MAPPING VOLATILITY SPILLOVERS IN GLOBAL CURRENCY MARKET

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ABSTRACT

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Tezer, Yelkenci

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This research aims to detect the cross-border volatility spillovers among various currencies within the foreign exchange market with respect to full trading day, and also trading and non-trading hours of three major stock markets (Tokyo, London and New York). The sample consists of eleven currency pairs, which covers a period from 2009 to 2017. Volatility spillovers among the selected currency pairs were tested by utilising a multivariate VAR-BEKK-GARCH model with respect to different sampling frequencies. In particular, the main aim is to reveal whether the major stock markets' sessions and different sampling frequencies have a differential impact on volatility spillovers in global currency market.

The results indicate that volatility spillovers among sample currencies are far stronger in higher frequency terms. One remarkable result is that rather than major currencies, some minor and exotic currencies play a leading role in volatility transmission during trading hours of major stock markets. Also, the results denote that the major currencies do not tend to play a solid leading role in volatility transmission with respect to full

trading day regardless any trading hours of the stock markets. This finding is more apparent when daily and intraday results are compared.

Keywords: Volatility spillover; Exchange rates; Multivariate GARCH; Intraday; Realized return; Realized volatility

ÖZET

KÜRESEL DÖVİZ PİYASASINDA OYNAKLIK YAYILMALARININ HARİTALANMASI

Tezer, Yelkenci

Finans Doktora

Tez Danışmanı: Doç. Dr. Gülin Vardar

Temmuz, 2020

Bu araştırma, döviz piyasası kapsamında çeşitli para birimleri arasındaki oynaklık yayılımlarını tüm işlem günü nezdinde ve ayrıca üç büyük borsanın (Tokyo, Londra ve New York) seans süresince ve seans harici saatleri nezdinde tespit etmeyi amaçlamaktadır. Araştırmaya 2009'dan 2017'ye kadar olan bir dönemi kapsayan 11 döviz paritesi dahil edilmiştir. Seçilen döviz pariteleri arasındaki oynaklık yayılımları çok değişkenli VAR-BEKK-GARCH modelinin farklı örneklem frekansları nezdinde kullanılmasıyla test edilmiştir. Özellikle temel amaç, büyük borsaların ve farklı örneklem frekanslarının döviz piyasalarındaki oynaklık bağlantıları üzerinde farklı bir etkisinin olup olmadığını analiz etmektir.

Sonuçlar, örneklemdeki para birimleri arasındaki oynaklık bağlantılarının yüksek frekansta çok daha güçlü olduğunu göstermektedir. Diğer dikkat çekici bir sonuç, majör para birimlerinden ziyade bazı minör ve egzotik para birimlerinin borsa seansları süresince oynaklık iletiminde öncü bir rol oynamasıdır. Aynı zamanda, borsa seans saatlerinin gözetilmediği tam işlem günü kapsamındaki sonuçlar da majör

paritelerin oynaklık iletiminde güçlü bir rol üstlenmediğini göstermektedir. Günlük ve gün içi sonuçlar karşılaştırıldığında bu bulgu daha belirgindir.

Anahtar Kelimeler: Volatilite yayılımı; Döviz kurları; Çok değişkenli GARCH; Gün içi; Gerçekleşen getiri; Gerçekleşen oynaklık

To My Mother

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CHAPTER 1: INTRODUCTION

The volatility is frequently associated with the rate of flow of information to the market in the finance literature (French, and Roll, 1984, 1989; Ross, 1989). Therefore, the dynamics and the route of the information flows across the markets or the financial variables can be understood by scrutinizing the volatility spillovers.

Till the early 2000s the research on volatility was highly based on parametric methods. As the mid frequency (daily) data became easily reachable, starting with Andersen and Bollerslev (1998b); Andersen et al. (2001, 2003), and Barndorff-Nielsen and Shephard (2002a) and followed by many others, the non-parametric volatility models have been standing out in the volatility literature since 2000s, and realized volatility has gained significant popularity.

In this dissertation, the analysis of the volatility spillovers in the currency market, which is the world's largest financial market, is employed. Thus, a more detailed introduction of this market is likely to be beneficial for the analysis. The average daily volume in the currency market reaches as high as $6.6 trillion in 2019 survey according to Bank of International Settlements' (BIS) latest report (BIS, 2019). In order to understand how huge the mentioned volume is, one can compare the average daily volume of the world's largest equity market, the New York Stock Exchange, for the same period which is $169 billion. In other words, the total daily turnover in the world equity markets ($301 billion) is one-twentieth of the currency market (The World Bank, 2020).

Table 1: FX Turnover by Currency Classifications (2010-2019)[1] (Source: BIS, 2019)

Currency	2010	2013	2016	2019	Change in percentage (2019-2010)
	Amount (Billion $)	Amount (Billion $)	Amount (Billion $)	Amount (Billion $)	
USD	3,371	4,662	4,437	5,824	27,20%
EUR	1,551	1,790	1,590	2,129	29,17%
JPY	754	1,235	1,096	1,108	1,17%
GBP	512	633	649	844	26,29%
AUD	301	463	349	447	24,75%
CAD	210	244	260	332	24,31%
CHF	250	276	243	327	29,52%
CNY	34	120	202	285	34,40%
HKD	94	77	88	233	97,69%
NZD	63	105	104	137	27,38%
SEK	87	94	112	134	17,82%
KRW	60	64	84	132	45,21%
SGD	56	75	91	119	26,59%
NOK	52	77	85	119	33,76%
MXN	50	135	97	114	15,84%
INR	38	53	58	114	67,33%
RUB	36	86	58	72	21,73%
ZAR	29	60	49	72	38,53%
TRY	29	71	73	71	-2,22%

The currency market is not only the most liquid financial market throughout the world but also it is unique in nature in terms of operating 24 hours a day, 5 days a week. In addition, a large number of and variety of traders including central banks, large commercial and investment banks, governments and other financial institutions as well as small investors and speculators trade in the over−the−counter (OTC) market.

The currency market activity has increased dramatically in the last two decades. The global currency market turnover rises from $880 billion to $1.42 trillion and $3.21 trillion in 1992, 2001 and 2007, respectively. The corresponding growth rates from 1992 to 2001 and 2001 to 2007 of 61% and 125%, respectively, cast higher levels of turnovers in the future (BIS, 2019).

Considering the dramatic increase in the currency market activity, foreign exchange rates, in fact, play one of the most important roles in a country's relative level of economic wealth. Exchange rates are also among the major determinants of foreign trade. They have the ability of influencing trade flows all around the globe.

[1] Turnover for years prior to 2013 may be underestimated owing to incomplete reporting in previous surveys. Methodological changes in the 2013 survey ensured more complete coverage of activity in emerging market and other currencies.

Therefore, exchange rates are among the most watched, analyzed and manipulated economic measures. Foreign exchange rates have been highly volatile since the currencies of the major industrial countries were allowed to float in 1973. When fixed rates abandoned, many observers thought exchange rate fluctuations would eventually dampen as market participants gained experience in flexibly priced currency markets.

Exchange rate volatility is a cause for concern if it impairs the smooth functioning of the world economy. Volatility can be detrimental in several ways. It can reduce the volume of international trade by creating uncertainty about the profits to be made from international transactions. Fluctuations in exchange rates also might restrict the international flow of capital by reducing both direct investment in foreign operating facilities and financial portfolio investment. Finally, exchange rate volatility might lead to higher prices for internationally traded goods by causing traders to add a risk premium to cover unanticipated exchange rate fluctuations.

The assessment of exchange rate volatility effects on the economy remains an active subject of theoretical and empirical investigation. This stems from the substantial increase in the volatility of exchange rates of major industrial countries including those of developing countries after the breakdown of the Bretton Woods system in March 1973.

Policy makers have taken a keen interest in the subject of exchange rate volatility for the purpose of formulating suitable macroeconomic policies. Similarly, corporate entities are concerned about its implications on profits, they are interested in mitigating the effects of exchange rate uncertainty by designing appropriate risk management tools.

The changeover to flexible exchange rate allows the exchange rate to adjust in line with changing economic conditions while providing monetary policy autonomy. But volatility in the exchange rate introduces uncertainty which in turns generate negative economic welfare effects. The fluctuations in the exchange rate affect consumer goods prices which in turn affect demand and consequently consumption.

Monetary policy is also affected by currency fluctuations especially where domestic growth is underpinned by exports as authorities attempt to support the

external sector through exchange rate stabilization at the expense of inflation stabilization, the core objective of monetary policy (Crosby, 2000). Further, exchange rate uncertainty can create incentives for trade protectionist tendencies and sharp currency reversals which in turn impose further costs on the economy (Bayoumi, and Eichengreen, 1998).

Volatility of exchange rates can also restrict the flow of international capital by reducing direct and portfolio investments. Speculative capital flows may also be induced by exchange rate volatility under the flexible regime that could in turn contribute to the instability in economic conditions. Greater exchange rate volatility increases uncertainty over the return of a given investment. Potential investors are attracted to invest in a foreign location as long as the expected returns are high enough to compensate for the currency risk.

There is a growing firm evidence that exchange rate volatility imposes significant effects on the volume of trade. This evidence is borne out of a variety of empirical tests that have been conducted over the years. Exchange rate variability affects international specialization in production which in turn leads to a reduction in the welfare of people as output declines and consequently income and consumption. Volatility in the exchange rate can lead to the reduction in the volume of international trade due to increases in the level of trade riskiness that creates uncertainty about profits. In addition, it causes prices of tradables to rise to the risk mark-up (risk premium) imposed by sellers in order to protect profits. This tends to affect the competitiveness of exports. In response to fluctuations in the exchange rate, firms shift resources from the risky tradable sector to the less risky non-tradable sector in order to protect their profits. Further, a rise in exchange rate uncertainty increases transaction costs as agents attempt to hedge against exchange rate risk.

Therefore, the pattern of volatility transmission in global currency markets is one of the most critical issues for traders as well as policymakers, since a strong volatility interaction between various markets results in both advantages and disadvantages. In particular, the existence of volatility transmissions in currency markets may limit hedging opportunities, but may also pave the way for possible speculative trading gains.

From the policymakers' perspective, there is an ongoing debate on the impact of central bank's intervention on exchange rate volatility. Some studies claim that these interventions either augment, or have no impact on volatility (Dominguez, 2003; Fratzcher, 2006; Rogers, and Siklos, 2003), whereas other document a decreasing volatility (Kim et al., 2000; Qiumin, and Qian, 2017). In this respect, volatility transmission analysis between currencies is crucial for central bank authorities as the results may be an indicator for their decisions.

There are numerous studies on volatility spillovers in global currency markets, with various stories incapsulated (Kenorgios et al., 2015; Kitamura, 2010; Bubak et al., 2011; Chang, and Taylor, 2003). Nevertheless, the sample dataset in the majority of these were confined to major currencies, and generally ignored interactions between major and minor currencies. In addition, in the majority of studies examining the volatility dynamics utilizing various time frequencies, samples were limited to either single or a small number of currencies (Seemann et al., 2011; Gau, and Hua, 2007; Melvin, and Melvin, 2003).

In this respect, the literature lacks a combined study embracing the volatility spillover effects among various currencies with regard to different time frequencies.

Not only currency market itself but also the interaction between stock markets and currency markets through volatility transmission is an ongoing debate in the literature. The impact of stock markets on currency markets is critical due to its implications for portfolio managers and speculators. The majority of these studies have documented the informational impact of stock markets on currency markets through volatility spillover (Sui, and Sun, 2016; Do et al., 2016; Guglielmo et al., 2014; Andreou et al., 2013). On the other hand, almost all of these have utilized daily data with limited sample, despite the significance of using intraday data to capture volatility transmissions documented in various studies (Kitamura, 2010; Melvin, and Melvin, 2003; Andersen et al., 2000; Andersen, and Bollerslev, 1997).

Some studies have also indicated that trading hours play a critical role in driving volatility linkages in global currency markets (Treepongkaruna et al., 2012, Cyree et al., 2004; Harvey and Huang, 1991). Yet, despite these findings, the literature

still lacks analyses of the volatility impact of stock markets on currency markets at intraday level using trading and non-trading hours of major stock markets.

This thesis aims to fill in these gaps by utilizing one of the most extensive sample. In particular, the research aims to detect the volatility spillover patterns among eleven currencies and examine the differential impact of major stock markets on these volatility transmission patterns of sample currency pairs, which, to the best of my knowledge, represents the highest number of currencies, used to date. One other unique feature of the dataset is that it is comprised of all types of currencies; namely major, minor and exotic currencies. The major currency sample consists of Euro (EURUSD), British Pound (GBPUSD), Japanese Yen (USDJPY), Swiss Franc (USDCHF), and Canadian Dollar (USDCAD). Minor currency sample includes Australian Dollar (AUDUSD), New Zealand Dollar (NZDUSD), Norwegian Krona (USDNOK) and Swedish Krona (USDSEK), and the exotic currency sample, Hong Kong Dollar (USDHKD), and Mexican Peso (USDMXN). Earlier studies have predominantly focused on only major currencies (Antonakakis, 2012; Kitamura, 2010; Inagaki, 2007; Hong, 2001), however, few focused exclusively on emerging market currencies. (Chkili, and Nguyen, 2014; Kumar, 2013; Bubak et al., 2011). The pair wise volatility transmissions among eleven currencies are scrutinized by employing different time frequencies; namely daily, 30-minute and 15-minute data. The sample period spans from 1st January, 2009 to, 31st December 2017. As a result, the data set consists of the largest number of observations in volatility spillover studies. This dissertation contributes to the existing literature in three-folds: First of all, it is the first research that aims to isolate the impact of three major stock markets, namely, New York, London and Tokyo taking into account their specific trading and non-trading periods. Secondly, it utilizes all major, minor and exotic currencies in a single sample, and thirdly, it employs one of the largest known datasets, with almost 3 million observations in 15 minute data interval and thereby, it allows us to compare the volatility transmission pattern among three different time-frequency.

The hypothesized research questions in the thesis can be summarized as follows:

a) Do the volatility spillovers among currencies vary from daily to intraday?

b) Do the major currencies play a leader role in the volatility transmission in different time frequencies?

c) Do intraday trading behavior in major stock markets create any differential impact on the volatility transmission patterns of currency pairs?

d) Do the major currencies play a leader role in the volatility transmission process in different trading sessions of stock markets?

e) Does volatility transmission increase with higher frequency data?

f) Do the major/minor/exotic currencies' role tend to change with respect to different sampling frequencies?

The volatility transmissions among the selected currencies are tested by utilizing multivariate VAR-BEKK-GARCH models, which will be discussed in detail in the subsequent chapters.

This dissertation consists of 7 chapters. The remainder of the thesis is organized as follows:

Following the introduction, Chapter 2 summarizes the theoretical framework including risk and uncertainty, modern portfolio theory (MPT), financial contagion, and volatility modelling.

Subsequent chapter (Chapter 3) includes the discussion of the relevant literature. In this chapter, starting from the structure of the relationship and transmission among the exchange rate returns, volatility spillovers among stock markets and currency market are discussed.

Chapter 4 involves the data description, sample selection, and discusses the covariance stationarity of the data.

Chapter 5 develops an understanding about the methodologies that are employed in this research. In this chapter, starting from the methods employed for initial diagnostics, the main models employed for volatility spillover analysis, namely VAR-BEKK-GARCH, and cDCC-GARCH methodology, and then robustness test, are introduced.

Chapter 6 discovers the results and discussion about the estimations which are employed by utilizing three different frequencies (daily, 30-minute and 15-minute), and sampling according to these frequencies with and without taking stock market sessions into consideration.

The final section Chapter 7 includes summary of the findings, conclusions regarding the literature review and findings chapters, discussion of the implications for both academicians and practitioners and possible directions to future research.

CHAPTER 2: THEORETICAL FRAMEWORK

2.1. Risk and Uncertainty

Financial institutions and corporations are in the business of managing many sources of risk. However, failures in risk management procedures have caused a number of financial disasters after the increase of financial uncertainty in the 1990s. Therefore, understanding the concepts of risk, uncertainty and volatility is an important part of assessing a portfolio's margin of safety levels.

Risk can be defined simply as the variability of unexpected outcomes associated with a given asset. In other words, risk is the degree of uncertainty about future net returns. It is significant that investors recognize the difference between risk and uncertainty, how the difference can change the way an opportunity is assessed, and the tools required to properly quantify the downside potential of any investment.

Knight (1921) made an important distinction between uncertainty and risk. Variability that can be quantified in terms of probabilities is thought of as "risk" whereas variability that cannot be quantified at all is best thought of simply as "uncertainty" in his famous thesis. In simple terms, while taking on risk occurs when an investor is not sure what might happen among a list of scenarios, taking on uncertainty occurs when an investor does not know what can happen with an unknown range of possible outcomes (Jean-Jacques, 2002).

Knight (1921) also discusses that this distinction is important in financial markets. If risk were the only relevant characteristic of randomness, well-organized financial institutions should be able to price and market insurance contracts that only depend on risky phenomena. Uncertainty, on the other hand, generates frictions that these institutions may not be able to accommodate. Ellsberg (1961) proposes a more specific definition of uncertainty, in which an event is uncertain or ambiguous if it has an unknown probability. Particularly, Ellsberg's paradox demonstrates important consequences of this distinction by showing that individuals may prefer gambles with precise probabilities to gambles with unknown odds. Uncertainty and risk are distinct characteristics of random environments, and they can also affect individuals' behavior

very differently. Such behavior is conflicting with the expected utility model, and this observation has recently stimulated a significant amount of research in economics and finance.

According to Epstein and Wang (1994), the principle of using the term “risk” to describe decision-situations in which probabilities are available to guide choice and “uncertainty” to describe decision-situations in which information is too imprecise to be summarized by probabilities is deeply embedded in both economic theory and decision theory. Situations of risk and uncertainty can be summarized as follows;

1. Situations of Risk. Situations in which the decision-maker assigns probabilities to events on the basis of known chances, where chances are shown as numerical proportions

2. Situations of Uncertainty. Situations in which the decision-maker is unable to assign probabilities to events because it is not possible to calculate chances.

2.2. Modern Portfolio Theory (MPT)

The fundamental key point behind MPT is that the assets in an investment portfolio should not be selected individually, each on their own merits. Rather, it is important to consider how each asset changes in price relative to how every other asset in the portfolio changes in price.

Investing is a tradeoff between risk and expected return. In general, assets with higher expected returns are riskier. For a given amount of risk, MPT describes how to select a portfolio with the highest possible expected return. Or, for a given expected return, MPT explains how to select a portfolio with the lowest possible risk. The targeted expected return cannot be more than the highest-returning available security, of course, unless negative holdings of assets are possible. (Elton, and Gruber, 1997)

Therefore, MPT is a form of diversification. Under certain assumptions and for specific quantitative definitions of risk and return, MPT explains how to find the

best possible diversification strategy. Markowitz (1952) introduced MPT in an article and later he wrote a book. (Markowitz, 1959)

MPT assumes that investors are risk averse, meaning that given two portfolios that offer the same expected return, investors will prefer the less risky one. Thus, an investor will take on increased risk only if compensated by higher expected returns. Conversely, an investor who wants higher expected returns must accept more risk. The exact trade-off will be the same for all investors, but different investors will evaluate the trade-off differently based on individual risk aversion characteristics.

The implication is that a rational investor will not invest in a portfolio if a second portfolio exists with a more favorable risk-expected return profile – i.e., if for that level of risk an alternative portfolio exists which has better expected returns. Note that the theory uses standard deviation of return as a proxy for risk, which is valid if asset returns are jointly normally distributed or otherwise elliptically distributed.

Under the model:

- Portfolio return is the proportion-weighted combination of the constituent assets' returns.

- Portfolio volatility is a function of the correlations of the component assets, for all asset pairs.

2.2.1. Mean-Variance (MV) optimization

An investor can reduce portfolio risk simply by holding combinations of instruments which are not perfectly positively correlated. In other words, investors can reduce their exposure to individual asset risk by holding a diversified portfolio of assets.

Diversification may allow for the same portfolio expected return with reduced risk. These ideas have been started with Markowitz and then reinforced by other economists and mathematicians who have expressed ideas in the limitation of variance through portfolio theory.

So according to Markowitz's findings, the model of an optimal portfolio with minimum variance, called classical Mean-Variance (MV) optimization, can be described as follows: If all the asset pairs have correlations of zero they are perfectly uncorrelated—the portfolio's return variance is the sum over all assets of the square of the fraction held in the asset times the asset's return variance.

Every possible combination of the risky assets, without including any holdings of the risk-free asset, can be plotted in risk-expected return space, and the collection of all such possible portfolios defines a region in this space.

According to Merton (1972), the left boundary of this region is a hyperbola, and the upper edge of this region is the efficient frontier in the absence of a risk-free asset (sometimes called "the Markowitz bullet"). Combinations along this upper edge represent portfolios (including no holdings of the risk-free asset) for which there is lowest risk for a given level of expected return. Equivalently, a portfolio lying on the efficient frontier represents the combination offering the best possible expected return for given risk level.

2.2.2. Shortcomings of MV optimization

Despite its theoretical importance, critics of MV Optimization question whether it is an ideal investing strategy, because its model of financial markets does not match the real world in many ways.

Efforts to translate the theoretical foundation into a viable portfolio construction algorithm have been plagued by technical difficulties stemming from the instability of the original optimization problem with respect to the available data. Brodie et al (2009) has shown that instabilities of this type disappear when a regularizing constraint or penalty term is incorporated in the optimization procedure.

Firstly, MV Optimization requires that the returns are normally distributed, but in the real data it is very rare to find normal distributed returns. Since this assumption brings some problems with it, the investor's problem is reduced to a one-

period problem. Samuelson (1970) and Constandinides and Malliaris (1995) discuss this topic in detail and they work on the choice of MV optimal portfolios.

Secondly, MV Optimization is valid only for the quadratic utility functions but there are many other concave utility functions adopted by risk-averse investors.

Thirdly, MV Optimization deals only with two parameters - mean and variance – but there are two other significant parameters such as skewness and kurtosis. There is some research showing that risk averse investors prefer positive skewness and avoid kurtosis. For further details of MV Optimization's shortcomings the reader can examine the studies of Kraus and Litzenberger (1976), Athayde and Flores (1997), Fang and Lai (1997), Dittmar (2002), Post, Levy and Vliet (2008), Wong (2007).

2.3. Financial Contagion

Financial contagion has been a great concern during the past two decades, especially nowadays when the global financial crisis and the subsequent sovereign debt crisis has drawn researchers' attention back to the contagion again. The contagion effects play a very important role for investors and policymakers in optimizing asset allocation, determining monetary and fiscal policy, and in preventing risk. The contagion channels could provide a door to decrease impacts on financial markets. Therefore, effective regulation and government policies will minimize the risk of contagion from a financial crisis.

There are several broad and restrictive definitions of financial contagion but so far no consensus on it. Through the literature studies, the description of contagion is classified by the degree of its spread and the channels through which it occurs.

In the spread of financial shocks between various countries, contagion has been defined as a substantial rise in linkages between different markets after a shock to one economy (Seth, and Sighania, 2017). The importance is the changing of the degree of correlation between markets before and after a financial shock. If two markets keep highly correlated before and after a shock, it is not necessarily a

contagion, it is just interdependence, and the essential point is the increase of the correlation after a financial shock. If the cross-market linkages rise significantly after a crisis, it suggests that contagion occurred since the transfer mechanism strengthened after a shock. That is the popular and most used definition, known as shift contagion..

The second category depends on the channels. The fundamentals of transmission like trade and economic linkages or related capital markets are not considered as contagion, only the transmission shock except those is considered as the contagion, and called pure contagion. According to Forbes and Rigobon (2002), the international stock market, bond market, and the foreign exchange market are leading financial markets that are referred to in the contagion literature.

From other dimensions, according to the World Bank, contagion is defined conceptually in three categories, in a broad definition, restrictive and very restrictive sense.

A broad definition is given as fundamentals-based contagion (Calvo, and Reinhart, 1996). It refers to the transmission of financial shock through real or financial linkages. The restrictive definition from the World Bank according to Nieh, Kao and Yang (2011) *"Contagion is the transmission of shocks to other countries or the crosscountry correlation, beyond any fundamental link among the countries and common shocks. This definition is usually referred to as excess co-movement, commonly explained by herding behaviors."*

The more restrictive definition is from Forbes and Rigobon (2002), *"Contagion occurs when cross-country correlations increase during 'crisis times' relative to correlations during 'tranquil' times"*.

The logic of a contagion test based on correlation is that during a crisis, contagion from one market to another is signaled through a significant increase in the correlation of these markets. That is, if the price of one market falls, the price of the other one also drops.

2.3.1. Main Causes of Contagion

Wyplosz (1996) analyzed the existence of contagion for currency crises and defined the contagion as "*an increase in the probability of a speculative attack on the domestic currency resulting from a speculative attack somewhere else in the world*". Similarly, Masson (1998) summarized contagion as changes in expectations other than changes in an economy's fundamentals. Edwards (2000) defines contagion as a situation where the extent and magnitude of the international transmission of shocks exceed what was expected by market participants. Samarakoon (2011) explained contagion briefly as the transmission of shocks from one market to another. It is stressed that the distinction between the effects of shocks during normal periods from that during crisis periods is important. Therefore, the definition is given as "*excessive impact of shocks of one market on another during a period of crisis*".

Bekaert, Harvey and Ng (2005) define contagion as excess correlation, which is the correlation over and above what is expected. According to Fratzscher (2000) contagion is the transmission of a shock to a country because of its real and financial interdependence with countries struggling in a crisis.

In their paper, Forbes and Rigobon (2002) define contagion as "*a significant increase in cross-market linkages after a shock to one country*" while a distinction between contagion and interdependence has been made additionally. This distinction is crucial while conducting an empirical analysis in order not to be mistaken about the period to choose for the analysis. A straightforward method is to choose a stable period of historic average and turmoil period after a crisis. According to the authors, the co-movement between the markets can be high during stable periods but in order to define the situation as contagion, co-movements should increase significantly after a shock to one market. If the co-movement was already high before the shock and continue to be high after the shock, then they describe the situation as interdependence, not contagion (Forbes, and Rigobon, 2002).

The reason why a contagion from one country to another occurs can be studied under different categories. The causes of contagion may be explained by either a country's real or financial linkages which can be defined as fundamentals of an economy, or by investor behaviors. Fundamental-based linkages may not be harmful

in normal times. The linkages can be referred to co-movements among the economies. However, the situation becomes opposite if those co-movements occur during turmoil times. In this case, the linkages may be defined as contagion. The existed literature shows that those macroeconomic and financial fundamentals may be helpful in explaining the occurrence and transmission of a crisis. Preventing a crisis in the beginning phase lies on understanding the reasons as well as the transmission mechanisms. Still, those fundamentals are not enough to fully explain the problem. In that case, other factors should be examined.

Second cause of contagion, which is related to investors' behavior, can happen any time without the need for a global shock. This type can be explained as an irrational investor behavior. Financial panics, herding behavior, loss of confidence and increased risk aversion may be the examples of irrational reasons for contagion.

2.4. Volatility Modelling

Volatility modelling and its evaluation require diverse subjective choices in varied extents. How should volatility be measured; for instance, standard deviation or variance. Moreover, what kind of method should be employed as proxy of observed volatility estimation. The decisions regarding to mentioned questions will certainly affect the results of the studies, which ultimately make volatility modelling literature unable to associate and estimate the outcomes of the former studies.

Initially, in the literature, two main diverse methods exist to measure volatility: standard deviation and variance. Walsh and Tsou (1998), Bluhm and Yu (2000) used standard deviations while West and Cho (1995), Akgiray (1989), Yu (2002) and Gospodinov et. al (2006) employed variances as a volatility measure. Furthermore, being a latent variable, a researcher has to decide how to measure observed volatility. The most common approaches can be listed as follows: daily squared returns (Merton, 1980; Klaassen, 1998), mean adjusted daily squared returns (Blair et. al, 2001, So et. al, 1999), daily squared return adjusted for serial correlation (Akgiray, 1989; Pagan, and Schwert, 1990), the absolute change in returns (Bali, 2000; Dunis et. al, 2000). The existence of different approaches is mostly grounded on the

question of whether the returns are adjusted for mean (constant or conditional) or not. The supporters of squared returns adjusted for mean and serial dependence set forth that empirically proved high autocorrelation in returns should be controlled while the adversaries claim that the statistical properties of the sample mean make estimating the true mean very inaccurate, consequently captivating deviations around zero instead of sample mean surges the accuracy of estimation.

Another significant choice is how to employ the sample to estimate model parameters regarding whether the sample have a dynamic structure, where the sample is restructured for every estimation, or a static structure, where the sample do not subject to change during all estimations. Methodologies including dynamic approach provide a better reflection of the structural changes in the economy to the parameters of the model and prevent biases depending on the static approach on the model performances.

The comparison between the static and dynamic approach plays a vital role in terms of processing the evaluation of performances. Even though this phase is as significant as modelling; yet is not treated as cautiously as modelling within the literature where the conclusions are principally derived from the rankings which are created according to the error statistics. Though, error statistics of the models, that are subject to comparison, are most of the time so close to each other which raises suspicion against if the performances are significantly distinguishes. Then again, the question of which error statistic should be employed points another matter in terms of the comparisons. The error statistics with the symmetric property are the most widely preferred ones. Afterward, the asymmetric error statistics started to be employed to reveal diverse exposure to risks arising from the positions, short or long, of investors in financial markets. The symmetric error statistic has a subsequent priority when it comes to the significance of the rankings created according to the error statistics, while it is more suitable to gauge model performances. A solution for the mentioned problem is provided by the contemporary advances in econometrics, namely Reality Check (RC), Superior Predictive Ability (SPA) and Model Confidence Set (MCS). The mentioned procedures support the evaluation of the error statistics by enabling researchers to be certain about the statistical significance of the rankings created

according to the error statistics, which eventually base the comparison in a more solid ground.

As for the modelling time span, the applicable modelling time span differs according to the motivation of the agents. Short modelling time spans are subject to trading purposes and VaR estimations of financial institutions, on the other hand, relatively longer time spans are usually subject to derivative markets. A certain model can produce very accurate estimations under the scope of a specific modelling time span, while it may fail to provide such accuracy for different time spans.

Lastly, the performances are relatively evaluated; therefore, the choice regarding to the models that will be involved in the evaluation procedure is critical as well. The more comprehensive model set provides more certainty about the performances of the models within the set. Random walk, historical mean, moving average, exponential weighted moving average (EWMA) can be stated as example for simple nonparametric models while stochastic volatility models and GARCH family models for parametric models. Recently, the researches employing and/or enhancing stochastic volatility model is more common and mostly concentrating on the parameter estimation methods, yet GARCH family models are way more dominant in the literature. The GARCH model is enhanced by the different researches through diverse approaches in order to integrate empirically verified volatility patterns in the financial markets, for instance leverage effect, nonlinearity, long-memory.

2.4.1. Exchange Rate Volatility Modelling

Classical econometric models used in exchange rate analysis make certain assumptions on the errors such as independence, uncorrelated structure and constant variability of error terms. However, many macroeconomic and financial time series vary over wide range around mean, and very large or small prediction errors may occur in practice. Since financial markets are sensitive to political events, speculations, changes in monetary policy etc., this variability in the error terms may occur. As noted by Üstünel (1999) the over-falls and over-rises in the returns of shares due to speculative rate moves force the Normal Distribution assumption. Also, this implies

that the variance of the errors may not be constant and it changes over time so the errors can be serially correlated in financial data. Additionally, one of the uncertain and decisive factors in pricing of exchange rate risk is volatility as a measure of dispersion and an indicator of magnitude of fluctuations of the asset price series since volatility is not directly observable.

As the volatility of the exchange rate increases, exchange rate risk may climb for international traders and investors because high volatility implies the high level of uncertainty of prices and high risk of loss or gain. The other determinants of exchange rates are the economic indicators, which depend on the international trade relations between two countries such as differentials in inflation, interest rate differentials, public debt, political stability, commercial balance etc. On the other hand, volatility shapes risk perception of foreign exchange markets related to underlying currency pair and indicates the amount of uncertainty, so volatility modelling has a great importance in exchange rate valuation, option pricing and other financial applications.

Volatility is expressed by the conditional standard deviation or conditional variance of the financial return series as a statistical measure and there are two main types of volatility referred to as historical (statistical) and implied volatility. Historical volatility indicates the recent price movements of the financial instrument for a certain period of time while implied volatility is obtained from the exchange rate based on market expectations and uses Black-Scholes model for European options. To derive implied volatility, Black-Scholes model assumes that the underlying asset price series follows geometric Brownian motion. The Black-Scholes formula is expressed as a partial differential equation by using the relations between elements of option price. Chen (2015) has explained the Black-Scholes equation as a deterministic representation of lognormal processes. Also, this model makes constant volatility assumption during the life of the option. Tsay (2005) has stated that the Black-Scholes approach is frequently criticized since some assumptions of the model may not hold in practice and implied volatility obtained from this model can be different from the real volatility. Also, Gereben (2005) has pointed out that implied volatility leads to obtaining a biased estimate, and does not include the information provided by generalized autoregressive conditional heteroscedastic and autoregressive-moving average predictors for volatility computed from historical exchange rate series. On the

other hand, in empirical finance studies, volatility has certain features which are seen especially in financial return series. One of these empirical findings in financial asset returns is the clustered volatility which can be seen in groups of low/high values of volatilities for certain periods of time.

As has been pointed out by Mandelbrot (1963), large changes tend to be followed by large changes, of either sign, and small changes tend to be followed by small changes. Also, Bollerslev (1990), Brooks, and Burke (1998), and Fiser and Horvath (2010) have examined the characteristics of exchange rate volatility and they emphasized the presence of volatility clustering in the exchange rate return series. For the second feature of volatility, as it has been stated in Tsay (2005), volatility evolves over time in a continuous manner, that is, jumps in volatility are not common. The other characteristic of the volatility is that the variability of the volatility is restricted with some fixed range. Statistically, this characteristic often implies stationarity of the volatility. Also, in case of large price changes, volatility and asset returns act in the opposite directions, called to as leverage effect.

In summary, since volatility is the unobservable component of exchange rates, it should be modeled correctly to obtain efficient parameter estimation and improve the accuracy of prediction intervals for assessing uncertainty in risk management. The assumptions of classical econometric models generally cannot be achieved for the financial time series in practice and this situation has led to widespread use of the conditionally heteroscedastic models which allow modelling non-constant variance. Besides, all of the aforementioned characteristics of return series have yielded development and diversity of the conditional heteroscedastic time series models for the volatility modelling. Subsequent chapter includes the discussion of the relevant literature.

CHAPTER 3: LITERATURE REVIEW

The structure of the relationship and transmission among the exchange rate returns has been examined by the regression and causality methods for a very long time. However, analyzing the relationships of the second moments of these variables is relatively new and uncompleted. Past studies mostly consisted of the univariate examination of volatilities, which ignored the transmission mechanism between the different currencies. The introduction of the multivariate GARCH models and their improved representations have rendered the inspection of these transmission mechanisms possible. The spillovers between the volatility of the returns have first been analyzed among the stock exchanges such as New York and London stock exchanges (Eun, and Shim; 1989).

Engle and Susmel (1993) explore whether the two different international stock markets follow the same volatility process by benefiting from the time varying nature of stock return variances. In their research, they emphasize that time-dependent volatilities in some international stock markets are similar.

Similarly, King and Wadhwani (1990) address an issue of simultaneous decline of almost all stock markets in October 1987. In their study on Tokyo, London, and New York financial markets, they emphasize that there is a widespread spillover effects among markets. The study points to the existence of spillover effects among markets which are in different economic structures. Lin et al. (1994) deal with the Tokyo and New York markets and investigate the correlation between stock market index returns and volatility.

King et al. (1994) estimate a multivariate factor model with the national stock exchange index data of 16 countries and investigate the integration of capital markets. They show that mostly unobservable variables cause to time-dependent covariance structures of stocks.

Henry et al. (2007) investigate the spillovers of returns and volatility in the stock market using causality tests in mean and variance by Cheung and Ng (1996) for eight South Asian countries (Indonesia, Philippines, South Korea, Hong-Kong, Japan,

Malaysia, Singapore, Thailand) and reveal that Thailand has momentarily binary volatility spillover effects on Indonesia.

In their study, Taşdemir and Yalama (2014) examine volatility transmissions between Turkish and Brazilian markets. According to their findings they conclude that there is a volatility spillover from São Paulo's stock market to Turkish stock market. In addition, they emphasize volatility transmissions from Turkey to Brazil during the periods of financial crisis.

Volatility spillovers among the different types of markets have followed these studies and included future, currency and bond markets. Using GJR-GARCH method, Korkmaz and Çevik (2009) analyze the effects of volatility index of USA (VIX) on the 15 developing countries' stock markets. They conclude that there exists leverage effect in the conditional volatility of the developing stock markets and bad news that come into markets increase much more volatility. They note that VIX affects the stock markets of Argentine, Brazil, Mexico, Chile, Peru, Hungary, Poland, Turkey, Malaysia, Thailand and Indonesia and increases their volatility. Corsi et al, (2015) analyzes the flight to quality phenomenon of financial institutions. They examine risk spillover by using bond return of 36 countries and stock market returns of 33 banks. Considering this study, during the European crisis banks have followed quality at bond market. In their researches, Eichengreen et al. (2001) conclude that there exists flight to quality from emerging markets to U.S. Treasury securities along the sample covering the period of 1991-1999 during the three crises period Mexican, Asian and Russian. The researchers deal with 10 years yield of U.S. Treasury bond and the difference between 10-year and 1-year U.S. Treasury rates as indicators of the international credit market conditions. They assert that the flight to quality considerably influence the region in which the crisis originates. Besides, they find less evidence of flight to quality impact on maturities and suggest that investors prefer short-term to long-term instruments during flight to quality period.

There are also some studies that include macroeconomic variables to model the volatility series. By using the method of causality in quantile, Balcılar et al. (2017) investigate whether U.S. news on inflation and unemployment causes returns and volatility of seven emerging Asian stock markets during the period 1994 - 2014. They argue that U.S. news influence on returns and volatility of all the stock markets. They

further suggest that these effects clustered around the tails of the conditional distribution of returns and volatility when they are either in falling or rising periods. Increasing volatility and importance of risk spillovers among the financial markets have extended the studies focusing on controlling and monitoring financial risk. Economic agents follow risk protection models as well as the probability of major downward market movements in order to implement robust policies. In these periods of high volatility and extreme market movements, it has been seen that a large amount of capital changes hands.

Previous studies on volatility have been widely focused on risk measurement and volatility spillovers. In this context, Cheung and Ng (1990) find that there is a causal relationship between the conditional variances of financial asset returns. Engle et al. (1990) investigate the information flow from one market to another in their study of Yen/Dollar exchange rate.

3.1. Volatility Spillovers Within Currency Market

The study of Hong's (2001) in the area of volatility spillover proposes tests which are based on the weighted sum of squared sample cross-correlations between two squared standardized residuals. In this test, a more flexible weighting method is developed for each lag by using all sample cross correlations, unlike the test of Cheung and Ng (1996) and the regression-based test of Granger (1969). Granger causality between the two currencies is investigated by using the weekly data of Dollar/Mark and Dollar/Yen exchange rates. The author emphasizes that German Mark's past volatility changes are the reason for the current volatility change in the Japanese Yen, but that there is no relationship in the opposite direction.

Kanas and Kouretas (2002) investigate causality in mean and in variance between foreign exchange of four Latin American countries against U.S. Dollar during the period of 1976-1993. Accordingly, using EGARCH-M model they examine movements of foreign exchange of Argentine, Brazil, Chile, and Mexico against US Dollar. Then, they test volatility contagion by getting help of Cheung and Ng (1996)'s approach.

Diebold and Yilmaz (2011), provide a simple and intuitive measure of interdependence of asset returns and/or volatilities. In particular, they formulate and examine precise and separate measures of return spillovers and volatility spillovers. Their framework facilitates study of both non-crisis and crisis episodes, including trends and bursts in spillovers, and both turn out to be empirically important. In an analysis of nineteen global equity markets from the early 1990s to the present, they find striking evidence of divergent behavior in the dynamics of return spillovers vs. volatility spillovers: Return spillovers display a gently increasing trend but no bursts, whereas volatility spillovers display no trend but clear bursts.

Kumar (2013) analyzes the nature of returns and volatility spillovers between exchange rates and stock price in the IBSA nations (India, Brazil, South Africa). The results of multivariate GARCH model suggests the integration between stock and foreign exchange markets and indicates the existence of bi-directional volatility spillover between stock and foreign exchange markets in the IBSA countries. Overall, results confirm the presence of returns and volatility spillovers within the IBSA nations and, in particular, the stock markets play a relatively more important role than foreign exchange markets in the first and second moment interactions and spillovers.

Volatility spillovers demonstrate more information than the price itself (Diebold, and Yilmaz 2011; Kumar 2013; Rey 2013). Ross (1989) mentions that the price volatility is directly related to the rate of information flow to the market; therefore, spillovers show the information transmission between different markets and/or assets as well as the speed of market adjustment to new information. In case of higher volatility spillover effect, considered markets are expected to react similarly to common information arriving into one of them. Besides, price volatility analysis serves as an assessment of the risk associated with financial products supporting the valuation and hedging techniques.

Previous studies on volatility spillovers in exchange rate have diverse conclusions. There is evidence on significant exchange rate spillovers in Europe (Jack, and McMillan, 2004; Kearney, and Patton, 2000) as well as asymmetric spillovers among selected currencies (Boero et al., 2011; Wand, and Yang, 2009). Especially, during the crises there is strong evidence for increase in volatility (Bollerslev, 1986; Engle, 1982; Kole, 2006), and even for prolonged volatility increases in the post-crisis

(Kole, 2006). Ozer-Imer and Ozkan (2014) consider daily data of 16 currencies during the 2008-2009 global financial crisis by applying two-step estimation, and the results indicate at least twofold increase in volatilities with the outbreak of crisis. Even though the persistence differs for each country depending on the volatility level, an inverse relation between volatility and duration of crisis is found. Grobys (2015) also examines monthly spillovers between 3 currencies and US stock market based on volatility spillover index created over a rolling time-window of 60 months. His results also support the finding of higher spillovers preceding the economic turbulence, and no spillover effects during normal economic conditions. Bekiros (2014) claims that major FX and stock markets become more nonlinearly integrated after financial crisis.

One of the most prominent findings about the pattern of exchange rates is the interaction between intraday changes and business hours. A clear and persistent intraday volatility pattern is found in 24-hour currency exchange markets: the most volatile during morning trading hours when the US and European markets are active, and spikes at the beginning of regular business days in Tokyo, London, and New York (Baillie, and Bollerslev, 1990; Andersen, and Bollerslev, 1998). Cyree, et al. (2004) support this trend by using hourly one-month euro-dollar interest rates and find the most intraday volatility during Asian markets business hours, and least volatile during US markets business hours. Besides, there are volatility spikes at the beginning of business days for all markets. These findings align with the model of Hong and Wang (2000) which anticipates volatility clusters at the beginning and end of regular business days since most traders are not active during non-business hours. This U-shaped pattern of intraday volatility is even experienced as doubly U-shaped pattern during openings and closings where there are separate trading sessions. Goodhart and Giugale (1993) supports U-shaped pattern in volatility, but with limited explanation on lower volatility during weekend breaks and early Fridays. Analysis of underlying stochastic process in exchange markets also affirms that opening hours of main financial centers are associated with volatility peaks followed by systematic decreases, and this trend is repeated every trading day (Seemann et al., 2011).

Kenourgios et al. (2015) examines the effects of quantitative easing (QE) announcements by the European Central Bank (ECB), the Bank of England (BoE) and the Bank of Japan (BoJ) on the intraday volatility transmissions among EUR, GBP and

JPY. The empirical results indicate: (i) an increased volatility transmission from EUR to JPY and GBP around the ECB announcements, and from GBP to EUR over the BoE announcements, (ii) the ECB and BoE announcements significantly increase the volatility of EUR and JPY, and (iii) a "calming down" impact on the volatility of EUR and GBP from the BoJ and the ECB announcements, respectively.

Kitamura (2010) examines intraday interdependence and volatility spillover among the euro, the pound and the Swiss franc. The authors employ the varying-correlation model of multivariate generalized autoregressive conditional heteroskedasticity. The main findings are (1) return volatility in the euro spills into the pound and the Swiss franc; and (2) these markets are highly integrated with the euro, and the degree of interdependence is state-dependent: euro news has a simultaneous impact on the pound and the Swiss franc, and comovements of these currencies and the euro become much higher in proportion to the arrival of news of the euro.

Caporale et al. (2015) examines the nature of the linkages between stock market prices and exchange rates in six advanced economies, namely the US, the UK, Canada, Japan, the euro area, and Switzerland, using data on the banking crisis between 2007 and 2010. Bivariate UEDCC-GARCH models are estimated producing evidence of unidirectional Granger causality from stock returns to exchange rate changes in the US and the UK, in the opposite direction in Canada, and bidirectional causality in the euro area and Switzerland. Furthermore, causality-in-variance from stock returns to exchange rate changes is found in the US and in the opposite direction in the euro area and Japan, while there is evidence of bidirectional feedback in Switzerland and Canada.

The clustering of the exchange rate volatility is often explained by the information theory and the inventory control theory. The inventory control theory states that a day trader will be unwilling to close his/her inventory position at the end of day due to market prices, but may accept poor prices (Hsich, and Kleidon, 1996). On the other hand, the information theory considers that new information cause price movements. French and Roll (1986) points out the different rate of information flow during trading vs non-trading hours. To understand what kind of information matters for volatility patterns, flow of public news is widely investigated (Chang, and Taylor, 2003; Gau, and Hua, 2004; Gau, 2005). Even though some studies claim the

disappearance of pattern after controlling the announcement effect (Ederington, and Lee, 2001), there is still evidence on remaining U-shaped pattern after considering the effects of public news arrivals in exchange rate markets (Hua, and Gau, 2006; Andersen, and Bollerslev, 1998; Han et al., 1999; Chang, and Taylor, 2003; Kenourgios et al., 2015). The scheduled news announcements are found to be only partially explaining this doubly U-shaped pattern (Gau, 2005) where quarterly earnings announcements by central banks (Kenourgios et al., 2015), order flows as buyer-initiated trades net of seller-initiated trades in foreign exchange markets (Kitamura, 2010), exchange rate uncertainties (Caporale et al., 2015), and verbal interventions in foreign exchange markets (Dewachter et al., 2014) are found to be significant for currency volatility transmissions. Lastly, Laakkonen (2014) highlights the importance of filtering out the intraday periodicity of volatility not to get biased results, as well as the selection of filtering method as analyzing the impact of news on exchange rate markets.

Andersen et al. (2000) characterizes the volatility in the Japanese stock market based on a 4-year sample of 5-min Nikkei 225 returns from 1994 through 1997. Through appropriately filtering out the strong intraday periodic pattern, the high-frequency returns reveal the existence of important long-memory daily volatility dependencies. This supports recent results stressing the importance of exploiting high-frequency intraday asset prices in the study of long-run volatility properties of asset returns.

Melvin and Melvin (2003) examines volatility spillovers of the DM/$ and ¥/$ exchange rate across regional markets using the integrated volatility of high frequency data. An analysis of quoting patterns reveals five distinct regions: Asia, Asia-Europe overlap, Europe, Europe-America overlap, and America. Regions differ in their inherent volatility; this is a result that has been shown in earlier papers that model the high frequency pattern of quotes and volatility in the FX market (Dacorogna et al., 1993; Andersen, and Bollerslev, 1997; Melvin, and Yin, 2000). The research finds out that own-region volatility spillovers are more significant economically (larger in magnitude) than interregional spillovers.

Using a nonparametric quantile causality test, Balcılar et al. (2016) analyzes return and volatility of 16 developed and developing countries' foreign exchanges

against U.S. dollar for the period from 1999 to 2012. Quantile causality approach enables them to test causality not only in mean but also causality that may exist in tails of distribution. Besides they investigate volatility spillovers by testing causality in variance.

Bubak et al. (2011) studies the dynamics of volatility transmission between Central European (CE) currencies and the EUR/USD foreign exchange using model-free estimates of daily exchange rate volatility based on intraday data. They formulate a flexible yet parsimonious parametric model in which the daily realized volatility of a given exchange rate depends both on its own lags as well as on the lagged realized volatilities of the other exchange rates. They find evidence of statistically significant intra-regional volatility spillovers among the CE foreign exchange markets. With the exception of the Czech and, prior to the recent turbulent economic events, Polish currencies, they find no significant spillovers running from the EUR/USD to the CE foreign exchange markets.

Considering the frequency of data, deployment of intraday data is valuable not only important to understand patterns throughout the day, but also to improve the estimation of volatility over different horizons (Andersen et al., 2000). In other words, high frequency data can result in more accurate volatility measurements, and hence efficiency gains (Bollerslev, and Wright, 2000). Considering that the short-term traders assess the market more frequently, and have shorter memory compared to long-term traders (Dacorogna et al., 1998), the frequency of volatility measurement would indicate the perceptions and actions of different traders. Even though Jiang et al. (2015) claims that intraday model has limited informational advantage over forecasting with daily data in Chinese commodity futures market, it is explained by possible lack of liquidity in the selected markets. In more extreme studies (Melvin, and Melvin, 2003; Cai et al., 2008; Bubak et al., 2011) even high-frequency data is employed to support the evidence for significant volatility spillovers in FX markets.

In their article, Diebold and Yılmaz (2009) develop accurate and separate measures of return and volatility spillovers. From January 1992 to November 2007 they investigate daily nominal local currency stock market indexes of seven developed stock markets (US, UK, France, Germany, Hong Kong, Japan and Australia) and twelve emerging markets (Indonesia, South Korea, Malaysia, Philippines, Singapore,

Taiwan, Thailand, Argentina, Brazil, Chile, Mexico and Turkey). They examine both non-crisis and crisis episodes involving trends as well as bursts in spillovers. Particularly, in the analysis of nineteen global equity markets, they show evidence of divergent behavior in the dynamics of return spillovers versus volatility spillovers. They demonstrate that return spillovers display a gently increasing trend but no bursts, link with gradually increasing financial market integration, whereas volatility spillovers exhibit no trend but clear bursts identifying with crisis events.

Selcuk and Gencay (2006) provide empirical evidence for intraday scaling behavior of stock market returns utilizing a 5 min stock market index (the Dow Jones Industrial Average) from the New York Stock Exchange. The findings indicate that the moments of the return distribution scale nonlinearly across time scales and accordingly, volatility scaling is nonlinear under such a data generating mechanism.

Yavas and Dedi (2016) investigate the linkages among equity returns (based on exchange traded funds, ETF) and transmission of volatilities in the following countries: Germany, Austria, Poland, Russia and Turkey. The findings include the existence of significant co-movement of returns among countries in the sample. All of the countries in the sample, with the exception of Turkey, experience volatility spillovers from other markets.

Nishimura et al. (2015) analyze the mechanism of return and volatility spillover effects from the Chinese to the Japanese stock market. Their result suggests that China has a large impact on Japanese stocks via China-related firms in Japan. Furthermore, they find evidence that this response has become stronger as the Chinese economy has gained importance in recent years.

Hamao et al. (1990) examine the price and price volatility dependence among the three main international stock markets. They employ daily opening and closing data of stock markets in Tokyo, London and New York. In their study, they use ARCH-type models to examine the relationship between prices and identify the existence of price volatility from New York to Tokyo, from London to Tokyo and from New York to London.

The literature on volatility spillover is not limited to exchange rate markets, but also covers equity markets (Hamao et al., 1990; Lin et al., 1994; Andersen et al.,

2000; Selcuk and Gencay, 2006; Diebold and Yilmaz, 2009; Yavas and Dedi, 2016), bond markets (Christiansen, 2003; Claeys, and Vasicek, 2012; Christiansen, 2007; Skintzi, and Refenes, 2006), futures contracts (Abhyankar, 1995; Pan, and Hsueh, 1998), various industries (Kaltenhauser, 2002), size-sorted portfolios (Conrad et al., 1991), commodities (Apergis, and Rezitis, 2003) and swaps (Eom et al., 2002). Especially, a vast literature on equity markets also includes the impact of overlapping trading hours in neighbor markets by high-frequency data (Jeong, 1999; Baur, and Jung, 2006; Egert, and Kocenda, 2007; Harju, and Hussain, 2008; Nishimura et al., 2012; Nishimura et al., 2015; Tsutsui, and Hirayama, 2013), volatility spillover direction between larger/developed markets and smaller/emerging markets (Hamao et al., 1990; Wei et al., 1995; Li, and Majerowska, 2008), and factors affecting the spillovers across national equity markets are studied (Pretorius, 2002). Still, there are some inconclusive results in equity market volatility and its transmission (Schleicher, 2001; Li, 2007).

3.2. Stock Markets and Currency Market Volatility Spillovers

Spillover effects in financial markets have received attention in the economic literature due to their impact on portfolio diversification on strategies, portfolio management (Fengler, and Gisler, 2015; Aboura, and Chevallier, 2014; Garcia, and Tsafack, 2011), and options and hedging strategies (James et al., 2012; Jayasinghe, and Tsui, 2008) and most studies concentrate on analyzing return and volatility spillovers across countries, but for identical assets.

Diebold and Yılmaz (2015) characterize daily volatility spillovers across U.S. stock, bond, foreign exchange and commodities markets, from January 1999 through January 2010. They show that despite significant volatility fluctuations in all four markets during the sample, cross-market volatility spillovers were quite limited until the global financial crisis that began in 2007. They conclude that the existence of crisis intensifies the volatility spillovers, especially the spillovers from the stock market to other markets taking place after the collapse of Lehman Brothers in September 2008.

Antonakakis (2012) examines return co-movements and volatility spillovers between major exchange rates before and after the introduction of euro. The euro

(Deutsche mark) is the dominant net transmitter of volatility, while the British pound the dominant net receiver of volatility in both periods. Nevertheless, cross-market volatility spillovers are bidirectional, and the highest spillovers occur between European markets.

In the last decade, a considerable body of evidence has been built upon price discovery and volatility spillover effects on developed and developing markets, concentrating majorly on the stock markets. (Bala, and Takimoto, 2017; Hemche et al., 2016; Kenourgios, and Dimitriou, 2015; Ghosh 2014; Duncan, and Kabundi, 2013; Sakthivel, and Kamaiah, 2011; Xiao, and Dhesi, 2010) In parallel with apparent increasing importance of the foreign exchange market, currency volatility becomes an issue of concern, particularly for monetary authorities and international investors seeking to diversify their risk. Recently, voluminous studies have been devoted to exploring integration and the spillover effect of the foreign exchange market for developed as well as emerging countries (Grenwood-Nimmo et al., 2016; Diebold, and Yılmaz, 2015; Antonakakis, 2012; Bubak et al., 2011; Kitamura, 2010).

Andreou et al. (2013) investigate bi-directional linkages between the stock and foreign exchange markets of a number of emerging economies. The researchers' analysis shows that there is strong evidence of bidirectional causality in variance between the foreign exchange market and stock market in all emerging economies but Colombia. Global and regional stock markets also contribute significantly to volatility spillovers.

Chkili and Nguyen (2014) use a regime-switching model approach to investigate the dynamic linkages between the exchange rates and stock market returns for the BRICS countries (Brazil, Russia, India, China and South Africa). The authors' evidence from Markov switching VAR models suggests that stock markets have more influence on exchange rates during both calm and turbulent periods.

Despite the examination of volatility spillovers for each asset, the understanding of the volatility transmission mechanism between foreign exchange and stock markets has also drawn much attention from financial economists and practitioners, since both variables play essential roles on asset allocation, portfolio diversification and economic development. Earlier studies focused mainly on major

industrialized countries, their mature stock markets and their dominant currencies. More recently, attention has focused on spillover effects between stock and foreign exchange markets in emerging countries because of the high growth and increasing openness of emerging markets. Studies by Sui and Sun (2016), Xiong and Han (2015), Panda and Deo, (2014), Andreou et al. (2013), Kumar (2013), Chkili, (2012), Zhao, (2010), and Choi et al. 2009 have adduced evidence of a bidirectional flow of volatility between the two financial markets. In the context of volatility transmission between exchange rates and stock prices, Chkili and Nguyen (2014), Kang and Yoon (2013), Antonakakis (2012), and Beer and Hebein (2011) found unidirectional transmission of volatility between equity and currency markets. In contrast to empirical evidence discussed in the above literature, some studies reported no evidence of volatility transmission between the two markets. (Morales, 2008; Apergis, and Rezitis, 2001)

Jawadi et al. (2015) study volatility spillover between the US and the three largest European stock markets (Frankfurt, London and Paris) around the time of the recent Subprime crisis. Through employing threshold generalized autoregressive conditional heteroscedasticity (GARCH) model estimations, they find weak evidence of volatility transmission between the two regions before the Subprime crisis. However, during the post-crisis period, they record returns and volatility spillover from US to European markets and vice versa at different times of the trading day, indicating that the two regions became more dependent during the recent Subprime crisis, a finding that supports the contagion hypothesis between the US and European stock markets.

Hong et al. (2009) contributes to the current literature by testing causality in tails. In finance literature, left tail probability associated with downward extreme market movements (Embrechts et al, 1997; Hong et al, 2009). In addition, quantiles, which are an element of Value at Risk (VaR) in finance theory, are mostly used as a measure of risk (Duffie, and Pan, 1997; Engle, and Manganelli, 2004). Causality test in risk of Hong et al. (2009) is based on the GARCH model and the conditional quantile model. Hong et al. (2009) pointed out that the Granger causality test in risk shows that whether a great deal of risk in a market in the past could be a messenger of a big risk in another market that could come in existence in the future.

Reviewing the literature on the interdependence between stock markets and foreign exchange markets, it is observed that most studies use low frequency data in examining volatility spillovers. While the use of high frequency data improved estimation of higher moments, in recent years, an apparent interest has emerged in utilizing high frequency data to construct realized volatility measure for exploring volatility transmission across various markets. (Jawadi et al., 2015; Bubak et al., 2011; Kitamura, 2010; Cai et al., 2008; Melvin, and Melvin, 2003; Andersen et al., 2000; Andersen, and Bollerslev, 1997) Do et al. (2016) assess financial market linkages both within and across stock and foreign exchange markets by investigating the spillover effects using high frequency data. Leung et al. (2017) study the hourly volatility spillover between the equity markets of New York, London and Tokyo, and their exchange rates for the period of 2001 through 2013. Despite extensive research on each of these interrelated issues, there is no notable attempt to incorporate within a unified empirical framework.

This research aims to detect the cross-border volatility linkages among eleven currencies within the foreign exchange market with respect to different time frequencies and stock market sessions.

CHAPTER 4: PRELIMINARY DATA ANALYSIS

In order to understand the pair wise volatility linkages within the foreign exchange market, a combination of eleven major, minor and exotic currencies were utilized in the dataset. The data includes trading quotes obtained from Reuters, cross-checked with Bloomberg to confirm accuracy. The sample period spans from January 1, 2009 to December 31, 2017, and consists of daily, 30-minute and 15-minute observations. The primary reason for selecting this sample period is data availability; the intraday data for the sample can be traced back to the beginning of 2009. Furthermore, this sample period allows the exclusion of the turmoil period of global crisis in 2007 and 2008, evidenced by exuberant volatility in all financial markets. The rationale for the selection of 30-minute and 15-minute intraday time frequencies is to reach the highest possible number of intraday observations. As such, the 15-minute observations alone yield 3,009,622 data points, which to my knowledge, is the largest number of observations to date among studies utilizing the same sample frequency.

As indicated above, the sample currencies include major, minor and exotic currencies quoted against US Dollar. The major currency sample consists of Euro (EURUSD), British Pound (GBPUSD), Japanese Yen (USDJPY), Swiss Franc (USDCHF), and Canadian Dollar (USDCAD). Minor currency sample includes Australian Dollar (AUDUSD), New Zealand Dollar (NZDUSD), Norwegian Krona (USDNOK) and Swedish Krona (USDSEK), and the exotic currency sample, Hong Kong Dollar (USDHKD), and Mexican Peso (USDMXN).[2] Furthermore, price quotations are gathered from real-time transaction data to ensure that they represent actual trading data. In addition, since global currency markets are 24-hour open markets, the data is continuous and convenient for high-frequency analysis.

The sample currencies are reliable representatives of global currency markets, being among the top fifteen currencies in terms of FX turnover, as depicted in Table 1.[3]

[2] Despite some minor difference of opinion in currency type classifications, the currency classifications used in the dissertation are consistent with the classifications from majority of the prominent FX web sources, including finance.yahoo.com, Forextraders.com, and Continental Currency.

[3] The FX turnover figures by currency classifications are obtained from Bank for International Settlements 2019 FX survey.

In particular, Table 1 reveals that all the sample currencies are positioned among the top 15 currencies when ranked by FX turnover amount. Furthermore, besides major currencies, the Mexican Peso, Australian Dollar, New Zealand Dollar, and Norwegian Krona are among the top twenty currencies in terms of percentage change in turnover throughout the same period.

The rationale behind the sample selection process is based not only on turnover, but also on regional variety in order to achieve an understanding of global outcomes. This research's main objective is to identify the volatility spillover relationships between eleven currencies within the foreign exchange market regarding to varying time frequencies and stock market sessions.

Consistent with the objective of the dissertation, the intraday observations are divided in accordance with the trading hours of Tokyo, London and New York stock exchanges. The trading hours of these stock markets are shown in Table 2.

Table 2: Trading Hours of Sample Stock Markets (Source: Thomson Reuters Eikon, 2018)

STOCK MARKET	TRADING HOURS (In Local time)
Tokyo	09:00-15:00
London	08:00-16:30
New York	09:30-16:00

London is on Greenwich Mean Time (GMT), whereas Tokyo is on GMT+9 and New York is on GMT-5 time zones, respectively. Thus, from Table 2, it can be deduced that there are two non-trading hour zones for all stock markets. The first zone is one hour between Tokyo closing at 15:00 pm (07:00 a.m. GMT) and London opening at 8:00 a.m. GMT, and the second is three hours between New York closing at 16:00 p.m. (21:00 p.m. GMT) and Tokyo opening at 9:00 a.m. (00:00 a.m. GMT).

As indicated before, dividing the total observations according to the three major stock markets' trading periods, and the two non-trading periods, makes the dissertation possible to observe the differential impact, if any, of these periods on volatility spillover patterns.

There is disparity in terms of total trading periods for these three markets, as revealed in Table 2. Specifically, the Tokyo stock exchange has a five-hour trading period[4] whereas London and New York have eight and a half, and six and a half hours, respectively. To overcome this difference, high frequency data in 30 and 15-minute intervals are employed to generate a sufficient number of observations. Consistent with the objectives of the research, utilizing three different frequencies (daily, 30-minute and 15-minute), and sampling according to these frequencies with and without taking stock market sessions into consideration will make the dissertation eligible to identify the impact of frequency differences and stock market sessions on the volatility transmission mechanism, and any differences with respect to the direction of the volatility spillovers.

As an introduction to summary statistics, the descriptive statistics, as well as the results of the unit root tests for sample currencies at daily frequency[5], are provided in Table 3.

[4] There is one-hour lunch break between 11:30 a.m. and 12:30 p.m. in Tokyo stock market.
[5] Descriptive statistics and unit root test results for intraday frequencies are not reported for brevity purposes but are available from the authors upon request. The first difference of all currencies at all frequencies are stationary.

Table 3: Descriptive Statistics (Daily Frequency)

	μ	$\tilde{\mu}$	σ	γ	κ	*JB*	*N*
AUDUSD	0.00%	0.00%	0.83%	-0.01	5.76	*603	2104
EURUSD	-0.01%	0.00%	0.65%	0.16	4.75	*253	2104
GBPUSD	0.00%	-0.01%	0.58%	-0.42	6.11	*826	2104
NZDUSD	0.00%	0.00%	0.87%	-0.11	4.77	*253	2104
USDCAD	0.00%	0.00%	0.62%	0.12	5.65	*559	2104
USDCHF	-0.01%	0.01%	0.85%	-5.99	16.37	*2001	2104
USDHKD	0.00%	0.00%	0.03%	-1.62	26.93	*4627	2104
USDJPY	0.01%	-0.01%	0.63%	0.08	6.64	*1051	2104
USDMXN	0.02%	0.00%	0.90%	7.34	17.64	*2381	2104
USDNOK	0.01%	-0.01%	0.84%	0.04	5.16	*371	2104
USDSEK	0.00%	0.01%	0.87%	-0.17	5.89	*671	2104

Notes: 1) *, ** and *** indicate statistical significance at the 1%, 5% and 10% level respectively. 2) μ, $\tilde{\mu}$, σ, γ, κ, *JB* and *N* refers to Mean, Median, Standard Deviation, Skewness, Kurtosis, Jarque–Bera and Number of observations respectively.

Table 3 indicates that the average daily percentage changes in sample currencies are within close proximity, possibly due to the number of observations. On the other hand, the standard deviation figures show some disparity, with figures for minor and exotic currencies larger compared to major currencies as expected. Furthermore, the skewness parameters for all countries are around zero, signifying that the return series do not vastly disperse from normal distribution. On the other hand, as revealed by Jarque-Berra statistics, the series do not fully conform to a normal distribution. The kurtosis parameters point out that the return series conform to a leptokurtic distribution, with a sharp peak and a heavier tail[6]. A leptokurtic distribution means that the investor can experience broader fluctuations (e.g. three or more standard deviations from the mean) resulting in greater potential for extremely low or high returns. Unit root test results illustrate that return series of the sample currencies are stationary. Moreover, ARCH test results clearly point out the existence of ARCH effect in percentage change series of the sample currencies.

[6] If the excess kurtosis (Kurtosis-3) is higher than zero, then the distribution is assumed to be leptokurtic and it has heavier tails compared to a uniform normal distribution.

CHAPTER 5: METHODOLOGY

GARCH was proposed by Bollerslev (1986) as the most general method of modeling volatility and variability of financial time series data. This model was derived from generalizing the GARCH autoregressive conditional variance model introduced by Engle (1982) for modeling the process of conditional variance of return on assets. In the GARCH model, previous estimates of volatility may affect the estimate of future variance. GARCH models are divided into univariate and multivariate models depending on the number of variables. In univariate GARCH models, the conditional variance of each time series is assumed to be independent of other time series, and the covariance between the series, which is an important factor in assessing the volatility of variables, is ignored. These limitations in univariate GARCH models impede their applications, and make them unrecognizable in many cases (Agnolucci, 2009; Hassan, and Malik, 2007; Kang et al., 2009).

Multivariate GARCH (MGARCH) models have been extensively used in the econometric literature to investigate the volatility transmission issue among financial variables. The increasing integration of financial variables has increased the relevance of models with dynamic covariances and conditional correlations, such as CCC (constant conditional correlation), the BEKK parameterization (Baba, Engle, Kraft, and Kroner), or DCC (dynamic conditional correlation) models particularly in exploring volatility spillover mechanisms. These models are more appropriate than univariate models.

VAR-MGARCH model proposed by Ling and McAleer (2003) has two important advantages over the multivariate GARCH model. The two important advantages include its flexibility compared to the conditional mean effects model, which facilitates the analysis of conditional mutual effects and volatility spillover between series, and its fewer computational complexities in assessing conditional volatility spillover, which saves time (Chang et al., 2011).

5.1. Initial Diagnostics

The initial diagnostic test to conduct the volatility analysis is to determine whether the price series contain unit root or not.

Unit root tests are conducted by using Augmented Dickey-Fuller (ADF), Phillips-Peron (PP) and Kwiatkowski and Phillips, Schmidt and Shin (KPSS) methods. Consistent with previous literature, (Aruga, and Managi, 2011) these three methods are utilized simultaneously to achieve robustness in results obtained from unit root tests.

Augmented Dickey-Fuller tests will be performed by means of the following structural equation:

(9) $$\Delta Y_t = \beta_1 + \beta_2 t + \delta Y_{t-1} + u_t$$

In Equation 9, *t* represents trend and β_1 represents the intercept term. ADF test is applied in the form both intercept and trend are involved.

ADF test assumes that error terms are independent with a constant variance. Phillips-Peron (1988) have developed an alternative test methodology by improving the assumptions of ADF method. PP test can be conducted via the following equation:

(10) $$Y_t = \beta_0 + \beta_1 Y_{t-1} + \beta_2 (t - T/2) + u_t$$

In Equation 10, *T* represents the number of observations, u_t represents the error terms with an expected mean of zero. In contrast to ADF test the assumption of homogeneity and no serial correlation in error terms are not required in PP test.[7]

In both ADF and PP tests, the null hypothesis indicates non-stationarity of series, whereas in KPSS test, null hypothesis indicates stationarity of time series. Thus, in contrast to ADF and PP tests, the rejection of null hypothesis indicates non-stationarity. The main objective of KPSS test is to isolate the deterministic trend in order to obtain stationary data series. KPSS test will be performed by means of the following equation:

[7] The primary reason why PP disregards the assumptions set forth by ADF is that the PP method uses ARIMA specification for past error terms whereas ADF uses AR specification.

(11) $Y_t = x_t\delta + u_t$

Consistent with the findings of prior researches, all the sample price series follow a non-stationary process, and thus contain unit root.

Accordingly, the price series are first differenced to achieve stationarity which is a prerequisite to carry out the volatility analysis among the sample currencies.

Consequently, in line with prior studies, once the price series are first differenced, they are transformed into the return series which turn out to be stationary.

The results obtained from unit root tests on return series are provided in

Table 4. Unit root test results illustrate that return series of the sample currencies are stationary.

Table 4: Unit Root Test Results (Daily Frequency)

	ADF	*PP*	*KPSS*	*ERS*
AUDUSD	*-57.36 [0]	*-105.57 [12]	0.03 [15]	* -103.62 [0]
EURUSD	*-51.89 [0]	*-104.90 [5]	0.02 [8]	* -104.66 [0]
GBPUSD	*-53.18 [0]	*-103.54 [5]	0.03 [3]	* -5.97 [8]
NZDUSD	*-50.52 [0]	*-106.14 [18]	0.07 [20]	* -27.81 [5]
USDCAD	*-51.54 [0]	*-105.19 [7]	0.03 [4]	* -9.23 [9]
USDCHF	*-53.89 [0]	*-103.03 [1]	0.02 [4]	* -102.45 [0]
USDHKD	*-54.08 [0]	*-169.95 [17]	0.03 [19]	* -3.80 [9]
USDJPY	*-51.29 [0]	*-103.81 [12]	0.03 [14]	* -17.40 [8]
USDMXN	*-50.11 [0]	*-112.93 [9]	0.04 [6]	* -3.74 [8]
USDNOK	*-50.11 [0]	*-104.88 [9]	0.02 [12]	* -29.32 [6]
USDSEK	*-48.30 [0]	*-103.23 [11]	0.03 [12]	* -102.40 [0]

Notes: 1) *, ** and *** indicate statistical significance at the 1%, 5% and 10% level respectively. 2) Numbers in square brackets correspond to lags for ADF (Augmented Dickey Fuller), ERS (Elliot et al., 1996) unit root tests and ARCH (Engle, 1982) test, bandwidth for PP (Phillips and Perron, 1988) and KPSS (Kwiatkowski et al., 1992) unit root tests. Maximum lags are set to 10, and lag length is determined using the modified Schwarz Information Criterion. Bandwidths are determined using the Newey-West Bandwidth. All auxiliary unit root regressions involve a constant and a trend.

The volatility spillover effect among the returns of sample currencies will be analyzed by means of a conditional heteroskedasticity model. Thus, in the second phase of the diagnostic tests, ARCH-LM test (Breusch–Godfrey serial correlation lagrange multiplier test) is applied on the return series for all sample currencies to check whether the residuals of these series contain ARCH effect or not.

The following specification is utilized to test the presence of ARCH effect in the residuals. In the below specification, the null hypothesis indicates no ARCH effect (Engle, 1982):

(12) $$\hat{u}_t = \alpha_0 + \alpha_1 X_{t,1} + \rho_1 \hat{u}_{t-1} + \rho_2 \hat{u}_{t-2} + \cdots + \rho_p \hat{u}_{t-p} + \varepsilon_t$$

$$nR^2 \sim \chi_p^2, \qquad H_0: \{\rho_1 = \rho_2 = \cdots = \rho_n = 0\}$$

Here n is the number of data-points available for the second regression. The rejection of the null hypothesis requires that at least one of the estimated ρ coefficients must be significant and it indicates the presence of ARCH components in the residuals.

The results of ARCH-LM test are displayed in

Table 5.

Table 5: The Results of ARCH-LM Test of Residual Series (Daily Frequency)

	ARCH
AUDUSD	*175.51 [1]
EURUSD	*36.47 [1]
GBPUSD	*245.08 [1]
NZDUSD	*67.49 [1]
USDCAD	*57.77 [1]
USDCHF	*75.93 [1]
USDHKD	*55.88 [1]
USDJPY	*129.36 [1]
USDMXN	*122.09 [1]
USDNOK	*122.09 [1]
USDSEK	*108.35 [1]

Notes: 1) *, ** and *** indicate statistical significance at the 1%, 5% and 10% level respectively. 2) Numbers in square brackets correspond to lags for ARCH (Engle, 1982) test. Maximum lags are set to 10, and lag length is determined using the modified Schwarz Information Criterion. Bandwidths are determined using the Newey-West Bandwidth.

As observed from

Table 5, the LM test statistics are significant at 95% confidence level conducive to the rejection of the null hypothesis and thus implies the presence of ARCH effect in the residuals of the return series for all the sample currencies, in other words ARCH test results clearly point out the existence of ARCH effect in percentage change series of the sample currencies. Accordingly, it is appropriate to estimate the return series by utilizing alternative ARCH specifications.

5.2. VAR-BEKK-GARCH

The volatility spillover effects between the selected currencies for each frequency will be analyzed by estimating the multivariate GARCH (MGARCH) model, introduced by Bollerslev, Engle and Wooldridge (1988). In this research, the VAR-BEKK-GARCH model, a multivariate volatility specification model proposed by Engle and Kroner (1995), is employed to measure the dynamics of the conditional volatility and volatility interdependence among sample currencies. This specification accounts for both volatility persistence of each currency, as well as own- and- cross volatility spillover effects between the currencies. In the present research, multivariate GARCH with BEKK specification developed by Engle and Kroner (1995) appears to be the most suitable approach to the inspection of volatility spillovers, because it specifies the positive definite covariance matrix. A notable feature of the BEKK specification is that it imposes no restriction on the correlation structure between the variables. For the empirical analysis on volatility spillover, the conditional mean equation is modeled through a Vector Autoregressive (VAR) model. The full BEKK model has three main advantages over alternative specifications of the MGARCH models: First, the VAR-BEKK-GARCH models allows for cross-sectional dynamics. More specifically, VAR-BEKK-GARCH not only defines volatility spillover but also indicates the detailed directions within revealed spillovers, which fits best to objective of this research. In this respect, other widely used specifications, including VECH-GARCH or DCC-GARCH, do not serve the purpose of this research since both models reveal information only about the magnitude and not the direction of volatility interdependencies. Therefore, DCC-GARCH specification is employed only for robustness purposes, which is discussed further in "Estimation and Interpretation of Findings" section. Secondly, by construction, it guarantees a positive estimated variance-covariance matrix. Finally, BEKK-GARCH is more parsimonious, allowing the reduction of the number of estimated parameters by enforcing restrictions both within and across equations. Based on the principle of minimum Akaike Information criterion values, VAR (1) model is chosen.

Since the 15-minute observations alone yield 3,009,622 data points, it is not possible to reach convergence through including all sample (11) currencies into a single model. Thus, the research employs VAR-BEKK-GARCH model as a bivariate

model and collects results for each possible pairwise combination among the sample currencies. More specifically, in order to reach same outcome of the multivariate model while overcoming the convergence problem, 70 bivariate models are employed for each frequency (30-minute and 15-minute) instead of a single multivariate model.

The VAR-BEKK-GARCH model in mean equation is expressed as:

$$(1) \qquad R_t = \mu + \sum_{i=1}^{k} \gamma_i R_{t-i} + \varepsilon_t$$

where $R_t = (R_{1t,} R_{2t})'$ is a vector of the returns for currency, $\mu = (\mu_{1,} \mu_2)'$ is the parameter vector of the mean, γ_i are (2 x 2) coefficient matrices, and $\varepsilon_t = (\varepsilon_{1t}, \varepsilon_{2t})'$ is a vector of residuals for currency return, which is assumed to be normally distributed with zero mean. We define conditional variance-covariance matrix (H_t) of the residuals $(\varepsilon_{1,t}, \varepsilon_{2,t})$ as follows:

$$(2) \qquad \varepsilon_t \left| \Omega_{t-1} \approx N(0, H_t) \right., \qquad H_t = \begin{vmatrix} h_{11,t} & h_{12,t} \\ h_{21,t} & h_{2,t}^2 \end{vmatrix}$$

where ε_t is the (2x1) residuals that are obtained from the VAR Model and Ω_{t-1} is the information set containing all the available information available up to time *(t-1).*Specifically, the equation of BEKK-GARCH (1,1) model takes the following form:

$$(3) \qquad H_t = C_0^{'} C_0 + A_{11}^{'} \varepsilon_{t-1} \varepsilon_{t-1}^{'} A + B_{11}^{'} H_{t-1} B_{11}$$

where H is defined as (2x2) conditional variance-covariance matrix of the residuals; C is a (2x2) upper triangular matrix of constants for currency pairs; A is a (2x2) matrix of ARCH coefficients, (a_{11}, a_{22}) that capture the effects of own shocks and cross-market shock interactions; and B is a (2x2) matrix of GARCH coefficients, (b_{11}, b_{22}) that capture the own market volatility persistence and the volatility transmissions between the markets. Engle and Kroner (1995) demonstrate that the upper presentation is unique if all diagonal elements of A, as well as the upper-left-hand elements of A_{11} and B_{11} are positive ($a_{11,} b_{11} > 0$).

