PhD Research

ANALYSING INTRADAY IMPLIED VOLATILITY FOR PRICING CURRENCY OPTIONS

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DECLARATION

I, Le Thi Ngoc Quynh, declare that this thesis has been composed solely by me, and that has not been submitted, in whole or in part, in any previous application for a degree. Except where stated otherwise by reference or acknowledgement, the work presented is entirely my own.

Signature: Le Thi Ngoc Quynh

Date: 31 March 2020

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ABSTRACT

This research analyses the intraday implied volatility (IV) for pricing currency options. It conducts analyses in three steps. First, estimates at-the-money IV using the price of options with one-month, two-month, and three-month maturity during the opening, midday, and closing period of a trading day. Second, the Mincer-Zarnowitz regression test assessing the performance of IV to forecast the volatility of the underlying currency of options for the within-week, one-week, and one-month forecast horizon. Third, mean absolute error (MAE), mean squared error (MSE), and root mean squared error (RMSE) measures evaluating the performance of IV to estimate the price of currency options for the within-week, one-week, and one-month estimate horizon. It employs Australian dollar, British pound, Canadian dollar, Euro, and Swiss franc options trading from 01 January 2010 to 31 December 2017. This study reveals four critical findings. First, three-month maturity IV does not contain useful information about future volatility of the underlying currency and pricing currency options. Second, IV incorporates all information is not relevant to compute the price of currency options for less than a week estimate horizon. Third, IV of the closing period on Monday or Tuesday subsumes most of the essential information compared to other periods of a trading day and other days of a week to forecast volatility of the underlying currency and estimate the value of currency options. Fourth, the shorter (longer) maturity IV holds vital information to price currency options for the shorter (longer) estimate horizon. The overall research findings imply that the information content embedded in one-month and two-month maturity IV is appropriate to calculate the currency options price for the one-week and one-month estimate horizon, respectively. The intraday IV approach adds a new dimension to obtain the unobservable volatility in pricing currency options accurately for the researchers and practitioners.

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LIST OF ABBREVIATION

ATM	At-the-money
AUD	Australian dollar
AUDC	Australian dollar call options price
AUDC_MKT	Australian dollar call options market price
AUDC_MOD	Australian dollar call options model price
AUDP	Australian dollar put options price
AUDP_MKT	Australian dollar put options market price
AUDP_MOD	Australian dollar put options model price
BS	Black-Scholes (1973) model
BSIV	Black-Scholes implied volatility
BSM	Merton (1973) version of the Black-Scholes (1973) model
CAD	Canadian dollar
CADC	Canadian dollar call options price
CADC_MKT	Canadian dollar call options market price
CADC_MOD	Canadian dollar call options model price
CADP	Canadian dollar put options price
CADP_MKT	Canadian dollar put options market price
CADP_MOD	Canadian dollar put options model price
CHF	Swiss franc
CHFC	Swiss franc call options price
CHFC_MKT	Swiss franc call options market price
CHFC_MOD	Swiss franc call options model price
CHFP	Swiss franc put options price
CHFP_MKT	Swiss franc put options market price
CHFP_MOD	Swiss franc put options model price
CMOD	Call model options price
EUR	Euro
EURC	Euro call options price
EURC_MKT	Euro call options market price
EURC_MOD	Euro call options model price
EURP	Euro put options price
EURP_MKT	Euro put options market price
EURP_MOD	Euro put options model price
FX	Foreign Exchange
GBP	British pound
GBPC	British pound call options price
GBPC_MKT	British pound call options market price
GBPC_MOD	British pound call options model price
GBPP	British pound put options price
GBPP_MKT	British pound put options market price
GBPP_MOD	British pound put options model price
IR_AUD	Australian dollar interest rate
IR_CAD	Canadian dollar interest rate
IR_CHF	Swiss franc interest rate

IR_EUR	Euro interest rate
IR_GBP	British pound interest rate
IR_USD	US dollar interest rate
ITM	In-the-money
IV	Implied volatility
IV_AUDC	Implied volatility for Australian dollar call price
IV_AUDP	Implied volatility for Australian dollar put price
IV_AUD	Implied volatility for Australian dollar options
IV_CADC	Implied volatility for Canadian dollar call price
IV_CADP	Implied volatility for Canadian dollar put price
IV_CAD	Implied volatility for Canadian dollar options
IV_CHFC	Implied volatility for Swiss franc call price
IV_CHFP	Implied volatility for Swiss franc put price
IV_CHF	Implied volatility for Swiss franc options
IV_EURC	Implied volatility for Euro call price
IV_EURP	Implied volatility for Euro put price
IV_EUR	Implied volatility for Euro options
IV_GBPC	Implied volatility for British pound call price
IV_GBPP	Implied volatility for British pound put price
IV_GBP	Implied volatility for British pound options
IVMPE	Implied volatility model pricing error
JPY	Japanese yen
LCE	London Commodity Exchange
MAE	Mean absolute error
MFIV	Model free implied volatility
MSE	Mean squared error
MZ	Mincer-Zarnowitz regressions
NYSE	New York Stock Exchange
OTC	Over the counter
OTM	Out-of-the-money
OPE	Options pricing error
PCP	Put-call pair
PMOD	Put model options price
RIC	Reuters Instruments Code
RMSE	Root mean squared error
RV	Realized volatility
RV_AUD	Realized volatility for Australian dollar options
RV_CAD	Realized volatility for Canadian dollar options
RV_CHF	Realized volatility for Swiss franc options
RV_EUR	Realized volatility for Euro options
RV_GBP	Realized volatility for British pound options
VIX	Implied volatility index

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CHAPTER 1
Introduction of Thesis

1.1 Introduction

Foreign currency options are one of the significant developments in the financial derivative markets. The currency options do not substitute the forward or futures contracts but use as a more versatile financial derivative. It can offer the opportunities and advantages to those seeking protection from financial distress resulting from the movement of foreign exchange (FX) rate. Over the past four decades, the currency options employ as a hedging tool and for speculative purposes has significantly grown into a majority of foreign exchange activity. It can be traded on a regulated exchange where they are sold in a standardised form by managing the underlying currency contract size, strike price, and expiration date. However, over-the-counter (OTC) options are allowed for customisation of the terms of the options contract for contract size, strike price, and date of maturity.

Holding either exchange-traded or OTC currency options for hedging or speculation can be costly. The options price or premium is derived using the spot price of the underlying currency of options. It is high for in-the-money (ITM) options (call and put strike price is less and more, respectively, than the spot price). It is low for out-of-the-money (OTM) options (call and put strike price is more and less, respectively, than the spot price). Therefore, the options premium plays a significant role in determining the state of the FX market. For example, the FX market experiences a forward volatility skew due to an expensive OTM call compared to the ITM call. It indicates that FX market participants are concerned about the tight foreign currency supply and the buy call options to secure their foreign currency amount. Similarly, the reverse volatility skew is developed in the FX market when the premium of the OTM put is higher than the premium of the ITM put. It reveals that market players are generally worried about an FX market crash, and they buy put options to protect their foreign currency value.

Black-Scholes (BS, 1973) model is most commonly used to calculate European options price (Yang & Jaewook, 2011). Bhattacharya (1980) and Rubinstein (1985) report that the BS model is biased in pricing options. However, there is few models appear to be consistently superior to it (Singh & Vipul, 2015). Using the Merton (1973) version of the Black-Scholes (1973) model

(BSM), the currency options price is calculated based on six elements: current spot price, strike price, domestic currency interest rate, foreign currency interest rate, time to maturity and volatility of the underlying currency. The first five components of the BSM model are obtainable from the financial market, whereas volatility is unobservable. Volatility captures the up or down movement of the underlying FX rate, which has a significant effect on the options price. The appreciation of the FX rate leads to an increase in the call options price and a decrease in the put options price. If the FX rate decreases, the price of the calls decreases and puts increases.

Further, the volatility reflects investors' expectations about the future movement of the underlying assets' price. The volatility of the underlying asset becomes a potential problem for the model when the practitioners use it to compute the option price. Since volatility is unobservable, the error in the estimation of volatility leads to the mispricing of options (Cruz, 2008). All options pricing theory indicates that options prices should have a positive correlation with the underlying asset's volatility (Christensen & Prabhala, 1998), and the mispricing of derivatives are related to change in volatility of the underlying assets (Singh & Vipul, 2015; Tu et al., 2016). The market participants require relevant future volatility of the underlying asset for pricing options (Becker et al., 2006). Since the volatility is essential for option pricing, it is critical to explore ways to incorporate appropriate volatility measures into option pricing issues.

Errors in predicting volatility lead to the error in evaluating the fair price for the option. When the use of options as a hedging tool and for speculative purposes has surged over the past three decades, the accuracy of options pricing plays a crucial role in managing financial risk as well as trading options. The existence of mispricing affects the hedge ratio selection, hedging effectiveness, and expected hedging cost (Lai et al., 2017). When a trader uses a volatility estimate that is not equal to the actual volatility experienced during the option's lifetime, both the expected return and the risk of the trader's arbitrage portfolio are affected (Figlewski, 1989). Moreover, the options are known to provide a source of leverage for speculators because the premium is much lower than the actual underlying asset price. However, as the contract size of options is large (for example, one option contract includes 100 shares), the potential loss realized by traders is also huge for mispricing of options. Last but not least, the options mispricing influences the efficiency of the options market, which leads arbitragers to realized

arbitrage profit. Therefore, a precise measure of volatility is crucial for accurately estimating and forecasting the currency options price.

The literature categories the volatility forecasting methods into two streams: (i) volatility forecasts using historical information such as GARCH family model, realized volatility (RV) model and others; and (ii) volatility forecasts using information embedded from options prices, namely implied volatility (IV). Recently, the IV has received significant attention from both academicians and market practitioners. It provides the market's expectation about the future volatility of the underlying assets over the remaining life of the option contract. The options market contains a broader and richer set of information in comparison with the underlying asset's market, as options traders estimate both the past and future information for pricing options. If the options market is efficient, the IV from options price should be an unbiased and useful predictor of the actual volatility of the underlying assets (Pati et al., 2018). The IV subsumes all available, including historical information (Beckers, 1981; Brous et al., 2010; Busch et al. 2011; Garvey & Gallagher, 2012; Latane & Rendleman, 1976; Schmalensee &Trippi, 1978; Wang & Wang, 2016).

