	28.068	0.213
. | . |	. | . |	24	-0.062	-0.005	28.471	0.241
. | . |	. | . |	25	0.073	-0.046	29.041	0.262
.*| . |	. | . |	26	-0.096	-0.034	30.053	0.265
. | . |	. | . |	27	0.022	-0.046	30.106	0.309
. | . |	. |*. |	28	0.041	0.109	30.300	0.349

*Probabilities may not be valid for this equation specification.

- ADP (2 hours)

Date: 01/22/19 Time: 15:24
Sample: 2013M06 2018M05
Included observations: 60

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
**| . |	**| . |	1	-0.302	-0.302	5.7543	0.016
. | . |	.*| . |	2	0.006	-0.094	5.7564	0.056
. | . |	. | . |	3	0.013	-0.015	5.7674	0.123
**| . |	**| . |	4	-0.241	-0.267	9.6163	0.047
. |*. |	. | . |	5	0.148	-0.014	11.099	0.049
.*| . |	.*| . |	6	-0.119	-0.120	12.070	0.060
.*| . |	**| . |	7	-0.121	-0.241	13.096	0.070
. | . |	.*| . |	8	0.050	-0.173	13.274	0.103
. | . |	.*| . |	9	-0.031	-0.109	13.342	0.148
. |*. |	. | . |	10	0.139	0.000	14.774	0.141
. | . |	.*| . |	11	-0.056	-0.128	15.009	0.182
. |*. |	. | . |	12	0.078	0.008	15.480	0.216
. | . |	. | . |	13	0.030	0.014	15.549	0.274
.*| . |	.*| . |	14	-0.159	-0.184	17.592	0.226
. |** |	. |*. |	15	0.224	0.102	21.727	0.115
.*| . |	. | . |	16	-0.153	-0.014	23.705	0.096
. | . |	. | . |	17	0.019	-0.005	23.738	0.127
. | . |	.*| . |	18	-0.008	-0.068	23.743	0.164
. | . |	. | . |	19	-0.055	0.047	24.015	0.196
. |*. |	. |*. |	20	0.136	0.083	25.744	0.174
. | . |	. | . |	21	-0.039	0.036	25.888	0.211
. | . |	. |*. |	22	0.023	0.093	25.939	0.254
. | . |	. |*. |	23	0.063	0.160	26.338	0.285
.*| . |	. | . |	24	-0.170	-0.056	29.330	0.208
. | . |	.*| . |	25	0.029	-0.090	29.417	0.247
.*| . |	. | . |	26	-0.083	-0.044	30.173	0.260
. |*. |	. |*. |	27	0.131	0.150	32.116	0.228
. | . |	.*| . |	28	-0.046	-0.070	32.360	0.260

*Probabilities may not be valid for this equation specification.

- ADP (3 hours)

Date: 01/22/19 Time: 15:23
Sample: 2013M06 2018M05
Included observations: 60

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
. | . |	. | . |	1	-0.021	-0.021	0.0275	0.868
. | . |	. | . |	2	-0.005	-0.005	0.0290	0.986
. | . |	. | . |	3	0.008	0.008	0.0329	0.998
. |*. |	. |*. |	4	0.079	0.080	0.4500	0.978
. |*. |	. |*. |	5	0.090	0.094	1.0017	0.962
**| . |	**| . |	6	-0.287	-0.286	6.6857	0.351
. | . |	. | . |	7	0.031	0.024	6.7544	0.455
. | . |	. | . |	8	-0.031	-0.039	6.8211	0.556
.*| . |	.*| . |	9	-0.103	-0.124	7.5935	0.576
.*| . |	.*| . |	10	-0.129	-0.102	8.8367	0.548
. | . |	. | . |	11	-0.042	0.006	8.9730	0.624
.*| . |	.*| . |	12	-0.075	-0.177	9.4082	0.668
. | . |	. |*. |	13	0.038	0.085	9.5218	0.732
. | . |	. |*. |	14	0.071	0.103	9.9270	0.768

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
. | . |	. | . |	15	0.037	-0.007	10.037	0.817
. | . |	. | . |	16	0.069	0.039	10.436	0.843
. | . |	. | . |	17	-0.011	0.002	10.447	0.884
. |*. |	. | . |	18	0.166	0.060	12.885	0.798
.*| . |	.*| . |	19	-0.118	-0.141	14.145	0.775
. | . |	. | . |	20	-0.046	-0.043	14.338	0.813
. | . |	.*| . |	21	-0.050	-0.101	14.578	0.844
. | . |	. | . |	22	0.058	0.063	14.902	0.866
. | . |	. |*. |	23	0.057	0.081	15.231	0.886
.*| . |	. | . |	24	-0.128	-0.010	16.916	0.852
. | . |	.*| . |	25	-0.064	-0.115	17.354	0.869
. | . |	. | . |	26	-0.053	-0.035	17.665	0.888
. | . |	.*| . |	27	-0.052	-0.113	17.970	0.904
.*| . |	.*| . |	28	-0.093	-0.084	18.971	0.899

*Probabilities may not be valid for this equation specification.

- ADP (4 hours)

Date: 01/22/19 Time: 15:21
Sample: 2013M06 2018M05
Included observations: 60

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
.*| . |	.*| . |	1	-0.131	-0.131	1.0889	0.297
. |*. |	. | . |	2	0.087	0.071	1.5764	0.455
. | . |	. | . |	3	-0.036	-0.016	1.6591	0.646
.*| . |	.*| . |	4	-0.154	-0.170	3.2324	0.520
. |** |	. |*. |	5	0.224	0.199	6.6321	0.249
**| . |	**| . |	6	-0.264	-0.213	11.448	0.075
. | . |	.*| . |	7	-0.044	-0.146	11.584	0.115
. | . |	. | . |	8	-0.013	0.011	11.596	0.170
.*| . |	. | . |	9	-0.080	-0.039	12.059	0.210
. |*. |	. | . |	10	0.104	-0.030	12.857	0.232
.*| . |	. | . |	11	-0.087	-0.001	13.430	0.266
.*| . |	.*| . |	12	-0.072	-0.134	13.836	0.311
. |*. |	. |*. |	13	0.159	0.115	15.843	0.258
.*| . |	. | . |	14	-0.099	-0.057	16.631	0.276
. |*. |	. | . |	15	0.095	-0.013	17.372	0.297
. | . |	. |*. |	16	0.039	0.098	17.500	0.354
.*| . |	.*| . |	17	-0.124	-0.100	18.836	0.338
. |*. |	. | . |	18	0.105	-0.046	19.806	0.344
***| . |	**| . |	19	-0.358	-0.286	31.452	0.036
. | . |	. | . |	20	0.051	-0.053	31.691	0.047
.*| . |	.*| . |	21	-0.079	-0.094	32.289	0.055
. | . |	. |*. |	22	0.039	0.087	32.441	0.070
. |*. |	. | . |	23	0.127	-0.005	34.068	0.064
.*| . |	. | . |	24	-0.106	0.004	35.233	0.065
. | . |	.*| . |	25	0.039	-0.152	35.395	0.081
. | . |	. | . |	26	0.001	-0.057	35.395	0.103
. | . |	.*| . |	27	-0.039	-0.112	35.562	0.125
. | . |	. | . |	28	0.042	-0.034	35.771	0.149

*Probabilities may not be valid for this equation specification.

- ADP (5 hours)

Date: 01/22/19 Time: 15:19
Sample: 2013M06 2018M05
Included observations: 60

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
. | . |	. | . |	1	-0.005	-0.005	0.0015	0.969
. |*. |	. |*. |	2	0.161	0.161	1.6543	0.437
.*| . |	.*| . |	3	-0.082	-0.083	2.0929	0.553
.*| . |	.*| . |	4	-0.138	-0.168	3.3513	0.501
. | . |	. |*. |	5	0.047	0.078	3.4999	0.623
**| . |	**| . |	6	-0.246	-0.215	7.6767	0.263
. | . |	. | . |	7	-0.009	-0.056	7.6820	0.361
. | . |	. |*. |	8	0.049	0.133	7.8565	0.448
. | . |	. | . |	9	-0.012	-0.039	7.8670	0.548
. | . |	. | . |	10	0.045	-0.065	8.0149	0.627
. | . |	. |*. |	11	0.014	0.079	8.0291	0.711
.*| . |	.*| . |	12	-0.110	-0.170	8.9744	0.705
. | . |	. | . |	13	0.018	-0.027	9.0013	0.773
.*| . |	.*| . |	14	-0.174	-0.076	11.441	0.651
. | . |	. | . |	15	0.036	0.003	11.549	0.713
.*| . |	.*| . |	16	-0.078	-0.094	12.062	0.740
. | . |	. | . |	17	-0.039	-0.033	12.194	0.788
. |*. |	. | . |	18	0.082	0.019	12.787	0.804
.*| . |	.*| . |	19	-0.126	-0.150	14.225	0.770
. |** |	. |*. |	20	0.238	0.193	19.483	0.491
. | . |	. |*. |	21	0.034	0.091	19.594	0.547
. |*. |	. |*. |	22	0.190	0.095	23.139	0.394
. | . |	. | . |	23	0.034	0.008	23.252	0.446
.*| . |	.*| . |	24	-0.120	-0.096	24.752	0.419
.*| . |	.*| . |	25	-0.069	-0.138	25.265	0.448
**| . |	.*| . |	26	-0.211	-0.132	30.131	0.262
.*| . |	. | . |	27	-0.073	-0.011	30.732	0.282
. | . |	. | . |	28	-0.039	-0.033	30.905	0.321

*Probabilities may not be valid for this equation specification.

- ADP (6 hours)

Date: 01/22/19 Time: 15:18
Sample: 2013M06 2018M05
Included observations: 60

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
. | . |	. | . |	1	0.039	0.039	0.0950	0.758
. |*. |	. |*. |	2	0.088	0.087	0.5945	0.743
.*| . |	.*| . |	3	-0.139	-0.147	1.8597	0.602
.*| . |	.*| . |	4	-0.147	-0.147	3.2983	0.509

. | . |	. | . |	5	-0.050	-0.014	3.4661	0.629
**| . |	**| . |	6	-0.207	-0.207	6.4114	0.379
. |*. |	. |*. |	7	0.128	0.113	7.5558	0.373
. | . |	. | . |	8	0.048	0.051	7.7176	0.462
. |*. |	. | . |	9	0.121	0.032	8.7774	0.458
. |*. |	. |*. |	10	0.152	0.134	10.502	0.398
. | . |	. | . |	11	0.035	0.050	10.594	0.478
.*| . |	.*| . |	12	-0.088	-0.131	11.192	0.513
.*| . |	. | . |	13	-0.093	0.019	11.876	0.538
.*| . |	.*| . |	14	-0.163	-0.114	14.033	0.447
. | . |	. | . |	15	-0.054	-0.047	14.277	0.505
.*| . |	. | . |	16	-0.090	-0.066	14.961	0.527
. | . |	.*| . |	17	-0.043	-0.126	15.124	0.587
. | . |	. | . |	18	0.054	-0.039	15.384	0.635
.*| . |	.*| . |	19	-0.099	-0.155	16.271	0.639
. | . |	. | . |	20	0.073	-0.033	16.769	0.668
. | . |	. | . |	21	-0.053	-0.032	17.035	0.709
. |*. |	. |*. |	22	0.132	0.132	18.736	0.662
. | . |	. | . |	23	-0.021	-0.006	18.780	0.714
.*| . |	.*| . |	24	-0.123	-0.096	20.331	0.678
.*| . |	.*| . |	25	-0.067	-0.067	20.803	0.704
. | . |	. |*. |	26	-0.020	0.076	20.848	0.750
.*| . |	.*| . |	27	-0.095	-0.167	21.860	0.744
.*| . |	.*| . |	28	-0.130	-0.169	23.818	0.691

*Probabilities may not be valid for this equation specification.

- ADP (monthly)

Date: 01/24/19 Time: 11:55
Sample: 2013M06 2018M05
Included observations: 60

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
. |*. |	. |*. |	1	0.208	0.208	2.7241	0.099
. | . |	. | . |	2	0.033	-0.011	2.7941	0.247
. | . |	. | . |	3	0.043	0.040	2.9133	0.405
. |*. |	. |*. |	4	0.118	0.106	3.8385	0.428
. |*. |	. | . |	5	0.081	0.036	4.2778	0.510
. |*. |	. |*. |	6	0.096	0.074	4.9103	0.555
. | . |	. | . |	7	0.058	0.020	5.1461	0.642
. | . |	.*| . |	8	-0.044	-0.078	5.2843	0.727
. | . |	. | . |	9	0.040	0.053	5.4023	0.798
.*| . |	.*| . |	10	-0.122	-0.173	6.5046	0.771
.*| . |	. | . |	11	-0.092	-0.052	7.1419	0.787
. | . |	. | . |	12	-0.013	0.018	7.1553	0.847
.*| . |	.*| . |	13	-0.147	-0.174	8.8676	0.783
.*| . |	. | . |	14	-0.085	0.019	9.4544	0.801
.*| . |	.*| . |	15	-0.111	-0.083	10.482	0.788
. | . |	. |*. |	16	0.069	0.145	10.889	0.816
. | . |	. |*. |	17	0.037	0.075	11.008	0.856
. | . |	. | . |	18	-0.017	-0.035	11.032	0.893
.*| . |	. | . |	19	-0.072	0.004	11.497	0.906
.*| . |	.*| . |	20	-0.153	-0.170	13.672	0.847

. |*. |	. |** |	21	0.170	0.232	16.428	0.745
. | . |	. | . |	22	0.048	-0.049	16.654	0.782
. |*. |	. |*. |	23	0.151	0.129	18.956	0.704
. | . |	. | . |	24	0.008	-0.031	18.962	0.754
.*| . |	.*| . |	25	-0.068	-0.172	19.447	0.775
.*| . |	.*| . |	26	-0.120	-0.066	21.024	0.741
. | . |	. | . |	27	0.012	-0.002	21.039	0.784
.*| . |	**| . |	28	-0.105	-0.220	22.329	0.766

*Probabilities may not be valid for this equation specification.

- AHE (1 hour)

Date: 01/22/19 Time: 15:48
Sample: 2013M06 2018M05
Included observations: 60

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
. |*. |	. |*. |	1	0.146	0.146	1.3471	0.246
. |*. |	. |*. |	2	0.129	0.110	2.4145	0.299
. | . |	. | . |	3	0.071	0.039	2.7429	0.433
. |*. |	. |*. |	4	0.160	0.136	4.4336	0.350
. | . |	.*| . |	5	-0.036	-0.089	4.5216	0.477
. |*. |	. |*. |	6	0.109	0.097	5.3379	0.501
. | . |	. | . |	7	0.051	0.025	5.5203	0.597
.*| . |	.*| . |	8	-0.077	-0.131	5.9420	0.654
.*| . |	. | . |	9	-0.090	-0.063	6.5343	0.685
. |*. |	. |*. |	10	0.079	0.091	7.0021	0.725
.*| . |	.*| . |	11	-0.142	-0.155	8.5434	0.664
.*| . |	. | . |	12	-0.070	-0.017	8.9257	0.709
**| . |	.*| . |	13	-0.214	-0.198	12.565	0.482
. | . |	. | . |	14	-0.054	0.001	12.802	0.542
**| . |	**| . |	15	-0.299	-0.206	20.207	0.164
. | . |	. | . |	16	-0.062	-0.004	20.531	0.197
.*| . |	. | . |	17	-0.101	-0.010	21.419	0.208
**| . |	.*| . |	18	-0.206	-0.192	25.184	0.120
.*| . |	. | . |	19	-0.104	0.052	26.163	0.126
.*| . |	.*| . |	20	-0.105	-0.137	27.184	0.130
.*| . |	.*| . |	21	-0.164	-0.117	29.744	0.097
.*| . |	. | . |	22	-0.066	0.015	30.177	0.114
. | . |	. | . |	23	0.036	0.022	30.308	0.141
. | . |	. | . |	24	0.047	0.022	30.533	0.168
. | . |	. | . |	25	-0.030	0.016	30.628	0.202
. | . |	**| . |	26	-0.029	-0.205	30.722	0.239
. | . |	. |*. |	27	0.067	0.110	31.223	0.262
. |*. |	. | . |	28	0.088	-0.018	32.126	0.269

*Probabilities may not be valid for this equation specification.

- AHE (2 hours)

Date: 01/22/19 Time: 15:47
Sample: 2013M06 2018M05
Included observations: 60

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
. | . |	. | . |	1	0.025	0.025	0.0402	0.841
. | . |	. | . |	2	-0.031	-0.031	0.1008	0.951
. | . |	. | . |	3	0.024	0.026	0.1380	0.987
. |*. |	. |*. |	4	0.100	0.098	0.8005	0.938
. | . |	. | . |	5	0.071	0.069	1.1437	0.950
. | . |	. | . |	6	0.021	0.024	1.1752	0.978
. | . |	. | . |	7	0.028	0.027	1.2308	0.990
.*| . |	.*| . |	8	-0.143	-0.158	2.6881	0.952
. | . |	. | . |	9	-0.053	-0.063	2.8908	0.968
. |*. |	. |*. |	10	0.129	0.116	4.1371	0.941
. | . |	. | . |	11	0.027	0.021	4.1906	0.964
.*| . |	.*| . |	12	-0.174	-0.148	6.5385	0.887
.*| . |	.*| . |	13	-0.201	-0.184	9.7250	0.716
. |*. |	. |*. |	14	0.179	0.185	12.309	0.582
**| . |	**| . |	15	-0.283	-0.334	18.915	0.218
.*| . |	.*| . |	16	-0.154	-0.146	20.931	0.181
.*| . |	. | . |	17	-0.078	-0.053	21.456	0.207
. | . |	. | . |	18	-0.022	0.030	21.499	0.255
.*| . |	.*| . |	19	-0.105	-0.079	22.490	0.261
.*| . |	.*| . |	20	-0.132	-0.164	24.106	0.238
. | . |	. | . |	21	0.064	0.056	24.502	0.269
.*| . |	. | . |	22	-0.113	-0.039	25.756	0.262
. | . |	. | . |	23	-0.012	-0.017	25.771	0.312
. | . |	.*| . |	24	0.028	-0.111	25.853	0.361
. | . |	.*| . |	25	-0.062	-0.086	26.267	0.393
.*| . |	.*| . |	26	-0.152	-0.103	28.810	0.320
. | . |	. | . |	27	0.005	-0.025	28.812	0.370
. |*. |	. | . |	28	0.192	-0.058	33.091	0.232

*Probabilities may not be valid for this equation specification.

- AHE (3 hours)

Date: 01/22/19 Time: 15:45
Sample: 2013M06 2018M05
Included observations: 60

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
. |*. |	. |*. |	1	0.088	0.088	0.4894	0.484
.*| . |	.*| . |	2	-0.153	-0.162	1.9881	0.370
.*| . |	.*| . |	3	-0.185	-0.161	4.2269	0.238
. | . |	. | . |	4	0.026	0.034	4.2728	0.370
. |*. |	. |*. |	5	0.190	0.142	6.7021	0.244
. | . |	. | . |	6	0.025	-0.024	6.7443	0.345
. | . |	. |*. |	7	0.040	0.099	6.8538	0.444
.*| . |	.*| . |	8	-0.139	-0.106	8.2425	0.410
. | . |	. |*. |	9	0.040	0.075	8.3580	0.499
. | . |	. | . |	10	0.065	0.021	8.6748	0.563

.*| . |	**| . |	11	-0.156	-0.209	10.517	0.485
**| . |	**| . |	12	-0.237	-0.223	14.860	0.249
. | . |	. | . |	13	-0.061	-0.026	15.153	0.298
. |*. |	. | . |	14	0.168	0.049	17.435	0.234
.*| . |	**| . |	15	-0.100	-0.214	18.259	0.249
.*| . |	.*| . |	16	-0.144	-0.090	20.016	0.220
.*| . |	. | . |	17	-0.135	-0.057	21.586	0.201
. | . |	. | . |	18	0.057	0.062	21.870	0.238
. | . |	.*| . |	19	-0.054	-0.200	22.132	0.278
.*| . |	.*| . |	20	-0.106	-0.150	23.182	0.280
. | . |	. | . |	21	-0.015	0.020	23.203	0.333
. | . |	. | . |	22	-0.049	-0.045	23.437	0.377
. |** |	. |*. |	23	0.254	0.130	29.900	0.152
. | . |	.*| . |	24	0.022	-0.108	29.951	0.186
. | . |	. | . |	25	-0.051	0.019	30.232	0.216
.*| . |	.*| . |	26	-0.177	-0.098	33.647	0.144
. | . |	.*| . |	27	-0.009	-0.117	33.657	0.176
. |** |	. | . |	28	0.251	0.009	40.963	0.054

*Probabilities may not be valid for this equation specification.

- AHE (4 hours)

Date: 01/22/19 Time: 15:44
Sample: 2013M06 2018M05
Included observations: 60

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
.*| . |	.*| . |	1	-0.096	-0.096	0.5825	0.445
. | . |	. | . |	2	0.033	0.024	0.6522	0.722
. | . |	. | . |	3	0.007	0.012	0.6553	0.884
. | . |	. | . |	4	-0.055	-0.055	0.8593	0.930
. |*. |	. |*. |	5	0.097	0.087	1.4934	0.914
.*| . |	.*| . |	6	-0.125	-0.108	2.5779	0.860
. | . |	. | . |	7	0.047	0.024	2.7339	0.908
.*| . |	. | . |	8	-0.067	-0.060	3.0517	0.931
. | . |	. | . |	9	0.021	0.021	3.0844	0.961
. | . |	. | . |	10	0.064	0.052	3.3938	0.971
.*| . |	.*| . |	11	-0.126	-0.098	4.6031	0.949
**| . |	**| . |	12	-0.263	-0.322	9.9763	0.618
.*| . |	.*| . |	13	-0.082	-0.128	10.514	0.651
. |*. |	. |*. |	14	0.108	0.107	11.457	0.650
.*| . |	. | . |	15	-0.076	-0.059	11.939	0.684
.*| . |	**| . |	16	-0.169	-0.238	14.357	0.572
.*| . |	**| . |	17	-0.134	-0.223	15.913	0.530
. |*. |	. | . |	18	0.078	0.033	16.458	0.561
.*| . |	.*| . |	19	-0.075	-0.110	16.963	0.592
.*| . |	**| . |	20	-0.087	-0.220	17.660	0.610
. |*. |	. | . |	21	0.084	0.011	18.328	0.628
. | . |	. | . |	22	-0.027	0.027	18.398	0.682
. |*. |	. | . |	23	0.199	0.071	22.393	0.497
. |*. |	. | . |	24	0.124	-0.011	23.977	0.463
. | . |	.*| . |	25	-0.063	-0.150	24.404	0.496
. | . |	. | . |	26	-0.038	-0.038	24.559	0.544

. | . |	. | . |	27	0.028	0.025	24.649	0.594
. |*. |	. | . |	28	0.192	-0.016	28.934	0.416

*Probabilities may not be valid for this equation specification.

- AHE (5 hours)

Date: 01/22/19 Time: 15:43
Sample: 2013M06 2018M05
Included observations: 60

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
.*| . |	.*| . |	1	-0.124	-0.124	0.9636	0.326
. | . |	. | . |	2	0.012	-0.003	0.9735	0.615
. | . |	. | . |	3	-0.035	-0.034	1.0531	0.788
.*| . |	.*| . |	4	-0.123	-0.133	2.0532	0.726
. | . |	. | . |	5	0.006	-0.027	2.0556	0.841
. | . |	. | . |	6	-0.021	-0.026	2.0870	0.912
. |** |	. |** |	7	0.230	0.221	5.7900	0.564
. | . |	. | . |	8	-0.061	-0.023	6.0556	0.641
. | . |	. | . |	9	-0.008	-0.025	6.0607	0.734
.*| . |	.*| . |	10	-0.099	-0.101	6.7877	0.745
.*| . |	. | . |	11	-0.078	-0.053	7.2508	0.778
.*| . |	.*| . |	12	-0.070	-0.100	7.6268	0.814
.*| . |	.*| . |	13	-0.083	-0.121	8.1675	0.833
. | . |	. | . |	14	0.061	-0.048	8.4690	0.863
. |*. |	. |*. |	15	0.148	0.166	10.291	0.801
. | . |	. | . |	16	-0.025	0.001	10.343	0.848
**| . |	**| . |	17	-0.226	-0.247	14.772	0.612
. |*. |	. |*. |	18	0.108	0.084	15.802	0.606
.*| . |	.*| . |	19	-0.162	-0.082	18.192	0.510
. | . |	. | . |	20	-0.014	-0.051	18.209	0.574
. |*. |	. | . |	21	0.113	0.022	19.422	0.558
. | . |	.*| . |	22	-0.009	-0.080	19.431	0.619
. | . |	. | . |	23	0.058	0.025	19.774	0.656
. | . |	. | . |	24	-0.034	0.070	19.892	0.703
. |*. |	. |*. |	25	0.128	0.097	21.633	0.657
. | . |	. | . |	26	-0.027	0.061	21.712	0.704
. | . |	. | . |	27	-0.008	-0.006	21.719	0.752
. | . |	. | . |	28	0.042	0.021	21.926	0.785

*Probabilities may not be valid for this equation specification.

- AHE (6 hours)

Date: 01/22/19 Time: 15:41
Sample: 2013M06 2018M05
Included observations: 60

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
.*| . |	.*| . |	1	-0.172	-0.172	1.8656	0.172
. | . |	. | . |	2	0.012	-0.018	1.8743	0.392
.*| . |	.*| . |	3	-0.156	-0.162	3.4640	0.325

. |*. |	. | . |	4	0.110	0.058	4.2668	0.371
. |*. |	. |*. |	5	0.147	0.181	5.7308	0.333
.*| . |	. | . |	6	-0.087	-0.056	6.2557	0.395
. |*. |	. |*. |	7	0.078	0.092	6.6841	0.462
. | . |	. | . |	8	-0.054	0.013	6.8932	0.548
.*| . |	.*| . |	9	-0.069	-0.143	7.2391	0.612
. | . |	. | . |	10	0.007	-0.013	7.2431	0.702
. | . |	. |*. |	11	0.071	0.076	7.6285	0.746
.*| . |	.*| . |	12	-0.092	-0.147	8.2875	0.762
. | . |	. | . |	13	-0.059	-0.054	8.5649	0.805
. | . |	. | . |	14	-0.011	0.026	8.5752	0.857
. | . |	.*| . |	15	-0.007	-0.089	8.5789	0.898
. |*. |	. |*. |	16	0.089	0.097	9.2515	0.903
.*| . |	.*| . |	17	-0.179	-0.108	12.033	0.798
. |*. |	. |*. |	18	0.154	0.082	14.129	0.721
.*| . |	.*| . |	19	-0.175	-0.100	16.915	0.596
. | . |	.*| . |	20	0.001	-0.095	16.915	0.658
. | . |	. | . |	21	0.041	0.054	17.074	0.707
. | . |	. | . |	22	-0.030	-0.051	17.162	0.754
. |*. |	. |*. |	23	0.195	0.171	20.974	0.583
.*| . |	.*| . |	24	-0.203	-0.067	25.229	0.393
. | . |	.*| . |	25	0.008	-0.092	25.237	0.449
. | . |	. | . |	26	-0.057	-0.032	25.592	0.486
. | . |	.*| . |	27	0.017	-0.070	25.624	0.540
. | . |	. | . |	28	0.046	-0.012	25.868	0.580

*Probabilities may not be valid for this equation specification.

- AHE (monthly)

Date: 01/24/19 Time: 10:54
Sample: 2013M06 2018M05
Included observations: 60

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
. | . |	. | . |	1	-0.023	-0.023	0.0320	0.858
. |*. |	. |*. |	2	0.097	0.096	0.6347	0.728
. | . |	. | . |	3	-0.023	-0.019	0.6684	0.881
. |*. |	. |*. |	4	0.089	0.080	1.1967	0.879
. |*. |	. |*. |	5	0.102	0.111	1.9016	0.863
.*| . |	.*| . |	6	-0.080	-0.094	2.3393	0.886
. | . |	. | . |	7	0.063	0.046	2.6207	0.918
.*| . |	.*| . |	8	-0.112	-0.101	3.5253	0.897
. | . |	. | . |	9	0.034	-0.002	3.6096	0.935
.*| . |	.*| . |	10	-0.149	-0.128	5.2525	0.874
.*| . |	.*| . |	11	-0.116	-0.127	6.2690	0.855
.*| . |	.*| . |	12	-0.124	-0.111	7.4521	0.826
.*| . |	.*| . |	13	-0.097	-0.072	8.1936	0.831
. | . |	. | . |	14	0.019	0.029	8.2234	0.877
.*| . |	.*| . |	15	-0.186	-0.129	11.091	0.746
. |*. |	. |*. |	16	0.077	0.083	11.596	0.771
. |*. |	. |** |	17	0.139	0.229	13.260	0.719
.*| . |	**| . |	18	-0.170	-0.227	15.834	0.604
. | . |	. | . |	19	0.025	0.016	15.891	0.665

. | . |	. | . |	20	-0.057	-0.020	16.192	0.705
. |*. |	. | . |	21	0.159	0.029	18.605	0.610
. | . |	. | . |	22	0.030	0.038	18.696	0.664
. | . |	. | . |	23	0.073	0.025	19.231	0.688
. |*. |	. |*. |	24	0.111	0.098	20.507	0.668
. | . |	. | . |	25	-0.007	-0.033	20.511	0.720
. |*. |	. | . |	26	0.082	-0.013	21.242	0.729
.*| . |	.*| . |	27	-0.155	-0.129	23.967	0.632
. |*. |	. |*. |	28	0.162	0.121	27.029	0.517

*Probabilities may not be valid for this equation specification.

- BP (1 hour)

Date: 01/22/19 Time: 14:29
Sample: 2013M06 2018M05
Included observations: 60

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
.*| . |	.*| . |	1	-0.085	-0.085	0.4604	0.497
.*| . |	.*| . |	2	-0.150	-0.158	1.8994	0.387
**| . |	***| . |	3	-0.330	-0.371	9.0168	0.029
. |*. |	. | . |	4	0.146	0.040	10.437	0.034
. | . |	.*| . |	5	-0.023	-0.138	10.473	0.063
. |*. |	. | . |	6	0.145	0.047	11.914	0.064
.*| . |	.*| . |	7	-0.154	-0.112	13.570	0.059
. | . |	. | . |	8	0.020	-0.033	13.598	0.093
. |*. |	. |*. |	9	0.102	0.165	14.362	0.110
. | . |	. | . |	10	0.025	-0.060	14.408	0.155
**| . |	.*| . |	11	-0.213	-0.157	17.841	0.085
. | . |	. | . |	12	-0.002	0.010	17.842	0.121
. | . |	.*| . |	13	0.026	-0.069	17.895	0.162
. | . |	.*| . |	14	-0.032	-0.185	17.976	0.208
. | . |	. | . |	15	0.004	-0.041	17.977	0.264
. |*. |	. |*. |	16	0.119	0.097	19.174	0.260
. | . |	. |*. |	17	0.062	0.080	19.511	0.300
. |*. |	. |*. |	18	0.100	0.162	20.401	0.311
**| . |	.*| . |	19	-0.212	-0.120	24.466	0.179
. | . |	. | . |	20	-0.058	0.064	24.775	0.210
. | . |	. | . |	21	0.008	0.000	24.781	0.257
. | . |	**| . |	22	0.049	-0.212	25.014	0.296
.*| . |	.*| . |	23	-0.145	-0.166	27.129	0.251
. |*. |	. | . |	24	0.134	0.062	28.997	0.220
. | . |	. | . |	25	0.049	-0.012	29.254	0.253
. | . |	. | . |	26	0.059	0.002	29.636	0.283
.*| . |	. | . |	27	-0.159	-0.044	32.482	0.215
.*| . |	. | . |	28	-0.092	-0.035	33.456	0.219

*Probabilities may not be valid for this equation specification.

- BP (2 hours)

Date: 01/22/19 Time: 14:28
Sample: 2013M06 2018M05
Included observations: 60

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
. | . |	. | . |	1	0.016	0.016	0.0152	0.902
. | . |	. | . |	2	-0.053	-0.054	0.1978	0.906
**| . |	**| . |	3	-0.243	-0.242	4.0463	0.257
. | . |	. |*. |	4	0.074	0.081	4.4076	0.354
. |*. |	. | . |	5	0.082	0.059	4.8656	0.433
. | . |	. | . |	6	0.033	-0.023	4.9397	0.552
. | . |	. |*. |	7	0.071	0.123	5.2968	0.624
.*| . |	.*| . |	8	-0.125	-0.110	6.4190	0.600
. | . |	. | . |	9	-0.056	-0.057	6.6468	0.674
. | . |	. | . |	10	-0.062	-0.029	6.9368	0.731
.*| . |	**| . |	11	-0.119	-0.215	8.0036	0.713
.*| . |	.*| . |	12	-0.111	-0.143	8.9522	0.707
. | . |	. | . |	13	0.007	-0.004	8.9558	0.776
.*| . |	.*| . |	14	-0.071	-0.187	9.3599	0.807
. | . |	.*| . |	15	-0.061	-0.077	9.6638	0.840
.*| . |	.*| . |	16	-0.171	-0.178	12.135	0.735
. |*. |	. | . |	17	0.098	0.026	12.967	0.738
. |*. |	. |*. |	18	0.170	0.190	15.534	0.625
. | . |	. | . |	19	0.049	-0.033	15.753	0.674
.*| . |	.*| . |	20	-0.101	-0.074	16.705	0.672
.*| . |	.*| . |	21	-0.139	-0.071	18.558	0.613
. |*. |	. | . |	22	0.083	-0.043	19.230	0.631
. | . |	.*| . |	23	0.039	-0.099	19.379	0.679
. |** |	. |*. |	24	0.275	0.174	27.176	0.296
. | . |	. | . |	25	0.061	0.029	27.574	0.328
. | . |	. | . |	26	0.034	0.058	27.700	0.373
.*| . |	.*| . |	27	-0.190	-0.124	31.754	0.241
. | . |	. | . |	28	0.031	-0.003	31.869	0.280

*Probabilities may not be valid for this equation specification.