The BEKK-GARCH model is conducted using the quasi-maximum likelihood estimation procedure. The log-likelihood function for a given sample of T observations is given by:

$$(4) \qquad \log L = -\frac{1}{2}\sum_{t=1}^{T}\left[k\log(2\pi) + \ln\left|H_t\right| + \varepsilon_t' H_t^{-1}\varepsilon_t\right]$$

where L is the parameter vector to be estimated, k is the number of the variables (i.e. for $k = 2$ in the bivariate form), T is a sample of organizations and H_t is the conditional variance-covariance matrix and ε_t is assumed to follow a joint Gaussian log-likelihood function.

Eq. (3) is presented in the matrix form through Eq. (4) to demonstrate the expansion through matrix multiplication resulting in h_{11} , h_{22} and h_{12} of the unrestricted model, which is presented by Eq. (5)- Eq. (8):

$$(5)\ H_t = C_0' C_0 + \begin{vmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{vmatrix}' \begin{vmatrix} \varepsilon_{1,t-1}^2 & \varepsilon_{1,t-1}, \varepsilon_{2,t-1} \\ \varepsilon_{1,t-1}, \varepsilon_{2,t-1} & \varepsilon_{2,t-1}^2 \end{vmatrix} \begin{vmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{vmatrix} + \begin{vmatrix} b_{11} & b_{12} \\ b_{21} & b_{22} \end{vmatrix}' H_{t-1} \begin{vmatrix} b_{11} & b_{12} \\ b_{21} & b_{22} \end{vmatrix}$$

$$(6)\ h_{11,t} = c_{11}^2 + a_{11}^2\varepsilon_{1,t-1}^2 + 2a_{11}a_{21}\varepsilon_{1,t-1}\varepsilon_{2,t-1} + a_{21}^2\varepsilon_{2,t-1}^2 + b_{11}^2 h_{11,t-1} + 2b_{11}b_{21}h_{12,t-1} + b_{21}^2 h_{22,t-1}$$

$$(7)\ h_{22,t} = c_{21}^2 + c_{22}^2 + a_{12}^2\varepsilon_{1,t-1}^2 + 2a_{12}a_{22}\varepsilon_{1,t-1}\varepsilon_{2,t-1} + a_{22}^2\varepsilon_{2,t-1}^2 + b_{12}^2 h_{11,t-1} + 2b_{12}b_{22}h_{12,t-1} + b_{22}^2 h_{22,t-1}$$

$$(8)\ h_{12,t} = c_{11}c_{21} + a_{11}a_{12}\varepsilon_{1,t-1}^2 + (a_{21}a_{12} + a_{11}a_{22})\varepsilon_{1,t-1}\varepsilon_{2,t-1} + a_{21}a_{22}\varepsilon_{2,t-1}^2 + b_{11}b_{12}h_{11,t1}$$
$$+ (b_{21}b_{12} + b_{11}b_{22})h_{12,t-1} + b_{21}b_{22}h_{22,t-1}$$

In pairwise analyses, Eq. (6) and Eq. (7) represents conditional variances for individual currencies that include cross-currency impacts whereas Eq. (8) expresses the cross-currency conditional covariances ($h_{12,t}$), derived from Eq.(6) and Eq.(7).

ARCH effect, i.e. the effect of a previous shock on the volatility of the same variable, is shown by the parameters (a_{11}, a_{22}) and the degree of volatility persistence is represented by the GARCH parameters, (b_{11}, b_{22}).

The off diagonal elements of γ_i matrix in Eq. 1 capture spillover effects in mean. Particularly, the coefficients $\gamma(1)_{12}$ and $\gamma(1)_{21}$ measure the bi-directional spillover effects in mean. Off-diagonal elements of A matrix, a_{12} and a_{21}, measure

the bi-directional spillover effects of previous shocks. Similarly, the off-diagonal elements of B matrix, b_{12} and b_{21}, measure the bi-directional spillover effects of variances. In particular, the parameters, a_{12} and a_{21} capture bi-directional shock transmission effects whereas b_{12} and b_{21} capture volatility spillover effects among the selected currencies.

5.3. cDCC-GARCH

cDCC-GARCH model of Aielli (2013) is employed as a robustness test to validate the pre-revealed dynamic volatility linkages between the sample currencies. Foremost advantage of employing DCC model is allowing for the recognition of probable ups and downs in conditional correlations during the sample period, which enabling the detection of dynamic behavior in reaction to the sample currencies' volatilities. An additional contribution of DCC-GARCH model is that the model estimates correlation coefficients of the standardized residuals, for this reason heteroscedasticity is taken into consideration directly (Chiang et al., 2007). The time varying correlation does not implicate any bias from volatility as the volatility is attuned by the process. Different from Forbes and Rigobon (2002), where cross market correlations are adjusted by volatility, DCC-GARCH continuously adjusts the correlation by the time-varying volatility. Consequently, DCC-GARCH delivers a greater measure in terms of correlation (Cho, and Parhizgari, 2008).

The volatility spillovers between the sample currencies are identified by the cDCC model of Aielli (2013). In order to introduce cDCC model, the initial step is the brief review of the DCC modeling (Engle, 2002) methodology. Representing the $K \times 1$ vector of the asset returns at time t by way of $y_t = \left(y_{1,t}, \ldots, y_{K,t}\right)'$, then assuming that

(9) $$E_{t-1}\left[y_t\right] = 0 \text{ and } E_{t-1}\left[y_t y_t'\right] = H_t$$

where $E_t\left[\cdot\right]$ represents the conditional expectation on $y_t, y_{t-1}, \cdots$, the asset conditional covariance matrix could be denoted as

(10) $$H_t = D_t^{1/2} R_t D_t^{1/2}$$

where $R_t = \left[\rho_{ij,t}\right]$ represents the diagonal matrix of the asset conditional variances, which is specified via $D_t = \mathrm{diag}\left(h_{1,t},\ldots,h_{K,t}\right)$, besides the asset conditional correlation matrix. In structure, R_t stands for the conditional covariance matrix of the asset standardized returns, that is $E_{t-1}\left[\varepsilon_t \varepsilon_t'\right] = R_t$, where $\varepsilon_t = \left[\varepsilon_{1,t},\ldots,\varepsilon_{K,t}\right]$, and $\varepsilon_{i,t} = y_{i,t} \big/ \sqrt{h_{i,t}}$. Engle (2002) reproduces the right hand side of Equation (9) rather than H_t directly

(11) $$\begin{aligned} R_t &= \left\{Q_t^*\right\}^{-1/2} Q_t \left\{Q_t^*\right\}^{-1/2} \\ Q_t &= \left(1-\alpha-\beta\right)S + \alpha\varepsilon_{t-1}\varepsilon_{t-1}' + \beta Q_{t-1} \end{aligned}$$

where $Q_t \equiv \left[q_{ij,t}\right]$, $S_t \equiv \left[s_{ij,t}\right]$, $Q_t^* = \mathrm{diag}\left\{Q_t\right\}$ and α and β are scalars. The resultant model is named as DCC-GARCH.

The cDCC-GARCH model undertakes the assumption that the correlation motivating procedure is

(12) $$Q_t = \left(1-\alpha-\beta\right)S + \alpha\left\{Q_{t-1}^{*1/2}\varepsilon_{t-1}\varepsilon_{t-1}'Q_{t-1}^{*1/2}\right\} + \beta Q_{t-1}$$

Overtly, in terms of the bivariate case the correlation is defined as

(13) $$\rho_{ij,t} = \frac{\omega_{ij,t-1} + \alpha\varepsilon_{i,t-1}\varepsilon_{j,t-1} + \beta\rho_{ij,t-1}}{\sqrt{\left\{\omega_{ii,t-1} + \alpha\varepsilon_{i,t-1}^2 + \beta\rho_{ii,t-1}\right\}\left\{\omega_{jj,t-1} + \alpha\varepsilon_{j,t-1}^2 + \beta\rho_{jj,t-1}\right\}}}$$

where $\omega_{ij,t} \equiv \left(1-\alpha-\beta\right)s_{ij} \big/ \sqrt{q_{ii,t}q_{jj,t}}$. Since $E_{t-1}\left[\varepsilon_{i,t}\varepsilon_{j,t}\right] = \rho_{ij,t}$, the formula for $\rho_{ij,t}$ associates a kind of GARCH procedures for the pertinent historical values and advances into a correlation-like ratio. α and β stand for the dynamic parameters of the correlation GARCH procedures. The time-varying intercept $\omega_{ij,t}$ can be perceived as an extemporized correction that is essential for purposes of tractability (Aielli, 2013).

CHAPTER 6: ESTIMATION AND INTERPRETATION OF FINDINGS

The analysis and interpretation of the estimations are represented below which are employed by utilizing three different frequencies (daily, 30-minute and 15-minute), and sampling according to these frequencies with and without taking stock market sessions into consideration, in order to identify the impact of frequency differences and stock market sessions on the volatility transmission mechanism, and any differences with respect to the direction of the volatility spillovers.

6.1. Volatility Spillovers Within Currency Market

The estimation results obtained from the VAR-BEKK-GARCH model are reported in Table 17 through See Notes (1).

Table 60 in the Appendix for daily, 30-minute and 15-minute observations. Before moving to the interpretation of the findings, it is noted that the estimation output provides robust coefficients. To elaborate, the statistical significance and persistence parameters of individual coefficients as well as the model validate the estimation quality.

In order to ensure that the results are not sensitive to sample selection bias, a structural break analysis is conducted on 30-minute and 15-minute frequencies through modified augmented Dickey-Fuller tests (Perron, 2006), which allow for levels and trends that differ across a single break date, since structural break is widely considered as a major source of nonlinearity in currency markets. The unit root tests are conducted with a single break, where the break consists of a level shift, a trend break, or both a shift and break. The results obtained from unit root tests are provided in Table 6.

Table 6: Dickey-Fuller Structural Break Test Results

	30 Minute Frequency			15 Minute Frequency		
	t	b_c	b_t	t	b_c	b_t
AUDUSD	-0.498 [0]	0.999 [0]	-1.150 [0]	0.050 [0]	0.859 [0]	-0.937 [0]
EURUSD	1.240 [0]	-1.009 [0]	0.044 [0]	0.252 [0]	-0.177 [0]	-0.254 [0]
GBPUSD	-0.288 [0]	-0.414 [0]	1.029 [0]	-0.836 [0]	0.674 [0]	0.424 [0]
NZDUSD	0.499 [0]	-0.130 [0]	-0.514 [0]	-1.154 [0]	1.141 [0]	1.156 [0]
USDCAD	-1.329 [0]	0.530 [0]	1.401 [0]	0.617 [0]	-0.523 [0]	-0.631 [0]
USDCHF	-0.137 [0]	-0.488 [0]	0.280 [0]	0.834 [0]	-1.617 [0]	-0.131 [0]
USDHKD	19.379 [0]	15.446 [0]	12.660 [0]	0.331 [0]	1.651 [0]	-0.331 [0]
USDJPY	-0.565 [0]	-0.307 [0]	0.461 [0]	0.210 [0]	-1.159 [0]	0.564 [0]
USDMXN	0.490 [0]	-0.520 [0]	-0.588 [0]	0.415 [3]	-0.902 [3]	-0.150 [3]
USDNOK	0.225 [0]	-0.623 [0]	-0.050 [0]	0.833 [0]	0.293 [0]	-0.291 [0]
USDSEK	0.079 [0]	-1.172 [0]	-0.036 [0]	0.692 [0]	-0.044 [0]	0.517 [0]

Notes: 1) *, ** and *** indicate statistical significance at the 1%, 5% and 10% level respectively. 2) Numbers in square brackets correspond to lags for Dickey-Fuller structural break test. Maximum lags are set to 10, and lag length is determined using the modified Schwarz Information Criterion. 3) t , b_c and b_t refers to Trend, Intercept Break and Trend Break respectively.

From the structural break test, it is found that all the currencies' price change series contain no structural break point for the full sample period. The rationale behind this outcome may be the frequency of the data. Consequently, analyses were conducted for the full sample period.

Table 7, Table 8 and Table 9 report the summarised results for short-term shock transmission and volatility spillover effects in three sampling frequencies. The shape of the arrows in the tables denote the direction of the interdependencies between sample currencies, if any.

The findings from the analyses can briefly be interpreted as follows:

The findings clearly point to the presence of volatility spillover effect among the sample currencies. Moreover, it can also be observed that, in most cases, the effect is bi-directional, indicating a strong volatility interaction among the selected currencies.

Volatility spillover among sample currencies is far stronger in the higher frequency data (30 minute and 15 minute). Interestingly, in 30- and 15-minute intervals, all analyses indicated at least one unilateral volatility transmission among sample currencies.

Table 7: Daily VAR-BEKK-GARCH Summary

Currency	AUDUSD	EURUSD	GBPUSD	NZDUSD	USDCAD	USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK	TOTAL
						Volatility Transmission						
AUDUSD	----------	←	↔	↔	-	↔	←	↔	↔	↔	-	
EURUSD	→	----------	←	-	←	→	-	←	→	↔	→	Unilateral
GBPUSD	↔	→	----------	↔	↔	↔	-	→	↔	↔	↔	36
NZDUSD	↔	-	↔	----------	-	←	-	←	↔	-	-	
USDCAD	-	→	↔	-	----------	↔	←	→	↔	↔	→	Bilateral
USDCHF	↔	←	↔	→	↔	----------	←	↔	↔	↔	↔	50
USDHKD	→	-	-	-	→	→	----------	↔	←	-	-	
USDJPY	↔	→	←	→	←	↔	↔	----------	↔	→	↔	None
USDMXN	↔	←	↔	↔	↔	↔	→	↔	----------	↔	←	24
USDNOK	↔	↔	↔	-	↔	↔	-	←	↔	----------	-	
USDSEK	-	←	↔	-	←	↔	-	↔	→	-	----------	
						Shock Transmission						
AUDUSD	----------	←	↔	↔	-	←	←	↔	→	→	-	
EURUSD	→	----------	↔	-	←	→	↔	←	↔	↔	-	Unilateral
GBPUSD	↔	↔	----------	↔	↔	↔	→	→	↔	↔	↔	38
NZDUSD	↔	-	↔	----------	←	-	←	←	↔	↔	-	
USDCAD	-	→	↔	→	----------	→	←	↔	→	↔	→	Bilateral
USDCHF	→	←	↔	-	←	----------	↔	↔	↔	↔	↔	56
USDHKD	→	↔	←	→	→	↔	----------	↔	↔	-	→	
USDJPY	↔	→	←	→	↔	↔	↔	----------	↔	↔	→	None
USDMXN	←	↔	↔	↔	←	↔	↔	↔	----------	↔	↔	16
USDNOK	←	↔	↔	↔	↔	↔	-	↔	↔	----------	-	
USDSEK	-	-	↔	-	←	↔	←	←	↔	-	----------	

Notes: ↔ indicates a bidirectional volatility transmission, → or ← indicates a unilateral volatility transmission, and - indicates no volatility transmission. ← means the related pair on the first column is volatility receiver while → is the indication of volatility transmitter.

Table 8: 30 Minute VAR-BEKK-GARCH Summary

Currency	AUDUSD	EURUSD	GBPUSD	NZDUSD	USDCAD	USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK	TOTAL
						Volatility Transmission						
AUDUSD	----------	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	
EURUSD	↔	----------	↔	↔	↔	↔	↔	↔	↔	↔	↔	Unilateral
GBPUSD	↔	↔	----------	↔	↔	↔	←	↔	→	←	↔	18
NZDUSD	↔	↔	↔	----------	↔	↔	←	↔	↔	↔	↔	
USDCAD	↔	↔	↔	↔	----------	↔	↔	→	↔	↔	↔	Bilateral
USDCHF	↔	↔	↔	↔	↔	----------	→	↔	↔	↔	↔	92
USDHKD	↔	↔	→	→	↔	←	----------	↔	↔	↔	←	
USDJPY	↔	↔	↔	↔	←	↔	↔	----------	→	↔	↔	None
USDMXN	↔	↔	←	↔	↔	↔	↔	←	----------	↔	←	0
USDNOK	↔	↔	→	↔	↔	↔	↔	↔	↔	----------	↔	
USDSEK	↔	↔	↔	↔	↔	↔	→	↔	→	↔	----------	
						Shock Transmission						
AUDUSD	----------	↔	↔	↔	↔	↔	→	↔	↔	←	↔	
EURUSD	↔	----------	↔	↔	↔	↔	→	↔	↔	↔	↔	Unilateral
GBPUSD	↔	↔	----------	↔	↔	↔	↔	↔	↔	←	-	14
NZDUSD	↔	↔	↔	----------	↔	↔	→	↔	↔	↔	↔	
USDCAD	↔	↔	↔	↔	----------	↔	↔	↔	↔	↔	←	Bilateral
USDCHF	↔	↔	↔	↔	↔	----------	↔	↔	↔	↔	↔	94
USDHKD	←	←	↔	←	↔	↔	----------	↔	↔	↔	↔	
USDJPY	↔	↔	↔	↔	↔	↔	↔	----------	↔	←	↔	None
USDMXN	↔	↔	↔	↔	↔	↔	↔	↔	----------	↔	↔	2
USDNOK	→	↔	→	↔	↔	↔	↔	→	↔	----------	↔	
USDSEK	↔	↔	-	↔	→	↔	↔	↔	↔	↔	----------	

Notes: ↔ indicates a bidirectional volatility transmission, → or ← indicates a unilateral volatility transmission, and - indicates no volatility transmission. ← means the related pair on the first column is volatility receiver while → is the indication of volatility transmitter.

Table 9: 15 Minute VAR-BEKK-GARCH Summary

Currency	AUDUSD	EURUSD	GBPUSD	NZDUSD	USDCAD	USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK	TOTAL
						Volatility Transmission						
AUDUSD	----------	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	
EURUSD	↔	----------	↔	↔	→	↔	↔	↔	↔	↔	↔	Unilateral
GBPUSD	↔	↔	----------	↔	↔	↔	↔	↔	↔	↔	↔	8
NZDUSD	↔	↔	↔	----------	↔	↔	↔	↔	↔	↔	←	
USDCAD	↔	←	↔	↔	----------	↔	↔	↔	↔	↔	↔	Bilateral
USDCHF	↔	↔	↔	↔	↔	----------	→	↔	↔	↔	↔	102
USDHKD	↔	↔	↔	↔	↔	←	----------	↔	↔	↔	←	
USDJPY	↔	↔	↔	↔	↔	↔	↔	----------	↔	↔	↔	None
USDMXN	↔	↔	↔	↔	↔	↔	↔	↔	----------	↔	↔	0
USDNOK	↔	↔	↔	↔	↔	↔	↔	↔	↔	----------	↔	
USDSEK	↔	↔	↔	→	↔	↔	→	↔	↔	↔	----------	
						Shock Transmission						
AUDUSD	----------	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	
EURUSD	↔	----------	↔	↔	↔	↔	↔	↔	↔	↔	↔	Unilateral
GBPUSD	↔	↔	----------	↔	↔	↔	↔	↔	↔	↔	↔	6
NZDUSD	↔	↔	↔	----------	↔	↔	↔	↔	↔	↔	↔	
USDCAD	↔	↔	↔	↔	----------	→	↔	↔	↔	↔	↔	Bilateral
USDCHF	↔	↔	↔	↔	←	----------	↔	↔	↔	↔	↔	104
USDHKD	↔	↔	↔	↔	↔	↔	----------	↔	←	↔	←	
USDJPY	↔	↔	↔	↔	↔	↔	↔	----------	↔	↔	↔	None
USDMXN	↔	↔	↔	↔	↔	↔	→	↔	----------	↔	↔	0
USDNOK	↔	↔	↔	↔	↔	↔	↔	↔	↔	----------	↔	
USDSEK	↔	↔	↔	↔	↔	↔	→	↔	↔	↔	----------	

Notes: ↔ indicates a bidirectional volatility transmission, → or ← indicates a unilateral volatility transmission, and - indicates no volatility transmission. ← means the related pair on the first column is volatility receiver while → is the indication of volatility transmitter.

Analyses provide unorthodox results indicating that major currencies do not play a strong leading role in volatility transmission. This finding is more distinct when daily and intraday results are compared. In particular, the majority of minor currencies (particularly the Norwegian Krona and Swedish Krona) transform from volatility receivers to volatility transmitters with the movement towards higher sampling frequencies. Likewise, as the observation frequencies increase, major currencies lose their volatility-transmitter role. Specifically, at the daily level the Euro, British Pound and Japanese Yen unilaterally transmit volatility to some sample currencies, yet in intraday frequencies they lose this particular role.

This result becomes even more pronounced in short-term shock transmissions. Notably, as opposed to daily results, the majority of the major currencies, including the British Pound and Japanese Yen, become shock receivers, while the majority of the minor currencies (particularly the New Zealand Dollar, Norwegian Krona Swedish Krona) become shock transmitters. Considering the fact that the Hong Kong Dollar was pegged to the U.S Dollar in 2005,[8] the presence of ARCH effect in HKD series indicates high volatility in intraday data, and provides additional evidence for the importance of using intraday analysis. These findings distinctly connote the importance of using high-frequency observations when analysing the volatility impacts of major currencies.

1-month forward swap spreads are extracted and plotted the as a proxy to gauge the risk premium levels for the sample currencies. **Figure 1** below displays the graphical representation of 1-month forward swap rates.

An interesting observation from **Figure 1** is the fact that minor currencies, including the Norwegian Krone, Swedish Krone and Hong Kong Dollar, have negative risk premiums in nominal terms, but the volatility of forward swap spreads in these currencies are much higher compared to their major-currency counterparts.

These results connote that minor currencies are open to much wider speculation conducive to higher volatility in those currencies' forward swap spreads,

[8] Since 18 May 2005, HKD is allowed to float between HKD 7.75 and HKD 7.85 per USD.

which is in turn transmitted into spot rate volatility, particularly in higher frequency trading.

These results combined with increasing FX trading and turnover in minor and exotic currencies might explain why these currencies transform to an originator role in volatility transmission processes.

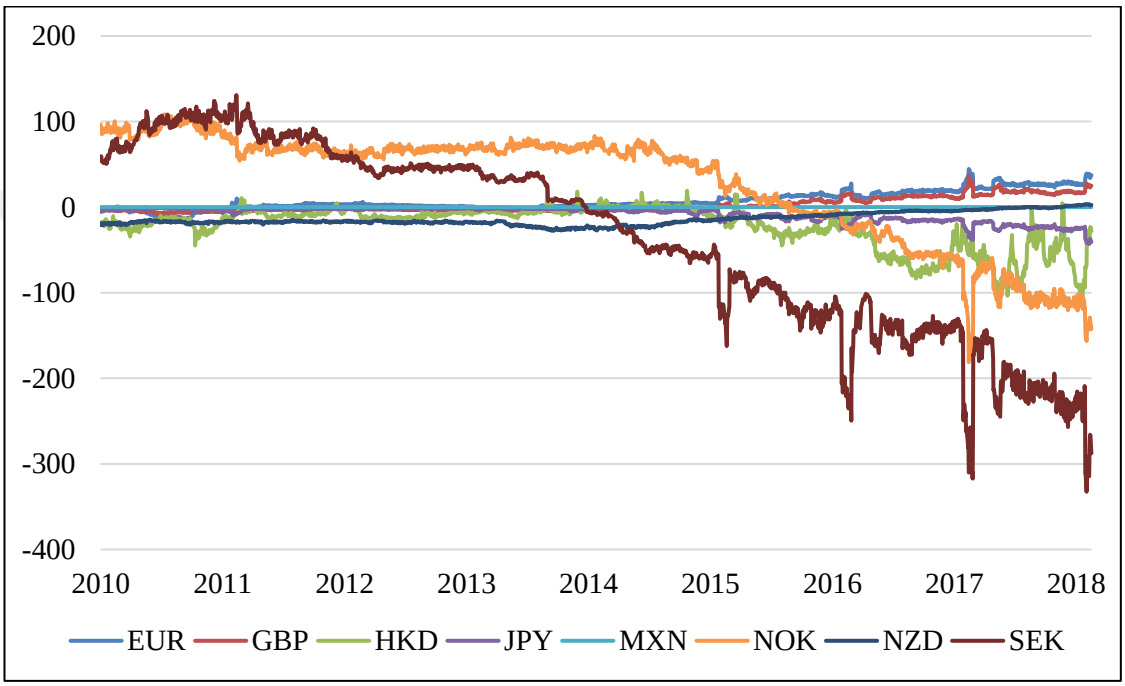

Figure 1: 1 Month Forward Swap Rates for Selected Sample Currencies (2010-2018) (Source: Thomson Reuters Eikon, 2019)

A comparison between daily frequency and intra-day frequency results indicates that the unidirectional volatility linkages among sample currencies tend to transform into bidirectional relationships. Even among two sample currencies seemingly unrelated in terms of volatility linkages (i.e., NZDUSD and EURUSD), bidirectional volatility linkages are observed in intra-day observations. Such difference may be caused by aggressive monitoring of the intraday traders and arbitrageurs to benefit from any possible change in market conditions.

These findings carry vital implications for traders and policymakers. From a trader's perspective, one of the most salient finding is the need for day traders to monitor not only the major currency fluctuations but also minor and exotic currency fluctuations for speculation and hedging purposes. This finding is a greater priority for day-traders and arbitrageurs attempting to exploit price fluctuations. From a hedgers' points of view, findings signal that minor and exotic currencies should closely be monitored or added to portfolios for controlling the currency risk.

From a policymaker's perspective, the findings signify that the monetary authorities should monitor the volatility interactions of their home currency against both major and minor currencies simultaneously. This action could prevent excess volatility, especially due to the unexpected impact of minor and exotic currencies, as revealed in the results of this dissertation.

6.2. Stock Markets and Currency Market Volatility Spillovers

The estimation results from VAR-BEKK-GARCH model including trading and non-trading hours of sample stock markets are reported in Appendix Table 61 through See Notes (1).

Table 140 in for 30-minute and 15-minute observations.[9] Coefficients in each table show the results of the estimated conditional mean equations (see Eq. 1) and conditional variance equations (see Eq. 3). Table 12 through Notes: ↔ indicates a bidirectional volatility transmission, → or ← indicates a unilateral volatility transmission, and - indicates no volatility transmission. ← means the related pair on the first column is volatility receiver while → is the indication of volatility transmitter.

Table 16 report the summarized results for volatility spillover effects in three time frequencies in trading and non-trading periods of three stock markets. The shapes of the arrows in the tables denote the direction of the interdependencies, if any, between sample currencies. A more elaborative analysis result, including the coefficients and statistical significance of short-term shocks and volatility transmissions, is provided in the Appendix. In the Appendix, off-diagonal elements of B matrix in structural form (b_{12} and b_{21}) are represented by β_{1i} and β_{i1}.

In addition, structural break analysis is conducted to intraday sample through modified augmented Dickey-Fuller (DF) tests (Perron, 2006). Since structural break is widely considered as a major source of nonlinearity in currency market, DF tests allow for levels and trends that differ across a single break date. The unit root tests are conducted with a single break where the break consists of a level shift, a trend break, or both a shift and break. The results obtained from unit root tests are provided in Table 10 and Table 11.

[9] The results of the pairwise analysis for each currency produced a total of 77 Tables.

Table 10: Dickey-Fuller Structural Break Test Results (30 Minute Frequency)

	USA			London			Tokyo			Morning			Evening		
	t	b_c	b_t	t	b_c	b_t	t	b_c	b_t	t	b_c	b_t	t	b_c	b_t
AUDUSD	-0.395	0.653	0.401	0.577	-1.148	-0.380	0.031	0.069	0.025	-0.735	1.139	0.735	-0.999	0.507	0.995
	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]
EURUSD	-0.862	0.693	0.700	0.852	-1.115	-0.493	-1.140	1.449	1.103	-0.114	-0.559	0.081	-1.159	-0.505	1.087
	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]
GBPUSD	-0.001	-1.201	1.227	-0.218	0.664	0.209	1.349	-0.863	-1.055	-0.699	0.869	0.794	0.436	-0.885	0.064
	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]
NZDUSD	-0.056	-0.184	-0.298	-0.513	1.128	0.490	1.029	-0.112	-0.121	0.334	0.101	-0.372	-0.416	1.402	0.404
	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]
USDCAD	-0.327	-0.460	0.356	-1.513	0.474	1.507	0.081	-0.869	0.071	-0.062	-0.609	0.057	-0.259	0.699	0.438
	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]
USDCHF	0.005	0.858	-0.139	1.499	-1.18	-1.448	0.189	-0.557	-0.223	-0.480	0.905	0.488	-0.630	1.408	-0.400
	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[3]	[3]	[3]
USDHKD	1.053	-1.424	-0.992	0.014	-1.055	-0.504	0.357	-0.309	-0.217	-1.312	0.445	1.312	1.210	-0.620	-1.229
	[3]	[3]	[3]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[2]	[2]	[2]
USDJPY	0.529	0.003	-0.610	0.258	0.356	-0.351	1.045	-0.485	-0.820	-0.733	1.498	0.678	-0.511	0.778	0.503
	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]
USDMXN	0.228	1.465	-0.432	0.388	-0.521	-0.124	0.513	-0.769	-0.510	-0.304	-1.440	0.717	0.744	-0.681	-0.744
	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]
USDNOK	-0.203	0.473	-0.318	0.387	-0.561	-0.176	-1.525	1.373	-0.769	0.120	-0.332	-0.131	0.468	-1.639	-0.298
	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]
USDSEK	0.871	0.431	-1.001	0.387	-0.561	-0.176	-0.922	1.632	-0.830	-0.553	0.742	0.511	0.126	-0.910	1.307
	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[2]	[2]	[2]

Notes: 1) *, ** and *** indicate statistical significance at the 1%, 5% and 10% level respectively. 2) Numbers in square brackets correspond to lags for Dickey-Fuller structural break test. Maximum lags are set to 10, and lag length is determined using the modified Schwarz Information Criterion. 3) t , b_c and b_t refers to Trend, Intercept Break and Trend Break respectively.

Table 11: Dickey-Fuller Structural Break Test Results (15 Minute Frequency)

	USA			London			Tokyo			Morning			Evening		
	t	b_c	b_t	t	b_c	b_t	t	b_c	b_t	t	b_c	b_t	t	b_c	b_t
AUDUSD	-0.924	1.322	0.924	-0.825	0.062	0.850	1.027	-0.266	-1.027	0.944	-0.323	-0.893	-0.228	-0.129	-0.652
	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]
EURUSD	0.526	-0.404	-0.596	1.195	-1.507	***1.748	1.081	-0.420	-1.131	1.074	-1.204	-0.633	-0.696	-0.209	-0.275
	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]
GBPUSD	1.094	-1.282	-1.411	-1.385	0.859	1.352	-0.200	-0.625	0.312	0.275	0.409	-0.244	-0.360	-0.262	-0.062
	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]
NZDUSD	-0.214	0.015	0.227	0.546	-1.292	1.089	-0.429	0.893	-1.344	1.544	-1.207	-1.357	0.081	0.777	-0.376
	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]
USDCAD	1.404	-0.513	-1.404	-0.813	0.092	-0.738	-1.392	0.479	1.423	-0.153	-0.643	0.165	0.630	-0.259	-0.331
	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[2]	[2]	[2]
USDCHF	-0.161	0.510	-0.043	-0.105	0.146	-0.462	0.860	-0.034	-0.900	-0.561	-0.096	0.498	0.526	-0.434	-0.526
	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]
USDHKD	0.654	0.684	-0.942	-0.273	0.248	0.070	1.136	-0.996	-1.220	-1.296	1.499	-0.870	0.656	0.603	-0.705
	[2]	[2]	[2]	[1]	[1]	[1]	[3]	[3]	[3]	[1]	[1]	[1]	[1]	[1]	[1]
USDJPY	0.581	-0.385	-0.536	-0.107	-0.611	0.546	-1.067	0.598	-0.662	-1.706	0.998	0.011	-0.054	0.500	0.329
	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]
USDMXN	0.637	-0.544	-0.660	1.259	-1.300	-1.259	0.267	0.136	-0.267	0.838	-0.705	-0.062	-0.033	-1.117	1.337
	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[2]	[2]	[2]
USDNOK	1.597	-1.049	-1.622	-0.296	-1.302	0.506	0.382	-0.874	0.445	0.222	0.735	-0.765	0.075	-0.300	0.563
	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]
USDSEK	0.347	1.615	-0.295	-0.273	1.087	0.273	0.347	0.331	-1.465	0.310	-0.558	-0.056	0.240	0.513	-0.467
	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[3]	[3]	[3]

Notes: 1) *, ** and *** indicate statistical significance at the 1%, 5% and 10% level respectively. 2) Numbers in square brackets correspond to lags for Dickey-Fuller structural break test. Maximum lags are set to 10, and lag length is determined using the modified Schwarz Information Criterion. 3) t, b_c and b_t refers to Trend, Intercept Break and Trend Break respectively.

The absence of any statistical significance in structural break test results reveals that, for all series, there is no structural break point for the full sample period, perhaps stemming from the frequency of the data. Consequently, the rest of the analyses were conducted for the full sample period. Accordingly, the empirical analyses are conducted by using BEKK-GARCH model (Engle, and Kroner, 1995), discussed further in the next section.

Table 12: Daily VAR-BEKK-GARCH Summary

Currency	AUDUSD	EURUSD	GBPUSD	NZDUSD	USDCAD	USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK	TOTAL
						Volatility Transmission						
AUDUSD	----------	←	↔	↔	-	↔	←	↔	↔	↔	-	
EURUSD	→	----------	←	-	←	→	-	←	→	↔	→	Unilateral
GBPUSD	↔	→	----------	↔	↔	↔	-	→	↔	↔	↔	36
NZDUSD	↔	-	↔	----------	-	←	-	←	↔	-	-	
USDCAD	-	→	↔	-	----------	↔	←	→	↔	↔	→	Bilateral
USDCHF	↔	←	↔	→	↔	----------	←	↔	↔	↔	↔	50
USDHKD	→	-	-	-	→	→	----------	↔	←	-	-	
USDJPY	↔	→	←	→	←	↔	↔	----------	↔	→	↔	None
USDMXN	↔	←	↔	↔	↔	↔	→	↔	----------	↔	←	24
USDNOK	↔	↔	↔	-	↔	↔	-	←	↔	----------	-	
USDSEK	-	←	↔	-	←	↔	-	↔	→	-	----------	

Notes: For all Tables, ↔ indicates a bidirectional volatility transmission, → or ← indicates a unilateral volatility transmission, and - indicates no volatility transmission. In cross-column notations, ← indicates that the associated pair on the first column is volatility receiver while → indicates that the mentioned pair is volatility transmitter.

Table 13: 30 Minute VAR-BEKK-GARCH Summary for Trading Hours

Currency	AUDUSD	EURUSD	GBPUSD	NZDUSD	USDCAD	USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK	TOTAL
						New York						
AUDUSD	----------	↔	→	↔	↔	→	→	↔	↔	↔	↔	
EURUSD	↔	----------	↔	↔	↔	↔	←	←	↔	↔	↔	Unilateral
GBPUSD	←	↔	----------	↔	↔	↔	↔	↔	←	↔	→	14
NZDUSD	↔	↔	↔	----------	↔	↔	↔	↔	←	↔	↔	
USDCAD	↔	↔	↔	↔	----------	↔	↔	↔	→	↔	↔	Bilateral
USDCHF	←	↔	↔	↔	↔	----------	↔	↔	↔	↔	↔	82
USDHKD	←	→	↔	↔	↔	↔	----------	←	←	←	→	
USDJPY	↔	→	↔	↔	↔	↔	→	----------	↔	↔	→	None
USDMXN	↔	↔	→	→	←	↔	→	↔	----------	↔	↔	14
USDNOK	↔	↔	↔	↔	↔	↔	→	↔	↔	----------	↔	
USDSEK	↔	↔	←	↔	↔	↔	←	←	↔	↔	----------	
						Tokyo						
AUDUSD	----------	←	→	↔	↔	↔	←	↔	↔	↔	↔	
EURUSD	→	----------	↔	↔	↔	↔	←	↔	→	↔	↔	Unilateral
GBPUSD	←	↔	----------	↔	↔	↔	↔	→	↔	↔	↔	10
NZDUSD	↔	↔	↔	----------	→	↔	↔	↔	↔	↔	↔	
USDCAD	↔	↔	↔	←	----------	↔	↔	→	↔	↔	↔	Bilateral
USDCHF	↔	↔	↔	↔	↔	----------	↔	↔	→	↔	↔	88
USDHKD	→	→	↔	↔	↔	↔	----------	↔	↔	→	↔	
USDJPY	↔	↔	←	↔	←	↔	↔	----------	-	↔	↔	None
USDMXN	↔	←	↔	↔	↔	←	↔	-	----------	↔	↔	12
USDNOK	↔	↔	↔	↔	↔	↔	←	↔	↔	----------	↔	
USDSEK	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	----------	
						London						
AUDUSD	----------	↔	↔	↔	↔	↔	←	↔	↔	↔	↔	
EURUSD	↔	----------	↔	↔	↔	-	-	↔	→	↔	↔	Unilateral
GBPUSD	↔	↔	----------	→	←	↔	↔	←	↔	↔	↔	12
NZDUSD	↔	↔	←	----------	↔	↔	→	↔	↔	↔	↔	
USDCAD	↔	↔	→	↔	----------	↔	←	↔	↔	↔	↔	Bilateral
USDCHF	↔	-	↔	↔	↔	----------	←	↔	→	↔	↔	80
USDHKD	→	-	↔	←	→	→	----------	↔	←	-	→	
USDJPY	↔	↔	→	↔	↔	↔	↔	----------	→	↔	↔	None
USDMXN	↔	←	↔	↔	↔	←	→	←	----------	↔	↔	18
USDNOK	↔	↔	↔	↔	↔	↔	-	↔	↔	----------	↔	
USDSEK	↔	↔	↔	↔	↔	↔	←	↔	↔	↔	----------	

Notes: ↔ indicates a bidirectional volatility transmission, → or ← indicates a unilateral volatility transmission, and - indicates no volatility transmission. ← means the related pair on the first column is volatility receiver while → is the indication of volatility transmitter.

Table 14: 30 Minute VAR-BEKK-GARCH Summary for Non-Trading Hours

Currency	AUDUSD	EURUSD	GBPUSD	NZDUSD	USDCAD	USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK	TOTAL
						Tokyo Closing-London Opening Period						
AUDUSD	----------	-	-	↔	←	↔	←	↔	←	↔	↔	
EURUSD	-	----------	↔	←	→	↔	→	↔	←	↔	↔	Unilateral
GBPUSD	-	↔	----------	←	→	↔	↔	↔	→	↔	↔	20
NZDUSD	↔	→	→	----------	↔	↔	←	↔	↔	→	-	
USDCAD	→	←	←	↔	----------	↔	→	↔	↔	↔	↔	Bilateral
USDCHF	↔	↔	↔	↔	↔	----------	↔	↔	↔	←	↔	64
USDHKD	→	←	↔	→	←	↔	----------	→	→	→	→	
USDJPY	↔	↔	↔	↔	↔	↔	←	----------	↔	↔	←	None
USDMXN	→	→	←	↔	↔	↔	←	↔	----------	↔	→	26
USDNOK	↔	↔	↔	←	↔	→	←	↔	↔	----------	↔	
USDSEK	↔	↔	↔	-	↔	↔	←	→	←	↔	----------	
						New York Closing- Tokyo Opening Period						
AUDUSD	----------	↔	↔	↔	↔	↔	↔	↔	→	←	↔	
EURUSD	↔	----------	↔	↔	↔	↔	↔	←	↔	→	↔	Unilateral
GBPUSD	↔	↔	----------	↔	←	↔	↔	↔	↔	↔	←	17
NZDUSD	↔	↔	↔	----------	↔	-	↔	←	↔	←	↔	
USDCAD	↔	↔	→	↔	----------	↔	↔	→	↔	→	→	Bilateral
USDCHF	↔	↔	↔	-	↔	----------	←	→	↔	↔	↔	72
USDHKD	↔	↔	↔	↔	↔	→	----------	→	←	↔	→	
USDJPY	↔	→	↔	→	←	←	←	----------	-	↔	↔	None
USDMXN	←	↔	↔	↔	↔	↔	→	-	----------	←	↔	21
USDNOK	→	←	↔	→	←	↔	↔	↔	→	----------	↔	
USDSEK	↔	↔	→	↔	←	↔	←	↔	↔	↔	----------	

Notes: ↔ indicates a bidirectional volatility transmission, → or ← indicates a unilateral volatility transmission, and - indicates no volatility transmission. ← means the related pair on the first column is volatility receiver while → is the indication of volatility transmitter.

Table 15: 15 Minute VAR-BEKK-GARCH Summary for Trading Hours

Currency	AUDUSD	EURUSD	GBPUSD	NZDUSD	USDCAD	USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK	TOTAL
						New York						
AUDUSD	----------	↔	↔	↔	↔	↔	↔	↔	↔	→	↔	
EURUSD	↔	----------	←	↔	↔	↔	←	↔	↔	↔	↔	Unilateral
GBPUSD	↔	→	----------	↔	←	↔	↔	↔	→	↔	↔	5
NZDUSD	↔	↔	↔	----------	↔	↔	↔	↔	↔	↔	↔	
USDCAD	↔	↔	→	↔	----------	↔	↔	↔	↔	↔	↔	Bilateral
USDCHF	↔	↔	↔	↔	↔	----------	↔	↔	↔	↔	↔	100
USDHKD	↔	→	↔	↔	↔	↔	----------	↔	↔	↔	↔	
USDJPY	↔	↔	↔	↔	↔	↔	↔	----------	↔	↔	↔	None
USDMXN	↔	↔	←	↔	↔	↔	↔	↔	----------	↔	↔	5
USDNOK	←	↔	↔	↔	↔	↔	↔	↔	↔	----------	↔	
USDSEK	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	----------	
						Tokyo						
AUDUSD	----------	↔	↔	←	↔	↔	↔	↔	↔	↔	↔	
EURUSD	↔	----------	↔	↔	↔	↔	←	↔	↔	↔	↔	Unilateral
GBPUSD	↔	↔	----------	↔	↔	↔	←	↔	↔	↔	↔	10
NZDUSD	→	↔	↔	----------	↔	↔	↔	↔	→	↔	↔	
USDCAD	↔	↔	↔	↔	----------	↔	←	→	↔	→	→	Bilateral
USDCHF	↔	↔	↔	↔	↔	----------	↔	↔	↔	↔	↔	88
USDHKD	↔	→	→	↔	→	↔	----------	↔	→	→	-	
USDJPY	↔	↔	↔	↔	←	↔	↔	----------	↔	↔	↔	None
USDMXN	↔	↔	↔	←	↔	↔	←	↔	----------	↔	↔	12
USDNOK	↔	↔	↔	↔	←	↔	←	↔	↔	----------	↔	
USDSEK	↔	↔	↔	↔	←	↔	-	↔	↔	↔	----------	
						London						
AUDUSD	----------	↔	↔	↔	↔	↔	↔	←	↔	↔	↔	
EURUSD	↔	----------	↔	↔	↔	↔	↔	↔	←	↔	↔	Unilateral
GBPUSD	↔	↔	----------	↔	↔	↔	←	↔	↔	↔	↔	16
NZDUSD	↔	↔	↔	----------	↔	↔	↔	↔	↔	↔	↔	
USDCAD	↔	↔	↔	↔	----------	↔	↔	↔	↔	↔	↔	Bilateral
USDCHF	↔	↔	↔	↔	↔	----------	↔	↔	↔	↔	↔	94
USDHKD	↔	↔	→	↔	↔	↔	----------	←	↔	←	←	
USDJPY	→	↔	↔	↔	↔	↔	→	----------	↔	→	↔	None
USDMXN	↔	→	↔	↔	↔	↔	↔	↔	----------	→	↔	0
USDNOK	↔	↔	↔	↔	↔	↔	→	←	←	----------	↔	
USDSEK	↔	↔	↔	↔	↔	↔	→	↔	↔	↔	----------	

Notes: ↔ indicates a bidirectional volatility transmission, → or ← indicates a unilateral volatility transmission, and - indicates no volatility transmission. ← means the related pair on the first column is volatility receiver while → is the indication of volatility transmitter.

Table 16: 15 Minute VAR-BEKK-GARCH Summary for Non-Trading Hours

Currency	AUDUSD	EURUSD	GBPUSD	NZDUSD	USDCAD	USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK	TOTAL
Tokyo Closing-London Opening Period												
AUDUSD	----------	←	↔	↔	↔	↔	↔	↔	↔	↔	↔	
EURUSD	→	----------	↔	↔	↔	-	↔	↔	↔	↔	↔	Unilateral
GBPUSD	↔	↔	----------	↔	↔	↔	↔	↔	↔	→	↔	5
NZDUSD	↔	↔	↔	----------	↔	↔	-	↔	↔	↔	↔	
USDCAD	↔	↔	↔	↔	----------	↔	↔	↔	↔	↔	↔	Bilateral
USDCHF	↔	-	↔	↔	↔	----------	↔	↔	↔	↔	↔	96
USDHKD	↔	↔	↔	-	↔	↔	----------	↔	←	←	→	
USDJPY	↔	↔	↔	↔	↔	↔	↔	----------	↔	↔	↔	None
USDMXN	↔	↔	↔	↔	↔	↔	→	↔	----------	↔	↔	9
USDNOK	↔	↔	←	↔	↔	↔	→	↔	↔	----------	↔	
USDSEK	↔	↔	↔	↔	↔	↔	←	↔	↔	↔	----------	
New York Closing- Tokyo Opening Period												
AUDUSD	----------	↔	↔	↔	↔	↔	-	↔	↔	↔	→	
EURUSD	↔	----------	↔	↔	-	↔	←	↔	↔	↔	↔	Unilateral
GBPUSD	↔	↔	----------	↔	↔	←	←	↔	↔	↔	↔	8
NZDUSD	↔	↔	↔	----------	→	↔	-	↔	-	↔	↔	
USDCAD	↔	-	↔	←	----------	↔	↔	↔	↔	↔	↔	Bilateral
USDCHF	↔	↔	→	↔	↔	----------	↔	↔	↔	-	↔	84
USDHKD	-	→	→	-	↔	↔	----------	↔	↔	→	←	
USDJPY	↔	↔	↔	↔	↔	↔	↔	----------	↔	↔	→	None
USDMXN	↔	↔	↔	-	↔	↔	↔	↔	----------	↔	↔	18
USDNOK	↔	↔	↔	↔	↔	-	←	↔	↔	----------	↔	
USDSEK	←	↔	↔	↔	↔	↔	→	←	↔	↔	----------	

Notes: ↔ indicates a bidirectional volatility transmission, → or ← indicates a unilateral volatility transmission, and - indicates no volatility transmission. ← means the related pair on the first column is volatility receiver while → is the indication of volatility transmitter.

Due to the large number of results were gathered from the analyses, a generalized interpretation referring to the objectives of the dissertation is followed by more elaborate and specific interpretations. During the day, bi-directional volatility linkages increase moving from Tokyo towards New York, a clear indication of the informational impact of stock markets on currency markets. There is a diminishing number of bi-directional volatility linkages moving from the highest data frequency, i.e. 15-minutes, towards daily. These findings denote the undisputable significance of using intraday data for volatility linkage analyses in currency markets.

One of the most striking finding of this particular research is the relative positions of sample currencies in volatility transmission process. More specifically, the findings reveal that in intraday stock market trading periods, the major currencies do not play the role of volatility transmitter, in contrast to expectations. On the contrary, these currencies generally to be net volatility receivers[10], whereas minor and exotic currencies take a leading role in volatility transmission. Even more surprisingly, the Yen and the Pound were found to be net volatility receivers during the trading hours of their respective stock markets.

Another novel finding lies in the volatility transmission patterns observed during non-trading periods. From Table 12 through Notes: ↔ indicates a bidirectional volatility transmission, → or ← indicates a unilateral volatility transmission, and - indicates no volatility transmission. ← means the related pair on the first column is volatility receiver while → is the indication of volatility transmitter.

Table 16, it can be observed that, despite the lack of remarkable difference in total number of significant volatility spillovers between these two non-trading periods, the number of bi-directional volatility spillovers decline with the closing of the New York stock exchange. This finding further supports the major informational impact of trading in stock markets on underlying currency markets, while also indicating that non-trading periods might be conducive to speculative trading for intraday currency

[10] A currency is considered to be a net receiver if the number of significant unidirectional volatility spillovers to that particular currency is more than it transmits. Similarly, it is considered to be a net transmitter if the number of significant unidirectional volatility spillovers from that currency is more than it receives.

traders, due to increased unidirectional volatility transmissions during these particular periods.

Additional findings related to data frequency and stock market trading hours have emerged from the results. The daily global trading in international stock markets start with Tokyo, and the results from Tokyo trading hours for both intraday frequencies highlight that, in this period, the main volatility transmitter to other sample currencies is Hong Kong Dollar (HKD), which may be ascribed to its dominant financial position in Asia. As such, since 2010, Hong Kong was able to maintain its position among the leaders in Global Financial Centers Index[11], with only London and New York ahead. Furthermore, as Hong Kong Dollar was pegged to U.S Dollar in 2005,[12] the presence of ARCH effect in HKD series indicates high volatility in intraday data, and provides additional evidence of the significance of intraday analysis. As indicated above, Japanese Yen is the net receiver in unidirectional volatility spillovers during this particular period.

By the opening of London stock exchange, there are some noteworthy changes in the volatility transmission patterns. More specifically, in this trading period, 15-minute observation results reveal that Yen transforms into a major net volatility transmitter, and HKD, into a net receiver. Another remarkable observation in London trading hours is that, similar to Yen's position in Tokyo trading hours, Pound becomes a net volatility receiver, while Mexican Peso captures the role of volatility transmitter. For London, 30-minute and 15-minute results are similar with the exception of HKD's position. In particular, similar to the results in Tokyo, HKD becomes a net transmitter.

Also of note is that, in 15-minute observations, none of the major currencies take the role of net volatility transmitter during Tokyo and London trading. Similarly, both Yen and Pound are volatility receivers during trading hours of their host stock markets.

Results from NY stock exchange trading hours show some structural changes in volatility transmission patterns. Based on both 15-minute and 30-minute

[11] Global Financial Centers Index is published by the Z/Yen Partners in collaboration with the China Development Institute. It is considered as the world's most authoritative comparison of the competitiveness of the world's leading financial centers.
[12] Since 18 May 2005, HKD is allowed to float between HKD 7.75 and HKD 7.85 per USD.

observation results, contrary to the situation in Tokyo and London, Pound and Yen turn out to be net volatility transmitters in this trading zone. Moreover, besides Pound and Yen, Australian Dollar and Mexican Peso are positioned as the major leading currencies in volatility spillover mechanism during trading hours of NY stock exchange. One other distinguishing characteristic of the NY trading period is the peak in the bi-directional volatility interactions.

The analysis results from three major stock markets' trading and non-trading hours display some discrepancies. Firstly, when compared to trading hours, there are an equal or higher number of significant unilateral volatility spillovers during non-trading periods, providing additional evidence on the considerable impact of stock market trading on volatility linkages in exchange markets.

In the first non-trading period following the closing of Tokyo market, Euro and Pound take the role of net volatility transmitters for both 15-minute and 30-minute results. However, in 30-minute frequency, HKD and New Zealand Dollar join Euro and Pound in this role. These findings strengthen the previously-stated argument that a micro structural perspective should be taken towards and confirm the existence of a hitherto largely unspoken impact of minor and exotic currencies in intraday volatility spillover patterns.

The results of the second non-trading period (closing of NY market) are somewhat similar to those in the first non-trading period. Despite some observed minor differences between 15 and 30-minute results, when combined, the overall results clearly indicate the relative power of minor and exotic currencies. In particular, HKD is consistently a net volatility transmitter for both frequencies; and Norwegian Krona, New Zealand Dollar and Australian Dollar are net volatility transmitters in different frequencies. When major currencies are considered, for 30-minute frequency results, Canadian Dollar emerges as a major volatility transmitter, and for 15-minute results, Japanese Yen and Swiss Franc. Strikingly, Euro and Pound are net volatility receivers in both intervals.

Daily data analysis results are consistent with those of recent studies (Salisu et. al., 2018, Kocenda, and Moravcova, 2019) disclosing the material impact of major currencies on minor and exotic currencies. Particularly, all major currencies except

Swiss Franc switch to net volatility transmitters; correspondingly, all other minor and exotic currencies, exception for HKD, to volatility receiver position.

The essentially aim of this dissertation was to identify the volatility spillover dynamics among a large sample of currencies, rather than explaining their possible causes. Even so, some rationale conducive to explaining these findings may be put forward. One plausible argument would be that the relative illiquidity of minor and exotic currencies leads to a higher volatility pattern. Thus, these types of currencies might provide some avenue for arbitrage and profit opportunities for speculators resulting from intraday price variations, in turn, resulting in a leading position for these currencies in volatility transmission process. Specifically, possibly stemming from the lower level of disclosure for these currencies, even at daily period, price jumps in minor and exotic currencies might represent considerable opportunities for watchful and informed traders, leading to unprecedented gains on the back of good trading strategies.

These results also carry implications with regard to the reformation of currency volatility indices developed by various exchanges and financial services companies. As one implication, the results indicate that JP Morgan weighted volatility index or CBOE Exchange Volatility Index neglect to track the volatility in many minor and exotic currencies, despite their apparent role as transmitter of volatility, particularly during non-trading hours of major stock exchanges. This evidence also denotes the significance of monitoring these type currencies for currency portfolio risk diversification purposes, particularly in an intraday setting.

CHAPTER 7: CONCLUSION

The results of this dissertation reveal various previously untold stories with regard to volatility linkages in currency markets. It may be possible to generalise these results to provide inferences for global currency markets, as the sample and number of observations is quite extensive in comparison with the pertinent literature.

In terms of answers to the research questions above, these results shed new light on the leading role of major currencies, clearly indicating that soft currencies also play a leading role in shock and volatility transmissions, and that fluctuations in these currencies should carefully be monitored. In addition, from both academic and professional points of view, the results underline the importance of using high frequency data to scrutinise volatility interdependencies in currency markets. Particularly since the number of volatility interdependencies is directly proportional to frequency, risk diversification opportunities erode in intra-day currency market transactions. Furthermore, such a situation involving tight interdependencies could be exploited by speculators and arbitrageurs through frequent trading and dynamic portfolio management.

The existence of tight volatility and shock transmissions represents a potential challenge for monetary authorities aiming to prevent excess volatility. Furthermore, previously unexplored phenomena involving the significant roles and impacts of minor and exotic currencies in shock and volatility transmissions denote that this issue is of great concern for the monetary authorities in major economies, as they suggest the need to monitor volatility in a greater range of currencies than is the norm at present.

There is an ongoing debate concerning the bilateral volatility linkages between stock markets and currency markets. However, there has been no attempt to explain the relative impact of distinct trading, as well as non-trading hours, in stock markets on volatility transmissions and spillover pattern in underlying currency markets.

From this viewpoint, this particular research attempts to fill in this gap in the pertinent literature by analyzing the impact of trading behavior in stock markets on the volatility dynamics of currency markets.

Accordingly, the research provides original findings that may shed light on volatility spillover patterns in currency markets, particularly from a microanalysis perspective. Firstly, as the previous studies are in lack, the findings denote that minor and exotic currencies also play a critical role in the volatility spillover dynamics during trading hours in major stock markets. In particular, Hong Kong Dollar, and to a lesser extent, Mexican peso, act as a volatility transmitter in the majority of the trading periods. More strikingly, Yen and Pound take no leading role in the volatility transmission process during Tokyo and London stock exchange trading hours, respectively. Secondly, the results also reveal the stock markets' significant informational impact on underlying currency markets, and its variation across stock markets.

These findings carry some vital implications for investor, particularly for speculative traders. The impact of speculative trading on volatility of the underlying asset is widely acknowledged, yet results from this research suggest that relatively less traded and generally overlooked currencies should be more closely monitored by speculators and volatility traders, as they are now known to take the role of volatility transmitter into major currencies during stock markets activity. The findings also unveil the limited risk hedging opportunities for currency portfolio managers in an intraday setting, resulting from an incremental increase in bi-directional volatility spillovers.

In addition, this study is important as it provides information about the integration of the sample currencies. The integration between the sample currencies in terms of intraday volatility spillover creates low diversification opportunities for investors. On the other hand, the lack of integration of these markets at daily level suggests high diversification opportunities for them. Therefore, investors can make investment plans by considering whether or not the markets are integrated regarding to daily and intraday terms. Moreover, policy makers may consider intraday integrations of currencies to be an important issue because a crisis or a shock in one currency might spillover to others and impact the overall financial performance.

Furthermore, the study is of value because it provides implications concerning modern portfolio theory to finance researchers. The differential existence of volatility spillover relationships between these currencies resulting from different

sampling frequencies indicates the appropriateness of financial assets in terms of modern portfolio theory may subject to change regarding different time frequencies. In other words, it demonstrates the fact that the number of volatility interdependencies is directly proportional to frequency, risk diversification opportunities erode in intra-day currency market transactions which makes chances to decrease for mean-variance optimization to comply with modern portfolio theory.

This particular research might pave the way for similar studies aiming to exploit the impact of stock market trading on volatility patterns in the currency market. The robustness of the findings could be ensured by taking the same approach in a sample consisting of emerging stock markets. In addition, determinants of volatility interactions among associated currencies may be scope of future research. One inherent assumption utilised in this dissertation was that intraday volatility in higher frequencies incorporates news announcements as revealed in recent studies (Chan, and Gray, 2018, Hussain et al., 2019). Yet, even beyond the scope of this particular research, the impact of news announcements can be examined in further studies by including news innovation in GARCH specifications, which requires rummaging all available news announcements to impact all sample currency pairs simultaneously, in an intraday setting.

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The data that support the findings of this study are available from the corresponding author, [T.Y.], upon reasonable request.

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APPENDICES

Appendix A. VAR-BEKK-GARCH Results

Appendix A.1. Daily VAR-BEKK-GARCH Results

Table 17: Daily VAR-BEKK-GARCH Results

AUDUSD	EURUSD	GBPUSD	NZDUSD	USDCAD	USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK
$ar(1)_{11}$	0.001	-0.030	-0.003	***-0.046	-0.020	*-0.066	-0.028	**0.050	-0.016	-0.009
	[0.030]	[-1.180]	[-0.086]	[-1.812]	[-0.967]	[-3.336]	[-1.281]	[2.124]	[-0.705]	[-0.376]
$ar(1)_{1i}$	**-0.064	-0.048	-0.041	-0.028	***0.034	***0.846	0.008	*0.095	**0.051	0.024
	[-2.331]	[-1.342]	[-1.310]	[-0.777]	[1.792]	[1.762]	[0.339]	[4.778]	[2.182]	[1.077]
Constant	0.000	0.000	0.000	0.000	0.000	0.000	0.000	*-0.001	0.000	0.000
	[-0.457]	[-0.720]	[-0.799]	[-0.771]	[-0.473]	[-0.983]	[0.056]	[-3.777]	[-0.956]	[-0.467]
$ar(1)_{i1}$	*-0.049	***-0.027	-0.008	0.011	0.036	*-0.001	0.015	*-0.138	**-0.055	**-0.060
	[-2.714]	[-1.698]	[-0.222]	[0.596]	[1.557]	[-3.808]	[0.939]	[-6.063]	[-2.179]	[-2.370]
$ar(1)_{ii}$	0.035	0.034	-0.022	-0.042	-0.006	*-0.068	0.002	*-0.227	*-0.082	*-0.085
	[1.517]	[1.523]	[-0.648]	[-1.642]	[-0.227]	[-3.262]	[0.102]	[-7.182]	[-3.301]	[-3.557]
Constant	***0.000	0.000	0.000	0.000	***0.000	0.000	0.000	*0.001	0.000	0.000
	[-1.738]	[-0.344]	[-0.174]	[1.039]	[-1.923]	[0.180]	[1.014]	[10.529]	[1.352]	[1.469]

Notes (1): 1) $ar(1)_{11}$ and $ar(1)_{22}$ capture variables' own lagged effects in mean 2) $ar(1)_{12}$ stands for lagged spillover effects in mean from one sample currency to another, and $ar(1)_{21}$ indicates the same effect in the opposite direction. 3) α_{11} and α_{22} represent the ARCH effect in two variables, respectively. 4) α_{12} measures the spillover effect of a previous shock in one sample currency on the another and α_{21} measures the spillover effect in the opposite direction. 5) β_{11} and β_{22} indicate the GARCH terms, which measure volatility persistence of each series. 6) β_{12} measures the spillover effect of the last period's variance of one sample currency on the current variance of another and β_{21} measures the spillover effect in the opposite direction. 7) Numbers in square brackets correspond to t-statistics. 8) * , ** and *** indicate statistical significance at the 1%, 5% and 10% level respectively.

Table 18: Daily VAR-BEKK-GARCH Results (Contd.)

c_{11}	*-0.001	*-0.001	*0.001	*0.001	*-0.001	*0.001	*0.001	0.000	*-0.002	*-0.001
	[-6.924]	[-4.267]	[7.621]	[6.020]	[-5.368]	[14.797]	[25.041]	[0.754]	[-10.225]	[-5.651]
c_{i1}	0.000	0.000	*0.001	**0.000	*-0.002	*0.000	***0.000	0.001	*-0.003	0.000
	[0.846]	[0.382]	[9.330]	[-2.570]	[-139.354]	[-3.703]	[-1.699]	[0.636]	[-12.860]	[-1.110]
c_{ii}	*0.000	0.000	*0.000	**0.000	0.000	*0.000	0.000	*0.005	0.000	0.000
	[4.120]	[0.000]	[-22.347]	[-2.021]	[0.000]	[21.831]	[0.000]	[5.017]	[0.000]	[1.255]
α_{11}	*0.266	*0.251	*0.183	*0.184	*0.263	*0.194	*0.258	*0.136	0.053	*0.252
	[12.470]	[12.428]	[11.853]	[6.024]	[15.842]	[62.278]	[68.056]	[6.765]	[1.385]	[10.434]
α_{1i}	0.019	*0.105	*0.299	-0.008	0.007	0.000	*0.051	*-0.132	*-0.260	***-0.043
	[1.235]	[6.266]	[19.018]	[-0.468]	[0.455]	[-0.557]	[18.317]	[-3.441]	[-8.613]	[-1.823]
α_{i1}	**-0.069	*-0.280	*0.061	-0.067	*0.055	*-1.285	*0.039	0.025	-0.026	0.029
	[-2.139]	[-8.340]	[10.534]	[-1.562]	[4.812]	[-9.284]	[7.081]	[0.514]	[-0.838]	[0.950]
α_{ii}	*0.178	*0.082	*-0.077	*0.196	*0.187	*0.520	*0.205	*0.930	*0.141	*0.151
	[10.439]	[2.947]	[-11.754]	[8.949]	[25.496]	[130.068]	[86.243]	[15.501]	[4.462]	[7.413]
β_{11}	*0.956	*0.918	*0.820	*0.970	*0.954	*0.978	*0.960	*0.919	*0.803	*0.959
	[136.267]	[119.453]	[111.445]	[120.733]	[157.667]	[1795.372]	[1331.092]	[36.730]	[39.625]	[116.980]
β_{1i}	-0.004	*-0.057	*1.629	***0.008	**-0.009	***0.000	*-0.019	*-0.408	*-0.154	0.007
	[-0.874]	[-6.469]	[259.837]	[1.677]	[-2.365]	[1.911]	[-40.831]	[-8.842]	[-10.481]	[1.011]
β_{i1}	**0.023	*0.134	*0.165	-0.002	*-0.032	*0.285	*0.003	**-0.105	*-0.220	-0.014
	[2.326]	[9.772]	[22.491]	[-0.150]	[-6.194]	[6.866]	[2.889]	[-2.380]	[-10.731]	[-1.521]
β_{ii}	*0.983	*1.019	*-0.841	*0.986	*0.959	*0.902	*0.977	*0.197	*0.763	*0.986
	[243.825]	[145.241]	[-122.822]	[171.881]	[2444.216]	[823.343]	[2580.710]	[3.606]	[34.976]	[172.893]

See Notes (1).

Table 19: Daily VAR-BEKK-GARCH Results (Contd.)

EURUSD	GBPUSD	NZDUSD	USDCAD	USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK
$ar(1)_{11}$	0.016	0.031	0.019	0.016	-0.027	0.000	-0.003	0.034	***0.055
	[0.786]	[1.280]	[0.863]	[0.582]	[-1.245]	[0.006]	[-0.139]	[1.197]	[1.723]
$ar(1)_{1i}$	-0.016	**-0.045	**0.046	0.015	0.414	-0.005	*0.065	0.037	**0.049
	[-0.609]	[-2.478]	[2.032]	[0.704]	[0.851]	[-0.252]	[4.191]	[1.618]	[1.964]
Constant	0.000	0.000	0.000	0.000	0.000	0.000	0.000	***0.000	0.000
	[-0.927]	[-0.527]	[-1.382]	[-0.882]	[-0.629]	[-1.293]	[-0.731]	[-1.940]	[-0.939]
$ar(1)_{i1}$	0.010	-0.005	**0.040	-0.045	**-0.001	0.029	*-0.103	***-0.066	*-0.113
	[0.516]	[-0.147]	[2.126]	[-1.112]	[-2.291]	[1.550]	[-3.510]	[-1.697]	[-2.760]
$ar(1)_{ii}$	0.021	-0.033	-0.024	-0.049	*-0.060	0.017	*-0.127	***-0.055	*-0.110
	[1.014]	[-1.315]	[-1.045]	[-1.279]	[-2.821]	[0.724]	[-4.256]	[-1.699]	[-3.592]
Constant	0.000	0.000	0.000	0.000	0.000	0.000	*0.001	0.000	0.000
	[0.147]	[0.520]	[1.063]	[-0.231]	[-0.617]	[1.298]	[5.355]	[1.378]	[0.691]
c_{11}	*0.000	0.000	**0.000	*0.000	*0.000	*0.000	0.000	***0.000	*0.000
	[-6.981]	[-0.292]	[2.331]	[4.448]	[17.793]	[4.452]	[-1.556]	[1.696]	[4.446]
c_{i1}	***0.000	*0.000	0.000	**-0.003	0.000	0.000	*-0.004	0.000	0.000
	[-1.899]	[-18.513]	[-0.198]	[-2.533]	[1.111]	[-0.366]	[-17.022]	[0.003]	[-0.013]
c_{ii}	*0.000	*-0.001	*0.000	0.002	*0.000	*0.001	0.000	*0.001	*-0.001
	[6.291]	[-40.758]	[-5.103]	[1.638]	[19.796]	[5.500]	[0.000]	[6.386]	[-6.202]
α_{11}	*0.217	*0.198	*0.154	*0.164	*0.173	*0.190	*0.153	*0.125	*0.192
	[16.957]	[16.481]	[7.925]	[6.955]	[65.479]	[24.861]	[5.850]	[3.979]	[6.954]
α_{1i}	*0.051	*0.050	0.026	*0.142	*-0.001	0.028	*0.779	*0.194	***0.078
	[2.739]	[3.083]	[1.218]	[3.923]	[-4.863]	[1.534]	[17.856]	[4.628]	[1.772]
α_{i1}	*-0.063	**0.030	*-0.069	-0.021	*-0.473	**0.034	**-0.065	**-0.043	0.002
	[-3.019]	[2.426]	[-3.836]	[-0.801]	[-3.772]	[2.553]	[-2.247]	[-2.127]	[0.098]
α_{ii}	*0.168	*0.148	*0.224	*0.307	*0.534	*0.240	*1.031	*0.251	*0.236
	[8.113]	[9.421]	[12.158]	[7.950]	[126.113]	[10.228]	[24.747]	[10.768]	[6.904]
β_{11}	*0.975	*-0.414	*0.986	*1.001	*0.984	*0.980	*0.990	*0.999	*-0.982
	[269.341]	[-36.426]	[250.022]	[83.725]	[2514.379]	[817.190]	[99.503]	[121.290]	[-128.726]
β_{1i}	***-0.007	*0.939	-0.005	*-0.130	0.000	-0.006	*-0.346	*-0.062	*0.035
	[-1.779]	[53.679]	[-1.130]	[-5.331]	[1.057]	[-1.561]	[-10.024]	[-4.627]	[2.733]
β_{i1}	**0.012	*0.845	*0.013	0.027	**0.076	**-0.008	0.021	**0.014	-0.002
	[2.150]	[91.197]	[2.769]	[1.555]	[1.972]	[-2.390]	[1.074]	[2.190]	[-0.240]
β_{ii}	*0.980	*0.407	*0.973	*0.812	*0.896	*0.967	*0.357	*0.944	*-0.956
	[205.568]	[30.631]	[208.794]	[23.509]	[761.472]	[150.322]	[7.449]	[94.405]	[-90.357]

See Notes (1).

Table 20: Daily VAR-BEKK-GARCH Results (Contd.)

GBPUSD	NZDUSD	USDCAD	USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK
$ar(1)_{11}$	0.021	0.027	-0.010	0.008	***0.039	*0.060	0.030	0.006
	[0.874]	[1.248]	[-1.387]	[0.353]	[1.817]	[5.973]	[1.185]	[0.246]
$ar(1)_{1i}$	-0.013	-0.012	*0.014	0.469	0.021	0.007	0.010	-0.005
	[-0.918]	[-0.589]	[2.904]	[1.228]	[1.212]	[0.908]	[0.625]	[-0.303]
Constant	0.000	0.000	*0.000	0.000	0.000	0.000	0.000	0.000
	[-0.520]	[-0.102]	[9.214]	[0.069]	[-0.555]	[0.295]	[-0.418]	[-0.231]
$ar(1)_{i1}$	-0.050	0.004	***-0.029	0.000	0.019	0.005	**-0.077	-0.031
	[-1.412]	[0.187]	[-1.792]	[-0.386]	[0.843]	[0.177]	[-2.070]	[-0.891]
$ar(1)_{ii}$	-0.014	*-0.059	-0.019	*-0.058	0.003	*-0.076	**-0.051	**-0.058
	[-0.596]	[-2.642]	[-1.177]	[-2.706]	[0.109]	[-3.639]	[-2.034]	[-2.437]
Constant	0.000	0.000	0.000	0.000	***0.000	0.000	0.000	0.000
	[0.344]	[1.019]	[-1.194]	[-0.407]	[1.803]	[0.793]	[1.187]	[1.050]
c_{11}	0.000	*0.000	*0.001	*0.000	*0.000	*0.000	0.000	0.000
	[0.002]	[2.679]	[27.072]	[13.571]	[4.826]	[33.812]	[-1.577]	[-0.859]
c_{i1}	*0.001	*0.000	*-0.001	*0.000	**-0.001	*-0.001	*-0.001	*-0.001
	[12.058]	[2.874]	[-22.533]	[-8.206]	[-2.192]	[-9.308]	[-5.056]	[-6.136]
c_{ii}	0.000	0.000	0.000	*0.000	0.000	0.000	0.000	0.000
	[-0.435]	[-0.437]	[0.000]	[-17.522]	[-0.643]	[0.000]	[0.000]	[-0.004]
α_{11}	*0.064	*0.169	*0.453	*0.159	*0.199	*0.193	*0.104	*0.123
	[2.912]	[9.235]	[645.997]	[60.293]	[17.639]	[293.426]	[3.610]	[8.774]
α_{1i}	*-0.299	*0.058	*-0.264	0.000	*-0.117	*-0.157	*0.223	*0.205
	[-9.664]	[3.079]	[-68.485]	[-0.131]	[-3.868]	[-87.208]	[6.629]	[8.250]
α_{i1}	*0.112	*-0.089	*0.048	*-0.262	0.014	*-0.014	*-0.078	*-0.077
	[7.495]	[-5.678]	[34.329]	[-2.578]	[0.880]	[-5.718]	[-5.801]	[-8.367]
α_{ii}	*0.238	*0.216	*0.098	*0.535	*0.255	*0.077	*0.165	*0.191
	[14.540]	[15.786]	[23.615]	[123.501]	[6.758]	[13.201]	[8.556]	[11.277]
β_{11}	*1.010	*-0.523	*0.836	*0.985	*0.977	*0.958	*0.997	*1.003
	[169.995]	[-13.403]	[3456.602]	[2523.239]	[451.081]	[8526.788]	[118.868]	[317.712]
β_{1i}	*0.114	*-0.653	*0.313	**0.000	*0.032	*0.107	*-0.092	*-0.104
	[6.109]	[-17.056]	[532.360]	[1.986]	[4.914]	[435.515]	[-7.905]	[-12.473]
β_{i1}	*-0.042	*-1.033	*-0.106	0.015	-0.006	*-0.023	*0.021	*0.032
	[-4.852]	[-48.574]	[-103.227]	[0.500]	[-1.071]	[-231.925]	[3.033]	[8.439]
β_{ii}	*0.929	*0.526	*1.030	*0.896	*0.955	*1.009	*0.947	*0.941
	[115.887]	[15.703]	[1979.101]	[737.167]	[65.139]	[8177.601]	[139.083]	[220.924]

See Notes (1).

Table 21: Daily VAR-BEKK-GARCH Results (Contd.)

NZDUSD	USDCAD	USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK
$ar(1)_{11}$	-0.025	-0.021	**-0.053	-0.020	0.011	-0.025	-0.014
	[-0.926]	[-0.887]	[-2.516]	[-0.926]	[0.555]	[-0.982]	[-0.555]
$ar(1)_{1i}$	-0.025	0.004	0.469	-0.002	**0.051	0.014	0.004
	[-0.620]	[0.162]	[0.900]	[-0.069]	[2.494]	[0.571]	[0.142]
Constant	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	[-0.070]	[0.246]	[-0.018]	[-0.271]	[0.154]	[-0.449]	[-0.156]
$ar(1)_{i1}$	-0.016	0.019	*-0.001	0.025	*0.040	-0.013	-0.041
	[-0.976]	[0.887]	[-3.326]	[1.522]	[2.620]	[-0.526]	[-1.632]
$ar(1)_{ii}$	*-0.069	-0.028	*-0.072	-0.003	**-0.051	-0.036	*-0.075
	[-2.674]	[-1.019]	[-2.848]	[-0.121]	[-2.286]	[-1.446]	[-2.895]
Constant	0.000	**0.000	0.000	***0.000	*0.001	0.000	0.000
	[1.040]	[-1.984]	[-0.620]	[1.745]	[6.289]	[1.138]	[1.035]
c_{11}	*-0.001	*0.001	*0.001	0.000	0.000	*-0.001	*0.001
	[-4.524]	[3.335]	[5.878]	[1.467]	[-0.034]	[-4.470]	[4.067]
c_{i1}	*0.000	0.001	0.000	*-0.001	*-0.003	0.000	0.000
	[4.084]	[1.374]	[-1.088]	[-7.080]	[-30.162]	[-1.018]	[-0.871]
c_{ii}	0.000	*0.002	*0.000	0.000	*-0.001	0.000	**0.000
	[-0.765]	[3.526]	[4.163]	[-0.074]	[-3.313]	[0.001]	[-2.076]
α_{11}	*0.154	*0.227	*0.180	*0.192	*0.097	*0.123	*0.209
	[4.392]	[11.124]	[12.303]	[13.299]	[3.444]	[5.170]	[6.449]
α_{1i}	-0.017	0.037	0.000	-0.021	*0.614	*-0.226	-0.045
	[-0.730]	[1.540]	[-0.371]	[-1.142]	[17.425]	[-11.719]	[-1.212]
α_{i1}	*-0.110	0.034	**-1.432	*0.131	*-0.119	*-0.086	-0.011
	[-2.630]	[1.346]	[-2.523]	[5.442]	[-3.152]	[-3.268]	[-0.230]
α_{ii}	*0.195	*0.193	*0.523	*0.313	*1.081	*-0.092	*0.165
	[7.642]	[9.531]	[23.522]	[13.372]	[31.323]	[-3.763]	[5.115]
β_{11}	*-0.977	*0.966	*0.980	*0.976	*1.023	*0.984	*0.973
	[-106.637]	[146.177]	[296.868]	[312.695]	[124.936]	[200.740]	[107.727]
β_{1i}	-0.009	***-0.014	0.000	0.004	*-0.261	-0.004	0.007
	[-1.391]	[-1.941]	[0.882]	[0.611]	[-23.333]	[-0.754]	[0.719]
β_{i1}	-0.010	**-0.022	***0.329	*-0.034	*0.081	0.007	0.000
	[-0.950]	[-2.412]	[1.942]	[-4.242]	[4.394]	[1.242]	[0.036]
β_{ii}	*-0.984	*0.953	*0.900	*0.940	*0.487	*0.979	*0.984
	[-152.912]	[117.035]	[138.127]	[98.408]	[23.858]	[210.516]	[113.853]

See Notes (1).

Table 22: Daily VAR-BEKK-GARCH Results (Contd.)