1.2 Mechanics of currency options

A currency option is a contract where the buyer has a right, but not the obligation, to buy or sell a particular currency at a specific exchange rate on or before a specified date. It provides payoffs that depend on the difference between the exercise price and the exchange rate at maturity. Currency options are one of the most widely used derivatives for corporations, individuals, or financial institutions to hedge against an adverse movement in exchange rates. There are two types of options: call and put. The call options grant the holder the right to buy an asset on a specific date at a fixed price. However, the put options give the holder the right to sell an asset by a specific date for a certain price. An options contract is alive until the date of maturity, and European options can only exercise at the maturity. However, American options holder can exercise on or before the date of maturity.

An Australian company that expects to receive 1 million US dollar (USD) of export income in two months illustrates the use of currency options. Since the company wants to convert into Australian dollars (AUD), it will have exposure to the spot rate between the AUD and the USD in two months. However, this rate is unknown in advance, and the company faces uncertainty for its future USD income. Such uncertainty leads to a challenge for the company in financial planning. The selling the USD in the forward market will eliminate this difficulty. If the two months forward rate is AUD1.2500/USD and the company decide to hedge with a forward contract at the quoted rate, the income of the company is fixed with AUD1,250,000 [USD1.000.000 x (AUD1.2500/USD)] in two months. If the company does not sell the USD in the forward market, it exposes the risk of making losses or profits. If the two months' time the spot rate is AUD1.1500/USD, converting at that rate would result in receipts of AUD1,150,000. It provides a loss of AUD100,000 (AUD1,250,000 - AUD1,150,000) in comparison with the forward hedge described above. In contrast, if the spot rate in two months' is AUD1.3500/USD, converting at that rate would result in a profit of AUD100,000 [(AUD1.3500/USD x USD1,000,000) – AUD1,250,000] relative to the forward position. It indicates that the company will have an opportunity loss of AUD100,000.

The holder of a currency option can use it as a hedging method, which (like the forward) puts a limit on the losses that are dealing at the spot rate could generate but (unlike the forward) does not eliminate all the potential profits. The reason is that the holder of the options has no obligation to exercise options at maturity. The Australian company could hedge its exposure

by buying a put option (to sell USD) at a strike price of AUD1.2500/USD, and the option premium is assumed to be AUD2000. If the spot value of USD in two months is lower than the strike price, say AUD1.1500/USD (put options are ITM), the company will exercise the option and sell USD1,000,000 at the strike price (AUD1.2500/USD) which is higher than the market price (AUD1.1500/USD). As a result, the Australian company's net proceeds will be AUD1,248,000 [{(AUD1.2500/USD) x USD1,000,000} - AUD2000]. On the other hand, if the spot rate of the USD in two months is higher than the strike price of the option, say AUD1.3500/USD, the option is OTM, the company will not exercise the option, and its loss is only AUD2,000 premium paid for the option. However, the Australian company will sell the USD dollar at the higher market price AUD1.3500/USD, and its net proceeds will be AUD1,348,000 [{(AUD1.3500/USD) x USD1,000,000} - AUD2000].

In summary, the profit from the put options will be higher if the USD is weaker than the strike price. If the USD is dramatically higher than the strike price, then the loss incurred by the option holder is limited to the premium. However, net proceeds will be positive if the difference between the market price and the strike price is higher than the options premium. It clarifies the core feature of options that the holder to experience a limited loss but remains with the profit opportunity from a favourable price movement of the underlying instrument in the market.

1.3 Development of currency options market

Foreign currency options trading began in the late 1970s and early 1980s in the organised exchanges in London, Philadelphia, and Chicago. At that time, currency options were purely used by major banks for offering international clients as hedging instruments, when buying and selling a significant amount of foreign exchange. These were typically related to export and imports of goods or services that required payment at a future period in foreign currency involving a large amount of money. However, the scenario of options trading changed in the early 1990s as currency options moved into mainstream finance and were soon widely adopted on the trading floors and exchanges. The recent dramatic growth in online trading provides further motivation for the massive growth in currency options trading. Options on the physical currency are traded on some organised exchanges worldwide.

The ancestor of Euronext is the London International Financial Futures Exchange (LIFFE). In 1982, LIFFE started to take advantage of the removal of currency control in the UK in 1979. After that, it has undergone a series of mergers and takeovers. In 1992 LIFFE merged with London Traded Options Market (LTOM) and changed its name to the London International Financial Futures and Options Exchange (LIFFOE). In 1996 it merged with London Commodity Exchange (LCE). In 2002 Euronext took over LIFFOE and formed Euronext.Liffoe. Finally, by the end of 2007, it was merged with New York Stock Exchange (NYSE) and named as NYSE Euronext. This exchange currently offers options, only on Euro against the US dollar or the US dollar against the Euro. Both of these options are European style with the ticker DEX. The unit of trading is 100, and the contract size is 10,000 units of the currency.

In December 1982, the Philadelphia Stock Exchange (PHLX) started trading in standardised foreign currency options contracts in the United States. Subsequently, PHLX introduced a range of currency options aimed at retail and small traders. The exchange currently provides options on some currencies, such as the AUD, Canadian dollar (CAD), British pound (GBP), Euro (EUR), Japanese yen (JPY), and Swiss franc (CHF) settling against the USD. The contract size is 10,000 units of a currency with a minimum trade size of one. Like NYSE Euronext, these options are also European style so they can be exercised only at maturity of the contract. The Chicago Board Options Exchange (CBOE) is the largest for trading options in the USA. Recently the exchange has introduced in its website a paper trading and virtual trading

platform, which provides the traders with the opportunity to become comfortable with reading options chains, opening and closing positions, and testing strategies. Currently, the Chicago Mercantile Exchange (CME) provides currency options on CHF, JPY, CAD, and EUR against the USD. Both American and European style options are available in the CME. It is suitable for small and retail traders, as the contract size is 10,000 units of a currency, and the minimum trade size is one.

International Securities Exchange (ISE) is based in New York and operates an entirely electronic trading platform. In a strict sense, it is not an exchange; it is an electronic auction of options, which was one of the first to replace the floor-based trading systems, widely used in the late 1990s and early 2000. The ISE currently offers four currencies, GBP, EUR, CAD, and the JPY. All options are European style. Many other exchanges trade foreign currency options. However, all have some trading aspects in common. First, options are available in pairs of currencies only, and not available for cross pairs; second, specialised currency options broker trades these options; finally, since the currency options are the specialised and sophisticated instrument, one has to have some prior currency options trading experience.

The OTC market in currency options has developed significantly in the major financial centers, such as London and New York. In London, this market was started in the 1970s as the banks began to write options for three to four months' maturity to scope with the risk management requirement of customers. The trade volume was small from the earlier of the period up to 1983. Since then, the market in London has developed significantly, as many domestic and foreign commercial and investment banks expanded their options activities. The significant change in the currency options market took place throughout the 1980s. During this period, the interest of the currency options traders shifted from exchanges to OTC trading because of some unique benefits of OTC currency options over options traded in exchanges. Financial institutions are willing to write or buy options that vary by amounts (notional principal), strike price, and maturity. Although the OTC markets were relatively illiquid in the early years, the market has grown to such proportions that liquidity is now considered quite good. Firms buying and selling currency options as part of their risk management program do so primarily in the OTC market. The advantage of this market is that large trades are possible, with strike prices, expiration dates, and other features tailored to meet the needs of corporate treasurers.

Further, the foreign exchange market spans the globe, with prices moving and currencies trading every hour of every business day. As a result, the currency options trading has been growing faster among all options (currency, stock, index, and commodity) markets. It is not very easy to measure precisely the size of the currency options market as currency options are traded not only in the exchanges; also, private banks trade a considerable volume in the interbank market. However, International Settlements (BIS) provides a rough estimate by conducting a survey every three years. The trend in currency options trading experienced dramatic growth since early 1995. The BIS survey result reveals that from 1995 to 2019, the average daily OTC turnover in currency options increased from 41 to 294 billion US dollar; more than 617% has increased in 24 years.

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1.4 Research objectives and hypotheses

This research aims to analyse the intraday IV for pricing currency options through (i) assessing the performance of IV to forecast the volatility of underlying currency of options, and (ii) evaluating the performance of IV to estimate the price of currency options. There is a sizeable literature investigating the information content of IV to forecast the volatility of the stock, stock index, and foreign currency, however, no significant research on the IV for pricing options. The following two (2) research objectives achieve the aim of this study.

In the previous studies, Kazantzis and Tessaromatis (2001) report that IV using JPY, GBP, CHF, CAD, and AUD has more information content based volatilities for horizons ranging from one day to three months. Kim and Kim (2003) show that the IV of the CAD, CHF, DEM, GBP, and JPY options tend to be low in the early part of the week but remain high in the latter part of the week beginning on Wednesdays. The research findings of Christoffersen and Mazzotta (2005) indicate that the IV based on the EUR, GBP, and JPY options accurately forecasts of one and three months ahead of actual volatility. They also show that the ATM call and put options price for EUR, GBP, and JPY provide mostly unbiased IV. Wang and Wang (2016) examine the information content of intraday IV using S&P500 Index options and find that the IV around noon contain more useful information regarding future volatility than IV at the market's closing. Wong and Heaney (2017) find that the information content of IV obtaining from GBP, EUR, AUD, and JPY options with one-month maturity improves the foreign exchange volatility forecast accuracy. Pati et al. (2018) examine the information content of the IV index in forecasting RV, using it as the proxy for the actual volatility. They report that the IV index contains incremental information in explaining future RV. The summary of these previous studies introduces the first research objective is to compute the IV based on the price of options with one-month, two-month, and three-month maturity during the opening, midday, and closing period of a trading day in forecasting RV of underlying currency of options for the within-week, one-week, and one-month forecast horizon.

Further, Hoque and Kalev (2015) show that intraday IV is more accurate in estimating volatility for pricing currency options. Therefore, second research objective is to compute the IV based on the price of options with one-month, two-month, and three-month maturity during the opening, midday, and closing period of a trading day in estimating the price of currency options for the within-week, one-week, and one-month estimate horizon. The within-week estimate

horizon indicates that the IV is estimated one day to four days before the date of pricing currency options. Similarly, the one-week and one-month estimate horizon imply that the IV is estimated one-week and one-month before the date of pricing currency options, respectively.