- BP (3 hours)

Date: 01/22/19 Time: 14:26
Sample: 2013M06 2018M05
Included observations: 60

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
. | . |	. | . |	1	-0.029	-0.029	0.0540	0.816
. | . |	. | . |	2	-0.022	-0.023	0.0857	0.958
.*| . |	.*| . |	3	-0.088	-0.089	0.5881	0.899
. |*. |	. |*. |	4	0.158	0.153	2.2393	0.692
. | . |	. | . |	5	-0.037	-0.034	2.3304	0.802
. | . |	. | . |	6	-0.040	-0.043	2.4405	0.875
. |*. |	. |*. |	7	0.173	0.204	4.5300	0.717
.*| . |	.*| . |	8	-0.122	-0.162	5.5913	0.693
. | . |	. | . |	9	0.007	0.022	5.5948	0.780
.*| . |	. | . |	10	-0.076	-0.035	6.0300	0.813

.*| . |	**| . |	11	-0.096	-0.213	6.7295	0.821
.*| . |	. | . |	12	-0.116	-0.050	7.7763	0.802
. | . |	. | . |	13	0.030	0.013	7.8482	0.853
. | . |	. | . |	14	0.016	-0.062	7.8681	0.896
.*| . |	. | . |	15	-0.118	-0.033	9.0206	0.876
.*| . |	.*| . |	16	-0.082	-0.096	9.5842	0.887
. |*. |	. |*. |	17	0.131	0.141	11.072	0.853
. |*. |	. |*. |	18	0.085	0.119	11.709	0.862
. | . |	. | . |	19	-0.054	-0.059	11.974	0.887
.*| . |	.*| . |	20	-0.155	-0.147	14.216	0.819
. | . |	. | . |	21	0.005	-0.050	14.218	0.860
. | . |	. | . |	22	0.037	-0.013	14.353	0.888
. | . |	. | . |	23	-0.011	-0.031	14.365	0.916
. |*. |	. |*. |	24	0.141	0.144	16.423	0.872
. | . |	. | . |	25	0.050	0.044	16.684	0.893
. |*. |	. |*. |	26	0.124	0.137	18.375	0.862
.*| . |	. | . |	27	-0.086	-0.014	19.209	0.862
. | . |	. | . |	28	0.023	-0.023	19.271	0.890

*Probabilities may not be valid for this equation specification.

- BP (4 hours)

Date: 01/22/19 Time: 14:25
Sample: 2013M06 2018M05
Included observations: 60

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
.*| . |	.*| . |	1	-0.178	-0.178	1.9934	0.158
. | . |	. | . |	2	-0.013	-0.046	2.0048	0.367
**| . |	***| . |	3	-0.337	-0.359	9.3997	0.024
. |*. |	. | . |	4	0.108	-0.031	10.171	0.038
. | . |	.*| . |	5	-0.040	-0.079	10.280	0.068
. |*. |	. | . |	6	0.103	-0.037	11.012	0.088
. |*. |	. |*. |	7	0.075	0.129	11.406	0.122
.*| . |	.*| . |	8	-0.163	-0.180	13.306	0.102
. | . |	. | . |	9	0.043	0.045	13.444	0.144
. | . |	. |*. |	10	0.017	0.083	13.466	0.199
. |*. |	. | . |	11	0.080	-0.022	13.948	0.236
.*| . |	.*| . |	12	-0.177	-0.115	16.381	0.174
. |*. |	. | . |	13	0.080	0.036	16.892	0.204
.*| . |	.*| . |	14	-0.093	-0.096	17.592	0.226
. | . |	.*| . |	15	-0.047	-0.174	17.774	0.275
. | . |	.*| . |	16	-0.062	-0.127	18.103	0.318
. |*. |	. | . |	17	0.122	-0.017	19.396	0.306
. | . |	. | . |	18	-0.012	-0.060	19.409	0.367
. | . |	. | . |	19	0.022	-0.005	19.451	0.428
. | . |	. | . |	20	-0.030	-0.050	19.536	0.487
.*| . |	.*| . |	21	-0.107	-0.132	20.627	0.482
. | . |	. | . |	22	0.006	-0.012	20.631	0.544
.*| . |	.*| . |	23	-0.070	-0.197	21.129	0.573
. |** |	. |*. |	24	0.270	0.145	28.669	0.233
. | . |	. |*. |	25	-0.033	0.096	28.782	0.273
. |*. |	. |*. |	26	0.168	0.146	31.854	0.198

**| . |	. | . |	27	-0.216	-0.006	37.107	0.093
. | . |	. | . |	28	0.010	-0.035	37.119	0.116

*Probabilities may not be valid for this equation specification.

- BP (5 hours)

Date: 01/22/19 Time: 14:23
Sample: 2013M06 2018M05
Included observations: 60

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
. |*. |	. |*. |	1	0.092	0.092	0.5297	0.467
. | . |	. | . |	2	-0.002	-0.011	0.5300	0.767
.*| . |	.*| . |	3	-0.156	-0.156	2.1114	0.550
. |*. |	. |*. |	4	0.082	0.114	2.5583	0.634
. |*. |	. |*. |	5	0.152	0.139	4.1259	0.531
. | . |	. | . |	6	0.067	0.013	4.4351	0.618
. |*. |	. |*. |	7	0.119	0.147	5.4336	0.607
.*| . |	.*| . |	8	-0.153	-0.153	7.1167	0.524
. | . |	. | . |	9	-0.031	-0.022	7.1860	0.618
. | . |	. | . |	10	0.008	0.036	7.1907	0.707
. | . |	.*| . |	11	-0.054	-0.160	7.4096	0.765
.*| . |	.*| . |	12	-0.081	-0.082	7.9233	0.791
.*| . |	. | . |	13	-0.088	-0.029	8.5316	0.807
.*| . |	.*| . |	14	-0.091	-0.138	9.1975	0.818
. | . |	. | . |	15	-0.047	0.013	9.3827	0.857
. | . |	. | . |	16	-0.026	-0.013	9.4420	0.894
. | . |	. | . |	17	0.063	0.066	9.7874	0.912
. | . |	. |*. |	18	0.037	0.124	9.9060	0.935
. | . |	. |*. |	19	0.070	0.098	10.355	0.944
.*| . |	.*| . |	20	-0.080	-0.073	10.945	0.948
. | . |	. | . |	21	-0.042	0.007	11.117	0.960
. | . |	.*| . |	22	-0.065	-0.121	11.533	0.966
. |*. |	. | . |	23	0.076	-0.003	12.115	0.969
. |*. |	. | . |	24	0.103	0.043	13.206	0.963
. | . |	. | . |	25	0.035	-0.035	13.337	0.972
. | . |	. |*. |	26	0.043	0.074	13.539	0.979
.*| . |	. | . |	27	-0.102	-0.052	14.715	0.973
. | . |	. | . |	28	0.070	0.056	15.284	0.975

*Probabilities may not be valid for this equation specification.

- BP (6 hours)

Date: 01/22/19 Time: 14:21
Sample: 2013M06 2018M05
Included observations: 60

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
. |*. |	. |*. |	1	0.119	0.119	0.8893	0.346
. | . |	. | . |	2	0.011	-0.003	0.8974	0.638
.*| . |	.*| . |	3	-0.093	-0.095	1.4627	0.691

. | . |	. | . |	4	0.006	0.029	1.4648	0.833
. | . |	. | . |	5	0.060	0.060	1.7113	0.887
. | . |	. | . |	6	0.034	0.010	1.7903	0.938
. |*. |	. |*. |	7	0.154	0.154	3.4593	0.840
.*| . |	.*| . |	8	-0.074	-0.105	3.8555	0.870
. |*. |	. |*. |	9	0.089	0.116	4.4387	0.880
. | . |	. | . |	10	0.007	0.008	4.4428	0.925
. | . |	. | . |	11	-0.000	-0.031	4.4428	0.955
. | . |	. |*. |	12	0.060	0.076	4.7232	0.967
.*| . |	.*| . |	13	-0.160	-0.193	6.7614	0.914
.*| . |	.*| . |	14	-0.079	-0.069	7.2618	0.924
. | . |	. | . |	15	-0.026	0.040	7.3181	0.948
. | . |	. | . |	16	0.055	-0.032	7.5753	0.961
. | . |	. |*. |	17	0.063	0.080	7.9191	0.968
. | . |	. | . |	18	0.071	0.073	8.3688	0.973
. | . |	. | . |	19	0.055	0.025	8.6469	0.979
.*| . |	. | . |	20	-0.127	-0.054	10.156	0.965
. | . |	. | . |	21	-0.029	-0.025	10.234	0.976
. | . |	. | . |	22	-0.015	0.009	10.257	0.984
. |*. |	. |*. |	23	0.112	0.110	11.508	0.977
. | . |	. | . |	24	0.061	-0.003	11.896	0.981
. | . |	. | . |	25	-0.020	-0.019	11.937	0.987
. | . |	. | . |	26	-0.050	-0.057	12.215	0.990
.*| . |	.*| . |	27	-0.123	-0.134	13.908	0.982
. | . |	. | . |	28	0.040	0.044	14.096	0.986

*Probabilities may not be valid for this equation specification.

- BP (monthly)

Date: 01/24/19 Time: 11:20
Sample: 2013M06 2018M05
Included observations: 60

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
. |*. |	. |*. |	1	0.096	0.096	0.5785	0.447
. |*. |	. |*. |	2	0.145	0.137	1.9293	0.381
. | . |	.*| . |	3	-0.039	-0.066	2.0308	0.566
. |*. |	. |*. |	4	0.211	0.207	4.9910	0.288
. | . |	. | . |	5	0.027	0.002	5.0409	0.411
. |*. |	. | . |	6	0.078	0.019	5.4610	0.486
. | . |	. | . |	7	-0.059	-0.050	5.7048	0.575
. | . |	. | . |	8	0.029	-0.013	5.7640	0.674
.*| . |	.*| . |	9	-0.075	-0.069	6.1793	0.722
. | . |	. | . |	10	0.005	-0.010	6.1811	0.800
.*| . |	.*| . |	11	-0.111	-0.079	7.1171	0.790
. | . |	. | . |	12	-0.065	-0.063	7.4415	0.827
.*| . |	.*| . |	13	-0.133	-0.074	8.8381	0.785
.*| . |	.*| . |	14	-0.101	-0.086	9.6577	0.787
.*| . |	. | . |	15	-0.089	-0.016	10.307	0.800
. | . |	. | . |	16	-0.065	-0.031	10.667	0.830
. | . |	. | . |	17	-0.023	0.040	10.711	0.871
. | . |	. |*. |	18	0.042	0.087	10.870	0.900
.*| . |	.*| . |	19	-0.158	-0.162	13.124	0.832

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
. |*. |	. |*. |	20	0.077	0.123	13.673	0.847
. | . |	. | . |	21	-0.017	-0.007	13.701	0.882
. |*. |	. | . |	22	0.080	0.004	14.327	0.889
. |*. |	. |*. |	23	0.120	0.190	15.767	0.865
. |*. |	. | . |	24	0.076	-0.029	16.367	0.874
. | . |	. | . |	25	-0.004	-0.048	16.369	0.903
.*| . |	.*| . |	26	-0.109	-0.176	17.675	0.887
. | . |	. | . |	27	-0.005	-0.050	17.677	0.913
. | . |	.*| . |	28	-0.052	-0.104	17.994	0.926

*Probabilities may not be valid for this equation specification.

- CCI (1 hour)

Date: 02/13/19 Time: 09:49
Sample: 2013M06 2018M05
Included observations: 60

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
. | . |	. | . |	1	-0.001	-0.001	9.E-05	0.992
.*| . |	.*| . |	2	-0.116	-0.116	0.8704	0.647
. |*. |	. |*. |	3	0.172	0.174	2.8044	0.423
. | . |	. | . |	4	0.033	0.017	2.8778	0.578
. | . |	. | . |	5	-0.013	0.027	2.8899	0.717
.*| . |	.*| . |	6	-0.150	-0.183	4.4486	0.616
.*| . |	.*| . |	7	-0.177	-0.193	6.6437	0.467
. | . |	. | . |	8	0.072	0.036	7.0151	0.535
. | . |	. | . |	9	-0.010	0.013	7.0228	0.635
**| . |	.*| . |	10	-0.205	-0.127	10.153	0.427
.*| . |	.*| . |	11	-0.088	-0.116	10.742	0.465
. |** |	. |*. |	12	0.236	0.195	15.041	0.239
. | . |	.*| . |	13	-0.060	-0.084	15.329	0.287
. | . |	. |*. |	14	0.057	0.149	15.593	0.339
. | . |	. | . |	15	0.026	-0.064	15.650	0.406
. |*. |	. |*. |	16	0.101	0.109	16.520	0.417
. | . |	.*| . |	17	0.046	-0.100	16.703	0.475
.*| . |	.*| . |	18	-0.171	-0.118	19.293	0.374
. | . |	. |*. |	19	0.042	0.084	19.451	0.428
. | . |	.*| . |	20	0.004	-0.096	19.453	0.493
.*| . |	.*| . |	21	-0.203	-0.146	23.393	0.323
. | . |	. | . |	22	-0.060	-0.038	23.750	0.360
.*| . |	. | . |	23	-0.087	-0.051	24.512	0.376
. |*. |	. |*. |	24	0.094	0.088	25.416	0.383
. |*. |	. |*. |	25	0.088	0.144	26.239	0.395
.*| . |	.*| . |	26	-0.117	-0.109	27.724	0.372
. |*. |	. |*. |	27	0.089	0.085	28.625	0.379
. |*. |	. | . |	28	0.178	-0.050	32.319	0.262

*Probabilities may not be valid for this equation specification.

- CCI (2 hours)

Date: 02/13/19 Time: 09:47
Sample: 2013M06 2018M05
Included observations: 60

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
. | . |	. | . |	1	0.068	0.068	0.2958	0.586
. | . |	. | . |	2	0.033	0.028	0.3646	0.833
. |*. |	. |*. |	3	0.179	0.176	2.4668	0.481
.*| . |	.*| . |	4	-0.134	-0.164	3.6639	0.453
. | . |	. | . |	5	-0.015	-0.001	3.6783	0.597
.*| . |	.*| . |	6	-0.080	-0.111	4.1190	0.661
.*| . |	.*| . |	7	-0.191	-0.129	6.6804	0.463
.*| . |	.*| . |	8	-0.081	-0.079	7.1542	0.520
. | . |	. | . |	9	-0.065	-0.019	7.4640	0.589
.*| . |	.*| . |	10	-0.139	-0.109	8.9072	0.541
. | . |	. | . |	11	0.025	0.028	8.9537	0.626
. | . |	. | . |	12	0.024	0.007	8.9981	0.703
. |*. |	. |*. |	13	0.123	0.139	10.193	0.678
.*| . |	**| . |	14	-0.087	-0.206	10.803	0.701
. | . |	.*| . |	15	-0.060	-0.074	11.103	0.745
. |*. |	. |*. |	16	0.180	0.127	13.831	0.611
. | . |	. | . |	17	-0.044	-0.021	14.001	0.667
. | . |	.*| . |	18	-0.036	-0.075	14.115	0.722
. | . |	. | . |	19	0.016	-0.026	14.139	0.776
.*| . |	. | . |	20	-0.113	-0.062	15.328	0.757
.*| . |	.*| . |	21	-0.135	-0.174	17.076	0.706
. | . |	. | . |	22	-0.034	-0.039	17.190	0.753
.*| . |	. | . |	23	-0.071	0.021	17.701	0.773
. | . |	.*| . |	24	-0.049	-0.087	17.952	0.805
. | . |	. | . |	25	0.044	-0.020	18.160	0.836
.*| . |	.*| . |	26	-0.082	-0.080	18.892	0.841
. | . |	. | . |	27	-0.003	-0.022	18.893	0.874
. |*. |	. |*. |	28	0.182	0.089	22.730	0.746

*Probabilities may not be valid for this equation specification.

- CCI (3 hours)

Date: 02/13/19 Time: 09:46
Sample: 2013M06 2018M05
Included observations: 60

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
. | . |	. | . |	1	-0.036	-0.036	0.0800	0.777
. | . |	. | . |	2	-0.063	-0.065	0.3378	0.845
. | . |	. | . |	3	0.052	0.047	0.5133	0.916
.*| . |	.*| . |	4	-0.091	-0.093	1.0679	0.899
. |*. |	. |*. |	5	0.122	0.125	2.0788	0.838
. | . |	. | . |	6	0.031	0.024	2.1466	0.906
. |*. |	. |*. |	7	0.083	0.115	2.6354	0.917
. | . |	. | . |	8	-0.048	-0.063	2.7980	0.946
. | . |	. | . |	9	-0.006	0.028	2.8002	0.972
. |*. |	. |*. |	10	0.133	0.108	4.1260	0.941

<table>
<tr><th></th><th></th><th></th><th></th><th></th><th></th><th></th></tr>
<tr><td>. | . |</td><td>. | . |</td><td>11</td><td>0.007</td><td>0.033</td><td>4.1292</td><td>0.966</td></tr>
<tr><td>. | . |</td><td>. | . |</td><td>12</td><td>0.010</td><td>-0.007</td><td>4.1378</td><td>0.981</td></tr>
<tr><td>.*| . |</td><td>.*| . |</td><td>13</td><td>-0.113</td><td>-0.122</td><td>5.1461</td><td>0.972</td></tr>
<tr><td>.*| . |</td><td>.*| . |</td><td>14</td><td>-0.156</td><td>-0.160</td><td>7.1053</td><td>0.931</td></tr>
<tr><td>. | . |</td><td>. | . |</td><td>15</td><td>0.044</td><td>-0.002</td><td>7.2626</td><td>0.950</td></tr>
<tr><td>. | . |</td><td>. | . |</td><td>16</td><td>0.045</td><td>0.024</td><td>7.4303</td><td>0.964</td></tr>
<tr><td>. | . |</td><td>. | . |</td><td>17</td><td>-0.015</td><td>-0.038</td><td>7.4492</td><td>0.977</td></tr>
<tr><td>.*| . |</td><td>.*| . |</td><td>18</td><td>-0.144</td><td>-0.153</td><td>9.2912</td><td>0.953</td></tr>
<tr><td>.*| . |</td><td>. | . |</td><td>19</td><td>-0.082</td><td>-0.064</td><td>9.9070</td><td>0.955</td></tr>
<tr><td>. | . |</td><td>. | . |</td><td>20</td><td>-0.045</td><td>-0.053</td><td>10.098</td><td>0.966</td></tr>
<tr><td>. | . |</td><td>. | . |</td><td>21</td><td>0.030</td><td>0.046</td><td>10.182</td><td>0.976</td></tr>
<tr><td>. | . |</td><td>.*| . |</td><td>22</td><td>-0.053</td><td>-0.096</td><td>10.455</td><td>0.982</td></tr>
<tr><td>.*| . |</td><td>.*| . |</td><td>23</td><td>-0.140</td><td>-0.106</td><td>12.422</td><td>0.963</td></tr>
<tr><td>.*| . |</td><td>.*| . |</td><td>24</td><td>-0.139</td><td>-0.125</td><td>14.410</td><td>0.937</td></tr>
<tr><td>. |*. |</td><td>. |** |</td><td>25</td><td>0.152</td><td>0.217</td><td>16.853</td><td>0.887</td></tr>
<tr><td>. | . |</td><td>.*| . |</td><td>26</td><td>-0.065</td><td>-0.099</td><td>17.321</td><td>0.899</td></tr>
<tr><td>.*| . |</td><td>.*| . |</td><td>27</td><td>-0.077</td><td>-0.093</td><td>17.988</td><td>0.904</td></tr>
<tr><td>. |*. |</td><td>. |*. |</td><td>28</td><td>0.151</td><td>0.134</td><td>20.643</td><td>0.840</td></tr>
</table>

*Probabilities may not be valid for this equation specification.

- CCI (4 hours)

Date: 02/13/19 Time: 09:44
Sample: 2013M06 2018M05
Included observations: 60

<table>
<tr><th>Autocorrelation</th><th>Partial Correlation</th><th></th><th>AC</th><th>PAC</th><th>Q-Stat</th><th>Prob*</th></tr>
<tr><td>.*| . |</td><td>.*| . |</td><td>1</td><td>-0.085</td><td>-0.085</td><td>0.4539</td><td>0.500</td></tr>
<tr><td>.*| . |</td><td>.*| . |</td><td>2</td><td>-0.103</td><td>-0.111</td><td>1.1314</td><td>0.568</td></tr>
<tr><td>. | . |</td><td>. | . |</td><td>3</td><td>-0.045</td><td>-0.065</td><td>1.2640</td><td>0.738</td></tr>
<tr><td>. | . |</td><td>. | . |</td><td>4</td><td>0.015</td><td>-0.007</td><td>1.2792</td><td>0.865</td></tr>
<tr><td>. | . |</td><td>. | . |</td><td>5</td><td>0.002</td><td>-0.010</td><td>1.2794</td><td>0.937</td></tr>
<tr><td>. |*. |</td><td>. |*. |</td><td>6</td><td>0.096</td><td>0.096</td><td>1.9179</td><td>0.927</td></tr>
<tr><td>. | . |</td><td>. | . |</td><td>7</td><td>0.036</td><td>0.057</td><td>2.0102</td><td>0.959</td></tr>
<tr><td>. | . |</td><td>. |*. |</td><td>8</td><td>0.061</td><td>0.095</td><td>2.2771</td><td>0.971</td></tr>
<tr><td>. | . |</td><td>. | . |</td><td>9</td><td>0.027</td><td>0.068</td><td>2.3311</td><td>0.985</td></tr>
<tr><td>.*| . |</td><td>. | . |</td><td>10</td><td>-0.074</td><td>-0.045</td><td>2.7377</td><td>0.987</td></tr>
<tr><td>.*| . |</td><td>.*| . |</td><td>11</td><td>-0.080</td><td>-0.081</td><td>3.2256</td><td>0.987</td></tr>
<tr><td>. | . |</td><td>. | . |</td><td>12</td><td>0.066</td><td>0.026</td><td>3.5622</td><td>0.990</td></tr>
<tr><td>. | . |</td><td>. | . |</td><td>13</td><td>0.024</td><td>-0.004</td><td>3.6087</td><td>0.995</td></tr>
<tr><td>.*| . |</td><td>.*| . |</td><td>14</td><td>-0.092</td><td>-0.111</td><td>4.2940</td><td>0.993</td></tr>
<tr><td>. | . |</td><td>. | . |</td><td>15</td><td>0.007</td><td>-0.022</td><td>4.2986</td><td>0.997</td></tr>
<tr><td>. | . |</td><td>. | . |</td><td>16</td><td>-0.036</td><td>-0.058</td><td>4.4059</td><td>0.998</td></tr>
<tr><td>. |*. |</td><td>. |*. |</td><td>17</td><td>0.096</td><td>0.098</td><td>5.1975</td><td>0.997</td></tr>
<tr><td>. | . |</td><td>. | . |</td><td>18</td><td>-0.064</td><td>-0.044</td><td>5.5573</td><td>0.998</td></tr>
<tr><td>.*| . |</td><td>.*| . |</td><td>19</td><td>-0.139</td><td>-0.129</td><td>7.3022</td><td>0.992</td></tr>
<tr><td>.*| . |</td><td>.*| . |</td><td>20</td><td>-0.086</td><td>-0.111</td><td>7.9946</td><td>0.992</td></tr>
<tr><td>. |*. |</td><td>. | . |</td><td>21</td><td>0.111</td><td>0.056</td><td>9.1724</td><td>0.988</td></tr>
<tr><td>. |*. |</td><td>. |*. |</td><td>22</td><td>0.174</td><td>0.205</td><td>12.128</td><td>0.955</td></tr>
<tr><td>.*| . |</td><td>.*| . |</td><td>23</td><td>-0.141</td><td>-0.096</td><td>14.129</td><td>0.923</td></tr>
<tr><td>. | . |</td><td>. | . |</td><td>24</td><td>0.035</td><td>0.057</td><td>14.258</td><td>0.941</td></tr>
<tr><td>.*| . |</td><td>.*| . |</td><td>25</td><td>-0.095</td><td>-0.100</td><td>15.212</td><td>0.936</td></tr>
<tr><td>. | . |</td><td>. | . |</td><td>26</td><td>-0.050</td><td>-0.032</td><td>15.486</td><td>0.948</td></tr>
</table>

.*| . |	.*| . |	27	-0.112	-0.134	16.909	0.933
. | . |	.*| . |	28	-0.015	-0.105	16.937	0.950

*Probabilities may not be valid for this equation specification.

- CCI (5 hours)

Date: 02/13/19 Time: 09:42
Sample: 2013M06 2018M05
Included observations: 60

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
.*| . |	.*| . |	1	-0.087	-0.087	0.4751	0.491
.*| . |	.*| . |	2	-0.167	-0.176	2.2656	0.322
. | . |	. | . |	3	0.055	0.023	2.4624	0.482
. | . |	. | . |	4	-0.019	-0.042	2.4869	0.647
.*| . |	.*| . |	5	-0.111	-0.108	3.3227	0.650
. |*. |	. |*. |	6	0.192	0.168	5.8619	0.439
. | . |	. | . |	7	0.008	0.007	5.8668	0.555
.*| . |	. | . |	8	-0.069	-0.003	6.2066	0.624
. | . |	. | . |	9	0.037	0.021	6.3054	0.709
. | . |	. | . |	10	0.064	0.059	6.6141	0.761
.*| . |	. | . |	11	-0.096	-0.043	7.3095	0.773
. | . |	. | . |	12	0.072	0.051	7.7079	0.808
. | . |	.*| . |	13	-0.056	-0.086	7.9605	0.846
.*| . |	. | . |	14	-0.079	-0.055	8.4600	0.864
. |*. |	. |*. |	15	0.177	0.156	11.052	0.749
. |*. |	. |*. |	16	0.131	0.119	12.502	0.709
.*| . |	. | . |	17	-0.085	0.022	13.125	0.728
. | . |	. | . |	18	-0.011	-0.012	13.136	0.783
.*| . |	**| . |	19	-0.182	-0.216	16.151	0.647
.*| . |	.*| . |	20	-0.113	-0.118	17.333	0.631
. |*. |	. | . |	21	0.095	-0.015	18.188	0.637
. |*. |	. | . |	22	0.116	0.049	19.513	0.613
**| . |	**| . |	23	-0.267	-0.246	26.677	0.270
. | . |	. | . |	24	0.047	-0.009	26.906	0.309
. | . |	. | . |	25	0.008	-0.054	26.913	0.360
.*| . |	.*| . |	26	-0.130	-0.075	28.751	0.323
.*| . |	.*| . |	27	-0.109	-0.184	30.098	0.310
. |*. |	. |*. |	28	0.182	0.080	33.954	0.202

*Probabilities may not be valid for this equation specification.

- CCI (6 hours)

Date: 02/13/19 Time: 09:40
Sample: 2013M06 2018M05
Included observations: 60

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
. | . |	. | . |	1	0.023	0.023	0.0345	0.853
.*| . |	.*| . |	2	-0.095	-0.095	0.6073	0.738
. | . |	. | . |	3	0.043	0.048	0.7257	0.867

. | . |	. | . |	4	0.031	0.019	0.7880	0.940
.*| . |	.*| . |	5	-0.123	-0.117	1.8047	0.875
. |** |	. |** |	6	0.270	0.287	6.8180	0.338
. |*. |	. | . |	7	0.089	0.043	7.3796	0.390
. | . |	. | . |	8	-0.052	0.000	7.5709	0.476
. | . |	. | . |	9	0.055	0.068	7.7903	0.555
. | . |	. | . |	10	0.006	-0.051	7.7929	0.649
.*| . |	. | . |	11	-0.075	0.001	8.2174	0.694
. | . |	.*| . |	12	-0.054	-0.127	8.4396	0.750
. | . |	.*| . |	13	-0.061	-0.125	8.7343	0.793
. | . |	. | . |	14	-0.042	-0.023	8.8777	0.839
. |** |	. |*. |	15	0.217	0.201	12.778	0.619
. | . |	. | . |	16	0.023	0.009	12.822	0.686
.*| . |	.*| . |	17	-0.175	-0.144	15.472	0.562
. | . |	. | . |	18	-0.060	-0.026	15.786	0.607
.*| . |	**| . |	19	-0.186	-0.215	18.937	0.461
.*| . |	. | . |	20	-0.140	-0.061	20.761	0.411
. |*. |	. | . |	21	0.092	-0.019	21.562	0.425
. |*. |	. | . |	22	0.118	0.053	22.920	0.406
**| . |	**| . |	23	-0.307	-0.245	32.375	0.093
.*| . |	.*| . |	24	-0.073	-0.080	32.927	0.106
. | . |	. | . |	25	-0.035	-0.020	33.054	0.130
.*| . |	. | . |	26	-0.080	0.010	33.754	0.141
.*| . |	. | . |	27	-0.090	-0.029	34.663	0.148
. |*. |	. |*. |	28	0.196	0.159	39.143	0.079

*Probabilities may not be valid for this equation specification.

- CCI (monthly)

Date: 02/13/19 Time: 09:54
Sample: 2013M06 2018M05
Included observations: 60

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
. |*. |	. |*. |	1	0.164	0.164	1.7027	0.192
. |** |	. |** |	2	0.276	0.256	6.5819	0.037
. | . |	.*| . |	3	-0.054	-0.143	6.7737	0.079
. |*. |	. |*. |	4	0.152	0.122	8.3159	0.081
. | . |	. | . |	5	-0.050	-0.044	8.4837	0.132
. |*. |	. |*. |	6	0.142	0.090	9.8733	0.130
. | . |	. | . |	7	-0.029	-0.018	9.9337	0.192
. |*. |	. | . |	8	0.136	0.071	11.261	0.187
**| . |	**| . |	9	-0.215	-0.234	14.618	0.102
. | . |	. | . |	10	-0.007	-0.009	14.622	0.146
**| . |	.*| . |	11	-0.248	-0.134	19.307	0.056
. | . |	. | . |	12	-0.030	-0.034	19.377	0.080
**| . |	.*| . |	13	-0.209	-0.077	22.847	0.044
.*| . |	.*| . |	14	-0.118	-0.151	23.967	0.046
.*| . |	. | . |	15	-0.192	-0.026	27.017	0.029
. | . |	. | . |	16	-0.010	0.039	27.026	0.041
. | . |	. |*. |	17	0.003	0.158	27.027	0.058
.*| . |	.*| . |	18	-0.075	-0.189	27.527	0.070
.*| . |	. | . |	19	-0.083	0.013	28.151	0.081

. | . |	.*| . |	20	-0.062	-0.069	28.504	0.098
. | . |	. |*. |	21	0.041	0.137	28.661	0.122
. |*. |	. |*. |	22	0.164	0.169	31.282	0.090
. |*. |	. | . |	23	0.177	0.062	34.423	0.059
. | . |	.*| . |	24	0.049	-0.157	34.672	0.073
. | . |	. | . |	25	0.041	-0.063	34.847	0.091
.*| . |	.*| . |	26	-0.098	-0.071	35.892	0.094
. | . |	.*| . |	27	-0.027	-0.091	35.973	0.116
.*| . |	.*| . |	28	-0.149	-0.142	38.546	0.089

*Probabilities may not be valid for this equation specification.