USDCAD	USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK
$ar(1)_{11}$	-0.015	*-0.084	**-0.053	**0.045	***-0.041	***-0.042
	[-0.819]	[-4.030]	[-2.366]	[2.044]	[-1.680]	[-1.712]
$ar(1)_{1i}$	-0.024	0.059	-0.004	*-0.050	-0.020	-0.018
	[-1.473]	[0.143]	[-0.212]	[-3.703]	[-1.245]	[-1.217]
Constant	0.000	0.000	0.000	*0.000	0.000	0.000
	[0.721]	[1.086]	[0.527]	[4.984]	[1.018]	[1.419]
$ar(1)_{i1}$	-0.048	*0.001	0.010	*0.143	**0.073	0.024
	[-1.399]	[3.151]	[0.511]	[4.731]	[2.347]	[0.770]
$ar(1)_{ii}$	0.024	*-0.067	-0.004	*-0.121	**-0.051	**-0.051
	[0.828]	[-3.094]	[-0.169]	[-4.069]	[-2.172]	[-2.301]
Constant	0.000	0.000	0.000	*0.001	0.000	0.000
	[0.198]	[-0.272]	[1.551]	[10.484]	[1.563]	[1.352]
c_{11}	*0.000	*0.000	*0.000	*0.001	*0.000	*0.000
	[10.078]	[13.879]	[8.390]	[3.844]	[-4.384]	[-5.872]
c_{i1}	*0.002	0.000	0.000	*0.006	***0.000	0.000
	[174.990]	[0.544]	[0.454]	[28.208]	[1.882]	[-0.181]
c_{ii}	*0.002	*0.000	*0.001	0.000	0.000	0.000
	[125.943]	[22.667]	[6.322]	[-0.002]	[0.001]	[0.002]
α_{11}	*0.190	*0.178	*0.227	*0.247	*0.247	*0.218
	[46.127]	[60.231]	[21.084]	[18.754]	[14.189]	[13.966]
α_{1i}	*-0.259	0.000	*-0.057	*0.360	*0.136	*0.135
	[-30.283]	[0.650]	[-5.460]	[6.344]	[5.412]	[5.535]
α_{i1}	-0.015	*0.599	*-0.033	0.019	*-0.046	-0.009
	[-1.627]	[5.133]	[-3.384]	[0.568]	[-2.812]	[-0.729]
α_{ii}	*0.275	*0.518	*0.220	*0.852	*0.114	*0.123
	[11.423]	[124.978]	[39.365]	[16.981]	[7.406]	[7.243]
β_{11}	*0.986	*0.982	*0.971	*1.008	*0.965	*0.972
	[1055.388]	[2053.324]	[365.596]	[75.661]	[209.178]	[300.377]
β_{1i}	*0.088	0.000	*0.015	*0.400	*-0.024	*-0.027
	[14.341]	[-1.266]	[6.031]	[6.080]	[-3.750]	[-5.749]
β_{i1}	*-0.016	*-0.107	0.004	**-0.065	*0.012	***0.004
	[-4.603]	[-3.003]	[1.607]	[-2.130]	[3.007]	[1.727]
β_{ii}	*0.879	*0.902	*0.972	*0.133	*0.992	*0.992
	[724.342]	[798.311]	[973.512]	[2.608]	[348.198]	[453.185]

See Notes (1).

Table 23: Daily VAR-BEKK-GARCH Results (Contd.)

USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK	**USDHKD**	USDJPY	USDMXN	USDNOK	USDSEK
$ar(1)_{11}$	***-0.049	-0.011	*-0.121	-0.044	**-0.033	$ar(1)_{11}$	**-0.050	*-0.063	*-0.058	**-0.056
	[-1.903]	[-0.506]	[-5.241]	[-1.445]	[-2.527]		[-2.433]	[-2.835]	[-2.616]	[-2.541]
$ar(1)_{1i}$	-1.067	-0.005	*0.090	0.014	0.008	$ar(1)_{1i}$	**0.000	*0.001	*0.001	*0.000
	[-1.614]	[-0.188]	[3.753]	[0.532]	[0.386]		[2.525]	[3.178]	[2.942]	[2.778]
Constant	*0.000	0.000	*-0.001	0.000	0.000	*Constant*	0.000	0.000	0.000	0.000
	[-2.762]	[0.272]	[-5.310]	[-0.241]	[-1.161]		[0.645]	[-0.455]	[-0.423]	[-0.401]
$ar(1)_{i1}$	0.000	*-0.050	*0.067	*0.083	*-0.050	$ar(1)_{i1}$	*-1.299	-0.047	-0.549	-0.561
	[1.588]	[-3.614]	[2.939]	[3.595]	[-5.978]		[-2.994]	[-0.110]	[-0.971]	[-0.912]
$ar(1)_{ii}$	*-0.070	***0.035	*-0.160	**-0.049	0.023	$ar(1)_{ii}$	-0.014	*-0.106	**-0.052	*-0.080
	[-2.867]	[1.936]	[-6.034]	[-2.207]	[1.471]		[-0.695]	[-6.378]	[-2.373]	[-3.463]
Constant	0.000	*0.000	*0.001	***0.000	*0.000	*Constant*	***0.000	0.000	0.000	0.000
	[-1.426]	[3.041]	[4.367]	[1.726]	[-12.897]		[1.802]	[1.601]	[1.052]	[1.106]
c_{11}	*0.002	*0.001	*-0.003	*0.002	*0.001	c_{11}	0.000	*0.000	*0.000	*0.000
	[10.574]	[10.674]	[-9.373]	[8.944]	[51.968]		[-0.205]	[20.808]	[7.129]	[7.793]
c_{i1}	0.000	*0.000	*0.001	0.000	*0.001	c_{i1}	*0.000	*0.000	0.000	0.000
	[0.301]	[10.153]	[3.028]	[-1.241]	[25.744]		[-11.655]	[8.697]	[-0.162]	[-0.444]
c_{ii}	*0.000	0.000	0.000	0.000	0.000	c_{ii}	*0.000	*0.000	*0.001	*0.000
	[2.635]	[0.000]	[-0.006]	[0.000]	[0.000]		[19.809]	[38.475]	[5.842]	[-4.316]
α_{11}	*0.149	*0.127	*0.680	*0.694	*0.049	α_{11}	*0.516	*0.518	*0.524	*0.525
	[8.424]	[37.278]	[13.687]	[15.332]	[10.388]		[124.959]	[124.440]	[23.859]	[41.510]
α_{1i}	*0.001	*-0.021	**-0.153	*0.117	*-0.156	α_{1i}	*0.534	*0.601	0.893	**1.167
	[3.039]	[-13.081]	[-2.090]	[4.583]	[-57.811]		[4.155]	[15.449]	[1.537]	[2.095]
α_{i1}	**1.155	*0.183	*-0.730	*-0.649	*0.268	α_{i1}	*-0.001	*0.000	0.000	0.000
	[2.096]	[36.830]	[-19.838]	[-22.395]	[40.105]		[-15.116]	[4.052]	[1.181]	[1.238]
α_{ii}	*0.520	*0.314	*0.293	0.023	*0.483	α_{ii}	*0.154	*0.041	*0.158	*0.155
	[24.488]	[447.182]	[4.763]	[0.970]	[711.546]		[77.197]	[37.493]	[14.802]	[14.889]
β_{11}	*0.967	*1.008	-0.062	*0.670	*1.048	β_{11}	*0.905	*0.900	*0.900	*0.899
	[176.115]	[3901.511]	[-0.478]	[20.645]	[1804.501]		[817.494]	[777.206]	[141.999]	[225.113]
β_{1i}	0.000	*0.067	*0.748	*-0.070	*0.188	β_{1i}	*-0.129	-0.003	-0.155	-0.215
	[-0.144]	[78.806]	[7.095]	[-5.539]	[50.513]		[-4.002]	[-0.379]	[-0.858]	[-1.271]
β_{i1}	**-0.398	*-0.153	*0.641	*0.192	*-0.250	β_{i1}	*0.000	*0.000	0.000	0.000
	[-2.492]	[-394.922]	[18.478]	[11.787]	[-681.926]		[5.281]	[-4.075]	[-0.535]	[-0.596]
β_{ii}	*0.900	*0.925	*0.506	*1.026	*0.805	β_{ii}	*0.985	*0.997	*0.985	*0.986
	[146.729]	[5527.509]	[3.507]	[171.893]	[4043.050]		[3667.046]	[26424.496]	[471.733]	[531.267]

See Notes (1).

Table 24: Daily VAR-BEKK-GARCH Results (Contd.)

USDJPY	USDMXN	USDNOK	USDSEK	**USDMXN**	USDNOK	USDSEK	**USDNOK**	USDSEK
$ar(1)_{11}$	*-0.080 [-11.148]	-0.002 [-0.101]	0.003 [0.147]	$ar(1)_{11}$	*-0.087 [-2.848]	*-0.127 [-4.848]	$ar(1)_{11}$	-0.003 [-0.105]
$ar(1)_{1i}$	-0.013 [-1.172]	-0.016 [-1.012]	-0.019 [-1.314]	$ar(1)_{1i}$	-0.010 [-0.399]	0.028 [1.257]	$ar(1)_{1i}$	-0.016 [-0.487]
Constant	0.000 [0.643]	***0.000 [1.920]	0.000 [1.216]	*Constant*	*0.001 [11.003]	*0.001 [3.982]	*Constant*	0.000 [1.463]
$ar(1)_{i1}$	*0.197 [38.615]	0.016 [0.654]	0.001 [0.050]	$ar(1)_{i1}$	0.004 [0.192]	-0.016 [-0.847]	$ar(1)_{i1}$	0.019 [0.576]
$ar(1)_{ii}$	*-0.080 [-4.065]	-0.021 [-0.997]	***-0.040 [-1.821]	$ar(1)_{ii}$	-0.021 [-0.929]	**-0.047 [-2.416]	$ar(1)_{ii}$	-0.052 [-1.549]
Constant	*0.001 [25.034]	***0.000 [1.673]	0.000 [1.277]	*Constant*	0.000 [-0.092]	0.000 [0.555]	*Constant*	0.000 [0.884]
c_{11}	*0.002 [57.349]	*0.001 [35.124]	*0.001 [18.230]	c_{11}	*0.004 [29.096]	*0.004 [23.999]	c_{11}	*0.001 [5.649]
c_{i1}	*0.005 [121.467]	***0.000 [-1.936]	0.000 [-0.448]	c_{i1}	*0.000 [-5.208]	*-0.001 [-3.715]	c_{i1}	**0.000 [2.163]
c_{ii}	0.000 [0.000]	*0.000 [7.052]	***0.000 [1.831]	c_{ii}	0.000 [0.000]	0.000 [0.000]	c_{ii}	*0.000 [5.335]
α_{11}	*0.144 [39.455]	*0.259 [87.127]	*0.238 [41.101]	α_{11}	*1.076 [28.428]	*0.880 [27.032]	α_{11}	*0.167 [6.098]
α_{1i}	*-0.611 [-102.046]	*-0.120 [-21.712]	*-0.120 [-6.574]	α_{1i}	*0.140 [9.817]	*0.082 [2.992]	α_{1i}	-0.019 [-0.609]
α_{i1}	*0.059 [13.224]	**0.007 [2.191]	***-0.012 [-1.717]	α_{i1}	*-0.739 [-21.299]	*-0.722 [-21.529]	α_{i1}	0.016 [0.487]
α_{ii}	*0.775 [184.067]	*0.178 [55.698]	*0.200 [13.891]	α_{ii}	*0.082 [7.400]	*0.123 [5.094]	α_{ii}	*0.201 [6.026]
β_{11}	*0.924 [1206.809]	*0.961 [1727.032]	*0.967 [1123.755]	β_{11}	*0.308 [12.356]	*-0.302 [-8.006]	β_{11}	*0.982 [154.284]
β_{1i}	*-0.219 [-47.117]	*0.031 [43.189]	*0.029 [5.614]	β_{1i}	*-0.047 [-15.686]	0.008 [0.339]	β_{1i}	0.005 [0.562]
β_{i1}	*-0.108 [-70.899]	0.000 [-0.052]	**0.002 [2.040]	β_{i1}	*0.305 [17.306]	*-0.343 [-16.376]	β_{i1}	-0.001 [-0.157]
β_{ii}	*0.332 [46.548]	*0.979 [2200.349]	*0.975 [244.861]	β_{ii}	*1.002 [544.255]	*-0.986 [-90.181]	β_{ii}	*0.976 [114.238]

See Notes (1).

Table 25: Daily VAR-BEKK-GARCH Results (Contd.)

EURUSD	GBPUSD	NZDUSD	USDCAD	USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK
$ar(1)_{11}$	0.016	0.031	0.019	0.016	-0.027	0.000	-0.003	0.034	***0.055
	[0.786]	[1.280]	[0.863]	[0.582]	[-1.245]	[0.006]	[-0.139]	[1.197]	[1.723]
$ar(1)_{1i}$	-0.016	**-0.045	**0.046	0.015	0.414	-0.005	*0.065	0.037	**0.049
	[-0.609]	[-2.478]	[2.032]	[0.704]	[0.851]	[-0.252]	[4.191]	[1.618]	[1.964]
Constant	0.000	0.000	0.000	0.000	0.000	0.000	0.000	***0.000	0.000
	[-0.927]	[-0.527]	[-1.382]	[-0.882]	[-0.629]	[-1.293]	[-0.731]	[-1.940]	[-0.939]
$ar(1)_{i1}$	0.010	-0.005	**0.040	-0.045	**-0.001	0.029	*-0.103	***-0.066	*-0.113
	[0.516]	[-0.147]	[2.126]	[-1.112]	[-2.291]	[1.550]	[-3.510]	[-1.697]	[-2.760]
$ar(1)_{ii}$	0.021	-0.033	-0.024	-0.049	*-0.060	0.017	*-0.127	***-0.055	*-0.110
	[1.014]	[-1.315]	[-1.045]	[-1.279]	[-2.821]	[0.724]	[-4.256]	[-1.699]	[-3.592]
Constant	0.000	0.000	0.000	0.000	0.000	0.000	*0.001	0.000	0.000
	[0.147]	[0.520]	[1.063]	[-0.231]	[-0.617]	[1.298]	[5.355]	[1.378]	[0.691]
c_{11}	*0.000	0.000	**0.000	*0.000	*0.000	*0.000	0.000	***0.000	*0.000
	[-6.981]	[-0.292]	[2.331]	[4.448]	[17.793]	[4.452]	[-1.556]	[1.696]	[4.446]
c_{i1}	***0.000	*0.000	0.000	**-0.003	0.000	0.000	*-0.004	0.000	0.000
	[-1.899]	[-18.513]	[-0.198]	[-2.533]	[1.111]	[-0.366]	[-17.022]	[0.003]	[-0.013]
c_{ii}	*0.000	*-0.001	*0.000	0.002	*0.000	*0.001	0.000	*0.001	*-0.001
	[6.291]	[-40.758]	[-5.103]	[1.638]	[19.796]	[5.500]	[0.000]	[6.386]	[-6.202]
α_{11}	*0.217	*0.198	*0.154	*0.164	*0.173	*0.190	*0.153	*0.125	*0.192
	[16.957]	[16.481]	[7.925]	[6.955]	[65.479]	[24.861]	[5.850]	[3.979]	[6.954]
α_{1i}	*0.051	*0.050	0.026	*0.142	*-0.001	0.028	*0.779	*0.194	***0.078
	[2.739]	[3.083]	[1.218]	[3.923]	[-4.863]	[1.534]	[17.856]	[4.628]	[1.772]
α_{i1}	*-0.063	**0.030	*-0.069	-0.021	*-0.473	**0.034	**-0.065	**-0.043	0.002
	[-3.019]	[2.426]	[-3.836]	[-0.801]	[-3.772]	[2.553]	[-2.247]	[-2.127]	[0.098]
α_{ii}	*0.168	*0.148	*0.224	*0.307	*0.534	*0.240	*1.031	*0.251	*0.236
	[8.113]	[9.421]	[12.158]	[7.950]	[126.113]	[10.228]	[24.747]	[10.768]	[6.904]
β_{11}	*0.975	*-0.414	*0.986	*1.001	*0.984	*0.980	*0.990	*0.999	*-0.982
	[269.341]	[-36.426]	[250.022]	[83.725]	[2514.379]	[817.190]	[99.503]	[121.290]	[-128.726]
β_{1i}	***-0.007	*0.939	-0.005	*-0.130	0.000	-0.006	*-0.346	*-0.062	*0.035
	[-1.779]	[53.679]	[-1.130]	[-5.331]	[1.057]	[-1.561]	[-10.024]	[-4.627]	[2.733]
β_{i1}	**0.012	*0.845	*0.013	0.027	**0.076	**-0.008	0.021	**0.014	-0.002
	[2.150]	[91.197]	[2.769]	[1.555]	[1.972]	[-2.390]	[1.074]	[2.190]	[-0.240]
β_{ii}	*0.980	*0.407	*0.973	*0.812	*0.896	*0.967	*0.357	*0.944	*-0.956
	[205.568]	[30.631]	[208.794]	[23.509]	[761.472]	[150.322]	[7.449]	[94.405]	[-90.357]

See Notes (1).

Table 26: Daily VAR-BEKK-GARCH Results (Contd.)

GBPUSD	NZDUSD	USDCAD	USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK
$ar(1)_{11}$	0.021	0.027	-0.010	0.008	***0.039	*0.060	0.030	0.006
	[0.874]	[1.248]	[-1.387]	[0.353]	[1.817]	[5.973]	[1.185]	[0.246]
$ar(1)_{1i}$	-0.013	-0.012	*0.014	0.469	0.021	0.007	0.010	-0.005
	[-0.918]	[-0.589]	[2.904]	[1.228]	[1.212]	[0.908]	[0.625]	[-0.303]
Constant	0.000	0.000	*0.000	0.000	0.000	0.000	0.000	0.000
	[-0.520]	[-0.102]	[9.214]	[0.069]	[-0.555]	[0.295]	[-0.418]	[-0.231]
$ar(1)_{i1}$	-0.050	0.004	***-0.029	0.000	0.019	0.005	**-0.077	-0.031
	[-1.412]	[0.187]	[-1.792]	[-0.386]	[0.843]	[0.177]	[-2.070]	[-0.891]
$ar(1)_{ii}$	-0.014	*-0.059	-0.019	*-0.058	0.003	*-0.076	**-0.051	**-0.058
	[-0.596]	[-2.642]	[-1.177]	[-2.706]	[0.109]	[-3.639]	[-2.034]	[-2.437]
Constant	0.000	0.000	0.000	0.000	***0.000	0.000	0.000	0.000
	[0.344]	[1.019]	[-1.194]	[-0.407]	[1.803]	[0.793]	[1.187]	[1.050]
c_{11}	0.000	*0.000	*0.001	*0.000	*0.000	*0.000	0.000	0.000
	[0.002]	[2.679]	[27.072]	[13.571]	[4.826]	[33.812]	[-1.577]	[-0.859]
c_{i1}	*0.001	*0.000	*-0.001	*0.000	**-0.001	*-0.001	*-0.001	*-0.001
	[12.058]	[2.874]	[-22.533]	[-8.206]	[-2.192]	[-9.308]	[-5.056]	[-6.136]
c_{ii}	0.000	0.000	0.000	*0.000	0.000	0.000	0.000	0.000
	[-0.435]	[-0.437]	[0.000]	[-17.522]	[-0.643]	[0.000]	[0.000]	[-0.004]
α_{11}	*0.064	*0.169	*0.453	*0.159	*0.199	*0.193	*0.104	*0.123
	[2.912]	[9.235]	[645.997]	[60.293]	[17.639]	[293.426]	[3.610]	[8.774]
α_{1i}	*-0.299	*0.058	*-0.264	0.000	*-0.117	*-0.157	*0.223	*0.205
	[-9.664]	[3.079]	[-68.485]	[-0.131]	[-3.868]	[-87.208]	[6.629]	[8.250]
α_{i1}	*0.112	*-0.089	*0.048	*-0.262	0.014	*-0.014	*-0.078	*-0.077
	[7.495]	[-5.678]	[34.329]	[-2.578]	[0.880]	[-5.718]	[-5.801]	[-8.367]
α_{ii}	*0.238	*0.216	*0.098	*0.535	*0.255	*0.077	*0.165	*0.191
	[14.540]	[15.786]	[23.615]	[123.501]	[6.758]	[13.201]	[8.556]	[11.277]
β_{11}	*1.010	*-0.523	*0.836	*0.985	*0.977	*0.958	*0.997	*1.003
	[169.995]	[-13.403]	[3456.602]	[2523.239]	[451.081]	[8526.788]	[118.868]	[317.712]
β_{1i}	*0.114	*-0.653	*0.313	**0.000	*0.032	*0.107	*-0.092	*-0.104
	[6.109]	[-17.056]	[532.360]	[1.986]	[4.914]	[435.515]	[-7.905]	[-12.473]
β_{i1}	*-0.042	*-1.033	*-0.106	0.015	-0.006	*-0.023	*0.021	*0.032
	[-4.852]	[-48.574]	[-103.227]	[0.500]	[-1.071]	[-231.925]	[3.033]	[8.439]
β_{ii}	*0.929	*0.526	*1.030	*0.896	*0.955	*1.009	*0.947	*0.941
	[115.887]	[15.703]	[1979.101]	[737.167]	[65.139]	[8177.601]	[139.083]	[220.924]

See Notes (1).

Table 27: Daily VAR-BEKK-GARCH Results (Contd.)

NZDUSD	USDCAD	USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK
$ar(1)_{11}$	-0.025	-0.021	**-0.053	-0.020	0.011	-0.025	-0.014
	[-0.926]	[-0.887]	[-2.516]	[-0.926]	[0.555]	[-0.982]	[-0.555]
$ar(1)_{1i}$	-0.025	0.004	0.469	-0.002	**0.051	0.014	0.004
	[-0.620]	[0.162]	[0.900]	[-0.069]	[2.494]	[0.571]	[0.142]
Constant	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	[-0.070]	[0.246]	[-0.018]	[-0.271]	[0.154]	[-0.449]	[-0.156]
$ar(1)_{i1}$	-0.016	0.019	*-0.001	0.025	*0.040	-0.013	-0.041
	[-0.976]	[0.887]	[-3.326]	[1.522]	[2.620]	[-0.526]	[-1.632]
$ar(1)_{ii}$	*-0.069	-0.028	*-0.072	-0.003	**-0.051	-0.036	*-0.075
	[-2.674]	[-1.019]	[-2.848]	[-0.121]	[-2.286]	[-1.446]	[-2.895]
Constant	0.000	**0.000	0.000	***0.000	*0.001	0.000	0.000
	[1.040]	[-1.984]	[-0.620]	[1.745]	[6.289]	[1.138]	[1.035]
c_{11}	*-0.001	*0.001	*0.001	0.000	0.000	*-0.001	*0.001
	[-4.524]	[3.335]	[5.878]	[1.467]	[-0.034]	[-4.470]	[4.067]
c_{i1}	*0.000	0.001	0.000	*-0.001	*-0.003	0.000	0.000
	[4.084]	[1.374]	[-1.088]	[-7.080]	[-30.162]	[-1.018]	[-0.871]
c_{ii}	0.000	*0.002	*0.000	0.000	*-0.001	0.000	**0.000
	[-0.765]	[3.526]	[4.163]	[-0.074]	[-3.313]	[0.001]	[-2.076]
α_{11}	*0.154	*0.227	*0.180	*0.192	*0.097	*0.123	*0.209
	[4.392]	[11.124]	[12.303]	[13.299]	[3.444]	[5.170]	[6.449]
α_{1i}	-0.017	0.037	0.000	-0.021	*0.614	*-0.226	-0.045
	[-0.730]	[1.540]	[-0.371]	[-1.142]	[17.425]	[-11.719]	[-1.212]
α_{i1}	*-0.110	0.034	**-1.432	*0.131	*-0.119	*-0.086	-0.011
	[-2.630]	[1.346]	[-2.523]	[5.442]	[-3.152]	[-3.268]	[-0.230]
α_{ii}	*0.195	*0.193	*0.523	*0.313	*1.081	*-0.092	*0.165
	[7.642]	[9.531]	[23.522]	[13.372]	[31.323]	[-3.763]	[5.115]
β_{11}	*-0.977	*0.966	*0.980	*0.976	*1.023	*0.984	*0.973
	[-106.637]	[146.177]	[296.868]	[312.695]	[124.936]	[200.740]	[107.727]
β_{1i}	-0.009	***-0.014	0.000	0.004	*-0.261	-0.004	0.007
	[-1.391]	[-1.941]	[0.882]	[0.611]	[-23.333]	[-0.754]	[0.719]
β_{i1}	-0.010	**-0.022	***0.329	*-0.034	*0.081	0.007	0.000
	[-0.950]	[-2.412]	[1.942]	[-4.242]	[4.394]	[1.242]	[0.036]
β_{ii}	*-0.984	*0.953	*0.900	*0.940	*0.487	*0.979	*0.984
	[-152.912]	[117.035]	[138.127]	[98.408]	[23.858]	[210.516]	[113.853]

See Notes (1).

Table 28: Daily VAR-BEKK-GARCH Results (Contd.)

USDCAD	USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK
$ar(1)_{11}$	-0.015	*-0.084	**-0.053	**0.045	***-0.041	***-0.042
	[-0.819]	[-4.030]	[-2.366]	[2.044]	[-1.680]	[-1.712]
$ar(1)_{1i}$	-0.024	0.059	-0.004	*-0.050	-0.020	-0.018
	[-1.473]	[0.143]	[-0.212]	[-3.703]	[-1.245]	[-1.217]
Constant	0.000	0.000	0.000	*0.000	0.000	0.000
	[0.721]	[1.086]	[0.527]	[4.984]	[1.018]	[1.419]
$ar(1)_{i1}$	-0.048	*0.001	0.010	*0.143	**0.073	0.024
	[-1.399]	[3.151]	[0.511]	[4.731]	[2.347]	[0.770]
$ar(1)_{ii}$	0.024	*-0.067	-0.004	*-0.121	**-0.051	**-0.051
	[0.828]	[-3.094]	[-0.169]	[-4.069]	[-2.172]	[-2.301]
Constant	0.000	0.000	0.000	*0.001	0.000	0.000
	[0.198]	[-0.272]	[1.551]	[10.484]	[1.563]	[1.352]
c_{11}	*0.000	*0.000	*0.000	*0.001	*0.000	*0.000
	[10.078]	[13.879]	[8.390]	[3.844]	[-4.384]	[-5.872]
c_{i1}	*0.002	0.000	0.000	*0.006	***0.000	0.000
	[174.990]	[0.544]	[0.454]	[28.208]	[1.882]	[-0.181]
c_{ii}	*0.002	*0.000	*0.001	0.000	0.000	0.000
	[125.943]	[22.667]	[6.322]	[-0.002]	[0.001]	[0.002]
α_{11}	*0.190	*0.178	*0.227	*0.247	*0.247	*0.218
	[46.127]	[60.231]	[21.084]	[18.754]	[14.189]	[13.966]
α_{1i}	*-0.259	0.000	*-0.057	*0.360	*0.136	*0.135
	[-30.283]	[0.650]	[-5.460]	[6.344]	[5.412]	[5.535]
α_{i1}	-0.015	*0.599	*-0.033	0.019	*-0.046	-0.009
	[-1.627]	[5.133]	[-3.384]	[0.568]	[-2.812]	[-0.729]
α_{ii}	*0.275	*0.518	*0.220	*0.852	*0.114	*0.123
	[11.423]	[124.978]	[39.365]	[16.981]	[7.406]	[7.243]
β_{11}	*0.986	*0.982	*0.971	*1.008	*0.965	*0.972
	[1055.388]	[2053.324]	[365.596]	[75.661]	[209.178]	[300.377]
β_{1i}	*0.088	0.000	*0.015	*0.400	*-0.024	*-0.027
	[14.341]	[-1.266]	[6.031]	[6.080]	[-3.750]	[-5.749]
β_{i1}	*-0.016	*-0.107	0.004	**-0.065	*0.012	***0.004
	[-4.603]	[-3.003]	[1.607]	[-2.130]	[3.007]	[1.727]
β_{ii}	*0.879	*0.902	*0.972	*0.133	*0.992	*0.992
	[724.342]	[798.311]	[973.512]	[2.608]	[348.198]	[453.185]

See Notes (1).

Table 29: Daily VAR-BEKK-GARCH Results (Contd.)

USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK	**USDHKD**	USDJPY	USDMXN	USDNOK	USDSEK
$ar(1)_{11}$	***-0.049	-0.011	*-0.121	-0.044	**-0.033	$ar(1)_{11}$	**-0.050	*-0.063	*-0.058	**-0.056
	[-1.903]	[-0.506]	[-5.241]	[-1.445]	[-2.527]		[-2.433]	[-2.835]	[-2.616]	[-2.541]
$ar(1)_{1i}$	-1.067	-0.005	*0.090	0.014	0.008	$ar(1)_{1i}$	**0.000	*0.001	*0.001	*0.000
	[-1.614]	[-0.188]	[3.753]	[0.532]	[0.386]		[2.525]	[3.178]	[2.942]	[2.778]
Constant	*0.000	0.000	*-0.001	0.000	0.000	*Constant*	0.000	0.000	0.000	0.000
	[-2.762]	[0.272]	[-5.310]	[-0.241]	[-1.161]		[0.645]	[-0.455]	[-0.423]	[-0.401]
$ar(1)_{i1}$	0.000	*-0.050	*0.067	*0.083	*-0.050	$ar(1)_{i1}$	*-1.299	-0.047	-0.549	-0.561
	[1.588]	[-3.614]	[2.939]	[3.595]	[-5.978]		[-2.994]	[-0.110]	[-0.971]	[-0.912]
$ar(1)_{ii}$	*-0.070	***0.035	*-0.160	**-0.049	0.023	$ar(1)_{ii}$	-0.014	*-0.106	**-0.052	*-0.080
	[-2.867]	[1.936]	[-6.034]	[-2.207]	[1.471]		[-0.695]	[-6.378]	[-2.373]	[-3.463]
Constant	0.000	*0.000	*0.001	***0.000	*0.000	*Constant*	***0.000	0.000	0.000	0.000
	[-1.426]	[3.041]	[4.367]	[1.726]	[-12.897]		[1.802]	[1.601]	[1.052]	[1.106]
c_{11}	*0.002	*0.001	*-0.003	*0.002	*0.001	c_{11}	0.000	*0.000	*0.000	*0.000
	[10.574]	[10.674]	[-9.373]	[8.944]	[51.968]		[-0.205]	[20.808]	[7.129]	[7.793]
c_{i1}	0.000	*0.000	*0.001	0.000	*0.001	c_{i1}	*0.000	*0.000	0.000	0.000
	[0.301]	[10.153]	[3.028]	[-1.241]	[25.744]		[-11.655]	[8.697]	[-0.162]	[-0.444]
c_{ii}	*0.000	0.000	0.000	0.000	0.000	c_{ii}	*0.000	*0.000	*0.001	*0.000
	[2.635]	[0.000]	[-0.006]	[0.000]	[0.000]		[19.809]	[38.475]	[5.842]	[-4.316]
α_{11}	*0.149	*0.127	*0.680	*0.694	*0.049	α_{11}	*0.516	*0.518	*0.524	*0.525
	[8.424]	[37.278]	[13.687]	[15.332]	[10.388]		[124.959]	[124.440]	[23.859]	[41.510]
α_{1i}	*0.001	*-0.021	**-0.153	*0.117	*-0.156	α_{1i}	*0.534	*0.601	0.893	**1.167
	[3.039]	[-13.081]	[-2.090]	[4.583]	[-57.811]		[4.155]	[15.449]	[1.537]	[2.095]
α_{i1}	**1.155	*0.183	*-0.730	*-0.649	*0.268	α_{i1}	*-0.001	*0.000	0.000	0.000
	[2.096]	[36.830]	[-19.838]	[-22.395]	[40.105]		[-15.116]	[4.052]	[1.181]	[1.238]
α_{ii}	*0.520	*0.314	*0.293	0.023	*0.483	α_{ii}	*0.154	*0.041	*0.158	*0.155
	[24.488]	[447.182]	[4.763]	[0.970]	[711.546]		[77.197]	[37.493]	[14.802]	[14.889]
β_{11}	*0.967	*1.008	-0.062	*0.670	*1.048	β_{11}	*0.905	*0.900	*0.900	*0.899
	[176.115]	[3901.511]	[-0.478]	[20.645]	[1804.501]		[817.494]	[777.206]	[141.999]	[225.113]
β_{1i}	0.000	*0.067	*0.748	*-0.070	*0.188	β_{1i}	*-0.129	-0.003	-0.155	-0.215
	[-0.144]	[78.806]	[7.095]	[-5.539]	[50.513]		[-4.002]	[-0.379]	[-0.858]	[-1.271]
β_{i1}	**-0.398	*-0.153	*0.641	*0.192	*-0.250	β_{i1}	*0.000	*0.000	0.000	0.000
	[-2.492]	[-394.922]	[18.478]	[11.787]	[-681.926]		[5.281]	[-4.075]	[-0.535]	[-0.596]
β_{ii}	*0.900	*0.925	*0.506	*1.026	*0.805	β_{ii}	*0.985	*0.997	*0.985	*0.986
	[146.729]	[5527.509]	[3.507]	[171.893]	[4043.050]		[3667.046]	[26424.496]	[471.733]	[531.267]

See Notes (1).

Table 30: Daily VAR-BEKK-GARCH Results (Contd.)

USDJPY	USDMXN	USDNOK	USDSEK	**USDMXN**	USDNOK	USDSEK	**USDNOK**	USDSEK
$ar(1)_{11}$	*-0.080 [-11.148]	-0.002 [-0.101]	0.003 [0.147]	$ar(1)_{11}$	*-0.087 [-2.848]	*-0.127 [-4.848]	$ar(1)_{11}$	-0.003 [-0.105]
$ar(1)_{1i}$	-0.013 [-1.172]	-0.016 [-1.012]	-0.019 [-1.314]	$ar(1)_{1i}$	-0.010 [-0.399]	0.028 [1.257]	$ar(1)_{1i}$	-0.016 [-0.487]
Constant	0.000 [0.643]	***0.000 [1.920]	0.000 [1.216]	*Constant*	*0.001 [11.003]	*0.001 [3.982]	*Constant*	0.000 [1.463]
$ar(1)_{i1}$	*0.197 [38.615]	0.016 [0.654]	0.001 [0.050]	$ar(1)_{i1}$	0.004 [0.192]	-0.016 [-0.847]	$ar(1)_{i1}$	0.019 [0.576]
$ar(1)_{ii}$	*-0.080 [-4.065]	-0.021 [-0.997]	***-0.040 [-1.821]	$ar(1)_{ii}$	-0.021 [-0.929]	**-0.047 [-2.416]	$ar(1)_{ii}$	-0.052 [-1.549]
Constant	*0.001 [25.034]	***0.000 [1.673]	0.000 [1.277]	*Constant*	0.000 [-0.092]	0.000 [0.555]	*Constant*	0.000 [0.884]
c_{11}	*0.002 [57.349]	*0.001 [35.124]	*0.001 [18.230]	c_{11}	*0.004 [29.096]	*0.004 [23.999]	c_{11}	*0.001 [5.649]
c_{i1}	*0.005 [121.467]	***0.000 [-1.936]	0.000 [-0.448]	c_{i1}	*0.000 [-5.208]	*-0.001 [-3.715]	c_{i1}	**0.000 [2.163]
c_{ii}	0.000 [0.000]	*0.000 [7.052]	***0.000 [1.831]	c_{ii}	0.000 [0.000]	0.000 [0.000]	c_{ii}	*0.000 [5.335]
α_{11}	*0.144 [39.455]	*0.259 [87.127]	*0.238 [41.101]	α_{11}	*1.076 [28.428]	*0.880 [27.032]	α_{11}	*0.167 [6.098]
α_{1i}	*-0.611 [-102.046]	*-0.120 [-21.712]	*-0.120 [-6.574]	α_{1i}	*0.140 [9.817]	*0.082 [2.992]	α_{1i}	-0.019 [-0.609]
α_{i1}	*0.059 [13.224]	**0.007 [2.191]	***-0.012 [-1.717]	α_{i1}	*-0.739 [-21.299]	*-0.722 [-21.529]	α_{i1}	0.016 [0.487]
α_{ii}	*0.775 [184.067]	*0.178 [55.698]	*0.200 [13.891]	α_{ii}	*0.082 [7.400]	*0.123 [5.094]	α_{ii}	*0.201 [6.026]
β_{11}	*0.924 [1206.809]	*0.961 [1727.032]	*0.967 [1123.755]	β_{11}	*0.308 [12.356]	*-0.302 [-8.006]	β_{11}	*0.982 [154.284]
β_{1i}	*-0.219 [-47.117]	*0.031 [43.189]	*0.029 [5.614]	β_{1i}	*-0.047 [-15.686]	0.008 [0.339]	β_{1i}	0.005 [0.562]
β_{i1}	*-0.108 [-70.899]	0.000 [-0.052]	**0.002 [2.040]	β_{i1}	*0.305 [17.306]	*-0.343 [-16.376]	β_{i1}	-0.001 [-0.157]
β_{ii}	*0.332 [46.548]	*0.979 [2200.349]	*0.975 [244.861]	β_{ii}	*1.002 [544.255]	*-0.986 [-90.181]	β_{ii}	*0.976 [114.238]

See Notes (1).

Appendix A.2. 30 Minute VAR-BEKK-GARCH Results

Table 31: 30 Minute VAR-BEKK-GARCH Results

AUDUSD	EURUSD	GBPUSD	NZDUSD	USDCAD	USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK
$ar(1)_{11}$	*-0.032	*-0.036	*-0.048	*-0.038	*-0.028	*-0.033	*-0.038	*-0.026	*-0.038	*-0.039
	[-8.988]	[-11.652]	[-13.033]	[-14.250]	[-10.147]	[-13.478]	[-13.725]	[-8.932]	[-12.490]	[-13.273]
$ar(1)_{1i}$	-0.002	0.006	*0.020	-0.005	0.003	0.022	*-0.015	*0.032	0.000	-0.004
	[-0.479]	[1.613]	[5.960]	[-1.524]	[1.193]	[0.442]	[-5.084]	[14.320]	[-0.044]	[-1.390]
Constant	**0.000	0.000	**0.000	0.000	**0.000	0.000	**0.000	*0.000	0.000	0.000
	[2.373]	[1.043]	[2.499]	[-0.397]	[2.033]	[0.463]	[2.175]	[-8.445]	[1.555]	[1.034]
$ar(1)_{i1}$	*0.007	*0.014	*0.078	*-0.033	*-0.028	*-0.001	***-0.003	*-0.121	*-0.039	*-0.035
	[3.327]	[8.638]	[18.325]	[-17.732]	[-13.314]	[-9.982]	[-1.845]	[-40.272]	[-13.953]	[-14.530]
$ar(1)_{ii}$	*-0.031	*-0.061	*-0.104	*-0.085	*-0.060	*-0.120	*-0.038	*-0.229	*-0.085	*-0.076
	[-8.652]	[-18.282]	[-26.291]	[-25.736]	[-18.726]	[-39.903]	[-12.938]	[-60.288]	[-28.475]	[-23.756]
Constant	0.000	0.000	*0.000	*0.000	*0.000	*0.000	0.000	*0.000	***0.000	0.000
	[1.318]	[1.059]	[9.208]	[3.771]	[-3.577]	[-5.213]	[1.584]	[-33.335]	[-1.787]	[-1.001]

See Notes (1).

Table 32: 30 Minute VAR-BEKK-GARCH Results (Contd.)

c_{11}	*0.000	*0.000	0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[23.157]	[13.878]	[0.437]	[-30.362]	[36.228]	[23.820]	[45.095]	[-20.554]	[-13.119]	[15.123]
c_{i1}	*0.000	*0.000	*0.000	*0.000	*0.000	***0.000	*0.000	*0.000	*0.000	*0.000
	[38.249]	[88.687]	[-24.750]	[86.677]	[-45.614]	[-1.677]	[-39.129]	[2.820]	[80.466]	[-92.093]
c_{ii}	*0.000	0.000	*0.000	0.000	*0.000	*0.000	*0.000	0.000	0.000	0.000
	[19.541]	[0.193]	[72.960]	[0.011]	[15.547]	[-38.270]	[17.913]	[0.001]	[0.020]	[0.016]
α_{11}	*0.106	*0.069	*0.059	*0.059	*0.133	*0.078	*0.153	*0.012	*0.099	*0.097
	[53.062]	[50.749]	[23.356]	[37.636]	[64.353]	[63.613]	[73.824]	[7.427]	[54.306]	[64.604]
α_{1i}	*-0.021	*-0.049	*-0.258	*0.072	0.000	*0.000	-0.003	*0.317	*0.015	*0.028
	[-8.749]	[-25.962]	[-47.051]	[31.851]	[0.031]	[-6.432]	[-1.378]	[137.921]	[4.780]	[9.620]
α_{i1}	*0.183	*0.166	*0.045	*-0.190	*-0.133	*-0.285	*-0.035	*-0.148	*-0.116	*-0.127
	[62.425]	[57.641]	[13.440]	[-65.060]	[-46.861]	[-6.432]	[-15.080]	[-65.475]	[-51.887]	[-54.973]
α_{ii}	*0.452	*0.508	*0.451	*0.497	*0.493	*0.252	*0.333	*0.642	*0.467	*0.479
	[130.882]	[173.910]	[92.460]	[152.372]	[154.154]	[70.341]	[90.402]	[209.211]	[141.943]	[141.935]
β_{11}	*1.000	*1.003	*1.008	*1.007	*0.991	*0.997	*0.986	*1.001	*1.001	*1.001
	[3770.913]	[6004.933]	[1180.401]	[5340.897]	[2320.575]	[9650.097]	[2736.641]	[7433.873]	[4313.254]	[4953.332]
β_{1i}	*0.016	*0.020	*0.109	*-0.026	0.000	*0.000	*0.005	*-0.022	*-0.022	*-0.023
	[28.793]	[56.276]	[47.176]	[-56.753]	[-0.357]	[5.351]	[11.459]	[-52.106]	[-27.061]	[-29.339]
β_{i1}	*-0.050	*-0.046	*-0.015	*0.050	*0.038	*0.047	*0.011	*0.025	*0.034	*0.038
	[-51.456]	[-47.722]	[-13.465]	[63.806]	[42.164]	[4.739]	[17.734]	[57.395]	[46.122]	[49.986]
β_{ii}	*0.895	*0.876	*0.860	*0.886	*0.889	*0.970	*0.942	*0.902	*0.883	*0.875
	[689.375]	[822.933]	[307.915]	[803.860]	[776.194]	[1220.380]	[772.454]	[1371.578]	[646.254]	[612.272]

See Notes (1).

Table 33: 30 Minute VAR-BEKK-GARCH Results (Contd.)

EURUSD	GBPUSD	NZDUSD	USDCAD	USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK
$ar(1)_{11}$	*-0.028	*-0.030	*-0.014	*-0.037	*-0.026	*-0.025	*-0.049	*-0.013	*-0.015
	[-7.678]	[-8.997]	[-4.440]	[-9.758]	[-8.690]	[-8.945]	[-16.155]	[-3.396]	[-3.948]
$ar(1)_{1i}$	**0.010	*0.006	*-0.010	**-0.007	***0.067	***-0.004	*-0.026	*0.008	*0.009
	[2.510]	[2.955]	[-3.327]	[-2.283]	[1.906]	[-1.924]	[-14.936]	[3.202]	[3.444]
Constant	0.000	0.000	0.000	***0.000	0.000	**0.000	*0.000	0.000	0.000
	[1.296]	[1.561]	[1.128]	[1.714]	[0.553]	[2.023]	[-9.595]	[0.593]	[0.911]
$ar(1)_{i1}$	*0.035	*0.021	*-0.023	*-0.068	*-0.001	-0.001	*-0.149	*-0.088	*-0.078
	[12.802]	[5.441]	[-7.133]	[-16.551]	[-9.024]	[-0.340]	[-38.914]	[-17.197]	[-16.366]
$ar(1)_{ii}$	*-0.073	*-0.056	*-0.054	*-0.095	*-0.125	*-0.036	*-0.152	*-0.114	*-0.103
	[-18.660]	[-18.902]	[-16.836]	[-24.471]	[-44.004]	[-13.193]	[-36.653]	[-28.748]	[-27.171]
Constant	0.000	*0.000	0.000	0.000	*0.000	**0.000	*0.000	*0.000	**0.000
	[0.404]	[3.314]	[-0.206]	[1.033]	[-5.387]	[2.003]	[-25.102]	[-3.798]	[-2.380]
c_{11}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[82.718]	[89.041]	[124.910]	[79.319]	[82.987]	[87.299]	[101.601]	[86.618]	[83.912]
c_{i1}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[40.752]	[20.143]	[-23.540]	[-52.293]	[11.537]	[-32.175]	[-62.396]	[-26.964]	[-28.430]
c_{ii}	*0.000	*0.000	0.000	*0.000	*0.000	*0.000	0.000	*0.000	*0.000
	[90.203]	[36.633]	[-0.002]	[74.464]	[32.090]	[51.422]	[0.001]	[95.636]	[106.953]
α_{11}	*0.368	*0.456	*-0.392	*0.338	*0.465	*0.426	*0.595	*0.407	*0.403
	[79.102]	[133.199]	[-78.047]	[80.518]	[138.250]	[135.758]	[139.239]	[81.286]	[87.534]
α_{1i}	*-0.081	*0.173	*0.399	*0.085	*0.001	*-0.052	*-0.090	*0.070	*0.066
	[-20.958]	[45.169]	[93.087]	[14.828]	[6.588]	[-22.128]	[-18.549]	[9.679]	[9.979]
α_{i1}	*0.037	*-0.006	*0.060	*-0.073	**0.120	*-0.018	*0.102	*0.037	*0.035
	[5.462]	[-2.816]	[7.839]	[-20.338]	[2.571]	[-6.893]	[21.783]	[8.585]	[9.279]
α_{ii}	*0.506	*0.154	*0.361	*0.472	*0.167	*0.298	*0.466	*0.467	*0.453
	[102.303]	[58.397]	[70.393]	[89.424]	[86.637]	[72.669]	[94.323]	[91.833]	[92.972]
β_{11}	*0.937	*0.896	*0.639	*0.949	*0.893	*0.913	*0.816	*0.906	*0.901
	[506.837]	[693.045]	[143.896]	[589.751]	[684.555]	[786.197]	[429.527]	[360.990]	[427.782]
β_{1i}	*0.033	*-0.051	*0.394	*-0.039	*0.000	*0.019	*0.168	*-0.035	*-0.035
	[19.122]	[-41.244]	[83.327]	[-16.500]	[-12.224]	[23.749]	[68.691]	[-10.089]	[-11.676]
β_{i1}	*-0.027	*0.007	*-0.423	*0.040	*-0.067	*0.008	*-0.060	*-0.021	*-0.026
	[-8.253]	[8.608]	[-73.149]	[23.598]	[-6.315]	[10.057]	[-45.812]	[-9.191]	[-14.243]
β_{ii}	*0.876	*0.989	*1.047	*0.866	*0.986	*0.952	*0.958	*0.889	*0.890
	[394.658]	[1603.406]	[598.141]	[359.265]	[3210.576]	[768.377]	[957.381]	[370.919]	[412.177]

See Notes (1).

Table 34: 30 Minute VAR-BEKK-GARCH Results (Contd.)

GBPUSD	NZDUSD	USDCAD	USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK
$ar(1)_{11}$	*-0.060	*-0.053	*-0.056	*-0.048	*-0.047	*-0.114	*-0.055	*-0.056
	[-21.871]	[-17.696]	[-17.146]	[-14.996]	[-16.099]	[-35.393]	[-16.366]	[-18.000]
$ar(1)_{1i}$	*0.012	*-0.024	*-0.014	*0.092	**-0.005	*-0.042	*-0.013	*-0.015
	[8.265]	[-9.971]	[-6.474]	[3.182]	[-2.421]	[-24.254]	[-7.488]	[-8.631]
Constant	0.000	0.000	0.000	0.000	0.000	*0.000	0.000	0.000
	[0.385]	[0.586]	[-0.818]	[-0.497]	[0.380]	[-14.279]	[-0.267]	[-0.607]
$ar(1)_{i1}$	*0.022	*-0.029	*-0.042	*-0.001	**-0.006	*-0.162	*-0.056	*-0.061
	[5.444]	[-10.210]	[-11.154]	[-7.448]	[-2.463]	[-38.712]	[-12.340]	[-14.087]
$ar(1)_{ii}$	*-0.055	*-0.059	*-0.083	*-0.125	*-0.039	*-0.211	*-0.082	*-0.079
	[-22.029]	[-19.317]	[-25.493]	[-45.302]	[-13.195]	[-56.823]	[-23.469]	[-25.040]
Constant	**0.000	0.000	*0.000	*0.000	***0.000	*0.000	**0.000	0.000
	[2.024]	[1.383]	[-4.440]	[-4.289]	[1.758]	[-27.661]	[-2.100]	[-1.324]
c_{11}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[84.928]	[99.043]	[87.399]	[91.131]	[98.223]	[119.344]	[95.043]	[89.588]
c_{i1}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[10.629]	[3.573]	[-34.606]	[13.445]	[-26.795]	[-62.939]	[-16.885]	[-16.021]
c_{ii}	*0.000	*0.000	*0.000	*0.000	*0.000	0.000	*0.000	*0.000
	[26.187]	[42.590]	[79.853]	[33.296]	[42.856]	[0.000]	[84.250]	[97.600]
α_{11}	*0.499	*0.430	*0.382	*0.478	*0.461	*0.612	*0.422	*0.411
	[163.791]	[128.907]	[118.206]	[142.968]	[156.838]	[140.246]	[112.725]	[111.244]
α_{1i}	*0.164	*0.185	*0.162	*0.001	*-0.067	*0.022	*0.077	*0.109
	[37.648]	[50.606]	[30.258]	[12.804]	[-22.009]	[3.853]	[10.459]	[14.747]
α_{i1}	*-0.030	*0.010	*-0.013	*0.246	0.002	*0.078	*0.017	0.003
	[-16.311]	[2.954]	[-6.099]	[6.541]	[0.693]	[17.379]	[6.386]	[0.968]
α_{ii}	*0.107	*0.428	*0.507	*0.167	*0.261	*0.555	*0.432	*0.444
	[51.147]	[150.891]	[146.744]	[105.395]	[53.497]	[108.432]	[114.405]	[117.841]
β_{11}	*0.879	*0.915	*0.929	*0.886	*0.895	*0.783	*0.912	*0.916
	[693.864]	[760.353]	[786.399]	[646.229]	[786.438]	[321.435]	[622.574]	[637.901]
β_{1i}	*-0.049	*-0.095	*-0.057	*0.000	*0.028	*0.190	*-0.042	*-0.057
	[-31.976]	[-43.033]	[-23.932]	[-18.234]	[24.555]	[52.262]	[-12.462]	[-17.134]
β_{i1}	*0.014	*0.010	*0.014	*-0.080	*0.003	*-0.063	*-0.004	0.002
	[22.932]	[6.850]	[14.043]	[-9.571]	[4.139]	[-47.005]	[-3.505]	[1.576]
β_{ii}	*0.998	*0.891	*0.880	*0.986	*0.961	*0.938	*0.901	*0.890
	[2646.559]	[758.800]	[603.674]	[4413.005]	[704.206]	[839.755]	[559.666]	[524.678]

See Notes (1).

Table 35: 30 Minute VAR-BEKK-GARCH Results (Contd.)

NZDUSD	USDCAD	USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK
$ar(1)_{11}$	*-0.063	*-0.047	*-0.047	*-0.052	*-0.051	*-0.054	*-0.060
	[-21.035]	[-16.050]	[-15.891]	[-19.585]	[-16.555]	[-18.472]	[-21.875]
$ar(1)_{1i}$	*-0.038	*-0.011	***-0.104	*-0.025	*0.036	*-0.009	*-0.019
	[-9.206]	[-3.452]	[-1.670]	[-7.915]	[16.530]	[-3.242]	[-6.822]
Constant	0.000	*0.000	**0.000	*0.000	*0.000	**0.000	0.000
	[1.211]	[2.856]	[2.275]	[2.793]	[-10.244]	[2.141]	[1.608]
$ar(1)_{i1}$	*-0.019	*-0.023	*-0.001	***-0.003	*-0.125	*-0.032	*-0.026
	[-10.805]	[-11.501]	[-7.790]	[-1.739]	[-48.412]	[-13.453]	[-11.598]
$ar(1)_{ii}$	*-0.066	*-0.063	*-0.124	*-0.039	*-0.345	*-0.084	*-0.072
	[-19.467]	[-18.911]	[-39.655]	[-14.122]	[-92.628]	[-25.539]	[-23.332]
Constant	0.000	*0.000	*0.000	**0.000	*0.000	***0.000	0.000
	[0.375]	[-5.194]	[-4.663]	[2.098]	[-41.997]	[-1.866]	[-0.944]
c_{11}	*0.000	*0.000	*0.000	*0.000	*0.000	***0.000	*0.000
	[10.381]	[-43.409]	[28.968]	[66.742]	[29.894]	[-1.785]	[5.326]
c_{i1}	*0.000	*0.000	*0.000	*0.000	0.000	*0.000	*0.000
	[59.882]	[48.713]	[6.207]	[-51.800]	[-1.519]	[96.527]	[-36.887]
c_{ii}	0.000	*0.000	*0.000	*0.000	0.000	*0.000	*0.000
	[0.002]	[11.266]	[29.927]	[34.210]	[0.000]	[19.922]	[43.117]
α_{11}	*0.088	*0.158	*0.285	*0.243	*0.075	*0.130	*0.116
	[39.325]	[66.350]	[43.863]	[75.896]	[32.702]	[58.906]	[59.103]
α_{1i}	*0.086	*-0.025	*0.000	*-0.043	*0.271	*0.010	*0.028
	[38.963]	[-10.648]	[3.018]	[-22.210]	[121.298]	[3.132]	[9.592]
α_{i1}	*-0.143	*-0.129	0.032	*-0.085	*-0.148	*-0.116	*-0.134
	[-34.678]	[-40.038]	[0.372]	[-26.048]	[-51.175]	[-44.727]	[-49.964]
α_{ii}	*0.502	*0.492	*0.180	*0.330	*0.713	*0.477	*0.492
	[158.585]	[145.617]	[79.943]	[69.592]	[230.729]	[141.698]	[153.237]
β_{11}	*1.001	*0.986	*0.951	*0.962	*0.995	*0.997	*0.998
	[2667.557]	[1848.505]	[393.527]	[1084.469]	[3005.886]	[3433.145]	[3929.002]
β_{1i}	*-0.028	*0.006	*0.000	*0.018	*-0.025	*-0.022	*-0.022
	[-54.501]	[6.760]	[-4.161]	[33.856]	[-39.854]	[-24.967]	[-21.971]
β_{i1}	*0.036	*0.039	***-0.032	*0.032	*0.028	*0.036	*0.041
	[27.874]	[38.899]	[-1.840]	[33.145]	[40.038]	[37.469]	[43.134]
β_{ii}	*0.886	*0.887	*0.984	*0.939	*0.884	*0.879	*0.872
	[742.365]	[727.370]	[2591.471]	[614.896]	[1230.281]	[633.040]	[623.131]

See Notes (1).

Table 36: 30 Minute VAR-BEKK-GARCH Results (Contd.)

USDCAD	USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK
$ar(1)_{11}$	*-0.049	*-0.046	*-0.048	-0.004	*-0.052	*-0.054
	[-17.601]	[-16.947]	[-17.733]	[-1.426]	[-16.586]	[-17.751]
$ar(1)_{1i}$	0.003	0.018	*0.005	*0.011	*0.010	*0.012
	[1.444]	[0.524]	[2.898]	[8.068]	[5.274]	[6.811]
Constant	0.000	*0.000	*0.000	*0.000	0.000	**0.000
	[0.411]	[4.312]	[3.305]	[3.014]	[0.901]	[2.568]
$ar(1)_{i1}$	*0.050	*0.001	***0.004	*0.073	*0.058	*0.043
	[15.708]	[7.154]	[1.916]	[18.423]	[14.569]	[11.138]
$ar(1)_{ii}$	*-0.073	*-0.125	*-0.042	*-0.054	*-0.087	*-0.074
	[-21.671]	[-51.561]	[-15.771]	[-16.837]	[-27.654]	[-24.157]
Constant	**0.000	*0.000	*0.000	*0.000	0.000	0.000
	[-2.113]	[-4.611]	[2.652]	[-3.180]	[-1.280]	[-0.629]
c_{11}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[79.251]	[85.307]	[90.274]	[64.591]	[55.307]	[67.012]
c_{i1}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[32.378]	[-10.001]	[22.652]	[-7.978]	[30.197]	[24.387]
c_{ii}	*0.000	*0.000	*0.000	0.000	*0.000	*0.000
	[74.652]	[32.852]	[46.273]	[-0.004]	[68.311]	[82.054]
α_{11}	*0.380	*0.455	*0.433	*0.329	*0.387	*0.402
	[129.609]	[168.619]	[161.695]	[151.104]	[106.434]	[119.600]
α_{1i}	*-0.080	*0.000	0.000	*-0.134	-0.004	0.008
	[-18.187]	[-5.349]	[-0.019]	[-47.332]	[-0.729]	[1.505]
α_{i1}	*0.052	***0.078	*-0.011	*-0.020	*0.073	*0.054
	[17.717]	[1.897]	[-4.788]	[-13.141]	[27.609]	[16.029]
α_{ii}	*0.501	*0.162	*0.295	*0.228	*0.455	*0.437
	[156.045]	[97.064]	[67.245]	[129.116]	[129.598]	[114.690]
β_{11}	*0.933	*0.899	*0.911	*0.969	*0.940	*0.931
	[989.891]	[856.860]	[1015.297]	[1611.043]	[689.960]	[684.423]
β_{1i}	*0.036	*0.000	*-0.006	*0.121	*0.051	*0.030
	[22.010]	[10.631]	[-6.644]	[162.682]	[18.534]	[11.998]
β_{i1}	*-0.035	*0.024	-0.001	*-0.031	*-0.055	*-0.039
	[-26.978]	[2.668]	[-1.284]	[-118.666]	[-33.773]	[-18.212]
β_{ii}	*0.884	*0.987	*0.952	*0.949	*0.876	*0.886
	[733.021]	[3870.736]	[707.256]	[2378.891]	[516.617]	[478.607]

See Notes (1).

Table 37: 30 Minute VAR-BEKK-GARCH Results (Contd.)

USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK	**USDHKD**	USDJPY	USDMXN	USDNOK	USDSEK
$ar(1)_{11}$	*-0.046	*-0.054	*-0.028	*-0.063	*-0.053	$ar(1)_{11}$	*-0.127	*-0.150	*-0.124	*-0.125
	[-13.720]	[-18.895]	[-9.174]	[-18.355]	[-14.900]		[-47.129]	[-50.765]	[-44.298]	[-50.861]
$ar(1)_{1i}$	***-0.084	*0.021	0.000	*0.032	*0.023	$ar(1)_{1i}$	0.000	*0.000	*0.000	*0.000
	[-1.952]	[9.704]	[-0.225]	[12.877]	[8.969]		[-0.601]	[4.286]	[5.841]	[6.883]
Constant	*0.000	*0.000	*0.000	0.000	0.000	*Constant*	*0.000	*0.000	*0.000	*0.000
	[-4.212]	[-6.574]	[9.489]	[-0.078]	[0.082]		[-7.391]	[-4.844]	[-4.919]	[-4.351]
$ar(1)_{i1}$	*0.000	-0.003	*0.010	*0.041	*0.034	$ar(1)_{i1}$	-0.022	*-0.206	***0.083	0.048
	[3.861]	[-1.516]	[3.086]	[12.350]	[10.113]		[-0.621]	[-2.744]	[1.809]	[1.035]
$ar(1)_{ii}$	*-0.125	*-0.038	*-0.025	*-0.090	*-0.076	$ar(1)_{ii}$	*-0.031	*-0.025	*-0.068	*-0.061
	[-46.687]	[-12.656]	[-9.328]	[-29.465]	[-24.314]		[-10.192]	[-7.185]	[-25.768]	[-19.459]
Constant	*0.000	0.000	0.000	*0.000	***0.000	*Constant*	0.000	***0.000	**0.000	0.000
	[-4.750]	[1.499]	[0.654]	[-3.941]	[-1.827]		[1.494]	[1.928]	[-2.147]	[-0.730]
c_{11}	*0.000	*0.000	*0.000	*0.000	*0.000	c_{11}	*0.000	*0.000	*0.000	*0.000
	[80.404]	[148.242]	[54.908]	[57.159]	[61.952]		[35.582]	[47.890]	[16.978]	[-37.011]
c_{i1}	*0.000	*0.000	*0.000	*0.000	*0.000	c_{i1}	*0.000	*0.000	*0.000	*0.000
	[13.343]	[37.270]	[52.905]	[29.600]	[30.387]		[14.190]	[26.670]	[-18.690]	[-7.724]
c_{ii}	*0.000	*0.000	0.000	*0.000	*0.000	c_{ii}	*0.000	0.000	*0.000	*0.000
	[-32.145]	[34.192]	[-0.001]	[-84.951]	[91.574]		[49.014]	[0.000]	[41.531]	[52.320]
α_{11}	*0.527	*0.494	*0.507	*0.531	*0.530	α_{11}	*0.171	*0.363	*0.166	*0.167
	[146.401]	[149.962]	[190.188]	[151.191]	[141.136]		[87.272]	[176.763]	[30.340]	[90.381]
α_{1i}	*0.001	*0.085	*0.328	*0.028	*0.026	α_{1i}	*0.506	*-2.919	*-0.297	***0.119
	[9.152]	[49.298]	[74.088]	[6.602]	[6.762]		[12.763]	[-46.987]	[-6.475]	[1.935]
α_{i1}	0.066	*0.035	*-0.219	*-0.172	*-0.164	α_{i1}	*0.001	*0.002	*0.000	*0.000
	[1.358]	[10.825]	[-61.665]	[-55.534]	[-49.323]		[8.798]	[50.969]	[-18.193]	[5.635]
α_{ii}	*0.165	*0.268	*-0.274	*0.370	*0.352	α_{ii}	*0.451	*0.240	*0.469	*0.473
	[89.910]	[66.312]	[-70.055]	[103.959]	[103.317]		[110.194]	[119.860]	[146.454]	[145.831]
β_{11}	*0.873	*0.891	*0.824	*0.859	*0.865	β_{11}	*0.986	*0.943	*0.986	*0.987
	[587.527]	[774.710]	[833.097]	[573.441]	[520.906]		[3187.557]	[1669.892]	[1127.848]	[3551.523]
β_{1i}	*0.000	*-0.029	*-0.402	*-0.032	*-0.022	β_{1i}	*-0.095	*2.673	*0.105	*0.055
	[-14.059]	[-48.592]	[-257.194]	[-16.918]	[-12.452]		[-11.200]	[143.062]	[8.312]	[3.957]
β_{i1}	*0.037	*-0.016	*0.177	*0.070	*0.061	β_{i1}	*0.000	*-0.002	*0.000	*0.000
	[3.262]	[-14.180]	[242.103]	[46.804]	[39.559]		[-12.078]	[-140.450]	[14.369]	[-6.875]
β_{ii}	*0.987	*0.960	*0.975	*0.935	*0.935	β_{ii}	*0.889	*0.967	*0.889	*0.883
	[3531.560]	[847.164]	[857.450]	[723.090]	[747.180]		[471.055]	[2219.090]	[616.566]	[644.613]

See Notes (1).

Table 38: 30 Minute VAR-BEKK-GARCH Results (Contd.)

USDJPY	USDMXN	USDNOK	USDSEK	**USDMXN**	USDNOK	USDSEK	**USDNOK**	USDSEK
$ar(1)_{11}$	*-0.061 [-18.941]	*-0.037 [-11.984]	*-0.036 [-13.503]	$ar(1)_{11}$	*-0.092 [-22.306]	*-0.190 [-49.420]	$ar(1)_{11}$	*-0.121 [-32.065]
$ar(1)_{1i}$	*0.018 [11.926]	***-0.003 [-1.870]	0.000 [-0.256]	$ar(1)_{1i}$	*0.047 [16.693]	*0.118 [48.371]	$ar(1)_{1i}$	*0.070 [19.342]
Constant	*0.000 [18.087]	**0.000 [2.323]	**0.000 [2.200]	*Constant*	*0.000 [-14.531]	*0.000 [-33.827]	*Constant*	***0.000 [-1.836]
$ar(1)_{i1}$	*0.066 [18.415]	0.005 [1.589]	***0.004 [1.713]	$ar(1)_{i1}$	*0.023 [15.307]	*0.073 [33.070]	$ar(1)_{i1}$	*0.039 [11.385]
$ar(1)_{ii}$	*-0.085 [-26.473]	*-0.067 [-23.041]	*-0.058 [-19.332]	$ar(1)_{ii}$	*-0.077 [-26.022]	*-0.119 [-42.790]	$ar(1)_{ii}$	*-0.081 [-20.817]
Constant	*0.000 [-24.064]	**0.000 [-2.084]	0.000 [-0.845]	*Constant*	0.000 [-1.643]	*0.000 [16.716]	*Constant*	0.000 [0.469]
c_{11}	*0.000 [87.814]	*0.000 [31.120]	*0.000 [54.610]	c_{11}	*0.000 [87.488]	*0.000 [-54.008]	c_{11}	*0.000 [88.709]
c_{i1}	*0.000 [52.272]	*0.000 [25.389]	*0.000 [32.911]	c_{i1}	*0.000 [-88.570]	*0.000 [-117.122]	c_{i1}	*0.000 [32.994]
c_{ii}	0.000 [0.000]	*0.000 [55.144]	*0.000 [56.273]	c_{ii}	0.000 [0.000]	0.000 [0.000]	c_{ii}	*0.000 [94.061]
α_{11}	*0.517 [159.802]	*0.232 [36.825]	*0.248 [59.244]	α_{11}	*0.282 [65.309]	*0.468 [88.923]	α_{11}	*0.455 [97.085]
α_{1i}	*0.124 [31.037]	**0.007 [1.995]	0.005 [1.510]	α_{1i}	*-0.023 [-7.030]	*-0.199 [-32.771]	α_{1i}	*0.019 [3.592]
α_{i1}	*-0.130 [-58.229]	*0.051 [31.627]	*0.050 [27.486]	α_{i1}	*0.091 [30.452]	*0.090 [27.097]	α_{i1}	*-0.047 [-8.343]
α_{ii}	*0.348 [105.713]	*0.457 [157.659]	*0.462 [143.887]	α_{ii}	*0.473 [147.251]	*0.606 [196.799]	α_{ii}	*0.390 [79.393]
β_{11}	*0.857 [564.957]	*0.969 [593.427]	*0.964 [850.536]	β_{11}	*0.887 [386.776]	*0.951 [1002.568]	β_{11}	*0.885 [353.474]
β_{1i}	*-0.210 [-117.088]	*-0.007 [-6.070]	*-0.010 [-8.081]	β_{1i}	*-0.066 [-13.503]	*0.090 [58.197]	β_{1i}	**-0.006 [-2.318]
β_{i1}	*0.065 [87.200]	*-0.020 [-35.712]	*-0.022 [-32.283]	β_{i1}	*-0.639 [-96.958]	*-0.139 [-73.000]	β_{i1}	*0.031 [10.645]
β_{ii}	*0.941 [1380.736]	*0.895 [787.373]	*0.891 [728.258]	β_{ii}	*-0.871 [-438.977]	*0.803 [527.971]	β_{ii}	*0.917 [383.203]

See Notes (1).

Table 39: 30 Minute VAR-BEKK-GARCH Results (Contd.)

AUDUSD	EURUSD	GBPUSD	NZDUSD	USDCAD	USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK
$ar(1)_{11}$	*-0.032	*-0.036	*-0.048	*-0.038	*-0.028	*-0.033	*-0.038	*-0.026	*-0.038	*-0.039
	[-8.988]	[-11.652]	[-13.033]	[-14.250]	[-10.147]	[-13.478]	[-13.725]	[-8.932]	[-12.490]	[-13.273]
$ar(1)_{1i}$	-0.002	0.006	*0.020	-0.005	0.003	0.022	*-0.015	*0.032	0.000	-0.004
	[-0.479]	[1.613]	[5.960]	[-1.524]	[1.193]	[0.442]	[-5.084]	[14.320]	[-0.044]	[-1.390]
Constant	**0.000	0.000	**0.000	0.000	**0.000	0.000	**0.000	*0.000	0.000	0.000
	[2.373]	[1.043]	[2.499]	[-0.397]	[2.033]	[0.463]	[2.175]	[-8.445]	[1.555]	[1.034]
$ar(1)_{i1}$	*0.007	*0.014	*0.078	*-0.033	*-0.028	*-0.001	***-0.003	*-0.121	*-0.039	*-0.035
	[3.327]	[8.638]	[18.325]	[-17.732]	[-13.314]	[-9.982]	[-1.845]	[-40.272]	[-13.953]	[-14.530]
$ar(1)_{ii}$	*-0.031	*-0.061	*-0.104	*-0.085	*-0.060	*-0.120	*-0.038	*-0.229	*-0.085	*-0.076
	[-8.652]	[-18.282]	[-26.291]	[-25.736]	[-18.726]	[-39.903]	[-12.938]	[-60.288]	[-28.475]	[-23.756]
Constant	0.000	0.000	*0.000	*0.000	*0.000	*0.000	0.000	*0.000	***0.000	0.000
	[1.318]	[1.059]	[9.208]	[3.771]	[-3.577]	[-5.213]	[1.584]	[-33.335]	[-1.787]	[-1.001]
c_{11}	*0.000	*0.000	0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[23.157]	[13.878]	[0.437]	[-30.362]	[36.228]	[23.820]	[45.095]	[-20.554]	[-13.119]	[15.123]
c_{i1}	*0.000	*0.000	*0.000	*0.000	*0.000	***0.000	*0.000	*0.000	*0.000	*0.000
	[38.249]	[88.687]	[-24.750]	[86.677]	[-45.614]	[-1.677]	[-39.129]	[2.820]	[80.466]	[-92.093]
c_{ii}	*0.000	0.000	*0.000	0.000	*0.000	*0.000	*0.000	0.000	0.000	0.000
	[19.541]	[0.193]	[72.960]	[0.011]	[15.547]	[-38.270]	[17.913]	[0.001]	[0.020]	[0.016]
α_{11}	*0.106	*0.069	*0.059	*0.059	*0.133	*0.078	*0.153	*0.012	*0.099	*0.097
	[53.062]	[50.749]	[23.356]	[37.636]	[64.353]	[63.613]	[73.824]	[7.427]	[54.306]	[64.604]
α_{1i}	*-0.021	*-0.049	*-0.258	*0.072	0.000	*0.000	-0.003	*0.317	*0.015	*0.028
	[-8.749]	[-25.962]	[-47.051]	[31.851]	[0.031]	[-6.432]	[-1.378]	[137.921]	[4.780]	[9.620]
α_{i1}	*0.183	*0.166	*0.045	*-0.190	*-0.133	*-0.285	*-0.035	*-0.148	*-0.116	*-0.127
	[62.425]	[57.641]	[13.440]	[-65.060]	[-46.861]	[-6.432]	[-15.080]	[-65.475]	[-51.887]	[-54.973]
α_{ii}	*0.452	*0.508	*0.451	*0.497	*0.493	*0.252	*0.333	*0.642	*0.467	*0.479
	[130.882]	[173.910]	[92.460]	[152.372]	[154.154]	[70.341]	[90.402]	[209.211]	[141.943]	[141.935]
β_{11}	*1.000	*1.003	*1.008	*1.007	*0.991	*0.997	*0.986	*1.001	*1.001	*1.001
	[3770.913]	[6004.933]	[1180.401]	[5340.897]	[2320.575]	[9650.097]	[2736.641]	[7433.873]	[4313.254]	[4953.332]
β_{1i}	*0.016	*0.020	*0.109	*-0.026	0.000	*0.000	*0.005	*-0.022	*-0.022	*-0.023
	[28.793]	[56.276]	[47.176]	[-56.753]	[-0.357]	[5.351]	[11.459]	[-52.106]	[-27.061]	[-29.339]
β_{i1}	*-0.050	*-0.046	*-0.015	*0.050	*0.038	*0.047	*0.011	*0.025	*0.034	*0.038
	[-51.456]	[-47.722]	[-13.465]	[63.806]	[42.164]	[4.739]	[17.734]	[57.395]	[46.122]	[49.986]
β_{ii}	*0.895	*0.876	*0.860	*0.886	*0.889	*0.970	*0.942	*0.902	*0.883	*0.875
	[689.375]	[822.933]	[307.915]	[803.860]	[776.194]	[1220.380]	[772.454]	[1371.578]	[646.254]	[612.272]

See Notes (1).

Table 40: 30 Minute VAR-BEKK-GARCH Results (Contd.)

EURUSD	GBPUSD	NZDUSD	USDCAD	USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK
$ar(1)_{11}$	*-0.028	*-0.030	*-0.014	*-0.037	*-0.026	*-0.025	*-0.049	*-0.013	*-0.015
	[-7.678]	[-8.997]	[-4.440]	[-9.758]	[-8.690]	[-8.945]	[-16.155]	[-3.396]	[-3.948]
$ar(1)_{1i}$	**0.010	*0.006	*-0.010	**-0.007	***0.067	***-0.004	*-0.026	*0.008	*0.009
	[2.510]	[2.955]	[-3.327]	[-2.283]	[1.906]	[-1.924]	[-14.936]	[3.202]	[3.444]
Constant	0.000	0.000	0.000	***0.000	0.000	**0.000	*0.000	0.000	0.000
	[1.296]	[1.561]	[1.128]	[1.714]	[0.553]	[2.023]	[-9.595]	[0.593]	[0.911]
$ar(1)_{i1}$	*0.035	*0.021	*-0.023	*-0.068	*-0.001	-0.001	*-0.149	*-0.088	*-0.078
	[12.802]	[5.441]	[-7.133]	[-16.551]	[-9.024]	[-0.340]	[-38.914]	[-17.197]	[-16.366]
$ar(1)_{ii}$	*-0.073	*-0.056	*-0.054	*-0.095	*-0.125	*-0.036	*-0.152	*-0.114	*-0.103
	[-18.660]	[-18.902]	[-16.836]	[-24.471]	[-44.004]	[-13.193]	[-36.653]	[-28.748]	[-27.171]
Constant	0.000	*0.000	0.000	0.000	*0.000	**0.000	*0.000	*0.000	**0.000
	[0.404]	[3.314]	[-0.206]	[1.033]	[-5.387]	[2.003]	[-25.102]	[-3.798]	[-2.380]
c_{11}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[82.718]	[89.041]	[124.910]	[79.319]	[82.987]	[87.299]	[101.601]	[86.618]	[83.912]
c_{i1}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[40.752]	[20.143]	[-23.540]	[-52.293]	[11.537]	[-32.175]	[-62.396]	[-26.964]	[-28.430]
c_{ii}	*0.000	*0.000	0.000	*0.000	*0.000	*0.000	0.000	*0.000	*0.000
	[90.203]	[36.633]	[-0.002]	[74.464]	[32.090]	[51.422]	[0.001]	[95.636]	[106.953]
α_{11}	*0.368	*0.456	*-0.392	*0.338	*0.465	*0.426	*0.595	*0.407	*0.403
	[79.102]	[133.199]	[-78.047]	[80.518]	[138.250]	[135.758]	[139.239]	[81.286]	[87.534]
α_{1i}	*-0.081	*0.173	*0.399	*0.085	*0.001	*-0.052	*-0.090	*0.070	*0.066
	[-20.958]	[45.169]	[93.087]	[14.828]	[6.588]	[-22.128]	[-18.549]	[9.679]	[9.979]
α_{i1}	*0.037	*-0.006	*0.060	*-0.073	**0.120	*-0.018	*0.102	*0.037	*0.035
	[5.462]	[-2.816]	[7.839]	[-20.338]	[2.571]	[-6.893]	[21.783]	[8.585]	[9.279]
α_{ii}	*0.506	*0.154	*0.361	*0.472	*0.167	*0.298	*0.466	*0.467	*0.453
	[102.303]	[58.397]	[70.393]	[89.424]	[86.637]	[72.669]	[94.323]	[91.833]	[92.972]
β_{11}	*0.937	*0.896	*0.639	*0.949	*0.893	*0.913	*0.816	*0.906	*0.901
	[506.837]	[693.045]	[143.896]	[589.751]	[684.555]	[786.197]	[429.527]	[360.990]	[427.782]
β_{1i}	*0.033	*-0.051	*0.394	*-0.039	*0.000	*0.019	*0.168	*-0.035	*-0.035
	[19.122]	[-41.244]	[83.327]	[-16.500]	[-12.224]	[23.749]	[68.691]	[-10.089]	[-11.676]
β_{i1}	*-0.027	*0.007	*-0.423	*0.040	*-0.067	*0.008	*-0.060	*-0.021	*-0.026
	[-8.253]	[8.608]	[-73.149]	[23.598]	[-6.315]	[10.057]	[-45.812]	[-9.191]	[-14.243]
β_{ii}	*0.876	*0.989	*1.047	*0.866	*0.986	*0.952	*0.958	*0.889	*0.890
	[394.658]	[1603.406]	[598.141]	[359.265]	[3210.576]	[768.377]	[957.381]	[370.919]	[412.177]

See Notes (1).

Table 41: 30 Minute VAR-BEKK-GARCH Results (Contd.)