The following eighteen (18) hypotheses has been developed based on the two (2) research objectives.

For research objective one (Figure 1.1):

H1: One-month maturity opening, midday, and closing period IV forecast RV of currency accurately for the within-week forecast horizon.

H2: Two-month maturity opening, midday, and closing period IV forecast RV of currency accurately for the within-week forecast horizon.

H3: Three-month maturity opening, midday, and closing period IV forecast RV of currency accurately for the within-week forecast horizon.

H4: One-month maturity opening, midday, and closing period IV forecast RV of currency accurately for the one-week forecast horizon.

H5: Two-month maturity opening, midday, and closing period IV forecast RV of currency accurately for the one-week forecast horizon.

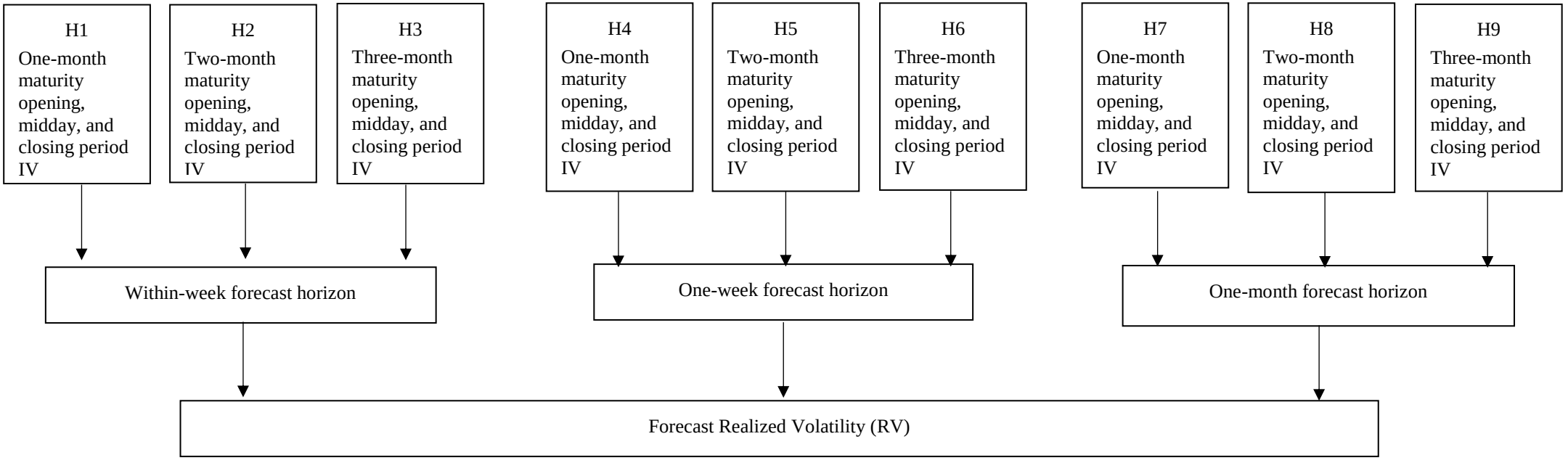
H6: Three-month maturity opening, midday, and closing period IV forecast RV of currency accurately for the one-week forecast horizon.

H7: One-month maturity opening, midday, and closing period IV forecast RV of currency accurately for the one-month forecast horizon.

H8: Two-month maturity opening, midday, and closing period IV forecast RV of currency accurately for the one-month forecast horizon.

H9: Three-month maturity opening, midday, and closing period IV forecast RV of currency accurately for the one-month forecast horizon.

Figure 1. 1: Hypothesis schema for research objective one



For research objective two (Figure 1.2):

H10: One-month maturity opening, midday, and closing period IV estimate currency options price accurately for the within-week estimate horizon.

H11: Two-month maturity opening, midday, and closing period IV estimate currency options price accurately for the within-week estimate horizon.

H12: Three-month maturity opening, midday, and closing period IV estimate currency options price accurately for the within-week estimate horizon.

H13: One-month maturity opening, midday, and closing period IV estimate currency options price accurately for the one-week estimate horizon.

H14: Two-month maturity opening, midday, and closing period IV estimate currency options price accurately for the one-week estimate horizon.

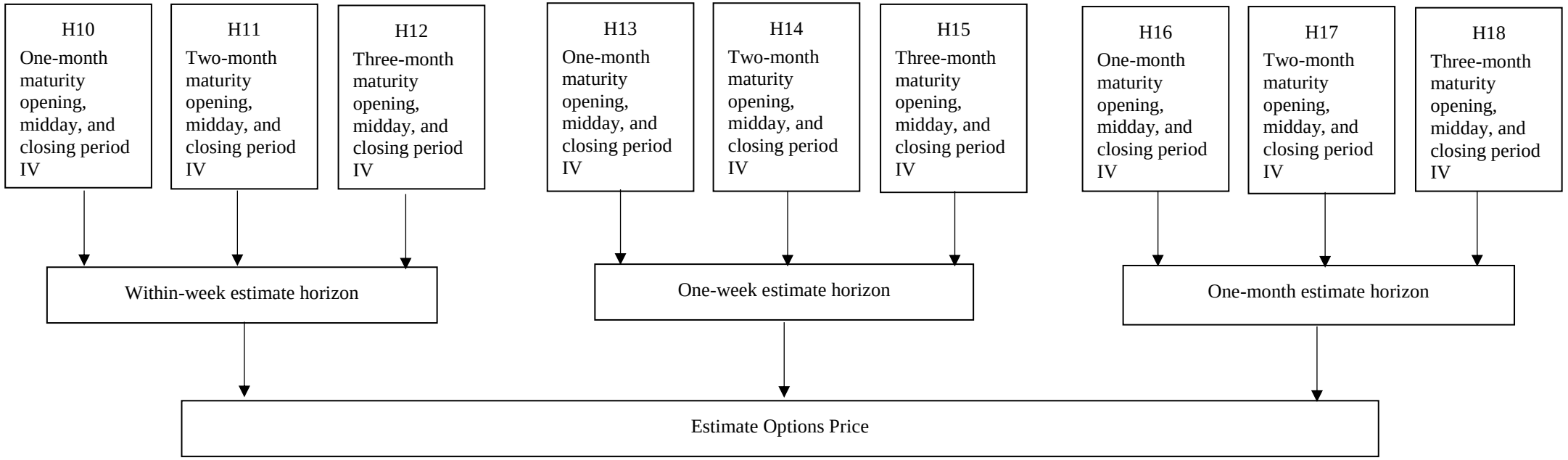
H15: Three-month maturity opening, midday, and closing period IV estimate currency options price accurately for the one-week estimate horizon.

H16: One-month maturity opening, midday, and closing period IV estimate currency options price accurately for the one-month estimate horizon.

H17: Two-month maturity opening, midday, and closing period IV estimate currency options price accurately for the one-month estimate horizon.

H18: Three-month maturity opening, midday, and closing period IV estimate currency options price accurately for the one-month estimate horizon.

Figure 1. 2: Hypothesis Schema for research objective two



1.5 Thesis structure

This thesis comprises six (6) chapters. Chapter 2 summaries the literature, chapter 3 describes the methodology and data, chapter 4 analysis the performance of IV for forecasting the volatility of underlying currency of options, chapter 5 evaluates the performance of IV for pricing currency options, and chapter 6 concludes the thesis including research significance, limitations, and recommendations for future research.

Chapter 2 reviews the performance of implied volatility (IV) in forecasting volatility and pricing options in different markets in the existing literature. This study involves a rigorous literature review on four areas to identify the research gaps and discover the potential of intraday IV to forecast volatility of foreign exchange and pricing currency options. The literature review focuses on four areas (i) the performance of IV to forecast volatility of the stock, stock index, and currency market, (ii) the realized volatility is appropriate to use as a proxy for the actual volatility, and (iii) biasedness of the options pricing model.

Chapter 3 discusses the methodology to test the eighteen (18) hypotheses. For hypotheses 01 to 09, the methods (i) estimate the IV based on the ATM price of call and put options, (ii) estimate the RV for the underlying currency of options, and (iii) analyse the performance of IV to forecast RV. For hypotheses 10 to 18, the procedures (i) calculate the call options model price (CMOD) and put options model price (PMOD) using the ATM estimated IV as input for the options pricing model, and (ii) compare the CMOD and PMOD with the call and put options market price, respectively. Chapter 3 also describes the details of the data used in this study.

Chapter 4 performs an empirical analysis of intraday IV to forecast the RV for testing hypotheses 01 to 09. The analysis conducts in three steps. First, calculate the IV based on the ATM price of currency options with one-month, two-month, and three-month maturity during the opening, midday, and closing period. Second, estimate the RV of the underlying currency of options to use as the proxy for the actual volatility of FX. Third, evaluate the performance of IV in forecasting RV for the within-week, one-week, and one-month forecast horizon.

Chapter 5 conducts an empirical analysis for testing hypotheses 10 to 18 in two steps. First, calculate the call options model price (CMOD) and put options model price (PMOD) using the ATM one-month, two-month, and three-month maturity IV obtained during the opening,

midday, and closing period of a trading day as input for BS options pricing model. Second, generate the options model pricing error by comparing the CMOD and PMOD with the call and put options market price, respectively, to evaluate the performance of IV for pricing currency options accurately, for the within-week, one-week, and one-month estimate horizon.

Chapter 6 discusses the findings from testing eighteen (18) hypotheses. For hypotheses 1 to 9, the empirical findings are based on the performance analysis of IV to forecast RV for the underlying currency of options for the within-week, one-week, and one-month forecast horizon. For hypotheses 10 to 18, the empirical results are based on the performance evaluation of IV to estimate the price of currency options for the within-week, one-week, and one-month estimate horizon. Chapter 6 also covers the discussion on the research significance, research limitations, and recommendations for future research.