- CORE CPI (1 hour)

Date: 01/22/19 Time: 16:10
Sample: 2013M06 2018M05
Included observations: 60

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
. | . |	. | . |	1	0.020	0.020	0.0255	0.873
.*| . |	.*| . |	2	-0.071	-0.071	0.3455	0.841
**| . |	.*| . |	3	-0.205	-0.203	3.0869	0.378
. | . |	. | . |	4	-0.022	-0.022	3.1194	0.538
. | . |	. | . |	5	0.056	0.030	3.3326	0.649
.*| . |	.*| . |	6	-0.118	-0.172	4.2982	0.636
. | . |	. | . |	7	-0.003	-0.005	4.2988	0.745
.*| . |	.*| . |	8	-0.152	-0.166	5.9581	0.652
. | . |	.*| . |	9	-0.033	-0.102	6.0371	0.736
.*| . |	**| . |	10	-0.175	-0.238	8.3084	0.599
. |*. |	. |*. |	11	0.144	0.075	9.8911	0.540
. |** |	. |*. |	12	0.280	0.212	15.975	0.192
. | . |	. | . |	13	0.042	-0.022	16.116	0.243
. | . |	. | . |	14	-0.016	0.019	16.136	0.305
. | . |	. | . |	15	-0.056	0.065	16.398	0.356
. | . |	. | . |	16	0.028	-0.044	16.463	0.421
. | . |	. | . |	17	-0.033	-0.047	16.554	0.485
**| . |	**| . |	18	-0.219	-0.252	20.821	0.289
. | . |	. | . |	19	-0.022	-0.003	20.863	0.344
. | . |	. | . |	20	-0.043	-0.064	21.037	0.395
. | . |	. | . |	21	0.038	0.000	21.177	0.448
. | . |	. |*. |	22	-0.008	0.077	21.183	0.509
. | . |	. | . |	23	0.023	-0.039	21.236	0.567
. | . |	.*| . |	24	0.056	-0.070	21.561	0.605
. | . |	. | . |	25	0.035	0.008	21.692	0.653
. | . |	.*| . |	26	-0.024	-0.162	21.753	0.702
. | . |	. | . |	27	0.045	0.022	21.986	0.738
. |*. |	. | . |	28	0.115	0.031	23.524	0.706

*Probabilities may not be valid for this equation specification.

- CORE CPI (2 hours)

Date: 01/22/19 Time: 16:08
Sample: 2013M06 2018M05
Included observations: 60

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
. | . |	. | . |	1	-0.049	-0.049	0.1540	0.695
.*| . |	.*| . |	2	-0.118	-0.121	1.0491	0.592
. | . |	. | . |	3	-0.037	-0.051	1.1397	0.768
. | . |	.*| . |	4	-0.046	-0.067	1.2802	0.865
. |*. |	. |*. |	5	0.109	0.094	2.0893	0.837
.*| . |	.*| . |	6	-0.128	-0.136	3.2157	0.781
. |*. |	. |*. |	7	0.153	0.169	4.8642	0.677
.*| . |	.*| . |	8	-0.090	-0.117	5.4492	0.709
. | . |	. | . |	9	-0.002	0.046	5.4496	0.793
.*| . |	.*| . |	10	-0.067	-0.125	5.7789	0.833
. | . |	. | . |	11	-0.000	0.057	5.7789	0.888
. |*. |	. | . |	12	0.150	0.058	7.5305	0.821
. | . |	. | . |	13	-0.054	0.026	7.7591	0.859
. | . |	. | . |	14	0.071	0.037	8.1633	0.881
.*| . |	.*| . |	15	-0.200	-0.158	11.459	0.719
.*| . |	.*| . |	16	-0.077	-0.100	11.960	0.747
. | . |	. | . |	17	0.025	-0.029	12.014	0.799
.*| . |	.*| . |	18	-0.147	-0.183	13.931	0.734
. | . |	. | . |	19	0.050	-0.024	14.157	0.774
. | . |	. | . |	20	0.043	0.059	14.327	0.814
. | . |	. | . |	21	0.065	0.024	14.726	0.836
.*| . |	. | . |	22	-0.070	-0.012	15.204	0.853
. | . |	. | . |	23	0.001	0.034	15.204	0.887
. | . |	. | . |	24	0.051	-0.012	15.471	0.906
. |*. |	. |*. |	25	0.112	0.159	16.798	0.889
. | . |	. | . |	26	0.020	-0.025	16.843	0.914
. | . |	. | . |	27	-0.049	0.069	17.118	0.928
. | . |	. | . |	28	0.042	0.013	17.323	0.942

*Probabilities may not be valid for this equation specification.

- CORE CPI (3 hours)

Date: 01/22/19 Time: 16:07
Sample: 2013M06 2018M05
Included observations: 60

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
. | . |	. | . |	1	-0.014	-0.014	0.0115	0.914
.*| . |	.*| . |	2	-0.191	-0.191	2.3448	0.310
. | . |	. | . |	3	0.010	0.005	2.3514	0.503
. | . |	.*| . |	4	-0.053	-0.093	2.5381	0.638
. | . |	. | . |	5	0.028	0.030	2.5921	0.763
. | . |	.*| . |	6	-0.056	-0.088	2.8050	0.833
. | . |	. | . |	7	0.002	0.015	2.8053	0.902
.*| . |	.*| . |	8	-0.080	-0.121	3.2585	0.917
. | . |	. |*. |	9	0.067	0.080	3.5819	0.937
. | . |	. | . |	10	0.018	-0.040	3.6071	0.963

. | . |	. |*. |	11	0.030	0.078	3.6770	0.978
. |*. |	. |*. |	12	0.105	0.080	4.5310	0.972
. | . |	. | . |	13	0.013	0.064	4.5436	0.984
. | . |	. |*. |	14	0.074	0.100	4.9816	0.986
.*| . |	.*| . |	15	-0.139	-0.112	6.5725	0.968
. | . |	. | . |	16	-0.065	-0.028	6.9330	0.975
. | . |	. | . |	17	0.016	-0.029	6.9553	0.984
.*| . |	.*| . |	18	-0.106	-0.112	7.9472	0.979
. | . |	. | . |	19	0.059	0.044	8.2676	0.984
. | . |	. | . |	20	0.050	0.029	8.5025	0.988
. | . |	. | . |	21	-0.034	-0.039	8.6153	0.992
.*| . |	.*| . |	22	-0.086	-0.093	9.3419	0.991
. | . |	. | . |	23	0.028	-0.022	9.4227	0.994
. | . |	. | . |	24	0.042	-0.016	9.6021	0.996
. |*. |	. |*. |	25	0.133	0.159	11.494	0.990
. | . |	. | . |	26	-0.014	-0.041	11.515	0.994
. | . |	. | . |	27	-0.064	0.070	11.973	0.994
. | . |	. | . |	28	0.067	0.059	12.489	0.995

*Probabilities may not be valid for this equation specification.

- CORE CPI (4 hours)

Date: 01/22/19 Time: 16:06
Sample: 2013M06 2018M05
Included observations: 60

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
**| . |	**| . |	1	-0.222	-0.222	3.1035	0.078
.*| . |	.*| . |	2	-0.076	-0.131	3.4705	0.176
. |*. |	. | . |	3	0.112	0.069	4.2958	0.231
.*| . |	. | . |	4	-0.071	-0.040	4.6319	0.327
. | . |	. | . |	5	0.056	0.052	4.8474	0.435
. | . |	. |*. |	6	0.071	0.084	5.1975	0.519
. | . |	. |*. |	7	0.046	0.109	5.3445	0.618
**| . |	**| . |	8	-0.227	-0.208	9.0333	0.339
. |*. |	. |*. |	9	0.205	0.126	12.084	0.209
. | . |	. | . |	10	0.034	0.065	12.169	0.274
. | . |	. |*. |	11	-0.016	0.077	12.189	0.350
. | . |	. | . |	12	0.020	-0.031	12.219	0.428
.*| . |	. | . |	13	-0.088	-0.064	12.832	0.461
. |*. |	. |*. |	14	0.112	0.097	13.855	0.461
.*| . |	**| . |	15	-0.199	-0.207	17.116	0.312
. | . |	.*| . |	16	0.042	-0.094	17.267	0.369
. | . |	. | . |	17	0.022	0.021	17.310	0.434
.*| . |	.*| . |	18	-0.133	-0.092	18.867	0.400
. |*. |	. |*. |	19	0.159	0.110	21.158	0.328
. | . |	. | . |	20	-0.043	-0.017	21.328	0.378
. | . |	. | . |	21	-0.012	0.033	21.340	0.438
.*| . |	.*| . |	22	-0.112	-0.090	22.561	0.427
. |*. |	. | . |	23	0.098	-0.014	23.521	0.431
. | . |	. |*. |	24	0.036	0.119	23.655	0.481
. | . |	. |*. |	25	0.045	0.150	23.867	0.527
. | . |	. | . |	26	-0.008	-0.029	23.874	0.583

. | . |	. |*. |	27	-0.009	0.125	23.885	0.637
. | . |	. | . |	28	0.063	0.007	24.344	0.663

*Probabilities may not be valid for this equation specification.

- CORE CPI (5 hours)

Date: 01/22/19 Time: 16:04
Sample: 2013M06 2018M05
Included observations: 60

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
.*| . |	.*| . |	1	-0.163	-0.163	1.6782	0.195
.*| . |	.*| . |	2	-0.084	-0.114	2.1342	0.344
. | . |	.*| . |	3	-0.035	-0.071	2.2124	0.530
.*| . |	.*| . |	4	-0.102	-0.137	2.8988	0.575
. | . |	. | . |	5	0.023	-0.035	2.9332	0.710
. | . |	. | . |	6	-0.006	-0.040	2.9355	0.817
. | . |	. | . |	7	0.054	0.032	3.1372	0.872
.*| . |	.*| . |	8	-0.150	-0.163	4.7553	0.783
. |*. |	. |*. |	9	0.153	0.111	6.4699	0.692
. | . |	. | . |	10	0.022	0.038	6.5068	0.771
.*| . |	. | . |	11	-0.080	-0.050	6.9874	0.800
. | . |	. | . |	12	0.025	-0.009	7.0361	0.855
.*| . |	.*| . |	13	-0.098	-0.080	7.7968	0.857
. |*. |	. |*. |	14	0.122	0.096	9.0008	0.831
.*| . |	**| . |	15	-0.203	-0.213	12.417	0.647
. | . |	.*| . |	16	-0.029	-0.128	12.488	0.710
. | . |	. | . |	17	0.027	-0.029	12.551	0.766
. | . |	.*| . |	18	-0.036	-0.078	12.667	0.811
. |*. |	. | . |	19	0.150	0.052	14.703	0.741
. | . |	. | . |	20	-0.009	0.013	14.711	0.793
. | . |	.*| . |	21	-0.057	-0.071	15.021	0.822
.*| . |	.*| . |	22	-0.098	-0.070	15.957	0.818
. | . |	. | . |	23	0.043	-0.059	16.146	0.849
. |*. |	. |*. |	24	0.096	0.103	17.096	0.845
. | . |	. |*. |	25	0.059	0.132	17.462	0.864
. | . |	. | . |	26	-0.008	-0.033	17.469	0.894
. | . |	. |*. |	27	0.028	0.124	17.558	0.916
. | . |	. | . |	28	0.050	0.055	17.846	0.930

*Probabilities may not be valid for this equation specification.

- CORE CPI (6 hours)

Date: 01/22/19 Time: 16:03
Sample: 2013M06 2018M05
Included observations: 60

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
.*| . |	.*| . |	1	-0.095	-0.095	0.5746	0.448
. |*. |	. |*. |	2	0.120	0.112	1.5030	0.472
.*| . |	.*| . |	3	-0.173	-0.156	3.4631	0.326

<table>
<tr><th></th><th></th><th></th><th></th><th></th><th></th><th></th></tr>
<tr><td>.*| . |</td><td>.*| . |</td><td>4</td><td>-0.112</td><td>-0.158</td><td>4.3002</td><td>0.367</td></tr>
<tr><td>. | . |</td><td>. |*. |</td><td>5</td><td>0.058</td><td>0.078</td><td>4.5299</td><td>0.476</td></tr>
<tr><td>. | . |</td><td>. | . |</td><td>6</td><td>-0.003</td><td>0.012</td><td>4.5307</td><td>0.605</td></tr>
<tr><td>. |*. |</td><td>. | . |</td><td>7</td><td>0.124</td><td>0.067</td><td>5.6060</td><td>0.586</td></tr>
<tr><td>.*| . |</td><td>.*| . |</td><td>8</td><td>-0.093</td><td>-0.079</td><td>6.2283</td><td>0.622</td></tr>
<tr><td>. |*. |</td><td>. | . |</td><td>9</td><td>0.077</td><td>0.064</td><td>6.6569</td><td>0.673</td></tr>
<tr><td>. | . |</td><td>. | . |</td><td>10</td><td>0.004</td><td>0.070</td><td>6.6581</td><td>0.757</td></tr>
<tr><td>. |*. |</td><td>. |*. |</td><td>11</td><td>0.089</td><td>0.080</td><td>7.2594</td><td>0.778</td></tr>
<tr><td>. | . |</td><td>. | . |</td><td>12</td><td>0.005</td><td>-0.002</td><td>7.2614</td><td>0.840</td></tr>
<tr><td>. | . |</td><td>. | . |</td><td>13</td><td>-0.049</td><td>-0.035</td><td>7.4532</td><td>0.877</td></tr>
<tr><td>. | . |</td><td>. | . |</td><td>14</td><td>0.012</td><td>0.032</td><td>7.4647</td><td>0.915</td></tr>
<tr><td>**| . |</td><td>**| . |</td><td>15</td><td>-0.273</td><td>-0.253</td><td>13.628</td><td>0.554</td></tr>
<tr><td>. | . |</td><td>. | . |</td><td>16</td><td>0.066</td><td>-0.023</td><td>13.998</td><td>0.599</td></tr>
<tr><td>.*| . |</td><td>.*| . |</td><td>17</td><td>-0.113</td><td>-0.066</td><td>15.112</td><td>0.587</td></tr>
<tr><td>. |*. |</td><td>. | . |</td><td>18</td><td>0.080</td><td>-0.032</td><td>15.674</td><td>0.615</td></tr>
<tr><td>. |*. |</td><td>. | . |</td><td>19</td><td>0.074</td><td>0.054</td><td>16.171</td><td>0.646</td></tr>
<tr><td>. | . |</td><td>. | . |</td><td>20</td><td>0.040</td><td>0.055</td><td>16.323</td><td>0.696</td></tr>
<tr><td>. | . |</td><td>. | . |</td><td>21</td><td>-0.036</td><td>-0.064</td><td>16.446</td><td>0.744</td></tr>
<tr><td>.*| . |</td><td>. | . |</td><td>22</td><td>-0.117</td><td>-0.059</td><td>17.784</td><td>0.719</td></tr>
<tr><td>. | . |</td><td>. | . |</td><td>23</td><td>0.035</td><td>0.043</td><td>17.909</td><td>0.762</td></tr>
<tr><td>. |*. |</td><td>. |*. |</td><td>24</td><td>0.077</td><td>0.167</td><td>18.528</td><td>0.777</td></tr>
<tr><td>. | . |</td><td>. | . |</td><td>25</td><td>0.063</td><td>0.039</td><td>18.948</td><td>0.800</td></tr>
<tr><td>.*| . |</td><td>.*| . |</td><td>26</td><td>-0.089</td><td>-0.102</td><td>19.814</td><td>0.800</td></tr>
<tr><td>. | . |</td><td>. | . |</td><td>27</td><td>0.018</td><td>0.058</td><td>19.853</td><td>0.837</td></tr>
<tr><td>. | . |</td><td>. | . |</td><td>28</td><td>-0.019</td><td>0.066</td><td>19.894</td><td>0.868</td></tr>
</table>

*Probabilities may not be valid for this equation specification.

- CORE CPI (monthly)

Date: 01/24/19 Time: 11:49
Sample: 2013M06 2018M05
Included observations: 60

<table>
<tr><th>Autocorrelation</th><th>Partial Correlation</th><th></th><th>AC</th><th>PAC</th><th>Q-Stat</th><th>Prob*</th></tr>
<tr><td>. |*. |</td><td>. |*. |</td><td>1</td><td>0.108</td><td>0.108</td><td>0.7381</td><td>0.390</td></tr>
<tr><td>. |** |</td><td>. |** |</td><td>2</td><td>0.224</td><td>0.215</td><td>3.9519</td><td>0.139</td></tr>
<tr><td>. | . |</td><td>. | . |</td><td>3</td><td>0.033</td><td>-0.009</td><td>4.0250</td><td>0.259</td></tr>
<tr><td>. |** |</td><td>. |*. |</td><td>4</td><td>0.247</td><td>0.209</td><td>8.0710</td><td>0.089</td></tr>
<tr><td>.*| . |</td><td>.*| . |</td><td>5</td><td>-0.067</td><td>-0.123</td><td>8.3728</td><td>0.137</td></tr>
<tr><td>. | . |</td><td>. | . |</td><td>6</td><td>0.068</td><td>-0.001</td><td>8.6954</td><td>0.191</td></tr>
<tr><td>. | . |</td><td>. | . |</td><td>7</td><td>-0.018</td><td>0.008</td><td>8.7182</td><td>0.274</td></tr>
<tr><td>. | . |</td><td>.*| . |</td><td>8</td><td>-0.045</td><td>-0.119</td><td>8.8658</td><td>0.354</td></tr>
<tr><td>.*| . |</td><td>. | . |</td><td>9</td><td>-0.086</td><td>-0.024</td><td>9.4019</td><td>0.401</td></tr>
<tr><td>. | . |</td><td>. | . |</td><td>10</td><td>0.032</td><td>0.054</td><td>9.4758</td><td>0.488</td></tr>
<tr><td>.*| . |</td><td>.*| . |</td><td>11</td><td>-0.156</td><td>-0.154</td><td>11.312</td><td>0.417</td></tr>
<tr><td>.*| . |</td><td>.*| . |</td><td>12</td><td>-0.141</td><td>-0.099</td><td>12.851</td><td>0.380</td></tr>
<tr><td>.*| . |</td><td>. | . |</td><td>13</td><td>-0.082</td><td>0.009</td><td>13.385</td><td>0.419</td></tr>
<tr><td>. | . |</td><td>. | . |</td><td>14</td><td>-0.061</td><td>-0.047</td><td>13.689</td><td>0.473</td></tr>
<tr><td>.*| . |</td><td>. | . |</td><td>15</td><td>-0.098</td><td>0.004</td><td>14.482</td><td>0.489</td></tr>
<tr><td>.*| . |</td><td>.*| . |</td><td>16</td><td>-0.132</td><td>-0.097</td><td>15.945</td><td>0.457</td></tr>
<tr><td>. | . |</td><td>. |*. |</td><td>17</td><td>0.037</td><td>0.081</td><td>16.061</td><td>0.520</td></tr>
<tr><td>. | . |</td><td>. | . |</td><td>18</td><td>-0.005</td><td>0.061</td><td>16.063</td><td>0.588</td></tr>
<tr><td>. | . |</td><td>.*| . |</td><td>19</td><td>-0.061</td><td>-0.108</td><td>16.396</td><td>0.631</td></tr>
</table>

. | . |	. |*. |	20	0.069	0.113	16.841	0.663
. | . |	.*| . |	21	-0.033	-0.085	16.947	0.714
. |*. |	. |*. |	22	0.100	0.090	17.934	0.710
. | . |	. | . |	23	0.049	0.066	18.179	0.748
. |** |	. |*. |	24	0.220	0.098	23.195	0.508
.*| . |	**| . |	25	-0.148	-0.205	25.531	0.433
. | . |	. | . |	26	0.012	-0.061	25.548	0.488
.*| . |	.*| . |	27	-0.094	-0.117	26.546	0.488
. | . |	.*| . |	28	-0.016	-0.081	26.578	0.541

*Probabilities may not be valid for this equation specification.

- CPI (1 hour)

Date: 01/24/19 Time: 11:27
Sample: 2013M06 2018M05
Included observations: 60

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
.*| . |	.*| . |	1	-0.114	-0.114	0.8235	0.364
. | . |	. | . |	2	-0.033	-0.047	0.8933	0.640
.*| . |	.*| . |	3	-0.107	-0.118	1.6448	0.649
. | . |	. | . |	4	-0.025	-0.056	1.6874	0.793
. | . |	. | . |	5	0.010	-0.011	1.6942	0.890
.*| . |	.*| . |	6	-0.068	-0.087	2.0090	0.919
. | . |	.*| . |	7	-0.050	-0.082	2.1815	0.949
.*| . |	.*| . |	8	-0.161	-0.198	4.0426	0.853
. | . |	. | . |	9	0.042	-0.040	4.1696	0.900
.*| . |	.*| . |	10	-0.070	-0.129	4.5320	0.920
. |*. |	. | . |	11	0.131	0.050	5.8367	0.884
. |** |	. |** |	12	0.300	0.317	12.830	0.382
.*| . |	. | . |	13	-0.071	0.003	13.228	0.430
. | . |	. | . |	14	-0.061	-0.054	13.524	0.486
.*| . |	. | . |	15	-0.073	-0.048	13.968	0.528
. | . |	. | . |	16	0.018	-0.043	13.995	0.599
. | . |	.*| . |	17	-0.052	-0.077	14.231	0.651
**| . |	**| . |	18	-0.272	-0.337	20.793	0.290
. | . |	. | . |	19	0.061	0.038	21.125	0.330
.*| . |	. | . |	20	-0.094	-0.060	21.951	0.343
. | . |	.*| . |	21	0.036	-0.107	22.072	0.395
. | . |	. |*. |	22	0.064	0.076	22.469	0.432
. |*. |	. | . |	23	0.103	0.008	23.527	0.430
. | . |	. | . |	24	0.070	-0.059	24.037	0.460
. | . |	. | . |	25	0.013	-0.007	24.055	0.516
.*| . |	.*| . |	26	-0.078	-0.148	24.725	0.535
. | . |	. |*. |	27	0.048	0.092	24.982	0.575
. |*. |	. | . |	28	0.089	0.036	25.896	0.579

*Probabilities may not be valid for this equation specification.

- CPI (2 hours)

Date: 01/22/19 Time: 15:57
Sample: 2013M06 2018M05
Included observations: 60

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
.*| . |	.*| . |	1	-0.074	-0.074	0.3420	0.559
.*| . |	.*| . |	2	-0.153	-0.159	1.8452	0.397
. | . |	. | . |	3	0.073	0.050	2.1929	0.533
.*| . |	.*| . |	4	-0.074	-0.091	2.5559	0.635
. | . |	. | . |	5	-0.007	-0.001	2.5596	0.768
. | . |	. | . |	6	-0.022	-0.055	2.5938	0.858
. |*. |	. |*. |	7	0.091	0.098	3.1718	0.869
.*| . |	**| . |	8	-0.192	-0.209	5.8139	0.668
. |*. |	. |*. |	9	0.088	0.112	6.3809	0.701
. | . |	.*| . |	10	-0.019	-0.112	6.4081	0.780
. | . |	. |*. |	11	0.006	0.097	6.4108	0.845
. |*. |	. | . |	12	0.127	0.048	7.6545	0.812
. | . |	. | . |	13	-0.054	0.019	7.8877	0.851
. | . |	. | . |	14	0.041	0.022	8.0253	0.888
**| . |	**| . |	15	-0.269	-0.262	14.005	0.525
. | . |	.*| . |	16	-0.026	-0.073	14.063	0.594
. | . |	.*| . |	17	-0.021	-0.113	14.101	0.660
.*| . |	.*| . |	18	-0.131	-0.155	15.626	0.619
. |*. |	. | . |	19	0.124	0.065	17.027	0.588
. | . |	. | . |	20	-0.039	-0.059	17.165	0.642
. | . |	. | . |	21	0.021	0.017	17.207	0.698
. | . |	. | . |	22	-0.014	-0.001	17.226	0.751
. | . |	. | . |	23	0.061	-0.033	17.600	0.779
. |*. |	. |*. |	24	0.090	0.132	18.432	0.782
. |*. |	. |*. |	25	0.110	0.150	19.712	0.762
. | . |	. | . |	26	0.001	0.008	19.712	0.805
. | . |	. |*. |	27	-0.061	0.148	20.128	0.825
. | . |	. | . |	28	0.052	-0.015	20.446	0.848

*Probabilities may not be valid for this equation specification.

- CPI (3 hours)

Date: 01/22/19 Time: 15:56
Sample: 2013M06 2018M05
Included observations: 60

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
. | . |	. | . |	1	-0.056	-0.056	0.1997	0.655
**| . |	**| . |	2	-0.299	-0.303	5.9164	0.052
. |*. |	. |*. |	3	0.130	0.100	7.0157	0.071
.*| . |	.*| . |	4	-0.074	-0.168	7.3785	0.117
.*| . |	. | . |	5	-0.068	-0.008	7.6952	0.174
. | . |	. | . |	6	0.061	-0.033	7.9551	0.241
. | . |	. | . |	7	-0.044	-0.046	8.0895	0.325
.*| . |	.*| . |	8	-0.180	-0.203	10.411	0.237
. |*. |	. |*. |	9	0.129	0.088	11.632	0.235
. | . |	.*| . |	10	0.027	-0.092	11.688	0.306

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
. | . |	. |*. |	11	0.020	0.139	11.717	0.385
. |*. |	. | . |	12	0.087	-0.002	12.302	0.422
. | . |	. |*. |	13	0.040	0.147	12.429	0.493
. | . |	. | . |	14	0.043	0.066	12.581	0.560
.*| . |	.*| . |	15	-0.202	-0.178	15.942	0.386
. | . |	. | . |	16	0.008	0.030	15.948	0.457
. | . |	.*| . |	17	-0.010	-0.125	15.956	0.527
.*| . |	. | . |	18	-0.095	-0.043	16.759	0.540
. |*. |	. |*. |	19	0.131	0.101	18.310	0.502
. | . |	.*| . |	20	-0.035	-0.086	18.427	0.559
.*| . |	. | . |	21	-0.104	-0.016	19.458	0.556
. | . |	.*| . |	22	-0.001	-0.120	19.458	0.617
. | . |	.*| . |	23	0.056	-0.072	19.774	0.656
. |*. |	. |*. |	24	0.080	0.127	20.434	0.672
. |*. |	. |*. |	25	0.126	0.089	22.124	0.629
. | . |	. |*. |	26	-0.019	0.084	22.163	0.680
. | . |	. |*. |	27	-0.061	0.105	22.584	0.707
. | . |	. | . |	28	0.071	0.042	23.173	0.724

*Probabilities may not be valid for this equation specification.

- CPI (4 hours)

Date: 01/22/19 Time: 15:55
Sample: 2013M06 2018M05
Included observations: 60

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
.*| . |	.*| . |	1	-0.201	-0.201	2.5416	0.111
.*| . |	.*| . |	2	-0.116	-0.163	3.4059	0.182
. |*. |	. |*. |	3	0.177	0.126	5.4576	0.141
.*| . |	. | . |	4	-0.096	-0.052	6.0654	0.194
. | . |	. | . |	5	-0.024	-0.018	6.1058	0.296
. |*. |	. |*. |	6	0.130	0.090	7.2773	0.296
. | . |	. | . |	7	-0.001	0.064	7.2773	0.401
**| . |	**| . |	8	-0.251	-0.235	11.792	0.161
. |*. |	. |*. |	9	0.207	0.102	14.922	0.093
. | . |	. | . |	10	0.024	0.045	14.964	0.133
. | . |	. |*. |	11	0.030	0.162	15.031	0.181
. | . |	. | . |	12	0.017	-0.036	15.053	0.239
.*| . |	. | . |	13	-0.076	-0.058	15.505	0.277
. | . |	. | . |	14	0.061	0.068	15.810	0.325
.*| . |	**| . |	15	-0.184	-0.214	18.620	0.231
. | . |	.*| . |	16	0.023	-0.106	18.664	0.286
. | . |	. | . |	17	0.014	-0.006	18.679	0.347
.*| . |	.*| . |	18	-0.133	-0.093	20.241	0.319
. |*. |	. |*. |	19	0.151	0.169	22.305	0.269
. | . |	.*| . |	20	-0.034	-0.075	22.414	0.318
. | . |	. | . |	21	-0.042	0.012	22.581	0.367
. | . |	.*| . |	22	-0.050	-0.090	22.830	0.411
. |*. |	. | . |	23	0.108	0.011	24.003	0.404
. | . |	. |*. |	24	0.048	0.180	24.245	0.448
. | . |	. |*. |	25	0.055	0.149	24.561	0.487
. | . |	. | . |	26	-0.006	0.025	24.565	0.544

. | . |	. |*. |	27	-0.016	0.139	24.596	0.597
. | . |	. | . |	28	0.067	-0.031	25.115	0.622

*Probabilities may not be valid for this equation specification.

- CPI (5 hours)

Date: 01/22/19 Time: 15:53
Sample: 2013M06 2018M05
Included observations: 60

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
.*| . |	.*| . |	1	-0.120	-0.120	0.9114	0.340
.*| . |	.*| . |	2	-0.136	-0.153	2.0996	0.350
. | . |	. | . |	3	0.037	-0.000	2.1886	0.534
.*| . |	.*| . |	4	-0.124	-0.145	3.2032	0.524
. | . |	.*| . |	5	-0.039	-0.074	3.3069	0.653
. | . |	. | . |	6	0.054	-0.002	3.5093	0.743
. | . |	. | . |	7	0.026	0.020	3.5568	0.829
**| . |	**| . |	8	-0.216	-0.232	6.8817	0.549
. |*. |	. |*. |	9	0.168	0.111	8.9494	0.442
. | . |	. | . |	10	0.032	0.003	9.0245	0.530
. | . |	. | . |	11	0.004	0.066	9.0256	0.620
. | . |	. | . |	12	0.061	0.018	9.3162	0.676
.*| . |	.*| . |	13	-0.108	-0.072	10.241	0.674
. | . |	. | . |	14	0.042	0.067	10.381	0.734
.*| . |	**| . |	15	-0.191	-0.219	13.390	0.572
. | . |	.*| . |	16	-0.054	-0.140	13.633	0.626
. | . |	.*| . |	17	-0.004	-0.070	13.634	0.693
. | . |	.*| . |	18	-0.052	-0.127	13.873	0.737
. |*. |	. | . |	19	0.122	0.054	15.226	0.708
. | . |	.*| . |	20	-0.044	-0.114	15.404	0.753
. | . |	.*| . |	21	-0.060	-0.136	15.752	0.783
. | . |	. | . |	22	-0.033	-0.062	15.857	0.823
. | . |	.*| . |	23	0.065	-0.084	16.278	0.843
. |*. |	. |*. |	24	0.102	0.128	17.350	0.833
. |*. |	. |*. |	25	0.088	0.144	18.178	0.835
. | . |	. | . |	26	0.018	0.071	18.214	0.868
. | . |	. |*. |	27	-0.017	0.191	18.248	0.896
. | . |	. | . |	28	0.048	0.057	18.515	0.912

*Probabilities may not be valid for this equation specification.

- CPI (6 hours)

Date: 01/22/19 Time: 15:52
Sample: 2013M06 2018M05
Included observations: 60

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
. | . |	. | . |	1	-0.027	-0.027	0.0463	0.830
. | . |	. | . |	2	0.011	0.010	0.0540	0.973
. | . |	. | . |	3	-0.006	-0.005	0.0560	0.997

.*| . |	.*| . |	4	-0.073	-0.073	0.4065	0.982
. | . |	. | . |	5	-0.026	-0.030	0.4528	0.994
. | . |	. | . |	6	0.031	0.032	0.5208	0.998
. | . |	. | . |	7	-0.001	0.000	0.5209	0.999
.*| . |	.*| . |	8	-0.173	-0.181	2.6660	0.954
. |*. |	. |*. |	9	0.129	0.121	3.8863	0.919
. | . |	. | . |	10	0.003	0.019	3.8872	0.952
. | . |	. | . |	11	0.050	0.046	4.0763	0.968
. | . |	. | . |	12	-0.012	-0.040	4.0883	0.982
. | . |	. | . |	13	-0.015	-0.005	4.1060	0.990
. | . |	. | . |	14	0.027	0.051	4.1649	0.994
**| . |	**| . |	15	-0.245	-0.261	9.1256	0.871
. | . |	. | . |	16	0.016	-0.022	9.1462	0.907
.*| . |	.*| . |	17	-0.110	-0.071	10.191	0.895
. | . |	. | . |	18	0.025	0.019	10.246	0.924
. | . |	. | . |	19	0.005	-0.021	10.248	0.947
. | . |	. | . |	20	0.016	-0.027	10.271	0.963
.*| . |	. | . |	21	-0.069	-0.058	10.730	0.968
. | . |	. | . |	22	-0.045	-0.051	10.925	0.976
. | . |	.*| . |	23	0.023	-0.071	10.978	0.983
. |*. |	. |*. |	24	0.113	0.189	12.302	0.976
. |*. |	. | . |	25	0.097	0.070	13.300	0.973
. | . |	. | . |	26	-0.051	-0.014	13.587	0.978
. | . |	. | . |	27	0.012	-0.005	13.602	0.985
. | . |	. | . |	28	-0.053	-0.035	13.933	0.988

*Probabilities may not be valid for this equation specification.