GBPUSD	NZDUSD	USDCAD	USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK
$ar(1)_{11}$	*-0.060	*-0.053	*-0.056	*-0.048	*-0.047	*-0.114	*-0.055	*-0.056
	[-21.871]	[-17.696]	[-17.146]	[-14.996]	[-16.099]	[-35.393]	[-16.366]	[-18.000]
$ar(1)_{1i}$	*0.012	*-0.024	*-0.014	*0.092	**-0.005	*-0.042	*-0.013	*-0.015
	[8.265]	[-9.971]	[-6.474]	[3.182]	[-2.421]	[-24.254]	[-7.488]	[-8.631]
Constant	0.000	0.000	0.000	0.000	0.000	*0.000	0.000	0.000
	[0.385]	[0.586]	[-0.818]	[-0.497]	[0.380]	[-14.279]	[-0.267]	[-0.607]
$ar(1)_{i1}$	*0.022	*-0.029	*-0.042	*-0.001	**-0.006	*-0.162	*-0.056	*-0.061
	[5.444]	[-10.210]	[-11.154]	[-7.448]	[-2.463]	[-38.712]	[-12.340]	[-14.087]
$ar(1)_{ii}$	*-0.055	*-0.059	*-0.083	*-0.125	*-0.039	*-0.211	*-0.082	*-0.079
	[-22.029]	[-19.317]	[-25.493]	[-45.302]	[-13.195]	[-56.823]	[-23.469]	[-25.040]
Constant	**0.000	0.000	*0.000	*0.000	***0.000	*0.000	**0.000	0.000
	[2.024]	[1.383]	[-4.440]	[-4.289]	[1.758]	[-27.661]	[-2.100]	[-1.324]
c_{11}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[84.928]	[99.043]	[87.399]	[91.131]	[98.223]	[119.344]	[95.043]	[89.588]
c_{i1}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[10.629]	[3.573]	[-34.606]	[13.445]	[-26.795]	[-62.939]	[-16.885]	[-16.021]
c_{ii}	*0.000	*0.000	*0.000	*0.000	*0.000	0.000	*0.000	*0.000
	[26.187]	[42.590]	[79.853]	[33.296]	[42.856]	[0.000]	[84.250]	[97.600]
α_{11}	*0.499	*0.430	*0.382	*0.478	*0.461	*0.612	*0.422	*0.411
	[163.791]	[128.907]	[118.206]	[142.968]	[156.838]	[140.246]	[112.725]	[111.244]
α_{1i}	*0.164	*0.185	*0.162	*0.001	*-0.067	*0.022	*0.077	*0.109
	[37.648]	[50.606]	[30.258]	[12.804]	[-22.009]	[3.853]	[10.459]	[14.747]
α_{i1}	*-0.030	*0.010	*-0.013	*0.246	0.002	*0.078	*0.017	0.003
	[-16.311]	[2.954]	[-6.099]	[6.541]	[0.693]	[17.379]	[6.386]	[0.968]
α_{ii}	*0.107	*0.428	*0.507	*0.167	*0.261	*0.555	*0.432	*0.444
	[51.147]	[150.891]	[146.744]	[105.395]	[53.497]	[108.432]	[114.405]	[117.841]
β_{11}	*0.879	*0.915	*0.929	*0.886	*0.895	*0.783	*0.912	*0.916
	[693.864]	[760.353]	[786.399]	[646.229]	[786.438]	[321.435]	[622.574]	[637.901]
β_{1i}	*-0.049	*-0.095	*-0.057	*0.000	*0.028	*0.190	*-0.042	*-0.057
	[-31.976]	[-43.033]	[-23.932]	[-18.234]	[24.555]	[52.262]	[-12.462]	[-17.134]
β_{i1}	*0.014	*0.010	*0.014	*-0.080	*0.003	*-0.063	*-0.004	0.002
	[22.932]	[6.850]	[14.043]	[-9.571]	[4.139]	[-47.005]	[-3.505]	[1.576]
β_{ii}	*0.998	*0.891	*0.880	*0.986	*0.961	*0.938	*0.901	*0.890
	[2646.559]	[758.800]	[603.674]	[4413.005]	[704.206]	[839.755]	[559.666]	[524.678]

See Notes (1).

Table 42: 30 Minute VAR-BEKK-GARCH Results (Contd.)

NZDUSD	USDCAD	USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK
$ar(1)_{11}$	*-0.063	*-0.047	*-0.047	*-0.052	*-0.051	*-0.054	*-0.060
	[-21.035]	[-16.050]	[-15.891]	[-19.585]	[-16.555]	[-18.472]	[-21.875]
$ar(1)_{1i}$	*-0.038	*-0.011	***-0.104	*-0.025	*0.036	*-0.009	*-0.019
	[-9.206]	[-3.452]	[-1.670]	[-7.915]	[16.530]	[-3.242]	[-6.822]
Constant	0.000	*0.000	**0.000	*0.000	*0.000	**0.000	0.000
	[1.211]	[2.856]	[2.275]	[2.793]	[-10.244]	[2.141]	[1.608]
$ar(1)_{i1}$	*-0.019	*-0.023	*-0.001	***-0.003	*-0.125	*-0.032	*-0.026
	[-10.805]	[-11.501]	[-7.790]	[-1.739]	[-48.412]	[-13.453]	[-11.598]
$ar(1)_{ii}$	*-0.066	*-0.063	*-0.124	*-0.039	*-0.345	*-0.084	*-0.072
	[-19.467]	[-18.911]	[-39.655]	[-14.122]	[-92.628]	[-25.539]	[-23.332]
Constant	0.000	*0.000	*0.000	**0.000	*0.000	***0.000	0.000
	[0.375]	[-5.194]	[-4.663]	[2.098]	[-41.997]	[-1.866]	[-0.944]
c_{11}	*0.000	*0.000	*0.000	*0.000	*0.000	***0.000	*0.000
	[10.381]	[-43.409]	[28.968]	[66.742]	[29.894]	[-1.785]	[5.326]
c_{i1}	*0.000	*0.000	*0.000	*0.000	0.000	*0.000	*0.000
	[59.882]	[48.713]	[6.207]	[-51.800]	[-1.519]	[96.527]	[-36.887]
c_{ii}	0.000	*0.000	*0.000	*0.000	0.000	*0.000	*0.000
	[0.002]	[11.266]	[29.927]	[34.210]	[0.000]	[19.922]	[43.117]
α_{11}	*0.088	*0.158	*0.285	*0.243	*0.075	*0.130	*0.116
	[39.325]	[66.350]	[43.863]	[75.896]	[32.702]	[58.906]	[59.103]
α_{1i}	*0.086	*-0.025	*0.000	*-0.043	*0.271	*0.010	*0.028
	[38.963]	[-10.648]	[3.018]	[-22.210]	[121.298]	[3.132]	[9.592]
α_{i1}	*-0.143	*-0.129	0.032	*-0.085	*-0.148	*-0.116	*-0.134
	[-34.678]	[-40.038]	[0.372]	[-26.048]	[-51.175]	[-44.727]	[-49.964]
α_{ii}	*0.502	*0.492	*0.180	*0.330	*0.713	*0.477	*0.492
	[158.585]	[145.617]	[79.943]	[69.592]	[230.729]	[141.698]	[153.237]
β_{11}	*1.001	*0.986	*0.951	*0.962	*0.995	*0.997	*0.998
	[2667.557]	[1848.505]	[393.527]	[1084.469]	[3005.886]	[3433.145]	[3929.002]
β_{1i}	*-0.028	*0.006	*0.000	*0.018	*-0.025	*-0.022	*-0.022
	[-54.501]	[6.760]	[-4.161]	[33.856]	[-39.854]	[-24.967]	[-21.971]
β_{i1}	*0.036	*0.039	***-0.032	*0.032	*0.028	*0.036	*0.041
	[27.874]	[38.899]	[-1.840]	[33.145]	[40.038]	[37.469]	[43.134]
β_{ii}	*0.886	*0.887	*0.984	*0.939	*0.884	*0.879	*0.872
	[742.365]	[727.370]	[2591.471]	[614.896]	[1230.281]	[633.040]	[623.131]

See Notes (1).

Table 43: 30 Minute VAR-BEKK-GARCH Results (Contd.)

USDCAD	USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK
$ar(1)_{11}$	*-0.049	*-0.046	*-0.048	-0.004	*-0.052	*-0.054
	[-17.601]	[-16.947]	[-17.733]	[-1.426]	[-16.586]	[-17.751]
$ar(1)_{1i}$	0.003	0.018	*0.005	*0.011	*0.010	*0.012
	[1.444]	[0.524]	[2.898]	[8.068]	[5.274]	[6.811]
Constant	0.000	*0.000	*0.000	*0.000	0.000	**0.000
	[0.411]	[4.312]	[3.305]	[3.014]	[0.901]	[2.568]
$ar(1)_{i1}$	*0.050	*0.001	***0.004	*0.073	*0.058	*0.043
	[15.708]	[7.154]	[1.916]	[18.423]	[14.569]	[11.138]
$ar(1)_{ii}$	*-0.073	*-0.125	*-0.042	*-0.054	*-0.087	*-0.074
	[-21.671]	[-51.561]	[-15.771]	[-16.837]	[-27.654]	[-24.157]
Constant	**0.000	*0.000	*0.000	*0.000	0.000	0.000
	[-2.113]	[-4.611]	[2.652]	[-3.180]	[-1.280]	[-0.629]
c_{11}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[79.251]	[85.307]	[90.274]	[64.591]	[55.307]	[67.012]
c_{i1}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[32.378]	[-10.001]	[22.652]	[-7.978]	[30.197]	[24.387]
c_{ii}	*0.000	*0.000	*0.000	0.000	*0.000	*0.000
	[74.652]	[32.852]	[46.273]	[-0.004]	[68.311]	[82.054]
α_{11}	*0.380	*0.455	*0.433	*0.329	*0.387	*0.402
	[129.609]	[168.619]	[161.695]	[151.104]	[106.434]	[119.600]
α_{1i}	*-0.080	*0.000	0.000	*-0.134	-0.004	0.008
	[-18.187]	[-5.349]	[-0.019]	[-47.332]	[-0.729]	[1.505]
α_{i1}	*0.052	***0.078	*-0.011	*-0.020	*0.073	*0.054
	[17.717]	[1.897]	[-4.788]	[-13.141]	[27.609]	[16.029]
α_{ii}	*0.501	*0.162	*0.295	*0.228	*0.455	*0.437
	[156.045]	[97.064]	[67.245]	[129.116]	[129.598]	[114.690]
β_{11}	*0.933	*0.899	*0.911	*0.969	*0.940	*0.931
	[989.891]	[856.860]	[1015.297]	[1611.043]	[689.960]	[684.423]
β_{1i}	*0.036	*0.000	*-0.006	*0.121	*0.051	*0.030
	[22.010]	[10.631]	[-6.644]	[162.682]	[18.534]	[11.998]
β_{i1}	*-0.035	*0.024	-0.001	*-0.031	*-0.055	*-0.039
	[-26.978]	[2.668]	[-1.284]	[-118.666]	[-33.773]	[-18.212]
β_{ii}	*0.884	*0.987	*0.952	*0.949	*0.876	*0.886
	[733.021]	[3870.736]	[707.256]	[2378.891]	[516.617]	[478.607]

See Notes (1).

Table 44: 30 Minute VAR-BEKK-GARCH Results (Contd.)

USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK	**USDHKD**	USDJPY	USDMXN	USDNOK	USDSEK
$ar(1)_{11}$	*-0.046	*-0.054	*-0.028	*-0.063	*-0.053	$ar(1)_{11}$	*-0.127	*-0.150	*-0.124	*-0.125
	[-13.720]	[-18.895]	[-9.174]	[-18.355]	[-14.900]		[-47.129]	[-50.765]	[-44.298]	[-50.861]
$ar(1)_{1i}$	***-0.084	*0.021	0.000	*0.032	*0.023	$ar(1)_{1i}$	0.000	*0.000	*0.000	*0.000
	[-1.952]	[9.704]	[-0.225]	[12.877]	[8.969]		[-0.601]	[4.286]	[5.841]	[6.883]
Constant	*0.000	*0.000	*0.000	0.000	0.000	*Constant*	*0.000	*0.000	*0.000	*0.000
	[-4.212]	[-6.574]	[9.489]	[-0.078]	[0.082]		[-7.391]	[-4.844]	[-4.919]	[-4.351]
$ar(1)_{i1}$	*0.000	-0.003	*0.010	*0.041	*0.034	$ar(1)_{i1}$	-0.022	*-0.206	***0.083	0.048
	[3.861]	[-1.516]	[3.086]	[12.350]	[10.113]		[-0.621]	[-2.744]	[1.809]	[1.035]
$ar(1)_{ii}$	*-0.125	*-0.038	*-0.025	*-0.090	*-0.076	$ar(1)_{ii}$	*-0.031	*-0.025	*-0.068	*-0.061
	[-46.687]	[-12.656]	[-9.328]	[-29.465]	[-24.314]		[-10.192]	[-7.185]	[-25.768]	[-19.459]
Constant	*0.000	0.000	0.000	*0.000	***0.000	*Constant*	0.000	***0.000	**0.000	0.000
	[-4.750]	[1.499]	[0.654]	[-3.941]	[-1.827]		[1.494]	[1.928]	[-2.147]	[-0.730]
c_{11}	*0.000	*0.000	*0.000	*0.000	*0.000	c_{11}	*0.000	*0.000	*0.000	*0.000
	[80.404]	[148.242]	[54.908]	[57.159]	[61.952]		[35.582]	[47.890]	[16.978]	[-37.011]
c_{i1}	*0.000	*0.000	*0.000	*0.000	*0.000	c_{i1}	*0.000	*0.000	*0.000	*0.000
	[13.343]	[37.270]	[52.905]	[29.600]	[30.387]		[14.190]	[26.670]	[-18.690]	[-7.724]
c_{ii}	*0.000	*0.000	0.000	*0.000	*0.000	c_{ii}	*0.000	0.000	*0.000	*0.000
	[-32.145]	[34.192]	[-0.001]	[-84.951]	[91.574]		[49.014]	[0.000]	[41.531]	[52.320]
α_{11}	*0.527	*0.494	*0.507	*0.531	*0.530	α_{11}	*0.171	*0.363	*0.166	*0.167
	[146.401]	[149.962]	[190.188]	[151.191]	[141.136]		[87.272]	[176.763]	[30.340]	[90.381]
α_{1i}	*0.001	*0.085	*0.328	*0.028	*0.026	α_{1i}	*0.506	*-2.919	*-0.297	***0.119
	[9.152]	[49.298]	[74.088]	[6.602]	[6.762]		[12.763]	[-46.987]	[-6.475]	[1.935]
α_{i1}	0.066	*0.035	*-0.219	*-0.172	*-0.164	α_{i1}	*0.001	*0.002	*0.000	*0.000
	[1.358]	[10.825]	[-61.665]	[-55.534]	[-49.323]		[8.798]	[50.969]	[-18.193]	[5.635]
α_{ii}	*0.165	*0.268	*-0.274	*0.370	*0.352	α_{ii}	*0.451	*0.240	*0.469	*0.473
	[89.910]	[66.312]	[-70.055]	[103.959]	[103.317]		[110.194]	[119.860]	[146.454]	[145.831]
β_{11}	*0.873	*0.891	*0.824	*0.859	*0.865	β_{11}	*0.986	*0.943	*0.986	*0.987
	[587.527]	[774.710]	[833.097]	[573.441]	[520.906]		[3187.557]	[1669.892]	[1127.848]	[3551.523]
β_{1i}	*0.000	*-0.029	*-0.402	*-0.032	*-0.022	β_{1i}	*-0.095	*2.673	*0.105	*0.055
	[-14.059]	[-48.592]	[-257.194]	[-16.918]	[-12.452]		[-11.200]	[143.062]	[8.312]	[3.957]
β_{i1}	*0.037	*-0.016	*0.177	*0.070	*0.061	β_{i1}	*0.000	*-0.002	*0.000	*0.000
	[3.262]	[-14.180]	[242.103]	[46.804]	[39.559]		[-12.078]	[-140.450]	[14.369]	[-6.875]
β_{ii}	*0.987	*0.960	*0.975	*0.935	*0.935	β_{ii}	*0.889	*0.967	*0.889	*0.883
	[3531.560]	[847.164]	[857.450]	[723.090]	[747.180]		[471.055]	[2219.090]	[616.566]	[644.613]

See Notes (1).

Table 45: 30 Minute VAR-BEKK-GARCH Results (Contd.)

USDJPY	USDMXN	USDNOK	USDSEK	**USDMXN**	USDNOK	USDSEK	**USDNOK**	USDSEK
$ar(1)_{11}$	*-0.061 [-18.941]	*-0.037 [-11.984]	*-0.036 [-13.503]	$ar(1)_{11}$	*-0.092 [-22.306]	*-0.190 [-49.420]	$ar(1)_{11}$	*-0.121 [-32.065]
$ar(1)_{1i}$	*0.018 [11.926]	***-0.003 [-1.870]	0.000 [-0.256]	$ar(1)_{1i}$	*0.047 [16.693]	*0.118 [48.371]	$ar(1)_{1i}$	*0.070 [19.342]
Constant	*0.000 [18.087]	**0.000 [2.323]	**0.000 [2.200]	*Constant*	*0.000 [-14.531]	*0.000 [-33.827]	*Constant*	***0.000 [-1.836]
$ar(1)_{i1}$	*0.066 [18.415]	0.005 [1.589]	***0.004 [1.713]	$ar(1)_{i1}$	*0.023 [15.307]	*0.073 [33.070]	$ar(1)_{i1}$	*0.039 [11.385]
$ar(1)_{ii}$	*-0.085 [-26.473]	*-0.067 [-23.041]	*-0.058 [-19.332]	$ar(1)_{ii}$	*-0.077 [-26.022]	*-0.119 [-42.790]	$ar(1)_{ii}$	*-0.081 [-20.817]
Constant	*0.000 [-24.064]	**0.000 [-2.084]	0.000 [-0.845]	*Constant*	0.000 [-1.643]	*0.000 [16.716]	*Constant*	0.000 [0.469]
c_{11}	*0.000 [87.814]	*0.000 [31.120]	*0.000 [54.610]	c_{11}	*0.000 [87.488]	*0.000 [-54.008]	c_{11}	*0.000 [88.709]
c_{i1}	*0.000 [52.272]	*0.000 [25.389]	*0.000 [32.911]	c_{i1}	*0.000 [-88.570]	*0.000 [-117.122]	c_{i1}	*0.000 [32.994]
c_{ii}	0.000 [0.000]	*0.000 [55.144]	*0.000 [56.273]	c_{ii}	0.000 [0.000]	0.000 [0.000]	c_{ii}	*0.000 [94.061]
α_{11}	*0.517 [159.802]	*0.232 [36.825]	*0.248 [59.244]	α_{11}	*0.282 [65.309]	*0.468 [88.923]	α_{11}	*0.455 [97.085]
α_{1i}	*0.124 [31.037]	**0.007 [1.995]	0.005 [1.510]	α_{1i}	*-0.023 [-7.030]	*-0.199 [-32.771]	α_{1i}	*0.019 [3.592]
α_{i1}	*-0.130 [-58.229]	*0.051 [31.627]	*0.050 [27.486]	α_{i1}	*0.091 [30.452]	*0.090 [27.097]	α_{i1}	*-0.047 [-8.343]
α_{ii}	*0.348 [105.713]	*0.457 [157.659]	*0.462 [143.887]	α_{ii}	*0.473 [147.251]	*0.606 [196.799]	α_{ii}	*0.390 [79.393]
β_{11}	*0.857 [564.957]	*0.969 [593.427]	*0.964 [850.536]	β_{11}	*0.887 [386.776]	*0.951 [1002.568]	β_{11}	*0.885 [353.474]
β_{1i}	*-0.210 [-117.088]	*-0.007 [-6.070]	*-0.010 [-8.081]	β_{1i}	*-0.066 [-13.503]	*0.090 [58.197]	β_{1i}	**-0.006 [-2.318]
β_{i1}	*0.065 [87.200]	*-0.020 [-35.712]	*-0.022 [-32.283]	β_{i1}	*-0.639 [-96.958]	*-0.139 [-73.000]	β_{i1}	*0.031 [10.645]
β_{ii}	*0.941 [1380.736]	*0.895 [787.373]	*0.891 [728.258]	β_{ii}	*-0.871 [-438.977]	*0.803 [527.971]	β_{ii}	*0.917 [383.203]

See Notes (1).

Appendix A.3. 15 Minute VAR-BEKK-GARCH Results

Table 46: 15 Minute VAR-BEKK-GARCH Results

AUDUSD	EURUSD	GBPUSD	NZDUSD	USDCAD	USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK
$ar(1)_{11}$	*-0.051	*-0.040	*-0.058	*-0.057	*-0.045	*-0.037	*-0.048	*-0.052	*-0.050	*-0.051
	[-14.280]	[-13.085]	[-14.112]	[-15.474]	[-14.926]	[-14.453]	[-18.318]	[-18.449]	[-15.171]	[-15.360]
$ar(1)_{1i}$	*0.019	0.005	*0.031	*-0.033	*-0.010	***0.066	-0.004	*-0.023	*-0.013	*-0.015
	[4.880]	[1.441]	[8.779]	[-8.097]	[-3.599]	[1.687]	[-1.310]	[-9.250]	[-4.766]	[-5.698]
Constant	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[5.267]	[4.844]	[5.053]	[5.248]	[4.933]	[5.661]	[4.395]	[9.203]	[5.610]	[5.385]
$ar(1)_{i1}$	*0.013	*0.017	*0.077	*-0.031	*-0.011	*-0.001	*-0.006	*-0.062	*-0.044	*-0.042
	[5.044]	[9.094]	[18.136]	[-12.265]	[-4.806]	[-13.382]	[-3.954]	[-26.996]	[-13.582]	[-13.013]
$ar(1)_{ii}$	*-0.044	*-0.061	*-0.092	*-0.071	*-0.055	*-0.145	*-0.043	*-0.067	*-0.062	*-0.051
	[-12.039]	[-19.288]	[-23.924]	[-19.802]	[-17.323]	[-47.608]	[-13.915]	[-22.508]	[-19.540]	[-15.837]
Constant	0.000	***0.000	*0.000	*0.000	0.000	*0.000	*0.000	*0.000	**0.000	**0.000
	[0.641]	[1.703]	[3.307]	[-3.550]	[-0.787]	[-5.226]	[10.053]	[-5.234]	[-1.993]	[-2.452]

See Notes (1).

Table 47: 15 Minute VAR-BEKK-GARCH Results (Contd.)

c_{11}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[49.550]	[47.377]	[72.311]	[45.382]	[61.009]	[65.254]	[56.632]	[56.561]	[54.394]	[47.286]
c_{i1}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[32.307]	[18.741]	[54.308]	[-18.589]	[-27.810]	[-3.879]	[-13.009]	[-29.798]	[-38.702]	[-34.484]
c_{ii}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[56.366]	[-53.277]	[-25.809]	[51.798]	[-54.016]	[39.944]	[86.508]	[45.139]	[-45.664]	[46.596]
α_{11}	*0.213	*0.214	*0.309	*0.205	*0.229	*0.298	*0.231	*0.244	*0.234	*0.227
	[48.688]	[55.983]	[66.578]	[55.268]	[78.390]	[88.883]	[83.245]	[66.021]	[55.926]	[51.017]
α_{1i}	**-0.008	*-0.011	*0.139	*0.039	*0.043	*-0.001	*0.027	*-0.051	*-0.057	*-0.043
	[-2.427]	[-4.287]	[24.573]	[11.555]	[14.992]	[-5.051]	[14.807]	[-17.108]	[-14.990]	[-9.374]
α_{i1}	*0.079	*0.080	0.007	*-0.084	*-0.030	*0.181	*0.020	*-0.042	*-0.048	*-0.063
	[19.252]	[16.212]	[1.625]	[-20.477]	[-12.172]	[5.514]	[5.874]	[-13.992]	[-15.397]	[-20.710]
α_{ii}	*0.331	*0.354	*0.183	*0.376	*0.382	*0.234	*0.453	*0.300	*0.297	*0.305
	[89.335]	[105.658]	[34.013]	[110.522]	[143.077]	[96.237]	[126.388]	[105.235]	[86.237]	[87.365]
β_{11}	*0.974	*0.971	*0.950	*0.973	*0.970	*0.947	*0.967	*0.966	*0.970	*0.970
	[794.663]	[911.901]	[684.360]	[869.177]	[1261.420]	[837.884]	[1216.786]	[935.155]	[853.100]	[740.458]
β_{1i}	*0.005	**0.002	*-0.034	*-0.009	*-0.009	*0.000	*-0.004	*0.013	*0.010	*0.008
	[4.947]	[2.062]	[-22.838]	[-8.161]	[-10.367]	[6.463]	[-7.523]	[15.048]	[8.516]	[5.528]
β_{i1}	*-0.021	*-0.018	*-0.009	*0.018	*0.011	*-0.071	0.000	*0.012	*0.016	*0.019
	[-17.356]	[-11.134]	[-7.413]	[14.346]	[13.995]	[-9.046]	[0.104]	[12.445]	[16.422]	[18.859]
β_{ii}	*0.939	*0.942	*0.973	*0.936	*0.932	*0.974	*0.899	*0.950	*0.944	*0.944
	[795.684]	[917.747]	[712.687]	[872.013]	[1070.915]	[1920.281]	[663.991]	[1097.862]	[838.114]	[834.733]

See Notes (1).

Table 48: 15 Minute VAR-BEKK-GARCH Results (Contd.)

EURUSD	GBPUSD	NZDUSD	USDCAD	USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK
$ar(1)_{11}$	*-0.029	*-0.036	*-0.037	*-0.054	*-0.027	*-0.033	*-0.031	*-0.028	*-0.027
	[-8.469]	[-13.815]	[-13.515]	[-25.152]	[-10.616]	[-11.821]	[-10.221]	[-6.525]	[-5.893]
$ar(1)_{1i}$	0.005	*0.009	*-0.017	*-0.018	-0.002	*-0.009	-0.002	-0.001	0.001
	[1.411]	[6.853]	[-11.277]	[-9.527]	[-0.047]	[-3.423]	[-0.819]	[-0.230]	[0.391]
Constant	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	[0.785]	[0.651]	[-0.076]	[0.109]	[0.713]	[0.039]	[1.368]	[0.821]	[0.736]
$ar(1)_{i1}$	*0.028	*0.041	*-0.028	*-0.062	*-0.002	*-0.006	*-0.067	*-0.051	*-0.045
	[10.049]	[20.399]	[-16.729]	[-25.093]	[-14.509]	[-3.125]	[-23.724]	[-9.328]	[-7.607]
$ar(1)_{ii}$	*-0.066	*-0.061	*-0.056	*-0.099	*-0.144	*-0.044	*-0.069	*-0.069	*-0.056
	[-19.959]	[-24.044]	[-26.671]	[-38.297]	[-46.986]	[-13.794]	[-22.623]	[-15.922]	[-12.403]
Constant	0.000	*0.000	*0.000	0.000	*0.000	*0.000	*0.000	*0.000	**0.000
	[0.927]	[3.437]	[-2.629]	[-1.049]	[-4.939]	[10.606]	[-4.352]	[-2.771]	[-2.044]
c_{11}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[61.838]	[67.231]	[64.681]	[106.074]	[65.272]	[67.754]	[66.972]	[66.120]	[62.149]
c_{i1}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[31.130]	[27.905]	[-19.916]	[-106.886]	[-4.703]	[-14.471]	[-15.142]	[-36.075]	[-32.554]
c_{ii}	*0.000	*0.000	*0.000	0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[-53.809]	[38.379]	[51.337]	[0.011]	[41.916]	[83.607]	[69.019]	[-70.685]	[59.055]
α_{11}	*0.270	*0.328	*0.289	*0.262	*0.314	*0.280	*0.302	*0.298	*0.280
	[49.242]	[102.129]	[86.138]	[128.485]	[117.834]	[118.819]	[105.997]	[67.162]	[53.032]
α_{1i}	*-0.027	*0.119	0.003	*0.028	*-0.001	*0.051	*-0.053	*-0.029	0.008
	[-6.776]	[32.172]	[0.746]	[17.269]	[-3.466]	[22.255]	[-17.170]	[-4.424]	[1.135]
α_{i1}	*0.045	-0.001	*-0.017	*-0.050	-0.009	*-0.031	*-0.010	0.000	*-0.016
	[4.959]	[-0.210]	[-4.351]	[-22.156]	[-0.326]	[-10.665]	[-4.344]	[-0.091]	[-3.550]
α_{ii}	*0.358	*0.170	*0.337	*0.361	*0.232	*0.455	*0.301	*0.305	*0.331
	[67.261]	[50.833]	[93.721]	[160.020]	[100.415]	[131.719]	[113.618]	[61.006]	[59.212]
β_{11}	*0.958	*0.942	*0.951	*0.960	*0.946	*0.956	*0.951	*0.953	*0.955
	[521.624]	[937.100]	[923.969]	[2291.429]	[1079.780]	[1391.493]	[1047.966]	[569.922]	[420.331]
β_{1i}	*0.005	*-0.031	***0.003	*0.008	*0.000	*-0.013	*0.010	-0.003	*-0.011
	[3.406]	[-27.696]	[1.848]	[25.894]	[3.788]	[-15.747]	[9.373]	[-1.041]	[-3.837]
β_{i1}	*-0.013	0.001	0.002	*0.016	-0.009	*0.014	*0.004	0.002	***0.003
	[-4.015]	[0.962]	[1.316]	[26.732]	[-1.388]	[12.957]	[6.068]	[1.301]	[1.709]
β_{ii}	*0.942	*0.983	*0.947	*0.943	*0.975	*0.898	*0.950	*0.940	*0.934
	[502.503]	[1198.247]	[850.345]	[1408.784]	[2064.177]	[676.160]	[1234.086]	[484.417]	[400.867]

See Notes (1).

Table 49: 15 Minute VAR-BEKK-GARCH Results (Contd.)

GBPUSD	NZDUSD	USDCAD	USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK
$ar(1)_{11}$	*-0.052	*-0.058	*-0.051	*-0.042	*-0.045	*-0.047	*-0.058	*-0.055
	[-16.493]	[-21.720]	[-15.929]	[-15.445]	[-16.252]	[-17.087]	[-18.319]	[-17.298]
$ar(1)_{1i}$	*0.010	*-0.023	*-0.010	-0.039	*-0.008	*-0.007	*-0.018	*-0.016
	[5.148]	[-12.586]	[-4.812]	[-1.442]	[-2.607]	[-3.936]	[-9.730]	[-8.652]
Constant	0.000	0.000	0.000	0.000	0.000	**0.000	0.000	0.000
	[1.443]	[0.736]	[0.731]	[1.396]	[1.466]	[2.034]	[1.195]	[1.086]
$ar(1)_{i1}$	*0.026	*-0.016	*-0.021	*-0.002	*-0.011	*-0.049	*-0.036	*-0.034
	[6.150]	[-6.519]	[-5.674]	[-10.638]	[-5.326]	[-18.116]	[-8.108]	[-7.711]
$ar(1)_{ii}$	*-0.051	*-0.046	*-0.056	*-0.144	*-0.040	*-0.051	*-0.051	*-0.038
	[-15.582]	[-19.168]	[-17.491]	[-45.120]	[-13.313]	[-18.233]	[-16.213]	[-12.320]
Constant	*0.000	*0.000	0.000	*0.000	*0.000	*0.000	0.000	**0.000
	[3.372]	[-2.665]	[-0.949]	[-4.428]	[10.018]	[-4.715]	[-1.553]	[-2.230]
c_{11}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[53.968]	[54.388]	[59.791]	[55.270]	[56.100]	[-53.651]	[52.292]	[52.933]
c_{i1}	*0.000	*0.000	*0.000	***0.000	0.000	*0.000	*0.000	*0.000
	[14.746]	[-31.300]	[-40.132]	[-1.883]	[-1.591]	[8.712]	[-24.086]	[-22.321]
c_{ii}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[34.940]	[-47.972]	[-49.744]	[42.304]	[78.810]	[76.645]	[54.323]	[63.170]
α_{11}	*0.362	*0.346	*0.289	*0.334	*0.299	*0.318	*0.329	*0.321
	[129.745]	[103.477]	[114.092]	[137.211]	[139.667]	[125.080]	[86.472]	[91.150]
α_{1i}	*0.115	*-0.065	*0.101	*0.000	*0.060	*-0.036	**-0.027	0.005
	[24.647]	[-14.423]	[20.355]	[-2.650]	[20.243]	[-8.817]	[-2.151]	[0.545]
α_{i1}	*-0.019	*0.009	*-0.015	-0.012	*-0.015	*-0.007	0.004	0.002
	[-9.813]	[3.082]	[-8.803]	[-0.594]	[-6.095]	[-4.783]	[1.644]	[1.053]
α_{ii}	*0.161	*0.295	*0.386	*0.228	*0.450	*0.307	*0.286	*0.304
	[52.958]	[82.487]	[129.186]	[100.837]	[131.673]	[119.418]	[69.960]	[83.238]
β_{11}	*0.940	*0.940	*0.962	*0.946	*0.957	*0.952	*0.953	*0.955
	[1104.731]	[879.488]	[1436.964]	[1325.050]	[1744.664]	[1272.560]	[723.918]	[856.067]
β_{1i}	*-0.028	*0.030	*-0.026	*0.000	*-0.020	*0.006	-0.003	*-0.014
	[-18.672]	[18.541]	[-16.251]	[2.940]	[-19.772]	[4.202]	[-0.744]	[-4.960]
β_{i1}	*0.004	*-0.008	*0.010	-0.007	*0.007	*0.003	*0.005	*0.004
	[6.525]	[-7.594]	[14.727]	[-1.283]	[7.798]	[7.971]	[4.557]	[4.926]
β_{ii}	*0.985	*0.959	*0.927	*0.976	*0.898	*0.949	*0.948	*0.943
	[1362.664]	[930.618]	[880.962]	[2093.096]	[641.624]	[1203.624]	[642.163]	[708.409]

See Notes (1).

Table 50: 15 Minute VAR-BEKK-GARCH Results (Contd.)

NZDUSD	USDCAD	USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK
$ar(1)_{11}$	*-0.066	*-0.050	*-0.040	*-0.045	*-0.055	*-0.058	*-0.060
	[-20.765]	[-17.590]	[-12.920]	[-17.538]	[-21.224]	[-22.594]	[-19.455]
$ar(1)_{1i}$	*-0.057	*-0.021	0.025	*-0.010	*-0.026	*-0.027	*-0.031
	[-14.064]	[-6.685]	[0.573]	[-2.886]	[-9.098]	[-10.989]	[-11.148]
Constant	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[3.374]	[3.159]	[2.824]	[3.812]	[3.786]	[3.458]	[3.384]
$ar(1)_{i1}$	*-0.019	*-0.012	*-0.001	0.000	*-0.044	*-0.036	*-0.032
	[-9.224]	[-5.770]	[-9.565]	[0.124]	[-26.861]	[-14.908]	[-11.085]
$ar(1)_{ii}$	*-0.055	*-0.057	*-0.144	*-0.042	*-0.057	*-0.057	*-0.044
	[-16.168]	[-18.076]	[-45.368]	[-14.063]	[-19.427]	[-20.129]	[-14.506]
Constant	*0.000	0.000	*0.000	*0.000	*0.000	***0.000	**0.000
	[-3.410]	[-1.159]	[-4.330]	[10.217]	[-4.491]	[-1.762]	[-2.214]
c_{11}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[36.625]	[47.114]	[42.428]	[43.669]	[34.872]	[42.285]	[34.141]
c_{i1}	*0.000	*0.000	**0.000	*0.000	*0.000	*0.000	*0.000
	[-22.851]	[-28.889]	[-2.068]	[-5.420]	[-30.263]	[-39.203]	[-35.491]
c_{ii}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[31.052]	[33.400]	[43.715]	[79.196]	[37.612]	[-33.844]	[35.434]
α_{11}	*0.149	*0.189	*0.249	*0.202	*0.160	*0.173	*0.165
	[50.349]	[79.966]	[64.676]	[80.869]	[52.338]	[55.333]	[48.653]
α_{1i}	*0.035	*0.031	0.000	*0.046	*-0.023	*-0.027	*-0.011
	[15.425]	[10.346]	[0.967]	[27.242]	[-9.685]	[-7.498]	[-2.775]
α_{i1}	*-0.131	*-0.048	*0.210	*0.015	*-0.085	*-0.093	*-0.103
	[-31.745]	[-18.810]	[5.826]	[3.919]	[-34.526]	[-32.261]	[-34.532]
α_{ii}	*0.377	*0.376	*0.243	*0.457	*0.326	*0.316	*0.330
	[119.822]	[125.905]	[97.730]	[130.496]	[129.341]	[94.776]	[99.884]
β_{11}	*0.986	*0.979	*0.962	*0.976	*0.986	*0.983	*0.984
	[1435.121]	[1702.382]	[796.257]	[1556.769]	[1612.813]	[1315.480]	[1205.122]
β_{1i}	*-0.005	*-0.004	0.000	*-0.008	*0.004	*0.005	**0.002
	[-6.627]	[-5.525]	[1.142]	[-12.754]	[6.384]	[5.057]	[2.113]
β_{i1}	*0.030	*0.015	*-0.077	-0.001	*0.022	*0.027	*0.027
	[26.340]	[20.082]	[-8.968]	[-0.605]	[32.705]	[29.601]	[28.405]
β_{ii}	*0.936	*0.933	*0.972	*0.896	*0.942	*0.941	*0.939
	[973.918]	[999.018]	[1795.053]	[642.865]	[1288.174]	[837.558]	[828.231]

See Notes (1).

Table 51: 15 Minute VAR-BEKK-GARCH Results (Contd.)

USDCAD	USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK
$ar(1)_{11}$	*-0.044	*-0.034	*-0.041	*-0.051	*-0.050	*-0.049
	[-15.267]	[-10.430]	[-15.037]	[-16.963]	[-16.297]	[-16.146]
$ar(1)_{1i}$	*0.009	**0.065	*-0.008	*0.015	*0.015	*0.015
	[4.088]	[1.981]	[-3.021]	[7.225]	[8.784]	[7.777]
Constant	*0.000	**0.000	*0.000	*0.000	*0.000	*0.000
	[-3.884]	[-2.185]	[-2.709]	[-3.205]	[-2.956]	[-3.554]
$ar(1)_{i1}$	*0.017	*0.001	-0.001	*0.069	*0.048	*0.048
	[5.901]	[8.088]	[-0.734]	[26.638]	[13.586]	[13.116]
$ar(1)_{ii}$	*-0.053	*-0.141	*-0.042	*-0.066	*-0.057	*-0.046
	[-17.837]	[-45.505]	[-13.188]	[-24.327]	[-19.443]	[-15.124]
Constant	0.000	*0.000	*0.000	*0.000	0.000	**0.000
	[-0.039]	[-3.779]	[11.760]	[-4.496]	[-1.591]	[-2.003]
c_{11}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[55.235]	[56.835]	[58.393]	[58.747]	[57.446]	[-55.524]
c_{i1}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[31.389]	[8.083]	[4.102]	[23.640]	[24.704]	[-22.000]
c_{ii}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[54.911]	[37.746]	[77.071]	[68.287]	[57.109]	[53.172]
α_{11}	*0.302	*-0.340	*0.296	*0.308	*0.332	*0.320
	[120.905]	[-122.887]	[126.337]	[106.637]	[108.580]	[102.150]
α_{1i}	*-0.025	*-0.001	*-0.035	*0.062	*0.070	*0.050
	[-6.408]	[-5.336]	[-12.101]	[23.016]	[14.761]	[11.246]
α_{i1}	0.003	*0.125	*-0.010	*0.027	*0.011	*0.028
	[1.464]	[4.632]	[-3.469]	[13.205]	[3.984]	[10.906]
α_{ii}	*0.370	*0.223	*0.441	*0.298	*0.275	*0.287
	[124.188]	[92.997]	[122.395]	[121.334]	[85.599]	[93.055]
β_{11}	*0.956	*0.942	*0.956	*0.954	*0.948	*0.950
	[1392.574]	[1099.613]	[1495.494]	[1147.019]	[1020.742]	[989.419]
β_{1i}	*0.004	*0.000	*0.008	*-0.014	*-0.015	*-0.010
	[3.534]	[-3.673]	[8.385]	[-17.994]	[-10.507]	[-6.916]
β_{i1}	*-0.005	0.002	0.000	*-0.009	*-0.006	*-0.010
	[-6.788]	[0.335]	[-0.431]	[-14.242]	[-6.743]	[-10.462]
β_{ii}	*0.933	*0.976	*0.902	*0.951	*0.953	*0.951
	[1000.181]	[1998.607]	[637.892]	[1370.821]	[907.698]	[959.571]

See Notes (1).

Table 52: 15 Minute VAR-BEKK-GARCH Results (Contd.)

USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK	**USDHKD**	USDJPY	USDMXN	USDNOK	USDSEK
$ar(1)_{11}$	*-0.044	*-0.050	*-0.056	*-0.057	*-0.056	$ar(1)_{11}$	*-0.142	*-0.141	*-0.144	*-0.143
	[-15.151]	[-17.200]	[-22.961]	[-17.629]	[-16.944]		[-52.317]	[-45.670]	[-43.664]	[-45.591]
$ar(1)_{1i}$	-0.021	*0.021	*0.009	*0.016	*0.012	$ar(1)_{1i}$	0.000	*0.001	*0.001	*0.001
	[-0.708]	[7.199]	[4.118]	[6.691]	[4.486]		[0.335]	[9.523]	[11.998]	[13.455]
Constant	0.000	***0.000	0.000	0.000	0.000	*Constant*	*0.000	*0.000	*0.000	*0.000
	[-0.656]	[1.717]	[-0.943]	[-0.772]	[-1.622]		[-4.279]	[-4.297]	[-6.072]	[-5.212]
$ar(1)_{i1}$	*0.001	*0.005	*0.026	*0.016	*0.018	$ar(1)_{i1}$	0.029	**0.066	0.017	-0.006
	[8.466]	[3.050]	[12.476]	[4.535]	[5.304]		[1.135]	[1.988]	[0.441]	[-0.138]
$ar(1)_{ii}$	*-0.141	*-0.043	*-0.048	*-0.052	*-0.043	$ar(1)_{ii}$	*-0.032	*-0.041	*-0.042	*-0.031
	[-48.953]	[-13.196]	[-18.471]	[-15.545]	[-13.499]		[-9.445]	[-14.319]	[-15.317]	[-10.744]
Constant	*0.000	*0.000	*0.000	**0.000	***0.000	*Constant*	*0.000	*0.000	***0.000	***0.000
	[-4.364]	[11.076]	[-5.621]	[-2.439]	[-1.908]		[10.604]	[-5.469]	[-1.865]	[-1.820]
c_{11}	*0.000	*0.000	*0.000	*0.000	*0.000	c_{11}	*0.000	*0.000	*0.000	*0.000
	[68.367]	[-64.836]	[71.999]	[70.396]	[69.187]		[41.326]	[42.084]	[44.295]	[42.936]
c_{i1}	*0.000	*0.000	*0.000	*0.000	*0.000	c_{i1}	0.000	0.000	0.000	**0.000
	[-2.886]	[-24.144]	[10.961]	[51.344]	[50.865]		[0.800]	[0.820]	[-0.855]	[1.980]
c_{ii}	*0.000	*0.000	*0.000	*0.000	*0.000	c_{ii}	*0.000	*0.000	*0.000	*0.000
	[35.154]	[84.336]	[83.614]	[47.706]	[45.599]		[76.373]	[76.367]	[62.951]	[65.171]
α_{11}	*0.373	*0.326	*0.350	*0.361	*0.356	α_{11}	*0.222	*0.232	*0.230	*0.232
	[129.142]	[126.396]	[135.134]	[112.543]	[112.910]		[95.960]	[92.707]	[96.058]	[99.343]
α_{1i}	*-0.001	**0.004	***0.004	*0.041	*0.030	α_{1i}	*0.341	0.000	*-0.147	-0.012
	[-5.250]	[2.185]	[1.667]	[12.683]	[9.298]		[14.062]	[-0.017]	[-3.630]	[-0.306]
α_{i1}	-0.035	*0.078	0.000	*-0.011	-0.001	α_{i1}	0.000	***0.000	**0.000	0.000
	[-1.110]	[23.765]	[0.110]	[-3.167]	[-0.456]		[-0.093]	[1.774]	[-2.042]	[1.498]
α_{ii}	*0.222	*0.439	*0.307	*0.280	*0.292	α_{ii}	*0.471	*0.324	*0.316	*0.318
	[94.720]	[124.493]	[145.653]	[89.558]	[98.285]		[123.933]	[121.059]	[114.171]	[126.778]
β_{11}	*0.929	*0.945	*0.939	*0.937	*0.939	β_{11}	*0.977	*0.975	*0.975	*0.975
	[927.034]	[1154.199]	[1037.457]	[959.748]	[941.217]		[2120.432]	[1854.563]	[2037.761]	[2080.523]
β_{1i}	*0.000	0.001	0.001	*-0.016	*-0.012	β_{1i}	*-0.059	0.008	*0.054	**0.019
	[6.170]	[1.112]	[0.608]	[-15.674]	[-12.553]		[-7.583]	[1.256]	[5.719]	[2.070]
β_{i1}	0.012	*-0.030	**-0.002	*-0.004	*-0.005	β_{i1}	0.000	0.000	***0.000	0.000
	[1.629]	[-25.305]	[-2.279]	[-4.077]	[-5.404]		[0.470]	[-1.332]	[1.830]	[-1.468]
β_{ii}	*0.977	*0.902	*0.950	*0.955	*0.953	β_{ii}	*0.890	*0.945	*0.943	*0.943
	[2130.507]	[668.233]	[1542.825]	[940.979]	[1069.453]		[604.813]	[1141.139]	[955.055]	[1095.674]

See Notes (1).

Table 53: 15 Minute VAR-BEKK-GARCH Results (Contd.)

USDJPY	USDMXN	USDNOK	USDSEK	**USDMXN**	USDNOK	USDSEK	**USDNOK**	USDSEK
$ar(1)_{11}$	*-0.075 [-23.793]	*-0.046 [-15.287]	*-0.038 [-11.809]	$ar(1)_{11}$	*-0.061 [-20.658]	*-0.061 [-20.238]	$ar(1)_{11}$	*-0.084 [-21.256]
$ar(1)_{1i}$	*0.082 [56.821]	*0.014 [10.249]	0.001 [1.010]	$ar(1)_{1i}$	*0.040 [22.552]	*0.041 [20.195]	$ar(1)_{1i}$	*0.060 [15.445]
Constant	*0.000 [9.712]	*0.000 [12.546]	*0.000 [10.043]	*Constant*	*0.000 [-6.484]	*0.000 [-5.371]	*Constant*	***0.000 [-1.864]
$ar(1)_{i1}$	**-0.007 [-2.571]	-0.004 [-1.101]	**-0.008 [-2.532]	$ar(1)_{i1}$	*0.019 [8.020]	*0.015 [5.519]	$ar(1)_{i1}$	*0.055 [14.166]
$ar(1)_{ii}$	*-0.042 [-14.518]	*-0.044 [-16.410]	*-0.034 [-13.636]	$ar(1)_{ii}$	*-0.049 [-16.535]	*-0.036 [-12.052]	$ar(1)_{ii}$	*-0.070 [-17.128]
Constant	*0.000 [-4.282]	**0.000 [-2.513]	0.000 [-1.330]	*Constant*	*0.000 [-2.846]	*0.000 [-3.095]	*Constant*	**0.000 [-2.089]
c_{11}	*0.000 [80.943]	*0.000 [83.530]	*0.000 [82.843]	c_{11}	*0.000 [73.017]	*0.000 [71.927]	c_{11}	*0.000 [62.189]
c_{i1}	*0.000 [3.406]	*0.000 [6.767]	*0.000 [11.220]	c_{i1}	*0.000 [17.359]	*0.000 [13.417]	c_{i1}	*0.000 [44.361]
c_{ii}	*0.000 [68.028]	*0.000 [57.885]	*0.000 [63.651]	c_{ii}	*0.000 [53.015]	*0.000 [53.568]	c_{ii}	*0.000 [39.332]
α_{11}	*0.505 [130.797]	*0.456 [124.640]	*0.452 [128.460]	α_{11}	*0.302 [118.195]	*0.300 [115.334]	α_{11}	*0.261 [48.215]
α_{1i}	*-0.045 [-14.854]	0.005 [1.225]	*0.028 [7.476]	α_{1i}	*0.035 [12.320]	*0.028 [9.511]	α_{1i}	*0.046 [8.836]
α_{i1}	*0.016 [5.182]	*0.007 [3.709]	*-0.039 [-23.899]	α_{i1}	*0.042 [16.558]	*0.043 [16.196]	α_{i1}	*0.081 [14.511]
α_{ii}	*0.293 [131.546]	*0.274 [109.273]	*0.272 [110.255]	α_{ii}	*0.286 [95.375]	*0.293 [94.481]	α_{ii}	*0.294 [58.550]
β_{11}	*0.873 [490.346]	*0.895 [607.710]	*0.898 [639.883]	β_{11}	*0.950 [1226.367]	*0.950 [1165.752]	β_{11}	*0.956 [522.478]
β_{1i}	*0.013 [10.173]	*-0.006 [-3.880]	*-0.015 [-10.694]	β_{1i}	*-0.011 [-12.768]	*-0.009 [-9.452]	β_{1i}	*-0.015 [-8.915]
β_{i1}	*-0.006 [-6.269]	0.000 [-0.026]	*0.009 [15.128]	β_{i1}	*-0.009 [-10.149]	*-0.009 [-8.954]	β_{i1}	*-0.021 [-10.895]
β_{ii}	*0.955 [1518.636]	*0.957 [1240.616]	*0.958 [1349.796]	β_{ii}	*0.954 [988.275]	*0.953 [956.919]	β_{ii}	*0.952 [569.675]

See Notes (1).

Table 54: 15 Minute VAR-BEKK-GARCH Results (Contd.)

AUDUSD	EURUSD	GBPUSD	NZDUSD	USDCAD	USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK
$ar(1)_{11}$	*-0.051	*-0.040	*-0.058	*-0.057	*-0.045	*-0.037	*-0.048	*-0.052	*-0.050	*-0.051
	[-14.280]	[-13.085]	[-14.112]	[-15.474]	[-14.926]	[-14.453]	[-18.318]	[-18.449]	[-15.171]	[-15.360]
$ar(1)_{1i}$	*0.019	0.005	*0.031	*-0.033	*-0.010	***0.066	-0.004	*-0.023	*-0.013	*-0.015
	[4.880]	[1.441]	[8.779]	[-8.097]	[-3.599]	[1.687]	[-1.310]	[-9.250]	[-4.766]	[-5.698]
Constant	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[5.267]	[4.844]	[5.053]	[5.248]	[4.933]	[5.661]	[4.395]	[9.203]	[5.610]	[5.385]
$ar(1)_{i1}$	*0.013	*0.017	*0.077	*-0.031	*-0.011	*-0.001	*-0.006	*-0.062	*-0.044	*-0.042
	[5.044]	[9.094]	[18.136]	[-12.265]	[-4.806]	[-13.382]	[-3.954]	[-26.996]	[-13.582]	[-13.013]
$ar(1)_{ii}$	*-0.044	*-0.061	*-0.092	*-0.071	*-0.055	*-0.145	*-0.043	*-0.067	*-0.062	*-0.051
	[-12.039]	[-19.288]	[-23.924]	[-19.802]	[-17.323]	[-47.608]	[-13.915]	[-22.508]	[-19.540]	[-15.837]
Constant	0.000	***0.000	*0.000	*0.000	0.000	*0.000	*0.000	*0.000	**0.000	**0.000
	[0.641]	[1.703]	[3.307]	[-3.550]	[-0.787]	[-5.226]	[10.053]	[-5.234]	[-1.993]	[-2.452]
c_{11}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[49.550]	[47.377]	[72.311]	[45.382]	[61.009]	[65.254]	[56.632]	[56.561]	[54.394]	[47.286]
c_{i1}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[32.307]	[18.741]	[54.308]	[-18.589]	[-27.810]	[-3.879]	[-13.009]	[-29.798]	[-38.702]	[-34.484]
c_{ii}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[56.366]	[-53.277]	[-25.809]	[51.798]	[-54.016]	[39.944]	[86.508]	[45.139]	[-45.664]	[46.596]
α_{11}	*0.213	*0.214	*0.309	*0.205	*0.229	*0.298	*0.231	*0.244	*0.234	*0.227
	[48.688]	[55.983]	[66.578]	[55.268]	[78.390]	[88.883]	[83.245]	[66.021]	[55.926]	[51.017]
α_{1i}	**-0.008	*-0.011	*0.139	*0.039	*0.043	*-0.001	*0.027	*-0.051	*-0.057	*-0.043
	[-2.427]	[-4.287]	[24.573]	[11.555]	[14.992]	[-5.051]	[14.807]	[-17.108]	[-14.990]	[-9.374]
α_{i1}	*0.079	*0.080	0.007	*-0.084	*-0.030	*0.181	*0.020	*-0.042	*-0.048	*-0.063
	[19.252]	[16.212]	[1.625]	[-20.477]	[-12.172]	[5.514]	[5.874]	[-13.992]	[-15.397]	[-20.710]
α_{ii}	*0.331	*0.354	*0.183	*0.376	*0.382	*0.234	*0.453	*0.300	*0.297	*0.305
	[89.335]	[105.658]	[34.013]	[110.522]	[143.077]	[96.237]	[126.388]	[105.235]	[86.237]	[87.365]
β_{11}	*0.974	*0.971	*0.950	*0.973	*0.970	*0.947	*0.967	*0.966	*0.970	*0.970
	[794.663]	[911.901]	[684.360]	[869.177]	[1261.420]	[837.884]	[1216.786]	[935.155]	[853.100]	[740.458]
β_{1i}	*0.005	**0.002	*-0.034	*-0.009	*-0.009	*0.000	*-0.004	*0.013	*0.010	*0.008
	[4.947]	[2.062]	[-22.838]	[-8.161]	[-10.367]	[6.463]	[-7.523]	[15.048]	[8.516]	[5.528]
β_{i1}	*-0.021	*-0.018	*-0.009	*0.018	*0.011	*-0.071	0.000	*0.012	*0.016	*0.019
	[-17.356]	[-11.134]	[-7.413]	[14.346]	[13.995]	[-9.046]	[0.104]	[12.445]	[16.422]	[18.859]
β_{ii}	*0.939	*0.942	*0.973	*0.936	*0.932	*0.974	*0.899	*0.950	*0.944	*0.944
	[795.684]	[917.747]	[712.687]	[872.013]	[1070.915]	[1920.281]	[663.991]	[1097.862]	[838.114]	[834.733]

See Notes (1).

Table 55: 15 Minute VAR-BEKK-GARCH Results (Contd.)

EURUSD	GBPUSD	NZDUSD	USDCAD	USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK
$ar(1)_{11}$	*-0.029	*-0.036	*-0.037	*-0.054	*-0.027	*-0.033	*-0.031	*-0.028	*-0.027
	[-8.469]	[-13.815]	[-13.515]	[-25.152]	[-10.616]	[-11.821]	[-10.221]	[-6.525]	[-5.893]
$ar(1)_{1i}$	0.005	*0.009	*-0.017	*-0.018	-0.002	*-0.009	-0.002	-0.001	0.001
	[1.411]	[6.853]	[-11.277]	[-9.527]	[-0.047]	[-3.423]	[-0.819]	[-0.230]	[0.391]
Constant	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	[0.785]	[0.651]	[-0.076]	[0.109]	[0.713]	[0.039]	[1.368]	[0.821]	[0.736]
$ar(1)_{i1}$	*0.028	*0.041	*-0.028	*-0.062	*-0.002	*-0.006	*-0.067	*-0.051	*-0.045
	[10.049]	[20.399]	[-16.729]	[-25.093]	[-14.509]	[-3.125]	[-23.724]	[-9.328]	[-7.607]
$ar(1)_{ii}$	*-0.066	*-0.061	*-0.056	*-0.099	*-0.144	*-0.044	*-0.069	*-0.069	*-0.056
	[-19.959]	[-24.044]	[-26.671]	[-38.297]	[-46.986]	[-13.794]	[-22.623]	[-15.922]	[-12.403]
Constant	0.000	*0.000	*0.000	0.000	*0.000	*0.000	*0.000	*0.000	**0.000
	[0.927]	[3.437]	[-2.629]	[-1.049]	[-4.939]	[10.606]	[-4.352]	[-2.771]	[-2.044]
c_{11}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[61.838]	[67.231]	[64.681]	[106.074]	[65.272]	[67.754]	[66.972]	[66.120]	[62.149]
c_{i1}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[31.130]	[27.905]	[-19.916]	[-106.886]	[-4.703]	[-14.471]	[-15.142]	[-36.075]	[-32.554]
c_{ii}	*0.000	*0.000	*0.000	0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[-53.809]	[38.379]	[51.337]	[0.011]	[41.916]	[83.607]	[69.019]	[-70.685]	[59.055]
α_{11}	*0.270	*0.328	*0.289	*0.262	*0.314	*0.280	*0.302	*0.298	*0.280
	[49.242]	[102.129]	[86.138]	[128.485]	[117.834]	[118.819]	[105.997]	[67.162]	[53.032]
α_{1i}	*-0.027	*0.119	0.003	*0.028	*-0.001	*0.051	*-0.053	*-0.029	0.008
	[-6.776]	[32.172]	[0.746]	[17.269]	[-3.466]	[22.255]	[-17.170]	[-4.424]	[1.135]
α_{i1}	*0.045	-0.001	*-0.017	*-0.050	-0.009	*-0.031	*-0.010	0.000	*-0.016
	[4.959]	[-0.210]	[-4.351]	[-22.156]	[-0.326]	[-10.665]	[-4.344]	[-0.091]	[-3.550]
α_{ii}	*0.358	*0.170	*0.337	*0.361	*0.232	*0.455	*0.301	*0.305	*0.331
	[67.261]	[50.833]	[93.721]	[160.020]	[100.415]	[131.719]	[113.618]	[61.006]	[59.212]
β_{11}	*0.958	*0.942	*0.951	*0.960	*0.946	*0.956	*0.951	*0.953	*0.955
	[521.624]	[937.100]	[923.969]	[2291.429]	[1079.780]	[1391.493]	[1047.966]	[569.922]	[420.331]
β_{1i}	*0.005	*-0.031	***0.003	*0.008	*0.000	*-0.013	*0.010	-0.003	*-0.011
	[3.406]	[-27.696]	[1.848]	[25.894]	[3.788]	[-15.747]	[9.373]	[-1.041]	[-3.837]
β_{i1}	*-0.013	0.001	0.002	*0.016	-0.009	*0.014	*0.004	0.002	***0.003
	[-4.015]	[0.962]	[1.316]	[26.732]	[-1.388]	[12.957]	[6.068]	[1.301]	[1.709]
β_{ii}	*0.942	*0.983	*0.947	*0.943	*0.975	*0.898	*0.950	*0.940	*0.934
	[502.503]	[1198.247]	[850.345]	[1408.784]	[2064.177]	[676.160]	[1234.086]	[484.417]	[400.867]

See Notes (1).

Table 56: 15 Minute VAR-BEKK-GARCH Results (Contd.)

GBPUSD	NZDUSD	USDCAD	USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK
$ar(1)_{11}$	*-0.052	*-0.058	*-0.051	*-0.042	*-0.045	*-0.047	*-0.058	*-0.055
	[-16.493]	[-21.720]	[-15.929]	[-15.445]	[-16.252]	[-17.087]	[-18.319]	[-17.298]
$ar(1)_{1i}$	*0.010	*-0.023	*-0.010	-0.039	*-0.008	*-0.007	*-0.018	*-0.016
	[5.148]	[-12.586]	[-4.812]	[-1.442]	[-2.607]	[-3.936]	[-9.730]	[-8.652]
Constant	0.000	0.000	0.000	0.000	0.000	**0.000	0.000	0.000
	[1.443]	[0.736]	[0.731]	[1.396]	[1.466]	[2.034]	[1.195]	[1.086]
$ar(1)_{i1}$	*0.026	*-0.016	*-0.021	*-0.002	*-0.011	*-0.049	*-0.036	*-0.034
	[6.150]	[-6.519]	[-5.674]	[-10.638]	[-5.326]	[-18.116]	[-8.108]	[-7.711]
$ar(1)_{ii}$	*-0.051	*-0.046	*-0.056	*-0.144	*-0.040	*-0.051	*-0.051	*-0.038
	[-15.582]	[-19.168]	[-17.491]	[-45.120]	[-13.313]	[-18.233]	[-16.213]	[-12.320]
Constant	*0.000	*0.000	0.000	*0.000	*0.000	*0.000	0.000	**0.000
	[3.372]	[-2.665]	[-0.949]	[-4.428]	[10.018]	[-4.715]	[-1.553]	[-2.230]
c_{11}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[53.968]	[54.388]	[59.791]	[55.270]	[56.100]	[-53.651]	[52.292]	[52.933]
c_{i1}	*0.000	*0.000	*0.000	***0.000	0.000	*0.000	*0.000	*0.000
	[14.746]	[-31.300]	[-40.132]	[-1.883]	[-1.591]	[8.712]	[-24.086]	[-22.321]
c_{ii}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[34.940]	[-47.972]	[-49.744]	[42.304]	[78.810]	[76.645]	[54.323]	[63.170]
α_{11}	*0.362	*0.346	*0.289	*0.334	*0.299	*0.318	*0.329	*0.321
	[129.745]	[103.477]	[114.092]	[137.211]	[139.667]	[125.080]	[86.472]	[91.150]
α_{1i}	*0.115	*-0.065	*0.101	*0.000	*0.060	*-0.036	**-0.027	0.005
	[24.647]	[-14.423]	[20.355]	[-2.650]	[20.243]	[-8.817]	[-2.151]	[0.545]
α_{i1}	*-0.019	*0.009	*-0.015	-0.012	*-0.015	*-0.007	0.004	0.002
	[-9.813]	[3.082]	[-8.803]	[-0.594]	[-6.095]	[-4.783]	[1.644]	[1.053]
α_{ii}	*0.161	*0.295	*0.386	*0.228	*0.450	*0.307	*0.286	*0.304
	[52.958]	[82.487]	[129.186]	[100.837]	[131.673]	[119.418]	[69.960]	[83.238]
β_{11}	*0.940	*0.940	*0.962	*0.946	*0.957	*0.952	*0.953	*0.955
	[1104.731]	[879.488]	[1436.964]	[1325.050]	[1744.664]	[1272.560]	[723.918]	[856.067]
β_{1i}	*-0.028	*0.030	*-0.026	*0.000	*-0.020	*0.006	-0.003	*-0.014
	[-18.672]	[18.541]	[-16.251]	[2.940]	[-19.772]	[4.202]	[-0.744]	[-4.960]
β_{i1}	*0.004	*-0.008	*0.010	-0.007	*0.007	*0.003	*0.005	*0.004
	[6.525]	[-7.594]	[14.727]	[-1.283]	[7.798]	[7.971]	[4.557]	[4.926]
β_{ii}	*0.985	*0.959	*0.927	*0.976	*0.898	*0.949	*0.948	*0.943
	[1362.664]	[930.618]	[880.962]	[2093.096]	[641.624]	[1203.624]	[642.163]	[708.409]

See Notes (1).

Table 57: 15 Minute VAR-BEKK-GARCH Results (Contd.)

NZDUSD	USDCAD	USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK
$ar(1)_{11}$	*-0.066	*-0.050	*-0.040	*-0.045	*-0.055	*-0.058	*-0.060
	[-20.765]	[-17.590]	[-12.920]	[-17.538]	[-21.224]	[-22.594]	[-19.455]
$ar(1)_{1i}$	*-0.057	*-0.021	0.025	*-0.010	*-0.026	*-0.027	*-0.031
	[-14.064]	[-6.685]	[0.573]	[-2.886]	[-9.098]	[-10.989]	[-11.148]
Constant	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[3.374]	[3.159]	[2.824]	[3.812]	[3.786]	[3.458]	[3.384]
$ar(1)_{i1}$	*-0.019	*-0.012	*-0.001	0.000	*-0.044	*-0.036	*-0.032
	[-9.224]	[-5.770]	[-9.565]	[0.124]	[-26.861]	[-14.908]	[-11.085]
$ar(1)_{ii}$	*-0.055	*-0.057	*-0.144	*-0.042	*-0.057	*-0.057	*-0.044
	[-16.168]	[-18.076]	[-45.368]	[-14.063]	[-19.427]	[-20.129]	[-14.506]
Constant	*0.000	0.000	*0.000	*0.000	*0.000	***0.000	**0.000
	[-3.410]	[-1.159]	[-4.330]	[10.217]	[-4.491]	[-1.762]	[-2.214]
c_{11}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[36.625]	[47.114]	[42.428]	[43.669]	[34.872]	[42.285]	[34.141]
c_{i1}	*0.000	*0.000	**0.000	*0.000	*0.000	*0.000	*0.000
	[-22.851]	[-28.889]	[-2.068]	[-5.420]	[-30.263]	[-39.203]	[-35.491]
c_{ii}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[31.052]	[33.400]	[43.715]	[79.196]	[37.612]	[-33.844]	[35.434]
α_{11}	*0.149	*0.189	*0.249	*0.202	*0.160	*0.173	*0.165
	[50.349]	[79.966]	[64.676]	[80.869]	[52.338]	[55.333]	[48.653]
α_{1i}	*0.035	*0.031	0.000	*0.046	*-0.023	*-0.027	*-0.011
	[15.425]	[10.346]	[0.967]	[27.242]	[-9.685]	[-7.498]	[-2.775]
α_{i1}	*-0.131	*-0.048	*0.210	*0.015	*-0.085	*-0.093	*-0.103
	[-31.745]	[-18.810]	[5.826]	[3.919]	[-34.526]	[-32.261]	[-34.532]
α_{ii}	*0.377	*0.376	*0.243	*0.457	*0.326	*0.316	*0.330
	[119.822]	[125.905]	[97.730]	[130.496]	[129.341]	[94.776]	[99.884]
β_{11}	*0.986	*0.979	*0.962	*0.976	*0.986	*0.983	*0.984
	[1435.121]	[1702.382]	[796.257]	[1556.769]	[1612.813]	[1315.480]	[1205.122]
β_{1i}	*-0.005	*-0.004	0.000	*-0.008	*0.004	*0.005	**0.002
	[-6.627]	[-5.525]	[1.142]	[-12.754]	[6.384]	[5.057]	[2.113]
β_{i1}	*0.030	*0.015	*-0.077	-0.001	*0.022	*0.027	*0.027
	[26.340]	[20.082]	[-8.968]	[-0.605]	[32.705]	[29.601]	[28.405]
β_{ii}	*0.936	*0.933	*0.972	*0.896	*0.942	*0.941	*0.939
	[973.918]	[999.018]	[1795.053]	[642.865]	[1288.174]	[837.558]	[828.231]

See Notes (1).

Table 58: 15 Minute VAR-BEKK-GARCH Results (Contd.)

USDCAD	USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK
$ar(1)_{11}$	*-0.044	*-0.034	*-0.041	*-0.051	*-0.050	*-0.049
	[-15.267]	[-10.430]	[-15.037]	[-16.963]	[-16.297]	[-16.146]
$ar(1)_{1i}$	*0.009	**0.065	*-0.008	*0.015	*0.015	*0.015
	[4.088]	[1.981]	[-3.021]	[7.225]	[8.784]	[7.777]
Constant	*0.000	**0.000	*0.000	*0.000	*0.000	*0.000
	[-3.884]	[-2.185]	[-2.709]	[-3.205]	[-2.956]	[-3.554]
$ar(1)_{i1}$	*0.017	*0.001	-0.001	*0.069	*0.048	*0.048
	[5.901]	[8.088]	[-0.734]	[26.638]	[13.586]	[13.116]
$ar(1)_{ii}$	*-0.053	*-0.141	*-0.042	*-0.066	*-0.057	*-0.046
	[-17.837]	[-45.505]	[-13.188]	[-24.327]	[-19.443]	[-15.124]
Constant	0.000	*0.000	*0.000	*0.000	0.000	**0.000
	[-0.039]	[-3.779]	[11.760]	[-4.496]	[-1.591]	[-2.003]
c_{11}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[55.235]	[56.835]	[58.393]	[58.747]	[57.446]	[-55.524]
c_{i1}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[31.389]	[8.083]	[4.102]	[23.640]	[24.704]	[-22.000]
c_{ii}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[54.911]	[37.746]	[77.071]	[68.287]	[57.109]	[53.172]
α_{11}	*0.302	*-0.340	*0.296	*0.308	*0.332	*0.320
	[120.905]	[-122.887]	[126.337]	[106.637]	[108.580]	[102.150]
α_{1i}	*-0.025	*-0.001	*-0.035	*0.062	*0.070	*0.050
	[-6.408]	[-5.336]	[-12.101]	[23.016]	[14.761]	[11.246]
α_{i1}	0.003	*0.125	*-0.010	*0.027	*0.011	*0.028
	[1.464]	[4.632]	[-3.469]	[13.205]	[3.984]	[10.906]
α_{ii}	*0.370	*0.223	*0.441	*0.298	*0.275	*0.287
	[124.188]	[92.997]	[122.395]	[121.334]	[85.599]	[93.055]
β_{11}	*0.956	*0.942	*0.956	*0.954	*0.948	*0.950
	[1392.574]	[1099.613]	[1495.494]	[1147.019]	[1020.742]	[989.419]
β_{1i}	*0.004	*0.000	*0.008	*-0.014	*-0.015	*-0.010
	[3.534]	[-3.673]	[8.385]	[-17.994]	[-10.507]	[-6.916]
β_{i1}	*-0.005	0.002	0.000	*-0.009	*-0.006	*-0.010
	[-6.788]	[0.335]	[-0.431]	[-14.242]	[-6.743]	[-10.462]
β_{ii}	*0.933	*0.976	*0.902	*0.951	*0.953	*0.951
	[1000.181]	[1998.607]	[637.892]	[1370.821]	[907.698]	[959.571]

See Notes (1).

Table 59: 15 Minute VAR-BEKK-GARCH Results (Contd.)

USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK	**USDHKD**	USDJPY	USDMXN	USDNOK	USDSEK
$ar(1)_{11}$	*-0.044	*-0.050	*-0.056	*-0.057	*-0.056	$ar(1)_{11}$	*-0.142	*-0.141	*-0.144	*-0.143
	[-15.151]	[-17.200]	[-22.961]	[-17.629]	[-16.944]		[-52.317]	[-45.670]	[-43.664]	[-45.591]
$ar(1)_{1i}$	-0.021	*0.021	*0.009	*0.016	*0.012	$ar(1)_{1i}$	0.000	*0.001	*0.001	*0.001
	[-0.708]	[7.199]	[4.118]	[6.691]	[4.486]		[0.335]	[9.523]	[11.998]	[13.455]
Constant	0.000	***0.000	0.000	0.000	0.000	*Constant*	*0.000	*0.000	*0.000	*0.000
	[-0.656]	[1.717]	[-0.943]	[-0.772]	[-1.622]		[-4.279]	[-4.297]	[-6.072]	[-5.212]
$ar(1)_{i1}$	*0.001	*0.005	*0.026	*0.016	*0.018	$ar(1)_{i1}$	0.029	**0.066	0.017	-0.006
	[8.466]	[3.050]	[12.476]	[4.535]	[5.304]		[1.135]	[1.988]	[0.441]	[-0.138]
$ar(1)_{ii}$	*-0.141	*-0.043	*-0.048	*-0.052	*-0.043	$ar(1)_{ii}$	*-0.032	*-0.041	*-0.042	*-0.031
	[-48.953]	[-13.196]	[-18.471]	[-15.545]	[-13.499]		[-9.445]	[-14.319]	[-15.317]	[-10.744]
Constant	*0.000	*0.000	*0.000	**0.000	***0.000	*Constant*	*0.000	*0.000	***0.000	***0.000
	[-4.364]	[11.076]	[-5.621]	[-2.439]	[-1.908]		[10.604]	[-5.469]	[-1.865]	[-1.820]
c_{11}	*0.000	*0.000	*0.000	*0.000	*0.000	c_{11}	*0.000	*0.000	*0.000	*0.000
	[68.367]	[-64.836]	[71.999]	[70.396]	[69.187]		[41.326]	[42.084]	[44.295]	[42.936]
c_{i1}	*0.000	*0.000	*0.000	*0.000	*0.000	c_{i1}	0.000	0.000	0.000	**0.000
	[-2.886]	[-24.144]	[10.961]	[51.344]	[50.865]		[0.800]	[0.820]	[-0.855]	[1.980]
c_{ii}	*0.000	*0.000	*0.000	*0.000	*0.000	c_{ii}	*0.000	*0.000	*0.000	*0.000
	[35.154]	[84.336]	[83.614]	[47.706]	[45.599]		[76.373]	[76.367]	[62.951]	[65.171]
α_{11}	*0.373	*0.326	*0.350	*0.361	*0.356	α_{11}	*0.222	*0.232	*0.230	*0.232
	[129.142]	[126.396]	[135.134]	[112.543]	[112.910]		[95.960]	[92.707]	[96.058]	[99.343]
α_{1i}	*-0.001	**0.004	***0.004	*0.041	*0.030	α_{1i}	*0.341	0.000	*-0.147	-0.012
	[-5.250]	[2.185]	[1.667]	[12.683]	[9.298]		[14.062]	[-0.017]	[-3.630]	[-0.306]
α_{i1}	-0.035	*0.078	0.000	*-0.011	-0.001	α_{i1}	0.000	***0.000	**0.000	0.000
	[-1.110]	[23.765]	[0.110]	[-3.167]	[-0.456]		[-0.093]	[1.774]	[-2.042]	[1.498]
α_{ii}	*0.222	*0.439	*0.307	*0.280	*0.292	α_{ii}	*0.471	*0.324	*0.316	*0.318
	[94.720]	[124.493]	[145.653]	[89.558]	[98.285]		[123.933]	[121.059]	[114.171]	[126.778]
β_{11}	*0.929	*0.945	*0.939	*0.937	*0.939	β_{11}	*0.977	*0.975	*0.975	*0.975
	[927.034]	[1154.199]	[1037.457]	[959.748]	[941.217]		[2120.432]	[1854.563]	[2037.761]	[2080.523]
β_{1i}	*0.000	0.001	0.001	*-0.016	*-0.012	β_{1i}	*-0.059	0.008	*0.054	**0.019
	[6.170]	[1.112]	[0.608]	[-15.674]	[-12.553]		[-7.583]	[1.256]	[5.719]	[2.070]
β_{i1}	0.012	*-0.030	**-0.002	*-0.004	*-0.005	β_{i1}	0.000	0.000	***0.000	0.000
	[1.629]	[-25.305]	[-2.279]	[-4.077]	[-5.404]		[0.470]	[-1.332]	[1.830]	[-1.468]
β_{ii}	*0.977	*0.902	*0.950	*0.955	*0.953	β_{ii}	*0.890	*0.945	*0.943	*0.943
	[2130.507]	[668.233]	[1542.825]	[940.979]	[1069.453]		[604.813]	[1141.139]	[955.055]	[1095.674]

See Notes (1).

Table 60: 15 Minute VAR-BEKK-GARCH Results (Contd.)

USDJPY	USDMXN	USDNOK	USDSEK	**USDMXN**	USDNOK	USDSEK	**USDNOK**	USDSEK
$ar(1)_{11}$	*-0.075 [-23.793]	*-0.046 [-15.287]	*-0.038 [-11.809]	$ar(1)_{11}$	*-0.061 [-20.658]	*-0.061 [-20.238]	$ar(1)_{11}$	*-0.084 [-21.256]
$ar(1)_{1i}$	*0.082 [56.821]	*0.014 [10.249]	0.001 [1.010]	$ar(1)_{1i}$	*0.040 [22.552]	*0.041 [20.195]	$ar(1)_{1i}$	*0.060 [15.445]
Constant	*0.000 [9.712]	*0.000 [12.546]	*0.000 [10.043]	*Constant*	*0.000 [-6.484]	*0.000 [-5.371]	*Constant*	***0.000 [-1.864]
$ar(1)_{i1}$	**-0.007 [-2.571]	-0.004 [-1.101]	**-0.008 [-2.532]	$ar(1)_{i1}$	*0.019 [8.020]	*0.015 [5.519]	$ar(1)_{i1}$	*0.055 [14.166]
$ar(1)_{ii}$	*-0.042 [-14.518]	*-0.044 [-16.410]	*-0.034 [-13.636]	$ar(1)_{ii}$	*-0.049 [-16.535]	*-0.036 [-12.052]	$ar(1)_{ii}$	*-0.070 [-17.128]
Constant	*0.000 [-4.282]	**0.000 [-2.513]	0.000 [-1.330]	*Constant*	*0.000 [-2.846]	*0.000 [-3.095]	*Constant*	**0.000 [-2.089]
c_{11}	*0.000 [80.943]	*0.000 [83.530]	*0.000 [82.843]	c_{11}	*0.000 [73.017]	*0.000 [71.927]	c_{11}	*0.000 [62.189]
c_{i1}	*0.000 [3.406]	*0.000 [6.767]	*0.000 [11.220]	c_{i1}	*0.000 [17.359]	*0.000 [13.417]	c_{i1}	*0.000 [44.361]
c_{ii}	*0.000 [68.028]	*0.000 [57.885]	*0.000 [63.651]	c_{ii}	*0.000 [53.015]	*0.000 [53.568]	c_{ii}	*0.000 [39.332]
α_{11}	*0.505 [130.797]	*0.456 [124.640]	*0.452 [128.460]	α_{11}	*0.302 [118.195]	*0.300 [115.334]	α_{11}	*0.261 [48.215]
α_{1i}	*-0.045 [-14.854]	0.005 [1.225]	*0.028 [7.476]	α_{1i}	*0.035 [12.320]	*0.028 [9.511]	α_{1i}	*0.046 [8.836]
α_{i1}	*0.016 [5.182]	*0.007 [3.709]	*-0.039 [-23.899]	α_{i1}	*0.042 [16.558]	*0.043 [16.196]	α_{i1}	*0.081 [14.511]
α_{ii}	*0.293 [131.546]	*0.274 [109.273]	*0.272 [110.255]	α_{ii}	*0.286 [95.375]	*0.293 [94.481]	α_{ii}	*0.294 [58.550]
β_{11}	*0.873 [490.346]	*0.895 [607.710]	*0.898 [639.883]	β_{11}	*0.950 [1226.367]	*0.950 [1165.752]	β_{11}	*0.956 [522.478]
β_{1i}	*0.013 [10.173]	*-0.006 [-3.880]	*-0.015 [-10.694]	β_{1i}	*-0.011 [-12.768]	*-0.009 [-9.452]	β_{1i}	*-0.015 [-8.915]
β_{i1}	*-0.006 [-6.269]	0.000 [-0.026]	*0.009 [15.128]	β_{i1}	*-0.009 [-10.149]	*-0.009 [-8.954]	β_{i1}	*-0.021 [-10.895]
β_{ii}	*0.955 [1518.636]	*0.957 [1240.616]	*0.958 [1349.796]	β_{ii}	*0.954 [988.275]	*0.953 [956.919]	β_{ii}	*0.952 [569.675]

See Notes (1).