CHAPTER 2

Literature Review

2.1 Introduction

This section reviews the performance of implied volatility (IV) in forecasting volatility and pricing options in different markets in the existing literature. This study involves a rigorous literature review to identify the research gaps and discover the potential of intraday IV to forecast volatility of foreign exchange and pricing currency options. First, the literature review focuses on the performance of IV to forecast volatility of the stock, stock index, and currency market. Several empirical studies analyse the performance of only daily IV in forecasting volatility. Therefore, the performance of intraday IV to forecast volatility is one of the critical issues in this study. Second, we examine the literature on the RV to confirm that it is appropriate to use as a proxy for the actual volatility. The appropriateness of RV for an alternative of actual volatility is critical since the performance of intraday IV is evaluated through forecasting RV. Third, this study investigates the literature, and no significant research has been found on the IV for pricing options. However, the IV is widely accepted in the literature that the information content embedded in IV is vital to forecast the volatility of the underlying asset of options. Therefore, a potential research issue that is evaluating the performance of IV to estimate the price of currency options by using it as input for the options pricing model. Fourth, the literature focuses on the biasedness of the options pricing model, which has an impact on the performance of IV for pricing currency options.

2.2 Implied volatility forecasting volatility

The term implied volatility (IV) refers to the volatility of the underlying asset of options in the BS option pricing models (López and Navarro, 2012). It is a widely held view that the IV is computed from the option price observed in the market is a reasonable estimate of the market's opinion of the volatility of the underlying asset. Therefore, the IV is considered as the forward-looking. Early studies that examine the forecastability of IV are equivocal with numerous differences. However, it seems that IV has been found to contain relevant information regarding future volatility, and it often outperforms estimator based on historical data in predicting future realized volatility (RV). Such superior performance appears to be repeated in different types of assets (Andersen et al., 2000).

For individual stock, earlier research such as Latane and Rendleman (1976), Schmalensee and Trippi (1978), Beckers (1981) find that IV provides a better forecast of future volatility than those based on historical data. From a time series perspective, Vasilellis and Meade (1996) and Lamoureux and Lastrapes (1993) find that the volatility forecasts implied by the options market could forecast time-series variations of equity better than predictions produced from time series models. The forecast horizons of this group of papers are around three months to three years. Mayhew and Stivers (2003) examine the information content of IV obtained from the 50 highest options volume companies on the Chicago Board Options Exchange for the period from 1988 to 1995, concerning modeling and predicting the individual firm returns' volatility. The findings indicate that IV consistently surpasses GARCH and incorporates all information contained in return shocks after the first lag for the most active options.

In recent research, Brous et al. (2010) test the accuracy of option IV and four historical volatility measures in predicting future volatility using 10-year daily data for 92 stocks of the S&P 100 Index. Their results show that for larger firms and higher options trading volume firms, IV forecasts are more accurate than historically based forecasts for the forecast interval from 1 day to 33 days. In another study, Garvey and Gallagher (2012) examine the forecastability of IV using a sample of 16 FTSE-100 stocks. Findings from their research indicate that IV on individual UK equities are strictly correlated to RV and provide a useful volatility forecasting method, especially for the medium forecasting horizons that are generated from contracts with maturities between 10 and 30 days.

For the index market, there are significant numbers of papers that use index option IV to predict stock index volatility. Most of these studies focus on S&P100 and S&P500, while the rest forecast index volatility of several smaller stock markets, including FTSE 100 Index, Toronto 35 Index, Spanish IBEX-35 Index, NZX 15 Index, S&P/ASX 200 Index, KOSPI 200 Index and S&P CNX Nifty. Day and Lewis (1992) examine the S&P 100 IV using the daily price of the underlying index from March 1983 to December 1989 and finds that it provides incremental information regarding future volatility compared to the conditional volatility from the GARCH family models. Fleming et al. (1995) find that the average of the S&P 100 option (OEX) implied volatilities (VIX) is a useful instrument for volatility forecasting. Christensen and Prabhala (1998) arrive at a similar conclusion when using the same index at a lower or monthly sampling frequency for the period from 1983 to 1995. Blair et al. (2001) compare the information content of IVs and intraday returns, regards to predicting index volatility over the forecast horizons from 1 to 20 days and find that IV index contains nearly all relevant information about future volatility. The data set in the research include daily S&P100 Index returns and daily IV covering the period from 1987 to 1999. Based on the out-of-sample test, his research indicates that VIX provides the most accurate prediction for 1, 5, 10, and 20 days ahead forecast. Furthermore, Christensen and Hansen (2002) extend the sample used in Christensen and Prabhala (1998) and study IV for the same index for the period from 1993 to 1997. Their findings suggest that IV subsumes valuable information about future movements of volatility, and IV is an efficient forecast of index return volatility. The high predictive ability of VIX has been reported by Gospodinov et al. (2006) and Banerjee et al. (2007).

The superior forecasting performance of IV has also been reported on the non-US market. Gwilym (1999) analyses the data from 21 June 1993 to 19 May 1995 for FTSE 100 index options and conclude that the daily IV contains more information than historical volatilities; however, their evidence suggests that IV is biased. Gwilym (2001) tests the information content of IV in the same context (using daily data of FTSE 100 options during the period from 1993 to 1995) and further supports the idea that IV contains more information compared to historical and GARCH volatility. They show that IV is better than either historical or GARCH based volatility forecasts for horizons ranging from one day to three months. They also find that IV may be a biased representation of market expectations when option prices do not represent the equilibrium market price. Corredor and Santamaria (2004) explore the performance of alternative volatility forecasts for the Spanish IBEX-35 index options using the daily closing prices of this index over the period from 1992 to 1996. Their results are consistent with superior

forecasts produced from IV if compared with historical time series forecasts such as a GARCH model. Noh and Kim (2006) state two different results using two different stock indices, namely the S&P 500 and FTSE 100, for the period from 1994 to 1999. Their findings confirm the inferior performance of IV compared to that of historical volatility for FTSE 100 futures, while for the S&P500, IV outperforms historical volatility in predicting future movement. Frijns et al. (2008) examine the predictive ability of the IV index compiled by NZX 15 Index for the period from September 2005 through May 2006. Their study reveals that IV has predictive power for 66 days ahead forecast of volatility.

In the more current research, another study of Frijns et al. (2010) using daily data on Australian IV Index (AVX) covering the period from 2002 to 2008, conclude that AVX provides essential information for future volatility forecast and it outweighs other commonly used methods such as RiskMetrics and GARCH. Other papers using HSI, KOSPI 200, S&P CNX Nifty, and S&P/ASX 200 report identical conclusion that IV has superior information content than the historical volatility in explaining the stock index volatility (Cheng & Fung, 2012; Ryu, 2012; Shaikh & Padhi, 2014). The superior forecast ability of VIX has been demonstrated in the majority of later research (Ammann et al., 2009; Frijns et al., 2010; Ryu, 2012). Moreover, Cheng and Fung (2012) compare the forecasting performance of model-free IV (MFIV) using different prediction horizons. Their findings conclude that Black-Scholes IV (BSIV) is unbiased for different horizon forecasts from one week to six weeks, and MFIV can beat the time-series forecasts based on historical volatility. They also report the decline in the predictive power of BSIV and MFIV as the forecasting horizon shortens. The volatility forecasting power of IV varies over time, depending on the level of investor sentiment using the data on the S&P 500 from January 1996 to August 2010 (Seo & Kim, 2015). Kourtis et al. (2016) compare the predictive ability and economic value of IV and RV for 13 equity indices from 10 countries at different forecast horizons (one day, five days, and twenty-two days ahead). They show that the forecast ability differs as the forecast horizon changes. The IV model offers a superior forecast at the monthly horizon. However, the method performs significantly worse for the crisis period from 2008-2009. Wang and Wang (2016) examine the information content of intraday IV using the S&P500 Index for the period from 2005 to 2010 and find that the IV around noon contains more useful information regarding future volatility than IV at the market's closing, which has been frequently used in the previous literature. Pati et al. (2018) examine the information content of the IV index in forecasting volatility based on the data sample from the three Asia-Pacific stock markets consisting of India, Australia, and Hong

Kong covering the period from Jan 2008 to July 2016. They use RV based on five-minute frequency data as the proxy for the latent volatility and conclude that the IV index contains incremental information in explaining future RV. The identical conclusion about superior informative content of IV compared to RV for S&P 500, the FTSE 100, and the Chinese 50 Exchange-Traded Funds is found in the research of Shi et al. (2019).

Another strand of research has focused on examining the dynamics of IV. Using the S&P 100 index option to examine the dynamic behavior of market volatility, Harvey and Whaley (1992) suggest that IV changes can be predicted ahead of time. Their study also indicates that IV tends to fall on Fridays and rise on Mondays. Using CBOE Market Volatility Index (VIX), an average of S&P 100 option, Fleming et al. (1995), however, reject the inter-week seasonality. Furthermore, this study indicates that VIX is inversely related to the contemporaneous S&P 100 index return and that both daily and weekly VIX changes are more sensitive to the negative shock than the positive shock in the market. Simon (1997) also reports similar IV asymmetries for treasury bonds and futures options. Ederington and Lee (1996), however, show that the IV in the treasury bonds and Eurodollar options on futures markets tend to decline on the days with scheduled announcements as the uncertainty regarding the impact of the announcement on security prices is resolved. Besides that, Hann et al. (2019) confirm a reasonably positive association between changes in the IV of each industry's first announcer and its peers around the first announcers' earning announcement.

For currency options, in the earlier research, Scott and Tucker (1989) analyse the predictive power of IV using options data for GBP, CAD, Deutsche mark (DEM), Japanese Yen (JPY), and CHF against the USD. They find that IV forecasts efficiently for up to six to nine months horizon, captures nearly 50 percent of actual currency volatility. However, when historical volatility is included in the investor's information set, they find no evidence of improved predictive accuracy. Xu and Taylor (1994) examine the informational efficiency of the currency options market in the Philadelphia Stock Exchange. They study four currencies (GBP, DEM, JPY, and CHF against the USD) over the period from January 1985 to January 1992. They find that option prices contain useful information about future volatilities. Jorion (1995) examines the forecasting power of IV for DEM, JPY, and CHF against the USD, traded on the CME. The results suggest that IV outperforms statistical time-series models regarding information content and predictive power but appears to be upward biased estimators of future volatility. Similarly, Kazantzis and Tessaromatis (2001) examine the information content and

predictive power of IV using six currencies (JPY, DEM, GBP, CHF, CAD, and AUD against the USD) for the period from December 1989 to April 1997. These authors report that although IV has more information content than approaches based only on historical or GARCH based volatilities for horizons ranging from one day to three months, it is also a biased predictor of future volatility for at least some of the currencies in the sample.