- CPI (monthly)

Date: 01/24/19 Time: 11:02
Sample: 2013M06 2018M05
Included observations: 60

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
. | . |	. | . |	1	0.032	0.032	0.0653	0.798
. |*. |	. |*. |	2	0.188	0.187	2.3242	0.313
. | . |	. | . |	3	-0.030	-0.042	2.3828	0.497
. |** |	. |*. |	4	0.213	0.187	5.4034	0.248
. | . |	. | . |	5	-0.044	-0.049	5.5355	0.354
. |*. |	. | . |	6	0.126	0.066	6.6374	0.356
. | . |	. | . |	7	-0.031	-0.011	6.7033	0.460
.*| . |	.*| . |	8	-0.075	-0.156	7.1019	0.526
.*| . |	.*| . |	9	-0.125	-0.091	8.2477	0.509
. | . |	. | . |	10	0.033	0.039	8.3294	0.597
.*| . |	.*| . |	11	-0.155	-0.131	10.149	0.517
.*| . |	.*| . |	12	-0.098	-0.077	10.896	0.538
.*| . |	. | . |	13	-0.105	-0.023	11.776	0.546
.*| . |	.*| . |	14	-0.095	-0.085	12.510	0.565
.*| . |	. | . |	15	-0.079	0.016	13.029	0.600
.*| . |	.*| . |	16	-0.116	-0.104	14.158	0.587
. | . |	. |*. |	17	0.048	0.090	14.356	0.642
. | . |	. |*. |	18	0.020	0.102	14.391	0.703
.*| . |	.*| . |	19	-0.082	-0.143	15.006	0.722

. | . |	. |*. |	20	0.053	0.081	15.270	0.761
. | . |	. | . |	21	-0.006	-0.028	15.274	0.809
. |*. |	. | . |	22	0.110	0.056	16.456	0.793
. | . |	. | . |	23	0.055	0.068	16.761	0.821
. |** |	. |*. |	24	0.225	0.124	21.969	0.581
.*| . |	.*| . |	25	-0.107	-0.155	23.181	0.567
. | . |	. | . |	26	0.030	-0.030	23.277	0.617
. | . |	.*| . |	27	-0.056	-0.104	23.625	0.651
. | . |	.*| . |	28	0.036	-0.078	23.773	0.693

*Probabilities may not be valid for this equation specification.

- PMI (1 hour)

Date: 01/22/19 Time: 15:13
Sample: 2013M06 2018M05
Included observations: 60

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
.*| . |	.*| . |	1	-0.101	-0.101	0.6479	0.421
. |*. |	. |*. |	2	0.091	0.082	1.1816	0.554
. | . |	. |*. |	3	0.072	0.091	1.5217	0.677
. | . |	. | . |	4	-0.036	-0.029	1.6084	0.807
. | . |	. | . |	5	-0.023	-0.045	1.6444	0.896
. | . |	. | . |	6	0.026	0.019	1.6905	0.946
. | . |	. | . |	7	-0.007	0.010	1.6937	0.975
**| . |	**| . |	8	-0.237	-0.244	5.7241	0.678
. | . |	.*| . |	9	-0.032	-0.092	5.7978	0.760
.*| . |	.*| . |	10	-0.119	-0.090	6.8505	0.739
.*| . |	.*| . |	11	-0.187	-0.179	9.5186	0.574
. | . |	.*| . |	12	-0.045	-0.096	9.6723	0.645
. | . |	. | . |	13	0.029	0.041	9.7377	0.715
.*| . |	.*| . |	14	-0.158	-0.133	11.752	0.626
. |*. |	. |*. |	15	0.127	0.078	13.094	0.595
. | . |	. | . |	16	0.071	0.062	13.516	0.635
. | . |	. | . |	17	-0.006	-0.010	13.519	0.701
. | . |	.*| . |	18	0.009	-0.089	13.526	0.759
. | . |	.*| . |	19	0.002	-0.125	13.526	0.811
. |*. |	. |*. |	20	0.171	0.138	16.254	0.701
. | . |	. | . |	21	-0.056	-0.061	16.549	0.738
. |*. |	.*| . |	22	0.079	-0.089	17.156	0.755
.*| . |	.*| . |	23	-0.094	-0.104	18.045	0.755
. | . |	. | . |	24	-0.015	-0.003	18.069	0.800
. | . |	. | . |	25	0.026	0.016	18.140	0.836
. | . |	. | . |	26	-0.060	-0.058	18.534	0.856
. | . |	. | . |	27	0.027	0.025	18.616	0.884
.*| . |	.*| . |	28	-0.112	-0.092	20.080	0.862

*Probabilities may not be valid for this equation specification.

- PMI (2 hours)

Date: 01/22/19 Time: 15:11
Sample: 2013M06 2018M05
Included observations: 60

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
. |*. |	. |*. |	1	0.074	0.074	0.3495	0.554
.*| . |	.*| . |	2	-0.078	-0.084	0.7352	0.692
.*| . |	.*| . |	3	-0.195	-0.185	3.2282	0.358
. | . |	. |*. |	4	0.053	0.078	3.4145	0.491
. |*. |	. |*. |	5	0.184	0.155	5.7043	0.336
. | . |	. | . |	6	0.044	-0.009	5.8398	0.441
. | . |	. | . |	7	-0.030	0.009	5.9017	0.551
**| . |	**| . |	8	-0.257	-0.210	10.612	0.225
.*| . |	.*| . |	9	-0.171	-0.174	12.749	0.174
. | . |	. | . |	10	0.025	-0.008	12.797	0.235
. | . |	. | . |	11	0.067	-0.030	13.142	0.284
.*| . |	.*| . |	12	-0.129	-0.176	14.429	0.274
.*| . |	. | . |	13	-0.133	-0.031	15.823	0.259
.*| . |	.*| . |	14	-0.202	-0.182	19.108	0.161
. | . |	. | . |	15	0.048	-0.009	19.298	0.201
. |*. |	. |*. |	16	0.172	0.113	21.808	0.149
. | . |	.*| . |	17	0.025	-0.086	21.861	0.190
. | . |	. | . |	18	-0.034	-0.005	21.964	0.234
.*| . |	.*| . |	19	-0.180	-0.110	24.891	0.164
. | . |	.*| . |	20	0.015	-0.106	24.911	0.205
. |*. |	. |*. |	21	0.203	0.106	28.854	0.118
. |*. |	. | . |	22	0.117	-0.037	30.185	0.114
. | . |	.*| . |	23	-0.058	-0.134	30.525	0.135
.*| . |	. | . |	24	-0.163	-0.047	33.280	0.098
. |*. |	. |*. |	25	0.075	0.087	33.882	0.110
. |*. |	. | . |	26	0.097	-0.064	34.914	0.114
. |*. |	. | . |	27	0.119	0.053	36.501	0.105
.*| . |	.*| . |	28	-0.092	-0.131	37.480	0.109

*Probabilities may not be valid for this equation specification.

- PMI (3 hours)

Date: 01/22/19 Time: 15:09
Sample: 2013M06 2018M05
Included observations: 60

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
. | . |	. | . |	1	0.021	0.021	0.0287	0.865
. | . |	. | . |	2	0.030	0.030	0.0866	0.958
. | . |	. | . |	3	-0.003	-0.004	0.0872	0.993
. |*. |	. |*. |	4	0.176	0.176	2.1519	0.708
. |*. |	. |*. |	5	0.083	0.078	2.6196	0.758
.*| . |	.*| . |	6	-0.109	-0.126	3.4378	0.752
. |*. |	. |*. |	7	0.135	0.143	4.7178	0.694
.*| . |	.*| . |	8	-0.108	-0.147	5.5502	0.697
. | . |	. | . |	9	0.005	-0.027	5.5522	0.784
.*| . |	.*| . |	10	-0.182	-0.146	8.0131	0.628

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
. | . |	. | . |	11	0.002	-0.023	8.0134	0.712
.*| . |	.*| . |	12	-0.102	-0.096	8.8209	0.718
. | . |	. | . |	13	-0.030	0.032	8.8912	0.781
. | . |	. | . |	14	0.026	0.046	8.9450	0.835
. | . |	. | . |	15	-0.040	0.022	9.0799	0.873
. | . |	. | . |	16	-0.008	-0.018	9.0860	0.910
.*| . |	.*| . |	17	-0.160	-0.110	11.304	0.840
. |*. |	. |*. |	18	0.173	0.132	13.950	0.732
. |*. |	. |*. |	19	0.123	0.149	15.316	0.702
. | . |	. | . |	20	0.054	0.008	15.585	0.742
. |*. |	. |*. |	21	0.075	0.125	16.118	0.763
. |*. |	. | . |	22	0.091	0.042	16.932	0.767
. |*. |	. | . |	23	0.077	-0.034	17.527	0.783
. | . |	. | . |	24	-0.053	-0.031	17.817	0.812
. |*. |	. |*. |	25	0.190	0.132	21.656	0.656
. | . |	.*| . |	26	-0.015	-0.087	21.682	0.706
. | . |	.*| . |	27	-0.051	-0.094	21.970	0.739
. | . |	. | . |	28	-0.041	0.014	22.166	0.774

*Probabilities may not be valid for this equation specification.

- PMI (4 hours)

Date: 01/22/19 Time: 15:07
Sample: 2013M06 2018M05
Included observations: 60

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
. | . |	. | . |	1	-0.038	-0.038	0.0927	0.761
. | . |	. | . |	2	-0.019	-0.020	0.1147	0.944
.*| . |	.*| . |	3	-0.088	-0.090	0.6184	0.892
. |*. |	. |*. |	4	0.172	0.166	2.5886	0.629
. | . |	. | . |	5	0.044	0.054	2.7201	0.743
.*| . |	.*| . |	6	-0.078	-0.079	3.1392	0.791
. |** |	. |** |	7	0.231	0.269	6.8974	0.440
.*| . |	.*| . |	8	-0.104	-0.132	7.6741	0.466
. | . |	. | . |	9	0.038	0.017	7.7774	0.557
.*| . |	.*| . |	10	-0.197	-0.141	10.669	0.384
. |*. |	. | . |	11	0.093	-0.014	11.322	0.417
. | . |	. | . |	12	0.033	0.054	11.407	0.494
. | . |	.*| . |	13	-0.056	-0.066	11.653	0.556
. | . |	. | . |	14	-0.006	-0.003	11.656	0.634
. | . |	. |*. |	15	0.019	0.094	11.686	0.703
. | . |	.*| . |	16	0.010	-0.085	11.694	0.765
.*| . |	. | . |	17	-0.142	-0.028	13.431	0.707
. |*. |	. |*. |	18	0.108	0.082	14.460	0.699
. | . |	. | . |	19	0.053	0.011	14.719	0.740
. | . |	. | . |	20	0.057	0.074	15.018	0.775
. |*. |	. |*. |	21	0.090	0.174	15.784	0.782
. | . |	. | . |	22	0.052	0.019	16.047	0.814
. | . |	. | . |	23	-0.019	-0.030	16.084	0.852
.*| . |	. | . |	24	-0.086	-0.056	16.851	0.855
. |*. |	. |*. |	25	0.197	0.143	20.992	0.693
. |*. |	. | . |	26	0.100	0.071	22.076	0.685

. | . |	. | . |	27	0.054	0.015	22.403	0.717
**| . |	.*| . |	28	-0.209	-0.186	27.487	0.492

*Probabilities may not be valid for this equation specification.

- PMI (5 hours)

Date: 01/22/19 Time: 15:05
Sample: 2013M06 2018M05
Included observations: 60

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
. | . |	. | . |	1	0.017	0.017	0.0182	0.893
.*| . |	.*| . |	2	-0.093	-0.094	0.5778	0.749
. |*. |	. |*. |	3	0.128	0.133	1.6488	0.648
. | . |	. | . |	4	0.024	0.009	1.6873	0.793
. | . |	. | . |	5	-0.006	0.018	1.6896	0.890
. | . |	. | . |	6	0.056	0.043	1.9091	0.928
. |*. |	. |*. |	7	0.166	0.165	3.8538	0.796
. |*. |	. |*. |	8	0.094	0.099	4.4835	0.811
. | . |	. | . |	9	0.044	0.065	4.6270	0.866
.*| . |	**| . |	10	-0.169	-0.206	6.7568	0.748
. | . |	. | . |	11	0.053	0.043	6.9669	0.802
. |*. |	. | . |	12	0.109	0.056	7.8821	0.794
.*| . |	.*| . |	13	-0.169	-0.148	10.141	0.682
. |*. |	. | . |	14	0.090	0.071	10.800	0.702
. |*. |	. | . |	15	0.128	0.048	12.154	0.667
.*| . |	.*| . |	16	-0.137	-0.113	13.736	0.618
.*| . |	. | . |	17	-0.097	-0.050	14.555	0.627
. |*. |	. | . |	18	0.085	0.065	15.196	0.648
.*| . |	.*| . |	19	-0.072	-0.079	15.671	0.679
. | . |	. | . |	20	-0.005	0.028	15.674	0.737
. | . |	. | . |	21	-0.022	-0.058	15.722	0.785
. | . |	. | . |	22	-0.026	0.007	15.790	0.826
. | . |	. | . |	23	-0.009	-0.057	15.799	0.864
.*| . |	. | . |	24	-0.077	-0.007	16.411	0.873
. | . |	. |*. |	25	0.013	0.083	16.430	0.901
. |*. |	. |*. |	26	0.159	0.118	19.190	0.828
.*| . |	.*| . |	27	-0.084	-0.103	19.985	0.831
.*| . |	.*| . |	28	-0.185	-0.096	23.961	0.684

*Probabilities may not be valid for this equation specification.

- PMI (6 hours)

Date: 01/22/19 Time: 15:03
Sample: 2013M06 2018M05
Included observations: 60

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
. | . |	. | . |	1	-0.037	-0.037	0.0863	0.769
. |*. |	. |*. |	2	0.121	0.119	1.0184	0.601
. |*. |	. |*. |	3	0.107	0.117	1.7604	0.624

. | . |	. | . |	4	-0.026	-0.032	1.8039	0.772
. | . |	. | . |	5	-0.014	-0.045	1.8173	0.874
.*| . |	.*| . |	6	-0.116	-0.128	2.7496	0.840
. |*. |	. |*. |	7	0.079	0.086	3.1851	0.867
.*| . |	.*| . |	8	-0.138	-0.099	4.5520	0.804
.*| . |	**| . |	9	-0.202	-0.218	7.5316	0.582
. | . |	. | . |	10	0.002	-0.014	7.5320	0.674
. | . |	. | . |	11	-0.057	0.024	7.7748	0.733
.*| . |	.*| . |	12	-0.136	-0.116	9.2091	0.685
. | . |	. | . |	13	-0.033	-0.051	9.2969	0.750
.*| . |	.*| . |	14	-0.117	-0.149	10.409	0.732
. |*. |	. |*. |	15	0.163	0.187	12.605	0.633
.*| . |	. | . |	16	-0.101	-0.043	13.472	0.638
. |*. |	. | . |	17	0.077	-0.022	13.984	0.668
. | . |	.*| . |	18	-0.036	-0.152	14.099	0.723
. | . |	. | . |	19	0.025	0.063	14.157	0.774
. |*. |	. |*. |	20	0.109	0.101	15.268	0.761
. | . |	. | . |	21	0.052	0.068	15.524	0.796
. | . |	.*| . |	22	0.045	-0.124	15.722	0.829
. | . |	. | . |	23	0.021	0.001	15.768	0.865
. | . |	. | . |	24	-0.048	-0.023	16.004	0.888
. | . |	. | . |	25	-0.015	0.003	16.027	0.914
. |*. |	. | . |	26	0.091	0.065	16.935	0.911
.*| . |	.*| . |	27	-0.099	-0.110	18.041	0.902
.*| . |	.*| . |	28	-0.111	-0.168	19.484	0.883

*Probabilities may not be valid for this equation specification.

- PMI (monthly)

Date: 01/24/19 Time: 11:43
Sample: 2013M06 2018M05
Included observations: 60

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
. | . |	. | . |	1	-0.012	-0.012	0.0090	0.925
. |*. |	. |*. |	2	0.172	0.172	1.9112	0.385
.*| . |	.*| . |	3	-0.092	-0.091	2.4684	0.481
. |*. |	. |*. |	4	0.153	0.128	4.0179	0.404
. | . |	. | . |	5	-0.064	-0.038	4.2974	0.507
. |*. |	. |*. |	6	0.125	0.078	5.3718	0.497
. | . |	. | . |	7	-0.057	-0.022	5.6006	0.587
. | . |	.*| . |	8	-0.025	-0.086	5.6465	0.687
.*| . |	. | . |	9	-0.082	-0.040	6.1326	0.727
. | . |	. | . |	10	-0.029	-0.050	6.1967	0.798
**| . |	**| . |	11	-0.245	-0.231	10.739	0.465
. | . |	. | . |	12	0.020	0.033	10.770	0.549
.*| . |	.*| . |	13	-0.161	-0.102	12.818	0.462
. | . |	. | . |	14	-0.011	-0.040	12.828	0.540
.*| . |	. | . |	15	-0.097	0.004	13.598	0.556
. |*. |	. |*. |	16	0.140	0.117	15.247	0.507
. | . |	. |*. |	17	0.048	0.145	15.443	0.564
.*| . |	**| . |	18	-0.176	-0.279	18.177	0.444
. | . |	. | . |	19	0.007	0.028	18.182	0.510

.*| . |	.*| . |	20	-0.123	-0.130	19.587	0.484
. |** |	. |** |	21	0.247	0.224	25.398	0.230
. | . |	. | . |	22	0.017	-0.002	25.425	0.277
. |*. |	. | . |	23	0.163	0.068	28.095	0.212
. | . |	. |*. |	24	-0.005	0.074	28.097	0.256
. | . |	.*| . |	25	0.018	-0.117	28.133	0.302
.*| . |	.*| . |	26	-0.144	-0.172	30.411	0.251
. |*. |	. |*. |	27	0.075	0.093	31.053	0.269
.*| . |	.*| . |	28	-0.067	-0.067	31.568	0.292

*Probabilities may not be valid for this equation specification.

- PPI (1 hour)

Date: 01/22/19 Time: 15:35
Sample: 2013M06 2018M05
Included observations: 60

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
**| . |	**| . |	1	-0.224	-0.224	3.1553	0.076
. | . |	. | . |	2	-0.002	-0.055	3.1555	0.206
. | . |	. | . |	3	-0.028	-0.043	3.2077	0.361
. | . |	. | . |	4	-0.045	-0.066	3.3447	0.502
. |*. |	. | . |	5	0.082	0.058	3.8011	0.578
. | . |	. |*. |	6	0.043	0.076	3.9307	0.686
. |*. |	. |** |	7	0.193	0.238	6.5477	0.477
**| . |	.*| . |	8	-0.224	-0.128	10.148	0.255
. |*. |	. | . |	9	0.093	0.043	10.784	0.291
. | . |	. | . |	10	-0.008	0.022	10.789	0.374
.*| . |	.*| . |	11	-0.148	-0.169	12.447	0.331
. |*. |	. | . |	12	0.176	0.072	14.849	0.250
. | . |	. |*. |	13	0.060	0.122	15.130	0.299
. | . |	. | . |	14	0.025	0.050	15.179	0.366
. | . |	. |*. |	15	0.071	0.182	15.596	0.409
. | . |	. | . |	16	-0.030	0.011	15.670	0.476
.*| . |	. | . |	17	-0.066	-0.046	16.048	0.520
. | . |	. | . |	18	0.050	0.057	16.273	0.574
. |*. |	. | . |	19	0.111	0.001	17.383	0.564
.*| . |	.*| . |	20	-0.114	-0.113	18.587	0.549
. | . |	. | . |	21	0.056	0.020	18.891	0.592
.*| . |	.*| . |	22	-0.121	-0.191	20.325	0.563
. | . |	. | . |	23	-0.013	0.005	20.341	0.621
. | . |	. | . |	24	-0.017	-0.036	20.372	0.675
. |*. |	. |*. |	25	0.153	0.108	22.874	0.585
**| . |	**| . |	26	-0.240	-0.211	29.151	0.304
. | . |	.*| . |	27	-0.059	-0.156	29.544	0.335
. |*. |	. |*. |	28	0.184	0.099	33.470	0.219

- PPI (2 hours)

Date: 01/22/19 Time: 15:33
Sample: 2013M06 2018M05
Included observations: 60

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
.*| . |	.*| . |	1	-0.081	-0.081	0.4116	0.521
. | . |	. | . |	2	0.042	0.036	0.5271	0.768
. | . |	. | . |	3	-0.058	-0.052	0.7474	0.862
. | . |	. | . |	4	0.034	0.024	0.8220	0.935
. |*. |	. |*. |	5	0.110	0.119	1.6353	0.897
. | . |	. | . |	6	-0.065	-0.054	1.9234	0.927
. | . |	. | . |	7	0.002	-0.012	1.9238	0.964
. | . |	. |*. |	8	0.063	0.081	2.2036	0.974
. | . |	. | . |	9	0.051	0.048	2.3914	0.984
.*| . |	**| . |	10	-0.192	-0.208	5.1392	0.882
. | . |	. | . |	11	0.060	0.056	5.4140	0.909
.*| . |	.*| . |	12	-0.146	-0.128	7.0566	0.854
. | . |	. | . |	13	0.069	0.001	7.4310	0.879
. | . |	. | . |	14	0.005	0.042	7.4329	0.917
.*| . |	. | . |	15	-0.068	-0.039	7.8187	0.931
. |*. |	. |*. |	16	0.149	0.123	9.7065	0.881
. | . |	. | . |	17	-0.002	0.056	9.7069	0.915
. | . |	. | . |	18	-0.042	-0.064	9.8658	0.936
. | . |	. | . |	19	-0.007	0.015	9.8699	0.956
.*| . |	.*| . |	20	-0.093	-0.112	10.679	0.954
. |*. |	. | . |	21	0.077	0.045	11.244	0.958
.*| . |	.*| . |	22	-0.093	-0.144	12.100	0.955
. | . |	. | . |	23	-0.040	-0.020	12.263	0.966
.*| . |	.*| . |	24	-0.111	-0.148	13.538	0.956
. | . |	. | . |	25	-0.020	-0.053	13.581	0.969
.*| . |	.*| . |	26	-0.194	-0.172	17.696	0.887
. | . |	. | . |	27	-0.006	-0.023	17.700	0.912
. | . |	. | . |	28	-0.051	-0.019	18.005	0.926

- PPI (3 hours)

Date: 01/22/19 Time: 15:32
Sample: 2013M06 2018M05
Included observations: 60

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
.*| . |	.*| . |	1	-0.086	-0.086	0.4662	0.495
. | . |	.*| . |	2	-0.060	-0.068	0.6942	0.707
. |*. |	. | . |	3	0.076	0.066	1.0758	0.783
. |*. |	. |*. |	4	0.105	0.116	1.8077	0.771
. | . |	. | . |	5	-0.051	-0.023	1.9802	0.852
. | . |	. | . |	6	-0.051	-0.052	2.1579	0.905
. | . |	. | . |	7	0.001	-0.030	2.1579	0.951
.*| . |	.*| . |	8	-0.074	-0.091	2.5501	0.959
. | . |	. | . |	9	0.042	0.043	2.6768	0.976
. | . |	. | . |	10	0.019	0.033	2.7035	0.988
. | . |	. | . |	11	0.037	0.061	2.8047	0.993

.*| . |	.*| . |	12	-0.113	-0.100	3.7912	0.987
.*| . |	.*| . |	13	-0.088	-0.134	4.4094	0.986
.*| . |	**| . |	14	-0.153	-0.220	6.3017	0.958
. | . |	. | . |	15	-0.008	-0.053	6.3068	0.974
.*| . |	. | . |	16	-0.079	-0.062	6.8312	0.976
. | . |	. |*. |	17	0.022	0.081	6.8737	0.985
. | . |	. | . |	18	0.010	0.053	6.8823	0.991
.*| . |	.*| . |	19	-0.086	-0.097	7.5490	0.991
. |*. |	. | . |	20	0.119	0.049	8.8644	0.984
. |*. |	. |*. |	21	0.107	0.078	9.9583	0.979
.*| . |	.*| . |	22	-0.198	-0.200	13.785	0.909
. | . |	. | . |	23	0.033	0.049	13.895	0.930
. | . |	. | . |	24	0.015	-0.037	13.918	0.948
. | . |	. | . |	25	-0.013	0.002	13.937	0.963
.*| . |	.*| . |	26	-0.170	-0.199	17.090	0.906
. |*. |	. | . |	27	0.141	0.051	19.342	0.857
. | . |	. | . |	28	0.017	-0.047	19.375	0.886

- PPI (4 hours)

Date: 01/22/19 Time: 15:29
Sample: 2013M06 2018M05
Included observations: 60

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
. | . |	. | . |	1	0.057	0.057	0.2029	0.652
.*| . |	**| . |	2	-0.202	-0.206	2.8135	0.245
. | . |	. | . |	3	0.010	0.038	2.8207	0.420
. |*. |	. |*. |	4	0.156	0.117	4.4442	0.349
.*| . |	.*| . |	5	-0.109	-0.127	5.2526	0.386
. | . |	. | . |	6	-0.042	0.030	5.3763	0.497
. | . |	. | . |	7	0.020	-0.028	5.4058	0.611
.*| . |	.*| . |	8	-0.066	-0.093	5.7150	0.679
. |*. |	. |*. |	9	0.075	0.134	6.1253	0.727
. | . |	. | . |	10	0.008	-0.058	6.1303	0.804
.*| . |	.*| . |	11	-0.190	-0.171	8.8826	0.633
.*| . |	.*| . |	12	-0.186	-0.146	11.551	0.482
. |*. |	. |*. |	13	0.151	0.074	13.364	0.420
. | . |	. | . |	14	0.054	0.004	13.602	0.480
.*| . |	.*| . |	15	-0.174	-0.105	16.093	0.376
.*| . |	.*| . |	16	-0.119	-0.110	17.288	0.367
. |*. |	. | . |	17	0.129	0.044	18.724	0.345
.*| . |	.*| . |	18	-0.074	-0.138	19.213	0.379
.*| . |	.*| . |	19	-0.150	-0.101	21.246	0.323
. |*. |	. |*. |	20	0.176	0.200	24.130	0.237
. |*. |	. | . |	21	0.119	0.033	25.474	0.227
.*| . |	.*| . |	22	-0.145	-0.163	27.521	0.192
. | . |	.*| . |	23	-0.049	-0.069	27.759	0.225
. | . |	.*| . |	24	-0.018	-0.132	27.792	0.269
.*| . |	.*| . |	25	-0.131	-0.088	29.629	0.238
. | . |	. | . |	26	-0.008	-0.041	29.636	0.283
. |*. |	. |*. |	27	0.182	0.082	33.369	0.185
. | . |	. | . |	28	0.002	0.028	33.370	0.222

- PPI (5 hours)

Date: 01/22/19 Time: 15:28
Sample: 2013M06 2018M05
Included observations: 60

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
. | . |	. | . |	1	0.029	0.029	0.0537	0.817
**| . |	**| . |	2	-0.227	-0.228	3.3588	0.186
.*| . |	.*| . |	3	-0.101	-0.091	4.0218	0.259
. |** |	. |*. |	4	0.218	0.183	7.1873	0.126
.*| . |	.*| . |	5	-0.071	-0.136	7.5290	0.184
**| . |	.*| . |	6	-0.218	-0.153	10.801	0.095
. | . |	. | . |	7	-0.001	0.018	10.801	0.148
. | . |	.*| . |	8	0.064	-0.074	11.094	0.196
. |*. |	. |*. |	9	0.181	0.205	13.484	0.142
.*| . |	.*| . |	10	-0.115	-0.086	14.462	0.153
.*| . |	.*| . |	11	-0.100	-0.084	15.218	0.173
. | . |	. | . |	12	-0.013	-0.018	15.232	0.229
. |*. |	. | . |	13	0.135	0.025	16.677	0.214
. | . |	. | . |	14	-0.047	-0.011	16.859	0.264
.*| . |	.*| . |	15	-0.164	-0.080	19.080	0.210
. | . |	.*| . |	16	-0.043	-0.094	19.236	0.257
. |*. |	. | . |	17	0.148	0.071	21.120	0.221
.*| . |	.*| . |	18	-0.070	-0.165	21.558	0.252
.*| . |	. | . |	19	-0.076	0.059	22.077	0.280
. |*. |	. |*. |	20	0.104	0.108	23.090	0.284
. |*. |	. | . |	21	0.138	0.006	24.916	0.251
.*| . |	.*| . |	22	-0.097	-0.072	25.837	0.259
.*| . |	. | . |	23	-0.084	-0.005	26.546	0.276
.*| . |	.*| . |	24	-0.077	-0.164	27.160	0.297
. | . |	. | . |	25	-0.022	-0.020	27.212	0.345
. | . |	.*| . |	26	-0.021	-0.069	27.261	0.396
. |*. |	. |*. |	27	0.088	0.131	28.138	0.404
. | . |	. | . |	28	0.064	0.046	28.615	0.432

- PPI (6 hours)

Date: 01/22/19 Time: 15:25
Sample: 2013M06 2018M05
Included observations: 60

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
. | . |	. | . |	1	0.028	0.028	0.0497	0.824
.*| . |	.*| . |	2	-0.129	-0.130	1.1200	0.571

. | . |	. | . |	3	-0.057	-0.050	1.3326	0.721
. |*. |	. |*. |	4	0.128	0.117	2.4288	0.657
.*| . |	.*| . |	5	-0.098	-0.123	3.0807	0.688
.*| . |	.*| . |	6	-0.149	-0.120	4.6139	0.594
. |*. |	. |*. |	7	0.153	0.161	6.2550	0.510
. |*. |	. | . |	8	0.085	0.015	6.7677	0.562
. |*. |	. |*. |	9	0.135	0.184	8.1037	0.524
. | . |	. |*. |	10	0.054	0.108	8.3174	0.598
. | . |	. | . |	11	0.012	-0.022	8.3283	0.684
.*| . |	. | . |	12	-0.070	-0.030	8.7117	0.727
. | . |	. | . |	13	0.037	0.073	8.8214	0.786
. | . |	.*| . |	14	-0.046	-0.075	8.9947	0.831
.*| . |	.*| . |	15	-0.116	-0.079	10.111	0.813
.*| . |	.*| . |	16	-0.086	-0.117	10.737	0.825
. |*. |	. | . |	17	0.095	-0.001	11.517	0.828
. | . |	.*| . |	18	0.000	-0.071	11.517	0.871
. | . |	. | . |	19	0.028	0.061	11.590	0.902
. | . |	. | . |	20	0.034	0.010	11.697	0.926
. |*. |	. |*. |	21	0.094	0.089	12.547	0.924
.*| . |	.*| . |	22	-0.159	-0.144	15.022	0.861
. | . |	. |*. |	23	-0.006	0.100	15.025	0.894
.*| . |	.*| . |	24	-0.154	-0.198	17.471	0.828
.*| . |	. | . |	25	-0.089	-0.040	18.309	0.829
. | . |	. | . |	26	0.020	0.023	18.352	0.863
. |*. |	. | . |	27	0.088	0.029	19.222	0.862
. | . |	. | . |	28	0.010	-0.061	19.234	0.891

- PPI (monthly)

Date: 01/24/19 Time: 10:58
Sample: 2013M06 2018M05
Included observations: 60

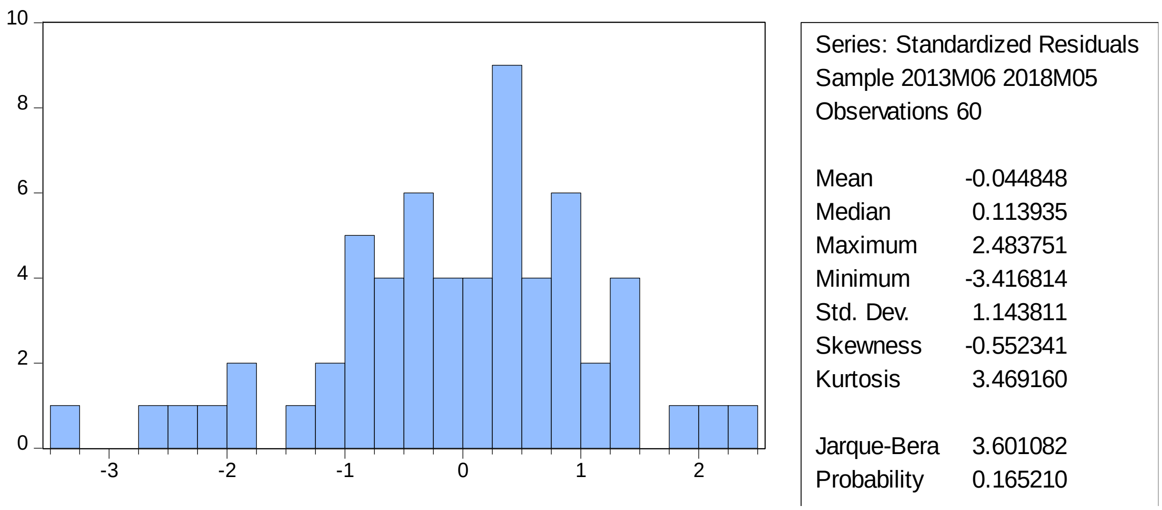
Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
. |*. |	. |*. |	1	0.093	0.093	0.5493	0.459
. |*. |	. |*. |	2	0.199	0.192	3.0910	0.213
.*| . |	.*| . |	3	-0.081	-0.120	3.5223	0.318
. |*. |	. |*. |	4	0.197	0.187	6.1031	0.192
. |*. |	. |*. |	5	0.089	0.098	6.6401	0.249
. | . |	.*| . |	6	0.000	-0.111	6.6401	0.355
. | . |	. | . |	7	-0.052	-0.035	6.8315	0.447
. | . |	. | . |	8	0.002	0.022	6.8320	0.555
.*| . |	.*| . |	9	-0.092	-0.142	7.4555	0.590
. | . |	. | . |	10	0.013	0.037	7.4688	0.681
.*| . |	.*| . |	11	-0.186	-0.135	10.088	0.522
. | . |	. | . |	12	-0.038	-0.045	10.197	0.599
.*| . |	.*| . |	13	-0.180	-0.082	12.770	0.466
. | . |	. | . |	14	0.038	0.057	12.886	0.536
**| . |	.*| . |	15	-0.219	-0.177	16.850	0.328
. | . |	. | . |	16	0.013	0.060	16.865	0.394
.*| . |	. | . |	17	-0.075	0.040	17.351	0.431
. | . |	.*| . |	18	0.009	-0.075	17.358	0.499
. | . |	. | . |	19	-0.044	0.030	17.530	0.554

. | . |	. | . |	20	0.034	0.059	17.639	0.611
. | . |	. | . |	21	0.010	-0.038	17.649	0.671
. |*. |	. | . |	22	0.075	0.040	18.197	0.694
. |*. |	. |*. |	23	0.120	0.174	19.649	0.663
. |*. |	. | . |	24	0.107	-0.049	20.823	0.649
. | . |	. | . |	25	0.008	-0.023	20.830	0.702
. | . |	. | . |	26	0.011	-0.027	20.844	0.750
.*| . |	.*| . |	27	-0.106	-0.192	22.113	0.732
. | . |	. | . |	28	0.061	0.014	22.548	0.755

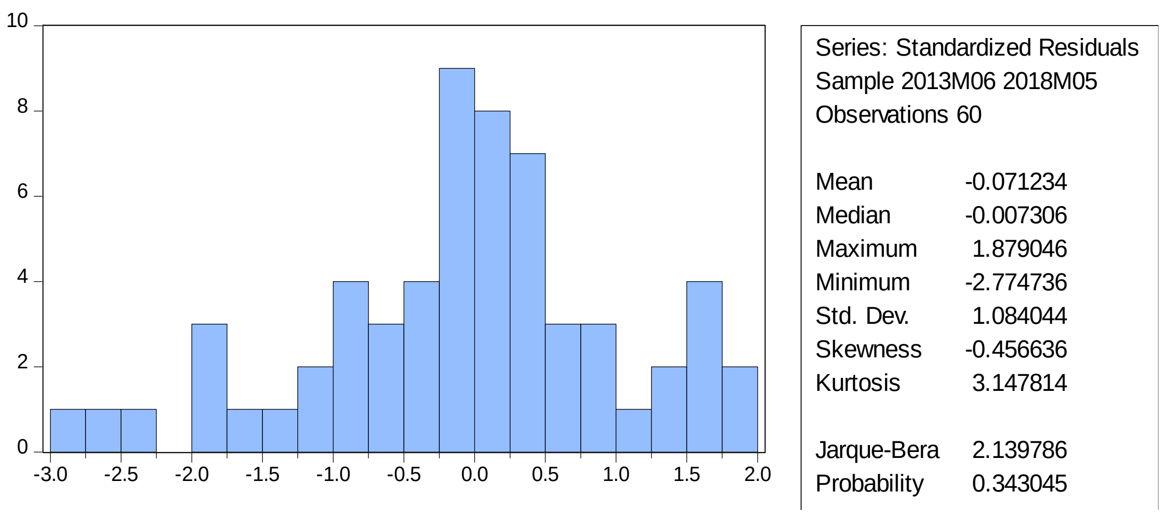
*Probabilities may not be valid for this equation specification.