Appendix A.4. 30 Minute Session Based VAR-BEKK-GARCH Results

Appendix A.4.1. USA Market Period

Table 61: 30 Minute VAR-BEKK-GARCH Results for USA Market Period

AUDUSD	EURUSD	GBPUSD	NZDUSD	USDCAD	USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK
$ar(1)_{11}$	*-0.042	*-0.044	*-0.048	*-0.048	*-0.033	*-0.031	*-0.038	*0.067	*-0.036	*-0.041
	[-8.375]	[-7.814]	[-6.642]	[-9.100]	[-7.122]	[-7.142]	[-8.303]	[11.420]	[-6.198]	[-7.094]
$ar(1)_{1i}$	*0.020	*0.031	*0.020	*-0.028	-0.008	-0.015	**-0.011	*0.049	-0.006	**-0.010
	[3.763]	[5.046]	[3.357]	[-4.769]	[-1.911]	[-0.163]	[-2.118]	[9.958]	[-1.250]	[-2.048]
Constant	0.000	0.000	0.000	0.000	0.000	0.000	0.000	*0.000	0.000	0.000
	[0.652]	[0.619]	[0.407]	[0.811]	[0.578]	[0.134]	[0.774]	[-5.508]	[0.606]	[0.840]
$ar(1)_{i1}$	*0.014	*0.018	*0.107	*-0.039	*-0.023	*0.000	*-0.009	**0.019	*-0.076	*-0.064
	[4.540]	[4.994]	[12.814]	[-9.097]	[-5.289]	[-2.982]	[-3.583]	[2.399]	[-13.043]	[-10.696]
$ar(1)_{ii}$	*-0.038	*-0.049	*-0.131	*-0.083	*-0.063	*-0.171	*-0.055	**0.013	*-0.106	*-0.087
	[-8.416]	[-9.304]	[-16.832]	[-14.907]	[-12.955]	[-32.988]	[-10.624]	[2.077]	[-19.664]	[-16.011]
Constant	0.000	0.000	0.000	*0.000	**0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[0.651]	[1.241]	[1.382]	[-2.620]	[-2.142]	[-11.598]	[3.342]	[-4.963]	[-4.654]	[-4.316]

See Notes (1).

Table 62: 30 Minute VAR-BEKK-GARCH Results for USA Market Period (Contd.)

c_{11}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[26.985]	[23.712]	[15.630]	[30.294]	[-42.419]	[21.194]	[23.824]	[21.153]	[24.839]	[25.526]
c_{i1}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[17.568]	[11.681]	[24.934]	[-20.007]	[17.724]	[3.663]	[-20.201]	[-17.778]	[-6.590]	[-5.100]
c_{ii}	*0.000	*0.000	*0.000	0.000	*0.000	*0.000	*0.000	0.000	*0.000	*0.000
	[12.911]	[19.457]	[4.013]	[1.275]	[19.219]	[14.437]	[25.619]	[-0.001]	[6.042]	[3.430]
α_{11}	*0.229	*0.245	*0.044	*0.250	*0.235	*0.214	*0.202	*0.473	*0.268	*0.268
	[33.952]	[33.985]	[7.931]	[45.273]	[52.300]	[31.651]	[40.477]	[111.102]	[31.466]	[34.220]
α_{1i}	*0.064	*0.051	*-0.359	*-0.085	*-0.051	*0.001	0.004	*-0.452	*-0.085	*-0.089
	[15.563]	[14.182]	[-36.364]	[-23.286]	[-13.617]	[5.429]	[1.048]	[-68.836]	[-13.743]	[-15.465]
α_{i1}	*0.041	*0.022	*0.160	*-0.016	*0.014	-0.115	*-0.025	*0.289	*0.026	*0.030
	[6.301]	[2.828]	[20.777]	[-75.796]	[3.911]	[-1.092]	[-5.009]	[80.025]	[3.586]	[4.605]
α_{ii}	*0.153	*0.115	*0.633	*0.099	*0.133	*0.196	*0.295	*-0.250	*0.098	*0.084
	[26.166]	[26.798]	[71.121]	[48.231]	[37.507]	[52.390]	[50.329]	[-36.300]	[21.114]	[19.580]
β_{11}	*0.967	*0.963	*1.040	*0.960	*0.970	*0.974	*0.976	*0.834	*0.960	*0.959
	[512.706]	[432.828]	[508.626]	[599.541]	[995.263]	[581.195]	[800.569]	[637.745]	[413.042]	[423.148]
β_{1i}	*-0.016	*-0.012	*0.176	*0.020	*0.011	*0.000	**0.002	*0.402	*0.018	*0.019
	[-14.452]	[-10.892]	[35.790]	[20.282]	[13.702]	[-6.885]	[2.322]	[167.238]	[12.020]	[13.521]
β_{i1}	*-0.004	0.000	*-0.071	*-0.004	-0.001	0.013	*0.011	*-0.137	*-0.007	*-0.008
	[-2.968]	[0.235]	[-21.220]	[-32.755]	[-1.029]	[0.668]	[7.236]	[-158.754]	[-4.790]	[-5.227]
β_{ii}	*0.988	*0.994	*0.761	*0.998	*0.990	*0.982	*0.952	*1.025	*0.997	*0.999
	[812.104]	[1358.803]	[121.492]	[5168.255]	[1529.880]	[1528.092]	[498.462]	[793.539]	[1322.219]	[1268.439]

See Notes (1).

Table 63: 30 Minute VAR-BEKK-GARCH Results for USA Market Period (Contd.)

EURUSD	GBPUSD	NZDUSD	USDCAD	USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK
$ar(1)_{11}$	*-0.038	*-0.033	*-0.037	*-0.036	*-0.020	*-0.029	*-0.026	*-0.030	*-0.034
	[-6.199]	[-5.737]	[-6.853]	[-4.575]	[-4.421]	[-6.056]	[-4.667]	[-6.169]	[-8.723]
$ar(1)_{1i}$	*0.026	*0.012	*-0.015	-0.009	**0.137	**-0.011	**-0.004	-0.004	-0.002
	[3.735]	[3.154]	[-3.140]	[-1.529]	[2.220]	[-2.558]	[-2.481]	[-1.716]	[-0.529]
Constant	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	[0.396]	[1.224]	[0.412]	[0.566]	[0.642]	[0.259]	[0.709]	[0.400]	[1.053]
$ar(1)_{i1}$	*0.035	*0.046	*-0.021	*-0.086	0.000	*-0.015	*-0.029	*-0.102	*-0.100
	[6.992]	[6.150]	[-4.342]	[-10.454]	[-1.312]	[-4.609]	[-2.683]	[-16.411]	[-16.018]
$ar(1)_{ii}$	*-0.056	*-0.070	*-0.057	*-0.111	*-0.173	*-0.055	-0.010	*-0.123	*-0.113
	[-9.029]	[-11.259]	[-10.879]	[-15.704]	[-35.062]	[-10.773]	[-1.265]	[-28.627]	[-21.319]
Constant	0.000	**0.000	0.000	**0.000	*0.000	*0.000	0.000	*0.000	*0.000
	[0.357]	[2.489]	[-1.921]	[-2.553]	[-13.150]	[3.629]	[1.502]	[-4.421]	[-4.503]
c_{11}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[11.676]	[14.397]	[26.806]	[8.248]	[39.591]	[21.602]	[9.397]	[15.012]	[32.157]
c_{i1}	*0.000	*0.000	*0.000	*0.000	**0.000	*0.000	*0.000	*0.000	*0.000
	[15.210]	[17.950]	[-21.133]	[-13.015]	[-2.104]	[-24.102]	[-305.532]	[-6.829]	[-13.292]
c_{ii}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.001	*0.000	0.000
	[20.359]	[2.857]	[4.431]	[-3.267]	[19.880]	[19.283]	[304.491]	[19.101]	[0.024]
α_{11}	*0.165	*0.136	*0.215	*0.142	*0.106	*0.173	*0.230	*0.232	*0.378
	[13.132]	[22.393]	[34.796]	[29.806]	[37.767]	[38.029]	[23.287]	[42.480]	[53.667]
α_{1i}	*0.041	0.005	*-0.077	*0.098	*0.000	*0.014	*-0.100	*-0.094	*-0.221
	[5.970]	[0.454]	[-16.955]	[17.291]	[-2.826]	[3.723]	[-7.042]	[-9.625]	[-39.592]
α_{i1}	*0.047	*0.093	*-0.053	*0.028	*-0.252	*-0.026	0.004	*0.031	*0.127
	[5.641]	[16.991]	[-14.105]	[7.508]	[-4.622]	[-6.656]	[1.599]	[9.467]	[34.028]
α_{ii}	*0.148	*0.378	*0.144	*0.212	*0.217	*0.303	*0.128	*0.090	*0.004
	[17.432]	[27.785]	[37.416]	[39.355]	[60.997]	[53.879]	[11.866]	[23.600]	[112.849]
β_{11}	*0.984	*0.997	*0.967	*0.989	*0.994	*0.983	*0.985	*0.970	*0.932
	[348.965]	[610.964]	[514.459]	[1205.664]	[3403.683]	[1036.163]	[422.092]	[614.168]	[372.563]
β_{1i}	*-0.007	*0.016	*0.020	*-0.017	0.000	0.000	*-0.279	*0.017	*0.045
	[-4.124]	[4.160]	[15.779]	[-15.908]	[1.481]	[-0.029]	[-29.500]	[7.919]	[27.681]
β_{i1}	*-0.010	*-0.033	*0.005	*-0.004	*0.051	*0.009	*0.030	*-0.007	*-0.026
	[-5.607]	[-13.464]	[7.030]	[-5.417]	[5.255]	[8.697]	[11.564]	[-12.527]	[-20.549]
β_{ii}	*0.985	*0.904	*0.990	*0.974	*0.978	*0.949	*0.409	*0.998	*1.012
	[548.489]	[133.428]	[1447.972]	[809.794]	[1457.460]	[520.757]	[2666.718]	[2067.288]	[1985.807]

See Notes (1).

Table 64: 30 Minute VAR-BEKK-GARCH Results for USA Market Period (Contd.)

GBPUSD	NZDUSD	USDCAD	USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK
$ar(1)_{11}$	*-0.043	*-0.040	*-0.041	*-0.041	*-0.037	*-0.050	*-0.057	*-0.050
	[-7.707]	[-7.604]	[-6.910]	[-10.821]	[-7.974]	[-9.149]	[-9.255]	[-8.729]
$ar(1)_{1i}$	*0.013	*-0.015	*-0.020	0.053	*-0.016	*-0.017	*-0.019	*-0.022
	[4.185]	[-3.513]	[-4.895]	[1.020]	[-4.364]	[-8.305]	[-6.031]	[-6.684]
Constant	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	[1.613]	[0.760]	[0.583]	[0.587]	[0.842]	[1.833]	[1.915]	[0.285]
$ar(1)_{i1}$	*0.052	*-0.037	*-0.054	0.000	*-0.024	*-0.047	*-0.092	*-0.076
	[6.046]	[-6.632]	[-8.716]	[-1.620]	[-5.737]	[-4.262]	[-11.488]	[-9.829]
$ar(1)_{ii}$	*-0.071	*-0.061	*-0.070	*-0.169	*-0.057	-0.002	*-0.096	*-0.078
	[-12.420]	[-11.799]	[-11.908]	[-35.626]	[-11.478]	[-0.334]	[-18.375]	[-14.747]
Constant	0.000	0.000	**0.000	*0.000	*0.000	0.000	*0.000	*0.000
	[1.894]	[-1.677]	[-2.488]	[-11.147]	[3.597]	[-0.370]	[-4.471]	[-3.218]
c_{11}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[19.683]	[17.467]	[19.673]	[39.754]	[24.288]	[36.715]	[47.856]	[29.618]
c_{i1}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.001	*0.000	*0.000
	[37.950]	[-15.716]	[3.080]	[9.224]	[-18.659]	[32.559]	[-6.188]	[-8.096]
c_{ii}	0.000	*0.000	*0.000	*0.000	*0.000	0.000	0.000	*0.000
	[0.054]	[-8.352]	[12.406]	[-9.650]	[18.981]	[0.000]	[0.000]	[-9.419]
α_{11}	*0.105	*0.148	*0.117	*0.438	*0.126	*0.487	*0.506	*0.150
	[24.602]	[24.839]	[37.340]	[43.081]	[37.785]	[50.094]	[51.975]	[27.942]
α_{1i}	-0.021	*-0.047	*0.090	*0.001	*0.047	*-0.067	*-0.176	*-0.049
	[-1.770]	[-8.617]	[17.573]	[6.523]	[8.943]	[-4.644]	[-11.526]	[-9.642]
α_{i1}	*0.089	*-0.046	*0.019	*0.732	*-0.036	*0.052	*0.095	*-0.014
	[26.001]	[-11.843]	[9.316]	[11.085]	[-10.902]	[11.880]	[12.999]	[-3.038]
α_{ii}	*0.431	*0.146	*0.158	*0.187	*0.332	*0.152	*0.066	*0.113
	[42.037]	[32.124]	[30.728]	[64.522]	[46.819]	[20.164]	[15.404]	[19.254]
β_{11}	*1.000	*0.984	*0.992	*0.857	*0.990	*0.828	*0.826	*0.984
	[1312.809]	[741.507]	[2158.237]	[134.099]	[1856.263]	[138.525]	[139.696]	[997.627]
β_{1i}	*0.025	*0.011	*-0.012	*-0.001	*-0.003	0.013	*0.070	*0.011
	[7.847]	[8.577]	[-15.471]	[-9.811]	[-2.902]	[1.399]	[11.247]	[11.046]
β_{i1}	*-0.032	*0.005	*-0.003	*-0.168	*0.011	*-0.060	*-0.039	0.000
	[-23.678]	[9.044]	[-10.498]	[-9.283]	[11.425]	[-33.330]	[-13.990]	[0.100]
β_{ii}	*0.877	*0.989	*0.985	*0.983	*0.938	*0.912	*1.010	*0.994
	[170.715]	[1403.734]	[1077.016]	[1971.401]	[359.592]	[154.381]	[1321.200]	[1047.596]

See Notes (1).

Table 65: 30 Minute VAR-BEKK-GARCH Results for USA Market Period (Contd.)

NZDUSD	USDCAD	USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK
$ar(1)_{11}$	*-0.075	*-0.058	*-0.055	*-0.058	*-0.071	*-0.071	*-0.076
	[-11.985]	[-10.801]	[-12.209]	[-13.545]	[-11.852]	[-12.750]	[-13.542]
$ar(1)_{1i}$	*-0.045	*-0.025	-0.005	*-0.025	*-0.034	*-0.037	*-0.039
	[-6.051]	[-11.374]	[-0.055]	[-4.422]	[-7.859]	[-7.894]	[-8.011]
Constant	**0.000	0.000	0.000	0.000	**0.000	**0.000	*0.000
	[2.090]	[1.472]	[1.909]	[1.209]	[2.115]	[2.003]	[2.616]
$ar(1)_{i1}$	*-0.022	*-0.018	0.000	**-0.006	*-0.033	*-0.047	*-0.041
	[-5.246]	[-3.886]	[-1.279]	[-2.258]	[-4.431]	[-10.629]	[-8.736]
$ar(1)_{ii}$	*-0.067	*-0.060	*-0.171	*-0.052	*-0.040	*-0.088	*-0.073
	[-11.996]	[-8.294]	[-31.571]	[-11.310]	[-6.849]	[-18.230]	[-14.062]
Constant	**0.000	**0.000	*0.000	*0.000	0.000	*0.000	*0.000
	[-2.472]	[-2.028]	[-11.238]	[4.604]	[-1.658]	[-4.861]	[-4.075]
c_{11}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[32.271]	[27.303]	[17.156]	[33.062]	[32.521]	[37.888]	[36.735]
c_{i1}	*0.000	*0.000	*0.000	*0.000	*0.001	*0.000	**0.000
	[-13.247]	[-29.394]	[15.246]	[-23.555]	[36.023]	[-7.249]	[-2.292]
c_{ii}	0.000	*0.000	0.000	*0.000	0.000	0.000	0.000
	[-0.001]	[16.711]	[0.000]	[32.251]	[0.000]	[0.006]	[-0.005]
α_{11}	*0.448	*0.372	*0.337	*0.323	*0.490	*0.453	*0.469
	[38.009]	[34.467]	[22.180]	[39.091]	[59.356]	[47.168]	[48.660]
α_{1i}	*-0.101	*-0.099	*-0.001	*-0.047	*-0.078	*-0.111	*-0.085
	[-21.846]	[-24.515]	[-7.509]	[-12.519]	[-8.098]	[-16.751]	[-11.204]
α_{i1}	*0.104	*0.025	*-0.527	*-0.074	*0.117	*0.079	*0.102
	[7.531]	[4.918]	[-5.940]	[-10.309]	[17.563]	[8.787]	[10.982]
α_{ii}	*0.083	*0.126	*0.195	*0.301	*0.125	*0.093	*0.083
	[19.506]	[29.962]	[59.052]	[50.270]	[14.463]	[29.332]	[27.158]
β_{11}	*0.877	*0.920	*0.926	*0.929	*0.846	*0.872	*0.857
	[142.740]	[192.043]	[131.088]	[268.417]	[181.852]	[162.910]	[136.848]
β_{1i}	*0.033	*0.030	*0.001	*0.022	0.009	*0.037	*0.028
	[19.320]	[17.288]	[3.029]	[13.514]	[1.639]	[16.202]	[9.471]
β_{i1}	*-0.040	*0.003	*1.386	*0.040	*-0.080	*-0.032	*-0.049
	[-9.631]	[5.890]	[6.327]	[12.403]	[-35.132]	[-9.372]	[-11.807]
β_{ii}	*1.004	*0.989	*-0.982	*0.943	*0.925	*1.002	*1.003
	[1268.621]	[1664.887]	[-1541.614]	[405.522]	[204.187]	[1942.366]	[1548.883]

See Notes (1).

Table 66: 30 Minute VAR-BEKK-GARCH Results for USA Market Period (Contd.)

USDCAD	USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK
$ar(1)_{11}$	-0.015	*-0.084	**-0.053	**0.045	***-0.041	***-0.042
	[-0.819]	[-4.030]	[-2.366]	[2.044]	[-1.680]	[-1.712]
$ar(1)_{1i}$	-0.024	0.059	-0.004	*-0.050	-0.020	-0.018
	[-1.473]	[0.143]	[-0.212]	[-3.703]	[-1.245]	[-1.217]
Constant	0.000	0.000	0.000	*0.000	0.000	0.000
	[0.721]	[1.086]	[0.527]	[4.984]	[1.018]	[1.419]
$ar(1)_{i1}$	-0.048	*0.001	0.010	*0.143	**0.073	0.024
	[-1.399]	[3.151]	[0.511]	[4.731]	[2.347]	[0.770]
$ar(1)_{ii}$	0.024	*-0.067	-0.004	*-0.121	**-0.051	**-0.051
	[0.828]	[-3.094]	[-0.169]	[-4.069]	[-2.172]	[-2.301]
Constant	0.000	0.000	0.000	*0.001	0.000	0.000
	[0.198]	[-0.272]	[1.551]	[10.484]	[1.563]	[1.352]
c_{11}	*0.000	*0.000	*0.000	*0.001	*0.000	*0.000
	[10.078]	[13.879]	[8.390]	[3.844]	[-4.384]	[-5.872]
c_{i1}	*0.002	0.000	0.000	*0.006	***0.000	0.000
	[174.990]	[0.544]	[0.454]	[28.208]	[1.882]	[-0.181]
c_{ii}	*0.002	*0.000	*0.001	0.000	0.000	0.000
	[125.943]	[22.667]	[6.322]	[-0.002]	[0.001]	[0.002]
α_{11}	*0.190	*0.178	*0.227	*0.247	*0.247	*0.218
	[46.127]	[60.231]	[21.084]	[18.754]	[14.189]	[13.966]
α_{1i}	*-0.259	0.000	*-0.057	*0.360	*0.136	*0.135
	[-30.283]	[0.650]	[-5.460]	[6.344]	[5.412]	[5.535]
α_{i1}	-0.015	*0.599	*-0.033	0.019	*-0.046	-0.009
	[-1.627]	[5.133]	[-3.384]	[0.568]	[-2.812]	[-0.729]
α_{ii}	*0.275	*0.518	*0.220	*0.852	*0.114	*0.123
	[11.423]	[124.978]	[39.365]	[16.981]	[7.406]	[7.243]
β_{11}	*0.986	*0.982	*0.971	*1.008	*0.965	*0.972
	[1055.388]	[2053.324]	[365.596]	[75.661]	[209.178]	[300.377]
β_{1i}	*0.088	0.000	*0.015	*0.400	*-0.024	*-0.027
	[14.341]	[-1.266]	[6.031]	[6.080]	[-3.750]	[-5.749]
β_{i1}	*-0.016	*-0.107	0.004	**-0.065	*0.012	***0.004
	[-4.603]	[-3.003]	[1.607]	[-2.130]	[3.007]	[1.727]
β_{ii}	*0.879	*0.902	*0.972	*0.133	*0.992	*0.992
	[724.342]	[798.311]	[973.512]	[2.608]	[348.198]	[453.185]

See Notes (1).

Table 67: 30 Minute VAR-BEKK-GARCH Results for USA Market Period (Contd.)

USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK	**USDHKD**	USDJPY	USDMXN	USDNOK	USDSEK
$ar(1)_{11}$	*-0.058	*-0.061	*-0.114	*-0.068	*-0.071	$ar(1)_{11}$	*-0.170	*-0.172	*-0.172	*-0.173
	[-9.926]	[-11.419]	[-19.218]	[-12.375]	[-11.923]		[-30.718]	[-32.707]	[-32.782]	[-35.670]
$ar(1)_{1i}$	-0.043	*0.027	*0.025	*0.022	*0.025	$ar(1)_{1i}$	0.000	0.000	**0.000	**0.000
	[-0.601]	[4.790]	[7.804]	[5.527]	[5.579]		[-0.044]	[-0.318]	[2.152]	[2.216]
Constant	0.000	0.000	*0.000	0.000	0.000	*Constant*	*0.000	*0.000	*0.000	*0.000
	[-0.234]	[-1.278]	[-4.848]	[-1.509]	[-1.340]		[-10.146]	[-11.079]	[-10.257]	[-10.116]
$ar(1)_{i1}$	0.000	**0.008	*0.050	*0.044	*0.037	$ar(1)_{i1}$	-0.054	-0.094	0.070	-0.152
	[-1.375]	[2.047]	[6.053]	[6.887]	[5.460]		[-0.969]	[-0.561]	[0.702]	[-1.958]
$ar(1)_{ii}$	*-0.170	*-0.056	*-0.017	*-0.091	*-0.077	$ar(1)_{ii}$	*-0.049	0.001	*-0.067	*-0.054
	[-33.633]	[-9.979]	[-3.613]	[-17.702]	[-12.638]		[-9.261]	[0.197]	[-14.944]	[-12.937]
Constant	*0.000	*0.000	*0.000	*0.000	*0.000	*Constant*	*0.000	0.000	*0.000	*0.000
	[-13.021]	[3.886]	[-6.204]	[-3.949]	[-3.607]		[3.291]	[1.073]	[-4.768]	[-3.556]
c_{11}	*0.000	*0.000	*0.000	*0.000	*0.000	c_{11}	*0.000	*0.000	*0.000	*0.000
	[29.920]	[32.536]	[38.070]	[20.046]	[40.527]		[15.025]	[7.592]	[-14.566]	[19.082]
c_{i1}	*0.000	*0.000	*0.000	*0.000	*0.000	c_{i1}	*0.000	*0.001	0.000	*0.000
	[5.403]	[29.185]	[27.183]	[17.340]	[44.023]		[5.428]	[18.217]	[0.767]	[2.964]
c_{ii}	*0.000	*0.000	0.000	*0.000	*0.000	c_{ii}	*0.000	0.000	*0.000	*0.000
	[11.883]	[12.061]	[0.001]	[-16.113]	[-13.322]		[24.030]	[0.000]	[13.688]	[14.565]
α_{11}	*0.410	*0.157	*0.441	*0.129	*0.128	α_{11}	*0.188	*0.220	*0.213	*0.217
	[37.997]	[47.229]	[97.820]	[32.584]	[50.402]		[57.818]	[58.875]	[59.740]	[69.495]
α_{1i}	**0.000	*0.010	*0.163	0.004	*0.004	α_{1i}	-0.045	0.169	0.014	*0.303
	[2.004]	[7.448]	[21.295]	[0.860]	[5.010]		[-0.965]	[1.143]	[0.158]	[4.524]
α_{i1}	*0.769	*0.030	*-0.135	*0.051	*0.054	α_{i1}	*0.001	*0.001	*-0.001	0.000
	[7.519]	[20.793]	[-41.751]	[12.096]	[26.087]		[4.119]	[10.213]	[-4.931]	[-0.168]
α_{ii}	*0.189	*0.272	*0.114	*0.184	*0.183	α_{ii}	*0.345	*0.124	*0.116	*0.103
	[61.411]	[61.235]	[18.844]	[33.383]	[67.250]		[41.861]	[12.751]	[30.611]	[36.303]
β_{11}	*0.873	*0.987	*0.899	*0.989	*0.989	β_{11}	*0.984	*0.978	*0.979	*0.978
	[124.213]	[1780.612]	[605.661]	[1348.426]	[2324.379]		[1839.304]	[1196.851]	[1531.114]	[1775.289]
β_{1i}	*0.000	*-0.002	*-0.215	*-0.003	*-0.003	β_{1i}	0.013	-0.048	-0.007	*-0.060
	[-2.899]	[-26.964]	[-83.567]	[-3.345]	[-9.624]		[1.364]	[-0.640]	[-0.382]	[-4.848]
β_{i1}	*-0.133	*-0.011	*0.052	*-0.010	*-0.011	β_{i1}	*0.000	*-0.001	*0.000	0.000
	[-5.648]	[-18.180]	[94.892]	[-11.258]	[-65.140]		[-5.698]	[-12.544]	[4.569]	[-0.181]
β_{ii}	*0.984	*0.958	*0.998	*0.981	*0.981	β_{ii}	*0.931	*0.812	*0.993	*0.994
	[1971.595]	[735.451]	[1352.263]	[895.646]	[2579.974]		[280.602]	[35.563]	[1986.670]	[2973.511]

See Notes (1).

Table 68: 30 Minute VAR-BEKK-GARCH Results for USA Market Period (Contd.)

USDJPY	USDMXN	USDNOK	USDSEK	**USDMXN**	USDNOK	USDSEK	**USDNOK**	USDSEK
$ar(1)_{11}$	*-0.049 [-9.443]	*-0.059 [-11.182]	*-0.059 [-11.121]	$ar(1)_{11}$	-0.003 [-0.374]	-0.004 [-0.559]	$ar(1)_{11}$	*-0.118 [-17.467]
$ar(1)_{1i}$	*0.015 [7.101]	*0.008 [2.780]	0.005 [1.776]	$ar(1)_{1i}$	0.014 [1.875]	**0.019 [2.449]	$ar(1)_{1i}$	*0.067 [9.903]
Constant	*0.000 [8.468]	*0.000 [4.500]	*0.000 [4.294]	*Constant*	0.000 [1.481]	0.000 [0.331]	*Constant*	*0.000 [-4.319]
$ar(1)_{i1}$	*0.030 [3.027]	*0.024 [3.896]	0.006 [1.208]	$ar(1)_{i1}$	*0.020 [6.671]	*0.010 [3.579]	$ar(1)_{i1}$	*0.049 [7.286]
$ar(1)_{ii}$	*-0.032 [-5.352]	*-0.072 [-15.949]	*-0.055 [-12.217]	$ar(1)_{ii}$	*-0.075 [-15.631]	*-0.059 [-11.532]	$ar(1)_{ii}$	*-0.091 [-13.438]
Constant	*0.000 [-9.267]	*0.000 [-4.936]	*0.000 [-3.854]	*Constant*	*0.000 [-4.351]	*0.000 [-3.986]	*Constant*	*0.000 [-3.704]
c_{11}	*0.000 [31.016]	*0.000 [35.633]	*0.000 [33.730]	c_{11}	*0.001 [295.850]	*0.001 [17.969]	c_{11}	*0.000 [38.201]
c_{i1}	*0.000 [21.412]	*0.000 [12.441]	*0.000 [15.580]	c_{i1}	*0.000 [9.517]	*0.000 [13.727]	c_{i1}	*0.000 [28.585]
c_{ii}	0.000 [0.000]	*0.000 [12.582]	*0.000 [-9.332]	c_{ii}	0.000 [0.024]	0.000 [0.000]	c_{ii}	*0.000 [-15.729]
α_{11}	*0.419 [86.782]	*0.309 [52.595]	*0.297 [51.919]	α_{11}	*0.150 [17.661]	*0.136 [14.892]	α_{11}	*0.150 [24.651]
α_{1i}	*0.167 [19.101]	*0.015 [3.482]	*0.026 [5.730]	α_{1i}	*0.024 [11.492]	*0.035 [14.567]	α_{1i}	*0.052 [9.066]
α_{i1}	*-0.065 [-26.673]	*-0.012 [-3.803]	*-0.013 [-4.101]	α_{i1}	*0.048 [5.104]	*0.036 [3.622]	α_{i1}	0.007 [1.124]
α_{ii}	*0.154 [29.839]	*0.138 [44.813]	*0.133 [42.159]	α_{ii}	*0.148 [26.519]	*0.146 [23.504]	α_{ii}	*0.103 [15.681]
β_{11}	*0.914 [478.483]	*0.946 [468.958]	*0.951 [511.428]	β_{11}	*0.647 [12752.144]	*0.875 [59.562]	β_{11}	*0.988 [1675.753]
β_{1i}	*-0.332 [-96.011]	*-0.007 [-5.631]	*-0.009 [-7.494]	β_{1i}	*-0.030 [-13.365]	*-0.021 [-11.664]	β_{1i}	*-0.006 [-11.988]
β_{i1}	*0.051 [117.793]	**0.001 [2.337]	0.000 [-0.361]	β_{i1}	*0.104 [25.295]	*0.028 [5.893]	β_{i1}	*-0.003 [-4.930]
β_{ii}	*0.969 [927.940]	*0.990 [2156.046]	*0.990 [1920.721]	β_{ii}	*0.996 [1597.687]	*0.992 [970.961]	β_{ii}	*0.992 [1554.584]

See Notes (1).

Appendix A.4.2. Tokyo Market Period

Table 69: 30 Minute VAR-BEKK-GARCH Results for Tokyo Market Period

AUDUSD	EURUSD	GBPUSD	NZDUSD	USDCAD	USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK
$ar(1)_{11}$	*-0.031	*-0.037	*-0.069	*-0.044	*-0.036	*-0.033	*-0.031	*-0.040	*-0.030	*-0.030
	[-4.261]	[-4.884]	[-9.251]	[-5.783]	[-6.467]	[-5.661]	[-5.796]	[-6.271]	[-4.293]	[-4.416]
$ar(1)_{1i}$	-0.009	0.024	*0.041	-0.024	-0.002	-0.229	-0.001	*-0.033	**0.020	0.016
	[-0.772]	[1.518]	[4.774]	[-1.438]	[-0.251]	[-1.772]	[-0.126]	[-3.567]	[2.245]	[1.782]
Constant	0.000	0.000	0.000	0.000	**0.000	0.000	0.000	0.000	0.000	0.000
	[1.617]	[1.960]	[0.860]	[1.746]	[2.424]	[1.765]	[1.817]	[1.161]	[1.319]	[1.442]
$ar(1)_{i1}$	0.001	**0.005	*0.039	*-0.016	-0.004	*-0.001	0.005	*-0.042	*-0.020	*-0.017
	[0.436]	[2.124]	[7.524]	[-6.307]	[-1.484]	[-5.344]	[1.720]	[-17.313]	[-5.640]	[-4.946]
$ar(1)_{ii}$	*-0.049	*-0.058	*-0.065	*-0.070	*-0.042	-0.010	-0.001	*-0.094	*-0.096	*-0.085
	[-7.865]	[-8.972]	[-8.823]	[-10.475]	[-7.476]	[-1.627]	[-0.135]	[-15.777]	[-15.159]	[-13.871]
Constant	**0.000	*0.000	**0.000	**0.000	0.000	0.000	*0.000	0.000	**0.000	0.000
	[2.133]	[3.195]	[2.450]	[-2.113]	[-1.137]	[0.674]	[-2.583]	[1.297]	[1.986]	[1.145]

See Notes (1).

Table 70: 30 Minute VAR-BEKK-GARCH Results for Tokyo Market Period (Contd.)

c_{11}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[11.681]	[15.641]	[41.412]	[28.715]	[16.834]	[16.267]	[19.975]	[14.841]	[10.584]	[11.994]
c_{i1}	0.000	0.000	*0.000	0.000	*0.000	0.000	*0.000	*0.000	*0.000	*0.000
	[0.737]	[-0.968]	[-15.891]	[1.819]	[6.784]	[-0.974]	[3.484]	[-7.891]	[-6.945]	[-3.402]
c_{ii}	*0.000	*0.000	*0.000	0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[13.171]	[-15.544]	[-10.977]	[-1.524]	[-6.388]	[-15.225]	[16.476]	[-11.395]	[15.669]	[12.906]
α_{11}	*0.082	*0.085	*0.570	*0.410	*0.104	*0.079	*0.116	*0.079	*0.081	*0.081
	[30.551]	[30.620]	[47.343]	[30.556]	[30.793]	[34.851]	[36.070]	[29.332]	[32.525]	[35.161]
α_{1i}	*0.006	*-0.006	*-0.072	*0.020	*0.015	0.000	*0.024	*0.011	*-0.010	*-0.007
	[3.047]	[-4.459]	[-73.276]	[4.483]	[7.624]	[-1.382]	[8.990]	[3.592]	[-5.003]	[-5.035]
α_{i1}	*0.063	*0.030	*-0.419	*0.622	*0.037	*-0.470	*0.024	*-0.057	*-0.077	*-0.061
	[5.545]	[3.582]	[-39.383]	[25.035]	[5.868]	[-5.521]	[5.721]	[-9.582]	[-16.159]	[-36.171]
α_{ii}	*0.144	*0.168	*0.216	*0.180	*0.183	*0.241	*0.286	*0.224	*0.158	*0.138
	[38.013]	[33.404]	[46.533]	[19.779]	[37.316]	[63.729]	[44.445]	[33.043]	[41.128]	[44.117]
β_{11}	*0.996	*0.995	*0.511	*0.837	*0.992	*0.996	*0.992	*0.997	*0.997	*0.996
	[3240.241]	[2691.640]	[29.609]	[92.357]	[1812.642]	[4563.362]	[2220.043]	[3580.490]	[3656.346]	[3727.313]
β_{1i}	0.000	*0.001	*0.092	*-0.011	*-0.003	0.000	*-0.005	*-0.002	0.000	**0.000
	[-0.987]	[6.322]	[45.183]	[-5.324]	[-7.793]	[1.567]	[-8.341]	[-4.462]	[1.673]	[2.529]
β_{i1}	*-0.007	-0.001	*0.429	*-0.248	*-0.009	*0.067	*-0.007	*0.012	*0.011	*0.007
	[-3.990]	[-0.787]	[33.575]	[-19.329]	[-8.357]	[4.137]	[-7.429]	[9.312]	[13.677]	[87.798]
β_{ii}	*0.989	*0.984	*0.905	*0.972	*0.983	*0.975	*0.960	*0.972	*0.986	*0.990
	[1777.101]	[991.815]	[350.094]	[281.538]	[1102.176]	[1410.086]	[549.905]	[571.232]	[1592.797]	[2191.139]

See Notes (1).

Table 71: 30 Minute VAR-BEKK-GARCH Results for Tokyo Market Period (Contd.)

EURUSD	GBPUSD	NZDUSD	USDCAD	USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK
$ar(1)_{11}$	*-0.057	*-0.048	*-0.061	*-0.081	*-0.054	*-0.047	*-0.054	*-0.045	*-0.045
	[-7.639]	[-7.679]	[-9.060]	[-13.756]	[-9.458]	[-8.555]	[-9.405]	[-5.531]	[-5.220]
$ar(1)_{1i}$	0.016	0.004	*-0.017	*-0.029	0.087	-0.006	-0.008	0.006	0.006
	[1.842]	[1.224]	[-2.598]	[-5.386]	[1.323]	[-1.714]	[-1.668]	[0.901]	[0.922]
Constant	**0.000	**0.000	**0.000	0.000	0.000	**0.000	0.000	0.000	0.000
	[2.338]	[2.333]	[2.412]	[1.797]	[1.854]	[2.139]	[1.780]	[1.792]	[1.691]
$ar(1)_{i1}$	*0.018	*0.032	*-0.025	*-0.059	*-0.001	**0.011	*-0.071	*-0.098	*-0.073
	[3.320]	[2.931]	[-5.127]	[-11.037]	[-4.940]	[2.199]	[-16.528]	[-9.472]	[-7.024]
$ar(1)_{ii}$	*-0.074	*-0.048	*-0.076	*-0.101	**-0.014	0.001	*-0.088	*-0.156	*-0.126
	[-9.759]	[-7.218]	[-11.547]	[-18.554]	[-2.549]	[0.238]	[-16.395]	[-17.889]	[-14.355]
Constant	*0.000	*0.000	**0.000	0.000	0.000	**0.000	0.000	0.000	0.000
	[2.580]	[3.629]	[-2.464]	[-1.721]	[0.709]	[-2.319]	[1.509]	[0.754]	[0.851]
c_{11}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[12.471]	[11.021]	[15.853]	[13.425]	[10.963]	[13.298]	[11.716]	[11.625]	[14.023]
c_{i1}	**0.000	*0.000	*0.000	*0.000	0.000	0.000	*0.000	*0.000	*0.000
	[-2.189]	[13.865]	[5.909]	[-12.643]	[-0.157]	[0.522]	[2.782]	[34.511]	[3.508]
c_{ii}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	0.000	*0.000
	[15.067]	[-21.415]	[14.068]	[7.442]	[17.126]	[23.290]	[16.523]	[1.364]	[11.611]
α_{11}	*0.149	*0.119	*0.153	*0.173	*0.121	*0.151	*0.126	*0.129	*0.141
	[30.324]	[28.818]	[35.040]	[36.450]	[32.101]	[42.075]	[34.939]	[37.560]	[22.542]
α_{1i}	*-0.035	*-0.079	*0.031	*0.188	0.000	*0.035	*0.072	*0.251	*0.059
	[-8.810]	[-7.860]	[8.166]	[35.074]	[1.053]	[6.601]	[17.205]	[20.883]	[7.267]
α_{i1}	*-0.023	*0.008	*0.022	*0.027	*-0.231	*-0.011	*-0.010	*0.003	*0.017
	[-4.144]	[6.353]	[5.155]	[4.988]	[-5.840]	[-5.319]	[-2.645]	[16.876]	[3.516]
α_{ii}	*0.193	*0.226	*0.173	*0.345	*0.238	*0.284	*0.240	*0.379	*0.195
	[29.058]	[34.961]	[31.906]	[56.868]	[63.771]	[40.853]	[36.524]	[40.120]	[25.321]
β_{11}	*0.988	*-1.008	*0.987	*0.987	*0.993	*0.989	*0.992	*0.993	*0.987
	[1182.323]	[-1056.159]	[1397.473]	[950.270]	[2204.832]	[1897.157]	[2029.505]	[2404.495]	[721.383]
β_{1i}	*0.008	*-1.667	*-0.006	*-0.039	0.000	*-0.007	*-0.011	*-0.106	*-0.014
	[9.902]	[-106.605]	[-9.147]	[-30.228]	[-0.876]	[-8.096]	[-14.430]	[-18.314]	[-7.326]
β_{i1}	*0.006	*0.019	*-0.005	-0.002	*0.040	*0.002	0.000	*0.001	*-0.006
	[4.955]	[19.163]	[-6.050]	[-1.837]	[5.670]	[4.330]	[0.420]	[70.227]	[-4.543]
β_{ii}	*0.977	*0.984	*0.982	*0.947	*0.976	*0.960	*0.967	*0.891	*0.977
	[610.948]	[477.951]	[913.369]	[607.768]	[1514.853]	[516.985]	[532.828]	[161.862]	[508.938]

See Notes (1).

Table 72: 30 Minute VAR-BEKK-GARCH Results for Tokyo Market Period (Contd.)

GBPUSD	NZDUSD	USDCAD	USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK
$ar(1)_{11}$	*-0.066	*-0.066	*-0.065	*-0.052	*-0.057	*-0.056	*-0.062	*-0.065
	[-11.103]	[-10.213]	[-10.044]	[-8.775]	[-9.470]	[-9.631]	[-11.424]	[-10.818]
$ar(1)_{1i}$	*0.007	*-0.019	*-0.015	0.011	*-0.012	**-0.010	-0.006	*-0.009
	[2.852]	[-3.384]	[-3.566]	[0.204]	[-4.159]	[-2.412]	[-1.727]	[-2.764]
Constant	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[3.273]	[3.766]	[3.049]	[3.697]	[2.764]	[2.926]	[2.666]	[3.037]
$ar(1)_{i1}$	*0.060	*-0.044	*-0.021	*-0.002	0.006	*-0.084	*-0.066	*-0.068
	[4.583]	[-7.311]	[-2.688]	[-5.814]	[0.706]	[-14.991]	[-9.031]	[-8.733]
$ar(1)_{ii}$	*-0.052	*-0.075	*-0.054	**-0.013	0.001	*-0.079	*-0.105	*-0.097
	[-8.282]	[-11.782]	[-8.376]	[-2.048]	[0.143]	[-12.785]	[-18.967]	[-16.305]
Constant	*0.000	**0.000	0.000	0.000	*0.000	0.000	0.000	0.000
	[3.264]	[-2.543]	[-0.926]	[0.518]	[-2.694]	[1.664]	[1.623]	[1.261]
c_{11}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[15.891]	[20.002]	[16.807]	[14.380]	[18.551]	[22.149]	[19.436]	[19.401]
c_{i1}	0.000	*0.000	0.000	0.000	**0.000	0.000	*0.000	*0.000
	[-1.387]	[6.577]	[1.723]	[-1.333]	[1.988]	[1.752]	[7.585]	[6.126]
c_{ii}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[16.568]	[14.634]	[-10.239]	[-12.192]	[22.178]	[16.672]	[12.029]	[11.206]
α_{11}	*0.159	*0.187	*0.157	*0.130	*0.157	*0.138	*0.189	*0.206
	[29.454]	[29.856]	[33.677]	[31.383]	[37.559]	[37.423]	[30.832]	[30.441]
α_{1i}	*-0.064	*0.027	*0.044	*-0.001	*0.071	*0.074	*0.039	**0.015
	[-5.085]	[6.016]	[7.728]	[-3.823]	[10.325]	[13.279]	[6.908]	[2.432]
α_{i1}	*-0.007	*0.048	*0.014	*-0.194	**-0.005	*-0.010	*0.023	*0.033
	[-3.164]	[9.213]	[5.674]	[-4.957]	[-2.472]	[-3.040]	[8.154]	[9.787]
α_{ii}	*0.197	*0.175	*0.197	*0.236	*0.300	*0.230	*0.154	*0.133
	[27.868]	[32.901]	[29.871]	[57.981]	[43.864]	[42.289]	[33.036]	[30.364]
β_{11}	*0.985	*0.978	*0.986	*0.991	*0.986	*0.990	*0.978	*0.974
	[858.104]	[678.514]	[1119.892]	[1616.311]	[1353.967]	[1789.253]	[660.478]	[539.397]
β_{1i}	*0.018	*-0.008	*-0.010	*0.000	*-0.015	*-0.014	*-0.011	*-0.005
	[6.259]	[-6.925]	[-8.337]	[3.431]	[-9.558]	[-11.928]	[-9.040]	[-4.221]
β_{i1}	*0.002	*-0.011	*-0.003	*0.030	0.000	0.001	*-0.006	*-0.008
	[3.750]	[-9.312]	[-5.384]	[4.072]	[0.647]	[1.801]	[-8.999]	[-10.015]
β_{ii}	*0.975	*0.982	*0.980	*0.976	*0.955	*0.970	*0.986	*0.990
	[548.904]	[855.008]	[764.802]	[1345.122]	[484.180]	[714.041]	[1164.194]	[1380.437]

See Notes (1).

Table 73: 30 Minute VAR-BEKK-GARCH Results for Tokyo Market Period (Contd.)

NZDUSD	USDCAD	USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK
$ar(1)_{11}$	*-0.061	*-0.050	*-0.038	*-0.036	*-0.047	*-0.045	*-0.045
	[-9.132]	[-8.385]	[-7.711]	[-6.936]	[-7.509]	[-7.242]	[-7.220]
$ar(1)_{1i}$	*-0.089	*-0.029	-0.244	-0.006	*-0.055	-0.014	**-0.015
	[-7.039]	[-3.007]	[-1.933]	[-0.928]	[-5.799]	[-1.845]	[-2.147]
Constant	*0.000	*0.000	*0.000	*0.000	**0.000	*0.000	*0.000
	[2.651]	[3.435]	[2.835]	[3.259]	[2.265]	[2.700]	[2.885]
$ar(1)_{i1}$	*-0.016	-0.001	*-0.001	-0.001	*-0.045	*-0.020	*-0.020
	[-5.869]	[-0.481]	[-4.232]	[-0.258]	[-15.318]	[-5.249]	[-6.793]
$ar(1)_{ii}$	*-0.066	*-0.043	-0.010	-0.006	*-0.086	*-0.095	*-0.087
	[-10.453]	[-6.921]	[-1.526]	[-0.971]	[-13.150]	[-14.987]	[-13.986]
Constant	**0.000	0.000	0.000	**0.000	0.000	**0.000	0.000
	[-2.279]	[-0.668]	[0.862]	[-2.343]	[1.619]	[2.213]	[1.371]
c_{11}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[16.782]	[19.134]	[12.632]	[17.765]	[19.129]	[37.932]	[18.238]
c_{i1}	*0.000	*0.000	**0.000	0.000	*0.000	*0.000	*0.000
	[-8.530]	[6.926]	[-2.151]	[-0.467]	[-13.927]	[8.418]	[3.478]
c_{ii}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[-12.042]	[-3.914]	[-12.282]	[27.684]	[8.998]	[-9.699]	[-11.960]
α_{11}	*0.196	*0.171	*0.141	*0.190	*0.181	*0.198	*0.205
	[23.630]	[36.625]	[23.566]	[35.532]	[26.948]	[45.908]	[31.143]
α_{1i}	*-0.015	*0.028	*0.000	*0.022	*-0.019	*0.013	0.001
	[-6.031]	[11.452]	[-3.452]	[7.220]	[-6.747]	[7.899]	[0.298]
α_{i1}	-0.027	*0.067	*-0.519	0.009	*-0.064	*0.047	*0.046
	[-1.519]	[11.021]	[-6.429]	[1.834]	[-9.330]	[18.971]	[5.369]
α_{ii}	*0.146	*0.188	*0.235	*0.299	*0.174	*0.140	*0.128
	[23.364]	[36.381]	[59.590]	[49.458]	[25.811]	[46.524]	[30.561]
β_{11}	*0.974	*0.981	*0.988	*0.978	*0.978	*0.974	*0.973
	[426.099]	[946.216]	[898.589]	[766.491]	[571.460]	[1245.111]	[515.201]
β_{1i}	*0.004	*-0.006	*0.000	*-0.004	*0.005	*-0.004	-0.001
	[5.404]	[-11.352]	[3.032]	[-4.863]	[7.145]	[-43.578]	[-1.745]
β_{i1}	-0.002	*-0.014	*0.093	*-0.004	*0.012	*-0.013	*-0.012
	[-0.621]	[-11.416]	[6.272]	[-3.128]	[8.025]	[-35.352]	[-7.672]
β_{ii}	*0.990	*0.981	*0.976	*0.956	*0.983	*0.988	*0.991
	[858.357]	[988.235]	[1423.930]	[551.807]	[729.025]	[2309.546]	[1468.566]

See Notes (1).

Table 74: 30 Minute VAR-BEKK-GARCH Results for Tokyo Market Period (Contd.)

USDCAD	USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK
$ar(1)_{11}$	*-0.065	*-0.051	*-0.051	*-0.061	*-0.063	*-0.075
	[-13.503]	[-9.653]	[-8.492]	[-10.137]	[-10.934]	[-12.180]
$ar(1)_{1i}$	*0.018	**0.128	0.005	*0.014	*0.010	*0.017
	[5.738]	[2.260]	[1.741]	[2.738]	[3.011]	[4.367]
Constant	*0.000	**0.000	*0.000	**0.000	**0.000	**0.000
	[-2.860]	[-2.214]	[-3.010]	[-2.040]	[-2.141]	[-1.980]
$ar(1)_{i1}$	*0.030	*0.001	0.002	*0.111	*0.057	*0.042
	[4.625]	[4.761]	[0.384]	[17.778]	[7.777]	[5.225]
$ar(1)_{ii}$	*-0.057	-0.010	-0.008	*-0.092	*-0.102	*-0.093
	[-11.510]	[-1.835]	[-1.287]	[-12.709]	[-17.297]	[-15.351]
Constant	0.000	0.000	*0.000	0.000	0.000	0.000
	[-0.844]	[0.745]	[-2.713]	[1.157]	[1.475]	[1.640]
c_{11}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[23.667]	[13.757]	[18.615]	[14.148]	[19.388]	[15.499]
c_{i1}	*0.000	0.000	**0.000	0.000	*0.000	*0.000
	[-23.155]	[0.139]	[2.531]	[1.111]	[-5.933]	[-12.194]
c_{ii}	*0.000	*0.000	*0.000	*0.000	*0.000	0.000
	[12.064]	[-15.072]	[25.869]	[24.686]	[12.599]	[0.009]
α_{11}	*0.160	*0.135	*0.168	*0.127	*0.170	*0.200
	[57.910]	[29.632]	[38.029]	[28.355]	[31.501]	[30.375]
α_{1i}	*-0.067	*0.001	*-0.050	*-0.081	*-0.043	0.005
	[-17.664]	[3.233]	[-8.099]	[-11.817]	[-6.833]	[1.478]
α_{i1}	*-0.026	*0.316	-0.001	*0.016	*-0.011	*-0.016
	[-11.090]	[8.134]	[-0.397]	[4.469]	[-3.707]	[-4.091]
α_{ii}	*0.210	*0.236	*0.291	*0.245	*0.154	*0.119
	[93.407]	[61.648]	[45.977]	[37.146]	[33.442]	[27.558]
β_{11}	*0.985	*0.990	*0.984	*0.992	*0.983	*-0.984
	[2074.648]	[1428.781]	[1242.149]	[1490.400]	[910.176]	[-555.606]
β_{1i}	*0.014	**0.000	*0.008	*0.015	*0.009	*-0.027
	[25.058]	[-2.115]	[5.839]	[11.586]	[8.240]	[-10.675]
β_{i1}	*0.005	*-0.056	0.000	*-0.004	*0.004	*0.592
	[12.127]	[-7.600]	[0.750]	[-4.065]	[6.199]	[91.327]
β_{ii}	*0.977	*0.976	*0.958	*0.966	*0.986	*1.001
	[2554.065]	[1363.271]	[549.033]	[544.424]	[1257.170]	[1102.408]

See Notes (1).

Table 75: 30 Minute VAR-BEKK-GARCH Results for Tokyo Market Period (Contd.)

USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK	**USDHKD**	USDJPY	USDMXN	USDNOK	USDSEK
$ar(1)_{11}$	*-0.038	*-0.039	*-0.047	*-0.054	*-0.058	$ar(1)_{11}$	**-0.013	**-0.011	**-0.015	**-0.013
	[-7.109]	[-6.584]	[-8.062]	[-7.898]	[-8.361]		[-2.351]	[-2.134]	[-2.434]	[-2.250]
$ar(1)_{1i}$	*-0.169	*0.023	**0.014	0.010	*0.014	$ar(1)_{1i}$	0.000	*0.001	*0.001	*0.001
	[-3.016]	[6.111]	[2.536]	[1.809]	[2.600]		[1.626]	[3.980]	[5.522]	[4.004]
Constant	0.000	0.000	0.000	0.000	0.000	*Constant*	0.000	0.000	0.000	0.000
	[-0.534]	[-0.421]	[0.083]	[-0.210]	[-0.209]		[1.144]	[0.901]	[1.123]	[0.797]
$ar(1)_{i1}$	*0.001	-0.008	*0.044	*0.049	*0.039	$ar(1)_{i1}$	-0.072	*0.344	-0.046	-0.028
	[5.136]	[-1.293]	[9.711]	[6.735]	[5.136]		[-0.915]	[5.987]	[-0.553]	[-0.367]
$ar(1)_{ii}$	**-0.013	0.010	*-0.076	*-0.111	*-0.095	$ar(1)_{ii}$	0.001	*-0.063	*-0.087	*-0.080
	[-2.071]	[1.588]	[-12.393]	[-16.801]	[-13.791]		[0.145]	[-12.454]	[-15.150]	[-14.841]
Constant	0.000	**0.000	0.000	0.000	0.000	*Constant*	**0.000	0.000	0.000	0.000
	[0.391]	[-1.977]	[1.317]	[1.759]	[1.370]		[-2.512]	[0.965]	[1.742]	[1.336]
c_{11}	*0.000	*0.000	*0.000	*0.000	*0.000	c_{11}	*0.000	*0.000	*0.000	*0.000
	[13.244]	[24.788]	[-13.930]	[14.038]	[11.538]		[-13.978]	[16.804]	[-13.678]	[17.704]
c_{i1}	0.000	*0.000	0.000	*0.000	*0.000	c_{i1}	*0.000	*0.000	*0.000	0.000
	[0.911]	[23.132]	[1.317]	[-5.297]	[-3.685]		[2.726]	[5.301]	[12.412]	[-0.665]
c_{ii}	*0.000	*0.000	*0.000	*0.000	*0.000	c_{ii}	*0.000	*0.000	0.000	*0.000
	[-15.371]	[-7.125]	[19.321]	[10.935]	[-8.879]		[21.004]	[15.641]	[-0.002]	[10.431]
α_{11}	*0.152	*0.144	*0.165	*0.229	*0.227	α_{11}	*0.220	*0.238	*0.237	*0.238
	[36.169]	[37.023]	[39.990]	[37.578]	[32.482]		[71.713]	[67.565]	[63.718]	[59.738]
α_{1i}	*0.000	0.007	*-0.032	*-0.044	*-0.016	α_{1i}	*0.332	*0.510	*0.303	*0.245
	[2.787]	[1.478]	[-8.549]	[-10.367]	[-3.175]		[5.390]	[13.009]	[6.468]	[5.445]
α_{i1}	*0.181	*0.031	-0.001	*-0.078	*-0.081	α_{i1}	*0.000	*0.001	*-0.001	*0.000
	[3.277]	[13.480]	[-0.249]	[-19.614]	[-19.148]		[-3.102]	[5.158]	[-5.156]	[-3.162]
α_{ii}	*0.236	*0.301	*0.207	*0.159	*0.134	α_{ii}	*0.301	*0.206	*0.126	*0.115
	[62.745]	[41.997]	[38.399]	[39.607]	[29.967]		[45.150]	[41.345]	[34.694]	[31.658]
β_{11}	*0.989	*-0.986	*0.987	*0.972	*0.973	β_{11}	*0.979	*0.976	*-0.976	*0.976
	[1594.955]	[-1922.418]	[1447.677]	[704.861]	[623.243]		[1871.476]	[1694.828]	[-1252.504]	[1407.856]
β_{1i}	*0.000	*0.022	*0.005	*0.009	**0.002	β_{1i}	*-0.061	*-0.097	*-2.132	*-0.040
	[-2.620]	[98.812]	[8.005]	[10.475]	[2.455]		[-5.156]	[-12.886]	[-9.880]	[-4.851]
β_{i1}	*-0.030	*0.408	0.001	*0.015	*0.015	β_{i1}	*0.000	*0.000	0.000	**0.000
	[-2.841]	[51.056]	[1.180]	[16.383]	[15.925]		[3.976]	[-5.927]	[-0.672]	[2.113]
β_{ii}	*0.976	*0.950	*0.976	*0.985	*0.991	β_{ii}	*0.954	*0.975	*0.991	*0.993
	[1451.902]	[483.270]	[790.915]	[1321.281]	[1364.848]		[494.548]	[798.161]	[1358.648]	[2355.030]

See Notes (1).

Table 76: 30 Minute VAR-BEKK-GARCH Results for Tokyo Market Period (Contd.)

USDJPY	USDMXN	USDNOK	USDSEK	**USDMXN**	USDNOK	USDSEK	**USDNOK**	USDSEK
$ar(1)_{11}$	-0.003 [-0.503]	-0.005 [-0.823]	-0.003 [-0.559]	$ar(1)_{11}$	*-0.084 [-14.084]	*-0.086 [-13.830]	$ar(1)_{11}$	*-0.135 [-18.403]
$ar(1)_{1i}$	-0.011 [-1.874]	-0.006 [-1.327]	-0.005 [-1.223]	$ar(1)_{1i}$	*0.053 [12.186]	*0.055 [14.539]	$ar(1)_{1i}$	*0.067 [10.572]
Constant	**0.000 [-2.526]	*0.000 [-3.174]	*0.000 [-3.109]	*Constant*	0.000 [1.097]	0.000 [1.915]	*Constant*	0.000 [1.697]
$ar(1)_{i1}$	0.000 [-0.042]	0.003 [0.724]	0.004 [0.950]	$ar(1)_{i1}$	*0.028 [4.102]	*0.028 [4.455]	$ar(1)_{i1}$	*0.052 [7.863]
$ar(1)_{ii}$	*-0.061 [-11.953]	*-0.080 [-13.646]	*-0.073 [-12.510]	$ar(1)_{ii}$	*-0.089 [-14.604]	*-0.084 [-14.834]	$ar(1)_{ii}$	*-0.114 [-15.683]
Constant	0.000 [0.795]	0.000 [1.338]	0.000 [0.785]	*Constant*	**0.000 [2.057]	**0.000 [2.308]	*Constant*	0.000 [1.637]
c_{11}	*0.000 [32.116]	*0.000 [25.867]	*0.000 [26.813]	c_{11}	*0.000 [24.415]	*0.000 [21.261]	c_{11}	*0.000 [14.005]
c_{i1}	*0.000 [4.238]	*0.000 [-3.798]	0.000 [-0.222]	c_{i1}	*0.000 [-4.411]	*0.000 [-6.186]	c_{i1}	*0.000 [-11.557]
c_{ii}	*0.000 [20.201]	*0.000 [14.309]	*0.000 [13.229]	c_{ii}	*0.000 [12.342]	*0.000 [8.795]	c_{ii}	*0.000 [6.925]
α_{11}	*0.294 [52.946]	*0.295 [45.869]	*0.296 [44.463]	α_{11}	*0.250 [40.443]	*0.271 [38.189]	α_{11}	*0.256 [20.572]
α_{1i}	0.000 [-0.013]	-0.003 [-1.200]	*0.010 [3.274]	α_{1i}	-0.002 [-0.336]	0.002 [0.591]	α_{1i}	*-0.038 [-8.621]
α_{i1}	-0.010 [-1.943]	*-0.046 [-10.253]	*-0.023 [-4.339]	α_{i1}	*-0.057 [-14.403]	*-0.084 [-18.894]	α_{i1}	*-0.117 [-12.061]
α_{ii}	*0.200 [35.659]	*0.143 [42.408]	*0.146 [40.990]	α_{ii}	*0.131 [30.979]	*0.119 [41.018]	α_{ii}	*0.158 [30.322]
β_{11}	*0.957 [636.736]	*0.956 [524.300]	*0.957 [523.590]	β_{11}	*0.964 [559.381]	*0.957 [409.037]	β_{11}	*0.952 [207.235]
β_{1i}	-0.001 [-1.467]	*0.002 [2.867]	**-0.002 [-2.410]	β_{1i}	*0.003 [2.803]	*0.003 [2.601]	β_{1i}	*0.008 [9.881]
β_{i1}	0.000 [0.100]	*0.009 [10.761]	*0.005 [4.968]	β_{i1}	*0.009 [13.197]	*0.013 [15.336]	β_{i1}	*0.037 [9.915]
β_{ii}	*0.977 [757.216]	*0.989 [1993.331]	*0.989 [1845.309]	β_{ii}	*0.991 [1584.305]	*0.992 [2430.649]	β_{ii}	*0.984 [1033.338]

See Notes (1).

Appendix A.4.3. London Market Period

Table 77: 30 Minute VAR-BEKK-GARCH Results for London Market Period

AUDUSD	EURUSD	GBPUSD	NZDUSD	USDCAD	USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK
$ar(1)_{11}$	*-0.032	*-0.030	*-0.041	*-0.043	*-0.029	*-0.030	*-0.033	*-0.047	*-0.028	*-0.030
	[-9.613]	[-7.867]	[-11.737]	[-8.727]	[-6.580]	[-7.581]	[-8.467]	[-11.104]	[-6.221]	[-6.623]
$ar(1)_{1i}$	**0.006	0.004	*0.015	*-0.026	-0.003	0.027	*-0.013	*-0.032	-0.002	-0.003
	[2.005]	[1.258]	[6.064]	[-4.719]	[-0.721]	[0.383]	[-3.057]	[-8.363]	[-0.638]	[-0.996]
Constant	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	[0.600]	[0.121]	[0.141]	[0.660]	[0.128]	[-0.188]	[1.447]	[0.485]	[0.181]	[0.111]
$ar(1)_{i1}$	-0.006	*0.014	*0.077	*-0.019	**-0.009	**0.000	*-0.007	*-0.044	*-0.051	*-0.041
	[-1.952]	[6.870]	[21.236]	[-4.096]	[-2.006]	[-2.338]	[-2.612]	[-10.366]	[-9.821]	[-6.972]
$ar(1)_{ii}$	0.003	*-0.028	*-0.101	*-0.039	*-0.031	*-0.120	*-0.035	*-0.035	*-0.064	*-0.055
	[0.926]	[-7.715]	[-37.463]	[-7.032]	[-6.500]	[-27.022]	[-8.642]	[-8.034]	[-14.735]	[-11.963]
Constant	*0.000	0.000	0.000	**0.000	0.000	0.000	**0.000	0.000	0.000	**0.000
	[-2.768]	[-1.304]	[0.910]	[2.402]	[-0.843]	[-1.418]	[2.152]	[0.204]	[1.884]	[2.141]

See Notes (1).

Table 78: 30 Minute VAR-BEKK-GARCH Results for London Market Period (Contd.)

c_{11}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[13.630]	[17.364]	[15.180]	[-13.320]	[13.614]	[16.115]	[5.223]	[16.551]	[16.448]	[16.277]
c_{i1}	*0.000	0.000	*0.000	*0.000	*0.000	0.000	*0.000	*0.000	**0.000	**0.000
	[-4.431]	[0.111]	[13.200]	[-22.681]	[3.445]	[-0.773]	[-32.364]	[-5.670]	[2.569]	[2.226]
c_{ii}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[12.910]	[14.739]	[-13.254]	[7.393]	[18.171]	[15.833]	[28.332]	[21.126]	[17.868]	[-14.739]
α_{11}	*0.152	*0.150	*0.099	*0.132	*0.132	*0.107	*0.132	*0.120	*0.136	*0.141
	[42.998]	[42.338]	[17.062]	[20.620]	[46.658]	[45.479]	[55.634]	[36.013]	[41.783]	[58.429]
α_{1i}	-0.003	*0.012	*-0.025	*0.221	*0.039	0.000	*0.030	*0.018	0.008	0.000
	[-1.096]	[4.027]	[-3.209]	[36.728]	[13.797]	[-1.195]	[15.764]	[4.683]	[1.594]	[0.986]
α_{i1}	*-0.041	*-0.017	*0.030	*0.030	*0.031	*-0.260	*0.042	*-0.016	*0.012	*0.019
	[-13.708]	[-4.392]	[6.290]	[3.431]	[16.093]	[-3.294]	[19.955]	[-4.569]	[5.183]	[15.615]
α_{ii}	*0.105	*0.078	*0.157	*0.412	*0.140	*0.290	*0.169	*0.175	*0.111	*0.104
	[32.549]	[30.564]	[26.867]	[42.905]	[52.149]	[78.653]	[59.407]	[40.207]	[26.692]	[37.783]
β_{11}	*0.988	*0.988	*0.995	*0.983	*0.990	*0.994	*0.991	*0.993	*0.990	*0.990
	[1722.195]	[1845.922]	[1591.773]	[449.872]	[2644.054]	[3889.033]	[3333.217]	[2262.939]	[2117.129]	[2715.913]
β_{1i}	*0.001	**-0.001	*0.004	*-0.077	*-0.005	0.000	*-0.004	*-0.003	*-0.003	*-0.001
	[2.741]	[-2.281]	[4.289]	[-30.718]	[-12.525]	[0.879]	[-14.232]	[-5.683]	[-3.415]	[-11.439]
β_{i1}	*0.006	*0.002	*-0.004	*-0.017	*-0.005	*0.048	*-0.006	*0.002	*-0.002	*-0.003
	[12.848]	[5.408]	[-6.842]	[-5.427]	[-17.323]	[2.685]	[-16.914]	[4.342]	[-5.303]	[-18.764]
β_{ii}	*0.994	*0.997	*0.987	*0.876	*0.990	*0.965	*0.984	*0.984	*0.992	*0.994
	[2293.881]	[3905.848]	[1322.827]	[190.016]	[2721.026]	[1241.228]	[1941.787]	[1222.170]	[1492.101]	[3157.554]

See Notes (1).

Table 79: 30 Minute VAR-BEKK-GARCH Results for London Market Period (Contd.)

EURUSD	GBPUSD	NZDUSD	USDCAD	USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK
$ar(1)_{11}$	0.005	0.003	0.002	-0.012	0.002	0.000	-0.001	0.006	0.010
	[1.067]	[0.670]	[0.401]	[-1.926]	[0.443]	[-0.052]	[-0.118]	[1.129]	[1.724]
$ar(1)_{1i}$	-0.004	-0.006	0.001	0.035	0.070	-0.005	0.001	0.005	0.008
	[-0.829]	[-1.624]	[0.146]	[6.564]	[1.411]	[-1.173]	[0.292]	[1.553]	[1.908]
Constant	**0.000	*0.000	**0.000	0.000	**0.000	0.000	0.000	**0.000	**0.000
	[-2.282]	[-2.666]	[-2.389]	[-2.812]	[-2.007]	[-1.658]	[-1.361]	[-2.285]	[-2.487]
$ar(1)_{i1}$	*0.025	*0.027	0.001	-0.058	0.000	**-0.008	*-0.021	*-0.058	*-0.077
	[5.789]	[4.954]	[0.239]	[-7.800]	[-1.456]	[-2.525]	[-5.118]	[-7.876]	[-9.833]
$ar(1)_{ii}$	*-0.035	*-0.057	*-0.012	-0.125	*-0.120	*-0.025	*-0.022	*-0.073	*-0.077
	[-7.346]	[-12.479]	[-2.986]	[-17.955]	[-27.157]	[-6.504]	[-5.254]	[-13.325]	[-12.936]
Constant	0.000	0.000	**0.000	0.000	0.000	**0.000	0.000	0.000	**0.000
	[-1.607]	[1.578]	[2.036]	[3.655]	[-1.528]	[2.355]	[0.624]	[0.826]	[2.127]
c_{11}	*0.000	*0.000	*0.000	0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[18.093]	[22.593]	[19.793]	[37.724]	[14.846]	[12.904]	[17.826]	[19.117]	[18.724]
c_{i1}	0.000	*0.000	*0.000	0.000	0.000	*0.000	*0.000	*0.000	*0.000
	[-1.118]	[-4.430]	[5.089]	[-29.239]	[0.483]	[-5.249]	[4.618]	[6.350]	[3.097]
c_{ii}	*0.000	*0.000	*0.000	0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[10.642]	[32.043]	[-12.551]	[-3.334]	[-19.768]	[22.805]	[16.740]	[24.410]	[-13.203]
α_{11}	*0.119	*0.105	*0.111	0.139	*0.077	*0.109	*0.105	*0.100	*0.106
	[29.333]	[39.538]	[33.967]	[28.264]	[37.358]	[43.029]	[36.080]	[34.498]	[27.445]
α_{1i}	*0.010	*-0.059	**0.005	0.166	0.000	*0.035	*0.025	*0.046	*0.093
	[4.279]	[-18.644]	[2.029]	[31.321]	[-1.515]	[16.384]	[7.504]	[9.597]	[16.000]
α_{i1}	*-0.023	*-0.009	*0.014	-0.203	-0.093	*0.022	0.001	*0.006	**0.007
	[-5.858]	[-4.426]	[5.561]	[-47.193]	[-1.904]	[11.075]	[0.368]	[3.369]	[2.247]
α_{ii}	*0.071	*0.153	*0.077	0.462	*0.288	*0.170	*0.174	*0.137	*0.188
	[28.168]	[45.729]	[29.911]	[110.819]	[80.610]	[53.313]	[44.981]	[33.789]	[31.201]
β_{11}	*0.992	*0.994	*0.993	1.009	*0.997	*0.994	*0.994	*0.994	*0.993
	[1915.122]	[3261.687]	[2373.211]	[333.305]	[5851.306]	[3294.894]	[2695.047]	[2516.421]	[1471.698]
β_{1i}	**-0.001	*0.008	**-0.001	-0.082	0.000	*-0.004	*-0.005	*-0.009	*-0.017
	[-2.099]	[19.408]	[-2.572]	[-23.871]	[1.098]	[-16.041]	[-10.168]	[-11.263]	[-12.695]
β_{i1}	*0.002	*0.001	*-0.002	0.089	-0.001	*-0.003	-0.001	*-0.001	*-0.002
	[6.126]	[5.711]	[-7.050]	[48.733]	[-0.070]	[-9.452]	[-1.241]	[-4.399]	[-3.485]
β_{ii}	*0.997	*0.987	*0.997	0.887	*0.965	*0.984	*0.983	*0.988	*0.980
	[4243.461]	[1923.025]	[3788.381]	[496.632]	[1389.214]	[1710.087]	[1363.139]	[1361.685]	[738.141]

See Notes (1).

Table 80: 30 Minute VAR-BEKK-GARCH Results for London Market Period (Contd.)

GBPUSD	NZDUSD	USDCAD	USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK
$ar(1)_{11}$	*-0.027	*-0.026	*-0.026	*-0.020	*-0.020	*-0.025	*-0.027	*-0.029
	[-6.124]	[-6.712]	[-5.670]	[-5.028]	[-5.002]	[-5.920]	[-6.210]	[-6.058]
$ar(1)_{1i}$	*0.009	*-0.013	*-0.011	-0.068	-0.004	*-0.010	*-0.011	*-0.012
	[2.805]	[-4.065]	[-3.237]	[-0.931]	[-1.036]	[-3.326]	[-3.986]	[-4.731]
Constant	0.000	0.000	**0.000	0.000	0.000	0.000	0.000	0.000
	[-1.311]	[-1.673]	[-2.207]	[-1.135]	[-1.255]	[-0.615]	[-1.319]	[-1.575]
$ar(1)_{i1}$	**0.014	-0.003	-0.004	*0.000	**-0.007	*-0.019	*-0.027	*-0.033
	[2.537]	[-0.671]	[-0.761]	[-3.013]	[-2.535]	[-4.289]	[-4.138]	[-5.385]
$ar(1)_{ii}$	*-0.049	*-0.015	*-0.024	*-0.120	*-0.026	*-0.018	*-0.046	*-0.045
	[-10.595]	[-4.194]	[-5.111]	[-22.879]	[-5.923]	[-4.297]	[-10.384]	[-9.993]
Constant	0.000	0.000	0.000	0.000	**0.000	0.000	0.000	**0.000
	[1.104]	[1.812]	[-0.852]	[-1.604]	[2.501]	[0.363]	[1.368]	[1.992]
c_{11}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[-14.004]	[15.836]	[-14.540]	[15.281]	[13.249]	[12.535]	[14.678]	[17.597]
c_{i1}	0.000	*0.000	*0.000	0.000	*0.000	0.000	*0.000	*0.000
	[1.377]	[-3.116]	[-3.246]	[-0.222]	[-41.931]	[0.248]	[2.998]	[6.628]
c_{ii}	*0.000	*0.000	*0.000	*0.000	0.000	*0.000	*0.000	*0.000
	[17.931]	[-13.327]	[-11.240]	[16.807]	[-0.736]	[-28.924]	[-18.872]	[-9.312]
α_{11}	*0.079	*0.085	*0.075	*0.074	*0.108	*0.081	*0.081	*0.079
	[34.629]	[34.535]	[40.972]	[43.880]	[40.287]	[40.982]	[42.069]	[39.736]
α_{1i}	*-0.041	-0.004	*0.048	*0.000	*0.041	0.007	*0.021	*0.044
	[-8.929]	[-1.286]	[11.464]	[-2.872]	[7.248]	[1.658]	[3.965]	[9.289]
α_{i1}	0.002	*-0.015	0.003	0.072	*-0.035	*-0.011	**0.003	0.004
	[1.022]	[-7.270]	[1.475]	[1.561]	[-6.316]	[-5.233]	[1.962]	[1.954]
α_{ii}	*0.155	*0.076	*0.160	*0.290	*0.425	*0.173	*0.129	*0.154
	[43.157]	[38.908]	[29.003]	[78.906]	[49.060]	[48.325]	[36.377]	[28.278]
β_{11}	*0.996	*0.996	*0.997	*0.997	*0.993	*0.997	*0.996	*0.996
	[4022.373]	[4123.478]	[5454.515]	[7601.800]	[2025.986]	[5324.136]	[4665.376]	[3754.032]
β_{1i}	*0.005	0.000	*-0.006	0.000	0.000	*-0.001	*-0.004	*-0.007
	[9.351]	[1.588]	[-10.680]	[1.887]	[-0.082]	[-3.156]	[-6.219]	[-8.634]
β_{i1}	0.000	*0.001	**-0.001	*-0.029	*0.015	*0.001	*-0.001	*-0.001
	[1.004]	[5.333]	[-2.449]	[-3.119]	[7.225]	[2.702]	[-3.128]	[-3.968]
β_{ii}	*0.987	*0.997	*0.988	*0.965	*0.883	*0.984	*0.990	*0.987
	[1659.624]	[6257.249]	[1180.978]	[1285.759]	[189.786]	[1651.835]	[1726.479]	[1028.920]

See Notes (1).

Table 81: 30 Minute VAR-BEKK-GARCH Results for London Market Period (Contd.)

NZDUSD	USDCAD	USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK
$ar(1)_{11}$	*-0.065	*-0.050	*-0.045	*-0.052	*-0.063	*-0.052	*-0.053
	[-18.260]	[-11.045]	[-9.750]	[-12.857]	[-14.086]	[-10.815]	[-12.087]
$ar(1)_{1i}$	*-0.042	*-0.017	0.012	*-0.031	*-0.043	*-0.011	*-0.014
	[-8.779]	[-3.800]	[0.139]	[-6.245]	[-9.633]	[-3.110]	[-3.598]
Constant	0.000	0.000	0.000	**0.000	0.000	0.000	0.000
	[0.668]	[1.303]	[0.906]	[2.280]	[1.240]	[1.212]	[1.342]
$ar(1)_{i1}$	*-0.008	-0.003	**0.000	-0.004	*-0.027	*-0.036	*-0.030
	[-3.069]	[-0.844]	[-2.131]	[-1.372]	[-7.272]	[-7.392]	[-6.485]
$ar(1)_{ii}$	*-0.021	*-0.027	*-0.121	*-0.035	*-0.026	*-0.058	*-0.050
	[-5.280]	[-6.283]	[-30.811]	[-8.729]	[-5.675]	[-12.914]	[-11.038]
Constant	0.000	0.000	0.000	**0.000	0.000	0.000	**0.000
	[1.754]	[0.164]	[-1.415]	[2.105]	[0.167]	[1.564]	[2.165]
c_{11}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[23.471]	[-16.415]	[17.007]	[6.959]	[18.090]	[21.560]	[19.399]
c_{i1}	0.000	0.000	0.000	0.000	*0.000	*0.000	*0.000
	[-1.150]	[-1.228]	[-0.590]	[-0.796]	[-3.317]	[7.378]	[3.535]
c_{ii}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[-8.575]	[-17.302]	[12.615]	[21.498]	[19.572]	[-21.686]	[14.154]
α_{11}	*0.146	*0.127	*0.107	*0.133	*0.119	*0.138	*0.147
	[52.388]	[32.481]	[40.685]	[50.611]	[31.175]	[45.973]	[40.116]
α_{1i}	*-0.018	*0.012	*0.000	*0.042	*0.023	*0.032	*0.024
	[-24.069]	[4.969]	[-4.009]	[24.231]	[6.783]	[8.982]	[6.692]
α_{i1}	*0.029	*0.038	-0.098	*0.067	**-0.011	*0.019	*0.032
	[7.794]	[15.490]	[-0.957]	[24.645]	[-2.419]	[7.633]	[10.065]
α_{ii}	*0.061	*0.114	*0.291	*0.169	*0.179	*0.120	*0.119
	[35.002]	[46.442]	[71.734]	[54.350]	[37.810]	[39.883]	[35.218]
β_{11}	*0.988	*0.991	*0.994	*0.990	*0.993	*0.989	*0.988
	[2750.192]	[1908.739]	[3219.572]	[2674.073]	[1818.684]	[2067.362]	[1535.234]
β_{1i}	*0.002	*-0.001	*0.000	*-0.006	*-0.004	*-0.006	*-0.004
	[67.073]	[-4.484]	[3.049]	[-21.733]	[-7.130]	[-10.185]	[-7.052]
β_{i1}	*-0.004	*-0.005	0.013	*-0.010	**0.002	*-0.003	*-0.005
	[-20.572]	[-16.639]	[0.542]	[-21.408]	[2.255]	[-8.740]	[-9.409]
β_{ii}	*0.999	*0.994	*0.965	*0.984	*0.983	*0.990	*0.992
	[8561.104]	[3623.117]	[1145.208]	[1702.262]	[1091.864]	[1903.250]	[1937.508]

See Notes (1).

Table 82: 30 Minute VAR-BEKK-GARCH Results for London Market Period (Contd.)