Covrig and Low (2003) use OTC data for USD per GBP, JPY per USD, and USD per AUD to examine the information of IV for different forecast horizons. They suggest that quoted IV subsumes the information content of historically based forecasts at shorter horizons (one-month and two-month horizon), and the former is as good as the latter at longer horizons (three-month and six-month horizon). Kim and Kim (2003) show that the IV of the CAD, CHF, DEM, GBP, and JPY options tends to be low in the early part of the week but remains high in the last part of the week beginning on Wednesdays. Pong et al. (2004) find that the IV of the DEM, GBP, and JPY options that incorporate most of the relevant information for the forecast horizon is either one-month or three-month. Christoffersen and Mazzotta (2005) show that the IV of ATM options for the EUR, GBP, and JPY provide mostly unbiased and reasonably accurate forecasts of one-month and three-month ahead of actual volatility. Chang and Tabak (2007) produce evidence that the IV of Brazilian real options contain significant information that is missing in the econometric models, and it provides superior FX forecasts.

In the more current research, Busch et al. (2011) test the role of IV in forecasting future volatility using data from three markets, including foreign exchange, stock, and bond markets. They identify that for all investigated markets, IV subsumes helpful information for volatility forecasting, and it provides an unbiased prediction in the foreign exchange and stock markets. Marshall et al. (2012) show that the IV of ATM options of CHF, EUR, GBP, and JPY tends to drop on the announcement day; moreover, the impact that positive news has on this is generally the same as the impact from negative news. Mwamba and Majadibodu (2012) examine the leading indicator for currency crisis identification using data on the South African rand against the US dollar and find that IV of foreign exchange options offers an early signal of the crisis before it occurs. Pilbeam and Langeland (2015) confirm that the IV of CHF, EUR, GBP, and JPY forecasts significantly outperform the GARCH model in both the low and high volatility periods of the FX market. Wong and Heaney (2017) find the knowledge of the volatility smile implied from foreign exchange options improves foreign exchange volatility forecast accuracy using options with one-month to maturity written on four exchange rate series, GBP/USD,

EUR/USD, AUD/USD, and the USD/JPY from 2001 to 2006. IV continues to be reported as a biased measure of actual volatility, but it outperforms historical volatilities in forecasting future RV in the research of Sahoo and Trivedi (2018). Their study employs the non-overlapping monthly volatility data of USD/Indian Rupee and finds that IV contains all the information content of historical volatility about future RV.

2.3 Realized volatility

Until the late 1970s, using monthly data played an essential role in empirical research due to the unavailability of and access problems to lower frequency, such as daily or intraday data. However, the development of information technology in the 1990s provides access to time-stamped observations on all quotes and transactions. These tick-by-tick data, termed as ultra-high-frequency data by Engle (2000), are usually referred to as high-frequency data in current studies. The availability of high-frequency data is vital for constructing an adequate framework for estimating and forecasting the conditional variance of financial assets returns. Although the high-frequency data provides more accurate measurement and prediction of future volatility, it also leads to microstructure noises that can arise through the bid-ask bounce, asynchronous trading, infrequent trading, and price discreteness, among other factors (McAleer & Medeiros, 2008).

In many financial applications, the asset price is assumed to follow a continuous-time diffusion process. That means the daily volatility can be calculated by integrating the volatility during the day, named integrated volatility. If the discretely sampled returns are serially uncorrelated, and the sample path of the volatility process is continuous, it follows the theory of quadratic variation. Further, given the Brownian motion, the quadratic variation might be found in asset returns (Baxter & Rennie, 1996). The quadratic variation process, therefore, measures the realized sample-path variation of the squared return process. The sum of intraday squared returns under the quadratic variation process is defined as RV.

The inherent nature of high-frequency data is that they are composed of the random daily number of time-series observations with random arrival times. This feature of the high-frequency data presents a problem concerning organising the data for empirical work. Engle and Russell (1998) and Engle (2000) propose an Autoregressive Conditional Duration Model for the irregular intervals data. The time aggregated data at minute sampling intervals can be used to avoid the time series modeling complications of high-frequency data. Although this aggregation up to fixed intervals of time may lead to loss of information, it is easy to implement and widely adopted in the current empirical analysis of asset pricing models that use high-frequency data. The data sampling frequency should be specific to the underlying asset because the trading intensity and price discovery are different across assets. Andersen et al. (2000, 2001a, 2003) propose a possible solution to reduce the microstructure bias by sampling the

returns at arbitrarily selected lower frequencies like five or fifteen minutes. Merton (1981) and Nelson (1991) argue that the precise estimation of volatility can be obtained from an arbitrarily short span of data provided that returns are sampled sufficiently frequently. Identically, Aït-Sahalia et al. (2005) report that sampling as frequently as possible would theoretically produce in the limit a perfect estimate of RV. With available high-frequency data, it is possible to obtain considerable improvements in measuring return volatility. These theoretical promises have been justified by the empirical research with high-frequency returns, especially after the introduction of the emerging RV concept by Andersen et al. (2001a).

A vast number of current researches apply this method and use five-minute returns to measure the RV and test its properties from different perspectives. Andersen et al. (2001a) use 30 individual Dow Jones Industrial Average (DJIA) stocks for the period from 1993 to 1998 to test the RV and find that the distribution of stock returns scaled by the realized standard deviations are also approximately Gaussian, as are the distributions of the realized logarithmic standard deviations and correlations. Moreover, volatilities and correlations move together, show strong dependence, and can be well described by long-memory processes. Similar conclusions are reported by applying different assets such as FTSE-100 Index futures, Taiwan Stock Exchange (TSE), S&P 500 (Areal & Taylor, 2002; Huang & Nieh, 2004; Thomakos & Wang, 2003). Barndorff-Nielsen and Shephard (2002, 2004) make further progress in the econometric analysis of the RV approach. They study the statistical properties of RV in the context of the stochastic volatility model and obtain the RV asymptotic distribution as well as its rate of convergence.

Huang and Nieh (2004) examine the distributional characteristics of the RV and dynamic correlations using high-frequency (one-minute) intraday stock indices for the TSE from January to December 2000. They find that the critical feature of this RV and correlations is that they are not only model-free but also approximately measurement-error-free. Their finding indicates that these estimated volatilities can be treated as observed rather than latent so that direct modeling and forecasting of RV can be performed using a conventional time-series approach. Chan and Fong (2006) estimate daily volatility using RV obtained by summing up intraday squared returns. They use the sample of the 30 stocks in the Dow Jones Industrial Average Stock Index from 1993 to 2000. Consistent with the theory of quadratic variation, their RV estimates are shown to be less noisy than standard volatility measures, such as absolute returns used in their previous study. Zhang and Hu (2013) investigate the information

content of RV using the data of the Chinese stock market from 2004 to 2009. The empirical analysis shows that RV can provide additional information in the volatility process for some stocks, but a similar conclusion cannot be drawn in some other stocks. The best time interval to construct RV measures is the 30 minutes interval. Likewise, Pooter et al. (2008) conclude that the optimal sampling frequency ranges are from 30 minutes to 65 minutes, significantly lower than the five-minute frequency when testing the S&P 100 index constituents and S&P 500 index futures for the period from 1997 to 2004. In another paper, Degiannakis and Floros (2016) construct measures of intraday RV for 17 European and USA stock indices and suggest that the intraday adjusted RV reduces the underestimation of the actual variability sharply.

Taylor and Xu (1997) estimate the RV at the hourly and daily level for five-minute returns of DEM/USD quotations from 1992 to 1993 to construct the conditional variances of hourly and daily returns, respectively. The findings show that a significant amount of information in five-minute returns can be found in the hourly conditional variances than that of daily conditional variances. A number of studies use five-minute returns to estimate the RV and examine its properties from different perspectives. Andersen et al. (2000) consider the unconditional and conditional distribution of the exchange rate volatilities and correlations, and find that the exchange rate returns standardized by RV are nearly Gaussian, and the realized variance tends to be log-normally distributed. Andersen et al. (2001b) derive the theoretical and empirical properties of RV for the DEM/USD and JPY/USD exchange rates based on the earlier work of Taylor and Xu (1997) for the period from 1986 to 1996. They find that the volatility movements are highly correlated across the two exchange rates, and the correlation between the exchange rates increases with volatility. Barndorff – Nielsen, and Shephard (2002) examine the statistical properties of RV in the context of the stochastic volatility model. They employ the dataset of a five-minute USD/DEM exchange rate from 1986 to 1996, and their results provide both a central limit theory approximation as well as an exact second-order analysis. The authors introduce the simple way of formally bridging the gap between realized and actual volatility. Liu et al. (2015) examine the accuracy of RV constructed from high-frequency of a variety of assets and compare them with a realized variance estimator. They consider the total of 400 different estimators for 31 different financial assets spanning five asset classes (US equities, UK equities, FX futures, bond futures, and Index futures) covering 11 years. The findings show that the five-minute RV as the benchmark can be outperformed other measures, and it is challenging to beat five-minute RV significantly.

2.4 Options pricing model

This section discusses the accuracy of the pricing model. Several papers focus on the futures pricing models for stock index futures (Becker et al., 2009; Dupoyet et al., 2011; Psychoyios et al., 2010; Zhang & Zhu, 2006; Zhongjin & Yingzi, 2010). Whereas, another trend of research concentrates on IV is the development of model-free implied volatility (MFIV), proposed by Britten-Jones and Neuberger (2000) and Car and Madan (1998). Instead of depending on any option pricing formula, MFIV uses options prices from the full range of available strike prices. Thus, the MFIV avoids the drawbacks of the BS option pricing model, such as the assumption of constant volatility. Although MFIV is reported to contain all information for future volatility obtained in BSIV and historical volatility and provides an efficient prediction of future volatility in some articles (Biktimirov & Wang, 2011; Jiang & Tian, 2005). The majority of studies using index options data and option prices on individual stocks find that BSIV outperforms MFIV in forecasting the future RV (Andersen et al., 2007; Cheng & Fung, 2012; Muzzioli, 2010; Taylor et al., 2010).