APPENDIX 4: NORMALITY (JARQUE-BERA TEST)

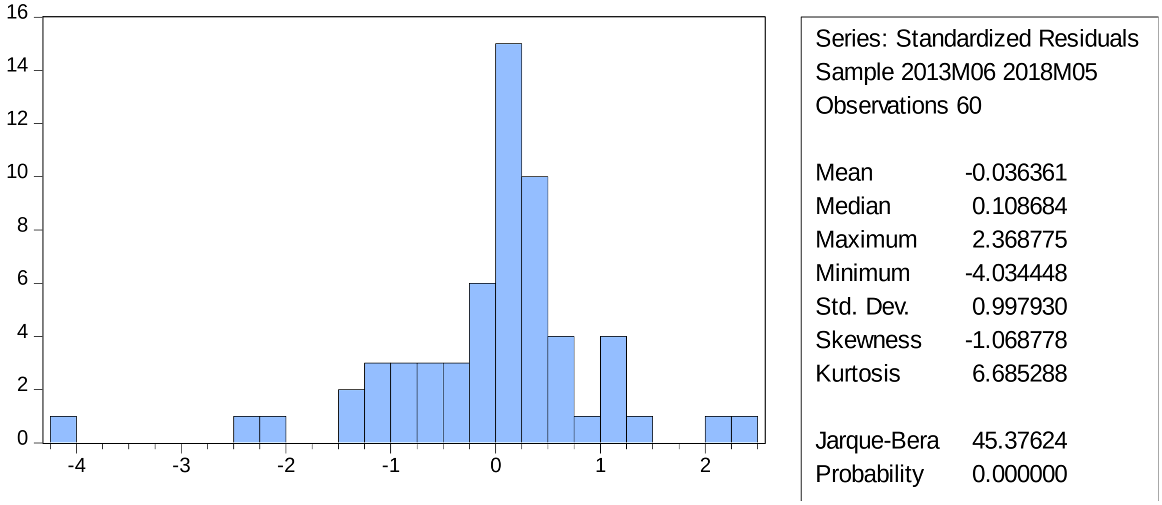
- ADP (1 hour)



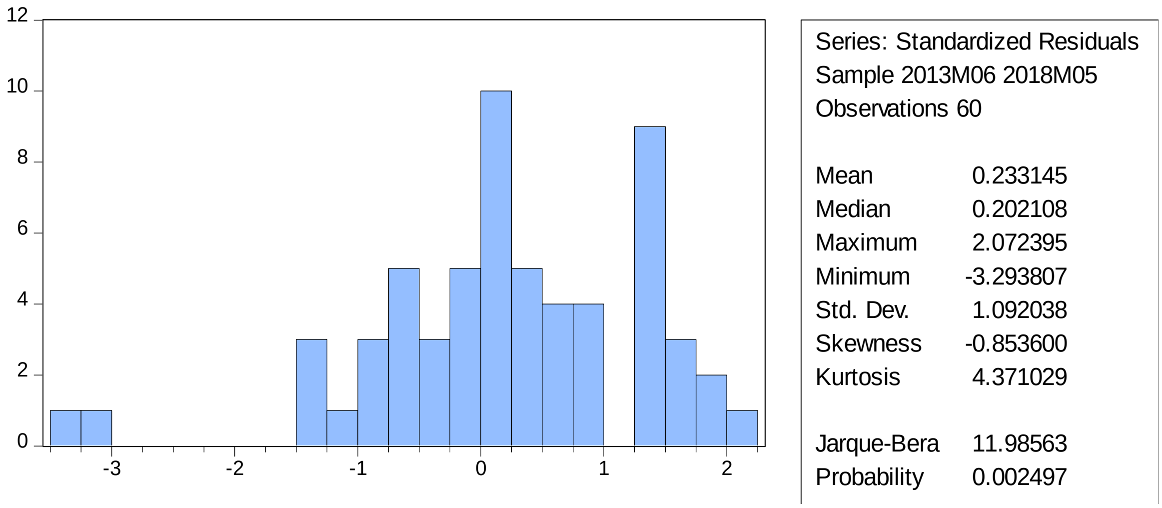
- ADP (2 hours)



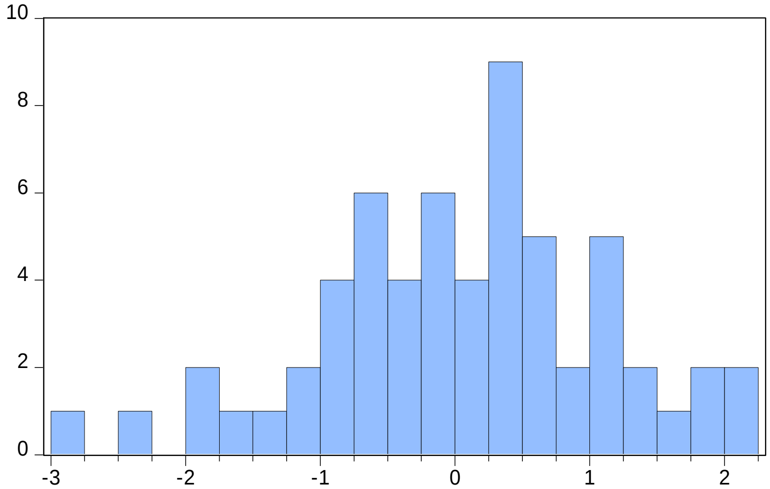
- ADP (3 hours)



- ADP (4 hours)

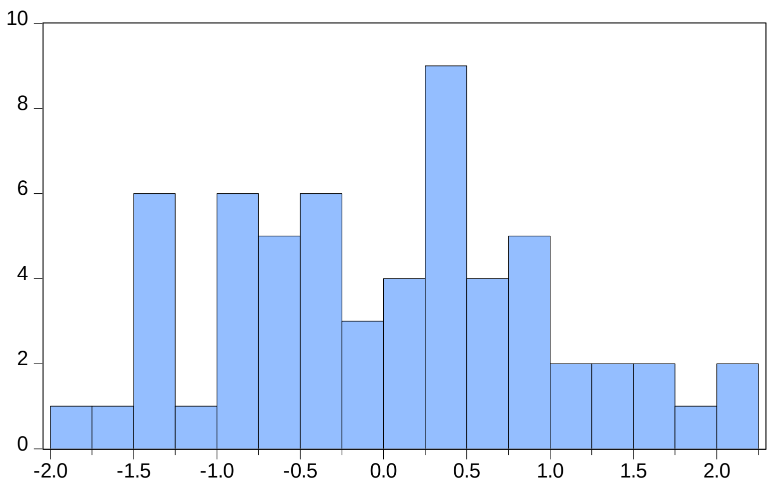


- ADP (5 hours)



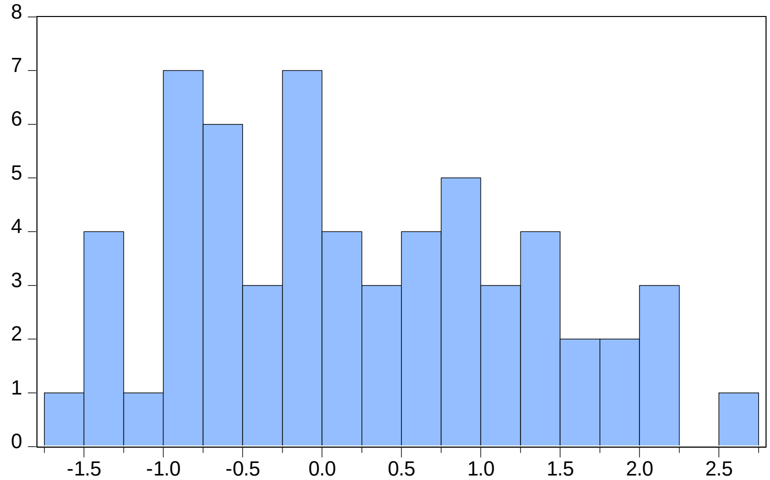
Series: Standardized Residuals	
Sample 2013M06 2018M05	
Observations 60	
Mean	0.053717
Median	0.121439
Maximum	2.147138
Minimum	-2.948150
Std. Dev.	1.066676
Skewness	-0.317689
Kurtosis	3.194866
Jarque-Bera	1.104192
Probability	0.575742

- ADP (6 hours)



Series: Standardized Residuals	
Sample 2013M06 2018M05	
Observations 60	
Mean	0.035885
Median	0.129168
Maximum	2.243678
Minimum	-1.803430
Std. Dev.	0.988230
Skewness	0.234029
Kurtosis	2.404550
Jarque-Bera	1.434098
Probability	0.488191

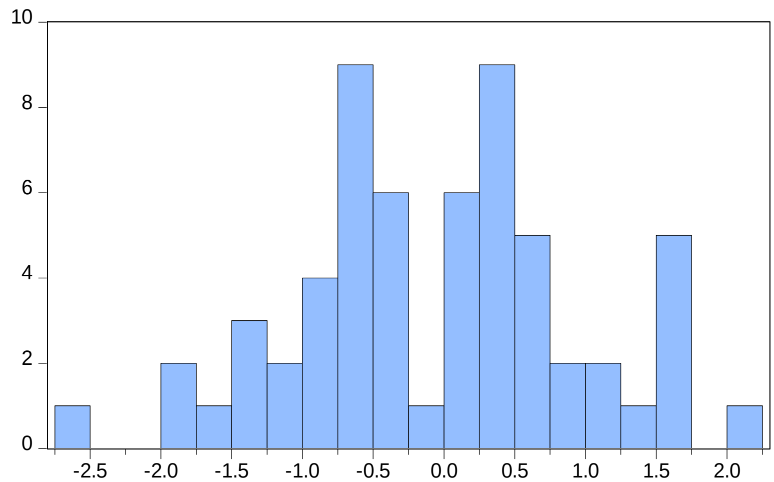
- ADP (monthly)



Series: Standardized Residuals
Sample 2013M06 2018M05
Observations 60

Mean	0.223229
Median	0.073939
Maximum	2.598890
Minimum	-1.618290
Std. Dev.	1.068025
Skewness	0.293784
Kurtosis	2.173221
Jarque-Bera	2.572003
Probability	0.276374

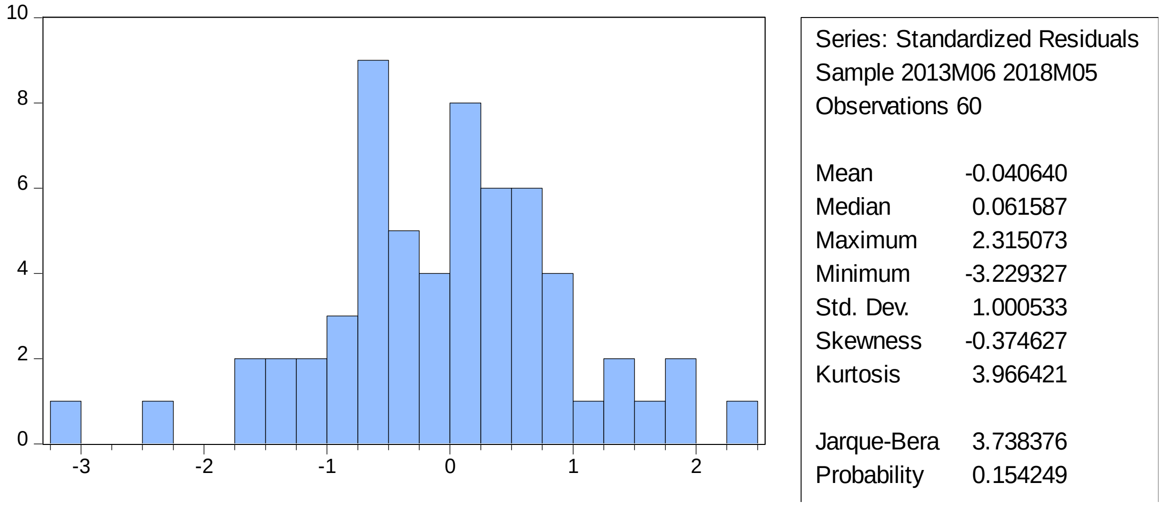
- AHE (1 hour)



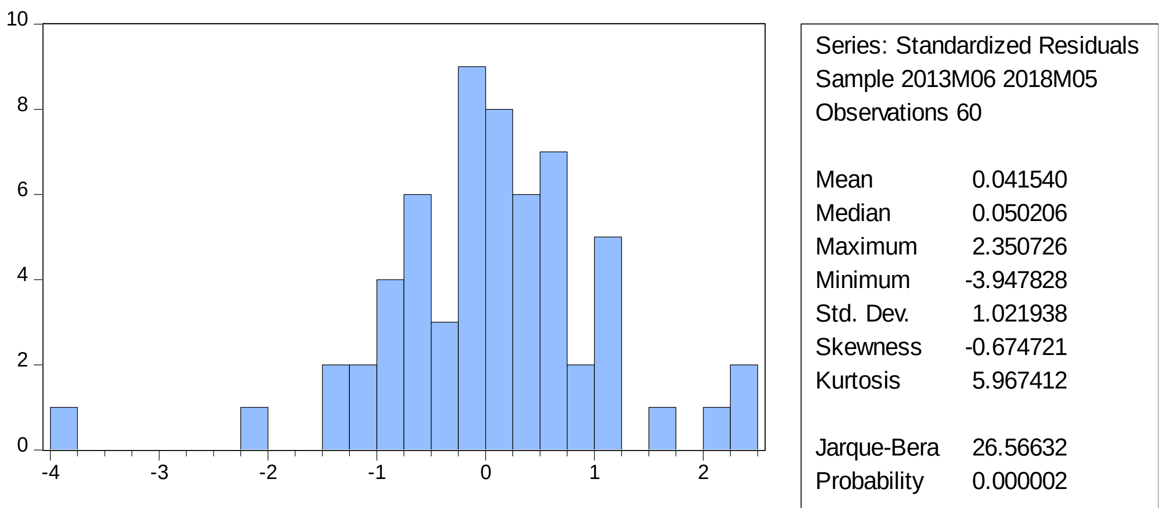
Series: Standardized Residuals
Sample 2013M06 2018M05
Observations 60

Mean	-0.058658
Median	0.012806
Maximum	2.230136
Minimum	-2.544094
Std. Dev.	1.001424
Skewness	0.053781
Kurtosis	2.727489
Jarque-Bera	0.214579
Probability	0.898265

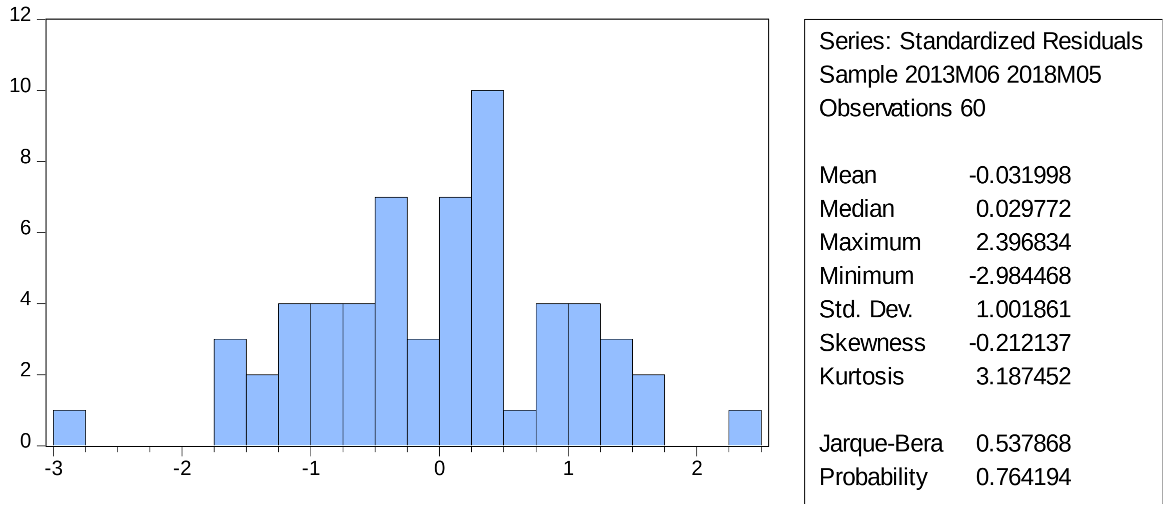
- AHE (2 hours)



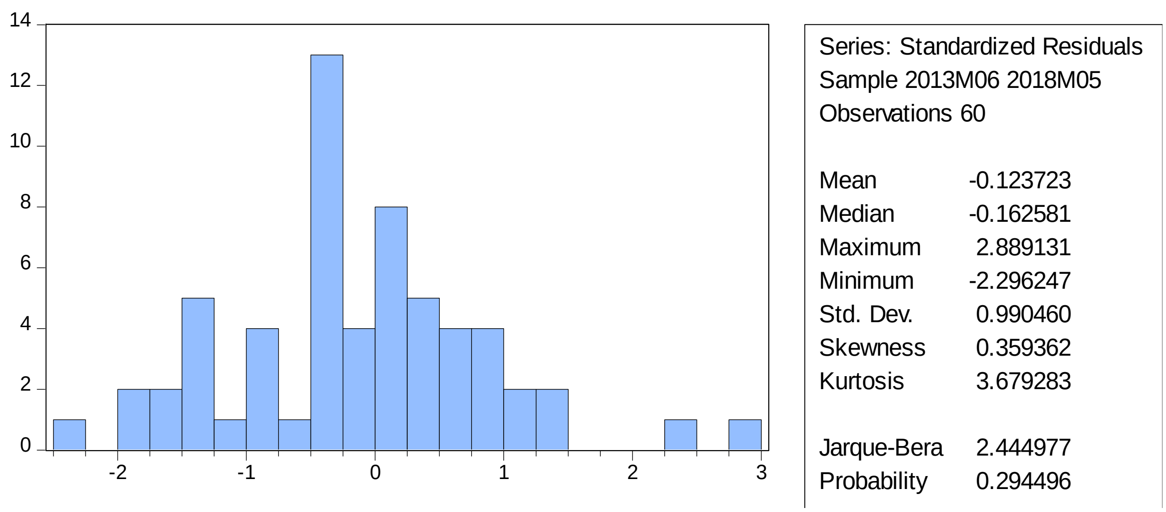
- AHE (3 hours)



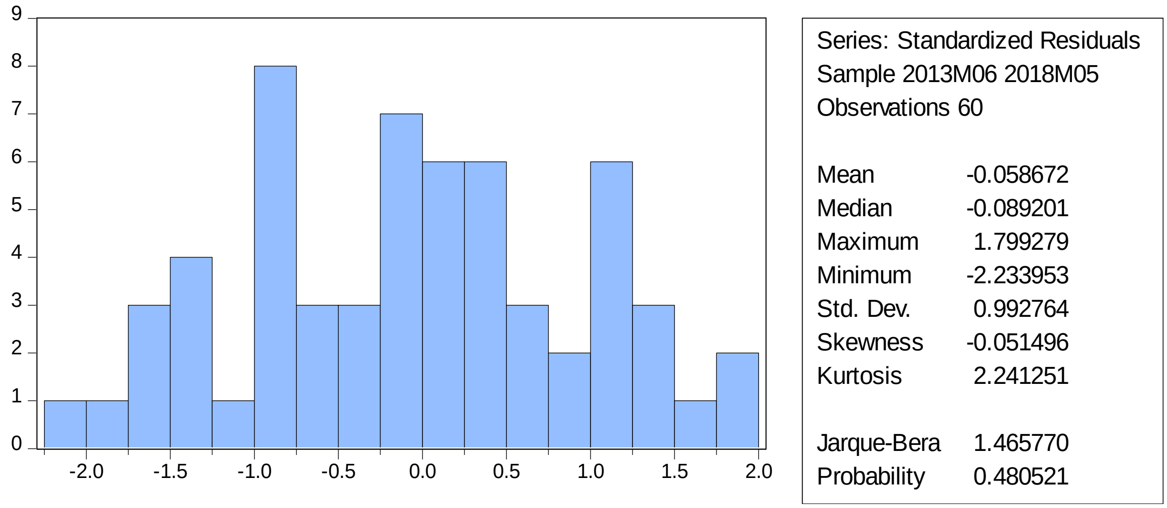
- AHE (4 hours)



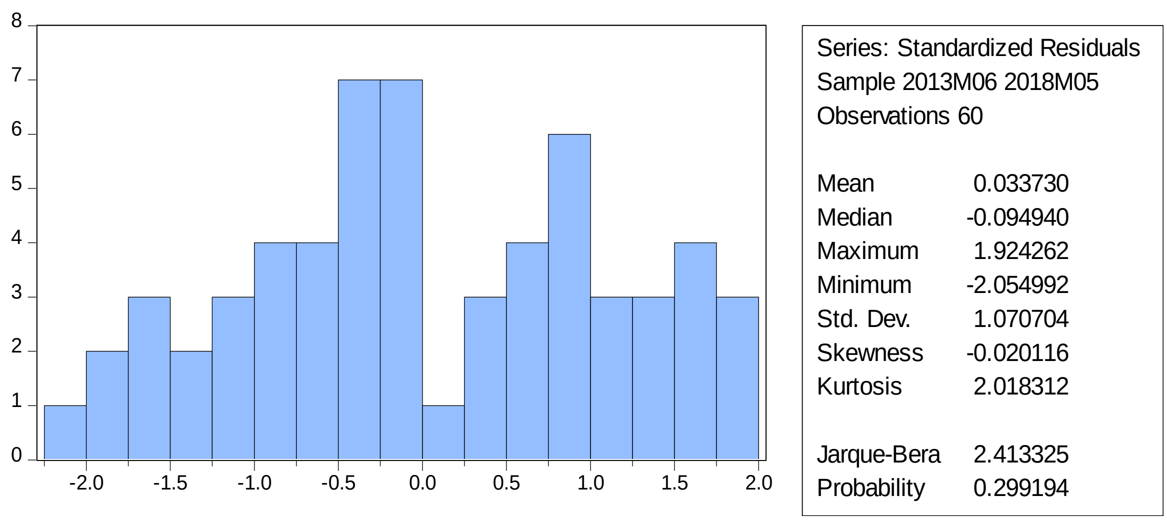
- AHE (5 hours)



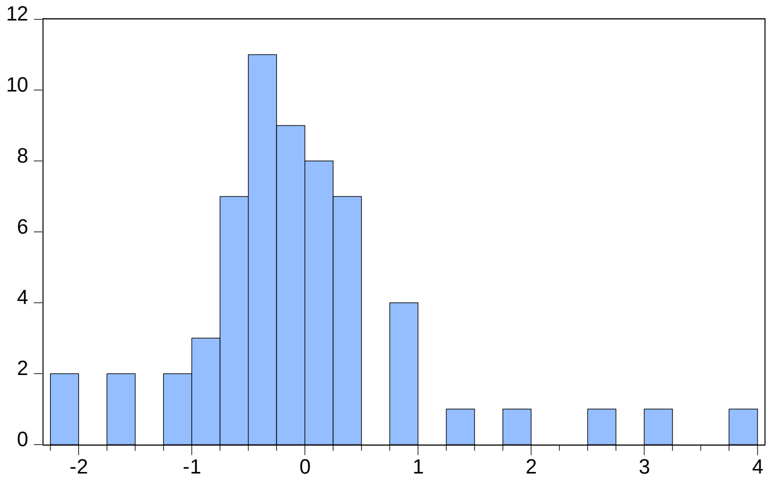
- AHE (6 hours)



- AHE (monthly)

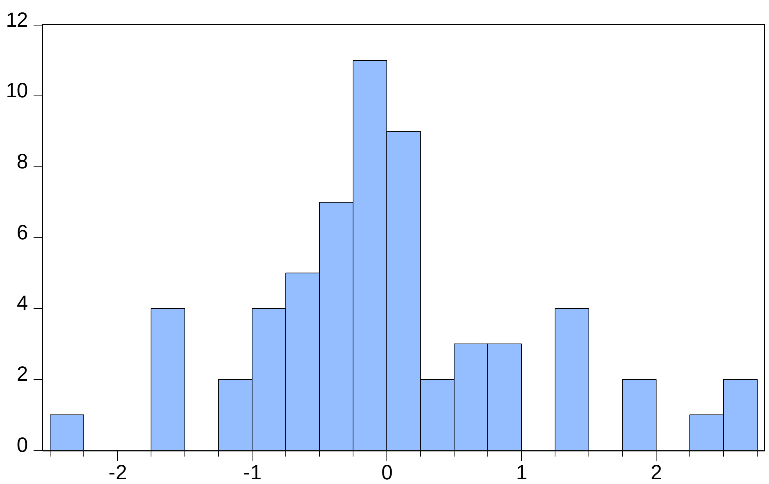


- BP (1 hour)



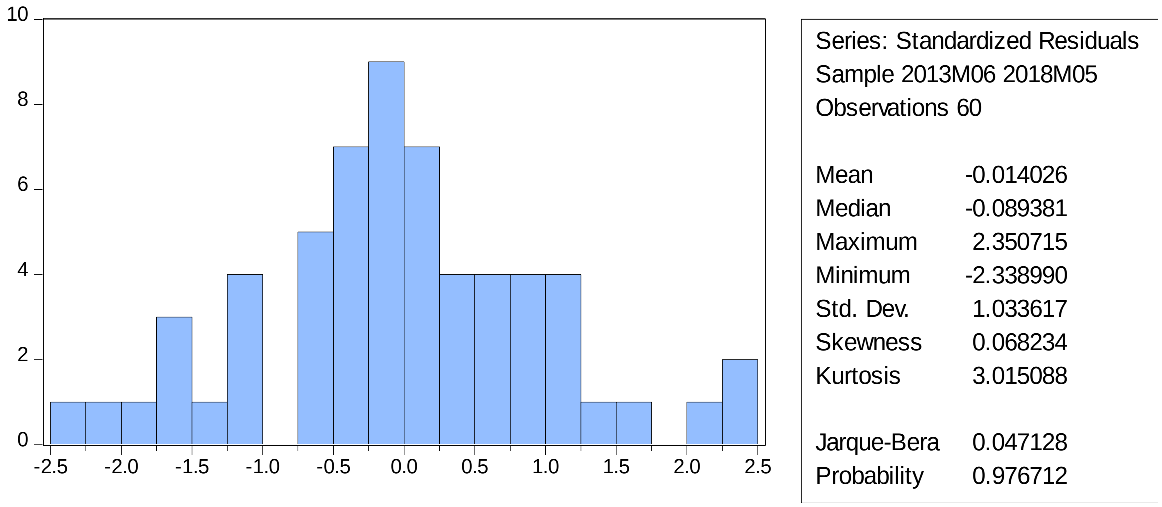
Series: Standardized Residuals	
Sample 2013M06 2018M05	
Observations 60	
Mean	-0.037066
Median	-0.203585
Maximum	3.784282
Minimum	-2.246863
Std. Dev.	1.048418
Skewness	1.331459
Kurtosis	6.587551
Jarque-Bera	49.90415
Probability	0.000000

- BP (2 hours)

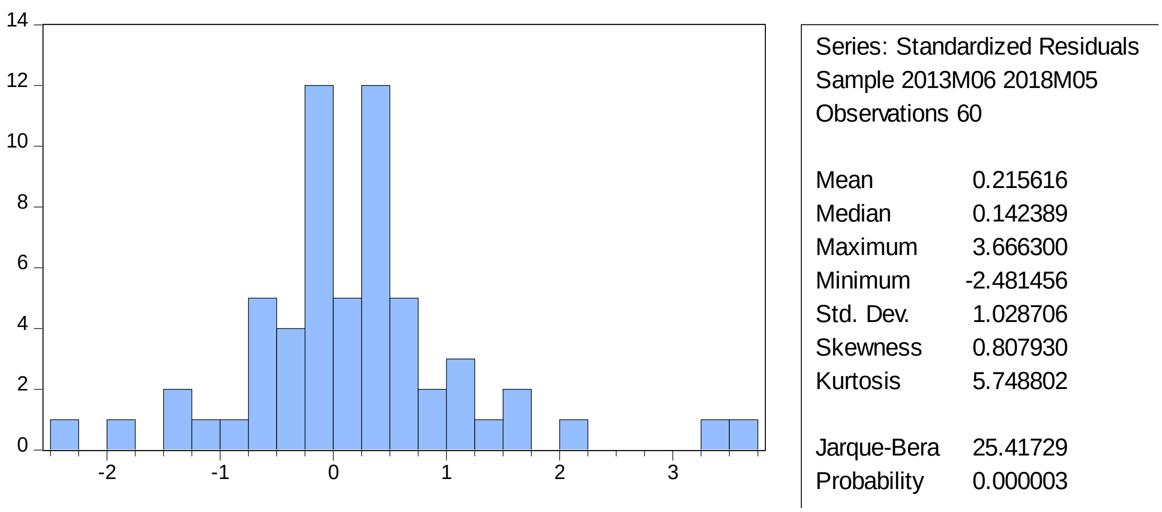


Series: Standardized Residuals	
Sample 2013M06 2018M05	
Observations 60	
Mean	0.040089
Median	-0.065514
Maximum	2.566623
Minimum	-2.370368
Std. Dev.	1.005923
Skewness	0.459786
Kurtosis	3.480033
Jarque-Bera	2.690114
Probability	0.260525