USDCAD	USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK
$ar(1)_{11}$	*-0.015	*-0.014	*-0.014	*-0.026	*-0.017	*-0.016
	[-3.451]	[-3.094]	[-3.219]	[-5.547]	[-3.794]	[-3.701]
$ar(1)_{1i}$	-0.001	0.049	*-0.013	*0.018	**0.006	0.002
	[-0.154]	[0.608]	[-3.650]	[4.857]	[2.238]	[0.700]
Constant	0.000	**0.000	0.000	0.000	0.000	**0.000
	[1.747]	[2.021]	[0.961]	[1.541]	[1.864]	[2.370]
$ar(1)_{i1}$	0.007	*0.000	0.005	*0.051	*0.043	*0.029
	[1.388]	[2.832]	[1.770]	[10.988]	[7.317]	[5.085]
$ar(1)_{ii}$	*-0.024	*-0.119	*-0.029	*-0.036	*-0.050	*-0.044
	[-4.960]	[-28.064]	[-9.570]	[-8.264]	[-11.310]	[-10.192]
Constant	0.000	0.000	*0.000	0.000	0.000	**0.000
	[0.281]	[-1.517]	[3.036]	[0.299]	[1.558]	[1.975]
c_{11}	*0.000	*0.000	*0.000	0.000	*0.000	0.000
	[16.312]	[15.389]	[13.905]	[0.322]	[-13.591]	[-1.273]
c_{i1}	*0.000	0.000	*0.000	*0.000	0.000	*0.000
	[-7.478]	[-0.506]	[-38.499]	[-30.965]	[1.121]	[6.367]
c_{ii}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[-10.065]	[-11.924]	[-24.996]	[10.079]	[21.869]	[5.238]
α_{11}	*0.086	*0.065	*0.087	*0.067	*0.069	*0.064
	[33.223]	[46.856]	[59.584]	[40.872]	[45.275]	[41.815]
α_{1i}	*-0.048	0.000	*-0.031	*-0.014	**-0.008	-0.007
	[-13.292]	[0.485]	[-16.777]	[-5.070]	[-2.127]	[-1.470]
α_{i1}	*-0.016	-0.054	*-0.021	*0.027	*0.004	*0.014
	[-8.326]	[-1.089]	[-14.851]	[17.850]	[6.728]	[8.901]
α_{ii}	*0.155	*0.292	*0.139	*0.167	*0.121	*0.122
	[40.494]	[78.238]	[51.786]	[61.033]	[32.916]	[34.039]
β_{11}	*0.996	*0.998	*0.996	*0.998	*0.998	*0.998
	[3405.127]	[10735.546]	[7151.278]	[8812.427]	[8638.233]	[9872.231]
β_{1i}	*0.005	0.000	*0.003	*0.003	*0.003	*0.002
	[11.887]	[-0.155]	[20.453]	[10.226]	[6.501]	[4.622]
β_{i1}	*0.002	*0.026	*0.002	*-0.003	*-0.001	*-0.002
	[8.742]	[2.589]	[13.314]	[-16.242]	[-17.333]	[-7.756]
β_{ii}	*0.988	*0.965	*0.989	*0.985	*0.991	*0.992
	[1722.399]	[1262.310]	[2430.568]	[2148.547]	[1842.669]	[1983.302]

See Notes (1).

Table 83: 30 Minute VAR-BEKK-GARCH Results for London Market Period (Contd.)

USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK	**USDHKD**	USDJPY	USDMXN	USDNOK	USDSEK
$ar(1)_{11}$	*-0.016 [-3.437]	*-0.028 [-5.842]	*-0.021 [-4.567]	*-0.029 [-5.541]	*-0.022 [-4.229]	$ar(1)_{11}$	*-0.118 [-25.574]	*-0.119 [-26.909]	*-0.120 [-29.832]	*-0.120 [-28.134]
$ar(1)_{1i}$	**-0.209 [-2.557]	*0.019 [4.227]	-0.006 [-1.447]	*0.015 [4.101]	0.003 [0.708]	$ar(1)_{1i}$	0.000 [-1.580]	*0.000 [2.965]	**0.000 [2.021]	**0.000 [2.571]
Constant	0.000 [-0.026]	0.000 [-0.330]	0.000 [-1.029]	0.000 [-0.038]	0.000 [0.068]	*Constant*	0.000 [-1.931]	**0.000 [-1.971]	0.000 [-1.626]	0.000 [-1.844]
$ar(1)_{i1}$	0.000 [0.821]	0.001 [0.252]	**0.007 [2.091]	*0.022 [4.010]	*0.024 [4.606]	$ar(1)_{i1}$	-0.061 [-0.819]	0.167 [1.882]	0.017 [0.150]	-0.136 [-1.291]
$ar(1)_{ii}$	*-0.120 [-30.008]	*-0.028 [-6.803]	*-0.017 [-4.128]	*-0.051 [-10.776]	*-0.048 [-10.033]	$ar(1)_{ii}$	*-0.024 [-4.470]	*-0.014 [-3.410]	*-0.035 [-8.837]	*-0.033 [-9.083]
Constant	0.000 [-1.703]	**0.000 [2.045]	0.000 [0.294]	0.000 [-0.153]	0.000 [1.025]	*Constant*	0.000 [1.398]	0.000 [0.626]	0.000 [1.551]	0.000 [1.535]
c_{11}	*0.000 [13.705]	*0.000 [5.280]	*0.000 [13.306]	*0.000 [-12.876]	*0.000 [10.390]	c_{11}	*0.000 [10.598]	*0.000 [11.773]	*0.000 [-16.537]	*0.000 [17.334]
c_{i1}	0.000 [1.188]	*0.000 [4.760]	0.000 [0.554]	*0.000 [26.283]	0.000 [0.078]	c_{i1}	*0.000 [10.879]	0.000 [0.528]	0.000 [0.691]	0.000 [-1.467]
c_{ii}	*0.000 [-9.485]	*0.000 [-2.970]	*0.000 [21.986]	0.000 [0.184]	*0.000 [-10.487]	c_{ii}	*0.000 [48.526]	*0.000 [16.753]	*0.000 [17.392]	0.000 [0.453]
α_{11}	*0.101 [46.143]	*0.125 [55.612]	*0.123 [43.869]	*0.152 [45.499]	*0.175 [43.573]	α_{11}	*0.240 [72.883]	*0.281 [72.831]	*0.289 [75.633]	*0.289 [79.999]
α_{1i}	**0.000 [1.979]	*-0.021 [-9.429]	*-0.008 [-3.059]	*-0.037 [-13.411]	*-0.031 [-10.393]	α_{1i}	*0.222 [2.868]	-0.043 [-0.707]	0.040 [0.507]	*0.561 [8.957]
α_{i1}	*0.280 [4.058]	*-0.034 [-12.733]	-0.001 [-0.406]	*-0.062 [-26.101]	*-0.082 [-29.259]	α_{i1}	*0.000 [4.358]	*0.000 [4.540]	*0.000 [-3.879]	0.000 [1.685]
α_{ii}	*0.287 [78.351]	*0.176 [55.775]	*0.163 [47.342]	*0.116 [47.828]	*0.112 [42.566]	α_{ii}	*0.441 [68.970]	*0.127 [45.821]	*0.088 [41.066]	*0.087 [43.413]
β_{11}	*0.995 [4946.882]	*0.992 [3534.090]	*0.993 [2997.022]	*0.987 [1835.379]	*0.984 [1381.891]	β_{11}	*0.976 [1611.203]	*0.967 [1200.688]	*0.965 [1225.229]	*-0.965 [-1269.558]
β_{1i}	0.000 [-1.502]	*0.003 [10.231]	*0.002 [4.794]	*0.006 [15.087]	*0.005 [11.376]	β_{1i}	*0.510 [4.607]	0.015 [1.197]	0.017 [0.990]	*-3.078 [-12.731]
β_{i1}	*-0.056 [-3.694]	*0.005 [11.982]	0.000 [-0.319]	*0.008 [21.036]	*0.010 [21.616]	β_{i1}	**0.000 [-2.356]	*0.000 [-3.888]	0.000 [1.476]	0.000 [0.485]
β_{ii}	*0.966 [1258.739]	*0.983 [1722.931]	*0.986 [1650.992]	*0.991 [2699.610]	*0.992 [2596.343]	β_{ii}	*-0.861 [-215.398]	*0.991 [2546.774]	*0.996 [4468.290]	*0.996 [4629.010]

See Notes (1).

Table 84: 30 Minute VAR-BEKK-GARCH Results for London Market Period (Contd.)

USDJPY	USDMXN	USDNOK	USDSEK	**USDMXN**	USDNOK	USDSEK	**USDNOK**	USDSEK
$ar(1)_{11}$	*-0.033 [-7.340]	*-0.029 [-6.839]	*-0.028 [-6.942]	$ar(1)_{11}$	*-0.021 [-4.774]	*-0.024 [-5.696]	$ar(1)_{11}$	*-0.066 [-10.854]
$ar(1)_{1i}$	*-0.009 [-3.848]	0.001 [0.685]	0.002 [0.810]	$ar(1)_{1i}$	*0.016 [7.426]	*0.022 [7.588]	$ar(1)_{1i}$	*0.035 [5.822]
Constant	**0.000 [1.999]	**0.000 [2.042]	**0.000 [2.502]	*Constant*	0.000 [0.366]	0.000 [0.471]	*Constant*	0.000 [1.348]
$ar(1)_{i1}$	-0.007 [-1.641]	-0.001 [-0.288]	-0.007 [-1.488]	$ar(1)_{i1}$	*0.030 [8.429]	*0.027 [6.433]	$ar(1)_{i1}$	*0.039 [6.997]
$ar(1)_{ii}$	*-0.015 [-3.282]	*-0.034 [-8.763]	*-0.032 [-7.475]	$ar(1)_{ii}$	*-0.048 [-11.980]	*-0.045 [-11.100]	$ar(1)_{ii}$	*-0.064 [-10.793]
Constant	0.000 [-0.432]	0.000 [0.553]	0.000 [1.274]	*Constant*	0.000 [0.559]	0.000 [1.140]	*Constant*	0.000 [1.573]
c_{11}	*0.000 [28.185]	*0.000 [22.054]	*0.000 [22.810]	c_{11}	*0.000 [23.009]	*0.000 [26.186]	c_{11}	*0.000 [24.926]
c_{i1}	0.000 [1.244]	*0.000 [-6.173]	**0.000 [2.149]	c_{i1}	**0.000 [-2.106]	0.000 [0.003]	c_{i1}	*0.000 [-2.736]
c_{ii}	*0.000 [18.293]	*0.000 [18.193]	*0.000 [-7.479]	c_{ii}	*0.000 [19.768]	*0.000 [11.583]	c_{ii}	*0.000 [-16.952]
α_{11}	*0.156 [48.585]	*0.158 [48.601]	*0.157 [48.852]	α_{11}	*0.170 [54.155]	*0.170 [49.750]	α_{11}	*0.164 [29.632]
α_{1i}	*-0.012 [-3.452]	*-0.040 [-12.861]	*-0.036 [-13.433]	α_{1i}	*0.015 [32.187]	*0.014 [3.403]	α_{1i}	*-0.008 [-3.846]
α_{i1}	0.003 [1.010]	*-0.020 [-10.869]	*-0.023 [-12.149]	α_{i1}	-0.004 [-1.941]	-0.005 [-1.811]	α_{i1}	*-0.068 [-13.354]
α_{ii}	*0.155 [43.559]	*0.105 [48.870]	*0.111 [41.692]	α_{ii}	*0.103 [44.618]	*0.104 [33.652]	α_{ii}	*0.104 [38.286]
β_{11}	*0.987 [1836.856]	*0.986 [1729.466]	*0.986 [1799.135]	β_{11}	*0.984 [1649.347]	*0.984 [1683.242]	β_{11}	*0.983 [902.402]
β_{1i}	**0.001 [2.152]	*0.006 [13.346]	*0.005 [12.184]	β_{1i}	*-0.001 [-24.425]	**-0.002 [-2.530]	β_{1i}	*0.002 [15.636]
β_{i1}	-0.001 [-1.198]	*0.003 [13.599]	*0.003 [11.804]	β_{i1}	*0.001 [5.043]	*0.002 [3.770]	β_{i1}	*0.011 [12.572]
β_{ii}	*0.988 [1730.367]	*0.994 [3634.896]	*0.993 [3055.225]	β_{ii}	*0.994 [3333.802]	*0.994 [2561.714]	β_{ii}	*0.993 [3726.446]

See Notes (1).

Appendix A.4.4. Tokyo Closing-London Opening Period

Table 85: 30 Minute VAR-BEKK-GARCH Results for Tokyo Closing-London Opening Period

AUDUSD	EURUSD	GBPUSD	NZDUSD	USDCAD	USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK
$ar(1)_{11}$	**-0.020	*-0.029	*-0.052	**-0.022	*-0.028	*-0.033	*-0.028	**-0.020	**-0.020	*-0.029
	[-2.449]	[-3.719]	[-6.552]	[-2.353]	[-3.666]	[-4.330]	[-3.546]	[-2.459]	[-2.448]	[-3.525]
$ar(1)_{1i}$	-0.007	0.004	*0.027	0.004	0.001	0.351	**-0.019	0.002	0.006	-0.003
	[-0.746]	[0.383]	[3.065]	[0.296]	[0.199]	[1.719]	[-2.052]	[0.149]	[1.033]	[-0.491]
Constant	**0.000	**0.000	**0.000	**0.000	0.000	0.000	0.000	0.000	0.000	0.000
	[2.281]	[2.209]	[2.002]	[2.326]	[1.866]	[1.840]	[1.916]	[1.655]	[1.856]	[1.797]
$ar(1)_{i1}$	-0.007	0.009	*0.027	*-0.026	0.003	*-0.001	0.009	*-0.067	*-0.049	*-0.043
	[-1.089]	[1.457]	[3.087]	[-4.317]	[0.350]	[-3.548]	[1.708]	[-10.281]	[-4.570]	[-4.519]
$ar(1)_{ii}$	-0.001	*-0.047	*-0.057	*-0.065	-0.004	*-0.032	**-0.016	*-0.083	*-0.051	*-0.059
	[-0.158]	[-5.699]	[-5.747]	[-7.240]	[-0.374]	[-3.588]	[-2.013]	[-9.233]	[-5.671]	[-6.986]
Constant	0.000	0.000	0.000	0.000	0.000	0.000	0.000	*0.000	*0.000	0.000
	[0.834]	[0.887]	[1.303]	[1.116]	[-0.641]	[-0.177]	[-1.224]	[3.799]	[3.242]	[1.004]

See Notes (1).

Table 86: 30 Minute VAR-BEKK-GARCH Results for Tokyo Closing-London Opening Period (Contd.)

c_{11}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[8.928]	[8.671]	[-10.231]	[9.394]	[-8.131]	[-7.498]	[-9.727]	[7.491]	[-9.861]	[7.867]
c_{i1}	0.000	0.000	*0.000	*0.000	0.000	0.000	*0.000	*0.000	*0.000	**0.000
	[1.303]	[1.708]	[-8.603]	[-3.487]	[1.888]	[-0.213]	[-3.222]	[-7.283]	[-9.546]	[-2.293]
c_{ii}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[11.519]	[11.480]	[8.962]	[8.342]	[-14.469]	[-11.210]	[6.670]	[8.140]	[10.116]	[11.856]
α_{11}	*0.155	*0.154	*0.126	*0.142	*0.148	*0.128	*0.184	*0.131	*0.176	*0.146
	[23.277]	[20.871]	[13.719]	[21.715]	[29.316]	[26.281]	[31.079]	[15.354]	[21.939]	[22.574]
α_{1i}	0.006	0.004	0.013	-0.001	*0.084	0.000	*0.043	-0.005	*0.184	*-0.024
	[1.226]	[0.831]	[1.249]	[-0.180]	[11.027]	[1.841]	[9.831]	[-0.293]	[11.860]	[-2.993]
α_{i1}	-0.007	-0.005	*0.050	**-0.023	*-0.015	*-0.598	*0.032	*-0.043	*0.031	-0.008
	[-0.782]	[-0.363]	[5.778]	[-2.242]	[-3.553]	[-3.889]	[5.832]	[-5.627]	[4.345]	[-1.700]
α_{ii}	*0.121	*0.132	*0.155	*0.145	*0.301	*0.257	*0.175	*0.232	*0.325	*0.112
	[23.723]	[24.001]	[17.826]	[18.321]	[34.978]	[38.826]	[25.869]	[17.616]	[24.604]	[22.863]
β_{11}	*0.988	*0.988	*0.990	*0.989	*-0.989	*0.991	*0.982	*0.991	*0.978	*0.989
	[950.321]	[833.009]	[716.432]	[913.518]	[-1105.630]	[1447.606]	[851.834]	[814.039]	[423.019]	[999.446]
β_{1i}	0.000	0.000	-0.003	0.000	*0.016	0.000	*-0.008	0.000	*-0.062	0.002
	[-0.044]	[0.147]	[-1.940]	[-0.244]	[9.387]	[-1.573]	[-9.537]	[-0.090]	[-10.985]	[1.945]
β_{i1}	0.001	0.000	*-0.006	0.003	**-0.003	*0.103	*-0.006	*0.009	*-0.011	0.001
	[0.626]	[-0.095]	[-5.074]	[1.944]	[-2.306]	[3.155]	[-5.844]	[5.193]	[-4.954]	[1.679]
β_{ii}	*0.992	*0.990	*0.988	*0.989	*-0.955	*0.971	*0.983	*0.968	*0.924	*0.992
	[1422.084]	[1223.626]	[791.318]	[730.852]	[-364.458]	[789.698]	[722.444]	[357.314]	[155.696]	[1395.447]

See Notes (1).

Table 87: 30 Minute VAR-BEKK-GARCH Results for Tokyo Closing-London Opening Period (Contd.)

EURUSD	GBPUSD	NZDUSD	USDCAD	USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK
$ar(1)_{11}$	0.000	-0.002	-0.002	*-0.026	-0.009	-0.007	-0.006	0.002	0.001
	[-0.008]	[-0.257]	[-0.179]	[-2.671]	[-1.250]	[-0.802]	[-0.693]	[0.219]	[0.141]
$ar(1)_{1i}$	-0.008	-0.003	0.008	*-0.021	0.340	0.002	-0.008	0.006	0.007
	[-0.851]	[-0.656]	[0.729]	[-2.727]	[1.817]	[0.226]	[-0.888]	[1.045]	[1.028]
Constant	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	[0.772]	[0.768]	[0.577]	[1.691]	[0.451]	[0.443]	[0.692]	[0.666]	[0.433]
$ar(1)_{i1}$	*0.021	*0.023	**-0.012	*-0.047	*-0.001	-0.004	*-0.048	*-0.052	**-0.033
	[2.914]	[2.796]	[-1.966]	[-3.979]	[-5.412]	[-0.597]	[-6.909]	[-3.592]	[-2.007]
$ar(1)_{ii}$	*-0.058	*-0.043	*-0.050	*-0.042	*-0.034	**-0.018	*-0.066	*-0.044	*-0.054
	[-6.407]	[-5.487]	[-5.614]	[-3.710]	[-4.067]	[-2.280]	[-7.723]	[-3.921]	[-4.465]
Constant	0.000	0.000	0.000	*0.000	0.000	0.000	*0.000	*0.000	*0.000
	[0.380]	[0.778]	[1.273]	[-3.745]	[-0.475]	[-0.506]	[4.338]	[2.627]	[3.536]
c_{11}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[7.060]	[7.717]	[8.407]	[9.383]	[7.903]	[10.810]	[9.125]	[-23.232]	[17.487]
c_{i1}	0.000	0.000	0.000	*0.000	**0.000	*0.000	**0.000	*0.000	*0.000
	[0.922]	[1.153]	[0.550]	[-9.028]	[2.273]	[-4.184]	[-2.529]	[-34.494]	[91.606]
c_{ii}	*0.000	*0.000	*0.000	0.000	*0.000	*0.000	*0.000	0.000	0.000
	[12.482]	[7.278]	[-7.811]	[0.005]	[-3.306]	[6.832]	[11.309]	[0.000]	[-0.005]
α_{11}	*0.104	*0.109	*0.114	*0.130	*0.097	*0.125	*0.117	*0.143	*0.140
	[23.743]	[19.365]	[21.606]	[33.277]	[25.303]	[26.533]	[24.676]	[32.757]	[23.515]
α_{1i}	*-0.015	-0.006	**0.012	*0.180	**0.001	*-0.033	-0.001	*0.368	*0.399
	[-3.133]	[-0.522]	[2.028]	[25.825]	[2.194]	[-8.175]	[-0.155]	[20.806]	[14.041]
α_{i1}	*0.012	*0.014	-0.003	*0.039	-0.083	**-0.012	*-0.015	*0.035	*0.022
	[3.082]	[3.644]	[-0.351]	[9.767]	[-0.730]	[-2.158]	[-2.940]	[557.131]	[15.252]
α_{ii}	*0.144	*0.151	*0.162	*0.345	*0.266	*0.164	*0.214	*0.531	*0.559
	[29.047]	[19.662]	[26.270]	[43.850]	[34.201]	[20.065]	[26.912]	[41.504]	[38.190]
β_{11}	*0.994	*0.993	*0.993	*0.990	*0.995	*0.992	*0.993	*0.970	*0.952
	[1796.878]	[1315.562]	[1371.749]	[1425.950]	[2286.600]	[1556.561]	[1569.157]	[1633.142]	[445.255]
β_{1i}	*0.002	0.000	**-0.002	*-0.042	0.000	*0.005	-0.001	*-0.239	*-0.585
	[3.338]	[0.047]	[-2.191]	[-22.681]	[-1.958]	[7.311]	[-1.029]	[-22.429]	[-154.292]
β_{i1}	-0.001	-0.001	-0.001	*-0.005	-0.022	**0.002	0.002	*-0.021	*-0.036
	[-1.958]	[-1.722]	[-0.635]	[-6.388]	[-0.988]	[2.327]	[1.788]	[-738.809]	[-20.471]
β_{ii}	*0.989	*0.988	*0.986	*0.945	*0.970	*0.985	*0.974	*0.777	*0.473
	[1427.487]	[803.717]	[910.782]	[438.414]	[596.177]	[644.931]	[535.301]	[79.344]	[229.447]

See Notes (1).

Table 88: 30 Minute VAR-BEKK-GARCH Results for Tokyo Closing-London Opening Period (Contd.)

GBPUSD	NZDUSD	USDCAD	USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK
$ar(1)_{11}$	*-0.048	*-0.045	*-0.054	*-0.047	*-0.040	*-0.047	*-0.054	*-0.050
	[-5.468]	[-5.355]	[-6.247]	[-6.254]	[-4.523]	[-5.696]	[-6.619]	[-5.848]
$ar(1)_{1i}$	0.008	-0.009	**-0.014	0.058	0.006	-0.011	*-0.011	-0.009
	[1.375]	[-1.217]	[-2.532]	[0.386]	[0.942]	[-1.764]	[-2.742]	[-1.957]
Constant	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	[0.709]	[0.556]	[0.240]	[0.365]	[0.209]	[0.610]	[0.722]	[0.590]
$ar(1)_{i1}$	0.015	-0.010	0.020	*-0.001	-0.009	*-0.033	-0.024	**-0.030
	[1.302]	[-1.649]	[1.822]	[-4.092]	[-1.188]	[-5.096]	[-1.761]	[-2.076]
$ar(1)_{ii}$	*-0.042	*-0.044	0.003	*-0.033	-0.015	*-0.051	*-0.036	*-0.051
	[-4.729]	[-5.512]	[0.329]	[-4.943]	[-1.716]	[-8.259]	[-3.828]	[-5.157]
Constant	0.000	0.000	0.000	0.000	0.000	*0.000	**0.000	0.000
	[1.122]	[0.729]	[-1.179]	[-0.361]	[-0.459]	[3.562]	[2.173]	[0.755]
c_{11}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[9.786]	[10.152]	[7.833]	[14.636]	[-9.625]	[-7.394]	[-9.000]	[-8.103]
c_{i1}	0.000	0.000	**0.000	0.000	*0.000	0.000	*0.000	0.000
	[1.845]	[0.841]	[-2.003]	[0.388]	[4.901]	[0.677]	[-5.752]	[-0.167]
c_{ii}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[7.765]	[7.133]	[14.880]	[-11.420]	[7.236]	[14.474]	[8.405]	[12.801]
α_{11}	*0.127	*0.128	*0.130	*0.123	*0.145	*0.126	*0.135	*0.131
	[26.546]	[22.177]	[31.103]	[27.887]	[30.552]	[28.661]	[22.624]	[22.152]
α_{1i}	-0.019	*0.028	*0.114	*0.000	*-0.061	*0.036	*0.148	*0.044
	[-1.650]	[3.471]	[11.681]	[-2.587]	[-9.661]	[3.673]	[5.625]	[4.390]
α_{i1}	*0.014	0.001	0.001	**-0.234	*-0.018	**-0.010	**0.012	*-0.012
	[3.588]	[0.157]	[0.555]	[-2.382]	[-3.646]	[-2.032]	[2.189]	[-3.596]
α_{ii}	*0.154	*0.170	*0.296	*0.262	*0.202	*0.236	*0.382	*0.114
	[19.038]	[19.295]	[37.082]	[38.549]	[21.045]	[27.540]	[23.855]	[21.933]
β_{11}	*0.991	*0.990	*0.991	*0.992	*0.989	*0.992	*0.986	*0.990
	[1452.642]	[1114.009]	[1563.014]	[1903.814]	[1343.807]	[1540.984]	[580.859]	[1040.494]
β_{1i}	0.002	**-0.004	*-0.021	*0.000	*0.010	*-0.007	*-0.072	*-0.008
	[0.887]	[-2.568]	[-10.817]	[2.787]	[8.751]	[-4.378]	[-8.304]	[-5.126]
β_{i1}	**-0.001	-0.002	-0.001	**0.033	*0.004	0.001	*-0.007	0.001
	[-2.369]	[-1.407]	[-1.760]	[2.047]	[3.496]	[1.235]	[-3.607]	[1.781]
β_{ii}	*0.988	*0.985	*0.956	*0.970	*0.976	*0.969	*0.896	*0.991
	[755.826]	[620.947]	[395.670]	[710.547]	[417.065]	[438.689]	[101.647]	[1259.960]

See Notes (1).

Table 89: 30 Minute VAR-BEKK-GARCH Results for Tokyo Closing-London Opening Period (Contd.)

NZDUSD	USDCAD	USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK
$ar(1)_{11}$	*-0.050	*-0.036	*-0.045	*-0.042	*-0.043	*-0.035	*-0.043
	[-8.702]	[-4.471]	[-6.051]	[-4.617]	[-4.908]	[-3.856]	[-5.053]
$ar(1)_{1i}$	*-0.032	-0.011	0.294	*-0.030	*-0.028	-0.002	-0.012
	[-4.049]	[-1.298]	[1.321]	[-3.255]	[-2.722]	[-0.267]	[-1.951]
Constant	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	[1.264]	[0.699]	[0.649]	[1.207]	[0.907]	[0.630]	[0.930]
$ar(1)_{i1}$	*-0.022	-0.003	*0.000	**0.013	*-0.048	*-0.039	*-0.035
	[-6.754]	[-0.431]	[-2.908]	[2.534]	[-8.285]	[-4.126]	[-3.158]
$ar(1)_{ii}$	*-0.062	-0.008	*-0.031	-0.013	*-0.069	*-0.052	*-0.056
	[-9.913]	[-0.814]	[-3.675]	[-1.667]	[-7.159]	[-6.480]	[-5.673]
Constant	0.000	0.000	0.000	0.000	*0.000	*0.000	0.000
	[0.922]	[-0.768]	[-0.303]	[-0.533]	[3.847]	[3.748]	[1.093]
c_{11}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[8.135]	[9.107]	[8.532]	[-10.060]	[9.588]	[-8.014]	[-7.308]
c_{i1}	*0.000	*0.000	0.000	*0.000	*0.000	**0.000	0.000
	[-4.431]	[-3.207]	[0.316]	[-5.059]	[-8.453]	[2.451]	[1.585]
c_{ii}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[-7.086]	[11.782]	[13.566]	[5.615]	[7.403]	[11.926]	[13.052]
α_{11}	*0.150	*0.133	*0.129	*0.170	*0.143	*0.147	*0.147
	[19.261]	[29.482]	[25.311]	[34.194]	[19.592]	[20.123]	[19.204]
α_{1i}	*-0.018	*0.048	0.000	*0.036	*-0.031	*-0.029	**-0.017
	[-4.885]	[8.205]	[0.234]	[8.957]	[-3.296]	[-3.407]	[-2.219]
α_{i1}	**-0.028	*-0.028	*-0.639	*0.047	*-0.037	-0.007	-0.006
	[-2.017]	[-6.451]	[-4.530]	[6.730]	[-4.284]	[-1.559]	[-1.009]
α_{ii}	*0.138	*0.303	*0.258	*0.164	*0.211	*0.103	*0.111
	[18.096]	[35.808]	[43.992]	[24.797]	[19.898]	[23.561]	[22.062]
β_{11}	*0.988	*-0.991	*0.991	*0.984	*0.990	*0.989	*0.989
	[741.824]	[-1427.357]	[1462.780]	[1021.407]	[949.965]	[918.250]	[788.502]
β_{1i}	*0.003	*0.009	0.000	*-0.007	*0.004	*0.003	0.001
	[4.152]	[6.881]	[-0.594]	[-9.789]	[3.035]	[2.941]	[0.633]
β_{i1}	**0.004	*-0.006	*0.124	*-0.008	*0.008	0.001	0.001
	[2.040]	[-4.832]	[4.241]	[-5.996]	[4.407]	[1.338]	[1.331]
β_{ii}	*0.990	*-0.955	*0.971	*0.985	*0.972	*0.994	*0.992
	[810.960]	[-367.178]	[827.373]	[784.900]	[405.860]	[1800.703]	[1345.911]

See Notes (1).

Table 90: 30 Minute VAR-BEKK-GARCH Results for Tokyo Closing-London Opening Period (Contd.)

USDCAD	USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK
$ar(1)_{11}$	*-0.037	*-0.040	*-0.041	*-0.044	*-0.041	*-0.045
	[-4.631]	[-4.735]	[-4.874]	[-5.087]	[-4.617]	[-5.131]
$ar(1)_{1i}$	0.006	*-0.417	*0.025	**0.014	0.003	0.006
	[1.363]	[-3.336]	[4.886]	[2.173]	[0.780]	[1.546]
Constant	0.000	0.000	0.000	0.000	0.000	0.000
	[1.136]	[0.825]	[1.205]	[1.472]	[1.150]	[1.436]
$ar(1)_{i1}$	0.008	*0.001	-0.001	*0.081	*0.056	*0.063
	[0.795]	[5.267]	[-0.135]	[8.777]	[4.015]	[3.638]
$ar(1)_{ii}$	-0.011	*-0.035	*-0.024	*-0.073	*-0.046	*-0.059
	[-1.727]	[-4.617]	[-2.992]	[-7.980]	[-5.861]	[-5.996]
Constant	0.000	0.000	0.000	*0.000	*0.000	0.000
	[-0.391]	[-0.600]	[-0.593]	[3.645]	[3.154]	[1.070]
c_{11}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[2.740]	[8.848]	[-11.004]	[7.671]	[-8.401]	[7.730]
c_{i1}	*0.000	0.000	*0.000	*0.000	*0.000	*0.000
	[20.375]	[0.529]	[-8.757]	[7.048]	[7.057]	[3.568]
c_{ii}	0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[0.621]	[-9.549]	[5.174]	[10.021]	[8.615]	[7.418]
α_{11}	*0.135	*0.125	*0.162	*0.137	*0.146	*0.153
	[33.664]	[25.200]	[30.863]	[21.264]	[20.957]	[22.324]
α_{1i}	*-0.169	*0.001	*0.061	*0.040	*-0.219	*0.067
	[-15.567]	[4.031]	[10.386]	[3.989]	[-8.602]	[6.016]
α_{i1}	*-0.016	0.022	*0.015	*0.032	**-0.010	**0.008
	[-46.417]	[0.172]	[4.368]	[7.179]	[-2.120]	[2.059]
α_{ii}	*0.300	*0.261	*0.181	*0.209	*0.334	*0.106
	[40.728]	[38.275]	[29.493]	[27.706]	[25.719]	[20.989]
β_{11}	*0.824	*0.992	*0.986	*0.991	*0.986	*0.988
	[373.052]	[1532.547]	[1112.040]	[1043.455]	[552.058]	[860.650]
β_{1i}	*1.402	*0.000	*-0.011	**-0.004	*0.080	*-0.007
	[87.372]	[-3.618]	[-10.586]	[-2.485]	[10.159]	[-4.230]
β_{i1}	*0.213	0.015	*-0.004	*-0.006	*0.004	*-0.002
	[615.995]	[0.514]	[-5.134]	[-6.794]	[2.814]	[-2.850]
β_{ii}	*-0.779	*0.970	*0.981	*0.973	*0.920	*0.993
	[-237.066]	[677.528]	[759.257]	[573.188]	[154.054]	[1428.339]

See Notes (1).

Table 91: 30 Minute VAR-BEKK-GARCH Results for Tokyo Closing-London Opening Period (Contd.)

USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK	**USDHKD**	USDJPY	USDMXN	USDNOK	USDSEK
$ar(1)_{11}$	0.002	-0.001	-0.013	*-0.026	**-0.019	$ar(1)_{11}$	*-0.033	*-0.034	*-0.033	*-0.033
	[0.281]	[-0.095]	[-1.455]	[-2.830]	[-2.280]		[-3.613]	[-3.726]	[-4.218]	[-3.783]
$ar(1)_{1i}$	-0.079	0.003	*0.021	*0.022	**0.011	$ar(1)_{1i}$	0.000	**0.001	**0.000	*0.000
	[-0.384]	[0.325]	[2.867]	[3.550]	[2.409]		[0.747]	[2.363]	[1.995]	[2.958]
Constant	0.000	0.000	0.000	0.000	0.000	*Constant*	0.000	0.000	0.000	0.000
	[-0.642]	[-0.291]	[-0.222]	[-0.356]	[-0.576]		[-0.371]	[-0.433]	[-0.538]	[-0.382]
$ar(1)_{i1}$	*0.001	*0.013	**0.013	**0.020	*0.028	$ar(1)_{i1}$	*0.554	-0.039	-0.388	0.108
	[4.000]	[2.738]	[2.388]	[2.270]	[4.411]		[3.802]	[-0.230]	[-1.520]	[0.463]
$ar(1)_{ii}$	*-0.034	**-0.017	*-0.045	*-0.044	*-0.054	$ar(1)_{ii}$	-0.013	*-0.045	*-0.048	*-0.053
	[-5.038]	[-2.102]	[-5.487]	[-5.461]	[-7.133]		[-1.520]	[-5.967]	[-6.068]	[-5.990]
Constant	0.000	0.000	*0.000	*0.000	0.000	*Constant*	0.000	*0.000	*0.000	0.000
	[-0.507]	[-0.501]	[3.851]	[3.421]	[1.272]		[-0.766]	[3.996]	[3.450]	[0.824]
c_{11}	*0.000	*0.000	*0.000	*0.000	*0.000	c_{11}	*0.000	*0.000	*0.000	*0.000
	[13.988]	[14.338]	[14.981]	[-10.541]	[10.375]		[12.269]	[11.805]	[-12.120]	[11.257]
c_{i1}	*0.000	*0.000	**0.000	*0.000	*0.000	c_{i1}	0.000	0.000	0.000	0.000
	[-3.143]	[2.657]	[-2.022]	[-2.877]	[-3.891]		[0.263]	[0.317]	[0.786]	[-0.111]
c_{ii}	*0.000	*0.000	*0.000	*0.000	*0.000	c_{ii}	*0.000	*0.000	*0.000	*0.000
	[3.548]	[11.030]	[11.540]	[11.312]	[3.913]		[9.109]	[11.212]	[8.602]	[9.391]
α_{11}	*0.300	*0.299	*0.299	*0.270	*0.314	α_{11}	*0.267	*0.251	*0.261	*0.259
	[28.578]	[32.920]	[33.680]	[32.415]	[37.568]		[36.606]	[33.363]	[43.305]	[40.644]
α_{1i}	*-0.001	*0.038	*-0.016	-0.001	*-0.036	α_{1i}	*0.439	*0.507	*0.786	*0.905
	[-8.502]	[14.462]	[-3.540]	[-0.149]	[-5.471]		[4.774]	[4.350]	[4.722]	[3.187]
α_{i1}	**-0.468	**0.017	*-0.052	*-0.054	*-0.097	α_{i1}	0.000	0.000	0.000	0.000
	[-2.215]	[2.154]	[-6.089]	[-11.731]	[-16.487]		[0.002]	[1.104]	[0.467]	[0.806]
α_{ii}	*0.237	*0.189	*0.196	*0.118	*0.132	α_{ii}	*0.131	*0.184	*0.096	*0.101
	[38.569]	[21.633]	[28.526]	[27.868]	[24.977]		[22.976]	[24.811]	[26.813]	[23.991]
β_{11}	*0.953	*0.955	*0.956	*0.965	*-0.949	β_{11}	*0.969	*0.973	*0.970	*0.971
	[264.320]	[328.469]	[358.614]	[440.243]	[-366.541]		[676.921]	[673.873]	[786.375]	[743.419]
β_{1i}	*0.000	*-0.008	*0.007	-0.001	*-0.008	β_{1i}	*-0.109	*-0.095	*-0.119	**-0.143
	[6.848]	[-8.892]	[4.846]	[-0.870]	[-4.161]		[-5.918]	[-3.945]	[-3.543]	[-2.203]
β_{i1}	*0.141	*-0.005	*0.012	*0.009	*-0.022	β_{i1}	0.000	0.000	0.000	0.000
	[3.128]	[-2.705]	[5.256]	[8.448]	[-14.426]		[0.533]	[-0.786]	[-0.185]	[-0.722]
β_{ii}	*0.975	*0.980	*0.977	*0.992	*-0.988	β_{ii}	*0.991	*0.981	*0.995	*0.994
	[884.654]	[509.560]	[645.809]	[1649.244]	[-860.074]		[1182.671]	[601.562]	[2499.191]	[2049.626]

See Notes (1).

Table 92: 30 Minute VAR-BEKK-GARCH Results for Tokyo Closing-London Opening Period (Contd.)

USDJPY	USDMXN	USDNOK	USDSEK	**USDMXN**	USDNOK	USDSEK	**USDNOK**	USDSEK
$ar(1)_{11}$	**-0.020 [-2.427]	**-0.018 [-2.013]	**-0.018 [-2.215]	$ar(1)_{11}$	*-0.056 [-6.398]	*-0.060 [-6.517]	$ar(1)_{11}$	*-0.085 [-25.745]
$ar(1)_{1i}$	-0.003 [-0.417]	0.007 [1.804]	*0.010 [2.676]	$ar(1)_{1i}$	*0.025 [5.922]	*0.032 [7.860]	$ar(1)_{1i}$	*0.061 [18.227]
Constant	0.000 [-0.156]	0.000 [-0.730]	0.000 [-0.370]	*Constant*	*0.000 [4.461]	*0.000 [4.117]	*Constant*	*0.000 [3.691]
$ar(1)_{i1}$	-0.007 [-1.008]	-0.018 [-1.524]	**-0.021 [-2.091]	$ar(1)_{i1}$	*0.058 [5.433]	0.025 [1.952]	$ar(1)_{i1}$	*0.017 [2.856]
$ar(1)_{ii}$	*-0.043 [-4.983]	*-0.042 [-4.533]	*-0.045 [-5.483]	$ar(1)_{ii}$	*-0.046 [-5.408]	*-0.050 [-5.668]	$ar(1)_{ii}$	*-0.053 [-10.131]
Constant	*0.000 [3.384]	*0.000 [3.926]	0.000 [1.283]	*Constant*	**0.000 [2.384]	0.000 [0.805]	*Constant*	*0.000 [12.587]
c_{11}	*0.000 [9.120]	*0.000 [8.608]	*0.000 [8.136]	c_{11}	*0.000 [15.502]	*0.000 [13.808]	c_{11}	*0.000 [-51.428]
c_{i1}	*0.000 [-5.810]	0.000 [-1.189]	*0.000 [3.083]	c_{i1}	*0.000 [-7.132]	0.000 [1.329]	c_{i1}	*0.000 [35.166]
c_{ii}	*0.000 [8.415]	*0.000 [12.792]	*0.000 [-6.547]	c_{ii}	*0.000 [10.332]	*0.000 [11.127]	c_{ii}	0.000 [0.000]
α_{11}	*0.153 [20.890]	*0.178 [18.876]	*0.174 [18.653]	α_{11}	*0.202 [25.464]	*0.219 [24.791]	α_{11}	*0.490 [46.370]
α_{1i}	*-0.031 [-4.990]	*-0.031 [-3.411]	-0.017 [-1.401]	α_{1i}	*-0.127 [-8.898]	*0.036 [4.009]	α_{1i}	*-0.120 [-18.265]
α_{i1}	*-0.019 [-3.942]	*0.015 [3.600]	*0.026 [8.333]	α_{i1}	*-0.017 [-3.215]	0.005 [1.066]	α_{i1}	*-0.337 [-38.952]
α_{ii}	*0.215 [28.085]	*0.105 [25.969]	*0.112 [24.241]	α_{ii}	*0.302 [15.217]	*0.104 [25.170]	α_{ii}	*0.238 [39.404]
β_{11}	*0.987 [781.854]	*0.983 [523.403]	*0.983 [524.984]	β_{11}	*0.974 [461.530]	*0.972 [460.127]	β_{11}	*0.758 [300.618]
β_{1i}	*0.005 [4.239]	*0.006 [3.629]	0.002 [0.891]	β_{1i}	*0.041 [8.554]	*-0.005 [-2.709]	β_{1i}	*0.100 [49.236]
β_{i1}	*0.005 [5.201]	**-0.001 [-2.150]	*-0.003 [-6.450]	β_{i1}	*0.008 [5.039]	0.000 [0.433]	β_{i1}	*0.212 [786.382]
β_{ii}	*0.974 [524.649]	*0.993 [2194.180]	*0.993 [1708.830]	β_{ii}	*0.938 [120.456]	*0.994 [1790.945]	β_{ii}	*0.900 [416.760]

See Notes (1).

Appendix A.4.5. New York Closing-Tokyo Opening Period

Table 93: 30 Minute VAR-BEKK-GARCH Results for New York Closing-Tokyo Opening Period

AUDUSD	EURUSD	GBPUSD	NZDUSD	USDCAD	USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK
$ar(1)_{11}$	*-0.071	*-0.047	*-0.066	*-0.044	*-0.063	*-0.053	*-0.060	*-0.050	*-0.056	*-0.059
	[-8.174]	[-4.659]	[-6.138]	[-4.446]	[-6.864]	[-5.393]	[-7.336]	[-5.715]	[-6.115]	[-6.452]
$ar(1)_{1i}$	*0.058	*0.058	0.012	0.020	-0.013	0.056	**-0.020	-0.018	-0.002	**-0.019
	[4.537]	[3.577]	[1.790]	[1.307]	[-1.344]	[0.446]	[-2.292]	[-1.921]	[-0.282]	[-2.147]
Constant	*0.000	0.000	*0.000	*0.000	*0.000	*0.000	*0.000	**0.000	*0.000	*0.000
	[-3.045]	[-1.723]	[-2.830]	[-2.682]	[-2.952]	[-2.635]	[-3.578]	[-2.054]	[-3.191]	[-3.210]
$ar(1)_{i1}$	*0.026	*0.026	*0.041	*-0.046	-0.006	-0.001	**-0.011	*-0.049	*-0.043	*-0.040
	[5.323]	[5.437]	[2.708]	[-9.179]	[-1.191]	[-1.730]	[-1.968]	[-6.831]	[-6.117]	[-5.108]
$ar(1)_{ii}$	*-0.062	*-0.097	*-0.079	*-0.124	*-0.078	*-0.121	*-0.050	*-0.124	*-0.117	*-0.095
	[-6.243]	[-9.416]	[-6.163]	[-13.244]	[-7.805]	[-13.874]	[-5.108]	[-12.567]	[-12.135]	[-9.851]
Constant	0.000	0.000	0.000	*0.000	*0.000	*0.000	*0.000	**0.000	*0.000	*0.000
	[-0.608]	[0.942]	[0.045]	[6.492]	[6.553]	[11.917]	[3.105]	[-2.212]	[5.556]	[4.736]

See Notes (1).

Table 94: 30 Minute VAR-BEKK-GARCH Results for New York Closing-Tokyo Opening Period (Contd.)

c_{11}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[19.881]	[16.882]	[17.897]	[19.071]	[12.155]	[23.522]	[5.053]	[18.286]	[19.246]	[20.991]
c_{i1}	*0.000	*0.000	*0.000	0.000	*0.000	*0.000	0.000	*0.000	*0.000	*0.000
	[-18.253]	[-10.630]	[10.424]	[1.646]	[6.784]	[9.627]	[-0.743]	[-5.957]	[5.770]	[3.718]
c_{ii}	0.000	0.000	*0.000	*0.000	0.000	0.000	*0.000	*0.000	0.000	0.000
	[0.005]	[0.000]	[18.976]	[7.500]	[1.274]	[0.000]	[19.894]	[20.310]	[1.857]	[0.010]
α_{11}	*0.285	*0.341	*0.281	*0.310	*0.191	*0.338	*0.192	*0.322	*0.299	*0.292
	[28.243]	[19.289]	[21.031]	[28.080]	[20.923]	[33.027]	[19.845]	[31.556]	[28.468]	[27.968]
α_{1i}	*-0.052	*-0.058	0.007	*0.009	*0.080	**-0.001	*0.106	*-0.186	-0.002	**-0.013
	[-10.094]	[-9.156]	[0.188]	[3.276]	[9.449]	[-2.365]	[17.074]	[-14.428]	[-0.273]	[-2.114]
α_{i1}	*-0.100	*-0.147	**0.026	*0.114	-0.009	*-0.996	*0.061	-0.011	*0.041	0.001
	[-5.244]	[-8.963]	[1.986]	[7.015]	[-1.120]	[-7.832]	[8.304]	[-0.951]	[4.029]	[0.148]
α_{ii}	*0.418	*0.330	*0.556	*0.147	*0.513	*0.166	*0.446	*0.355	*0.149	*0.124
	[34.032]	[24.771]	[24.902]	[23.694]	[41.275]	[36.015]	[46.356]	[25.594]	[25.228]	[26.343]
β_{11}	*0.938	**0.151	*0.974	*0.941	*0.978	*0.926	*0.980	*0.940	*0.944	*0.945
	[205.718]	[2.159]	[101.904]	[233.068]	[472.568]	[216.976]	[441.104]	[222.623]	[240.627]	[262.635]
β_{1i}	*0.034	*0.499	*0.278	*-0.004	*-0.043	*-0.003	*-0.016	*0.057	-0.002	**0.004
	[17.385]	[39.746]	[10.727]	[-13.080]	[-12.856]	[-2.596]	[-7.762]	[9.662]	[-0.742]	[2.187]
β_{i1}	*0.052	*1.667	*-0.034	*-0.038	**-0.008	**-0.844	*-0.023	0.001	*-0.022	*-0.017
	[8.051]	[27.338]	[-2.593]	[-10.218]	[-2.379]	[-2.368]	[-10.688]	[0.071]	[-7.715]	[-7.370]
β_{ii}	*0.911	-0.047	*0.491	*0.987	*0.851	*-0.985	*0.902	*0.837	*0.988	*0.993
	[216.856]	[-0.637]	[13.604]	[1187.503]	[122.644]	[-819.932]	[219.064]	[65.425]	[647.576]	[1150.820]

See Notes (1).

Table 95: 30 Minute VAR-BEKK-GARCH Results for New York Closing-Tokyo Opening Period (Contd.)

EURUSD	GBPUSD	NZDUSD	USDCAD	USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK
$ar(1)_{11}$	*-0.047	*-0.037	*-0.053	*-0.057	**-0.025	*-0.043	*-0.054	*-0.039	*-0.039
	[-4.118]	[-3.877]	[-5.296]	[-5.500]	[-2.505]	[-4.697]	[-7.542]	[-3.641]	[-3.154]
$ar(1)_{1i}$	*0.054	*0.011	*-0.054	-0.003	*-0.231	**0.010	-0.006	-0.013	-0.012
	[5.103]	[3.680]	[-6.025]	[-0.449]	[-3.367]	[2.011]	[-1.184]	[-1.865]	[-1.659]
Constant	0.000	0.000	0.000	**0.000	0.000	**0.000	*0.000	0.000	0.000
	[0.035]	[-1.469]	[-0.054]	[-2.204]	[-0.551]	[-2.414]	[-2.783]	[-0.600]	[-0.596]
$ar(1)_{i1}$	*0.045	*0.106	*-0.057	*-0.068	-0.001	-0.002	*-0.120	*-0.100	*-0.093
	[5.496]	[6.132]	[-7.468]	[-5.705]	[-1.369]	[-0.249]	[-12.430]	[-6.835]	[-5.781]
$ar(1)_{ii}$	*-0.088	*-0.064	*-0.104	*-0.109	*-0.118	*-0.071	*-0.127	*-0.131	*-0.116
	[-8.030]	[-6.094]	[-11.384]	[-9.682]	[-12.648]	[-7.260]	[-15.395]	[-11.794]	[-9.966]
Constant	0.000	0.000	*0.000	*0.000	*0.000	*0.000	0.000	*0.000	*0.000
	[0.613]	[1.514]	[6.730]	[8.630]	[10.774]	[3.243]	[-1.010]	[4.364]	[4.022]
c_{11}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[18.838]	[-4.499]	[-19.328]	[4.608]	[17.376]	[9.483]	[-7.704]	[-16.712]	[17.172]
c_{i1}	*0.000	*0.001	0.000	*0.000	**0.000	*0.000	*0.000	*0.000	*0.000
	[-7.473]	[18.655]	[-1.764]	[-3.392]	[2.563]	[-8.258]	[-21.927]	[7.375]	[-19.120]
c_{ii}	0.000	0.000	0.000	*0.000	*0.000	*0.000	0.000	*0.000	0.000
	[-0.001]	[0.000]	[0.001]	[3.361]	[11.054]	[4.364]	[0.002]	[11.722]	[1.841]
α_{11}	*0.433	*0.408	*0.487	*0.208	*0.465	*0.165	*0.228	*0.437	*0.459
	[37.409]	[21.157]	[38.473]	[29.354]	[39.172]	[27.845]	[18.883]	[40.634]	[37.125]
α_{1i}	*0.049	*-0.274	*-0.074	*0.228	*0.002	*0.040	*0.165	*-0.292	*-0.373
	[6.018]	[-7.266]	[-8.539]	[18.079]	[3.479]	[5.143]	[12.756]	[-21.832]	[-23.941]
α_{i1}	*-0.047	*-0.031	*0.058	*0.025	*0.188	*-0.025	*0.018	*-0.021	0.007
	[-6.243]	[-8.532]	[5.242]	[6.076]	[2.798]	[-6.113]	[4.443]	[-3.124]	[0.936]
α_{ii}	*0.124	*0.397	*0.125	*0.393	*0.154	*0.393	*0.295	*0.135	*0.096
	[14.489]	[19.628]	[21.579]	[31.995]	[33.800]	[32.084]	[26.088]	[20.319]	[9.952]
β_{11}	*0.910	*0.909	*0.898	*0.978	*0.909	*0.988	*-0.974	*0.919	*0.926
	[205.011]	[109.078]	[190.188]	[685.502]	[213.526]	[1266.163]	[-393.274]	[207.425]	[266.752]
β_{1i}	*-0.007	*0.266	*0.015	*-0.063	*-0.001	-0.002	*0.042	*0.063	*0.071
	[-3.151]	[10.200]	[6.488]	[-16.379]	[-3.654]	[-1.239]	[12.332]	[14.884]	[18.302]
β_{i1}	*0.039	*0.039	*-0.026	*-0.008	*-0.058	*0.005	*0.016	0.004	*0.011
	[13.655]	[9.567]	[-8.350]	[-5.794]	[-3.526]	[5.206]	[9.400]	[1.490]	[6.696]
β_{ii}	*0.992	*0.679	*0.994	*0.915	*0.988	*0.933	*-0.913	*0.988	*0.981
	[772.581]	[19.225]	[994.155]	[192.239]	[1485.509]	[229.621]	[-142.252]	[396.717]	[423.401]

See Notes (1).

Table 96: 30 Minute VAR-BEKK-GARCH Results for New York Closing-Tokyo Opening Period (Contd.)

GBPUSD	NZDUSD	USDCAD	USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK
$ar(1)_{11}$	*-0.089	*-0.086	*-0.056	*-0.060	*-0.058	*-0.057	*-0.079	*-0.084
	[-9.425]	[-8.375]	[-5.635]	[-6.276]	[-6.356]	[-6.714]	[-7.925]	[-8.592]
$ar(1)_{1i}$	**0.006	*-0.038	-0.009	-0.050	*0.014	*-0.018	-0.006	*-0.012
	[2.120]	[-4.607]	[-1.634]	[-0.780]	[3.115]	[-4.151]	[-1.179]	[-2.663]
Constant	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	[0.468]	[0.715]	[1.001]	[0.709]	[0.448]	[1.418]	[-0.330]	[-0.845]
$ar(1)_{i1}$	0.033	*-0.043	*-0.094	0.000	-0.015	*-0.111	*-0.060	*-0.042
	[1.590]	[-4.689]	[-9.073]	[0.713]	[-1.337]	[-8.535]	[-3.711]	[-3.002]
$ar(1)_{ii}$	*-0.082	*-0.103	*-0.113	*-0.122	*-0.069	*-0.110	*-0.119	*-0.097
	[-7.367]	[-11.521]	[-11.526]	[-14.680]	[-7.221]	[-11.340]	[-11.933]	[-10.869]
Constant	0.000	*0.000	*0.000	*0.000	*0.000	0.000	*0.000	*0.000
	[0.294]	[6.565]	[5.975]	[10.913]	[3.062]	[-1.328]	[4.887]	[4.599]
c_{11}	0.000	*0.000	*0.000	*0.000	*0.000	0.000	*0.000	*0.000
	[0.587]	[12.965]	[3.898]	[11.395]	[6.135]	[-0.445]	[-7.411]	[15.058]
c_{i1}	*-0.001	*0.000	*0.000	*0.000	0.000	*0.000	*0.000	*0.000
	[-29.386]	[5.775]	[-28.785]	[3.991]	[-1.481]	[-12.735]	[4.561]	[9.028]
c_{ii}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	0.000
	[6.581]	[-6.211]	[-2.739]	[10.128]	[15.613]	[-16.488]	[10.660]	[1.693]
α_{11}	*0.191	*0.154	*0.126	*0.205	*0.142	*0.197	*0.181	*0.161
	[20.820]	[23.029]	[24.017]	[24.268]	[20.405]	[29.086]	[30.362]	[21.173]
α_{1i}	-0.033	-0.003	*0.217	*0.002	*0.064	*0.427	-0.018	-0.007
	[-0.929]	[-0.692]	[13.106]	[4.269]	[5.670]	[16.739]	[-1.865]	[-0.722]
α_{i1}	*0.017	*0.047	0.003	*0.283	0.004	*0.008	*-0.038	*0.008
	[4.062]	[9.221]	[0.570]	[6.081]	[0.966]	[2.705]	[-9.740]	[2.975]
α_{ii}	*0.513	*0.151	*0.602	*0.161	*0.463	*0.340	*0.166	*0.139
	[30.558]	[22.192]	[41.067]	[32.713]	[37.345]	[28.350]	[27.655]	[17.655]
β_{11}	*0.963	*0.985	*0.989	*0.977	*0.990	*0.925	*0.986	*0.982
	[253.062]	[864.828]	[886.988]	[467.561]	[983.478]	[309.327]	[701.086]	[727.452]
β_{1i}	*0.158	-0.001	*-0.098	*-0.001	*-0.011	*-0.715	*-0.012	0.000
	[7.840]	[-0.828]	[-15.645]	[-4.683]	[-3.973]	[-29.935]	[-5.114]	[-0.242]
β_{i1}	*0.019	*-0.009	*-0.006	*-0.039	*-0.003	*-0.150	*0.011	*-0.005
	[5.885]	[-11.127]	[-3.450]	[-5.253]	[-3.025]	[-57.338]	[13.789]	[-11.262]
β_{ii}	*0.628	*0.988	*0.779	*0.987	*0.904	*-0.760	*0.981	*0.989
	[25.437]	[901.492]	[80.948]	[1358.474]	[182.342]	[-56.485]	[709.632]	[641.156]

See Notes (1).

Table 97: 30 Minute VAR-BEKK-GARCH Results for New York Closing-Tokyo Opening Period (Contd.)

NZDUSD	USDCAD	USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK
$ar(1)_{11}$	*-0.059 [-5.398]	*-0.065 [-6.398]	*-0.056 [-6.108]	*-0.056 [-5.378]	*-0.051 [-4.939]	*-0.061 [-5.784]	*-0.065 [-6.422]
$ar(1)_{1i}$	-0.012 [-0.568]	*-0.041 [-3.039]	-0.082 [-0.495]	**-0.022 [-1.975]	*-0.038 [-3.530]	0.000 [0.040]	-0.022 [-1.943]
Constant	0.000 [-0.464]	0.000 [-0.104]	0.000 [-0.797]	0.000 [-1.200]	0.000 [-1.079]	0.000 [-0.655]	0.000 [-0.538]
$ar(1)_{i1}$	*-0.020 [-6.477]	-0.006 [-1.737]	0.000 [0.252]	-0.003 [-0.974]	*-0.034 [-7.205]	*-0.022 [-4.325]	*-0.016 [-3.319]
$ar(1)_{ii}$	*-0.102 [-11.951]	*-0.079 [-7.721]	*-0.122 [-13.588]	*-0.069 [-7.745]	*-0.115 [-12.474]	*-0.107 [-12.458]	*-0.085 [-9.442]
Constant	*0.000 [5.698]	*0.000 [6.800]	*0.000 [10.372]	*0.000 [3.659]	0.000 [-1.161]	*0.000 [5.357]	*0.000 [5.123]
c_{11}	*0.001 [30.047]	*0.000 [20.799]	*0.000 [28.525]	*0.000 [25.285]	*0.000 [28.154]	*0.001 [28.299]	*0.001 [36.316]
c_{i1}	*0.000 [-11.678]	*0.000 [-2.777]	*0.000 [-4.528]	*0.000 [-3.314]	*0.000 [8.511]	*0.000 [2.687]	*0.000 [15.406]
c_{ii}	0.000 [-0.004]	*0.000 [25.099]	0.000 [0.000]	*0.000 [12.859]	*0.000 [15.169]	0.000 [-0.915]	0.000 [0.001]
α_{11}	*0.502 [28.033]	*0.365 [23.084]	*0.475 [27.322]	*0.448 [23.503]	*0.427 [23.677]	*0.520 [30.700]	*0.538 [33.988]
α_{1i}	*-0.042 [-13.525]	0.005 [0.769]	*-0.001 [-4.474]	*0.024 [3.238]	*0.050 [5.423]	-0.017 [-1.710]	0.004 [1.245]
α_{i1}	*-0.237 [-6.154]	*-0.056 [-4.506]	*-2.036 [-9.115]	*0.137 [6.725]	*0.108 [5.947]	0.003 [0.124]	0.014 [0.664]
α_{ii}	*0.176 [20.306]	*0.515 [39.940]	*0.174 [35.288]	*0.396 [39.395]	*0.308 [25.435]	*0.152 [29.931]	*0.130 [25.744]
β_{11}	*0.542 [16.907]	*0.801 [42.011]	*0.736 [42.224]	*0.711 [29.871]	*0.731 [38.207]	*0.613 [21.536]	*0.546 [20.364]
β_{1i}	*0.039 [11.050]	0.000 [0.054]	*0.001 [9.388]	-0.004 [-0.636]	*-0.052 [-5.810]	0.001 [0.118]	*-0.012 [-18.737]
β_{i1}	*-0.127 [-6.623]	-0.011 [-0.994]	*0.445 [5.961]	*-0.035 [-3.369]	*-0.149 [-10.112]	*-0.139 [-7.997]	*-0.220 [-15.407]
β_{ii}	*0.998 [635.044]	*0.858 [121.941]	*0.984 [1139.489]	*0.931 [269.217]	*0.902 [112.387]	*0.988 [278.995]	*0.985 [1116.757]

See Notes (1).

Table 98: 30 Minute VAR-BEKK-GARCH Results for New York Closing-Tokyo Opening Period (Contd.)

USDCAD	USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK
$ar(1)_{11}$	*-0.094	*-0.087	*-0.078	*-0.087	*-0.104	*-0.108
	[-10.819]	[-11.989]	[-9.585]	[-10.261]	[-12.474]	[-12.419]
$ar(1)_{1i}$	*0.027	0.082	-0.006	*0.014	*0.028	*0.031
	[4.583]	[1.241]	[-1.206]	[2.735]	[6.603]	[5.757]
Constant	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[5.244]	[5.542]	[6.732]	[6.301]	[5.971]	[7.031]
$ar(1)_{i1}$	*0.048	0.000	-0.011	*0.043	*0.067	*0.049
	[5.205]	[0.721]	[-1.148]	[3.736]	[5.237]	[3.812]
$ar(1)_{ii}$	*-0.089	*-0.121	*-0.064	*-0.121	*-0.121	*-0.096
	[-8.358]	[-12.409]	[-6.458]	[-11.804]	[-13.360]	[-9.977]
Constant	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[6.115]	[9.888]	[3.050]	[-3.104]	[6.374]	[4.810]
c_{11}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[10.147]	[7.426]	[7.543]	[11.433]	[-7.146]	[9.756]
c_{i1}	*0.000	*0.000	*0.000	*0.000	0.000	0.000
	[27.388]	[-2.802]	[18.225]	[28.780]	[1.194]	[1.194]
c_{ii}	0.000	*0.000	0.000	0.000	*0.000	*0.000
	[0.006]	[-10.513]	[0.001]	[0.005]	[-8.695]	[4.702]
α_{11}	*0.136	*0.154	*0.128	*0.189	*0.144	*0.175
	[23.353]	[17.382]	[25.957]	[20.892]	[18.584]	[17.889]
α_{1i}	**-0.038	*-0.003	*-0.141	*0.306	-0.022	*0.058
	[-2.045]	[-6.172]	[-13.314]	[16.330]	[-1.832]	[4.663]
α_{i1}	*0.020	*-0.328	**0.010	*0.037	*0.014	*0.017
	[4.264]	[-6.982]	[2.496]	[8.430]	[3.864]	[3.537]
α_{ii}	*0.544	*0.173	*0.445	*0.398	*0.139	*0.119
	[44.342]	[35.169]	[39.554]	[35.619]	[24.365]	[18.051]
β_{11}	*0.993	*0.988	*0.992	*0.986	*0.989	*0.983
	[1071.058]	[709.154]	[1707.294]	[576.943]	[822.838]	[547.038]
β_{1i}	*0.036	*0.000	*0.013	*-0.028	0.003	*-0.012
	[9.325]	[5.571]	[7.286]	[-5.399]	[1.832]	[-4.844]
β_{i1}	*-0.009	*0.057	-0.001	*-0.035	-0.001	0.000
	[-4.864]	[7.900]	[-1.191]	[-11.912]	[-1.596]	[-0.068]
β_{ii}	*0.834	*0.985	*0.909	*0.777	*0.990	*0.994
	[115.302]	[1195.497]	[198.319]	[58.032]	[1098.423]	[988.617]

See Notes (1).

Table 99: 30 Minute VAR-BEKK-GARCH Results for New York Closing-Tokyo Opening Period (Contd.)

USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK	**USDHKD**	USDJPY	USDMXN	USDNOK	USDSEK
$ar(1)_{11}$	*-0.087	*-0.065	*-0.083	*-0.090	*-0.104	$ar(1)_{11}$	*-0.116	*-0.116	*-0.120	*-0.119
	[-7.861]	[-6.664]	[-8.047]	[-8.298]	[-10.403]		[-14.246]	[-13.252]	[-14.928]	[-12.254]
$ar(1)_{1i}$	-0.084	*0.026	0.003	*0.026	*0.037	$ar(1)_{1i}$	0.000	0.000	**0.001	*0.001
	[-1.177]	[4.104]	[0.626]	[3.858]	[5.303]		[-0.590]	[-0.022]	[2.425]	[2.692]
Constant	*0.000	*0.000	*0.000	*0.000	*0.000	*Constant*	*0.000	*0.000	*0.000	*0.000
	[6.244]	[7.021]	[7.338]	[6.291]	[7.141]		[11.656]	[13.390]	[14.062]	[11.294]
$ar(1)_{i1}$	0.000	**0.018	*0.045	*0.051	0.012	$ar(1)_{i1}$	-0.062	-0.063	*0.274	**0.234
	[0.943]	[2.260]	[5.920]	[4.762]	[1.110]		[-0.817]	[-0.594]	[2.855]	[2.403]
$ar(1)_{ii}$	*-0.122	*-0.080	*-0.128	*-0.120	*-0.085	$ar(1)_{ii}$	*-0.057	*-0.113	*-0.106	*-0.088
	[-14.251]	[-8.040]	[-13.910]	[-12.591]	[-9.112]		[-5.597]	[-12.277]	[-11.299]	[-8.887]
Constant	*0.000	**0.000	0.000	*0.000	*0.000	*Constant*	*0.000	0.000	*0.000	*0.000
	[10.205]	[2.191]	[0.362]	[4.831]	[4.935]		[2.840]	[-1.744]	[4.725]	[4.764]
c_{11}	*0.000	*0.000	*0.000	*0.000	*0.000	c_{11}	*0.000	*0.000	*0.000	*0.000
	[26.376]	[23.916]	[21.728]	[24.358]	[21.298]		[-13.935]	[9.895]	[-14.900]	[-13.534]
c_{i1}	*0.000	*0.000	**0.000	*0.000	*0.000	c_{i1}	0.000	*0.000	**0.000	0.000
	[10.411]	[6.125]	[-1.985]	[4.697]	[-3.921]		[-1.357]	[-3.395]	[2.396]	[0.679]
c_{ii}	0.000	*0.000	**0.000	*0.000	0.000	c_{ii}	*0.000	*0.000	*0.000	*0.000
	[-0.003]	[12.284]	[2.111]	[10.050]	[-0.012]		[17.362]	[7.496]	[9.000]	[8.856]
α_{11}	*0.580	*0.496	*0.539	*0.552	*0.483	α_{11}	*0.160	*0.167	*0.174	*0.176
	[42.678]	[31.861]	[38.966]	[39.782]	[32.756]		[34.793]	[31.451]	[34.456]	[31.880]
α_{1i}	0.001	0.013	0.000	*0.089	*0.034	α_{1i}	*-0.276	0.071	*-0.484	*-0.392
	[1.445]	[1.839]	[-0.062]	[8.199]	[4.148]		[-3.391]	[0.335]	[-7.768]	[-6.020]
α_{i1}	*-0.625	0.001	*-0.026	*-0.070	*-0.087	α_{i1}	0.000	-0.001	**-0.001	**0.000
	[-5.572]	[0.183]	[-3.485]	[-7.686]	[-12.013]		[-1.370]	[-1.238]	[-2.397]	[-2.406]
α_{ii}	*0.155	*0.295	*0.106	*0.135	*0.127	α_{ii}	*0.436	*0.338	*0.137	*0.119
	[37.836]	[30.628]	[19.624]	[23.070]	[23.087]		[39.009]	[25.134]	[27.340]	[21.905]
β_{11}	*-0.811	*0.853	*0.843	*0.825	*0.854	β_{11}	*0.987	*0.986	*0.985	*0.985
	[-82.986]	[90.798]	[103.036]	[100.752]	[95.782]		[1511.400]	[1188.029]	[1236.636]	[1094.733]
β_{1i}	-0.001	*-0.011	**0.005	*-0.040	*-0.018	β_{1i}	*0.048	0.021	*0.080	*0.067
	[-1.164]	[-3.614]	[2.153]	[-9.407]	[-5.902]		[2.988]	[0.490]	[8.465]	[6.400]
β_{i1}	*0.947	0.004	*0.025	*0.043	*0.058	β_{i1}	0.000	*0.001	*0.000	0.000
	[5.279]	[1.352]	[5.031]	[9.749]	[16.492]		[0.485]	[3.508]	[2.645]	[1.628]
β_{ii}	*0.989	*0.962	*0.992	*0.999	*0.998	β_{ii}	*0.914	*0.892	*0.990	*0.992
	[1179.152]	[410.135]	[1268.907]	[688.654]	[744.551]		[202.993]	[96.553]	[1312.106]	[1311.949]

See Notes (1).

Table 100: 30 Minute VAR-BEKK-GARCH Results for New York Closing-Tokyo Opening Period (Contd.)

USDJPY	USDMXN	USDNOK	USDSEK	**USDMXN**	USDNOK	USDSEK	**USDNOK**	USDSEK
$ar(1)_{11}$	*-0.065 [-7.870]	*-0.069 [-8.459]	*-0.062 [-7.015]	$ar(1)_{11}$	*-0.120 [-12.396]	*-0.120 [-12.507]	$ar(1)_{11}$	*-0.141 [-13.216]
$ar(1)_{1i}$	0.002 [0.474]	0.007 [1.209]	-0.005 [-0.760]	$ar(1)_{1i}$	*0.054 [8.092]	*0.067 [8.600]	$ar(1)_{1i}$	*0.070 [6.731]
Constant	*0.000 [3.693]	*0.000 [3.360]	*0.000 [3.586]	*Constant*	0.000 [-0.749]	0.000 [-0.493]	*Constant*	*0.000 [4.507]
$ar(1)_{i1}$	*-0.017 [-2.752]	0.006 [1.023]	0.000 [-0.051]	$ar(1)_{i1}$	*0.023 [3.630]	**0.020 [2.359]	$ar(1)_{i1}$	*0.045 [4.520]
$ar(1)_{ii}$	*-0.108 [-12.310]	*-0.100 [-12.499]	*-0.084 [-10.833]	$ar(1)_{ii}$	*-0.115 [-13.504]	*-0.101 [-11.192]	$ar(1)_{ii}$	*-0.105 [-9.791]
Constant	0.000 [-1.260]	*0.000 [6.031]	*0.000 [6.988]	*Constant*	*0.000 [5.799]	*0.000 [6.370]	*Constant*	*0.000 [4.405]
c_{11}	*0.000 [16.275]	*0.000 [17.729]	*0.000 [18.147]	c_{11}	*0.000 [20.962]	*0.000 [19.635]	c_{11}	*0.000 [14.240]
c_{i1}	0.000 [0.294]	**0.000 [2.002]	*0.000 [4.079]	c_{i1}	0.000 [-1.225]	*0.000 [-5.515]	c_{i1}	*0.000 [13.929]
c_{ii}	*0.000 [12.625]	*0.000 [9.425]	*0.000 [7.988]	c_{ii}	*0.000 [9.466]	*0.000 [8.608]	c_{ii}	*0.000 [-11.974]
α_{11}	*0.418 [32.901]	*0.441 [39.981]	*0.439 [37.402]	α_{11}	*0.329 [30.378]	*0.299 [24.441]	α_{11}	*0.238 [22.306]
α_{1i}	0.014 [1.531]	*0.033 [4.871]	*0.035 [6.750]	α_{1i}	-0.006 [-0.668]	**-0.017 [-2.086]	α_{1i}	*0.121 [12.989]
α_{i1}	-0.003 [-0.392]	*-0.038 [-6.098]	*-0.031 [-4.952]	α_{i1}	*-0.101 [-10.728]	*-0.142 [-17.425]	α_{i1}	*0.093 [9.382]
α_{ii}	*0.289 [17.545]	*0.136 [29.042]	*0.121 [24.903]	α_{ii}	*0.137 [23.301]	*0.136 [18.944]	α_{ii}	*0.209 [18.203]
β_{11}	*0.923 [199.385]	*0.914 [217.325]	*0.915 [206.932]	β_{11}	*0.898 [119.994]	*0.915 [138.263]	β_{11}	*0.962 [238.026]
β_{1i}	-0.005 [-1.631]	*-0.008 [-3.900]	*-0.009 [-6.996]	β_{1i}	0.003 [0.695]	*0.014 [4.473]	β_{1i}	*-0.032 [-8.544]
β_{i1}	0.000 [0.018]	*0.004 [2.813]	0.003 [1.897]	β_{i1}	*0.025 [10.617]	*0.031 [12.209]	β_{i1}	*-0.023 [-6.039]
β_{ii}	*0.918 [81.832]	*0.991 [1568.870]	*0.992 [1489.945]	β_{ii}	*0.990 [841.115]	*0.987 [618.587]	β_{ii}	*0.966 [216.466]

See Notes (1).

Appendix A.5. 15 Minute Session Based VAR-BEKK-GARCH Results

Appendix A.5.1. USA Market Period

Table 101: 30 Minute VAR-BEKK-GARCH Results for USA Market Period

AUDUSD	EURUSD	GBPUSD	NZDUSD	USDCAD	USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK
$ar(1)_{11}$	*-0.047	*-0.041	*-0.057	*-0.046	*-0.038	*-0.034	*-0.049	*-0.038	*-0.037	*-0.044
	[-14.749]	[-12.963]	[-14.334]	[-15.276]	[-11.970]	[-12.838]	[-17.861]	[-11.736]	[-12.297]	[-15.048]
$ar(1)_{1i}$	*0.019	*0.010	*0.028	*-0.023	*-0.007	*0.341	*-0.017	*-0.007	*-0.006	*-0.010
	[5.341]	[2.728]	[8.308]	[-6.837]	[-2.612]	[7.449]	[-5.581]	[-2.646]	[-3.088]	[-4.328]
Constant	0.000	0.000	0.000	**0.000	*0.000	0.000	**0.000	0.000	0.000	**0.000
	[-1.594]	[-1.028]	[-1.614]	[-2.209]	[-4.244]	[-0.906]	[-1.968]	[-0.154]	[-0.084]	[-2.028]
$ar(1)_{i1}$	*0.007	*0.014	*0.066	*-0.036	-0.004	*0.000	*-0.005	*-0.047	*-0.064	*-0.048
	[2.779]	[6.379]	[14.454]	[-14.657]	[-1.361]	[-3.977]	[-2.727]	[-16.786]	[-18.570]	[-14.842]
$ar(1)_{ii}$	*-0.035	*-0.053	*-0.088	*-0.059	*-0.043	*-0.147	*-0.049	*-0.056	*-0.086	*-0.074
	[-10.575]	[-16.213]	[-20.211]	[-17.165]	[-13.502]	[-49.496]	[-18.243]	[-18.667]	[-32.370]	[-24.210]
Constant	0.000	0.000	0.000	0.000	0.000	*0.000	*0.000	**0.000	*0.000	**0.000
	[-1.078]	[-0.625]	[-0.063]	[1.608]	[-1.072]	[-6.248]	[5.259]	[-2.272]	[-4.870]	[-2.460]

See Notes (1).

Table 102: 30 Minute VAR-BEKK-GARCH Results for USA Market Period (Contd.)

c_{11}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[61.738]	[41.818]	[35.367]	[10.197]	[78.168]	[-72.704]	[72.288]	[75.831]	[75.897]	[47.026]
c_{i1}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[60.889]	[52.734]	[61.465]	[-5.486]	[-76.289]	[-8.460]	[-57.848]	[-33.226]	[-29.802]	[-61.306]
c_{ii}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[41.578]	[27.567]	[36.252]	[65.975]	[25.312]	[12.194]	[49.917]	[30.447]	[28.927]	[24.137]
α_{11}	*0.273	*0.258	*0.156	*0.107	*0.283	*0.374	*0.276	*0.378	*0.388	*0.243
	[64.623]	[47.690]	[20.708]	[25.185]	[87.300]	[109.621]	[82.595]	[94.860]	[97.889]	[58.931]
α_{1i}	*0.066	*0.075	*-0.107	*0.127	*-0.099	*0.000	*-0.013	*-0.103	*-0.180	*-0.108
	[20.395]	[22.261]	[-11.872]	[36.352]	[-32.436]	[6.464]	[-5.229]	[-35.596]	[-52.502]	[-25.014]
α_{i1}	*0.132	*0.164	*0.129	*-0.155	*-0.098	*0.375	*-0.066	*0.020	*0.012	*-0.114
	[35.810]	[36.591]	[26.412]	[-31.810]	[-35.347]	[10.730]	[-20.356]	[5.703]	[4.274]	[-42.750]
α_{ii}	*0.347	*0.302	*0.482	*0.496	*0.317	*0.176	*0.349	*0.185	*0.130	*0.313
	[81.871]	[49.815]	[76.244]	[126.363]	[97.943]	[117.838]	[102.997]	[44.716]	[43.704]	[72.161]
β_{11}	*0.954	*0.962	*1.011	*1.001	*0.947	*0.919	*0.954	*0.921	*0.918	*0.964
	[648.611]	[520.202]	[499.043]	[1045.682]	[908.919]	[641.461]	[908.138]	[576.373]	[605.147]	[735.575]
β_{1i}	*-0.022	*-0.018	*0.073	*-0.041	*0.041	*0.000	*0.009	*0.032	*0.052	*0.028
	[-18.854]	[-14.161]	[23.647]	[-33.680]	[44.332]	[-8.124]	[10.920]	[32.396]	[45.323]	[19.276]
β_{i1}	*-0.041	*-0.063	*-0.065	*0.044	*0.027	*-0.114	*0.028	*-0.004	-0.001	*0.041
	[-32.123]	[-36.928]	[-36.010]	[26.830]	[34.271]	[-15.529]	[26.529]	[-4.472]	[-1.212]	[44.226]
β_{ii}	*0.932	*0.932	*0.842	*0.875	*0.944	*0.987	*0.932	*0.981	*0.990	*0.930
	[624.797]	[401.817]	[293.911]	[514.937]	[986.407]	[4952.538]	[802.873]	[939.012]	[1457.334]	[540.364]

See Notes (1).

Table 103: 30 Minute VAR-BEKK-GARCH Results for USA Market Period (Contd.)