Biktimirov and Wang (2017) compare the performance of BSIV with MFIV in predicting volatility using the data from 13 North American, European, and Asian stock market indexes. The findings indicate the dominance of BSIV to MFIV for predicting future volatility, and BSIV provides more accurate volatility forecasting for a one-month forecast horizon than MFIV and GJR-GARCH volatility. Harikumar et al. (2004) compare the performance of the BS model and GARCH option pricing models in estimating call option prices for the foreign exchange market. The closed-form model options price is generated for the BS volatility model, and the empirical martingale simulation is used as the options pricing model for the GARCH models. The dataset used in the study includes data on call options of three currencies (GBP, JPY, and CHF) for the period from 1987 to 1996. The results show that the BS model performs more accurately than the GARCH model in options pricing. Baldeaux et al. (2015) construct a stochastic volatility model that recovers the typically observed IV smiles and skews for short-dated vanilla foreign exchange options and allow to price payoffs in foreign currencies, lower than possible under the standard risk-neutral pricing for long-dated derivatives.

Similarly, Lian et al. (2016) introduce a stochastic volatility model for pricing FX derivatives, which is consistent with stylized facts (smiles, skews, and symmetries) of the FX market. The

authors extend the Esscher transform technique to obtain analytical pricing formulas based on solving a system of Markov-modulated Esscher parameters.

2.5 Conclusion

This chapter discusses literature and evidence related to the performance of IV in forecasting volatility as well as options price. Various papers are testing the forecasting power of IV. The predictive ability testing focuses mainly on the leading stock indices and foreign exchange rates. For stock and stock indexes, numerical analyses report that IVs provide a better forecast of future volatility than those based on historical data, but they are biased (Beckers, 1981; Cheng & Fung, 2012; Latane & Rendleman, 1976; Ryu, 2012; Schmalensee & Trippi, 1978; Shaikh & Padhi, 2014). Moreover, IV provides better forecasts at the monthly horizon. For the foreign exchange market, IV is proved to provide incremental information about a future variance for short horizons up to three months (Covrig & Low, 2003). IV incorporates most of the relevant information and holds superior predictive power for the FX market (Busch et al., 2011). IV tends to be low and high in the early and later of the week, respectively (Kim & Kim, 2003). IV of ATM options provide mostly unbiased and relatively accurate forecasts of one-month and three-month ahead of actual volatility (Christoffersen & Mazzotta, 2005). Overall, the literature has not provided a clear explanation to the question of practitioners that which measure of volatility can estimate and forecast volatility accurately.

The availability of high-frequency data is increasing; the research attention has shifted towards a model that employs intraday data in estimating and forecasting daily volatility. Most of the research finds the importance of intraday data in improving volatility predicting. There is a significant amount of information in the five-minute returns when estimating hourly variances. The first hours of the trading day contain more relevant information about the volatility observed at the end of the trading day, and the additional use of intraday data today to forecast volatility on the following day is most advantageous when the following day is a low volume or an up-market day. So far, there are not many pieces of research utilising the high-frequency data in estimating and forecasting IV. The variety in the information content of IV at different intraday levels has been confirmed in the research of Wang and Wang (2016). Their findings indicate that VIX around noon is most informative for forecasting RV. In terms of the FX market, all the previous literature in IV has concluded that the relevant information for predicting the volatility of an underlying asset can be found in the options price. However, concentrating on FX volatility indicates that IV contains the discrete information regarding the FX movement at a specific time of the trading day. Therefore, daily IV is not sufficient for estimating FX volatility accurately. Most of the studies for currency options employ the closing

price that can not subsume all the information of volatility for the whole trading period. It leads to the question that the IV of which period (opening, midday, or closing) of a trading day can provide the most incremental information for forecasting volatility and estimating options price.

The RV is most widely used proxy for actual volatility in the previous literature is the daily squared return. Nevertheless, the increasing availability of high-frequency data has led to a significant improvement in measuring volatility (Pati et al., 2018). As the daily squared return is considered as the noisy proxy for the actual volatility, the RV calculated from high-frequency intraday returns is a better choice for the actual volatility. The use of a five-minute interval is the most common and widely used in the literature (Andersen et al., 2003), and it is challenging to beat the five-minute RV (Liu et al., 2015). The five-minute interval is found to maintain not only the right balance between very-low-frequency observation but also robustness to market microstructure effect that rises from using too short-time intervals.

CHAPTER 3
Methodology and Data

3.1 Introduction

This chapter first discusses the methodology to test the eighteen (18) hypotheses that have been developed in chapter 1. For hypothesis 01 to hypothesis 09, the methods are used to (i) estimate the IV based on the ATM price of call and put options with one-month, two-month, and three-month maturity during the opening, midday, and closing period of a trading day, (ii) estimate the RV for the underlying currency of options and using it as the proxy for the actual foreign exchange volatility, and (iii) analyse the performance of IV to forecast RV for the within-week, one-week, and one-month forecast horizon. For hypothesis 10 to hypothesis 18, the procedures are employed to (i) calculate the call options model price (CMOD) and put options model price (PMOD) using the ATM estimated IV as input for the options pricing model, and (ii) compare the CMOD and PMOD with the call and put options market price, respectively, evaluating the performance of IV to estimate the price of currency optionsfor the within-week, one-week, and one-month estimate horizon. Finally, the details of the data are described in this chapter.

3.2 Implied volatility estimation

The IV refers to the volatility of the return of the asset underlying an option in an option pricing model. Under the BS model, the log return of the underlying asset price from the present time up to the expiration date of the option is assumed to follow a normal distribution. When all the variables involved in the option valuation (the stock price, the strike price, the risk-free rate, and the time to maturity) can be directly observed, by equating the market price of the option to its model value, one recovers the IV over the life of the option. Therefore, the IV is considered to be a forward-looking volatility estimate.

The use of an inappropriate option valuation model will lead to mismeasurements in the IV. For example, if the options are American, but the European model is applied to calculate that options IV, then the error will be caused by the neglect of the early exercise option. Other biases may be due to the different closing times of stock and options markets (Blair et al., 2001). The BS model has been using widely in the literature (Corredor & Santamaria, 2016) for pricing European options. Ease of calculation, as well as theoretical approximations between stochastic volatility and conditional volatility models to BS for ATM options and nearest to expiration (Fleming, 1998; Nelson, 1990), are some of the reasons for its widespread application.

Further, Biktimirov and Wang (2017) demonstrate the outperformance of IV obtaining through the BS model over the model-free IV in predicting future volatility from both developed and emerging index options markets. Merton (1973) extended the BS model for continuous dividends. As the interest gained on holding foreign currency is equivalent to a continuously paid dividend on a stock, the Merton version of the BS (BSM) model employs for the foreign currency options where FX rate replaces the stock price. The notation of the BSM model and its' descriptions are as follows:

C_t = call options price in domestic currency at time t

P_t = put option price in domestic currency at time t

S_t = spot rate at time t

X_t = exercise price in domestic currency at time t

R_t^d = domestic currency interest rate at time t

R_t^f = foreign currency interest rate at time t

T = options expiration time

σ_t = volatility of underlying currency

N = Cumulative normal distribution function

In BSM model, the European type call and put options are priced as,

$$\boldsymbol{C_t = S_t e^{-R_t^f T} N(d_{1,t}) - X_t e^{-R_t^d} N(d_{2,t})}, \quad \textbf{(3.1)}$$

$$\boldsymbol{P_t = X_t e^{-R_t^d T} N(-d_{2,t}) - S_t e^{-R_t^f} N(-d_{1,t})}, \quad \textbf{(3.2)}$$

$$d_{1,t} = \frac{ln\left(\frac{S_t}{X_t}\right) + \left(R_t^d - R_t^f + \frac{\sigma_t^2}{2}\right)T}{\sigma_t\sqrt{T}} \quad and$$

$$d_{2,t} = \frac{ln\left(\frac{S_t}{X_t}\right) + \left(R_t^d - R_t^f - \frac{\sigma_t^2}{2}\right)T}{\sigma_t\sqrt{T}} = d_{1,t} - \sigma_t\sqrt{T}\,.$$

For notations convenience, let $\xi_t = e^{-R_t^f T}$ and $\eta_t = e^{-R_t^d T}$ so that equations (3.1) and (3.2) can be written as follows:

$$\boldsymbol{C_t = S_t \xi_t N[d_{1,t}(\sigma_t)] - X_t \eta_t N[d_{2,t}(\sigma_t)]}, \quad \textbf{(3.3)}$$

$$\boldsymbol{P_t = X_t \eta_t N[-d_{2,t}(\sigma_t)] - S_t \xi_t N[-d_{1,t}(\sigma_t)]}. \quad \textbf{(3.4)}$$

The C_t and P_t is substituted with call options market price (C_t^{MKT}) and put options market price (P_t^{MKT}) as in equation (3.5) and equation (3.6), respectively.

$$\boldsymbol{C_t^{MKT} = S_t \xi_t N[d_{1,t}(\sigma_{c,t}^{k,l})] - X_t \eta_t N[d_{2,t}(\sigma_{c,t}^{k,l})]} \quad \textbf{(3.5)}$$

$$\boldsymbol{P_t^{MKT} = X_t \eta_t N[-d_{2,t}(\sigma_{p,t}^{k,l})] - S_t \xi_t N[-d_{1,t}(\sigma_{p,t}^{k,l})]} \quad \textbf{(3.6)}$$

Now the equation (3.5) and equation (3.6) provides the IV for call options market price $\left(\sigma_{c,t}^{k,l}\right)$ and IV for put options market price $\left(\sigma_{p,t}^{k,l}\right)$, respectively, through an iterative search procedure, where $\forall_k$= one-month, two-month, and three-month maturity options; $\forall_l$= opening, midday, and closing period of a trading day.

It is not possible to invert equation (3.5) and (3.6) with respect to the $\left(\sigma_{c,t}^{k,l}\right)$ and $\left(\sigma_{p,t}^{k,l}\right)$, respectively. Alternatively, an iterative search procedure can be used to identify the IV for the given options market prices. The two most popular approaches in the literature are the Newton-Raphson and Dekker-Brent method, respectively (Press et al., 1992). The Dekker-Brent method refers to a blend of the bisection, secant and inverse quadratic interpolation methods, and convergence assured. The Newton-Raphson method is faster in processing, but it is less robust in comparison with the Dekker-Brent method. Both methods work very well for a single option and produce a significantly accurate estimate of IV in negligible computing time (Li, 2008). The Newton-Raphson method is at risk of machine failure due to an inappropriate division by a small number, or it might send the next iteration out of a bracketed region. However, this study utilises a relatively simple function of the volatility for option prices; it is, therefore, possible to use the Newton-Raphson approach.