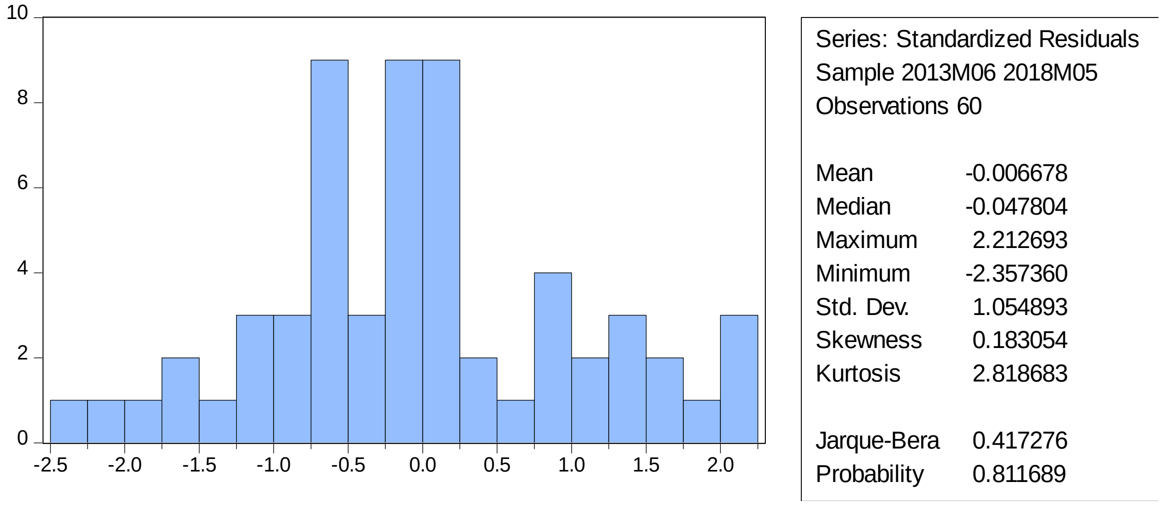
- BP (3 hours)



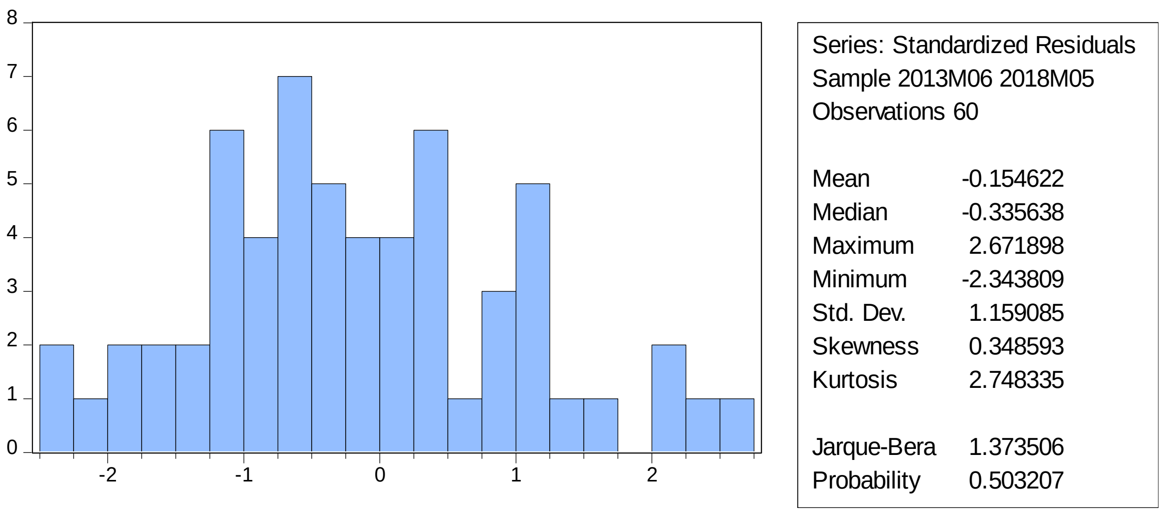
- BP (4 hours)



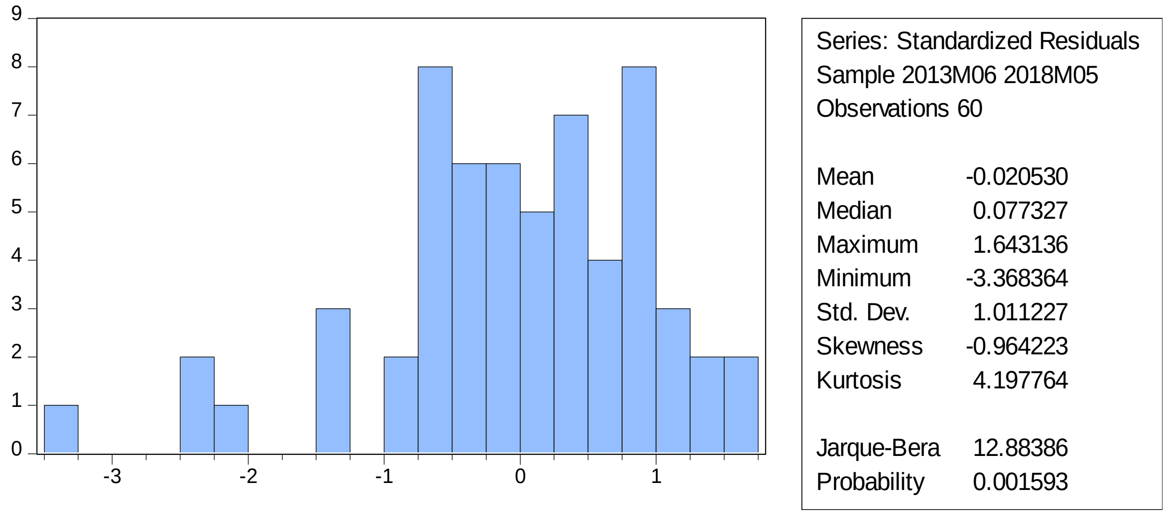
- BP (5 hours)



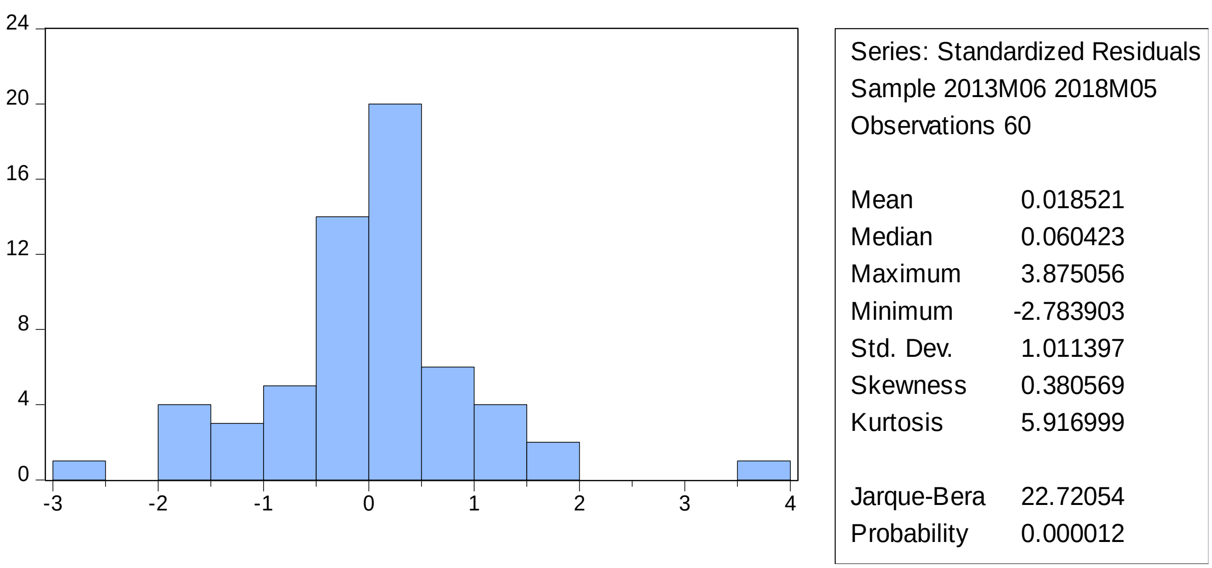
- BP (6 hours)



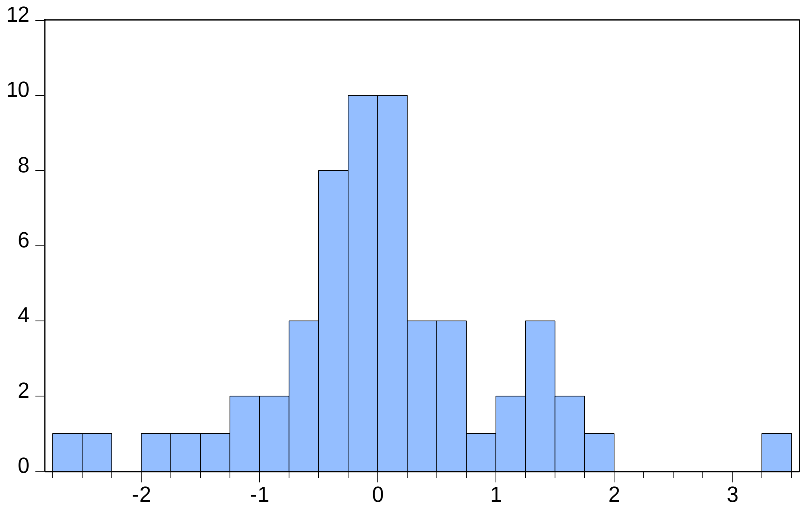
- BP (monthly)



- CCI (1 hour)



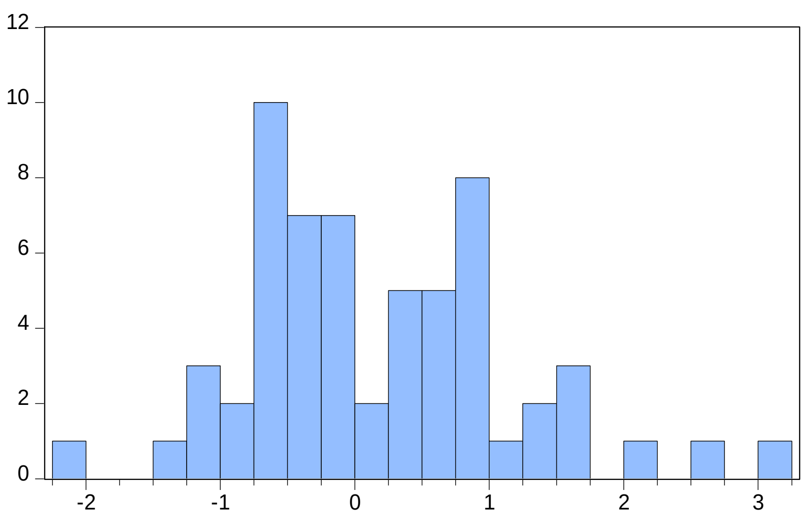
- CCI (2 hours)



Series: Standardized Residuals
Sample 2013M06 2018M05
Observations 60

Mean	0.027827
Median	-0.042266
Maximum	3.309429
Minimum	-2.614021
Std. Dev.	1.008049
Skewness	0.232099
Kurtosis	4.428567
Jarque-Bera	5.640709
Probability	0.059585

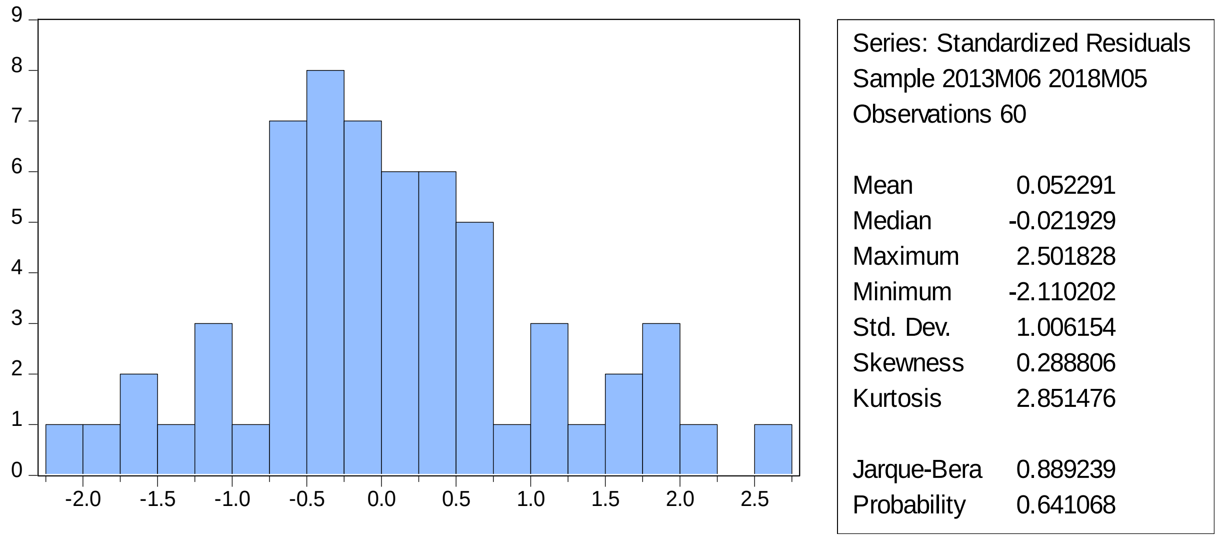
- CCI (3 hours)



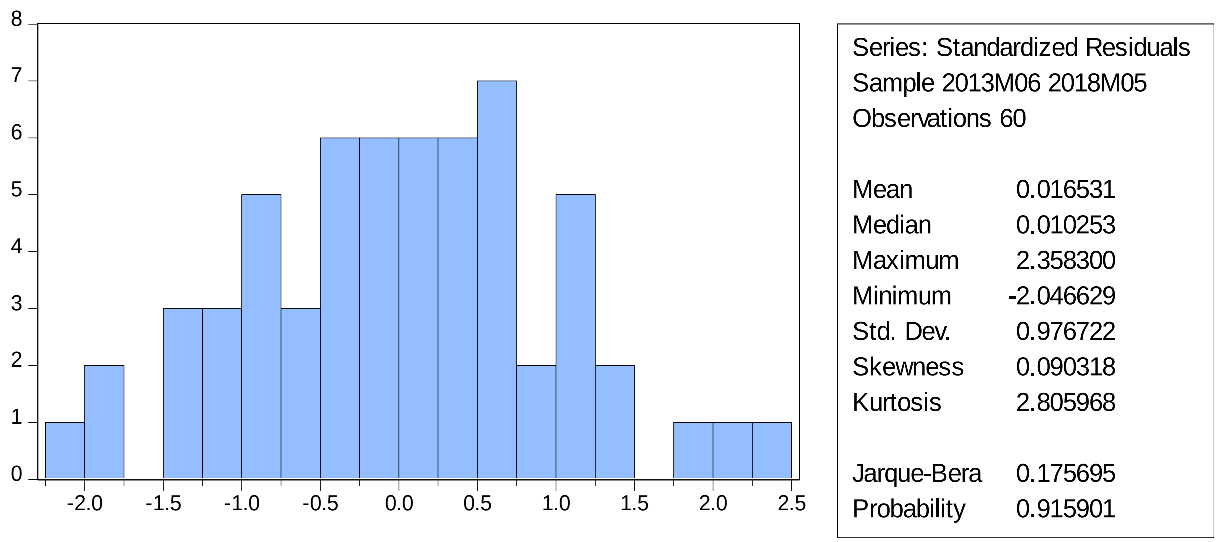
Series: Standardized Residuals
Sample 2013M06 2018M05
Observations 60

Mean	0.178538
Median	-0.019813
Maximum	3.097697
Minimum	-2.081715
Std. Dev.	0.992014
Skewness	0.571454
Kurtosis	3.362661
Jarque-Bera	3.594400
Probability	0.165762

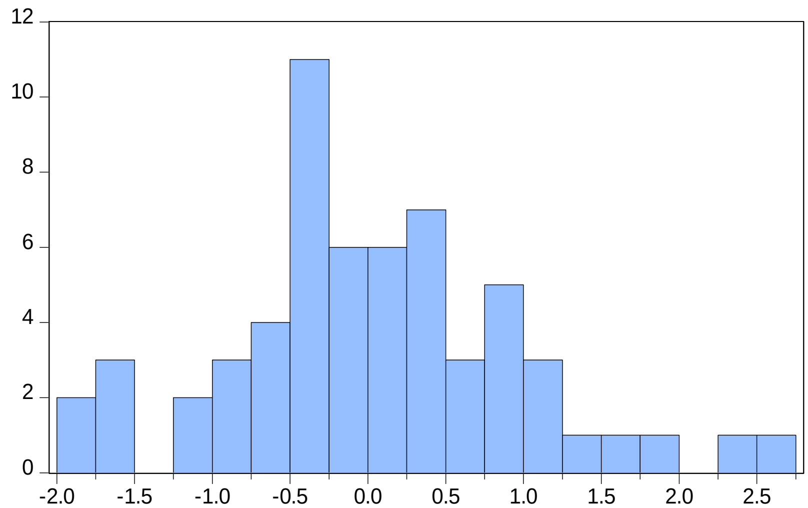
- CCI (4 hours)



- CCI (5 hours)



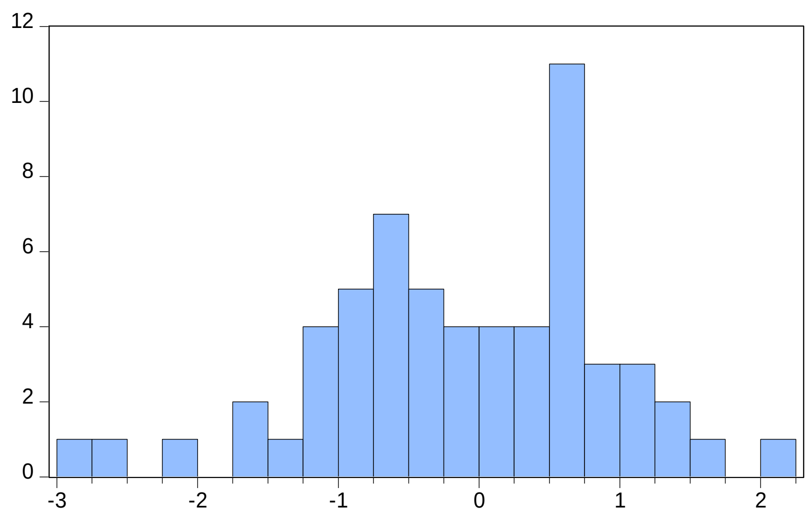
- CCI (6 hours)



Series: Standardized Residuals
Sample 2013M06 2018M05
Observations 60

Mean	0.047470
Median	-0.033404
Maximum	2.669887
Minimum	-1.830572
Std. Dev.	0.941529
Skewness	0.335580
Kurtosis	3.294585
Jarque-Bera	1.343093
Probability	0.510918

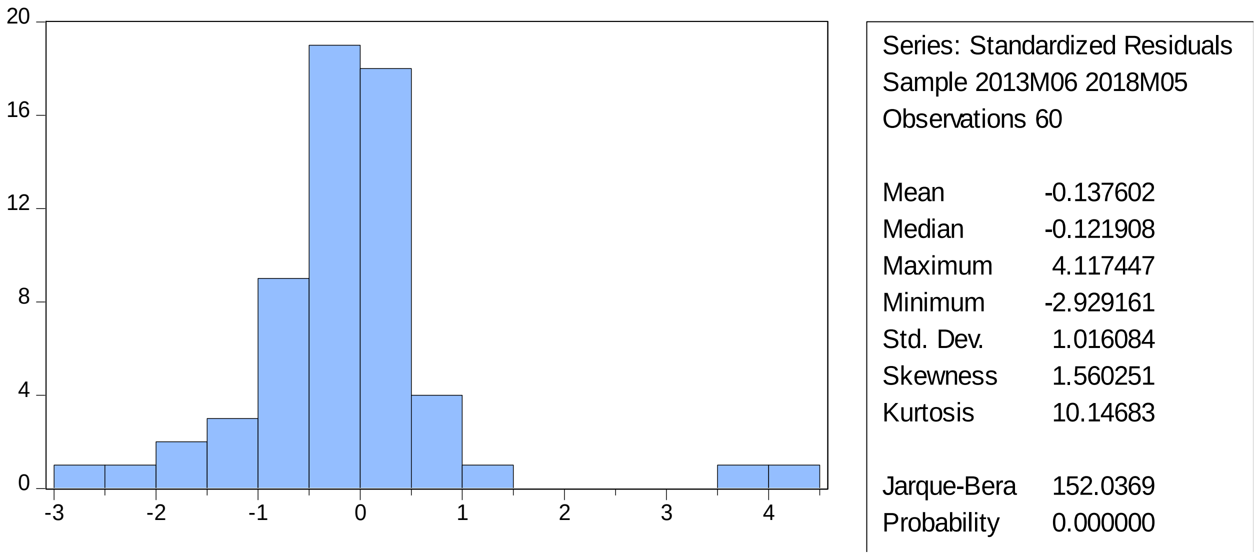
- CCI (monthly)



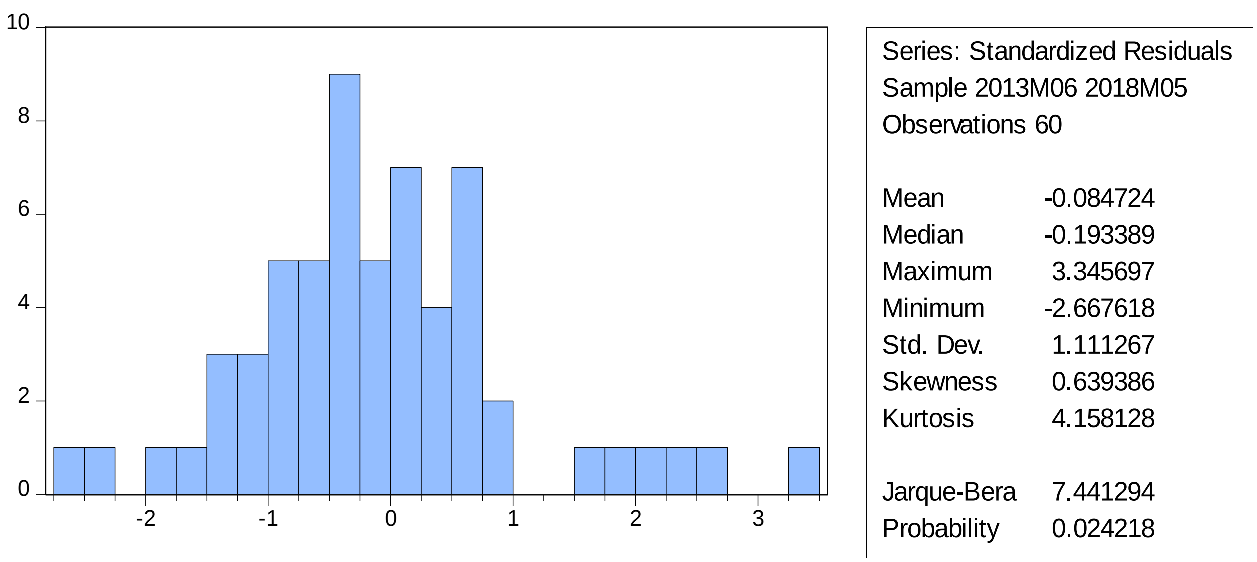
Series: Standardized Residuals
Sample 2013M06 2018M05
Observations 60

Mean	-0.118337
Median	-0.044630
Maximum	2.107478
Minimum	-2.766097
Std. Dev.	0.998434
Skewness	-0.392315
Kurtosis	3.016913
Jarque-Bera	1.539825
Probability	0.463054

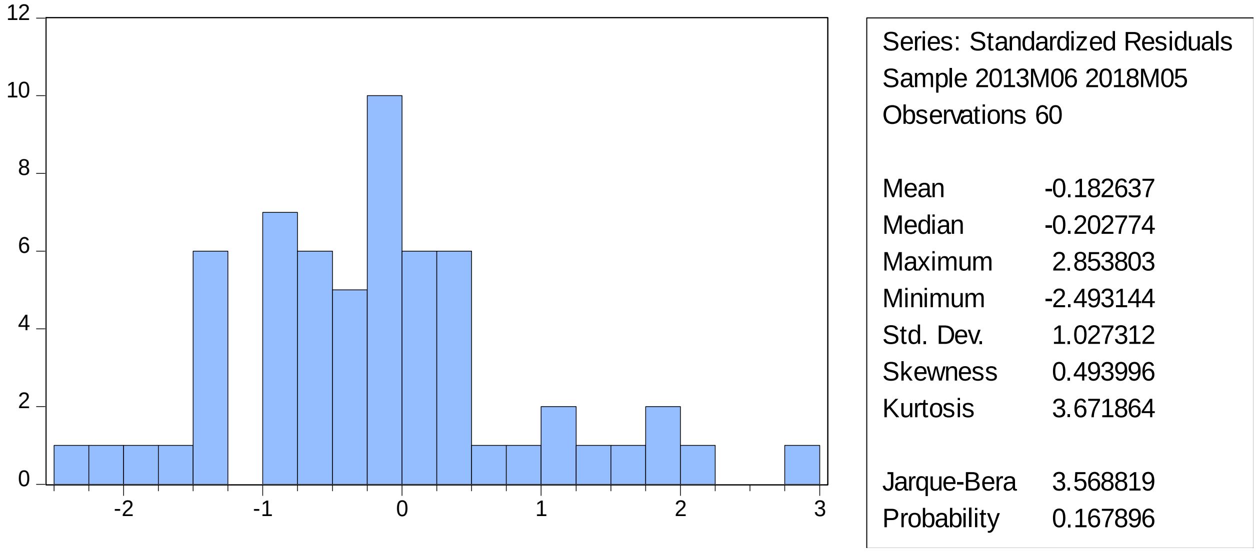
- CORE CPI (1 hour)



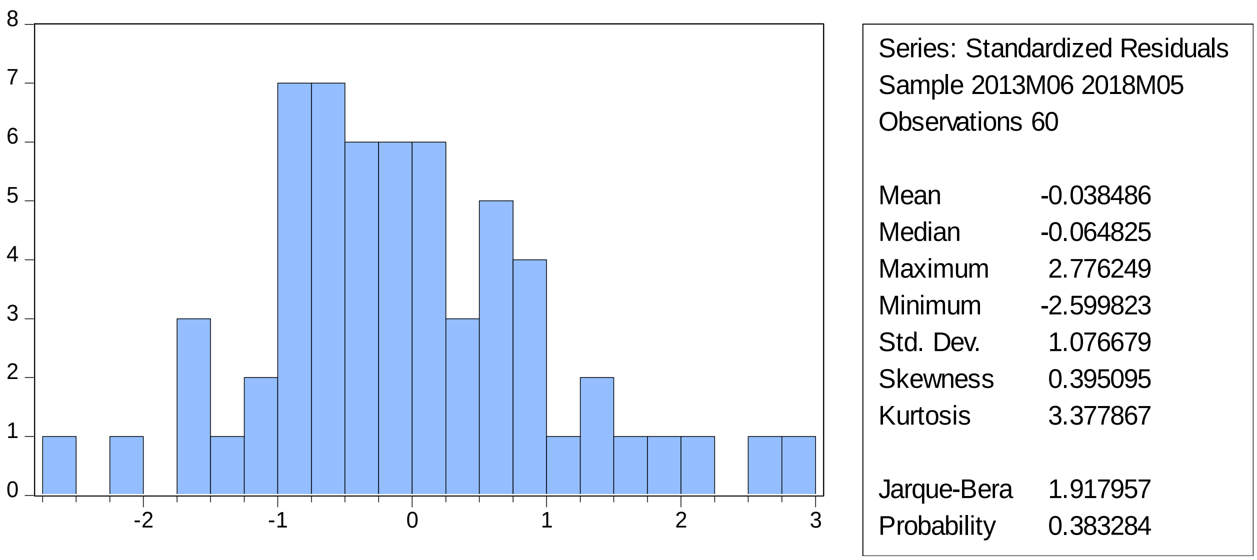
- CORE CPI (2 hours)



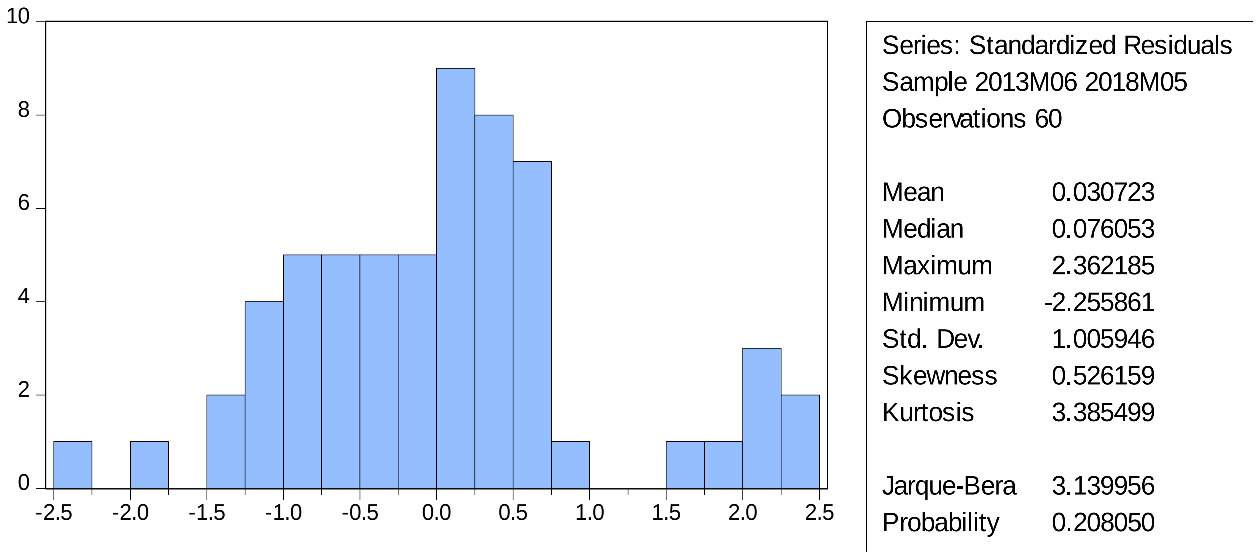
- CORE CPI (3 hours)



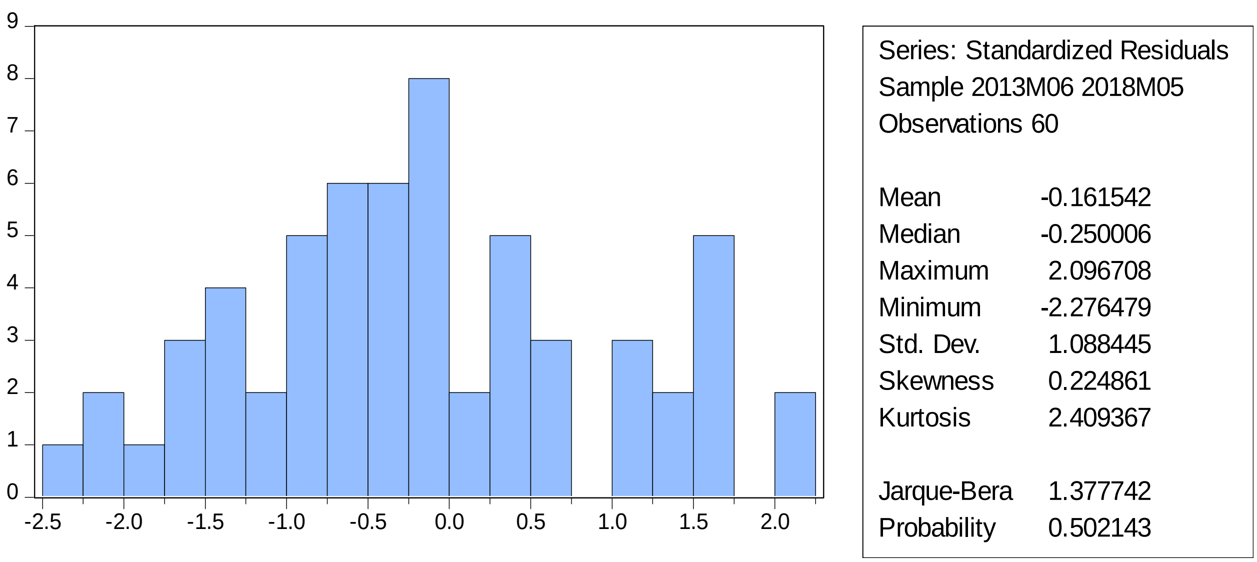
- CORE CPI (4 hours)