EURUSD	GBPUSD	NZDUSD	USDCAD	USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK
$ar(1)_{11}$	*-0.041	*-0.043	*-0.025	*-0.032	*-0.032	*-0.045	*-0.035	*-0.028	*-0.023
	[-12.009]	[-13.731]	[-8.549]	[-8.259]	[-10.940]	[-15.477]	[-11.809]	[-7.714]	[-5.972]
$ar(1)_{1i}$	*0.009	*0.009	*-0.008	-0.004	*0.125	*-0.009	0.003	**0.005	*0.011
	[2.703]	[4.451]	[-3.034]	[-1.269]	[4.028]	[-3.327]	[1.363]	[1.981]	[4.358]
Constant	0.000	0.000	**0.000	*0.000	0.000	0.000	0.000	0.000	0.000
	[0.147]	[-1.182]	[-2.293]	[-2.933]	[-1.369]	[-1.193]	[-0.857]	[-0.637]	[-1.928]
$ar(1)_{i1}$	*0.019	*0.026	*-0.050	*-0.070	*0.000	-0.003	*-0.033	*-0.055	*-0.062
	[7.172]	[7.284]	[-21.620]	[-15.329]	[-3.633]	[-1.380]	[-11.530]	[-10.590]	[-13.001]
$ar(1)_{ii}$	*-0.062	*-0.056	*-0.057	*-0.090	*-0.147	*-0.045	*-0.046	*-0.088	*-0.089
	[-17.476]	[-17.881]	[-19.568]	[-21.661]	[-50.274]	[-14.982]	[-15.874]	[-24.274]	[-23.318]
Constant	0.000	0.000	**0.000	0.000	*0.000	*0.000	0.000	*0.000	0.000
	[-0.512]	[-0.994]	[2.380]	[0.206]	[-8.742]	[4.308]	[-1.367]	[-4.451]	[-1.053]
c_{11}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[62.802]	[67.001]	[60.664]	[41.139]	[-86.342]	[79.560]	[86.206]	[77.832]	[71.941]
c_{i1}	*0.000	*0.000	*0.000	*0.000	0.000	*0.000	*0.000	*0.000	*0.000
	[48.322]	[41.268]	[-24.445]	[-16.179]	[-0.836]	[-53.788]	[-22.802]	[-48.040]	[-40.287]
c_{ii}	*0.000	*0.000	*0.000	0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[57.640]	[59.421]	[88.838]	[0.000]	[18.218]	[62.261]	[38.848]	[44.588]	[74.220]
α_{11}	*0.312	*0.335	*0.315	*0.096	*0.408	*0.334	*0.397	*0.450	*0.303
	[58.378]	[73.172]	[69.437]	[39.330]	[125.941]	[90.942]	[114.390]	[100.773]	[58.281]
α_{1i}	*0.017	*0.059	**0.008	*0.094	0.000	*-0.044	*-0.103	*-0.305	*0.047
	[3.975]	[9.905]	[2.007]	[38.385]	[0.173]	[-19.372]	[-34.579]	[-57.257]	[7.752]
α_{i1}	*0.101	*0.042	*-0.078	*-0.086	-0.006	*-0.060	*0.008	*0.038	*-0.024
	[21.587]	[15.878]	[-19.292]	[-36.751]	[-0.168]	[-18.969]	[3.103]	[10.999]	[-6.662]
α_{ii}	*0.375	*0.361	*0.414	*0.220	*0.174	*0.335	*0.214	*0.101	*0.387
	[84.758]	[84.710]	[113.973]	[91.904]	[109.657]	[97.260]	[59.950]	[27.439]	[78.849]
β_{11}	*0.951	*0.943	*0.944	*1.170	*0.910	*0.937	*0.916	*0.904	*0.955
	[502.448]	[550.979]	[574.756]	[1426.283]	[710.411]	[722.869]	[697.891]	[610.244]	[476.500]
β_{1i}	0.002	*-0.007	*-0.005	*-0.275	0.000	*0.016	*0.032	*0.083	*-0.040
	[0.987]	[-2.722]	[-3.839]	[-320.546]	[-0.481]	[20.883]	[30.973]	[50.222]	[-15.162]
β_{i1}	*-0.051	*-0.024	*0.026	*0.224	*-0.028	*0.023	*-0.002	*-0.004	*0.016
	[-26.416]	[-19.073]	[15.731]	[319.453]	[-3.869]	[23.551]	[-3.230]	[-4.960]	[9.608]
β_{ii}	*0.908	*0.908	*0.904	*0.779	*0.987	*0.937	*0.974	*0.993	*0.894
	[485.333]	[442.153]	[604.917]	[1085.018]	[4707.751]	[811.611]	[1083.855]	[1266.344]	[371.610]

See Notes (1).

Table 104: 30 Minute VAR-BEKK-GARCH Results for USA Market Period (Contd.)

GBPUSD	NZDUSD	USDCAD	USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK
$ar(1)_{11}$	*-0.054	*-0.052	*-0.059	*-0.043	*-0.055	*-0.049	*-0.052	*-0.050
	[-18.023]	[-20.416]	[-19.276]	[-13.863]	[-19.863]	[-16.224]	[-20.327]	[-15.314]
$ar(1)_{1i}$	*0.011	*-0.015	*-0.012	*0.121	*-0.011	*-0.005	*-0.008	*-0.007
	[6.117]	[-9.023]	[-6.003]	[4.002]	[-4.895]	[-2.906]	[-22.041]	[-3.830]
Constant	0.000	**0.000	*0.000	0.000	0.000	0.000	0.000	0.000
	[-1.541]	[-1.996]	[-3.148]	[-1.164]	[-1.436]	[-0.438]	[-0.452]	[-1.836]
$ar(1)_{i1}$	*0.031	*-0.035	-0.006	**0.000	*-0.007	*-0.029	*-0.036	*-0.045
	[7.825]	[-16.323]	[-1.636]	[-2.438]	[-2.872]	[-9.011]	[-47.343]	[-10.058]
$ar(1)_{ii}$	*-0.054	*-0.046	*-0.051	*-0.149	*-0.045	*-0.038	*-0.074	*-0.072
	[-17.660]	[-17.748]	[-15.968]	[-50.212]	[-16.446]	[-14.252]	[-34.276]	[-23.803]
Constant	0.000	0.000	0.000	*0.000	*0.000	0.000	*0.000	0.000
	[-0.921]	[1.600]	[-1.887]	[-6.088]	[6.566]	[-1.142]	[-66.917]	[-1.769]
c_{11}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[48.545]	[63.858]	[81.630]	[87.942]	[63.685]	[90.477]	[110.969]	[64.725]
c_{i1}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[24.718]	[-16.560]	[-86.430]	[5.457]	[-42.352]	[-29.423]	[-60.584]	[-31.166]
c_{ii}	*0.000	*0.000	0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[71.806]	[-82.487]	[0.000]	[8.716]	[77.343]	[31.265]	[-13.231]	[54.790]
α_{11}	*0.281	*0.294	*0.205	*0.390	*0.295	*0.390	*0.406	*0.312
	[55.175]	[62.751]	[65.520]	[113.449]	[70.982]	[96.363]	[145.005]	[65.536]
α_{1i}	**0.016	*0.029	*-0.136	*0.000	**-0.008	*-0.111	*-0.236	*-0.034
	[2.410]	[6.284]	[-30.579]	[5.552]	[-2.194]	[-28.004]	[-89.221]	[-4.318]
α_{i1}	*0.032	*-0.046	*-0.081	*0.305	*-0.044	-0.003	*-0.014	*-0.035
	[11.927]	[-12.194]	[-39.127]	[9.383]	[-17.410]	[-1.199]	[-14.705]	[-11.799]
α_{ii}	*0.403	*0.423	*0.299	*0.171	*0.374	*0.213	*0.122	*0.371
	[88.772]	[108.956]	[65.824]	[114.911]	[111.631]	[59.532]	[86.982]	[73.439]
β_{11}	*0.952	*0.939	*0.967	*0.905	*0.943	*0.905	*-0.841	*0.938
	[465.097]	[513.605]	[1106.521]	[580.216]	[611.196]	[547.372]	[-313.126]	[468.724]
β_{1i}	*0.008	-0.001	*0.048	*0.000	*0.009	*0.044	*1.496	*0.013
	[2.617]	[-0.700]	[40.231]	[-7.238]	[6.753]	[29.772]	[534.479]	[3.540]
β_{i1}	*-0.015	*0.007	*0.020	*-0.058	*0.018	-0.001	*0.067	*0.013
	[-11.817]	[4.582]	[37.996]	[-9.582]	[19.426]	[-0.903]	[27.790]	[9.902]
β_{ii}	*0.890	*0.904	*0.945	*0.987	*0.921	*0.975	*0.938	*0.912
	[384.361]	[551.669]	[763.132]	[5063.991]	[711.895]	[1068.317]	[463.350]	[390.101]

See Notes (1).

Table 105: 30 Minute VAR-BEKK-GARCH Results for USA Market Period (Contd.)

NZDUSD	USDCAD	USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK
$ar(1)_{11}$	*-0.060	*-0.048	*-0.042	*-0.052	*-0.052	*-0.045	*-0.052
	[-19.384]	[-16.623]	[-17.117]	[-19.056]	[-18.050]	[-15.797]	[-17.323]
$ar(1)_{1i}$	*-0.040	*-0.013	*0.164	-0.006	*-0.020	*-0.008	*-0.017
	[-10.934]	[-4.315]	[3.555]	[-1.718]	[-8.195]	[-3.428]	[-6.816]
Constant	0.000	**0.000	0.000	0.000	0.000	0.000	0.000
	[-1.399]	[-2.450]	[-0.606]	[-1.206]	[-0.496]	[0.232]	[-0.869]
$ar(1)_{i1}$	*-0.020	-0.003	*0.000	*-0.005	*-0.033	*-0.053	*-0.039
	[-9.998]	[-1.422]	[-5.258]	[-3.370]	[-14.387]	[-19.904]	[-14.964]
$ar(1)_{ii}$	*-0.048	*-0.053	*-0.146	*-0.057	*-0.050	*-0.087	*-0.076
	[-15.210]	[-15.995]	[-47.183]	[-20.078]	[-18.651]	[-31.423]	[-24.851]
Constant	0.000	0.000	*0.000	*0.000	0.000	*0.000	0.000
	[1.052]	[-0.900]	[-6.118]	[5.131]	[-0.897]	[-4.273]	[-1.788]
c_{11}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[75.387]	[86.318]	[89.294]	[88.186]	[87.367]	[80.577]	[79.794]
c_{i1}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[-17.488]	[-76.305]	[10.423]	[-55.618]	[-23.642]	[-19.004]	[-21.500]
c_{ii}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[90.296]	[-14.618]	[-10.425]	[63.327]	[25.677]	[7.370]	[44.486]
α_{11}	*0.362	*0.273	*0.416	*0.336	*0.439	*0.448	*0.391
	[84.202]	[102.023]	[119.548]	[101.430]	[112.079]	[121.753]	[81.318]
α_{1i}	0.001	*-0.089	*0.000	*-0.028	*-0.084	*-0.136	*-0.056
	[0.268]	[-37.071]	[5.105]	[-13.433]	[-30.909]	[-41.375]	[-12.424]
α_{i1}	0.007	*-0.109	*0.538	*-0.050	*0.062	*0.048	0.001
	[1.108]	[-32.642]	[10.507]	[-11.820]	[16.951]	[16.388]	[0.238]
α_{ii}	*0.389	*0.310	*0.172	*0.337	*0.157	*0.109	*0.291
	[99.328]	[85.915]	[116.881]	[100.805]	[45.333]	[44.740]	[53.432]
β_{11}	*0.904	*0.945	*0.888	*0.925	*0.882	*0.877	*0.899
	[399.381]	[996.477]	[513.387]	[666.135]	[448.818]	[422.834]	[380.935]
β_{1i}	**0.003	*0.042	*0.000	*0.015	*0.031	*0.045	*0.025
	[2.187]	[50.223]	[-8.086]	[22.246]	[29.491]	[36.887]	[11.103]
β_{i1}	*-0.027	*0.026	*-0.160	*0.030	*-0.022	*-0.018	*-0.006
	[-8.809]	[25.954]	[-15.703]	[20.587]	[-19.212]	[-17.774]	[-2.936]
β_{ii}	*0.918	*0.948	*0.987	*0.933	*0.989	*0.998	*0.947
	[557.424]	[868.032]	[5134.632]	[837.994]	[1332.189]	[1904.412]	[420.006]

See Notes (1).

Table 106: 30 Minute VAR-BEKK-GARCH Results for USA Market Period (Contd.)

USDCAD	USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK
$ar(1)_{11}$	*-0.042	*-0.030	*-0.034	*-0.040	*-0.040	*-0.048
	[-15.791]	[-9.102]	[-11.830]	[-13.242]	[-13.612]	[-15.696]
$ar(1)_{1i}$	*0.014	*-0.143	*0.018	*0.015	*0.017	*0.030
	[6.157]	[-3.793]	[7.331]	[7.824]	[9.802]	[16.981]
Constant	**0.000	0.000	0.000	0.000	**0.000	**0.000
	[2.190]	[1.536]	[1.610]	[1.421]	[2.101]	[2.289]
$ar(1)_{i1}$	*0.010	*0.000	0.003	*0.032	*0.056	*0.044
	[3.469]	[2.695]	[1.441]	[10.737]	[15.461]	[12.693]
$ar(1)_{ii}$	*-0.046	*-0.146	*-0.043	*-0.043	*-0.073	*-0.059
	[-15.879]	[-45.913]	[-15.824]	[-15.048]	[-25.996]	[-20.386]
Constant	0.000	*0.000	*0.000	0.000	*0.000	0.000
	[-0.358]	[-6.205]	[7.305]	[-0.338]	[-2.665]	[-1.944]
c_{11}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[82.079]	[89.635]	[95.175]	[97.387]	[93.192]	[87.386]
c_{i1}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[41.486]	[-2.859]	[32.317]	[14.851]	[25.224]	[19.155]
c_{ii}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[27.565]	[-11.125]	[79.925]	[42.921]	[12.198]	[43.801]
α_{11}	*0.392	*0.440	*0.401	*0.447	*0.429	*0.412
	[88.849]	[131.430]	[132.069]	[132.610]	[117.763]	[112.714]
α_{1i}	*0.150	*0.000	*0.059	*0.078	*0.212	*0.099
	[48.382]	[-4.459]	[24.322]	[22.619]	[55.486]	[17.129]
α_{i1}	*0.051	-0.076	*0.022	*-0.021	*0.021	*0.017
	[15.872]	[-1.831]	[7.093]	[-8.462]	[8.677]	[7.236]
α_{ii}	*0.186	*0.172	*0.337	*0.225	*0.143	*0.299
	[67.258]	[112.637]	[111.152]	[61.970]	[53.637]	[62.308]
β_{11}	*0.910	*0.891	*0.908	*0.889	*0.894	*0.904
	[569.657]	[560.711]	[710.167]	[607.351]	[603.297]	[584.103]
β_{1i}	*-0.048	*0.000	*-0.025	*-0.025	*-0.068	*-0.034
	[-47.371]	[6.086]	[-26.934]	[-19.209]	[-52.321]	[-13.810]
β_{i1}	*-0.015	*0.033	*-0.012	*0.011	*-0.003	*-0.005
	[-18.812]	[3.982]	[-9.531]	[12.755]	[-3.559]	[-4.210]
β_{ii}	*0.979	*0.987	*0.931	*0.972	*0.989	*0.942
	[1485.884]	[4954.219]	[808.574]	[1005.740]	[1574.424]	[463.555]

See Notes (1).

Table 107: 30 Minute VAR-BEKK-GARCH Results for USA Market Period (Contd.)

USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK	**USDHKD**	USDJPY	USDMXN	USDNOK	USDSEK
$ar(1)_{11}$	*-0.044	*-0.053	*-0.053	*-0.051	*-0.056	$ar(1)_{11}$	*-0.148	*-0.147	*-0.147	*-0.147
	[-15.350]	[-16.764]	[-16.244]	[-15.086]	[-17.120]		[-47.745]	[-53.448]	[-44.008]	[-56.452]
$ar(1)_{1i}$	**0.091	*0.021	0.002	*0.008	*0.012	$ar(1)_{1i}$	**0.000	*0.000	0.000	*0.000
	[2.226]	[6.128]	[0.964]	[3.537]	[4.474]		[2.035]	[2.984]	[1.772]	[3.521]
Constant	**0.000	**0.000	0.000	0.000	0.000	*Constant*	*0.000	*0.000	*0.000	*0.000
	[-2.245]	[-2.422]	[-1.802]	[-0.107]	[0.367]		[-6.086]	[-6.873]	[-6.007]	[-6.473]
$ar(1)_{i1}$	0.000	0.001	*0.011	*0.017	*0.022	$ar(1)_{i1}$	*-0.108	0.027	-0.093	*-0.130
	[0.718]	[0.620]	[4.380]	[4.464]	[6.204]		[-3.423]	[0.660]	[-1.648]	[-2.648]
$ar(1)_{ii}$	*-0.148	*-0.046	*-0.035	*-0.067	*-0.068	$ar(1)_{ii}$	*-0.041	*-0.029	*-0.057	*-0.056
	[-51.206]	[-14.847]	[-11.062]	[-20.316]	[-20.831]		[-14.007]	[-10.908]	[-19.697]	[-18.376]
Constant	*0.000	*0.000	0.000	*0.000	0.000	*Constant*	*0.000	0.000	*0.000	**0.000
	[-5.987]	[4.566]	[-0.802]	[-3.707]	[-1.707]		[6.355]	[-1.124]	[-4.972]	[-2.081]
c_{11}	*0.000	*0.000	*0.000	*0.000	*0.000	c_{11}	*0.000	*0.000	*0.000	*0.000
	[83.430]	[86.090]	[36.936]	[76.540]	[81.141]		[-15.268]	[18.765]	[-10.454]	[11.843]
c_{i1}	**0.000	*0.000	*0.000	*0.000	*0.000	c_{i1}	*0.000	*0.000	*0.000	0.000
	[-2.003]	[61.959]	[40.214]	[88.409]	[92.501]		[3.072]	[-4.891]	[3.778]	[-0.244]
c_{ii}	*0.000	*0.000	*0.000	0.000	0.000	c_{ii}	*0.000	*0.000	*0.000	*0.000
	[-13.588]	[48.312]	[46.308]	[0.001]	[0.014]		[31.445]	[-24.818]	[24.616]	[79.549]
α_{11}	*0.400	*0.341	*0.288	*0.286	*0.259	α_{11}	*0.174	*0.176	*0.175	*0.175
	[122.346]	[95.980]	[43.988]	[74.364]	[75.978]		[125.117]	[121.259]	[121.947]	[112.075]
α_{1i}	*0.000	*0.056	*0.056	*0.150	*0.112	α_{1i}	0.050	*-0.184	*-0.239	0.033
	[-4.737]	[26.790]	[25.555]	[34.698]	[29.333]		[1.701]	[-5.211]	[-5.052]	[0.625]
α_{i1}	0.070	*0.080	*0.078	*0.110	*0.127	α_{i1}	*0.000	*0.000	*0.000	*0.000
	[1.954]	[18.332]	[34.967]	[48.393]	[48.760]		[-3.475]	[-3.959]	[-8.254]	[-4.362]
α_{ii}	*0.172	*0.341	*0.287	*0.283	*0.312	α_{ii}	*0.397	*0.311	*0.356	*0.391
	[109.517]	[95.344]	[85.646]	[90.021]	[95.664]		[130.334]	[101.135]	[94.207]	[109.416]
β_{11}	*0.918	*0.939	*0.954	*0.952	*0.959	β_{11}	*0.987	*0.987	*0.987	*0.987
	[793.900]	[813.424]	[466.125]	[960.777]	[1085.141]		[5349.590]	[5151.700]	[5202.154]	[4704.241]
β_{1i}	*0.000	*-0.017	*-0.017	*-0.039	*-0.031	β_{1i}	*0.017	*0.038	*0.081	*0.037
	[4.895]	[-25.951]	[-23.546]	[-35.779]	[-31.715]		[3.139]	[6.217]	[9.747]	[3.812]
β_{i1}	*0.021	*-0.042	*-0.026	*-0.047	*-0.051	β_{i1}	*0.000	*0.000	*0.000	*0.000
	[3.127]	[-27.351]	[-37.880]	[-58.134]	[-65.057]		[4.068]	[5.915]	[8.255]	[4.055]
β_{ii}	*0.987	*0.928	*0.952	*0.935	*0.929	β_{ii}	*0.909	*0.945	*0.919	*0.904
	[4627.864]	[720.730]	[899.629]	[797.903]	[826.607]		[705.785]	[950.788]	[548.754]	[538.574]

See Notes (1).

Table 108: 30 Minute VAR-BEKK-GARCH Results for USA Market Period (Contd.)

USDJPY	USDMXN	USDNOK	USDSEK	**USDMXN**	USDNOK	USDSEK	**USDNOK**	USDSEK
$ar(1)_{11}$	*-0.051 [-17.787]	*-0.045 [-15.871]	*-0.048 [-17.326]	$ar(1)_{11}$	*-0.036 [-12.508]	*-0.040 [-13.705]	$ar(1)_{11}$	*-0.091 [-30.239]
$ar(1)_{1i}$	*-0.005 [-2.993]	0.000 [-0.153]	0.000 [-0.268]	$ar(1)_{1i}$	*0.016 [7.688]	*0.018 [8.323]	$ar(1)_{1i}$	*0.044 [13.202]
Constant	*0.000 [7.546]	*0.000 [5.548]	*0.000 [5.763]	*Constant*	0.000 [-1.741]	0.000 [-1.592]	*Constant*	*0.000 [-3.870]
$ar(1)_{i1}$	-0.001 [-0.530]	**0.009 [2.566]	0.006 [1.696]	$ar(1)_{i1}$	*0.032 [10.811]	*0.026 [10.023]	$ar(1)_{i1}$	*0.036 [14.954]
$ar(1)_{ii}$	*-0.035 [-13.643]	*-0.065 [-24.832]	*-0.061 [-21.505]	$ar(1)_{ii}$	*-0.073 [-25.687]	*-0.067 [-21.945]	$ar(1)_{ii}$	*-0.082 [-26.815]
Constant	0.000 [-1.418]	*0.000 [-3.465]	0.000 [-1.512]	*Constant*	*0.000 [-3.967]	**0.000 [-2.015]	*Constant*	*0.000 [-3.534]
c_{11}	*0.000 [88.304]	*0.000 [79.515]	*0.000 [73.713]	c_{11}	*0.000 [55.808]	*0.000 [44.417]	c_{11}	*0.000 [77.547]
c_{i1}	*0.000 [26.017]	*0.000 [29.465]	*0.000 [42.022]	c_{i1}	*0.000 [16.025]	*0.000 [36.552]	c_{i1}	*0.000 [84.238]
c_{ii}	*0.000 [57.497]	*0.000 [41.812]	*0.000 [57.779]	c_{ii}	*0.000 [23.533]	*0.000 [36.252]	c_{ii}	*0.000 [35.394]
α_{11}	*0.360 [120.701]	*0.347 [86.376]	*0.323 [87.803]	α_{11}	*0.301 [92.332]	*0.239 [70.521]	α_{11}	*0.190 [48.086]
α_{1i}	*0.022 [7.432]	*0.063 [17.829]	*0.061 [14.102]	α_{1i}	*0.081 [29.237]	*0.051 [11.563]	α_{1i}	*0.072 [16.717]
α_{i1}	*0.029 [14.822]	*0.031 [15.123]	*0.059 [29.946]	α_{i1}	*0.028 [11.470]	*0.076 [30.739]	α_{i1}	*0.200 [51.322]
α_{ii}	*0.267 [103.659]	*0.275 [51.661]	*0.330 [78.649]	α_{ii}	*0.173 [34.386]	*0.346 [81.757]	α_{ii}	*0.358 [78.876]
β_{11}	*0.925 [816.796]	*0.930 [636.507]	*0.938 [744.370]	β_{11}	*0.948 [832.630]	*0.968 [1028.575]	β_{11}	*0.975 [949.737]
β_{1i}	*-0.014 [-13.196]	*-0.027 [-22.812]	*-0.026 [-17.689]	β_{1i}	*-0.022 [-27.369]	*-0.012 [-9.604]	β_{1i}	*-0.018 [-16.818]
β_{i1}	*-0.010 [-16.437]	*-0.012 [-14.832]	*-0.022 [-30.048]	β_{i1}	*-0.005 [-6.600]	*-0.029 [-31.934]	β_{i1}	*-0.072 [-51.596]
β_{ii}	*0.959 [1291.466]	*0.952 [501.199]	*0.931 [587.747]	β_{ii}	*0.983 [835.917]	*0.921 [530.703]	β_{ii}	*0.907 [524.998]

See Notes (1).

Appendix A.5.2. Tokyo Market Period

Table 109: 15 Minute VAR-BEKK-GARCH Results for Tokyo Market Period

AUDUSD	EURUSD	GBPUSD	NZDUSD	USDCAD	USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK
$ar(1)_{11}$	*-0.038	*-0.034	*-0.054	*-0.041	*-0.031	*-0.030	*-0.043	*-0.033	*-0.035	*-0.037
	[-11.599]	[-10.849]	[-13.126]	[-12.259]	[-9.894]	[-9.938]	[-14.086]	[-11.019]	[-11.726]	[-11.854]
$ar(1)_{1i}$	0.007	0.006	*0.022	*-0.022	0.005	*0.183	*-0.013	*0.012	0.002	-0.001
	[1.794]	[1.637]	[6.543]	[-5.237]	[1.813]	[3.077]	[-4.544]	[4.429]	[0.863]	[-0.462]
Constant	*0.000	*0.000	*0.000	0.000	*0.000	*0.000	0.000	*0.000	*0.000	*0.000
	[3.265]	[4.009]	[2.745]	[0.832]	[3.161]	[4.511]	[1.616]	[2.646]	[3.856]	[3.163]
$ar(1)_{i1}$	0.000	*0.006	*0.032	*-0.018	*-0.004	*0.000	*0.006	*-0.038	*-0.023	*-0.022
	[0.131]	[4.202]	[8.405]	[-11.656]	[-2.643]	[-6.188]	[3.572]	[-23.755]	[-10.482]	[-10.622]
$ar(1)_{ii}$	*-0.031	*-0.050	*-0.066	*-0.060	*-0.038	*-0.104	**-0.007	*-0.084	*-0.087	*-0.083
	[-10.465]	[-17.316]	[-17.272]	[-18.964]	[-12.938]	[-34.625]	[-2.341]	[-28.764]	[-34.397]	[-28.425]
Constant	0.000	**0.000	*0.000	0.000	0.000	*0.000	*0.000	0.000	0.000	0.000
	[1.517]	[2.440]	[2.645]	[-0.819]	[-1.003]	[-3.281]	[5.273]	[-0.818]	[0.552]	[0.762]

See Notes (1).

Table 110: 15 Minute VAR-BEKK-GARCH Results for Tokyo Market Period (Contd.)

c_{11}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[63.805]	[77.810]	[67.790]	[61.326]	[74.490]	[71.379]	[67.784]	[57.818]	[64.370]	[69.000]
c_{i1}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[19.122]	[31.309]	[28.148]	[-25.094]	[-19.509]	[3.290]	[-20.890]	[-23.989]	[-20.089]	[-18.624]
c_{ii}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[20.507]	[-10.697]	[-61.798]	[69.897]	[-19.136]	[-23.400]	[57.124]	[47.010]	[-11.843]	[30.999]
α_{11}	*0.370	*0.411	*0.457	*0.326	*0.377	*0.411	*0.308	*0.344	*0.403	*0.392
	[83.074]	[97.035]	[78.269]	[71.095]	[100.901]	[110.097]	[95.734]	[70.380]	[90.319]	[91.901]
α_{1i}	*0.023	*0.041	*0.057	*0.028	*-0.010	0.000	*-0.006	*-0.012	*-0.054	*-0.034
	[14.758]	[31.740]	[9.807]	[14.506]	[-5.780]	[0.340]	[-3.150]	[-6.923]	[-24.195]	[-16.340]
α_{i1}	*-0.072	*-0.071	*-0.104	*-0.041	*0.068	0.062	*-0.024	*-0.013	*0.055	*0.035
	[-15.867]	[-14.055]	[-19.340]	[-6.989]	[19.917]	[0.734]	[-7.842]	[-3.648]	[21.135]	[12.902]
α_{ii}	*0.180	*0.121	*0.268	*0.433	*0.176	*0.188	*0.333	*0.309	*0.129	*0.191
	[42.906]	[54.248]	[50.944]	[127.707]	[73.093]	[109.790]	[102.370]	[85.767]	[63.244]	[68.350]
β_{11}	*0.913	*0.890	*0.870	*0.922	*0.915	*0.884	*0.940	*0.918	*0.897	*0.898
	[446.239]	[413.516]	[227.695]	[415.919]	[583.302]	[374.840]	[744.084]	[383.122]	[381.039]	[399.754]
β_{1i}	*-0.009	*-0.014	-0.004	*-0.004	*0.004	0.000	*0.004	*0.007	*0.018	*0.013
	[-17.667]	[-31.498]	[-1.384]	[-5.347]	[7.090]	[-1.867]	[5.481]	[9.566]	[22.424]	[18.899]
β_{i1}	*0.033	*0.036	*0.044	*-0.007	*-0.023	*-0.054	*0.005	*-0.007	*-0.021	*-0.020
	[26.406]	[30.761]	[13.316]	[-3.302]	[-27.383]	[-2.832]	[6.356]	[-5.413]	[-30.275]	[-25.096]
β_{ii}	*0.988	*0.997	*0.940	*0.920	*0.987	*0.984	*0.949	*0.956	*0.995	*0.985
	[1391.745]	[3134.861]	[339.056]	[765.821]	[2585.330]	[3895.950]	[1005.702]	[912.124]	[3177.274]	[1887.323]

See Notes (1).

Table 111: 15 Minute VAR-BEKK-GARCH Results for Tokyo Market Period (Contd.)

EURUSD	GBPUSD	NZDUSD	USDCAD	USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK
$ar(1)_{11}$	*-0.037	*-0.039	*-0.031	*-0.023	*-0.026	*-0.034	*-0.029	*-0.033	*-0.027
	[-11.727]	[-13.075]	[-10.396]	[-5.425]	[-10.630]	[-11.919]	[-9.051]	[-9.435]	[-7.388]
$ar(1)_{1i}$	*0.019	*0.007	*-0.010	-0.006	**0.105	**-0.005	-0.001	*-0.006	0.003
	[5.565]	[3.952]	[-3.273]	[-1.784]	[2.472]	[-2.451]	[-0.334]	[-2.638]	[1.110]
Constant	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	[1.184]	[1.075]	[1.212]	[-0.122]	[0.927]	[1.083]	[1.116]	[0.540]	[0.215]
$ar(1)_{i1}$	*0.018	*0.013	*-0.037	*-0.075	*0.000	*0.026	*-0.047	*-0.067	*-0.073
	[6.972]	[3.611]	[-16.964]	[-17.114]	[-4.999]	[8.921]	[-18.088]	[-13.598]	[-15.957]
$ar(1)_{ii}$	*-0.055	*-0.051	*-0.058	*-0.085	*-0.104	-0.005	*-0.072	*-0.107	*-0.109
	[-18.987]	[-15.454]	[-18.032]	[-21.011]	[-34.866]	[-1.555]	[-25.075]	[-28.068]	[-30.333]
Constant	0.000	0.000	0.000	0.000	*0.000	*0.000	0.000	0.000	0.000
	[1.858]	[1.864]	[0.509]	[0.530]	[-3.571]	[3.025]	[0.071]	[0.558]	[0.894]
c_{11}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[-53.253]	[22.942]	[18.446]	[37.086]	[53.664]	[-25.031]	[-13.642]	[56.366]	[22.398]
c_{i1}	*0.000	*0.000	*0.000	*0.000	0.000	0.000	*0.000	*0.000	*0.000
	[-39.607]	[32.592]	[-26.607]	[-28.179]	[1.049]	[-1.735]	[24.479]	[-35.702]	[12.151]
c_{ii}	*0.000	*0.000	*0.000	0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[23.508]	[7.897]	[-24.487]	[0.000]	[26.359]	[48.407]	[18.639]	[-31.968]	[33.657]
α_{11}	*0.360	*0.139	*0.138	*0.143	*0.370	*0.157	*0.163	*0.401	*0.179
	[87.204]	[59.261]	[63.141]	[55.610]	[98.920]	[76.577]	[60.410]	[103.584]	[42.961]
α_{1i}	*0.123	*-0.087	*0.074	*0.074	0.000	*0.053	*-0.033	*-0.193	*0.158
	[52.943]	[-25.501]	[25.619]	[35.327]	[-1.821]	[25.855]	[-8.078]	[-39.040]	[34.252]
α_{i1}	*0.022	*0.040	*-0.099	*-0.110	**0.073	*-0.005	*-0.065	*0.045	*0.038
	[5.678]	[26.608]	[-25.746]	[-62.534]	[2.466]	[-3.454]	[-48.148]	[19.673]	[18.678]
α_{ii}	*0.122	*0.345	*0.438	*0.273	*0.177	*0.287	*0.333	*0.119	*0.276
	[45.291]	[102.897]	[148.863]	[179.032]	[119.124]	[107.064]	[114.605]	[46.422]	[70.483]
β_{11}	*0.939	*0.995	*0.993	*1.016	*0.938	*0.989	*0.988	*0.934	*0.980
	[823.125]	[2901.508]	[2949.646]	[1355.428]	[798.852]	[3611.936]	[2202.404]	[858.978]	[1238.237]
β_{1i}	*-0.028	*0.030	*-0.016	*-0.051	0.000	*-0.012	*0.002	*0.040	*-0.030
	[-47.861]	[39.412]	[-21.177]	[-69.645]	[1.201]	[-36.560]	[2.623]	[34.394]	[-29.048]
β_{i1}	*-0.002	*-0.014	*0.028	*0.049	*-0.017	*0.001	*0.017	*-0.006	*-0.011
	[-3.517]	[-27.725]	[28.286]	[102.266]	[-2.894]	[3.997]	[50.187]	[-14.777]	[-21.171]
β_{ii}	*0.993	*0.923	*0.914	*0.941	*0.986	*0.960	*0.944	*0.994	*0.963
	[2455.246]	[671.122]	[824.168]	[2202.724]	[4647.783]	[1424.706]	[1071.891]	[2869.845]	[974.946]

See Notes (1).

Table 112: 15 Minute VAR-BEKK-GARCH Results for Tokyo Market Period (Contd.)

GBPUSD	NZDUSD	USDCAD	USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK
$ar(1)_{11}$	*-0.056	*-0.053	*-0.064	*-0.046	*-0.047	*-0.049	*-0.050	*-0.048
	[-20.311]	[-18.349]	[-21.476]	[-22.467]	[-17.507]	[-20.126]	[-21.159]	[-16.511]
$ar(1)_{1i}$	*0.011	*-0.018	*-0.016	*0.078	*-0.009	*-0.006	*-0.005	*-0.005
	[14.144]	[-7.113]	[-7.415]	[3.248]	[-5.496]	[-3.311]	[-4.960]	[-3.126]
Constant	**0.000	0.000	*0.000	**0.000	*0.000	*0.000	0.000	*0.000
	[2.538]	[1.621]	[2.672]	[2.526]	[3.076]	[2.645]	[1.946]	[2.673]
$ar(1)_{i1}$	*0.021	*-0.028	0.001	*0.000	0.000	*-0.051	*-0.049	*-0.058
	[4.920]	[-10.850]	[0.410]	[-3.062]	[0.059]	[-16.697]	[-15.696]	[-14.256]
$ar(1)_{ii}$	*-0.048	*-0.048	*-0.030	*-0.105	-0.004	*-0.065	*-0.091	*-0.089
	[-16.818]	[-15.668]	[-8.952]	[-37.258]	[-1.163]	[-21.908]	[-31.460]	[-30.548]
Constant	**0.000	0.000	*0.000	*0.000	*0.000	0.000	0.000	0.000
	[2.235]	[0.308]	[-2.806]	[-3.476]	[5.743]	[0.298]	[1.469]	[1.084]
c_{11}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[54.965]	[41.488]	[44.622]	[16.463]	[-10.282]	[-69.172]	[-21.668]	[-41.114]
c_{i1}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[80.089]	[-64.189]	[-46.304]	[-13.844]	[-4.053]	[107.589]	[-98.586]	[15.472]
c_{ii}	0.000	*0.000	0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[-0.025]	[14.433]	[0.002]	[-16.600]	[13.398]	[-56.792]	[31.532]	[-25.826]
α_{11}	*0.099	*0.111	*0.133	*0.092	*0.125	*0.094	*0.085	*0.096
	[48.647]	[50.047]	[50.755]	[51.899]	[68.400]	[32.949]	[45.125]	[51.276]
α_{1i}	*-0.071	*0.013	*-0.067	*0.000	*0.065	*0.083	*0.068	*0.065
	[-14.732]	[3.661]	[-16.327]	[-3.488]	[23.007]	[18.036]	[21.086]	[16.776]
α_{i1}	*0.045	*-0.131	*-0.095	**-0.032	*-0.013	*-0.025	*-0.006	*-0.031
	[46.973]	[-53.970]	[-49.750]	[-2.103]	[-11.480]	[-19.519]	[-11.830]	[-17.264]
α_{ii}	*0.372	*0.432	*0.338	*0.214	*0.324	*0.356	*0.172	*0.283
	[108.924]	[129.044]	[80.959]	[99.895]	[101.891]	[139.321]	[65.659]	[55.187]
β_{11}	*0.999	*0.992	*0.989	*0.996	*0.993	*0.996	*1.074	*0.997
	[4731.125]	[2701.211]	[2343.653]	[6552.143]	[4740.506]	[4765.414]	[1512.336]	[4819.824]
β_{1i}	*0.027	*0.004	*0.013	0.000	*-0.015	*-0.014	*-1.052	*-0.014
	[29.404]	[4.960]	[17.392]	[0.643]	[-34.337]	[-30.459]	[-413.510]	[-19.014]
β_{i1}	*-0.015	*0.033	*0.018	*0.514	*0.003	*0.006	*0.153	*0.006
	[-47.695]	[52.760]	[44.788]	[6.659]	[11.630]	[15.989]	[172.360]	[15.846]
β_{ii}	*0.911	*0.916	*0.948	*-0.980	*0.950	*0.940	*-1.065	*0.962
	[609.399]	[886.692]	[933.163]	[-2639.473]	[1031.380]	[1163.406]	[-1979.962]	[727.972]

See Notes (1).

Table 113: 15 Minute VAR-BEKK-GARCH Results for Tokyo Market Period (Contd.)

NZDUSD	USDCAD	USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK
$ar(1)_{11}$	*-0.056	*-0.047	*-0.044	*-0.057	*-0.049	*-0.046	*-0.049
	[-17.647]	[-16.012]	[-16.799]	[-20.979]	[-15.702]	[-17.235]	[-19.937]
$ar(1)_{1i}$	*-0.028	*-0.012	*0.130	*-0.018	0.001	-0.002	*-0.008
	[-6.086]	[-3.535]	[3.054]	[-5.748]	[0.252]	[-0.639]	[-4.141]
Constant	0.000	0.000	**0.000	0.000	0.000	**0.000	**0.000
	[0.550]	[1.738]	[2.397]	[-0.020]	[1.144]	[2.261]	[2.194]
$ar(1)_{i1}$	*-0.014	*-0.010	*0.000	*0.011	*-0.035	*-0.034	*-0.030
	[-9.025]	[-5.882]	[-8.967]	[6.699]	[-21.151]	[-17.136]	[-18.778]
$ar(1)_{ii}$	*-0.054	*-0.044	*-0.104	*-0.009	*-0.080	*-0.094	*-0.090
	[-17.010]	[-15.852]	[-36.601]	[-3.029]	[-25.195]	[-30.012]	[-35.724]
Constant	0.000	0.000	*0.000	*0.000	0.000	0.000	0.000
	[-0.414]	[-0.561]	[-3.197]	[4.754]	[-0.119]	[1.177]	[1.273]
c_{11}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[51.721]	[93.671]	[77.757]	[62.267]	[66.495]	[70.224]	[70.441]
c_{i1}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[-20.735]	[-23.733]	[8.305]	[-23.952]	[-26.341]	[-23.140]	[-19.729]
c_{ii}	*0.000	*0.000	*0.000	*0.000	*0.000	0.000	*0.000
	[62.575]	[16.959]	[18.604]	[58.941]	[32.581]	[-0.001]	[15.834]
α_{11}	*0.261	*0.374	*0.364	*0.289	*0.312	*0.358	*0.360
	[63.720]	[129.197]	[116.173]	[90.325]	[82.560]	[106.809]	[107.470]
α_{1i}	*0.030	*-0.026	*0.000	-0.003	*-0.024	*-0.059	*-0.045
	[16.531]	[-13.998]	[3.200]	[-1.720]	[-13.268]	[-36.596]	[-22.025]
α_{i1}	*-0.074	*0.095	*0.325	*-0.027	*-0.050	*0.044	*0.046
	[-11.205]	[28.190]	[5.994]	[-8.122]	[-13.025]	[16.353]	[14.636]
α_{ii}	*0.434	*0.138	*0.184	*0.316	*0.293	*0.118	*0.157
	[126.587]	[76.476]	[128.149]	[98.810]	[76.696]	[66.037]	[65.465]
β_{11}	*0.947	*0.913	*0.910	*0.946	*0.929	*0.917	*0.915
	[512.460]	[804.065]	[593.096]	[784.614]	[553.071]	[606.038]	[570.540]
β_{1i}	*-0.005	*0.006	*0.000	*0.003	*0.014	*0.019	*0.016
	[-5.824]	[11.952]	[-6.697]	[4.472]	[19.044]	[35.127]	[23.134]
β_{i1}	0.004	*-0.023	*-0.096	*0.007	0.002	*-0.016	*-0.018
	[1.655]	[-36.700]	[-7.449]	[6.771]	[1.645]	[-30.580]	[-25.578]
β_{ii}	*0.919	*0.992	*0.985	*0.952	*0.963	*0.996	*0.991
	[697.515]	[3914.732]	[4413.848]	[1078.426]	[927.089]	[5052.693]	[2572.906]

See Notes (1).

Table 114: 15 Minute VAR-BEKK-GARCH Results for Tokyo Market Period (Contd.)

USDCAD	USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK
$ar(1)_{11}$	*-0.044	*-0.035	*-0.041	*-0.042	*-0.042	*-0.046
	[-15.655]	[-12.369]	[-13.779]	[-13.545]	[-13.111]	[-15.223]
$ar(1)_{1i}$	*0.020	*-0.177	*0.014	**0.005	*0.012	*0.019
	[9.985]	[-4.723]	[8.262]	[2.543]	[8.137]	[12.688]
Constant	0.000	0.000	0.000	0.000	0.000	0.000
	[0.598]	[0.060]	[1.281]	[0.904]	[0.041]	[0.545]
$ar(1)_{i1}$	*0.018	*0.000	-0.004	*0.065	*0.058	*0.045
	[5.912]	[3.347]	[-1.398]	[20.186]	[13.598]	[11.825]
$ar(1)_{ii}$	*-0.039	*-0.104	*-0.010	*-0.075	*-0.089	*-0.080
	[-11.883]	[-41.799]	[-3.447]	[-25.100]	[-29.904]	[-29.973]
Constant	0.000	*0.000	*0.000	0.000	0.000	0.000
	[-0.340]	[-3.040]	[5.264]	[1.053]	[1.010]	[0.871]
c_{11}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[74.721]	[75.138]	[67.436]	[69.924]	[70.993]	[76.458]
c_{i1}	*0.000	0.000	*0.000	*0.000	*0.000	*0.000
	[29.322]	[0.612]	[16.966]	[19.928]	[24.565]	[21.908]
c_{ii}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[16.145]	[25.886]	[42.158]	[22.273]	[15.993]	[29.289]
α_{11}	*0.425	*0.442	*0.414	*0.425	*0.434	*0.433
	[126.341]	[149.007]	[134.122]	[123.430]	[147.593]	[140.007]
α_{1i}	*0.139	0.000	*0.082	*0.072	*0.182	*0.143
	[37.506]	[0.263]	[29.879]	[15.284]	[47.601]	[36.854]
α_{i1}	-0.003	**-0.058	0.000	*0.007	*0.005	**0.005
	[-0.827]	[-1.965]	[0.036]	[3.316]	[2.986]	[2.219]
α_{ii}	*0.166	*0.177	*0.246	*0.261	*0.133	*0.168
	[76.770]	[107.357]	[90.308]	[46.084]	[64.577]	[70.315]
β_{11}	*0.918	*0.908	*0.921	*0.914	*0.912	*0.912
	[863.250]	[791.800]	[851.385]	[677.792]	[825.390]	[857.807]
β_{1i}	*-0.036	0.000	*-0.028	*-0.024	*-0.050	*-0.040
	[-36.940]	[-0.329]	[-30.293]	[-14.909]	[-49.036]	[-38.450]
β_{i1}	*-0.002	*0.019	0.000	**0.001	0.000	0.000
	[-3.136]	[3.109]	[0.516]	[2.225]	[-0.715]	[-0.888]
β_{ii}	*0.987	*0.986	*0.970	*0.969	*0.992	*0.987
	[2508.947]	[4167.117]	[1541.103]	[690.767]	[2914.620]	[2229.079]

See Notes (1).

Table 115: 15 Minute VAR-BEKK-GARCH Results for Tokyo Market Period (Contd.)

USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK	**USDHKD**	USDJPY	USDMXN	USDNOK	USDSEK
$ar(1)_{11}$	*-0.036	*-0.044	*-0.039	*-0.043	*-0.042	$ar(1)_{11}$	*-0.105	*-0.105	*-0.104	*-0.105
	[-11.599]	[-14.010]	[-13.289]	[-12.917]	[-12.211]		[-37.176]	[-35.568]	[-45.009]	[-35.930]
$ar(1)_{1i}$	**-0.093	*0.018	-0.001	*0.015	*0.011	$ar(1)_{1i}$	0.000	*0.000	*0.000	*0.000
	[-2.302]	[8.338]	[-0.601]	[6.508]	[4.628]		[0.746]	[2.717]	[4.173]	[5.150]
Constant	0.000	0.000	0.000	0.000	0.000	*Constant*	*0.000	*0.000	*0.000	*0.000
	[-0.654]	[-1.371]	[-1.329]	[-1.121]	[0.499]		[-3.188]	[-2.880]	[-3.165]	[-3.935]
$ar(1)_{i1}$	*0.000	*-0.030	*0.028	*0.036	*0.035	$ar(1)_{i1}$	-0.013	0.051	**-0.144	**-0.135
	[2.579]	[-12.320]	[11.913]	[9.190]	[9.364]		[-0.274]	[1.276]	[-2.415]	[-2.452]
$ar(1)_{ii}$	*-0.105	-0.002	*-0.064	*-0.086	*-0.084	$ar(1)_{ii}$	-0.002	*-0.054	*-0.077	*-0.074
	[-38.313]	[-0.647]	[-22.569]	[-26.670]	[-26.071]		[-0.682]	[-19.259]	[-30.916]	[-25.593]
Constant	*0.000	*0.000	0.000	0.000	0.000	*Constant*	*0.000	0.000	0.000	0.000
	[-2.964]	[5.523]	[0.421]	[-0.532]	[1.113]		[5.756]	[0.254]	[1.387]	[0.906]
c_{11}	*0.000	0.000	*0.000	*0.000	*0.000	c_{11}	*0.000	*0.000	*0.000	*0.000
	[22.231]	[1.365]	[22.552]	[32.140]	[43.854]		[-24.901]	[26.799]	[31.357]	[25.571]
c_{i1}	**0.000	*0.000	*0.000	*0.000	*0.000	c_{i1}	*0.000	0.000	0.000	0.000
	[2.120]	[58.962]	[33.837]	[35.766]	[56.960]		[-5.107]	[-0.604]	[-0.051]	[-1.547]
c_{ii}	*0.000	0.000	*0.000	*0.000	*0.000	c_{ii}	*0.000	*0.000	*0.000	*0.000
	[-26.034]	[-0.042]	[13.494]	[-11.616]	[-9.865]		[42.232]	[72.607]	[21.603]	[26.719]
α_{11}	*0.167	*0.167	*0.175	*0.245	*0.219	α_{11}	*0.186	*0.182	*0.207	*0.193
	[62.023]	[69.065]	[68.609]	[51.845]	[61.161]		[113.129]	[115.130]	[101.002]	[94.341]
α_{1i}	0.000	*-0.047	*0.039	*0.103	*0.036	α_{1i}	*0.673	*0.278	*0.078	0.034
	[1.764]	[-11.235]	[13.541]	[22.372]	[8.422]		[17.197]	[8.715]	[2.632]	[1.251]
α_{i1}	*0.091	*0.017	*0.073	*0.065	*0.111	α_{i1}	*0.000	0.000	0.000	0.000
	[3.556]	[5.877]	[33.742]	[29.493]	[53.146]		[4.001]	[1.028]	[-0.136]	[1.111]
α_{ii}	*0.199	*0.338	*0.332	*0.230	*0.314	α_{ii}	*0.360	*0.352	*0.119	*0.203
	[98.894]	[85.007]	[118.054]	[74.867]	[108.720]		[97.681]	[134.644]	[56.480]	[48.951]
β_{11}	*0.988	*0.989	*0.986	*0.972	*0.976	β_{11}	*0.985	*0.985	*0.981	*0.983
	[2569.959]	[2889.741]	[2390.657]	[949.357]	[1242.925]		[3916.369]	[4232.961]	[2852.104]	[2971.828]
β_{1i}	**0.000	*0.012	*-0.007	*-0.019	*-0.006	β_{1i}	*-0.108	*-0.042	**-0.011	-0.005
	[-2.260]	[17.710]	[-12.835]	[-19.182]	[-6.310]		[-14.226]	[-6.943]	[-2.055]	[-1.087]
β_{i1}	*-0.014	*-0.003	*-0.018	*-0.017	*-0.031	β_{i1}	*0.000	0.000	0.000	0.000
	[-3.556]	[-5.129]	[-30.497]	[-29.246]	[-67.197]		[-4.706]	[-0.355]	[-0.362]	[-0.938]
β_{ii}	*0.982	*0.945	*0.946	*0.971	*0.950	β_{ii}	*0.935	*0.941	*0.993	*0.980
	[3101.362]	[801.471]	[1152.951]	[1329.327]	[1324.949]		[760.607]	[1144.914]	[4189.863]	[1254.084]

See Notes (1).

Table 116: 15 Minute VAR-BEKK-GARCH Results for Tokyo Market Period (Contd.)

USDJPY	USDMXN	USDNOK	USDSEK	**USDMXN**	USDNOK	USDSEK	**USDNOK**	USDSEK
$ar(1)_{11}$	*-0.025 [-8.271]	0.002 [0.505]	0.000 [-0.151]	$ar(1)_{11}$	*-0.062 [-21.282]	*-0.065 [-21.275]	$ar(1)_{11}$	*-0.092 [-24.757]
$ar(1)_{1i}$	**0.008 [2.565]	*-0.008 [-5.029]	*-0.019 [-10.258]	$ar(1)_{1i}$	*0.025 [14.978]	*0.030 [14.914]	$ar(1)_{1i}$	*0.033 [8.768]
Constant	*0.000 [4.759]	*0.000 [7.151]	*0.000 [5.396]	*Constant*	0.000 [0.384]	0.000 [0.028]	*Constant*	0.000 [1.202]
$ar(1)_{i1}$	0.002 [0.894]	0.005 [1.930]	*0.013 [5.269]	$ar(1)_{i1}$	*0.021 [7.249]	*0.021 [7.647]	$ar(1)_{i1}$	*0.035 [10.987]
$ar(1)_{ii}$	*-0.046 [-16.902]	*-0.076 [-27.152]	*-0.079 [-28.713]	$ar(1)_{ii}$	*-0.080 [-30.509]	*-0.079 [-29.414]	$ar(1)_{ii}$	*-0.093 [-25.694]
Constant	0.000 [0.004]	*0.000 [2.612]	**0.000 [2.480]	*Constant*	0.000 [0.994]	0.000 [1.180]	*Constant*	**0.000 [2.171]
c_{11}	*0.000 [73.991]	*0.000 [58.802]	*0.000 [63.319]	c_{11}	*0.000 [84.100]	*0.000 [79.834]	c_{11}	*0.000 [29.214]
c_{i1}	*0.000 [24.835]	*0.000 [-17.924]	*0.000 [13.532]	c_{i1}	*0.000 [48.789]	*0.000 [-7.264]	c_{i1}	*0.000 [-19.830]
c_{ii}	*0.000 [-52.030]	0.000 [-0.010]	*0.000 [27.481]	c_{ii}	0.000 [0.225]	0.000 [-0.045]	c_{ii}	*0.000 [-24.587]
α_{11}	*0.267 [114.140]	*0.343 [93.810]	*0.315 [93.264]	α_{11}	*0.354 [132.860]	*0.361 [123.389]	α_{11}	*0.196 [60.769]
α_{1i}	*0.025 [12.805]	*0.005 [4.996]	*0.033 [17.915]	α_{1i}	*0.047 [24.894]	*0.049 [24.687]	α_{1i}	*-0.089 [-32.959]
α_{i1}	*0.055 [31.121]	0.002 [1.755]	*0.027 [12.677]	α_{i1}	*0.030 [11.199]	0.002 [0.511]	α_{i1}	*-0.085 [-24.798]
α_{ii}	*0.317 [124.771]	*0.099 [62.213]	*0.203 [59.867]	α_{ii}	*0.105 [55.508]	*0.127 [63.031]	α_{ii}	*0.246 [64.984]
β_{11}	*0.963 [1731.893]	*-0.946 [-842.212]	*0.952 [1050.234]	β_{11}	*0.959 [1008.479]	*-0.959 [-731.919]	β_{11}	*0.978 [1488.403]
β_{1i}	*-0.010 [-18.192]	*-0.020 [-656.982]	*-0.010 [-21.156]	β_{1i}	*0.394 [51.079]	*-0.378 [-35.697]	β_{1i}	*0.020 [31.996]
β_{i1}	*-0.014 [-32.020]	*0.208 [78.606]	*-0.003 [-6.084]	β_{i1}	*-0.117 [-27.583]	*0.111 [14.434]	β_{i1}	*0.018 [25.441]
β_{ii}	*0.953 [1311.918]	*0.997 [6548.763]	*0.981 [1511.612]	β_{ii}	*-1.019 [-1504.325]	*1.014 [960.086]	β_{ii}	*0.967 [1065.265]

See Notes (1).

Appendix A.5.3. London Market Period

Table 117: 15 Minute VAR-BEKK-GARCH Results for London Market Period

AUDUSD	EURUSD	GBPUSD	NZDUSD	USDCAD	USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK
$ar(1)_{11}$	*-0.043	*-0.042	*-0.060	*-0.054	*-0.044	*-0.041	*-0.050	*-0.053	*-0.040	*-0.045
	[-14.179]	[-14.814]	[-14.299]	[-17.616]	[-16.451]	[-15.305]	[-19.355]	[-18.479]	[-12.574]	[-15.106]
$ar(1)_{1i}$	0.005	**0.007	*0.023	*-0.025	-0.001	0.016	*-0.024	*-0.021	-0.003	*-0.008
	[1.899]	[2.194]	[6.400]	[-8.013]	[-0.590]	[0.300]	[-8.636]	[-7.924]	[-1.730]	[-3.694]
Constant	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	[0.135]	[1.083]	[0.843]	[0.174]	[0.131]	[1.213]	[0.410]	[-0.274]	[1.564]	[0.970]
$ar(1)_{i1}$	*0.009	*0.010	*0.055	*-0.028	0.002	*0.000	*-0.012	*-0.050	*-0.056	*-0.048
	[3.551]	[4.914]	[11.613]	[-11.076]	[0.718]	[-5.841]	[-7.268]	[-19.131]	[-15.304]	[-14.154]
$ar(1)_{ii}$	*-0.027	*-0.033	*-0.084	*-0.051	*-0.033	*-0.136	*-0.041	*-0.050	*-0.059	*-0.054
	[-9.071]	[-12.451]	[-19.638]	[-14.982]	[-10.190]	[-45.697]	[-14.384]	[-15.931]	[-19.805]	[-18.110]
Constant	0.000	0.000	0.000	**0.000	0.000	**0.000	*0.000	0.000	0.000	0.000
	[-1.086]	[-1.166]	[1.529]	[2.396]	[0.461]	[-2.176]	[2.761]	[0.901]	[0.713]	[0.933]

See Notes (1).

Table 118: 15 Minute VAR-BEKK-GARCH Results for London Market Period (Contd.)

c_{11}	*0.000	*0.000	*0.000	0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[35.003]	[70.536]	[61.109]	[0.081]	[-27.061]	[50.054]	[35.159]	[16.683]	[57.070]	[44.804]
c_{i1}	*0.000	*0.000	*0.000	0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[-43.110]	[31.453]	[75.510]	[0.105]	[9.010]	[2.711]	[-33.274]	[-35.636]	[-15.008]	[-29.145]
c_{ii}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[77.969]	[19.934]	[14.096]	[95.256]	[46.362]	[19.747]	[29.377]	[-7.226]	[34.823]	[-27.955]
α_{11}	*0.115	*0.287	*0.156	*0.081	*0.134	*0.273	*0.185	*0.094	*0.298	*0.233
	[53.877]	[128.049]	[92.603]	[44.136]	[61.602]	[70.176]	[62.150]	[43.245]	[88.261]	[49.493]
α_{1i}	*-0.079	*0.083	*0.049	*0.151	*0.108	0.000	*0.018	*0.050	*-0.128	*-0.096
	[-28.208]	[55.776]	[74.407]	[55.052]	[39.883]	[1.611]	[8.972]	[16.223]	[-37.853]	[-23.668]
α_{i1}	*0.024	*0.013	*0.126	*-0.115	**-0.005	*0.190	*-0.014	*-0.108	*0.014	*-0.046
	[18.497]	[12.793]	[53.623]	[-40.208]	[-2.133]	[3.709]	[-5.036]	[-46.444]	[5.701]	[-14.472]
α_{ii}	*0.293	*0.083	*0.295	*0.480	*0.282	*0.215	*0.356	*0.361	*0.120	*0.206
	[78.446]	[61.719]	[102.802]	[151.703]	[83.307]	[93.496]	[120.725]	[127.768]	[47.247]	[44.786]
β_{11}	*-1.152	*0.952	*0.996	*1.003	*0.991	*0.958	*0.981	*0.998	*0.952	*0.971
	[-343.566]	[1549.462]	[4731.396]	[3761.748]	[2900.675]	[822.772]	[1512.767]	[3019.950]	[939.762]	[792.900]
β_{1i}	*-0.949	*-0.018	*0.005	*-0.044	*-0.018	**0.000	-0.001	*-0.011	*0.030	*0.019
	[-342.016]	[-50.206]	[44.444]	[-61.225]	[-33.744]	[-2.130]	[-1.040]	[-17.381]	[33.483]	[17.880]
β_{i1}	*0.355	*0.003	*-0.045	*0.029	*0.002	*-0.043	*0.007	*0.027	*-0.003	*0.015
	[46.941]	[108.224]	[-54.953]	[42.953]	[2.784]	[-4.285]	[9.157]	[41.436]	[-4.831]	[15.812]
β_{ii}	*1.107	*0.998	*0.930	*0.889	*0.961	*0.980	*0.934	*0.931	*0.992	*0.969
	[231.658]	[9623.928]	[846.368]	[745.670]	[1137.021]	[2499.935]	[918.688]	[980.534]	[1759.912]	[655.795]

See Notes (1).

Table 119: 15 Minute VAR-BEKK-GARCH Results for London Market Period (Contd.)

EURUSD	GBPUSD	NZDUSD	USDCAD	USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK
$ar(1)_{11}$	*-0.021	*-0.023	*-0.020	*-0.040	*-0.018	*-0.022	*-0.024	*-0.016	-0.008
	[-6.619]	[-7.169]	[-7.153]	[-10.382]	[-6.707]	[-7.906]	[-8.439]	[-4.050]	[-1.912]
$ar(1)_{1i}$	**0.007	**0.005	*-0.009	*-0.025	-0.046	*-0.008	*-0.006	0.003	*0.012
	[2.259]	[1.987]	[-7.050]	[-8.685]	[-0.949]	[-2.952]	[-2.588]	[1.386]	[4.054]
Constant	0.000	0.000	0.000	*0.000	0.000	0.000	0.000	0.000	0.000
	[-0.310]	[-0.483]	[-1.869]	[-2.893]	[-0.127]	[-0.910]	[0.512]	[-0.003]	[-0.785]
$ar(1)_{i1}$	*0.007	*0.018	*-0.008	*-0.037	*0.000	*-0.007	*-0.039	*-0.027	*-0.038
	[2.863]	[5.052]	[-3.940]	[-8.742]	[-6.585]	[-3.118]	[-15.358]	[-5.609]	[-7.885]
$ar(1)_{ii}$	*-0.032	*-0.056	*-0.032	*-0.052	*-0.137	*-0.039	*-0.043	*-0.049	*-0.054
	[-10.848]	[-18.248]	[-22.580]	[-13.248]	[-44.421]	[-13.383]	[-14.452]	[-14.150]	[-14.795]
Constant	0.000	0.000	*0.000	0.000	**0.000	*0.000	0.000	0.000	0.000
	[-0.976]	[1.698]	[3.903]	[-0.326]	[-2.137]	[2.813]	[0.304]	[-0.756]	[1.165]
c_{11}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[70.474]	[49.150]	[20.697]	[58.752]	[59.898]	[58.534]	[22.286]	[61.907]	[32.373]
c_{i1}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[16.202]	[49.582]	[80.211]	[-65.185]	[3.722]	[-54.641]	[-16.584]	[-28.396]	[-4.537]
c_{ii}	*0.000	*0.000	*0.000	0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[5.115]	[31.937]	[-89.725]	[-0.001]	[-14.776]	[49.940]	[63.123]	[37.665]	[41.634]
α_{11}	*0.325	*0.246	*0.096	*0.313	*0.299	*0.224	*0.236	*0.335	*0.283
	[95.562]	[61.886]	[57.483]	[163.184]	[88.991]	[73.228]	[29.299]	[86.447]	[44.799]
α_{1i}	*0.097	*0.081	*0.113	*-0.186	*0.000	*-0.016	*-0.012	*-0.173	*0.039
	[36.644]	[21.247]	[46.873]	[-75.327]	[3.271]	[-8.117]	[-3.438]	[-31.958]	[4.826]
α_{i1}	**-0.009	*0.066	*-0.045	*0.028	*0.177	*-0.072	*-0.033	*0.033	*0.057
	[-2.298]	[28.577]	[-33.664]	[11.707]	[3.401]	[-30.054]	[-9.364]	[12.419]	[20.850]
α_{ii}	*0.086	*0.260	*0.454	*0.145	*0.211	*0.356	*0.325	*0.129	*0.225
	[27.483]	[73.756]	[143.299]	[53.846]	[102.527]	[126.597]	[108.180]	[37.514]	[51.091]
β_{11}	*0.931	*0.963	*1.069	*0.949	*0.945	*0.970	*0.967	*0.937	*0.943
	[755.798]	[706.413]	[783.256]	[2527.643]	[764.736]	[1158.902]	[380.863]	[710.006]	[443.358]
β_{1i}	*-0.026	*-0.022	*-0.650	*0.052	*0.000	*0.008	0.001	*0.045	*-0.014
	[-32.738]	[-16.717]	[-210.824]	[113.449]	[-4.494]	[14.670]	[0.562]	[28.850]	[-5.241]
β_{i1}	*0.015	*-0.020	*0.230	*-0.011	*-0.042	*0.024	*0.009	*-0.009	*-0.024
	[13.053]	[-25.996]	[55.208]	[-18.124]	[-4.139]	[35.910]	[7.431]	[-11.825]	[-24.667]
β_{ii}	*1.001	*0.957	*-0.971	*0.991	*0.981	*0.933	*0.940	*0.992	*0.968
	[1992.581]	[770.559]	[-465.777]	[1523.165]	[2859.745]	[1038.047]	[914.435]	[1293.791]	[611.590]

See Notes (1).

Table 120: 15 Minute VAR-BEKK-GARCH Results for London Market Period (Contd.)

GBPUSD	NZDUSD	USDCAD	USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK
$ar(1)_{11}$	*-0.033	*-0.032	*-0.040	*-0.029	*-0.033	*-0.033	*-0.033	*-0.030
	[-10.953]	[-12.177]	[-13.774]	[-11.033]	[-13.589]	[-12.602]	[-12.082]	[-10.665]
$ar(1)_{1i}$	*0.006	*-0.009	*-0.007	-0.013	*-0.009	*-0.008	**-0.004	-0.003
	[3.197]	[-4.259]	[-3.158]	[-0.310]	[-4.272]	[-4.199]	[-2.573]	[-1.679]
Constant	0.000	*0.000	0.000	0.000	**0.000	0.000	0.000	**0.000
	[-1.569]	[-2.796]	[-1.754]	[-1.483]	[-2.396]	[-1.544]	[-1.864]	[-1.987]
$ar(1)_{i1}$	*0.015	*-0.009	*0.010	*0.000	*-0.010	*-0.031	*-0.026	*-0.031
	[4.243]	[-3.988]	[3.231]	[-4.799]	[-4.948]	[-10.708]	[-13.744]	[-8.032]
$ar(1)_{ii}$	*-0.052	*-0.028	*-0.031	*-0.137	*-0.035	*-0.032	*-0.042	*-0.043
	[-17.598]	[-11.531]	[-9.372]	[-50.609]	[-12.955]	[-11.624]	[-16.451]	[-15.625]
Constant	0.000	*0.000	*0.000	**0.000	*0.000	0.000	0.000	0.000
	[1.059]	[3.833]	[-2.844]	[-1.972]	[4.035]	[1.158]	[1.090]	[1.753]
c_{11}	*0.000	0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[16.333]	[0.491]	[81.944]	[22.185]	[38.764]	[5.319]	[24.159]	[77.960]
c_{i1}	*0.000	*0.000	*0.000	0.000	*0.000	*0.000	*0.000	*0.000
	[59.342]	[7.326]	[-63.665]	[0.384]	[-36.009]	[-43.697]	[56.701]	[46.569]
c_{ii}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[18.859]	[88.126]	[10.951]	[-23.419]	[31.408]	[58.575]	[92.657]	[7.412]
α_{11}	*0.068	*0.082	*0.118	*0.064	*0.138	*0.073	*0.082	*0.072
	[39.223]	[41.959]	[66.989]	[52.762]	[58.209]	[47.780]	[43.649]	[56.817]
α_{1i}	*-0.039	*0.040	*-0.015	*0.000	*0.017	*0.025	*0.049	*0.083
	[-9.221]	[64.142]	[-5.822]	[-3.316]	[6.584]	[9.477]	[15.287]	[24.441]
α_{i1}	*0.063	*-0.078	*-0.069	*-0.145	*-0.058	*-0.051	*-0.006	*-0.018
	[34.869]	[-42.540]	[-38.561]	[-5.151]	[-23.894]	[-39.987]	[-11.491]	[-32.795]
α_{ii}	*0.332	*0.429	*0.324	*0.254	*0.389	*0.354	*0.225	*0.281
	[109.206]	[143.606]	[107.265]	[114.653]	[154.101]	[135.470]	[131.157]	[86.978]
β_{11}	*1.001	*0.999	*0.990	*0.998	*0.988	*0.998	*0.997	*0.998
	[6872.622]	[5907.279]	[5218.355]	[11779.620]	[2121.951]	[8779.391]	[5872.964]	[10871.680]
β_{1i}	*0.017	*-0.018	*0.010	0.000	*0.002	*-0.009	*-0.017	*-0.028
	[18.693]	[-37.863]	[72.638]	[1.336]	[2.727]	[-18.359]	[-37.764]	[-31.587]
β_{i1}	*-0.016	*0.018	*0.016	*0.028	*0.019	*0.012	*0.001	*0.003
	[-32.317]	[35.916]	[38.069]	[4.993]	[26.335]	[32.757]	[35.213]	[165.564]
β_{ii}	*0.933	*0.903	*0.943	*0.972	*0.918	*0.931	*0.965	*0.951
	[835.734]	[817.104]	[985.134]	[2422.368]	[1029.460]	[978.073]	[2563.567]	[814.221]

See Notes (1).

Table 121: 15 Minute VAR-BEKK-GARCH Results for London Market Period (Contd.)

NZDUSD	USDCAD	USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK
$ar(1)_{11}$	*-0.066	*-0.046	*-0.047	*-0.054	*-0.061	*-0.050	*-0.052
	[-26.182]	[-15.827]	[-18.190]	[-19.239]	[-27.880]	[-15.461]	[-16.675]
$ar(1)_{1i}$	*-0.039	**-0.006	-0.082	*-0.019	*-0.029	*-0.007	*-0.012
	[-12.130]	[-2.157]	[-1.713]	[-5.929]	[-10.617]	[-3.103]	[-4.829]
Constant	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	[0.472]	[0.883]	[1.168]	[0.865]	[0.401]	[1.452]	[1.181]
$ar(1)_{i1}$	*-0.014	-0.005	*0.000	**-0.004	*-0.033	*-0.045	*-0.038
	[-49.834]	[-1.850]	[-7.498]	[-2.567]	[-18.068]	[-14.263]	[-12.202]
$ar(1)_{ii}$	*-0.038	*-0.043	*-0.136	*-0.042	*-0.041	*-0.057	*-0.056
	[-27.386]	[-13.534]	[-43.680]	[-14.506]	[-15.389]	[-20.339]	[-18.907]
Constant	*0.000	0.000	**0.000	*0.000	0.000	0.000	0.000
	[4.134]	[-0.758]	[-2.052]	[2.988]	[0.829]	[0.976]	[1.320]
c_{11}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[62.856]	[81.036]	[72.933]	[65.704]	[39.700]	[65.522]	[75.337]
c_{i1}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[-15.953]	[-66.863]	[4.194]	[-42.973]	[-37.329]	[-15.448]	[-16.378]
c_{ii}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[80.659]	[4.713]	[15.590]	[53.174]	[28.934]	[22.125]	[22.368]
α_{11}	*0.100	*0.268	*0.311	*0.250	*0.095	*0.330	*0.325
	[46.860]	[100.886]	[106.189]	[92.063]	[46.165]	[109.216]	[107.766]
α_{1i}	*0.111	*-0.109	**0.000	*0.007	*0.042	*-0.118	*-0.093
	[47.952]	[-47.032]	[2.237]	[3.042]	[16.752]	[-37.665]	[-31.294]
α_{i1}	*-0.128	*-0.058	*0.263	*-0.035	*-0.117	*0.027	*0.017
	[-22.689]	[-18.308]	[4.551]	[-10.039]	[-42.966]	[11.163]	[6.353]
α_{ii}	*0.465	*0.231	*0.210	*0.362	*0.360	*0.112	*0.142
	[125.906]	[67.062]	[95.444]	[122.583]	[124.505]	[52.214]	[57.309]
β_{11}	*0.998	*0.952	*0.940	*0.960	*0.996	*0.936	*0.935
	[3590.574]	[1213.481]	[849.736]	[1155.081]	[4079.351]	[808.388]	[883.989]
β_{1i}	*-0.030	*0.040	*0.000	*0.005	*-0.007	*0.032	*0.027
	[-41.499]	[57.194]	[-3.606]	[7.534]	[-14.576]	[34.451]	[31.267]
β_{i1}	*0.032	*0.014	*-0.062	*0.018	*0.029	*-0.008	*-0.008
	[23.569]	[18.108]	[-5.308]	[15.702]	[39.471]	[-12.164]	[-10.513]
β_{ii}	*0.895	*0.967	*0.981	*0.928	*0.932	*0.995	*0.991
	[673.282]	[1143.932]	[2682.719]	[868.218]	[915.138]	[2230.738]	[1871.816]

See Notes (1).

Table 122: 15 Minute VAR-BEKK-GARCH Results for London Market Period (Contd.)

USDCAD	USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK
$ar(1)_{11}$	*-0.027	*-0.024	*-0.021	*-0.036	*-0.028	*-0.033
	[-9.444]	[-8.045]	[-7.580]	[-11.132]	[-8.912]	[-11.528]
$ar(1)_{1i}$	*0.007	-0.024	**0.005	*0.014	*0.007	*0.013
	[3.274]	[-0.525]	[2.001]	[6.852]	[4.191]	[7.901]
Constant	*0.000	*0.000	0.000	*0.000	*0.000	*0.000
	[4.223]	[3.631]	[1.592]	[3.319]	[3.659]	[4.332]
$ar(1)_{i1}$	0.002	*0.000	**0.005	*0.046	*0.045	*0.039
	[0.926]	[3.887]	[2.377]	[15.115]	[12.064]	[10.851]
$ar(1)_{ii}$	*-0.028	*-0.134	*-0.038	*-0.044	*-0.046	*-0.043
	[-11.754]	[-49.176]	[-13.341]	[-14.781]	[-16.590]	[-15.094]
Constant	0.000	**0.000	*0.000	**0.000	0.000	0.000
	[0.670]	[-2.575]	[4.288]	[2.073]	[1.368]	[1.534]
c_{11}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[92.222]	[94.878]	[85.079]	[80.414]	[83.916]	[86.867]
c_{i1}	*0.000	*0.000	*0.000	*0.000	*0.000	0.000
	[24.984]	[-2.745]	[22.953]	[18.816]	[6.936]	[0.912]
c_{ii}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[33.763]	[-15.606]	[81.017]	[-63.826]	[19.074]	[18.179]
α_{11}	*0.406	*0.405	*0.357	*0.394	*0.421	*0.416
	[134.793]	[141.185]	[114.188]	[115.008]	[125.412]	[132.758]
α_{1i}	*0.102	*0.000	*0.040	*0.039	*0.158	*0.104
	[31.216]	[-4.419]	[15.586]	[11.630]	[39.120]	[24.009]
α_{i1}	*0.008	**-0.115	0.005	*-0.008	*-0.007	*-0.009
	[3.318]	[-2.428]	[1.696]	[-3.076]	[-3.635]	[-4.395]
α_{ii}	*0.156	*0.201	*0.361	*0.286	*0.126	*0.166
	[72.591]	[103.211]	[116.068]	[96.129]	[54.983]	[57.062]
β_{11}	*0.914	*0.912	*0.929	*0.916	*0.905	*0.905
	[859.274]	[870.981]	[894.312]	[728.998]	[695.167]	[716.927]
β_{1i}	*-0.030	*0.000	*-0.018	*-0.011	*-0.042	*-0.029
	[-33.533]	[5.556]	[-19.762]	[-9.791]	[-32.463]	[-19.763]
β_{i1}	*-0.002	*0.032	*-0.006	*0.005	*0.007	*0.011
	[-3.235]	[3.284]	[-5.796]	[5.779]	[9.302]	[14.082]
β_{ii}	*0.988	*0.982	*0.926	*0.953	*0.993	*0.987
	[2875.311]	[3142.851]	[765.000]	[967.638]	[1999.797]	[1404.700]

See Notes (1).

Table 123: 15 Minute VAR-BEKK-GARCH Results for London Market Period (Contd.)

USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK	**USDHKD**	USDJPY	USDMXN	USDNOK	USDSEK
$ar(1)_{11}$	*-0.033	*-0.041	*-0.037	*-0.038	*-0.039	$ar(1)_{11}$	*-0.139	*-0.136	*-0.136	*-0.137
	[-9.855]	[-13.240]	[-13.749]	[-11.329]	[-11.119]		[-54.433]	[-48.335]	[-48.087]	[-47.413]
$ar(1)_{1i}$	0.015	*0.021	0.005	*0.011	*0.008	$ar(1)_{1i}$	*0.000	*0.000	*0.000	*0.000
	[0.271]	[6.608]	[1.793]	[4.949]	[3.319]		[3.115]	[4.630]	[4.558]	[6.384]
Constant	*0.000	0.000	0.000	0.000	0.000	*Constant*	*0.000	**0.000	0.000	**0.000
	[3.111]	[-1.582]	[-0.824]	[0.648]	[0.779]		[-2.583]	[-2.504]	[-1.872]	[-1.998]
$ar(1)_{i1}$	*0.000	0.001	*0.015	0.003	*0.014	$ar(1)_{i1}$	**-0.077	*0.171	-0.005	-0.069
	[2.634]	[0.732]	[7.113]	[0.846]	[3.726]		[-2.079]	[3.554]	[-0.079]	[-1.179]
$ar(1)_{ii}$	*-0.137	*-0.040	*-0.030	*-0.038	*-0.043	$ar(1)_{ii}$	*-0.030	*-0.025	*-0.035	*-0.036
	[-48.111]	[-12.883]	[-11.148]	[-12.169]	[-13.165]		[-10.197]	[-9.017]	[-13.261]	[-13.766]
Constant	0.000	**0.000	0.000	0.000	0.000	*Constant*	*0.000	0.000	0.000	0.000
	[-1.695]	[2.460]	[1.045]	[-0.069]	[1.399]		[3.471]	[1.117]	[1.372]	[1.278]
c_{11}	*0.000	*0.000	*0.000	*0.000	*0.000	c_{11}	*0.000	*0.000	*0.000	*0.000
	[29.349]	[73.263]	[37.229]	[68.409]	[67.366]		[16.464]	[24.592]	[24.027]	[-25.139]
c_{i1}	*0.000	*0.000	*0.000	*0.000	*0.000	c_{i1}	*0.000	*0.000	0.000	*0.000
	[4.677]	[58.970]	[35.225]	[71.847]	[66.796]		[-6.074]	[-4.041]	[-1.632]	[8.631]
c_{ii}	*0.000	*0.000	*0.000	*0.000	*0.000	c_{ii}	*0.000	*0.000	*0.000	*0.000
	[17.887]	[44.166]	[40.399]	[-15.706]	[-10.065]		[18.320]	[29.514]	[26.893]	[22.828]
α_{11}	*0.144	*0.283	*0.158	*0.250	*0.235	α_{11}	*0.203	*0.206	*0.244	*0.225
	[49.918]	[99.130]	[72.001]	[72.764]	[63.409]		[108.377]	[104.383]	[93.899]	[94.788]
α_{1i}	*0.000	*0.036	*0.016	*0.084	*0.045	α_{1i}	**0.086	-0.052	0.044	-0.008
	[3.450]	[19.564]	[8.173]	[21.606]	[10.561]		[2.048]	[-1.302]	[0.752]	[-0.165]
α_{i1}	*0.259	*0.090	*0.071	*0.064	*0.073	α_{i1}	*0.000	0.000	*0.000	*0.000
	[6.692]	[24.458]	[34.177]	[24.182]	[29.293]		[-5.773]	[-1.182]	[-2.832]	[-5.257]
α_{ii}	*0.238	*0.350	*0.328	*0.242	*0.270	α_{ii}	*0.399	*0.336	*0.122	*0.204
	[98.469]	[116.299]	[129.893]	[72.967]	[85.862]		[113.050]	[121.079]	[49.159]	[38.493]
β_{11}	*0.990	*0.957	*0.987	*0.966	*0.970	β_{11}	*0.982	*0.981	*0.975	*0.978
	[2346.657]	[1247.919]	[2745.267]	[1180.591]	[1138.252]		[3326.922]	[3114.797]	[2049.384]	[2341.620]
β_{1i}	*0.000	*-0.012	*-0.005	*-0.019	*-0.011	β_{1i}	-0.009	0.015	-0.002	0.008
	[-4.052]	[-22.726]	[-10.977]	[-21.433]	[-11.863]		[-1.062]	[1.719]	[-0.184]	[0.811]
β_{i1}	*-0.049	*-0.037	*-0.019	*-0.031	*-0.032	β_{i1}	*0.000	*0.000	**0.000	*0.000
	[-6.529]	[-28.306]	[-30.716]	[-39.633]	[-47.600]		[7.963]	[2.900]	[2.252]	[10.385]
β_{ii}	*0.976	*0.931	*0.940	*0.952	*0.950	β_{ii}	*0.909	*0.936	*0.991	*0.975
	[2206.455]	[868.924]	[1096.331]	[946.092]	[1109.761]		[589.139]	[964.657]	[2553.834]	[700.389]

See Notes (1).