Despite numerous weighted-average techniques for calculating IV have been suggested, there is no theoretically appropriate weighting scheme in the literature to estimate IV. Jorion (1995) computes IV as the average of the call options price IV and the put options price IV. Furthermore, Hull (2014) suggests that, for a given strike price and maturity, the correct volatility to use in conjunction with the BS model to price a European call should always be the same as that used to price a European put. To implement this idea for equations (3.5) and (3.6), this present study estimates IV as:

$$\widehat{\boldsymbol{\sigma}}_{\boldsymbol{t}}^{\boldsymbol{k,l}} = \frac{\widehat{\boldsymbol{\sigma}}_{\boldsymbol{c,t}}^{\boldsymbol{k,l}} + \widehat{\boldsymbol{\sigma}}_{\boldsymbol{p,t}}^{\boldsymbol{k,l}}}{\mathbf{2}} \qquad (\mathbf{3.7})$$

3.3 Realized volatility estimation

The actual volatility is unobservable, so in evaluating volatility estimating and forecasting, the usual proxy for 'true volatility' is the so-called realized variance. This is calculated by the sum of squared intraday returns sampled at the equally spaced interval (Andersen & Bollerslev, 1998; Barndorff-Nielsen & Shephard, 2002). Particularly, the quadratic variation theory indicates that the realized variance asymptotically converges to the actual unobserved variance as the sampling frequency increased to infinity (Barndorff-Nieslen & Shephard, 2002). The RV is constructed by summing the squared intraday returns sampled at a particular frequency. The optimal frequency for constructing RV is unknown. Following the standard practice and previous literature, there is litter evidence that the five-minute RV as the benchmark can be outperformed by any other measures, and it is difficult to significantly beat five-minute RV (Liu et al., 2015). Thus, this study uses daily RV series constructed from five-minute intraday transaction prices as a proxy for the unobservable variance. If $\boldsymbol{S_i}$ is the exchange rate for 5 minutes sampling frequency, the underlying exchange rate return in 5 minutes interval is estimated as

$$\boldsymbol{r_{i,t} = ln\left(\frac{S_i}{S_{i-1}}\right)}, \qquad \textbf{(3.8)}$$

where $r_{i,t}$ is the return in interval i on day t. The realized variance of day t is computed as

$$\boldsymbol{v_t = \sum_{i=1}^{n} r_{t,i}^2}, \qquad \textbf{(3.9)}$$

where n is the total number of intervals for the options trading hour from 9:30 to 16:00 of trading days Monday to Friday. Since RV is the standard deviation of the realized variance, the RV per trading day is

$$\boldsymbol{\hat{\sigma}_t^{RV} = \sqrt{v_t}\,.} \qquad \textbf{(3.10)}$$

As intraday data of trading days are used to provide RV estimate, days when the exchange is closed are ignored and the RV per annum is,

$$\boldsymbol{\hat{\sigma}_t^{RV} = \sqrt{Dv_t}\,,} \qquad \textbf{(3.11)}$$

where, D is 252 trading days per year consistent with the normal assumption of options market.

3.4 Implied volatility forecasting realized volatility

This section discusses the methodology to assess the performance of IV in forecasting RV. For each IV obtained from different maturity of options, the forecasting evaluation is implemented using the regression test that is introduced by Mincer and Zarnowitz (1969), namely Mincer-Zarnowitz (MZ) regression. In the MZ regression, the RV is regressed on a constant and IV as in equation (3.12),

$$\boldsymbol{RV_{t+i}^{m} = \beta_0 + \beta_1 \hat{\sigma}_t^{k,l} + \varepsilon_t,} \qquad \textbf{(3.12)}$$

where $\forall_m$= within-week, one-week, and one-month forecast horizon.

The MZ regression allows evaluating two different aspects of the volatility forecast. First, the unbiasedness and efficiency of the forecast are evaluated by testing the intercept and slope through the joint hypothesis (H_0: $\beta_0 = 0$ and $\beta_1 = 1$) (Guler et al., 2017). Second, the accuracy of the forecast is evaluated by the high goodness of fit value, R-squared (R^2). The R^2 is a statistical measure that represents the percentage of the variance for RV explained by IV. The R^2 is used to compare the capability of IV to forecast RV for different situations. For example, the R^2 of IV for the one-week forecast horizon is higher than that of the one-month forecast horizon. It indicates that the RV can be explained well by the IV for the one-week forecast horizon, that is, IV outperform to forecast RV for the one-week forecast horizon than the one-month forecast horizon. The MZ regression is estimated using the OLS (ordinary least squared) method with Newey-West corrected errors for heteroscedasticity and serial correlation. As the variance of the innovation term ε_t in equation (3.12) depends on the accuracy of the volatility proxy, the higher quality the proxy is, the more accurately the regression parameters are estimated. Moreover, the R^2 - in (3.12) is also penalised if the quality of the proxy decreases.

3.5 Implied volatility estimating options model price

This section provides the method to estimate the currency options model price. The CMOD and PMOD is calculated using the ATM estimated IV as input for the BSM options pricing model. The C_t^{MKT} and P_t^{MKT} in equation (3.5) and equation (3.6), respectively, is substituted with call options estimated model price $\left(\widehat{\Pi}_{c,t}^{MOD}\right)$ and put options estimated model price $\left(\widehat{\Pi}_{p,t}^{MOD}\right)$ as in equation (3.13) and equation (3.14), respectively.

$$\widehat{\boldsymbol{\Pi}}_{\boldsymbol{c,t}}^{\boldsymbol{MOD}} = \boldsymbol{S_t\xi_t N}\left[\boldsymbol{d_{1,t}}\left(\widehat{\boldsymbol{\sigma}}_{\boldsymbol{t-i}}^{\boldsymbol{k,l}}\right)\right] - \boldsymbol{X_t\eta_t N}\left[\boldsymbol{d_{2,t}}\left(\widehat{\boldsymbol{\sigma}}_{\boldsymbol{t-i}}^{\boldsymbol{k,l}}\right)\right] \quad \textbf{(3.13)}$$

$$\widehat{\boldsymbol{\Pi}}_{\boldsymbol{p,t}}^{\boldsymbol{MOD}} = \boldsymbol{X_t\eta_t N}\left[-\boldsymbol{d_{2,t}}\left(\widehat{\boldsymbol{\sigma}}_{\boldsymbol{t-i}}^{\boldsymbol{k,l}}\right)\right] - \boldsymbol{S_t\xi_t N}\left[-\boldsymbol{d_{1,t}}\left(\widehat{\boldsymbol{\sigma}}_{\boldsymbol{t-i}}^{\boldsymbol{k,l}}\right)\right] \quad \textbf{(3.14)}$$

where $\forall_i =$ within-week, one-week, and one-month estimate horizon. The within-week estimate horizon indicates that the IV is estimated one day to four days before the date of pricing currency options. Similarly, the one-week and one-month estimate horizon imply that the IV is estimated one-week and one-month before the date of pricing currency options, respectively. In equations (3.13) and (3.14), $i > 0$ to estimate the call options model price $\left(\widehat{\Pi}_{c,t}^{MOD}\right)$ and put options model price $\left(\widehat{\Pi}_{p,t}^{MOD}\right)$ based on the ATM estimated IV at the time *t-i* $\left(\hat{\sigma}_{t-i}^{k,l}\right)$ using equation (3.7).

3.6 Options pricing error estimation

The options pricing error (OPE) estimation methodology is developed in this section. The OPE is computed as the difference between the observed ATM options market price and the estimated options model price. The OPE is generated using standard statistical accuracy criteria, such as mean absolute error (MAE), mean squared error (MSE), and the root mean squared error (RMSE). If $\Pi_{j,t}^{ATM}$ and $\widehat{\Pi}_{j,t}^{MOD}$ represent the ATM options market price and estimated options model price, respectively, the OPE is generated for a number of observations under MSE, MAE and MAPE measures as follows, respectively,

$$\boldsymbol{MAE^{m,l} = \frac{1}{n}\sum_{t=1}^{n}\left|\Pi_{j,t}^{ATM} - \widehat{\Pi}_{j,t}^{MOD}\right|} \quad \textbf{(3.15)}$$

$$\boldsymbol{MSE^{m,l} = \frac{1}{n}\sum_{t=1}^{n}\left(\Pi_{j,t}^{ATM} - \widehat{\Pi}_{j,t}^{MOD}\right)^{2}} \quad \textbf{(3.16)}$$

$$\boldsymbol{RMSE^{m,l} = \sqrt{\frac{1}{n}\sum_{t=1}^{n}\left(\Pi_{j,t}^{ATM} - \widehat{\Pi}_{j,t}^{MOD}\right)^{2}}} \quad \textbf{(3.17)}$$

For $\forall j = c\ (call\ price)\ and\ p(put\ price)$.

MSE, RMSE, and MAE are three of the most popular measures of the accuracy of the minimum pricing error estimation. While the MSE and RMSE metrics are appropriate if the loss function used in the estimator's decision-making process is that of the symmetric mean square error, the MAE is suitable to the loss function that is the symmetric mean absolute error. The MAE approach does not permit the offsetting effect of over- and under-prediction (Kambouroudis et al., 2016). Although there are some valid concerns over using RMSE raised by Willmott et al. (2005), the RMSE is considered to be more appropriate to assess the model performance than the MAE when the error distribution is Gaussian. It is reported that an estimation that is considered as good using one measure might not be the same according to another measure (Elliott & Timmermann, 2008). However, the combination of metrics, including but not limited to RMSE and MAE, are necessary to evaluate model performance (Chai & Draxler, 2014).

3.7 Data description

This study uses the intraday data for AUD, CAD, CHF, EUR, and GBP European currency options provided by the Options Price Reporting Authority (OPRA) as the last-sale options quotations. The OPRA reports prices on US equity, index, currency, and interest rate options from the following exchanges: AMEX, Boston, Chicago, ISE, Pacific, and Philadelphia. These data are obtained from Thomson Reuter's database through Securities Industry Research Centre of Asia-Pacific (SIRCA), that provides global intraday trade and quote information for over 240 markets around the world with data coverage beginning from January 1996 for an extensive range of equities, indices, foreign exchange, money, fixed income, and derivative instruments. The Reuters Instruments Code (RIC) is employed to extract European options data from Reuter's database through the options ticker symbols XDA, XDC, XDS, XDE, and XDB for AUD, CAD, CHF, EUR, and GBP, respectively. The sample period begins on 01 January 2010 and ends on 31 December 2017 for all currencies.