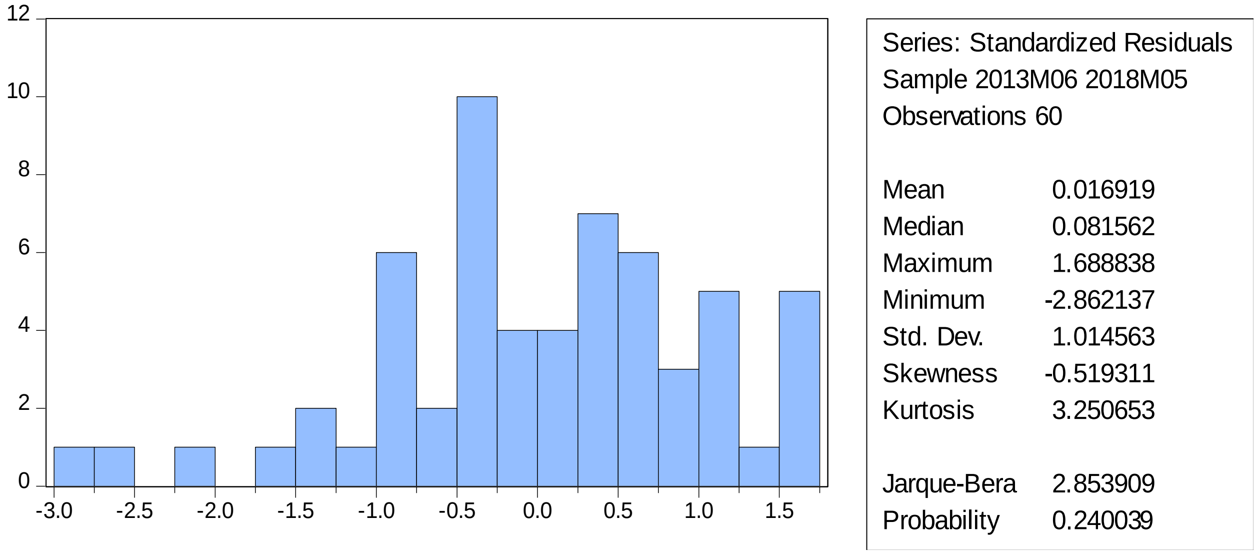
- CORE CPI (5 hours)



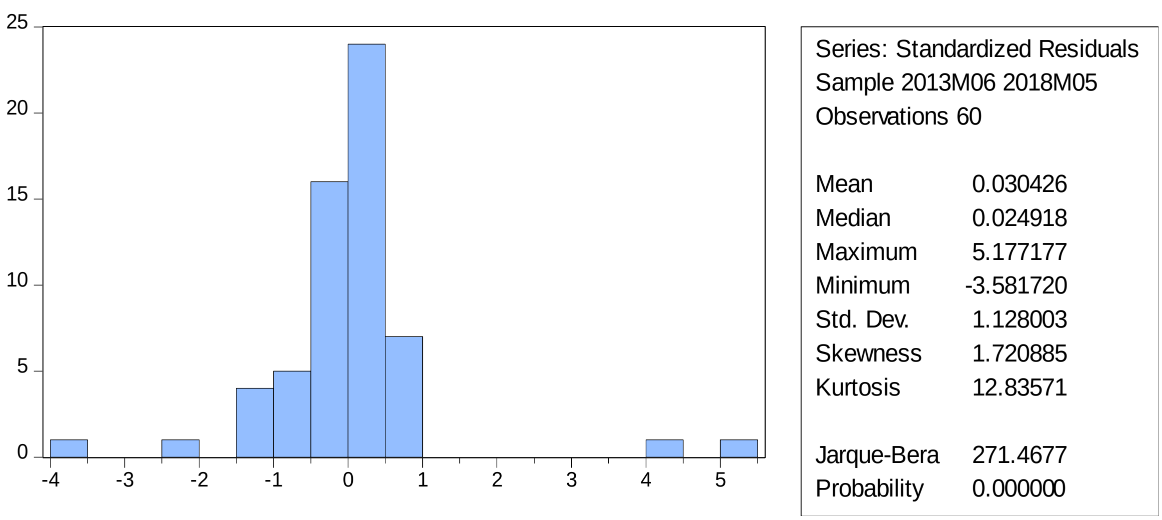
- CORE CPI (6 hours)



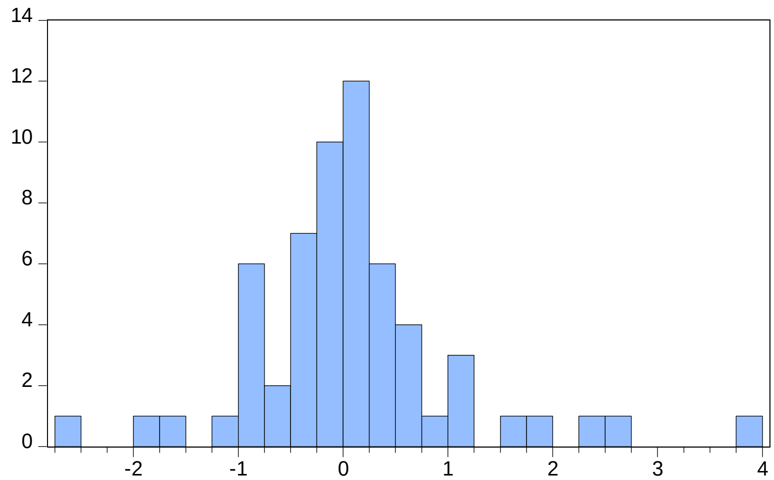
- CORE CPI (monthly)



- CPI (1 hour)



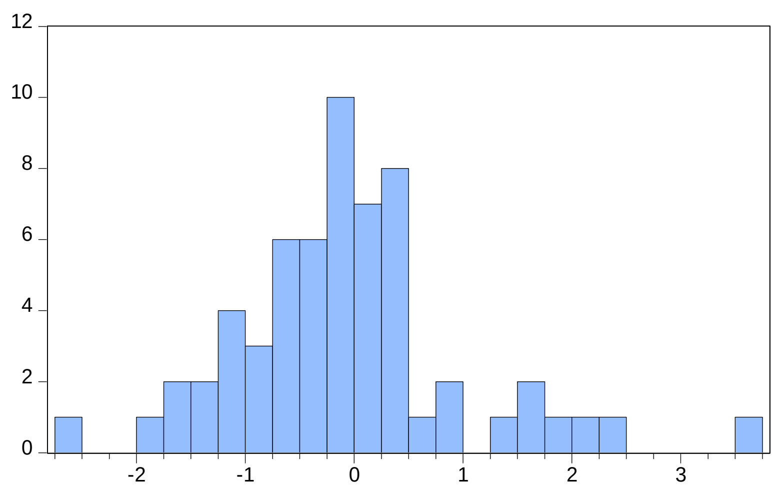
- CPI (2 hours)



Series: Standardized Residuals
Sample 2013M06 2018M05
Observations 60

Mean	0.077721
Median	0.024061
Maximum	3.795224
Minimum	-2.673249
Std. Dev.	1.022609
Skewness	0.859931
Kurtosis	5.843271
Jarque-Bera	27.60529
Probability	0.000001

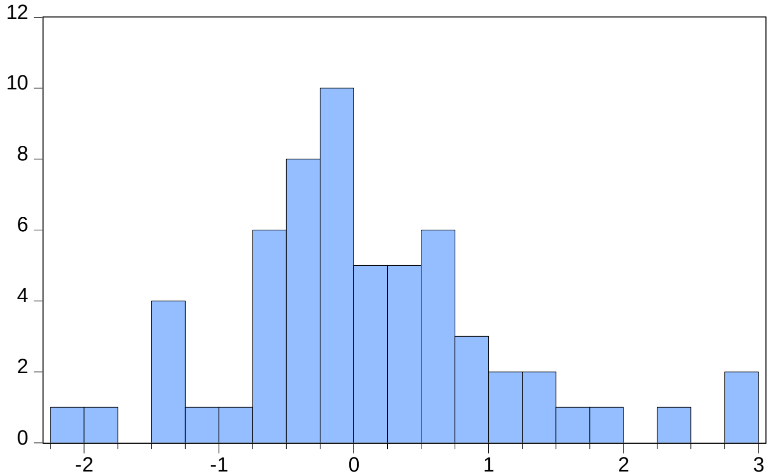
- CPI (3 hours)



Series: Standardized Residuals
Sample 2013M06 2018M05
Observations 60

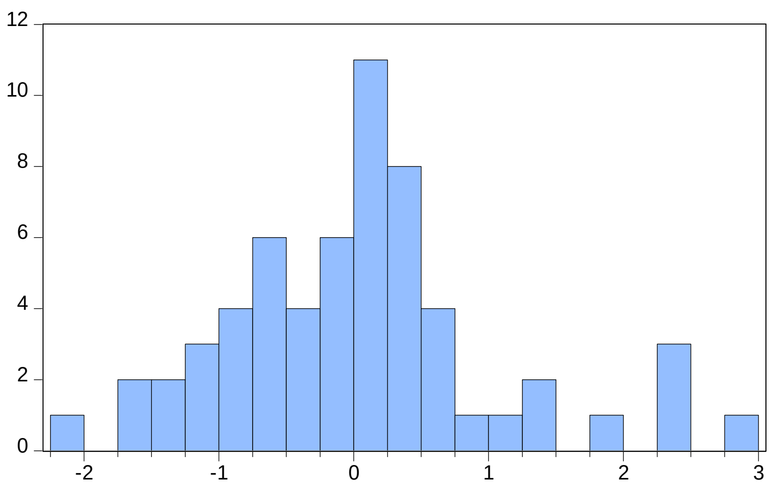
Mean	-0.059874
Median	-0.108796
Maximum	3.562791
Minimum	-2.688629
Std. Dev.	1.057805
Skewness	0.722447
Kurtosis	4.779036
Jarque-Bera	13.13171
Probability	0.001408

- CPI (4 hours)



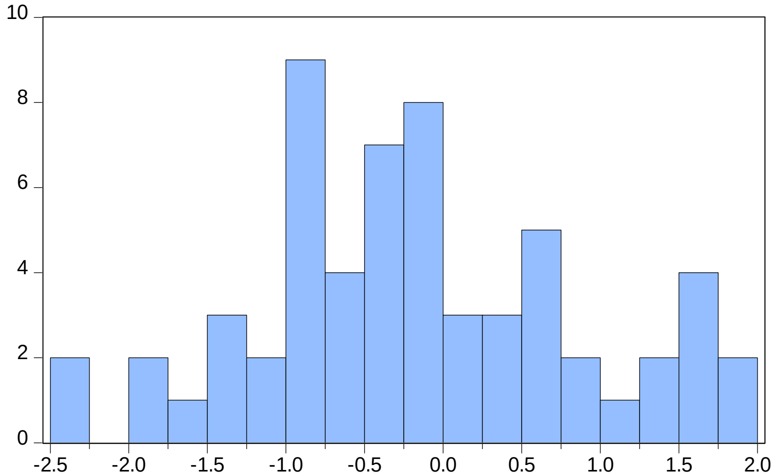
Series: Standardized Residuals	
Sample 2013M06 2018M05	
Observations 60	
Mean	0.109175
Median	-0.012411
Maximum	2.955203
Minimum	-2.081354
Std. Dev.	1.019051
Skewness	0.533919
Kurtosis	3.776717
Jarque-Bera	4.358921
Probability	0.113103

- CPI (5 hours)



Series: Standardized Residuals	
Sample 2013M06 2018M05	
Observations 60	
Mean	0.039277
Median	0.058700
Maximum	2.755844
Minimum	-2.212342
Std. Dev.	1.004695
Skewness	0.607458
Kurtosis	3.681392
Jarque-Bera	4.850796
Probability	0.088443

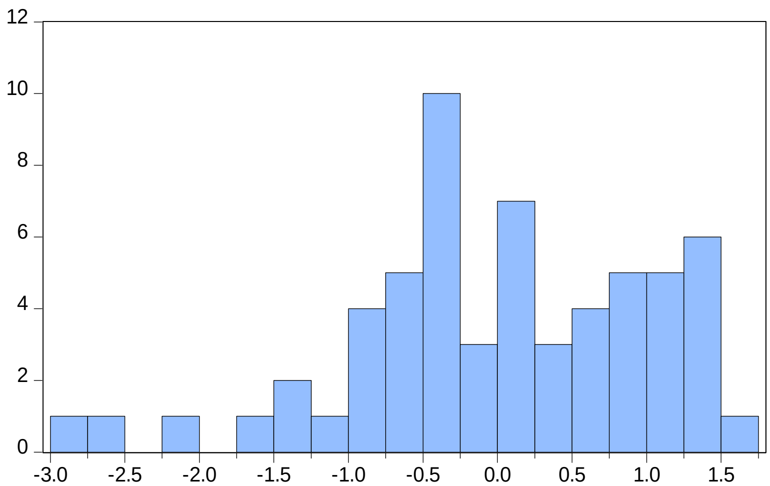
- CPI (6 hours)



Series: Standardized Residuals
Sample 2013M06 2018M05
Observations 60

Mean	-0.164285
Median	-0.251767
Maximum	1.946825
Minimum	-2.376107
Std. Dev.	1.024028
Skewness	0.182426
Kurtosis	2.654461
Jarque-Bera	0.631285
Probability	0.729320

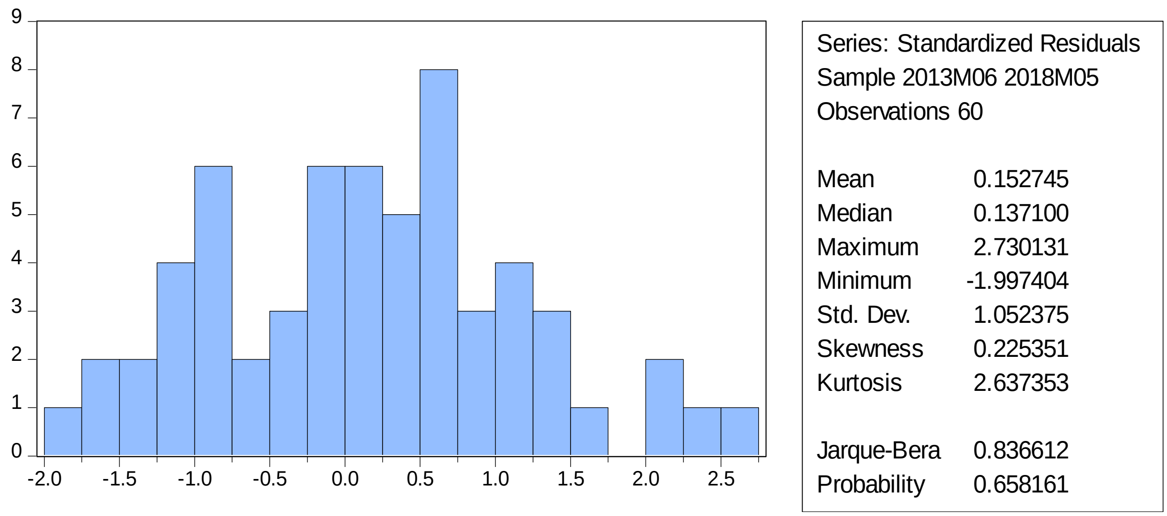
- CPI (monthly)



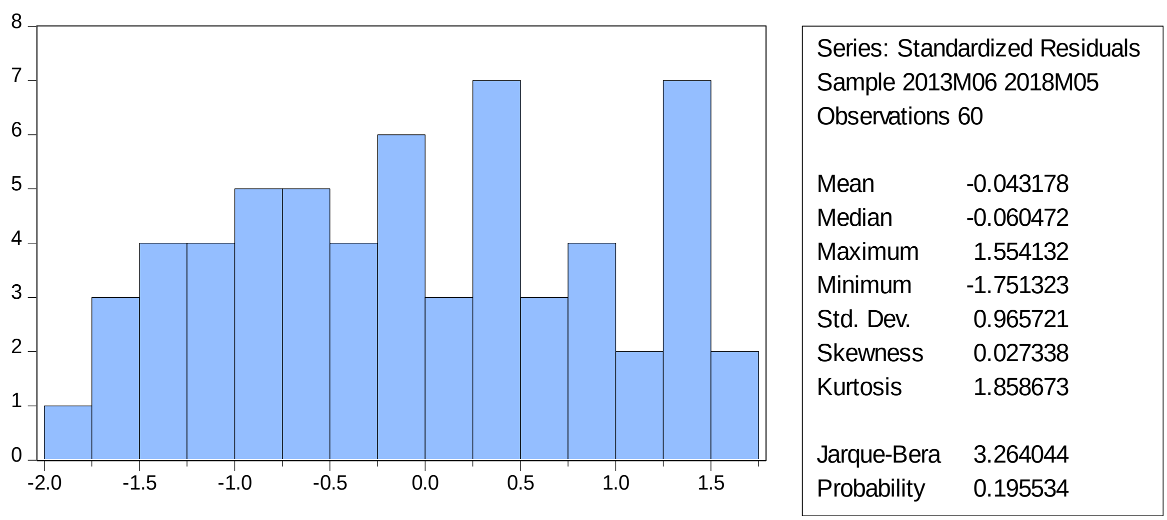
Series: Standardized Residuals
Sample 2013M06 2018M05
Observations 60

Mean	0.008327
Median	0.054284
Maximum	1.656328
Minimum	-2.813263
Std. Dev.	1.016075
Skewness	-0.539858
Kurtosis	3.089196
Jarque-Bera	2.934355
Probability	0.230575

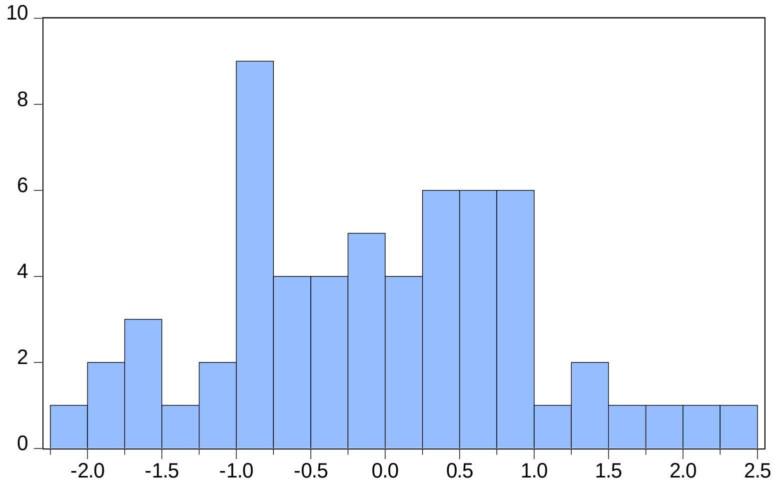
- PMI (1 hour)



- PMI (2 hours)



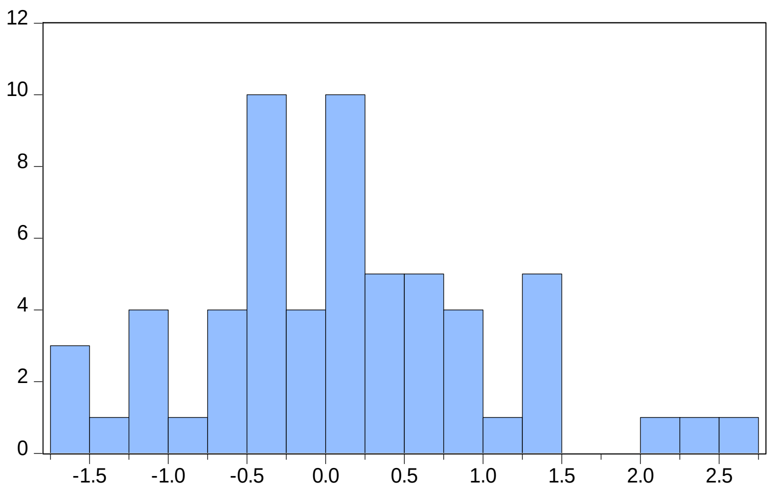
- PMI (3 hours)



Series: Standardized Residuals
Sample 2013M06 2018M05
Observations 60

Mean	-0.069055
Median	-0.095858
Maximum	2.340557
Minimum	-2.048942
Std. Dev.	1.015809
Skewness	0.126929
Kurtosis	2.530115
Jarque-Bera	0.713089
Probability	0.700091

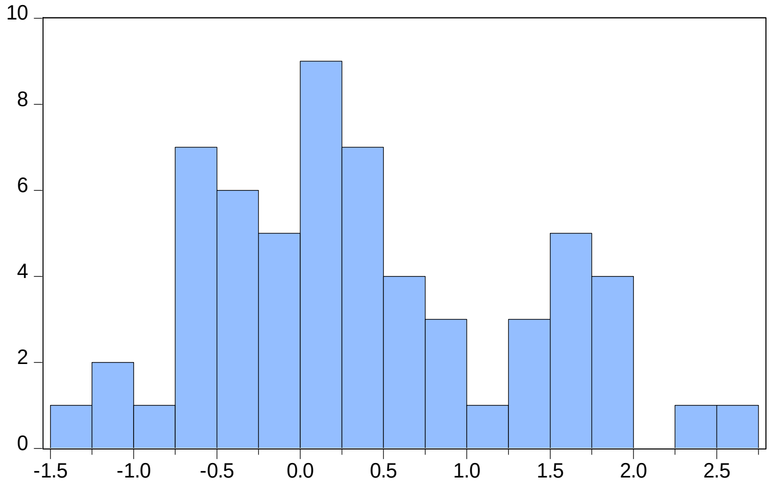
- PMI (4 hours)



Series: Standardized Residuals
Sample 2013M06 2018M05
Observations 60

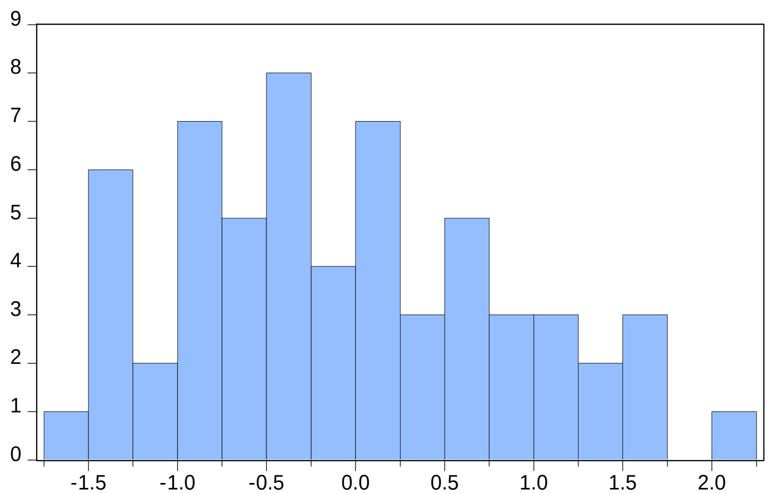
Mean	0.117147
Median	0.037774
Maximum	2.728321
Minimum	-1.574298
Std. Dev.	0.944577
Skewness	0.455541
Kurtosis	3.205382
Jarque-Bera	2.180633
Probability	0.336110

- PMI (5 hours)



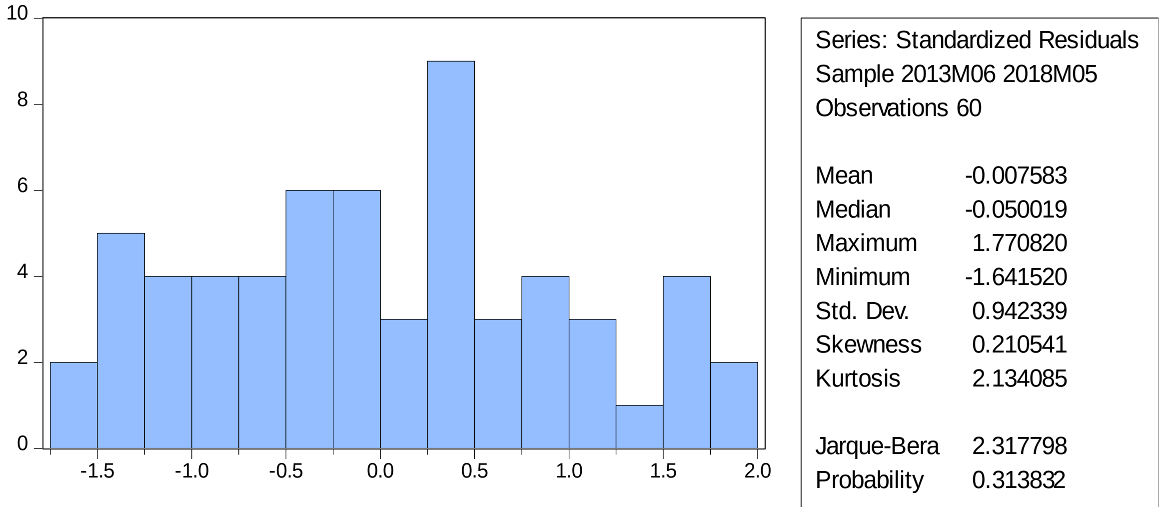
Series: Standardized Residuals	
Sample 2013M06 2018M05	
Observations 60	
Mean	0.377235
Median	0.149616
Maximum	2.566710
Minimum	-1.327264
Std. Dev.	0.940066
Skewness	0.396442
Kurtosis	2.321668
Jarque-Bera	2.722003
Probability	0.256404

- PMI (6 hours)

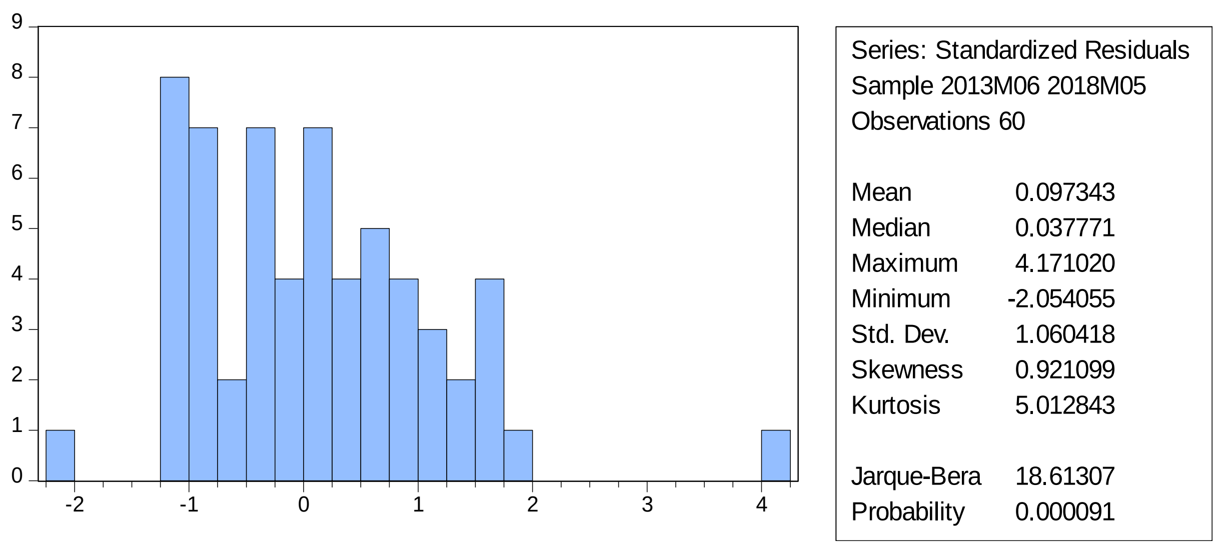


Series: Standardized Residuals	
Sample 2013M06 2018M05	
Observations 60	
Mean	-0.061777
Median	-0.190410
Maximum	2.095353
Minimum	-1.729633
Std. Dev.	0.911906
Skewness	0.312070
Kurtosis	2.281511
Jarque-Bera	2.264444
Probability	0.322316

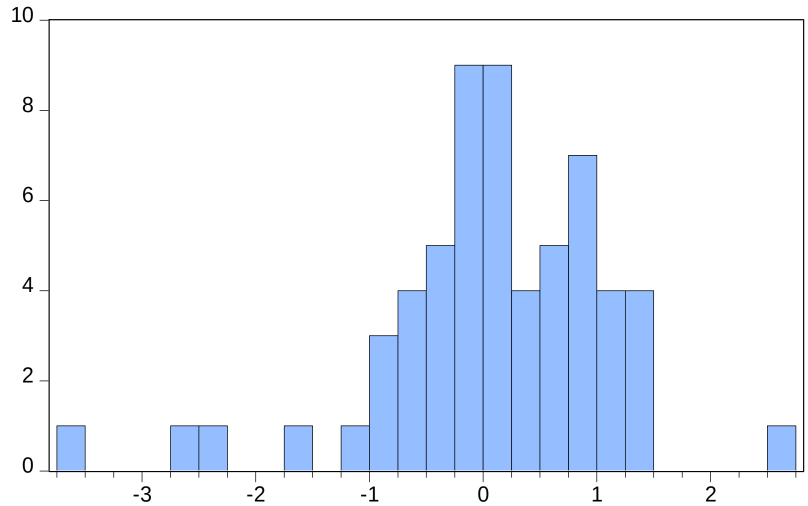
- PMI (monthly)



- PPI (1 hour)

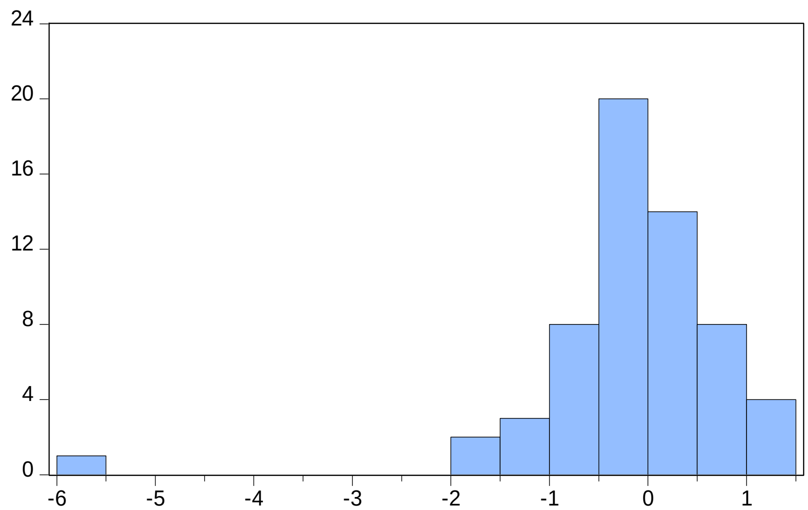


- PPI (2 hours)



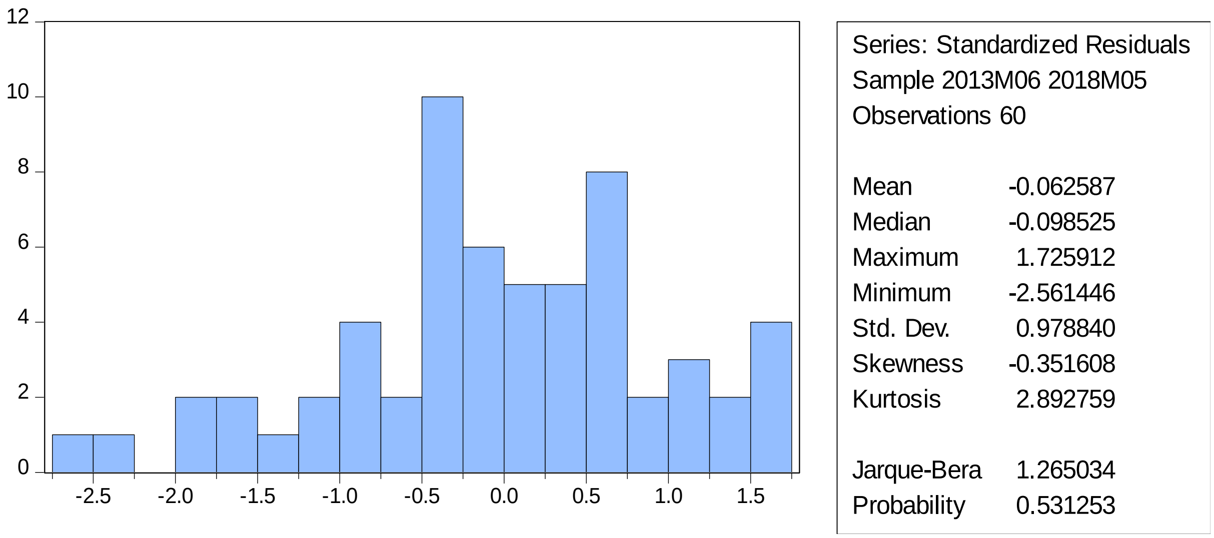
Series: Standardized Residuals	
Sample 2013M06 2018M05	
Observations 60	
Mean	0.091779
Median	0.080511
Maximum	2.500534
Minimum	-3.564721
Std. Dev.	1.004612
Skewness	-1.032419
Kurtosis	5.522048
Jarque-Bera	26.56071
Probability	0.000002

- PPI (3 hours)