Table 124: 15 Minute VAR-BEKK-GARCH Results for London Market Period (Contd.)

USDJPY	USDMXN	USDNOK	USDSEK	**USDMXN**	USDNOK	USDSEK	**USDNOK**	USDSEK
$ar(1)_{11}$	*-0.042 [-15.973]	*-0.033 [-11.401]	*-0.034 [-12.155]	$ar(1)_{11}$	*-0.036 [-12.075]	*-0.037 [-13.253]	$ar(1)_{11}$	*-0.058 [-15.461]
$ar(1)_{1i}$	*-0.005 [-2.672]	0.001 [1.056]	0.001 [0.981]	$ar(1)_{1i}$	*0.023 [11.376]	*0.026 [13.132]	$ar(1)_{1i}$	*0.032 [8.550]
Constant	*0.000 [5.191]	*0.000 [4.127]	*0.000 [5.428]	*Constant*	0.000 [0.997]	0.000 [1.108]	*Constant*	0.000 [0.951]
$ar(1)_{i1}$	**-0.007 [-2.420]	0.002 [0.684]	0.003 [0.823]	$ar(1)_{i1}$	*0.028 [8.944]	*0.026 [8.516]	$ar(1)_{i1}$	*0.037 [11.356]
$ar(1)_{ii}$	*-0.029 [-10.017]	*-0.036 [-15.391]	*-0.039 [-16.072]	$ar(1)_{ii}$	*-0.045 [-15.367]	*-0.045 [-16.923]	$ar(1)_{ii}$	*-0.061 [-16.677]
Constant	0.000 [0.037]	0.000 [0.734]	0.000 [1.085]	*Constant*	0.000 [0.713]	0.000 [0.687]	*Constant*	0.000 [1.305]
c_{11}	*0.000 [78.488]	*0.000 [90.767]	*0.000 [86.053]	c_{11}	*0.000 [74.090]	*0.000 [75.221]	c_{11}	*0.000 [43.396]
c_{i1}	*0.000 [6.112]	*0.000 [17.369]	*0.000 [38.999]	c_{i1}	*0.000 [11.442]	*0.000 [8.629]	c_{i1}	**0.000 [-2.142]
c_{ii}	*0.000 [63.108]	*0.000 [38.671]	*0.000 [31.284]	c_{ii}	*0.000 [28.484]	*0.000 [24.168]	c_{ii}	*0.000 [26.109]
α_{11}	*0.369 [110.773]	*0.385 [130.966]	*0.374 [123.171]	α_{11}	*0.340 [118.611]	*0.339 [122.318]	α_{11}	*0.206 [50.493]
α_{1i}	*-0.021 [-6.787]	*0.051 [15.362]	*0.066 [21.576]	α_{1i}	*0.105 [40.116]	*0.086 [32.332]	α_{1i}	*-0.080 [-22.944]
α_{i1}	*0.017 [9.064]	*-0.005 [-3.204]	*0.011 [7.915]	α_{i1}	*0.008 [3.730]	-0.002 [-0.781]	α_{i1}	*-0.050 [-9.879]
α_{ii}	*0.298 [107.962]	*0.161 [60.798]	*0.183 [76.162]	α_{ii}	*0.135 [54.369]	*0.162 [55.464]	α_{ii}	*0.240 [49.695]
β_{11}	*0.924 [697.715]	*0.920 [859.587]	*0.924 [819.829]	β_{11}	*0.934 [902.181]	*0.935 [973.639]	β_{11}	*0.972 [750.396]
β_{1i}	*0.003 [2.688]	*-0.019 [-18.566]	*-0.024 [-28.656]	β_{1i}	*-0.028 [-35.437]	*-0.023 [-29.304]	β_{1i}	*0.027 [23.689]
β_{i1}	*-0.006 [-9.043]	0.000 [-0.486]	*-0.006 [-15.814]	β_{i1}	0.001 [1.555]	*0.003 [4.043]	β_{i1}	*0.013 [8.941]
β_{ii}	*0.951 [1109.307]	*0.984 [1594.499]	*0.980 [1942.956]	β_{ii}	*0.990 [2036.530]	*0.986 [1537.171]	β_{ii}	*0.959 [662.634]

See Notes (1).

Appendix A.5.4. Tokyo Closing-London Opening Period

Table 125: 15 Minute VAR-BEKK-GARCH Results for Tokyo Closing-London Opening Period

AUDUSD	EURUSD	GBPUSD	NZDUSD	USDCAD	USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK
$ar(1)_{11}$	*-0.037	*-0.036	*-0.050	*-0.046	*-0.037	*-0.034	*-0.042	*-0.044	*-0.034	*-0.037
	[-12.624]	[-14.658]	[-12.427]	[-14.724]	[-12.698]	[-13.238]	[-16.416]	[-13.951]	[-11.261]	[-12.193]
$ar(1)_{1i}$	0.003	0.005	*0.020	*-0.023	0.001	0.064	*-0.019	*-0.015	-0.001	**-0.005
	[1.191]	[1.821]	[6.156]	[-6.711]	[0.544]	[1.362]	[-6.815]	[-5.525]	[-0.303]	[-2.338]
Constant	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	[1.298]	[-0.446]	[0.123]	[-0.313]	[0.337]	[0.498]	[0.562]	[-0.678]	[0.609]	[0.362]
$ar(1)_{i1}$	0.004	*0.012	*0.056	*-0.030	0.005	*-0.001	*-0.008	*-0.059	*-0.055	*-0.052
	[1.550]	[5.713]	[12.937]	[-12.964]	[1.758]	[-9.507]	[-4.962]	[-21.778]	[-14.785]	[-14.410]
$ar(1)_{ii}$	*-0.019	*-0.043	*-0.079	*-0.059	*-0.027	*-0.111	*-0.032	*-0.060	*-0.064	*-0.061
	[-6.135]	[-16.470]	[-20.341]	[-17.171]	[-7.673]	[-39.211]	[-11.356]	[-19.403]	[-21.335]	[-19.641]
Constant	0.000	0.000	0.000	*0.000	**0.000	0.000	0.000	**0.000	0.000	0.000
	[0.397]	[-1.324]	[0.681]	[2.876]	[-2.283]	[-1.682]	[1.930]	[2.566]	[1.371]	[1.886]

See Notes (1).

Table 126: 15 Minute VAR-BEKK-GARCH Results for Tokyo Closing-London Opening Period (Contd.)

c_{11}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[36.396]	[-8.058]	[40.069]	[3.694]	[75.945]	[35.520]	[31.968]	[7.888]	[29.936]	[38.389]
c_{i1}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[42.833]	[4.467]	[67.472]	[15.892]	[-69.676]	[3.224]	[-23.286]	[-14.411]	[-34.534]	[-37.288]
c_{ii}	*0.000	*0.000	0.000	**0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[38.177]	[-58.128]	[-0.292]	[1.987]	[17.434]	[24.537]	[50.263]	[6.053]	[30.777]	[25.391]
α_{11}	*0.187	*0.122	*0.107	*0.090	*0.231	*0.246	*0.185	*0.094	*0.206	*0.198
	[58.105]	[61.774]	[21.520]	[44.923]	[81.595]	[52.719]	[61.211]	[42.611]	[38.922]	[53.300]
α_{1i}	*0.016	*-0.053	*-0.029	*0.131	*-0.054	**0.000	*0.022	*0.060	*-0.045	*-0.053
	[5.352]	[-18.633]	[-3.777]	[55.636]	[-17.504]	[2.283]	[11.759]	[20.013]	[-7.559]	[-11.091]
α_{i1}	*0.090	*0.030	*0.134	*-0.113	*-0.064	*0.201	*-0.016	*-0.098	*-0.042	*-0.054
	[33.050]	[15.469]	[40.149]	[-31.343]	[-29.674]	[3.460]	[-6.233]	[-42.040]	[-18.989]	[-27.386]
α_{ii}	*0.291	*0.353	*0.342	*0.469	*0.293	*0.223	*0.359	*0.357	*0.237	*0.256
	[90.087]	[81.587]	[59.413]	[140.830]	[110.144]	[96.313]	[129.495]	[118.867]	[49.518]	[56.692]
β_{11}	*0.982	*-1.087	*1.010	*1.002	*0.964	*0.965	*0.981	*0.998	*0.977	*0.980
	[1228.385]	[-747.339]	[871.406]	[2657.419]	[1257.757]	[691.476]	[1478.352]	[3065.647]	[669.552]	[1095.896]
β_{1i}	-0.001	*-0.590	*0.030	*-0.042	*0.027	*0.000	*-0.005	*-0.014	*0.007	*0.007
	[-0.764]	[-185.218]	[14.420]	[-54.713]	[30.304]	[-2.613]	[-9.589]	[-21.529]	[4.108]	[5.264]
β_{i1}	*-0.025	*0.322	*-0.049	*0.029	*0.015	*-0.050	*0.007	*0.023	*0.014	*0.018
	[-32.290]	[60.926]	[-43.852]	[27.560]	[27.850]	[-4.319]	[9.366]	[36.566]	[20.436]	[27.292]
β_{ii}	*0.949	*0.994	*0.912	*0.889	*0.957	*0.978	*0.929	*0.934	*0.960	*0.953
	[900.384]	[278.024]	[423.537]	[619.049]	[1333.341]	[2467.242]	[929.065]	[938.345]	[612.086]	[582.710]

See Notes (1).

Table 127: 15 Minute VAR-BEKK-GARCH Results for Tokyo Closing-London Opening Period (Contd.)

EURUSD	GBPUSD	NZDUSD	USDCAD	USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK
$ar(1)_{11}$	*-0.018	*-0.019	*-0.013	-0.007	*-0.018	*-0.020	*-0.017	*-0.007	*-0.011
	[-5.607]	[-6.092]	[-4.349]	[-1.708]	[-7.156]	[-7.218]	[-6.483]	[-2.720]	[-3.020]
$ar(1)_{1i}$	0.003	0.003	-0.004	-0.005	0.066	**-0.006	-0.002	*0.007	**0.005
	[0.824]	[1.106]	[-1.214]	[-1.267]	[1.267]	[-2.063]	[-0.809]	[4.607]	[2.122]
Constant	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	[-0.904]	[0.155]	[-1.326]	[-3.811]	[0.262]	[-0.550]	[-0.469]	[-1.349]	[-0.798]
$ar(1)_{i1}$	*0.009	*0.016	*-0.028	-0.067	*-0.001	-0.002	*-0.049	*-0.029	*-0.040
	[3.197]	[4.630]	[-14.573]	[-13.150]	[-9.841]	[-0.862]	[-19.554]	[-10.600]	[-8.352]
$ar(1)_{ii}$	*-0.040	*-0.050	*-0.049	-0.067	*-0.112	*-0.031	*-0.055	*-0.054	*-0.054
	[-11.382]	[-16.381]	[-15.250]	[-13.814]	[-40.918]	[-10.280]	[-18.144]	[-30.128]	[-15.481]
Constant	0.000	0.000	*0.000	0.000	**0.000	0.000	*0.000	0.000	*0.000
	[-1.182]	[1.160]	[4.309]	[0.958]	[-2.241]	[1.570]	[3.557]	[1.080]	[2.885]
c_{11}	*0.000	*0.000	*0.000	0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[27.554]	[59.745]	[15.751]	[42.497]	[60.122]	[49.529]	[23.921]	[29.649]	[31.146]
c_{i1}	*0.000	*0.000	*0.000	0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[28.244]	[47.212]	[6.526]	[-21.945]	[4.956]	[-43.088]	[-5.602]	[8.163]	[6.017]
c_{ii}	*0.000	*0.000	*0.000	0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[29.582]	[30.285]	[13.459]	[-8.716]	[-21.872]	[61.107]	[62.911]	[38.548]	[40.408]
α_{11}	*0.152	*0.261	*0.134	0.077	*0.300	*0.245	*0.142	*0.177	*0.188
	[40.640]	[71.175]	[45.599]	[33.875]	[84.125]	[69.864]	[56.935]	[38.095]	[41.397]
α_{1i}	*-0.049	*0.087	*0.082	0.138	*0.000	*-0.023	*0.023	*0.159	*0.209
	[-255.025]	[23.823]	[31.937]	[64.391]	[3.044]	[-11.983]	[8.034]	[22.529]	[36.478]
α_{i1}	*0.089	*0.059	*-0.053	-0.124	*0.279	*-0.068	*-0.046	*0.029	*0.025
	[20.879]	[24.654]	[-15.486]	[-55.779]	[4.975]	[-25.911]	[-21.723]	[11.273]	[8.748]
α_{ii}	*0.374	*0.243	*0.433	0.278	*0.216	*0.354	*0.333	*0.301	*0.355
	[97.157]	[64.794]	[136.764]	[130.061]	[116.171]	[120.142]	[119.175]	[52.787]	[69.796]
β_{11}	*-0.998	*0.959	*0.992	1.107	*0.946	*0.966	*0.990	*0.978	*0.973
	[-1155.197]	[808.774]	[1720.688]	[1628.747]	[773.491]	[975.158]	[2250.143]	[759.390]	[624.615]
β_{1i}	*-0.033	*-0.024	*-0.032	-0.178	*0.000	*0.007	*-0.011	*-0.060	*-0.092
	[-118.484]	[-20.576]	[-37.162]	[-240.157]	[-4.772]	[13.076]	[-14.674]	[-20.864]	[-30.002]
β_{i1}	*0.043	*-0.017	*0.013	0.149	*-0.067	*0.025	*0.012	*-0.010	*-0.011
	[24.796]	[-23.573]	[12.548]	[282.311]	[-5.759]	[31.996]	[19.263]	[-10.465]	[-9.122]
β_{ii}	*-0.889	*0.961	*0.900	0.849	*0.980	*0.928	*0.940	*0.934	*0.902
	[-412.984]	[766.233]	[708.385]	[1472.606]	[3195.367]	[928.758]	[1018.396]	[365.428]	[305.234]

See Notes (1).

Table 128: 15 Minute VAR-BEKK-GARCH Results for Tokyo Closing-London Opening Period (Contd.)

GBPUSD	NZDUSD	USDCAD	USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK
$ar(1)_{11}$	*-0.035	*-0.034	*-0.039	*-0.032	*-0.033	*-0.035	*-0.035	*-0.032
	[-13.141]	[-12.475]	[-12.972]	[-13.460]	[-12.734]	[-12.862]	[-11.139]	[-11.249]
$ar(1)_{1i}$	*0.006	*-0.011	*-0.009	**0.092	**-0.006	*-0.007	-0.003	-0.003
	[3.311]	[-4.347]	[-5.061]	[2.226]	[-2.457]	[-4.159]	[-1.766]	[-1.798]
Constant	0.000	**0.000	0.000	0.000	**0.000	0.000	0.000	*0.000
	[-1.898]	[-2.207]	[-1.869]	[-1.908]	[-2.232]	[-1.799]	[-1.757]	[-3.119]
$ar(1)_{i1}$	*0.013	*-0.014	-0.005	*0.000	*-0.008	*-0.038	*-0.032	*-0.036
	[3.815]	[-5.726]	[-1.333]	[-5.784]	[-4.186]	[-13.510]	[-7.567]	[-9.144]
$ar(1)_{ii}$	*-0.045	*-0.033	*-0.032	*-0.112	*-0.027	*-0.039	*-0.052	*-0.049
	[-15.563]	[-10.230]	[-10.926]	[-40.983]	[-9.123]	[-14.122]	[-18.053]	[-16.748]
Constant	0.000	*0.000	0.000	0.000	**0.000	*0.000	0.000	*0.000
	[0.393]	[3.629]	[-0.436]	[-1.517]	[2.204]	[2.982]	[1.866]	[3.013]
c_{11}	*0.000	*0.000	*0.000	*0.000	*0.000	0.000	*0.000	*0.000
	[11.082]	[-4.225]	[55.897]	[19.635]	[19.976]	[1.813]	[22.829]	[16.578]
c_{i1}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[24.498]	[67.976]	[-28.060]	[19.099]	[-13.955]	[-43.671]	[19.750]	[45.765]
c_{ii}	*0.000	0.000	*0.000	*0.000	*0.000	*0.000	*0.000	0.000
	[3.209]	[0.205]	[-26.794]	[-31.513]	[40.045]	[55.459]	[11.661]	[-0.173]
α_{11}	*0.066	*0.077	*0.288	*0.062	*0.123	*0.069	*0.082	*0.082
	[35.918]	[41.970]	[65.301]	[47.764]	[48.436]	[51.263]	[52.203]	[43.584]
α_{1i}	*-0.054	*0.041	*-0.041	0.000	*0.018	*0.043	*0.101	*0.123
	[-13.017]	[13.101]	[-7.313]	[-0.162]	[6.726]	[13.827]	[25.473]	[27.760]
α_{i1}	*0.055	*-0.078	*-0.026	0.024	*-0.048	*-0.043	*-0.003	*-0.011
	[31.800]	[-31.377]	[-13.498]	[0.792]	[-21.845]	[-37.639]	[-5.074]	[-10.467]
α_{ii}	*0.325	*0.421	*0.198	*0.255	*0.382	*0.348	*0.298	*0.335
	[101.607]	[133.863]	[75.737]	[113.583]	[127.712]	[120.819]	[71.901]	[84.554]
β_{11}	*1.001	*1.000	*0.936	*0.998	*0.992	*0.999	*0.996	*0.997
	[4483.773]	[5841.829]	[476.225]	[11406.142]	[2417.637]	[10475.014]	[6495.212]	[3951.628]
β_{1i}	*0.018	*-0.017	*0.012	*0.000	*-0.006	*-0.012	*-0.044	*-0.053
	[18.844]	[-23.930]	[5.696]	[-2.761]	[-7.444]	[-20.485]	[-31.399]	[-26.645]
β_{i1}	*-0.014	*0.019	*0.008	**-0.012	*0.015	*0.009	0.000	*0.002
	[-28.798]	[26.770]	[13.721]	[-1.971]	[22.163]	[31.057]	[-0.544]	[6.623]
β_{ii}	*0.935	*0.905	*0.980	*0.972	*0.915	*0.936	*0.935	*0.921
	[759.627]	[723.938]	[1820.217]	[2360.125]	[767.367]	[943.438]	[491.244]	[417.576]

See Notes (1).

Table 129: 15 Minute VAR-BEKK-GARCH Results for Tokyo Closing-London Opening Period (Contd.)

NZDUSD	USDCAD	USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK
$ar(1)_{11}$	*-0.058	*-0.041	-0.042	*-0.051	*-0.055	*-0.043	*-0.045
	[-19.735]	[-14.040]	[-15.723]	[-19.228]	[-20.011]	[-13.428]	[-15.869]
$ar(1)_{1i}$	*-0.034	-0.002	0.068	*-0.016	*-0.023	**-0.004	*-0.009
	[-8.611]	[-0.805]	[1.101]	[-5.082]	[-8.138]	[-1.971]	[-3.992]
Constant	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	[-0.158]	[0.457]	[0.771]	[0.042]	[-0.260]	[0.590]	[0.426]
$ar(1)_{i1}$	*-0.015	-0.002	-0.001	-0.002	*-0.039	*-0.042	*-0.041
	[-7.393]	[-0.772]	[-8.393]	[-1.094]	[-16.610]	[-11.885]	[-13.627]
$ar(1)_{ii}$	*-0.045	*-0.039	-0.111	*-0.032	*-0.049	*-0.063	*-0.063
	[-13.436]	[-12.072]	[-36.628]	[-12.462]	[-17.110]	[-20.324]	[-21.409]
Constant	*0.000	0.000	0.000	**0.000	*0.000	**0.000	**0.000
	[3.190]	[-1.215]	[-2.400]	[2.098]	[2.955]	[2.352]	[1.984]
c_{11}	*0.000	*0.000	0.000	*0.000	*0.000	*0.000	*0.000
	[6.311]	[-86.503]	[66.350]	[64.455]	[10.849]	[62.676]	[64.564]
c_{i1}	*0.000	*0.000	0.000	*0.000	*0.000	*0.000	*0.000
	[2.943]	[69.314]	[24.759]	[-35.170]	[-20.806]	[-17.060]	[-14.840]
c_{ii}	*0.000	0.000	0.000	*0.000	*0.000	*0.000	*0.000
	[-17.111]	[-0.006]	[-6.745]	[66.774]	[24.370]	[23.793]	[24.917]
α_{11}	*0.103	*0.257	0.306	*0.252	*0.088	*0.313	*0.311
	[25.055]	[100.667]	[100.388]	[93.006]	[41.339]	[96.149]	[91.778]
α_{1i}	*0.100	*-0.100	0.000	0.001	*0.051	*-0.109	*-0.086
	[43.327]	[-42.242]	[-3.428]	[0.525]	[21.446]	[-30.638]	[-27.582]
α_{i1}	*-0.117	*-0.061	0.212	*-0.034	*-0.108	*0.018	*0.012
	[-23.842]	[-22.003]	[2.998]	[-10.188]	[-40.521]	[7.370]	[3.946]
α_{ii}	*0.455	*0.249	0.215	*0.355	*0.355	*0.123	*0.154
	[139.060]	[79.939]	[116.103]	[125.703]	[125.824]	[41.389]	[48.587]
β_{11}	*0.998	*0.953	0.938	*0.960	*0.998	*0.939	*0.939
	[1133.299]	[1283.949]	[736.517]	[1106.331]	[2903.557]	[758.336]	[702.070]
β_{1i}	*-0.032	*0.040	0.000	*0.003	*-0.010	*0.031	*0.025
	[-38.473]	[63.032]	[-0.834]	[4.215]	[-16.163]	[29.560]	[25.028]
β_{i1}	*0.029	*0.014	1.261	*0.017	*0.026	*-0.006	*-0.005
	[18.886]	[18.915]	[8.704]	[14.931]	[34.937]	[-9.407]	[-5.878]
β_{ii}	*0.894	*0.964	-0.980	*0.926	*0.935	*0.993	*0.988
	[641.475]	[1230.481]	[-3074.190]	[843.219]	[999.410]	[1818.450]	[1306.071]

See Notes (1).

Table 130: 15 Minute VAR-BEKK-GARCH Results for Tokyo Closing-London Opening Period (Contd.)

USDCAD	USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK
$ar(1)_{11}$	*-0.031	*-0.028	*-0.023	*-0.037	*-0.033	*-0.038
	[-10.276]	[-10.605]	[-8.796]	[-12.883]	[-11.566]	[-13.422]
$ar(1)_{1i}$	*0.006	*-0.107	*0.011	*0.012	*0.008	*0.014
	[3.597]	[-2.812]	[5.137]	[5.855]	[5.957]	[26.541]
Constant	*0.000	*0.000	**0.000	*0.000	*0.000	*0.000
	[4.148]	[3.247]	[2.406]	[4.477]	[3.718]	[4.571]
$ar(1)_{i1}$	0.006	*0.000	**0.005	*0.064	*0.053	*0.046
	[1.748]	[4.918]	[2.351]	[20.776]	[12.211]	[11.642]
$ar(1)_{ii}$	*-0.028	*-0.110	*-0.033	*-0.055	*-0.057	*-0.052
	[-9.461]	[-38.280]	[-11.513]	[-18.913]	[-18.990]	[-19.116]
Constant	0.000	*0.000	**0.000	*0.000	*0.000	**0.000
	[0.395]	[-2.636]	[2.523]	[3.548]	[2.822]	[2.160]
c_{11}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[76.445]	[79.070]	[88.310]	[84.294]	[93.995]	[81.502]
c_{i1}	*0.000	*0.000	*0.000	*0.000	*0.000	0.000
	[22.088]	[-4.453]	[16.827]	[14.137]	[6.801]	[0.335]
c_{ii}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[-30.685]	[-18.784]	[82.126]	[65.181]	[21.737]	[24.010]
α_{11}	*0.400	*0.400	*0.361	*0.393	*0.412	*0.406
	[129.490]	[131.146]	[136.057]	[118.566]	[136.180]	[138.997]
α_{1i}	*0.077	*0.000	*0.036	*0.028	*0.150	*0.090
	[15.668]	[-4.875]	[14.627]	[8.499]	[31.555]	[18.943]
α_{i1}	0.000	*-0.199	*0.009	*-0.009	*-0.006	*-0.009
	[-0.161]	[-4.204]	[3.633]	[-4.362]	[-3.994]	[-4.975]
α_{ii}	*0.182	*0.208	*0.354	*0.280	*0.142	*0.180
	[73.918]	[120.413]	[116.421]	[88.463]	[39.995]	[51.691]
β_{11}	*0.915	*0.912	*0.928	*0.913	*0.908	*0.907
	[828.626]	[742.643]	[1005.720]	[679.056]	[777.490]	[752.087]
β_{1i}	*-0.027	*0.000	*-0.013	*-0.006	*-0.040	*-0.024
	[-19.132]	[6.703]	[-15.079]	[-4.682]	[-28.695]	[-14.715]
β_{i1}	**0.002	*0.052	*-0.006	*0.008	*0.006	*0.010
	[2.199]	[5.130]	[-6.590]	[10.779]	[9.422]	[14.835]
β_{ii}	*0.985	*0.981	*0.924	*0.957	*0.989	*0.982
	[2353.732]	[3361.220]	[775.182]	[1004.363]	[1255.217]	[1049.414]

See Notes (1).

Table 131: 15 Minute VAR-BEKK-GARCH Results for Tokyo Closing-London Opening Period (Contd.)

USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK	**USDHKD**	USDJPY	USDMXN	USDNOK	USDSEK
$ar(1)_{11}$	*-0.032	*-0.035	*-0.038	*-0.034	*-0.040	$ar(1)_{11}$	*-0.114	*-0.110	*-0.111	*-0.113
	[-11.240]	[-12.626]	[-13.665]	[-9.922]	[-12.367]		[-39.333]	[-40.019]	[-48.363]	[-40.724]
$ar(1)_{1i}$	-0.017	*0.016	**0.006	*0.011	*0.010	$ar(1)_{1i}$	*0.000	*0.000	*0.000	*0.000
	[-0.284]	[5.302]	[2.445]	[5.235]	[4.100]		[3.657]	[5.655]	[6.854]	[8.975]
Constant	0.000	*0.000	0.000	0.000	0.000	*Constant*	**0.000	**0.000	0.000	*0.000
	[0.572]	[-2.990]	[-1.164]	[1.050]	[0.716]		[-2.227]	[-2.337]	[-1.643]	[-2.845]
$ar(1)_{i1}$	*0.000	0.001	*0.018	*0.011	*0.015	$ar(1)_{i1}$	-0.054	-0.004	-0.084	-0.116
	[4.818]	[0.895]	[8.507]	[3.141]	[4.537]		[-1.427]	[-0.087]	[-1.217]	[-1.561]
$ar(1)_{ii}$	*-0.112	*-0.033	*-0.038	*-0.051	*-0.050	$ar(1)_{ii}$	*-0.025	*-0.031	*-0.043	*-0.042
	[-41.479]	[-11.921]	[-13.766]	[-16.727]	[-16.780]		[-7.907]	[-10.674]	[-14.792]	[-14.691]
Constant	0.000	0.000	*0.000	0.000	**0.000	*Constant*	0.000	*0.000	0.000	0.000
	[-1.649]	[1.680]	[3.088]	[0.715]	[2.275]		[1.930]	[2.934]	[1.858]	[1.565]
c_{11}	*0.000	*0.000	*0.000	*0.000	*0.000	c_{11}	*0.000	*0.000	*0.000	*0.000
	[31.147]	[46.297]	[38.206]	[73.785]	[73.060]		[20.861]	[24.203]	[23.923]	[26.429]
c_{i1}	*0.000	*0.000	*0.000	*0.000	*0.000	c_{i1}	*0.000	*0.000	*0.000	*0.000
	[2.965]	[31.892]	[32.557]	[72.252]	[76.184]		[-5.029]	[-3.825]	[-3.958]	[-35.446]
c_{ii}	*0.000	*0.000	*0.000	*0.000	*0.000	c_{ii}	*0.000	*0.000	*0.000	0.000
	[-27.233]	[39.175]	[39.584]	[41.022]	[10.420]		[33.996]	[51.983]	[31.068]	[0.004]
α_{11}	*0.174	*0.292	*0.179	*0.258	*0.258	α_{11}	*0.209	*0.212	*0.223	*0.222
	[60.062]	[89.000]	[75.061]	[76.118]	[76.452]		[109.398]	[106.936]	[101.442]	[104.373]
α_{1i}	0.000	*0.034	*0.015	*0.041	*0.049	α_{1i}	*0.154	0.000	0.015	*0.570
	[1.624]	[20.425]	[7.996]	[10.526]	[13.088]		[3.378]	[-0.008]	[0.176]	[7.697]
α_{i1}	*0.194	*0.069	*0.062	*0.053	*0.059	α_{i1}	*0.000	**0.000	*0.000	*0.000
	[3.287]	[10.337]	[27.974]	[23.194]	[25.551]		[-5.250]	[-2.037]	[-4.738]	[2.836]
α_{ii}	*0.236	*0.348	*0.323	*0.287	*0.269	α_{ii}	*0.391	*0.331	*0.252	*0.276
	[100.478]	[118.682]	[121.216]	[78.585]	[85.925]		[112.398]	[115.152]	[50.863]	[59.141]
β_{11}	*0.985	*0.958	*0.984	*0.966	*0.965	β_{11}	*0.981	*0.980	*0.978	*-0.979
	[1973.879]	[989.268]	[2379.131]	[1138.002]	[1097.617]		[3181.907]	[2948.962]	[2541.374]	[-2628.516]
β_{1i}	**0.000	*-0.009	*-0.003	*-0.010	*-0.013	β_{1i}	*-0.026	0.013	0.024	*-1.872
	[-2.317]	[-16.585]	[-7.749]	[-9.672]	[-13.537]		[-2.628]	[1.173]	[1.341]	[-11.968]
β_{i1}	*-0.039	*-0.031	*-0.018	*-0.030	*-0.031	β_{i1}	*0.000	*0.000	*0.000	0.000
	[-3.275]	[-10.495]	[-27.338]	[-37.874]	[-46.013]		[6.910]	[3.315]	[4.610]	[1.581]
β_{ii}	*0.976	*0.927	*0.944	*0.939	*0.948	β_{ii}	*0.905	*0.940	*0.955	*0.949
	[2267.425]	[797.357]	[1057.855]	[721.442]	[1036.056]		[558.595]	[1026.084]	[506.316]	[477.448]

See Notes (1).

Table 132: 15 Minute VAR-BEKK-GARCH Results for Tokyo Closing-London Opening Period (Contd.)

USDJPY	USDMXN	USDNOK	USDSEK	**USDMXN**	USDNOK	USDSEK	**USDNOK**	USDSEK
$ar(1)_{11}$	*-0.036 [-11.569]	*-0.027 [-9.270]	*-0.027 [-9.015]	$ar(1)_{11}$	*-0.042 [-14.380]	*-0.044 [-15.501]	$ar(1)_{11}$	*-0.070 [-18.914]
$ar(1)_{1i}$	*-0.006 [-4.524]	0.000 [-0.122]	0.000 [-0.223]	$ar(1)_{1i}$	*0.023 [12.790]	*0.028 [14.523]	$ar(1)_{1i}$	*0.035 [9.615]
Constant	0.000 [1.511]	*0.000 [3.718]	**0.000 [2.480]	*Constant*	*0.000 [3.250]	*0.000 [3.121]	*Constant*	0.000 [1.871]
$ar(1)_{i1}$	-0.001 [-0.670]	0.006 [1.626]	**0.008 [2.225]	$ar(1)_{i1}$	*0.030 [9.345]	*0.024 [8.076]	$ar(1)_{i1}$	*0.031 [9.827]
$ar(1)_{ii}$	*-0.031 [-11.436]	*-0.045 [-17.510]	*-0.047 [-18.121]	$ar(1)_{ii}$	*-0.054 [-17.834]	*-0.051 [-17.454]	$ar(1)_{ii}$	*-0.066 [-18.426]
Constant	**0.000 [2.273]	**0.000 [2.027]	**0.000 [2.041]	*Constant*	**0.000 [2.219]	0.000 [1.913]	*Constant*	*0.000 [2.668]
c_{11}	*0.000 [79.623]	*0.000 [92.664]	*0.000 [84.582]	c_{11}	*0.000 [64.755]	*0.000 [-57.705]	c_{11}	*0.000 [48.629]
c_{i1}	*0.000 [7.531]	*0.000 [13.031]	*0.000 [26.781]	c_{i1}	*0.000 [8.233]	*0.000 [51.674]	c_{i1}	*0.000 [-8.381]
c_{ii}	*0.000 [56.390]	*0.000 [42.744]	*0.000 [33.796]	c_{ii}	*0.000 [22.609]	*0.000 [61.397]	c_{ii}	*0.000 [29.892]
α_{11}	*0.360 [103.963]	*0.377 [127.796]	*0.369 [123.010]	α_{11}	*0.337 [118.645]	*0.351 [105.325]	α_{11}	*0.276 [60.410]
α_{1i}	-0.003 [-1.126]	*0.050 [15.042]	*0.066 [19.059]	α_{1i}	*0.092 [32.887]	*0.086 [55.251]	α_{1i}	*-0.096 [-25.766]
α_{i1}	*0.017 [9.481]	*0.005 [3.318]	*0.017 [11.650]	α_{i1}	0.001 [0.360]	*-0.008 [-5.077]	α_{i1}	*-0.107 [-20.962]
α_{ii}	*0.291 [108.479]	*0.200 [58.567]	*0.187 [63.410]	α_{ii}	*0.142 [38.341]	*0.109 [66.298]	α_{ii}	*0.257 [54.717]
β_{11}	*0.922 [698.796]	*0.917 [786.956]	*0.921 [777.321]	β_{11}	*0.938 [938.084]	*0.972 [579.867]	β_{11}	*0.944 [470.406]
β_{1i}	-0.002 [-1.860]	*-0.020 [-17.058]	*-0.026 [-23.381]	β_{1i}	*-0.024 [-29.157]	*0.669 [174.412]	β_{1i}	*0.042 [24.066]
β_{i1}	*-0.005 [-8.163]	**-0.001 [-2.072]	*-0.005 [-11.879]	β_{i1}	*0.003 [4.774]	*-0.110 [-14.902]	β_{i1}	*0.038 [17.946]
β_{ii}	*0.955 [1161.551]	*0.974 [1040.805]	*0.979 [1492.523]	β_{ii}	*0.989 [1317.891]	*-1.030 [-448.105]	β_{ii}	*0.944 [466.287]

See Notes (1).

Appendix A.5.5. New York Closing-Tokyo Opening Period

Table 133: 15 Minute VAR-BEKK-GARCH Results for New York Closing-Tokyo Opening Period

AUDUSD	EURUSD	GBPUSD	NZDUSD	USDCAD	USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK
$ar(1)_{11}$	*-0.045	*-0.041	*-0.043	*-0.047	*-0.042	*-0.038	*-0.047	*-0.049	*-0.040	*-0.043
	[-14.552]	[-14.061]	[-15.045]	[-14.887]	[-14.744]	[-14.404]	[-17.902]	[-17.806]	[-16.130]	[-13.726]
$ar(1)_{1i}$	*0.009	**0.007	*0.009	*-0.019	-0.003	0.014	*-0.022	*-0.013	-0.001	-0.004
	[2.756]	[2.092]	[13.803]	[-5.310]	[-1.053]	[0.346]	[-7.904]	[-5.234]	[-0.819]	[-1.935]
Constant	0.000	**0.000	*0.000	*0.000	**0.000	**0.000	0.000	**0.000	**0.000	0.000
	[-1.668]	[-2.275]	[-5.499]	[-3.163]	[-2.426]	[-2.141]	[-1.940]	[-2.361]	[-2.159]	[-1.917]
$ar(1)_{i1}$	*0.007	*0.011	*0.065	*-0.034	0.000	*-0.001	*-0.011	*-0.052	*-0.043	*-0.040
	[2.614]	[4.885]	[16.804]	[-14.543]	[0.048]	[-7.733]	[-6.138]	[-20.476]	[-14.293]	[-11.651]
$ar(1)_{ii}$	*-0.027	*-0.040	*-0.092	*-0.063	*-0.034	*-0.138	*-0.041	*-0.064	*-0.068	*-0.066
	[-8.329]	[-13.180]	[-33.207]	[-18.465]	[-10.496]	[-44.796]	[-13.699]	[-22.017]	[-24.480]	[-21.275]
Constant	**0.000	0.000	0.000	*0.000	0.000	0.000	*0.000	0.000	*0.000	*0.000
	[-2.029]	[-1.402]	[-0.656]	[4.752]	[1.605]	[-1.122]	[4.297]	[0.156]	[3.144]	[2.883]

See Notes (1).

Table 134: 15 Minute VAR-BEKK-GARCH Results for New York Closing-Tokyo Opening Period (Contd.)

c_{11}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[49.174]	[65.544]	[44.507]	[12.242]	[64.100]	[61.109]	[30.385]	[12.999]	[-53.278]	[60.362]
c_{i1}	*0.000	*0.000	*0.000	*0.000	*0.000	0.000	*0.000	*0.000	**0.000	*0.000
	[4.636]	[19.018]	[49.145]	[68.525]	[-55.560]	[1.898]	[-19.865]	[-15.855]	[2.221]	[-12.486]
c_{ii}	*0.000	0.000	*0.000	0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[-19.654]	[0.029]	[2.966]	[0.003]	[-20.311]	[18.028]	[55.216]	[13.441]	[14.450]	[-23.288]
α_{11}	*0.256	*0.287	*0.259	*0.116	*0.241	*0.295	*0.181	*0.127	*0.286	*0.274
	[84.063]	[98.001]	[40.415]	[51.910]	[73.561]	[91.602]	[54.532]	[65.021]	[84.373]	[80.286]
α_{1i}	*0.022	*0.054	*0.192	*0.106	*-0.061	0.000	*0.030	*0.026	*-0.085	*-0.083
	[9.027]	[35.420]	[26.066]	[39.464]	[-18.932]	[0.046]	[14.268]	[7.464]	[-21.714]	[-24.388]
α_{i1}	*-0.042	*0.015	*0.068	*-0.119	*-0.067	-0.034	*-0.021	*-0.088	*0.028	*-0.012
	[-11.772]	[4.231]	[19.214]	[-31.406]	[-25.649]	[-0.804]	[-8.293]	[-35.493]	[17.834]	[-4.096]
α_{ii}	*0.150	*0.133	*0.137	*0.477	*0.315	*0.195	*0.399	*0.357	*0.112	*0.180
	[42.438]	[60.783]	[32.088]	[140.961]	[104.594]	[102.274]	[135.195]	[123.944]	[72.163]	[46.900]
β_{11}	*0.960	*0.949	*0.955	*0.997	*0.963	*0.950	*0.983	*0.995	*0.953	*0.955
	[972.098]	[965.324]	[756.638]	[2311.178]	[1104.985]	[902.288]	[1413.238]	[3189.443]	[895.139]	[833.815]
β_{1i}	*-0.006	*-0.015	*-0.044	*-0.038	*0.025	0.000	*-0.008	*-0.014	*0.019	*0.021
	[-9.161]	[-37.130]	[-33.348]	[-51.068]	[26.660]	[-0.686]	[-14.746]	[-16.495]	[19.361]	[22.398]
β_{i1}	*0.015	*0.007	*-0.016	*0.028	*0.014	-0.009	*0.008	*0.025	*-0.009	0.000
	[22.633]	[11.214]	[-31.445]	[24.134]	[21.998]	[-1.197]	[10.582]	[31.432]	[-26.012]	[-0.378]
β_{ii}	*0.991	*0.994	*0.981	*0.890	*0.955	*0.983	*0.917	*0.923	*0.996	*0.983
	[1827.712]	[3654.681]	[1634.434]	[656.243]	[1243.474]	[3415.793]	[862.973]	[850.732]	[7010.072]	[1051.851]

See Notes (1).

Table 135: 15 Minute VAR-BEKK-GARCH Results for New York Closing-Tokyo Opening Period (Contd.)

EURUSD	GBPUSD	NZDUSD	USDCAD	USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK
$ar(1)_{11}$	*-0.026	*-0.022	-0.020	*-0.036	*-0.022	*-0.027	*-0.023	*-0.023	*-0.018
	[-8.371]	[-6.999]	[-6.582]	[-8.981]	[-8.065]	[-9.440]	[-7.988]	[-6.037]	[-6.168]
$ar(1)_{1i}$	*0.010	-0.003	-0.005	*-0.029	-0.001	*-0.020	0.002	0.000	*0.006
	[2.931]	[-1.360]	[-1.746]	[-8.705]	[-0.039]	[-7.864]	[1.082]	[-0.014]	[2.906]
Constant	**0.000	*0.000	0.000	*0.000	0.000	**0.000	0.000	**0.000	**0.000
	[-1.973]	[-2.782]	[-2.304]	[-4.231]	[-1.524]	[-1.972]	[-1.389]	[-2.057]	[-2.572]
$ar(1)_{i1}$	*0.011	*0.018	-0.032	*-0.057	*0.000	*-0.011	*-0.044	*-0.032	*-0.035
	[4.058]	[5.479]	[-14.679]	[-12.475]	[-7.283]	[-4.453]	[-14.995]	[-6.109]	[-9.528]
$ar(1)_{ii}$	*-0.040	*-0.059	-0.053	*-0.062	*-0.138	*-0.039	*-0.061	*-0.065	*-0.060
	[-12.090]	[-17.973]	[-16.396]	[-14.576]	[-47.409]	[-12.965]	[-20.624]	[-17.313]	[-20.186]
Constant	*0.000	0.000	0.000	*0.000	0.000	*0.000	0.000	0.000	*0.000
	[-2.752]	[-1.793]	[5.379]	[3.994]	[-1.444]	[3.528]	[0.561]	[1.536]	[3.528]
c_{11}	*0.000	*0.000	0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[59.876]	[-18.095]	[12.247]	[54.733]	[54.025]	[32.212]	[16.132]	[-52.355]	[28.199]
c_{i1}	*0.000	*0.000	0.000	*0.000	0.000	*0.000	0.000	*0.000	*0.000
	[14.478]	[-17.572]	[77.136]	[-22.953]	[1.537]	[-30.648]	[-1.547]	[12.133]	[58.942]
c_{ii}	**0.000	*0.000	0.000	0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[2.027]	[24.406]	[-2.791]	[0.000]	[19.863]	[62.811]	[78.954]	[-18.706]	[7.815]
α_{11}	*0.348	*0.153	0.140	*0.129	*0.334	*0.208	*0.153	*0.357	*0.228
	[99.643]	[42.526]	[72.668]	[60.584]	[88.369]	[64.456]	[53.742]	[98.073]	[48.496]
α_{1i}	*0.104	*-0.069	0.075	*0.100	0.000	*-0.012	*0.022	*-0.212	*0.148
	[42.184]	[-16.359]	[29.235]	[44.814]	[0.989]	[-5.919]	[6.960]	[-42.836]	[35.501]
α_{i1}	0.005	*0.036	-0.059	*-0.078	-0.014	*-0.069	*-0.026	*0.030	*0.061
	[1.645]	[17.267]	[-20.823]	[-39.958]	[-0.481]	[-29.824]	[-14.112]	[14.203]	[24.644]
α_{ii}	*0.122	*0.328	0.454	*0.248	*0.189	*0.385	*0.338	*0.100	*0.261
	[50.729]	[88.202]	[144.906]	[112.373]	[116.836]	[128.820]	[114.941]	[40.833]	[71.794]
β_{11}	*0.939	*0.993	0.994	*1.095	*0.947	*0.980	*0.990	*0.942	*0.961
	[859.703]	[1713.191]	[4209.816]	[1759.745]	[836.979]	[1528.553]	[2215.840]	[835.407]	[683.834]
β_{1i}	*-0.025	*0.035	-0.029	*-0.169	0.000	*-0.002	*-0.018	*0.043	*-0.051
	[-36.021]	[29.716]	[-41.557]	[-262.500]	[-1.520]	[-3.484]	[-22.536]	[35.181]	[-36.330]
β_{i1}	*0.007	*-0.013	0.017	*0.138	*-0.016	*0.022	*0.008	*-0.007	*-0.024
	[9.260]	[-18.948]	[22.047]	[288.189]	[-3.001]	[32.188]	[13.745]	[-12.476]	[-25.404]
β_{ii}	*0.996	*0.919	0.896	*0.860	*0.984	*0.919	*0.928	*0.997	*0.946
	[2410.719]	[526.447]	[689.848]	[1745.459]	[4182.077]	[854.639]	[784.002]	[2035.728]	[698.036]

See Notes (1).

Table 136: 15 Minute VAR-BEKK-GARCH Results for New York Closing-Tokyo Opening Period (Contd.)

GBPUSD	NZDUSD	USDCAD	USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK
$ar(1)_{11}$	*-0.043	*-0.037	*-0.048	*-0.035	*-0.038	*-0.039	*-0.039	*-0.036
	[-14.740]	[-14.099]	[-16.189]	[-12.790]	[-13.980]	[-13.876]	[-12.453]	[-11.829]
$ar(1)_{1i}$	*0.007	*-0.009	*-0.009	0.008	*-0.012	*-0.006	-0.003	-0.002
	[4.353]	[-3.865]	[-4.360]	[0.258]	[-5.753]	[-4.105]	[-1.797]	[-1.128]
Constant	**0.000	**0.000	**0.000	**0.000	**0.000	0.000	**0.000	*0.000
	[-2.535]	[-1.971]	[-2.413]	[-2.199]	[-2.356]	[-1.781]	[-2.346]	[-2.643]
$ar(1)_{i1}$	*0.017	*-0.016	*0.019	*0.000	*-0.011	*-0.034	*-0.023	*-0.031
	[4.504]	[-7.574]	[5.507]	[-2.886]	[-5.288]	[-12.510]	[-5.527]	[-7.616]
$ar(1)_{ii}$	*-0.053	*-0.038	*-0.030	*-0.140	*-0.036	*-0.049	*-0.061	*-0.058
	[-16.854]	[-13.077]	[-10.115]	[-46.876]	[-12.719]	[-21.987]	[-19.689]	[-21.378]
Constant	0.000	*0.000	0.000	0.000	*0.000	0.000	*0.000	*0.000
	[-1.539]	[6.071]	[0.102]	[-0.689]	[4.593]	[0.464]	[3.203]	[3.645]
c_{11}	*0.000	*0.000	*0.000	*0.000	*0.000	0.000	*0.000	*0.000
	[24.108]	[10.808]	[-44.933]	[24.398]	[10.284]	[-0.676]	[56.103]	[9.057]
c_{i1}	*0.000	*0.000	*0.000	0.000	0.000	*0.000	*0.000	*0.000
	[69.768]	[-76.722]	[35.117]	[0.370]	[-1.872]	[58.895]	[13.435]	[30.388]
c_{ii}	0.000	0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[-0.017]	[0.012]	[40.082]	[-27.810]	[74.674]	[59.742]	[-26.689]	[-3.856]
α_{11}	*0.127	*0.120	*0.135	*0.090	*0.137	*0.122	*0.114	*0.116
	[61.949]	[63.116]	[74.786]	[40.531]	[67.592]	[62.713]	[53.214]	[52.615]
α_{1i}	*-0.053	*0.011	*-0.020	0.000	*0.026	*0.022	*0.012	*0.059
	[-12.977]	[3.368]	[-7.996]	[0.230]	[10.049]	[6.893]	[89.696]	[12.812]
α_{i1}	*0.030	*-0.091	*-0.045	*-0.064	*-0.040	*-0.031	*0.012	*-0.012
	[23.129]	[-39.029]	[-31.658]	[-3.995]	[-19.500]	[-26.917]	[11.482]	[-6.897]
α_{ii}	*0.357	*0.441	*0.349	*0.220	*0.417	*0.355	*0.138	*0.299
	[97.997]	[146.352]	[113.434]	[114.724]	[139.037]	[116.112]	[64.313]	[69.788]
β_{11}	*0.997	*0.995	*0.991	*0.996	*0.992	*0.995	*0.993	*0.995
	[4322.896]	[4543.586]	[4661.618]	[5051.107]	[3682.161]	[4722.055]	[4938.363]	[3648.876]
β_{1i}	*0.038	*-0.010	0.000	0.000	*-0.013	*-0.016	*-0.004	*-0.031
	[31.054]	[-13.273]	[0.234]	[-1.097]	[-21.906]	[-24.221]	[-60.154]	[-22.817]
β_{i1}	*-0.015	*0.025	*0.009	*0.011	*0.013	*0.009	*-0.002	*0.003
	[-33.426]	[40.498]	[27.079]	[4.253]	[21.382]	[28.587]	[-15.618]	[6.476]
β_{ii}	*0.901	*0.904	*0.943	*0.979	*0.904	*0.923	*0.989	*0.943
	[429.842]	[794.473]	[1067.902]	[3299.492]	[709.830]	[785.910]	[3063.410]	[549.096]

See Notes (1).

Table 137: 15 Minute VAR-BEKK-GARCH Results for New York Closing-Tokyo Opening Period (Contd.)

NZDUSD	USDCAD	USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK
$ar(1)_{11}$	*-0.060	*-0.048	-0.047	*-0.058	*-0.062	*-0.055	*-0.057
	[-19.684]	[-16.040]	[-16.941]	[-19.231]	[-20.147]	[-19.250]	[-18.741]
$ar(1)_{1i}$	*-0.033	**-0.007	0.030	*-0.024	*-0.014	*-0.006	*-0.011
	[-8.093]	[-2.307]	[0.566]	[-6.617]	[-4.707]	[-3.005]	[-4.404]
Constant	*0.000	**0.000	0.000	0.000	0.000	0.000	0.000
	[-2.582]	[-1.983]	[-1.024]	[-1.918]	[-1.759]	[-1.779]	[-1.533]
$ar(1)_{i1}$	*-0.015	0.003	0.000	**-0.003	*-0.029	*-0.022	*-0.021
	[-8.953]	[1.514]	[-8.381]	[-2.007]	[-12.401]	[-9.443]	[-7.872]
$ar(1)_{ii}$	*-0.044	*-0.041	-0.138	*-0.040	*-0.059	*-0.063	*-0.061
	[-14.343]	[-12.423]	[-48.128]	[-13.131]	[-19.276]	[-21.843]	[-21.980]
Constant	*0.000	0.000	0.000	*0.000	0.000	*0.000	*0.000
	[5.229]	[1.335]	[-1.478]	[3.974]	[0.004]	[3.584]	[2.693]
c_{11}	*0.000	*0.000	0.000	*0.000	*0.000	*0.000	*0.000
	[61.137]	[101.788]	[73.787]	[80.560]	[59.151]	[79.797]	[55.441]
c_{i1}	*0.000	*0.000	0.000	*0.000	*0.000	*0.000	*0.000
	[-3.040]	[-69.077]	[13.924]	[-27.503]	[-10.811]	[-7.618]	[33.957]
c_{ii}	*0.000	0.000	0.000	*0.000	*0.000	0.000	0.000
	[76.936]	[-0.007]	[-5.145]	[76.807]	[64.224]	[0.004]	[0.008]
α_{11}	*0.255	*0.237	0.344	*0.270	*0.282	*0.332	*0.361
	[70.608]	[104.211]	[93.067]	[96.174]	[65.924]	[107.734]	[79.841]
α_{1i}	*0.033	*-0.074	0.000	0.001	-0.006	*-0.071	**0.003
	[14.299]	[-36.431]	[-5.382]	[0.319]	[-1.719]	[-28.226]	[2.088]
α_{i1}	*-0.082	*-0.065	0.277	*-0.051	*-0.036	*0.043	*0.077
	[-13.692]	[-24.698]	[4.459]	[-13.552]	[-8.972]	[18.010]	[22.967]
α_{ii}	*0.438	*0.316	0.194	*0.397	*0.318	*0.112	*0.132
	[133.350]	[110.328]	[123.268]	[132.401]	[95.876]	[68.065]	[56.122]
β_{11}	*0.940	*0.958	0.908	*0.946	*0.935	*0.919	*-0.860
	[511.297]	[1558.311]	[461.834]	[915.110]	[469.557]	[646.960]	[-249.621]
β_{1i}	*-0.013	*0.031	0.000	*0.003	0.002	*0.021	*-0.057
	[-11.398]	[60.383]	[-0.865]	[3.800]	[1.049]	[26.927]	[-43.855]
β_{i1}	0.000	*0.012	0.751	*0.019	0.002	*-0.020	*-0.765
	[-0.105]	[16.827]	[6.409]	[13.721]	[0.978]	[-32.085]	[-187.743]
β_{ii}	*0.908	*0.954	-0.984	*0.915	*0.940	*0.997	*0.967
	[668.873]	[1321.916]	[-4058.526]	[791.250]	[697.452]	[5442.873]	[1784.459]

See Notes (1).

Table 138: 15 Minute VAR-BEKK-GARCH Results for New York Closing-Tokyo Opening Period (Contd.)

USDCAD	USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK
$ar(1)_{11}$	*-0.037	*-0.031	*-0.027	*-0.042	*-0.038	*-0.043
	[-11.518]	[-10.513]	[-9.646]	[-13.722]	[-12.759]	[-14.913]
$ar(1)_{1i}$	*0.018	0.002	*0.008	*0.010	*0.009	*0.016
	[8.916]	[0.074]	[3.750]	[5.737]	[6.068]	[10.386]
Constant	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[5.212]	[5.719]	[3.334]	[7.200]	[5.899]	[6.863]
$ar(1)_{i1}$	**0.007	*0.000	0.003	*0.052	*0.045	*0.038
	[2.084]	[4.038]	[1.575]	[16.240]	[11.563]	[9.872]
$ar(1)_{ii}$	*-0.033	*-0.137	*-0.041	*-0.061	*-0.062	*-0.057
	[-10.833]	[-49.395]	[-14.388]	[-22.280]	[-20.862]	[-20.245]
Constant	*0.000	0.000	*0.000	0.000	*0.000	*0.000
	[4.702]	[-1.444]	[3.676]	[1.529]	[3.092]	[2.937]
c_{11}	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[73.106]	[75.559]	[75.054]	[79.699]	[81.802]	[-71.187]
c_{i1}	*0.000	**0.000	*0.000	0.000	*0.000	*0.000
	[15.530]	[-2.494]	[13.824]	[0.562]	[8.957]	[4.240]
c_{ii}	*0.000	*0.000	*0.000	*0.000	0.000	*0.000
	[24.144]	[-15.252]	[77.541]	[74.086]	[-0.042]	[3.360]
α_{11}	*0.435	*0.435	*0.375	*0.420	*0.435	*0.438
	[140.212]	[135.892]	[135.892]	[132.107]	[135.612]	[140.769]
α_{1i}	*0.098	*0.000	*0.036	*0.049	*0.183	*0.118
	[23.197]	[-4.891]	[13.469]	[12.892]	[45.965]	[24.964]
α_{i1}	*-0.020	*-0.116	*0.013	**-0.005	0.000	*-0.011
	[-10.859]	[-3.450]	[5.357]	[-2.318]	[-0.216]	[-5.549]
α_{ii}	*0.160	*0.185	*0.387	*0.290	*0.114	*0.151
	[69.051]	[112.776]	[113.938]	[98.894]	[71.395]	[57.053]
β_{11}	*0.910	*0.908	*0.930	*0.911	*0.905	*0.902
	[785.866]	[759.318]	[1022.378]	[725.497]	[779.114]	[706.853]
β_{1i}	*-0.028	*0.000	*-0.012	**-0.003	*-0.048	*-0.032
	[-24.253]	[5.437]	[-12.219]	[-2.249]	[-41.915]	[-21.220]
β_{i1}	*0.005	*0.054	*-0.006	*0.006	*0.004	*0.012
	[7.852]	[8.533]	[-6.619]	[7.276]	[10.068]	[15.782]
β_{ii}	*0.989	*0.985	*0.915	*0.946	*0.995	*0.991
	[2823.805]	[4166.757]	[672.051]	[898.674]	[4879.380]	[1868.311]

See Notes (1).

Table 139: 15 Minute VAR-BEKK-GARCH Results for New York Closing-Tokyo Opening Period (Contd.)

USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK	**USDHKD**	USDJPY	USDMXN	USDNOK	USDSEK
$ar(1)_{11}$	*-0.037	*-0.041	*-0.041	-0.043	*-0.049	$ar(1)_{11}$	*-0.141	*-0.138	*-0.140	*-0.140
	[-12.241]	[-14.663]	[-14.358]	[-12.391]	[-15.271]		[-54.085]	[-46.506]	[-48.611]	[-53.153]
$ar(1)_{1i}$	0.023	*0.041	0.003	0.014	*0.016	$ar(1)_{1i}$	*0.000	*0.000	*0.000	*0.000
	[0.548]	[14.224]	[1.203]	[6.048]	[6.683]		[3.901]	[4.610]	[3.695]	[6.054]
Constant	*0.000	*0.000	*0.000	0.000	*0.000	*Constant*	0.000	0.000	0.000	0.000
	[4.590]	[5.065]	[3.764]	[4.092]	[4.350]		[-1.166]	[-1.364]	[-0.956]	[-1.139]
$ar(1)_{i1}$	*0.000	*0.003	*0.019	0.012	*0.021	$ar(1)_{i1}$	**-0.076	0.050	0.021	-0.079
	[2.993]	[4.377]	[8.166]	[3.264]	[6.218]		[-2.294]	[1.087]	[0.398]	[-1.422]
$ar(1)_{ii}$	*-0.139	*-0.032	*-0.049	-0.056	*-0.059	$ar(1)_{ii}$	*-0.031	*-0.042	*-0.053	*-0.052
	[-48.069]	[-11.892]	[-17.189]	[-17.204]	[-19.102]		[-10.635]	[-14.794]	[-23.827]	[-20.493]
Constant	0.000	*0.000	0.000	0.000	*0.000	*Constant*	*0.000	0.000	*0.000	**0.000
	[-0.831]	[7.811]	[1.095]	[1.955]	[3.545]		[3.409]	[0.890]	[2.765]	[2.159]
c_{11}	*0.000	*0.000	*0.000	0.000	*0.000	c_{11}	*0.000	*0.000	*0.000	*0.000
	[29.155]	[43.679]	[38.585]	[59.360]	[63.900]		[-11.063]	[21.138]	[-23.583]	[-23.202]
c_{i1}	*0.000	*0.000	*0.000	0.000	*0.000	c_{i1}	*0.000	*0.000	0.000	0.000
	[3.462]	[127.128]	[24.225]	[63.320]	[76.139]		[5.369]	[-6.526]	[-0.685]	[1.159]
c_{ii}	*0.000	*0.000	*0.000	0.000	0.000	c_{ii}	*0.000	*0.000	*0.000	*0.000
	[-17.367]	[-14.438]	[-48.767]	[-3.229]	[0.002]		[36.328]	[20.734]	[27.159]	[27.826]
α_{11}	*0.183	*0.139	*0.181	0.273	*0.253	α_{11}	*0.188	*0.191	*0.216	*0.199
	[54.793]	[82.621]	[78.518]	[81.830]	[74.483]		[116.214]	[112.423]	[119.395]	[113.195]
α_{1i}	0.000	*0.014	*0.011	0.095	*0.056	α_{1i}	0.018	-0.037	*0.210	*0.139
	[1.008]	[12.342]	[5.566]	[25.115]	[14.614]		[0.524]	[-0.887]	[7.850]	[3.689]
α_{i1}	*0.080	*0.066	*0.048	0.059	*0.080	α_{i1}	*0.000	**0.000	0.000	*0.000
	[3.410]	[34.559]	[24.132]	[29.065]	[35.302]		[-6.111]	[-2.501]	[-1.632]	[-3.719]
α_{ii}	*0.206	*0.418	*0.330	0.234	*0.279	α_{ii}	*0.424	*0.351	*0.106	*0.221
	[99.464]	[137.746]	[123.588]	[72.279]	[93.730]		[124.538]	[132.125]	[55.406]	[42.404]
β_{11}	*0.985	*-1.031	*0.985	0.966	*0.970	β_{11}	*0.984	*0.984	*0.980	*0.983
	[1785.530]	[-1400.577]	[2626.968]	[1304.834]	[1295.219]		[4052.559]	[3981.335]	[3405.193]	[3822.069]
β_{1i}	**0.000	*-0.227	**-0.001	-0.017	*-0.009	β_{1i}	0.011	*0.053	*-0.032	-0.005
	[-2.095]	[-44.822]	[-2.162]	[-20.553]	[-11.475]		[1.673]	[7.070]	[-7.330]	[-0.697]
β_{i1}	*-0.012	*0.340	*-0.014	-0.024	*-0.032	β_{i1}	*0.000	*0.000	0.000	*0.000
	[-2.995]	[41.075]	[-23.764]	[-41.340]	[-55.249]		[8.015]	[4.321]	[0.709]	[2.778]
β_{ii}	*0.982	*0.938	*0.935	0.961	*0.950	β_{ii}	*0.897	*0.926	*0.994	*0.973
	[3018.554]	[721.131]	[938.717]	[1014.854]	[1182.583]		[589.107]	[893.759]	[4644.617]	[730.447]

See Notes (1).

Table 140: 15 Minute VAR-BEKK-GARCH Results for New York Closing-Tokyo Opening Period (Contd.)

USDJPY	USDMXN	USDNOK	USDSEK	**USDMXN**	USDNOK	USDSEK	**USDNOK**	USDSEK
$ar(1)_{11}$	*-0.043 [-14.333]	*-0.033 [-11.598]	*-0.034 [-11.761]	$ar(1)_{11}$	*-0.051 [-17.149]	*-0.052 [-18.486]	$ar(1)_{11}$	*-0.073 [-20.427]
$ar(1)_{1i}$	*-0.007 [-3.954]	0.000 [0.335]	0.001 [0.706]	$ar(1)_{1i}$	*0.020 [10.293]	*0.021 [10.000]	$ar(1)_{1i}$	*0.031 [8.428]
Constant	*0.000 [3.327]	*0.000 [5.067]	*0.000 [4.246]	*Constant*	0.000 [0.589]	0.000 [0.495]	*Constant*	*0.000 [3.171]
$ar(1)_{i1}$	0.000 [-0.150]	*0.019 [5.239]	*0.019 [5.455]	$ar(1)_{i1}$	*0.022 [7.141]	*0.019 [6.725]	$ar(1)_{i1}$	*0.030 [9.013]
$ar(1)_{ii}$	*-0.043 [-20.614]	*-0.054 [-21.203]	*-0.058 [-19.251]	$ar(1)_{ii}$	*-0.061 [-20.918]	*-0.060 [-21.812]	$ar(1)_{ii}$	*-0.070 [-19.475]
Constant	0.000 [-1.358]	*0.000 [2.815]	**0.000 [2.473]	*Constant*	*0.000 [3.139]	**0.000 [2.106]	*Constant*	*0.000 [3.496]
c_{11}	*0.000 [83.786]	*0.000 [158.599]	*0.000 [81.685]	c_{11}	*0.000 [76.596]	*0.000 [85.188]	c_{11}	*0.000 [38.535]
c_{i1}	*0.000 [4.219]	*0.000 [-3.517]	*0.000 [17.124]	c_{i1}	*0.000 [85.700]	*0.000 [3.875]	c_{i1}	*0.000 [-25.971]
c_{ii}	*0.000 [68.437]	*0.000 [17.378]	*0.000 [36.791]	c_{ii}	0.000 [0.009]	*0.000 [-17.809]	c_{ii}	*0.000 [27.012]
α_{11}	*0.397 [122.597]	*0.422 [228.591]	*0.406 [129.457]	α_{11}	*0.350 [132.678]	*0.348 [121.330]	α_{11}	*0.199 [57.989]
α_{1i}	*-0.012 [-3.789]	*0.032 [10.613]	*0.065 [21.465]	α_{1i}	*0.079 [41.088]	*0.064 [23.512]	α_{1i}	*-0.092 [-29.539]
α_{i1}	*0.014 [7.573]	*-0.021 [-13.957]	*0.008 [5.635]	α_{i1}	*-0.004 [-6.871]	*-0.011 [-4.579]	α_{i1}	*-0.065 [-18.098]
α_{ii}	*0.299 [109.062]	*0.125 [78.249]	*0.172 [67.679]	α_{ii}	*0.120 [87.406]	*0.159 [54.526]	α_{ii}	*0.238 [58.642]
β_{11}	*0.912 [677.781]	*0.904 [4174.191]	*0.910 [684.866]	β_{11}	*0.925 [802.938]	*0.926 [824.093]	β_{11}	*0.973 [946.285]
β_{1i}	**0.003 [2.049]	*-0.010 [-10.338]	*-0.023 [-23.706]	β_{1i}	*-0.022 [-45.565]	*-0.018 [-19.567]	β_{1i}	*0.032 [29.220]
β_{i1}	*-0.004 [-5.634]	*0.009 [23.997]	0.000 [0.331]	β_{i1}	*0.009 [29.988]	*0.009 [13.727]	β_{i1}	*0.019 [17.916]
β_{ii}	*0.947 [1039.109]	*0.993 [4238.675]	*0.985 [2048.297]	β_{ii}	*0.995 [5902.337]	*0.988 [1697.212]	β_{ii}	*0.957 [725.640]

See Notes (1).

Appendix B. cDCC-GARCH Results

Appendix B.1. 30 Minute cDCC-GARCH Results

Table 141: 30 Minute cDCC-GARCH Results

AUDUSD	EURUSD	GBPUSD	NZDUSD	USDCAD	USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK
μ_1	*-0.032	*-0.036	*-0.048	*-0.038	*-0.028	*-0.033	*-0.038	*-0.026	*-0.038	*-0.039
	[-8.988]	[-11.652]	[-13.033]	[-14.250]	[-10.147]	[-13.478]	[-13.725]	[-8.932]	[-12.490]	[-13.273]
Constant	**0.000	0.000	**0.000	0.000	**0.000	0.000	**0.000	*0.000	0.000	0.000
	[2.373]	[1.043]	[2.499]	[-0.397]	[2.033]	[0.463]	[2.175]	[-8.445]	[1.555]	[1.034]
μ_2	0.035	0.034	-0.022	-0.042	-0.006	*-0.068	0.002	*-0.227	*-0.082	*-0.085
	[1.517]	[1.523]	[-0.648]	[-1.642]	[-0.227]	[-3.262]	[0.102]	[-7.182]	[-3.301]	[-3.557]
Constant	***0.000	0.000	0.000	0.000	***0.000	0.000	0.000	*0.001	0.000	0.000
	[-1.738]	[-0.344]	[-0.174]	[1.039]	[-1.923]	[0.180]	[1.014]	[10.529]	[1.352]	[1.469]

Notes (2): 1) μ_1 and μ_2 are mean terms 2) α_{11} and α_{22} represent the ARCH effect in two variables, respectively. 3) α_{12} measures the spillover effect of a previous shock in one sample currency on the another and α_{21} measures the spillover effect in the opposite direction. 4) β_{11} and β_{22} indicate the GARCH terms, which measure volatility persistence of each series. 5) β_{12} measures the spillover effect of the last period's variance of one sample currency on the current variance of another and β_{21} measures the spillover effect in the opposite direction. 6) In order to reach a more accurate estimation, each pairwise dynamic correlation is calculated separately in consequence different driving parameters α_{DCC} and β_{DCC} . 7) Numbers in square brackets correspond to t-statistics. 8) * , ** and *** indicate statistical significance at the 1%, 5% and 10% level respectively.

Table 142: 30 Minute cDCC-GARCH Results (Contd.)

α_{11}	*0.106	*0.069	*0.059	*0.059	*0.133	*0.078	*0.153	*0.012	*0.099	*0.097
	[53.062]	[50.749]	[23.356]	[37.636]	[64.353]	[63.613]	[73.824]	[7.427]	[54.306]	[64.604]
α_{1i}	*-0.021	*-0.049	*-0.258	*0.072	0.000	*0.000	-0.003	*0.317	*0.015	*0.028
	[-8.749]	[-25.962]	[-47.051]	[31.851]	[0.031]	[-6.432]	[-1.378]	[137.921]	[4.780]	[9.620]
α_{i1}	*0.183	*0.166	*0.045	*-0.190	*-0.133	*-0.285	*-0.035	*-0.148	*-0.116	*-0.127
	[62.425]	[57.641]	[13.440]	[-65.060]	[-46.861]	[-6.432]	[-15.080]	[-65.475]	[-51.887]	[-54.973]
α_{ii}	*0.452	*0.508	*0.451	*0.497	*0.493	*0.252	*0.333	*0.642	*0.467	*0.479
	[130.882]	[173.910]	[92.460]	[152.372]	[154.154]	[70.341]	[90.402]	[209.211]	[141.943]	[141.935]
β_{11}	*1.000	*1.003	*1.008	*1.007	*0.991	*0.997	*0.986	*1.001	*1.001	*1.001
	[3770.913]	[6004.933]	[1180.401]	[5340.897]	[2320.575]	[9650.097]	[2736.641]	[7433.873]	[4313.254]	[4953.332]
β_{1i}	*0.016	*0.020	*0.109	*-0.026	0.000	*0.000	*0.005	*-0.022	*-0.022	*-0.023
	[28.793]	[56.276]	[47.176]	[-56.753]	[-0.357]	[5.351]	[11.459]	[-52.106]	[-27.061]	[-29.339]
β_{i1}	*-0.050	*-0.046	*-0.015	*0.050	*0.038	*0.047	*0.011	*0.025	*0.034	*0.038
	[-51.456]	[-47.722]	[-13.465]	[63.806]	[42.164]	[4.739]	[17.734]	[57.395]	[46.122]	[49.986]
β_{ii}	*0.895	*0.876	*0.860	*0.886	*0.889	*0.970	*0.942	*0.902	*0.883	*0.875
	[689.375]	[822.933]	[307.915]	[803.860]	[776.194]	[1220.380]	[772.454]	[1371.578]	[646.254]	[612.272]
α_{DCC}	**0.030	*0.034	***0.035	***0.023	*0.036	*0.029	*0.037	*0.027	*0.006	**0.007
	[2.481]	[3.735]	[1.673]	[1.903]	[3.731]	[3.434]	[4.823]	[1.353]	[2.930]	[2.229]
β_{DCC}	*0.966	*0.958	0.452	*0.897	*0.954	*0.964	*0.953	*0.505	*0.993	*0.991
	[61.740]	[69.500]	[1.079]	[11.830]	[60.270]	[70.150]	[87.320]	[0.822]	[427.800]	[224.000]

See Notes (2).

Appendix B.2. 15 Minute cDCC-GARCH Results

Table 143: 15 Minute cDCC-GARCH Results

AUDUSD	EURUSD	GBPUSD	NZDUSD	USDCAD	USDCHF	USDHKD	USDJPY	USDMXN	USDNOK	USDSEK
μ_1	*-0.051	*-0.040	*-0.058	*-0.057	*-0.045	*-0.037	*-0.048	*-0.052	*-0.050	*-0.051
	[-14.280]	[-13.085]	[-14.112]	[-15.474]	[-14.926]	[-14.453]	[-18.318]	[-18.449]	[-15.171]	[-15.360]
Constant	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000	*0.000
	[5.267]	[4.844]	[5.053]	[5.248]	[4.933]	[5.661]	[4.395]	[9.203]	[5.610]	[5.385]
μ_2	*-0.044	*-0.061	*-0.092	*-0.071	*-0.055	*-0.145	*-0.043	*-0.067	*-0.062	*-0.051
	[-12.039]	[-19.288]	[-23.924]	[-19.802]	[-17.323]	[-47.608]	[-13.915]	[-22.508]	[-19.540]	[-15.837]
Constant	0.000	***0.000	*0.000	*0.000	0.000	*0.000	*0.000	*0.000	**0.000	**0.000
	[0.641]	[1.703]	[3.307]	[-3.550]	[-0.787]	[-5.226]	[10.053]	[-5.234]	[-1.993]	[-2.452]

See Notes (2).

Table 144: 15 Minute cDCC-GARCH Results (Contd.)

α_{11}	*0.213	*0.214	*0.309	*0.205	*0.229	*0.298	*0.231	*0.244	*0.234	*0.227
	[48.688]	[55.983]	[66.578]	[55.268]	[78.390]	[88.883]	[83.245]	[66.021]	[55.926]	[51.017]
α_{1i}	**-0.008	*-0.011	*0.139	*0.039	*0.043	*-0.001	*0.027	*-0.051	*-0.057	*-0.043
	[-2.427]	[-4.287]	[24.573]	[11.555]	[14.992]	[-5.051]	[14.807]	[-17.108]	[-14.990]	[-9.374]
α_{i1}	*0.079	*0.080	0.007	*-0.084	*-0.030	*0.181	*0.020	*-0.042	*-0.048	*-0.063
	[19.252]	[16.212]	[1.625]	[-20.477]	[-12.172]	[5.514]	[5.874]	[-13.992]	[-15.397]	[-20.710]
α_{ii}	*0.331	*0.354	*0.183	*0.376	*0.382	*0.234	*0.453	*0.300	*0.297	*0.305
	[89.335]	[105.658]	[34.013]	[110.522]	[143.077]	[96.237]	[126.388]	[105.235]	[86.237]	[87.365]
β_{11}	*0.974	*0.971	*0.950	*0.973	*0.970	*0.947	*0.967	*0.966	*0.970	*0.970
	[794.663]	[911.901]	[684.360]	[869.177]	[1261.420]	[837.884]	[1216.786]	[935.155]	[853.100]	[740.458]
β_{1i}	*0.005	**0.002	*-0.034	*-0.009	*-0.009	*0.000	*-0.004	*0.013	*0.010	*0.008
	[4.947]	[2.062]	[-22.838]	[-8.161]	[-10.367]	[6.463]	[-7.523]	[15.048]	[8.516]	[5.528]
β_{i1}	*-0.021	*-0.018	*-0.009	*0.018	*0.011	*-0.071	0.000	*0.012	*0.016	*0.019
	[-17.356]	[-11.134]	[-7.413]	[14.346]	[13.995]	[-9.046]	[0.104]	[12.445]	[16.422]	[18.859]
β_{ii}	*0.939	*0.942	*0.973	*0.936	*0.932	*0.974	*0.899	*0.950	*0.944	*0.944
	[795.684]	[917.747]	[712.687]	[872.013]	[1070.915]	[1920.281]	[663.991]	[1097.862]	[838.114]	[834.733]
α_{DCC}	*0.039	*0.043	***0.004	0.008	*0.041	*0.033	*0.040	***0.006	**0.007	***0.008
	[3.469]	[2.842]	[1.923]	[1.287]	[3.768]	[2.898]	[3.830]	[1.678]	[2.373]	[1.715]
β_{DCC}	*0.937	*0.941	*0.996	*0.986	*0.941	*0.954	*0.945	*0.994	*0.992	*0.988
	[54.470]	[44.260]	[169.100]	[59.680]	[59.300]	[57.620]	[68.120]	[204.400]	[302.300]	[109.500]

See Notes (2).

CURRICULUM VITAE

Tezer Yelkenci completed his high school education with a high honor degree in Izmir Turkish College, in 2007. Mr. Yelkenci attended Izmir University of Economics, where he received a B.A. Degree in Economics with Risk Management and Insurance Option Program from Faculty of Economics and Administrative Sciences in 2012 as high honor student. During 2009-2012, he received success scholarship from the university and had worked as a teaching assistant in the International Trade and Finance Department of the same university. Mr. Yelkenci received his MSc in Finance degree in 2014 as high honor student. In the same year, he started his PhD degree at Izmir University of Economics and was appointed as research assistant at the International Trade and Finance Department of the same university. He is currently Head of Investments at Nora Global Logistics. His research is focused on volatility and financial markets. His academic papers have been published in international journals (e.g. “Impact of stock market trading on currency market volatility spillovers”, “A closer insight into the causality between short selling trades and volatility”, “A theoretical approach to financial distress prediction modeling”).