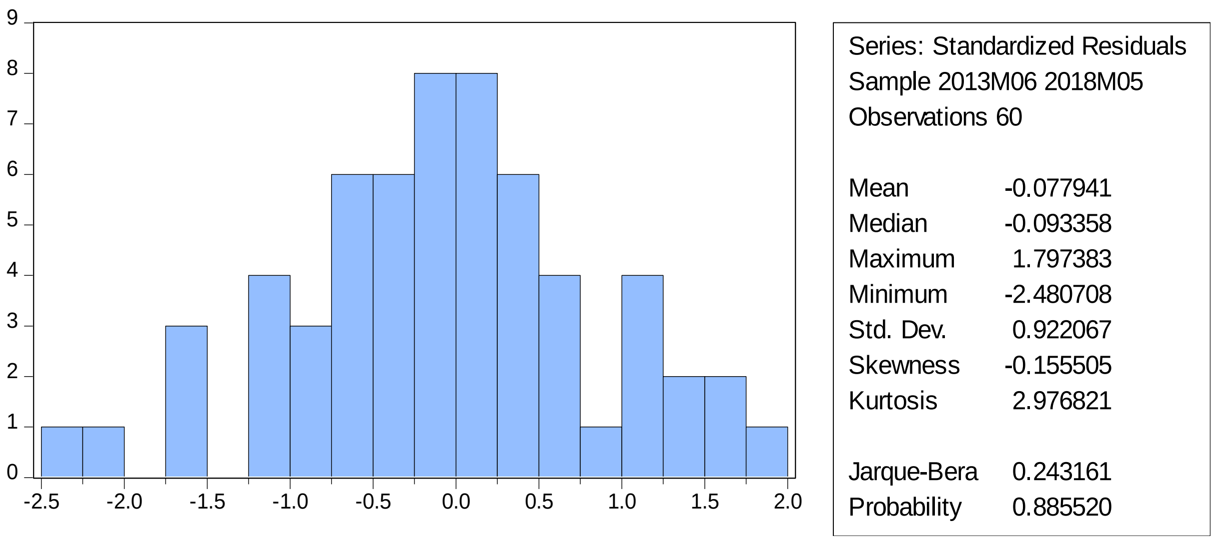


Series: Standardized Residuals	
Sample 2013M06 2018M05	
Observations 60	
Mean	-0.147563
Median	-0.106787
Maximum	1.446349
Minimum	-5.612894
Std. Dev.	0.975295
Skewness	-2.905840
Kurtosis	17.63334
Jarque-Bera	619.7759
Probability	0.000000

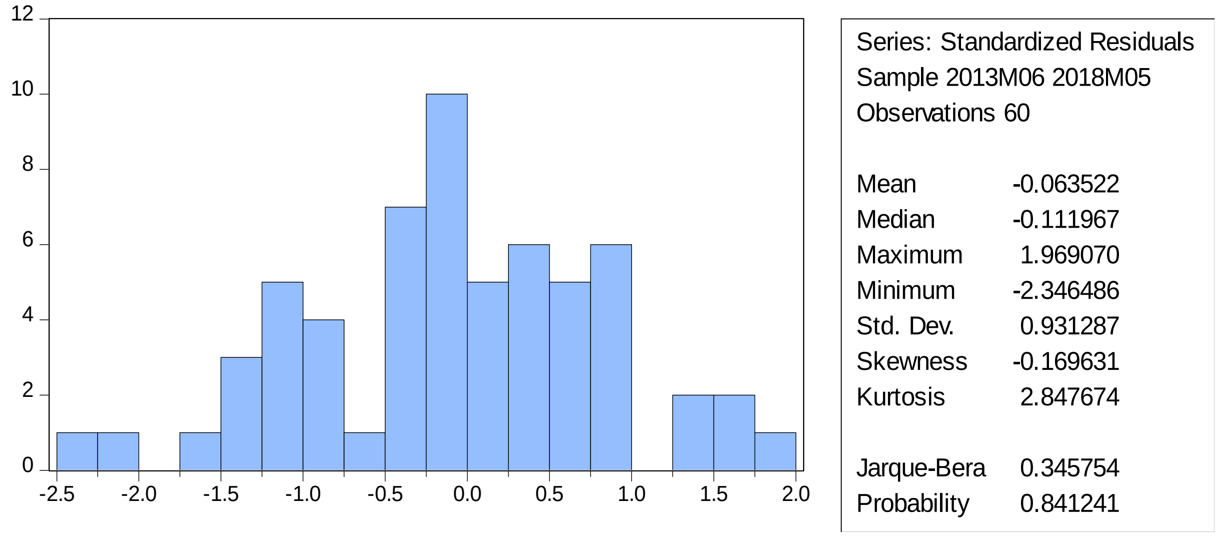
- PPI (4 hours)



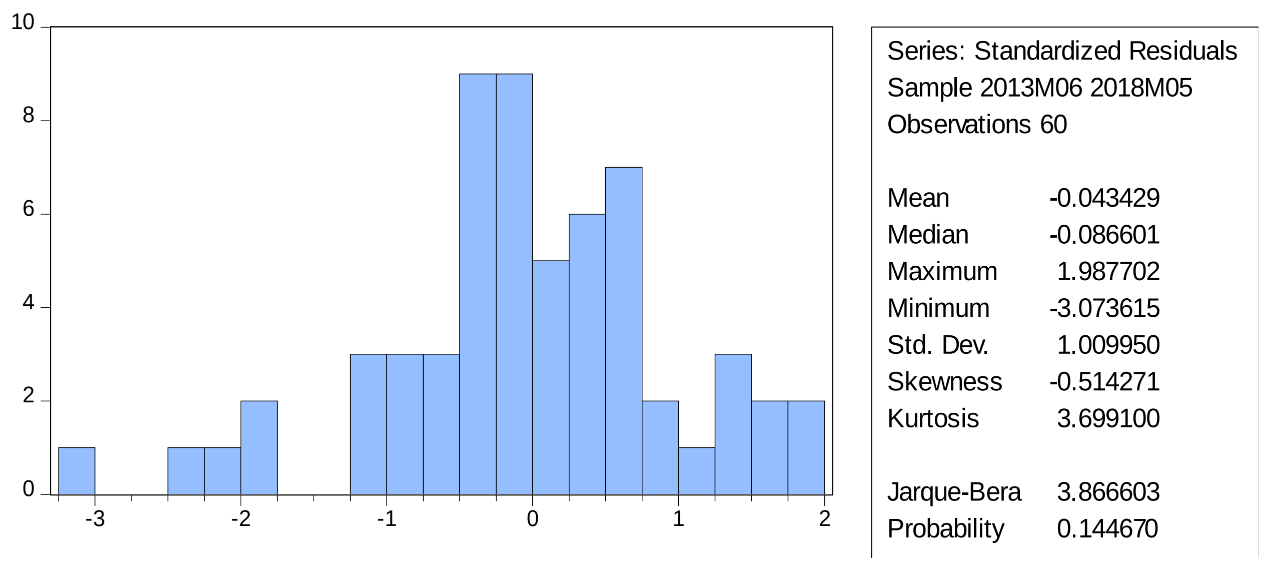
- PPI (5 hours)



- PPI (6 hours)



- PPI (monthly)



APPENDIX 5: UNIT ROOT (ADF TEST)

- ADP (1 hour)

Group unit root test: Summary
Series: ONEHR, ADP
Date: 01/22/19 Time: 15:26
Sample: 2013M06 2018M05
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-7.41124	0.0000	2	118
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-8.81923	0.0000	2	118
ADF - Fisher Chi-square	63.3379	0.0000	2	118
PP - Fisher Chi-square	63.7522	0.0000	2	118

** Probabilities for Fisher tests are computed using an asymptotic Chi
-square distribution. All other tests assume asymptotic normality.

- ADP (2 hours)

Group unit root test: Summary
Series: TWOHR, ADP
Date: 01/22/19 Time: 15:24
Sample: 2013M06 2018M05
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-9.71485	0.0000	2	118
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-10.6078	0.0000	2	118
ADF - Fisher Chi-square	75.7390	0.0000	2	118

PP - Fisher Chi-square	79.9129	0.0000	2	118

** Probabilities for Fisher tests are computed using an asymptotic Chi
-square distribution. All other tests assume asymptotic normality.

- ADP (3 hours)

Group unit root test: Summary
Series: THREEHR, ADP
Date: 01/22/19 Time: 15:23
Sample: 2013M06 2018M05
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-8.40679	0.0000	2	118
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-8.76073	0.0000	2	118
ADF - Fisher Chi-square	62.8626	0.0000	2	118
PP - Fisher Chi-square	63.2795	0.0000	2	118

** Probabilities for Fisher tests are computed using an asymptotic Chi
-square distribution. All other tests assume asymptotic normality.

- ADP (4 hours)

Group unit root test: Summary
Series: FOURHR, ADP
Date: 01/22/19 Time: 15:21
Sample: 2013M06 2018M05
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-9.08089	0.0000	2	118
Null: Unit root (assumes individual unit root process)				

Im, Pesaran and Shin W-stat	-9.69543	0.0000	2	118
ADF - Fisher Chi-square	70.0034	0.0000	2	118
PP - Fisher Chi-square	70.3895	0.0000	2	118

** Probabilities for Fisher tests are computed using an asymptotic Chi
-square distribution. All other tests assume asymptotic normality.

- ADP (5 hours)

Group unit root test: Summary
Series: FIVEHR, ADP
Date: 01/22/19 Time: 15:20
Sample: 2013M06 2018M05
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-8.21564	0.0000	2	118
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-8.96520	0.0000	2	118
ADF - Fisher Chi-square	64.5099	0.0000	2	118
PP - Fisher Chi-square	64.9274	0.0000	2	118

** Probabilities for Fisher tests are computed using an asymptotic Chi
-square distribution. All other tests assume asymptotic normality.

- ADP (6 hours)

Group unit root test: Summary
Series: SIXHR, ADP
Date: 01/22/19 Time: 15:18
Sample: 2013M06 2018M05
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-7.95421	0.0000	2	118
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-8.45473	0.0000	2	118
ADF - Fisher Chi-square	60.3301	0.0000	2	118

PP - Fisher Chi-square	60.5320	0.0000	2	118

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

- ADP (monthly)

Group unit root test: Summary
Series: MONTHLY_CHG, ADP
Date: 01/24/19 Time: 11:55
Sample: 2013M06 2018M05
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-7.34677	0.0000	2	118
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-7.54887	0.0000	2	118
ADF - Fisher Chi-square	52.5570	0.0000	2	118
PP - Fisher Chi-square	52.9745	0.0000	2	118

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

- AHE (1 hour)

Group unit root test: Summary
Series: ONEHR, AHE
Date: 01/22/19 Time: 15:48
Sample: 2013M06 2018M05
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-13.8825	0.0000	2	118
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-15.0361	0.0000	2	118
ADF - Fisher Chi-square	76.5985	0.0000	2	118
PP - Fisher Chi-square	79.1228	0.0000	2	118

** Probabilities for Fisher tests are computed using an asymptotic Chi
-square distribution. All other tests assume asymptotic normality.

- AHE (2 hours)

Group unit root test: Summary
Series: TWOHR, AHE
Date: 01/22/19 Time: 15:47
Sample: 2013M06 2018M05
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-15.1951	0.0000	2	118
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-15.9818	0.0000	2	118
ADF - Fisher Chi-square	84.5979	0.0000	2	118
PP - Fisher Chi-square	87.1517	0.0000	2	118

** Probabilities for Fisher tests are computed using an asymptotic Chi
-square distribution. All other tests assume asymptotic normality.

- AHE (3 hours)

Group unit root test: Summary
Series: THREEHR, AHE
Date: 01/22/19 Time: 15:46
Sample: 2013M06 2018M05
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-15.4570	0.0000	2	118
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-16.2331	0.0000	2	118
ADF - Fisher Chi-square	86.6168	0.0000	2	118
PP - Fisher Chi-square	89.3812	0.0000	2	118

** Probabilities for Fisher tests are computed using an asymptotic Chi
-square distribution. All other tests assume asymptotic normality.

- AHE (4 hours)

Group unit root test: Summary
Series: FOURHR, AHE
Date: 01/22/19 Time: 15:44
Sample: 2013M06 2018M05
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-16.5914	0.0000	2	118
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-16.7006	0.0000	2	118
ADF - Fisher Chi-square	90.1856	0.0000	2	118
PP - Fisher Chi-square	92.7760	0.0000	2	118

** Probabilities for Fisher tests are computed using an asymptotic Chi
-square distribution. All other tests assume asymptotic normality.

- AHE (5 hours)

Group unit root test: Summary
Series: FIVEHR, AHE
Date: 01/22/19 Time: 15:43
Sample: 2013M06 2018M05
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-16.6964	0.0000	2	118
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-16.8173	0.0000	2	118
ADF - Fisher Chi-square	91.0324	0.0000	2	118
PP - Fisher Chi-square	96.1453	0.0000	2	118

** Probabilities for Fisher tests are computed using an asymptotic Chi
-square distribution. All other tests assume asymptotic normality.

- AHE (6 hours)

Group unit root test: Summary
Series: SIXHR, AHE
Date: 01/22/19 Time: 15:42
Sample: 2013M06 2018M05
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-16.1937	0.0000	2	118
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-16.5643	0.0000	2	118
ADF - Fisher Chi-square	89.1726	0.0000	2	118
PP - Fisher Chi-square	93.4697	0.0000	2	118

** Probabilities for Fisher tests are computed using an asymptotic Chi
-square distribution. All other tests assume asymptotic normality.

- AHE (monthly)

Group unit root test: Summary
Series: MONTHLY_CHG, AHE
Date: 01/24/19 Time: 10:55
Sample: 2013M06 2018M05
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-15.0627	0.0000	2	118
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-15.8867	0.0000	2	118
ADF - Fisher Chi-square	83.8188	0.0000	2	118
PP - Fisher Chi-square	86.7412	0.0000	2	118

** Probabilities for Fisher tests are computed using an asymptotic Chi
-square distribution. All other tests assume asymptotic normality.

- BP (1 hour)

Group unit root test: Summary
Series: ONEHR, BP
Date: 01/22/19 Time: 14:30
Sample: 2013M06 2018M05
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0 to 2
Newey-West automatic bandwidth selection and Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-12.4251	0.0000	2	116
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-12.6653	0.0000	2	116
ADF - Fisher Chi-square	90.7913	0.0000	2	116
PP - Fisher Chi-square	72.2098	0.0000	2	118

** Probabilities for Fisher tests are computed using an asymptotic Chi
-square distribution. All other tests assume asymptotic normality.

- BP (2 hours)

Group unit root test: Summary
Series: TWOHR, BP
Date: 01/22/19 Time: 14:28
Sample: 2013M06 2018M05
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0 to 2
Newey-West automatic bandwidth selection and Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-11.9720	0.0000	2	116
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-11.8484	0.0000	2	116
ADF - Fisher Chi-square	84.3497	0.0000	2	116
PP - Fisher Chi-square	63.8816	0.0000	2	118

** Probabilities for Fisher tests are computed using an asymptotic Chi
-square distribution. All other tests assume asymptotic normality.

- BP (3 hours)

Group unit root test: Summary
Series: THREEHR, BP
Date: 01/22/19 Time: 14:27
Sample: 2013M06 2018M05
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-13.5383	0.0000	2	118
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-12.8404	0.0000	2	118
ADF - Fisher Chi-square	91.4068	0.0000	2	118
PP - Fisher Chi-square	73.5770	0.0000	2	118

** Probabilities for Fisher tests are computed using an asymptotic Chi
-square distribution. All other tests assume asymptotic normality.

- BP (4 hours)

Group unit root test: Summary
Series: FOURHR, BP
Date: 01/22/19 Time: 14:25
Sample: 2013M06 2018M05
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0 to 2
Newey-West automatic bandwidth selection and Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-11.7811	0.0000	2	116
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-11.5709	0.0000	2	116
ADF - Fisher Chi-square	82.0216	0.0000	2	116
PP - Fisher Chi-square	64.1471	0.0000	2	118

** Probabilities for Fisher tests are computed using an asymptotic Chi
-square distribution. All other tests assume asymptotic normality.

- BP (5 hours)

Group unit root test: Summary
Series: FIVEHR, BP
Date: 01/22/19 Time: 14:23
Sample: 2013M06 2018M05
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-13.4820	0.0000	2	118
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-12.9090	0.0000	2	118
ADF - Fisher Chi-square	91.9144	0.0000	2	118
PP - Fisher Chi-square	76.0534	0.0000	2	118

** Probabilities for Fisher tests are computed using an asymptotic Chi
-square distribution. All other tests assume asymptotic normality.

- BP (6 hours)

Group unit root test: Summary
Series: SIXHR, BP
Date: 01/22/19 Time: 14:22
Sample: 2013M06 2018M05
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-13.4470	0.0000	2	118
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-12.8928	0.0000	2	118
ADF - Fisher Chi-square	91.7950	0.0000	2	118
PP - Fisher Chi-square	65.6656	0.0000	2	118

** Probabilities for Fisher tests are computed using an asymptotic Chi
-square distribution. All other tests assume asymptotic normality.

- BP (monthly)

Group unit root test: Summary
Series: MONTHLY_CHG, BP
Date: 01/24/19 Time: 11:20
Sample: 2013M06 2018M05
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-11.5687	0.0000	2	118
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-11.7739	0.0000	2	118
ADF - Fisher Chi-square	82.8510	0.0000	2	118
PP - Fisher Chi-square	54.2437	0.0000	2	118

** Probabilities for Fisher tests are computed using an asymptotic Chi
-square distribution. All other tests assume asymptotic normality.

- CCI (1 hour)

Group unit root test: Summary
Series: ONEHR, CCI
Date: 02/13/19 Time: 09:49
Sample: 2013M06 2018M05
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0 to 1
Newey-West automatic bandwidth selection and Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-8.93297	0.0000	2	117
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-11.3710	0.0000	2	117
ADF - Fisher Chi-square	83.2844	0.0000	2	117
PP - Fisher Chi-square	89.8209	0.0000	2	118

** Probabilities for Fisher tests are computed using an asymptotic Chi
-square distribution. All other tests assume asymptotic normality.

- CCI (2 hours)

Group unit root test: Summary
Series: TWOHR, CCI
Date: 02/13/19 Time: 09:47
Sample: 2013M06 2018M05
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0 to 1
Newey-West automatic bandwidth selection and Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-7.74661	0.0000	2	117
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-10.7431	0.0000	2	117
ADF - Fisher Chi-square	78.1334	0.0000	2	117
PP - Fisher Chi-square	84.7197	0.0000	2	118

** Probabilities for Fisher tests are computed using an asymptotic Chi
-square distribution. All other tests assume asymptotic normality.

- CCI (3 hours)

Group unit root test: Summary
Series: THREEHR, CCI
Date: 02/13/19 Time: 09:46
Sample: 2013M06 2018M05
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0 to 1
Newey-West automatic bandwidth selection and Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-8.40196	0.0000	2	117
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-10.6109	0.0000	2	117
ADF - Fisher Chi-square	77.0089	0.0000	2	117
PP - Fisher Chi-square	83.3931	0.0000	2	118

** Probabilities for Fisher tests are computed using an asymptotic Chi
-square distribution. All other tests assume asymptotic normality.

- CCI (4 hours)

Group unit root test: Summary
Series: FOURHR, CCI
Date: 02/13/19 Time: 09:44
Sample: 2013M06 2018M05
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0 to 1
Newey-West automatic bandwidth selection and Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-9.66007	0.0000	2	117
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-10.8663	0.0000	2	117
ADF - Fisher Chi-square	79.1698	0.0000	2	117
PP - Fisher Chi-square	85.5480	0.0000	2	118

** Probabilities for Fisher tests are computed using an asymptotic Chi
-square distribution. All other tests assume asymptotic normality.

- CCI (5 hours)

Group unit root test: Summary
Series: FIVEHR, CCI
Date: 02/13/19 Time: 09:42
Sample: 2013M06 2018M05
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0 to 1
Newey-West automatic bandwidth selection and Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-10.4006	0.0000	2	117
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-11.2150	0.0000	2	117
ADF - Fisher Chi-square	82.0387	0.0000	2	117
PP - Fisher Chi-square	88.5815	0.0000	2	118

** Probabilities for Fisher tests are computed using an asymptotic Chi
-square distribution. All other tests assume asymptotic normality.

- CCI (6 hours)

Group unit root test: Summary
Series: SIXHR, CCI
Date: 02/13/19 Time: 09:42
Sample: 2013M06 2018M05

Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0 to 1
Newey-West automatic bandwidth selection and Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-9.12296	0.0000	2	117
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-10.2763	0.0000	2	117
ADF - Fisher Chi-square	74.1257	0.0000	2	117
PP - Fisher Chi-square	80.2481	0.0000	2	118

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

- CCI (monthly)

Group unit root test: Summary
Series: MONTHLY_CHG, CCI
Date: 02/13/19 Time: 09:55
Sample: 2013M06 2018M05
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-4.81679	0.0000	2	116
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-7.62014	0.0000	2	116
ADF - Fisher Chi-square	53.2904	0.0000	2	116
PP - Fisher Chi-square	82.6014	0.0000	2	118

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

- CORE CPI (1 hour)

Group unit root test: Summary
Series: ONEHR, CORECPI
Date: 01/22/19 Time: 16:10
Sample: 2013M06 2018M05
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0

Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-10.9839	0.0000	2	118
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-9.41388	0.0000	2	118
ADF - Fisher Chi-square	68.2377	0.0000	2	118
PP - Fisher Chi-square	68.4873	0.0000	2	118

** Probabilities for Fisher tests are computed using an asymptotic Chi
-square distribution. All other tests assume asymptotic normality.

- CORE CPI (2 hours)

Group unit root test: Summary
Series: TWOHR, CORECPI
Date: 01/22/19 Time: 16:09
Sample: 2013M06 2018M05
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-10.5701	0.0000	2	118
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-9.29559	0.0000	2	118
ADF - Fisher Chi-square	67.3111	0.0000	2	118
PP - Fisher Chi-square	67.1021	0.0000	2	118

** Probabilities for Fisher tests are computed using an asymptotic Chi
-square distribution. All other tests assume asymptotic normality.

- CORE CPI (3 hours)

Group unit root test: Summary
Series: THREEHR, CORECPI
Date: 01/22/19 Time: 16:07
Sample: 2013M06 2018M05
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-10.0773	0.0000	2	118
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-9.07823	0.0000	2	118
ADF - Fisher Chi-square	65.5705	0.0000	2	118
PP - Fisher Chi-square	65.3982	0.0000	2	118

** Probabilities for Fisher tests are computed using an asymptotic Chi
-square distribution. All other tests assume asymptotic normality.

- CORE CPI (4 hours)

Group unit root test: Summary
Series: FOURHR, CORECPI
Date: 01/22/19 Time: 16:06
Sample: 2013M06 2018M05
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-10.3660	0.0000	2	118
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-9.75095	0.0000	2	118
ADF - Fisher Chi-square	70.7866	0.0000	2	118
PP - Fisher Chi-square	70.7939	0.0000	2	118

** Probabilities for Fisher tests are computed using an asymptotic Chi
-square distribution. All other tests assume asymptotic normality.

- CORE CPI (5 hours)

Group unit root test: Summary
Series: FIVEHR, CORECPI
Date: 01/22/19 Time: 16:05
Sample: 2013M06 2018M05
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Cross-

Method	Statistic	Prob.**	sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-10.8292	0.0000	2	118
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-9.67048	0.0000	2	118
ADF - Fisher Chi-square	70.1912	0.0000	2	118
PP - Fisher Chi-square	70.4226	0.0000	2	118

** Probabilities for Fisher tests are computed using an asymptotic Chi
-square distribution. All other tests assume asymptotic normality.

- COE CPI (6 hours)

Group unit root test: Summary
Series: SIXHR, CORECPI
Date: 01/22/19 Time: 16:03
Sample: 2013M06 2018M05
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-10.5143	0.0000	2	118
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-9.09309	0.0000	2	118
ADF - Fisher Chi-square	65.6910	0.0000	2	118
PP - Fisher Chi-square	65.5244	0.0000	2	118

** Probabilities for Fisher tests are computed using an asymptotic Chi
-square distribution. All other tests assume asymptotic normality.

- CORE CPI (monthly)

Group unit root test: Summary
Series: MONTHLY_CHG, CORECPI
Date: 01/24/19 Time: 11:49
Sample: 2013M06 2018M05
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				

Levin, Lin & Chu t*	-9.58317	0.0000	2	118
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-8.76133	0.0000	2	118
ADF - Fisher Chi-square	62.9573	0.0000	2	118
PP - Fisher Chi-square	63.1221	0.0000	2	118

** Probabilities for Fisher tests are computed using an asymptotic Chi
-square distribution. All other tests assume asymptotic normality.

- CPI (1 hour)

Group unit root test: Summary
Series: ONEHR, CPI
Date: 01/24/19 Time: 11:27
Sample: 2013M06 2018M05
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-8.66830	0.0000	2	118
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-8.20103	0.0000	2	118
ADF - Fisher Chi-square	57.7972	0.0000	2	118
PP - Fisher Chi-square	58.1618	0.0000	2	118

** Probabilities for Fisher tests are computed using an asymptotic Chi
-square distribution. All other tests assume asymptotic normality.

- CPI (2 hours)

Group unit root test: Summary
Series: TWOHR, CPI
Date: 01/22/19 Time: 15:58
Sample: 2013M06 2018M05
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-8.28074	0.0000	2	118

Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-8.08274	0.0000	2	118
ADF - Fisher Chi-square	56.8706	0.0000	2	118
PP - Fisher Chi-square	56.7766	0.0000	2	118

** Probabilities for Fisher tests are computed using an asymptotic Chi
-square distribution. All other tests assume asymptotic normality.

- CPI (3 hours)

Group unit root test: Summary
Series: THREEHR, CPI
Date: 01/22/19 Time: 15:56
Sample: 2013M06 2018M05
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-7.82746	0.0000	2	118
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-7.86538	0.0000	2	118
ADF - Fisher Chi-square	55.1300	0.0000	2	118
PP - Fisher Chi-square	55.0727	0.0000	2	118

** Probabilities for Fisher tests are computed using an asymptotic Chi
-square distribution. All other tests assume asymptotic normality.

- CPI (4 hours)

Group unit root test: Summary
Series: FOURHR, CPI
Date: 01/22/19 Time: 15:55
Sample: 2013M06 2018M05
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-8.05809	0.0000	2	118
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-8.53810	0.0000	2	118

ADF - Fisher Chi-square	60.3461	0.0000	2	118
PP - Fisher Chi-square	60.4683	0.0000	2	118

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

- CPI (5 hours)

Group unit root test: Summary
Series: FIVEHR, CPI
Date: 01/22/19 Time: 15:54
Sample: 2013M06 2018M05
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-8.50487	0.0000	2	118
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-8.45763	0.0000	2	118
ADF - Fisher Chi-square	59.7507	0.0000	2	118
PP - Fisher Chi-square	60.0970	0.0000	2	118

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

- CPI (6 hours)

Group unit root test: Summary
Series: SIXHR, CPI
Date: 01/22/19 Time: 15:52
Sample: 2013M06 2018M05
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-8.24735	0.0000	2	118
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-7.88024	0.0000	2	118
ADF - Fisher Chi-square	55.2505	0.0000	2	118
PP - Fisher Chi-square	55.1988	0.0000	2	118

** Probabilities for Fisher tests are computed using an asymptotic Chi
-square distribution. All other tests assume asymptotic normality.

- CPI (monthly)

Group unit root test: Summary
Series: MONTHLY_CHG, CPI
Date: 01/24/19 Time: 11:03
Sample: 2013M06 2018M05
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-7.39591	0.0000	2	118
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-7.54848	0.0000	2	118
ADF - Fisher Chi-square	52.5167	0.0000	2	118
PP - Fisher Chi-square	52.7965	0.0000	2	118

** Probabilities for Fisher tests are computed using an asymptotic Chi
-square distribution. All other tests assume asymptotic normality.

- PMI (1 hour)

Group unit root test: Summary
Series: ONEHR, PMI
Date: 01/22/19 Time: 15:13
Sample: 2013M06 2018M05
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-9.82513	0.0000	2	118
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-10.3957	0.0000	2	118
ADF - Fisher Chi-square	76.2098	0.0000	2	118
PP - Fisher Chi-square	76.2658	0.0000	2	118

** Probabilities for Fisher tests are computed using an asymptotic Chi
-square distribution. All other tests assume asymptotic normality.

- PMI (2 hours)

Group unit root test: Summary
Series: TWOHR, PMI
Date: 01/22/19 Time: 15:11
Sample: 2013M06 2018M05
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-9.33726	0.0000	2	118
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-9.59298	0.0000	2	118
ADF - Fisher Chi-square	69.8703	0.0000	2	118
PP - Fisher Chi-square	69.7846	0.0000	2	118

** Probabilities for Fisher tests are computed using an asymptotic Chi
-square distribution. All other tests assume asymptotic normality.

- PMI (3 hours)

Group unit root test: Summary
Series: THREEHR, PMI
Date: 01/22/19 Time: 15:09
Sample: 2013M06 2018M05
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-8.78482	0.0000	2	118
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-9.02558	0.0000	2	118
ADF - Fisher Chi-square	65.0693	0.0000	2	118
PP - Fisher Chi-square	65.0775	0.0000	2	118

** Probabilities for Fisher tests are computed using an asymptotic Chi
-square distribution. All other tests assume asymptotic normality.

- PMI (4 hours)

Group unit root test: Summary
Series: FOURHR, PMI
Date: 01/22/19 Time: 15:07
Sample: 2013M06 2018M05
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-10.2414	0.0000	2	118
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-10.4289	0.0000	2	118
ADF - Fisher Chi-square	76.4560	0.0000	2	118
PP - Fisher Chi-square	76.6748	0.0000	2	118

** Probabilities for Fisher tests are computed using an asymptotic Chi
-square distribution. All other tests assume asymptotic normality.

- PMI (5 hours)

Group unit root test: Summary
Series: FIVEHR, PMI
Date: 01/22/19 Time: 15:06
Sample: 2013M06 2018M05
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-10.1759	0.0000	2	118
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-10.2481	0.0000	2	118
ADF - Fisher Chi-square	75.0976	0.0000	2	118
PP - Fisher Chi-square	75.2000	0.0000	2	118

** Probabilities for Fisher tests are computed using an asymptotic Chi
-square distribution. All other tests assume asymptotic normality.

- PMI (6 hours)

Group unit root test: Summary
Series: SIXHR, PMI
Date: 01/22/19 Time: 15:04
Sample: 2013M06 2018M05
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-8.99446	0.0000	2	118
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-9.76481	0.0000	2	118
ADF - Fisher Chi-square	71.2815	0.0000	2	118
PP - Fisher Chi-square	71.4032	0.0000	2	118

** Probabilities for Fisher tests are computed using an asymptotic Chi
-square distribution. All other tests assume asymptotic normality.

- PMI (monthly)

Group unit root test: Summary
Series: MONTHLY_CHG, PMI
Date: 01/24/19 Time: 11:44
Sample: 2013M06 2018M05
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-8.81009	0.0000	2	118
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-9.22343	0.0000	2	118
ADF - Fisher Chi-square	66.7629	0.0000	2	118
PP - Fisher Chi-square	66.7034	0.0000	2	118

** Probabilities for Fisher tests are computed using an asymptotic Chi
-square distribution. All other tests assume asymptotic normality.

- PPI (1 hour)

Group unit root test: Summary
Series: ONEHR, PPI
Date: 01/22/19 Time: 15:36
Sample: 2013M06 2018M05
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-10.5029	0.0000	2	118
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-9.85909	0.0000	2	118
ADF - Fisher Chi-square	70.8161	0.0000	2	118
PP - Fisher Chi-square	70.3211	0.0000	2	118

- PPI (2 hours)

Group unit root test: Summary
Series: TWOHR, PPI
Date: 01/22/19 Time: 15:34
Sample: 2013M06 2018M05
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-10.5971	0.0000	2	118
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-9.69266	0.0000	2	118
ADF - Fisher Chi-square	69.7073	0.0000	2	118
PP - Fisher Chi-square	69.5977	0.0000	2	118

- PPI (3 hours)

Group unit root test: Summary

Series: THREEHR, PPI
Date: 01/22/19 Time: 15:32
Sample: 2013M06 2018M05
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-9.87774	0.0000	2	118
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-8.73091	0.0000	2	118
ADF - Fisher Chi-square	62.5325	0.0000	2	118
PP - Fisher Chi-square	62.4192	0.0000	2	118

- PPI (4 hours)

Group unit root test: Summary
Series: FOURHR, PPI
Date: 01/22/19 Time: 15:30
Sample: 2013M06 2018M05
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-9.54351	0.0000	2	118
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-8.73636	0.0000	2	118
ADF - Fisher Chi-square	62.5763	0.0000	2	118
PP - Fisher Chi-square	62.5119	0.0000	2	118

- PPI (5 hours)

Group unit root test: Summary
Series: FIVEHR, PPI
Date: 01/22/19 Time: 15:29
Sample: 2013M06 2018M05
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0

Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-9.63525	0.0000	2	118
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-9.00747	0.0000	2	118
ADF - Fisher Chi-square	64.7136	0.0000	2	118
PP - Fisher Chi-square	65.5705	0.0000	2	118

- PPI (6 hours)

Group unit root test: Summary
Series: SIXHR, PPI
Date: 01/22/19 Time: 15:25
Sample: 2013M06 2018M05
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-9.84582	0.0000	2	118
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-9.16077	0.0000	2	118
ADF - Fisher Chi-square	65.8853	0.0000	2	118
PP - Fisher Chi-square	65.8007	0.0000	2	118

- PPI (monthly)

Group unit root test: Summary
Series: MONTHLY_CHG, PPI
Date: 01/24/19 Time: 10:58
Sample: 2013M06 2018M05
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				

Levin, Lin & Chu t*	-8.46966	0.0000	2	118
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-8.30628	0.0000	2	118
ADF - Fisher Chi-square	59.0434	0.0000	2	118
PP - Fisher Chi-square	58.9786	0.0000	2	118

** Probabilities for Fisher tests are computed using an asymptotic Chi
-square distribution. All other tests assume asymptotic normality.