The options are traded on Monday to Friday, excluding public holidays from 9:30 to 16:00 (US Eastern standard time), and expire on the third Friday of each month. The contract size of five sample currency options is AUD10,000, CAD10,000, CHF10,000, EUR10,000, and GBP 10,000, and settle in US dollar. The time to maturity of an option is assumed to be the number of calendar days remaining until the option matures. The option with the time to maturity ranging from 2 days to less than or equal to 30 days is considered to be a one-month maturity option. The two-month maturity options include those that have time to maturity is between 31 days to less than or equal to 60 days. The options that have time to maturity covering from 61 days to 90 days are considered to be the three-month maturity options. All sample currency options are used to construct the intraday IV for the opening period (9:30 to 10:00), midday period (12:30 to 13:00), and closing period (15:30 to 16:00) of the trading day. Each of these trading periods is selected for half an hour slot in order to position them evenly in a six and half hours trading day from 9:30 to 16:00. It means the time difference between ‘opening period’ and ‘midday period’ and between ‘midday period’ and ‘closing period’ is equal (i.e., two and half hours).

In this study, the ATM put-call pairs used to obtain unbiased IV through the BSM options pricing model. The BSM model assumes the volatility is constant, which introduces bias into the IV estimation. Hull and White (1987) stated that the magnitude of the bias in the BS model

was the smallest for near-the-money and close-to-maturity options. Therefore, the IV is calculated based on the ATM one-month, two-month, and three-month maturity options traded during the opening, midday, and closing period of a trading day. To distinguish ATM options, we follow the criteria in Xing et al. (2010). That is, call and put options are considered as ATM when the ratio of the strike price to the stock price is between 0.995 and 1.005. The midpoint of the close bid/ask quote of each five-minute interval computes each options price to mitigate problems due to bid/ask bounce (Blair et al., 2001). The for one-month, two-month, and three-month USD deposit interest rate use as the risk-free interest rate in the BSM model for all currency options at the corresponding maturity. The continuous dividend yield for the currency options is equal to the foreign currency deposit interest rate. The reason is that holding a foreign currency that pays interest in the foreign currency at the foreign deposit interest rate, which reinvests in the foreign currency continuously, is similar to holding stock paying a continuous dividend, which reinvests in the additional units of the stock.

This study tests the eighteen (18) hypotheses to achieve the aim of the research. Therefore, it selects the ATM put-call pair (PCP) obtained for the same trading date, trading time, expiration date, expiration time, and strike price as the first step for testing the hypothesis. Tables 3.1 to 3.6 show the details of PCP for all hypotheses. The number of PCPs and the number of trading days is analogous. Table 3.1 describes the PCP in estimating the IV based on the price of call and put options with one-month, two-month, and three-month maturity to test hypotheses 1, 2, and 3, respectively. Panels A, B, and C present the PCPs of each currency for the within-week forecast horizon (Mon-Fri, Tue-Fri, Wed-Fri, and Thu-Fri) during the opening, midday, and closing period of a trading day, respectively.

For one-month maturity IV (hypothesis 1), the total PCPs of AUD, CAD, CHF, EUR, and GBP options are reported in columns 2, 3, 4, 5, and 6, respectively. In column 2, the appendix Table A4.1a in the parenthesis below AUD provides the details of AUD options data for testing hypothesis 1. For example, the one-month maturity opening period IV_AUD (0.1689) in column 13 is computed employing the PCP pair on 21-Jun-10 (Monday) to forecast the RV_AUD (0.0989) in the last column on 25-Jun-10 (Friday) for within-week forecast horizon. It continues to 367 trading days or 367 PCP pairs. Similarly, the CAD, CHF EUR, and GBP options data details are presented in the appendix Tables A4.4a, A4.7a, A4.10a, and A4.13a, respectively.

For two-month maturity IV (hypothesis 2), the total PCPs of AUD, CAD, CHF, EUR, and GBP options are reported in columns 7, 8, 9, 10, and 11, respectively. In column 7, the appendix Table A4.1b in the parenthesis below AUD shows the details of AUD options data for testing hypothesis 2. For example, the two-month maturity opening period IV_AUD (0.2115) in column 13 is calculated using the PCP pair on 31-May-10 (Monday) to forecast the RV_AUD (0.2130) in the last column on 04-Jun-10 (Friday) for within-week forecast horizon. It continues to 269 trading days or 269 PCP pairs. Similarly, the CAD, CHF EUR, and GBP options data details are explained in the appendix Tables A4.4b, A4.7b, A4.10b, and A4.13b, respectively.

For three-month maturity IV (hypothesis 3), the total PCPs of AUD, CAD, CHF, EUR, and GBP options are reported in columns 12, 13, 14, 15, and 16, respectively. In column 12, the appendix Table A4.1c in the parenthesis below AUD presents the details of AUD options data for testing hypothesis 3. For example, the three-month maturity opening period IV_AUD (0.1343) in column 13 is estimated for the PCP pair on 19-Apr-10 (Monday) to forecast the RV_AUD (0.0852) in the last column on 23-Apr-10 (Friday) for within-week forecast horizon. It continues to 241 trading days or 241 PCP pairs. Similarly, the CAD, CHF EUR, and GBP options data details are given in the appendix Tables A4.4c, A4.7c, A4.10c, and A4.13c, respectively.

Table 3. 1: Put-call pair for hypothesis 1, hypothesis 2 and hypothesis 3
(IV forecast RV of currency for within-week forecast horizon)

Within-week	One-month maturity IV (hypothesis 1)					Two-month maturity IV (hypothesis 2)					Three-month maturity IV (hypothesis 3)				
	AUD (A4.1a)	CAD (A4.4a)	CHF (A4.7a)	EUR (A4.10a)	GBP (A4.13a)	AUD (A4.1b)	CAD (A4.4b)	CHF (A4.7b)	EUR (A4.10b)	GBP (A4.13b)	AUD (A4.1c)	CAD (A4.4c)	CHF (A4.7c)	EUR (A4.10c)	GBP (A4.13c)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Panel A: Opening period (9:30-10:00)															
Mon-Fri	367	331	249	351	293	269	316	226	345	270	241	267	207	292	244
Tue-Fri	364	328	243	356	289	283	334	225	364	279	189	223	150	240	196
Wed-Fri	381	345	247	367	310	269	321	221	351	265	188	222	148	236	191
Thu-Fri	391	355	261	370	310	251	299	201	334	248	196	229	154	253	197
Panel B: Midday period (12:30-13:00)															
Mon-Fri	355	356	355	355	355	371	373	368	366	367	373	374	367	367	364
Tue-Fri	360	358	359	358	360	397	397	392	391	392	363	363	356	355	353
Wed-Fri	365	360	364	367	370	385	384	379	379	379	364	363	356	356	354
Thu-Fri	374	373	371	374	372	364	364	359	358	359	363	362	356	355	355
Panel C: Closing period (15:30-16:00)															
Mon-Fri	356	354	355	356	355	372	373	368	366	368	373	373	367	365	364
Tue-Fri	360	358	358	360	360	397	397	292	391	392	363	363	356	355	353
Wed-Fri	362	363	359	367	365	385	384	379	379	380	364	363	356	356	355
Thu-Fri	379	368	372	375	374	366	365	360	361	360	365	364	357	357	356

Notes: This table describes the PCP in estimating the IV based on the price of call and put options with one-month, two-month, and three-month maturity to test hypotheses 1, 2, and 3, respectively. Panels A, B, and C present the PCPs of each currency for the within-week forecast horizon (Mon-Fri, Tue-Fri, Wed-Fri, and Thu-Fri) during the opening, midday, and closing period of a trading day, respectively. IV and RV represents implied volatility and realized volatility, respectively. The appendix table reference is in the parenthesis below the each of currency symbol. For example, A4.1a in the parenthesis below AUD is the appendix table which provides details of AUD options data for testing hypothesis 1. Similarly, A4.1b and A4.1c provides details of AUD options data for testing hypothesis 2 and hypothesis 3, respectively. The total sets/series of put-call pair is 180 [{panel A = 60 (4x15)} + {panel B = 60 (4x15)} + {panel C = 60 (4x15)}]

Table 3.2 describes the PCP in estimating the IV based on the price of call and put options with one-month, two-month, and three-month maturity to test hypotheses 4, 5, and 6, respectively. The PCPs of each currency for the one-week forecast horizon (Mon-Mon, Tue-Tue, Wed-Wed, Thu-Thu, and Fri-Fri) during the opening, midday, and closing period are presented in panel A, B, and C, respectively. For one-month maturity IV (hypothesis 4), the total PCPs of AUD, CAD, CHF, EUR, and GBP options are reported in columns 2, 3, 4, 5, and 6, respectively. In column 2, the appendix Table A4.2a in the parenthesis below AUD presents the details of AUD options data for testing hypothesis 4. For example, the one-month maturity opening period IV_AUD (0.1689) in column 13 is estimated using PCP pair on 21-Jun-10 (Monday) to forecast the RV_AUD (0.0741) in the last column on 28-Jun-10 (Monday) for one-week forecast horizon. It continues to 366 trading days or 366 PCP pairs. Similarly, the CAD, CHF EUR, and GBP options data details are explained in the appendix Tables A4.5a, A4.8a, A4.11a, and A4.14a, respectively.

For two-month maturity IV (hypothesis 5), the total PCPs of AUD, CAD, CHF, EUR, and GBP options are reported in columns 7, 8, 9, 10, and 11, respectively. In column 7, the appendix Table A4.2b in the parenthesis below AUD provides the details of AUD options data for testing hypothesis 5. For example, the two-month maturity opening period IV_AUD (0.2115) in column 13 is estimated based on the PCP pair on 31-May-10 (Monday) to forecast the RV_AUD (0.1226) in the last column on 07-Jun-10 (Monday) for the one-week forecast horizon. It continues to 268 trading days or 268 PCP pairs. Similarly, the CAD, CHF EUR, and GBP options data details are given in the appendix Tables A4.5b, A4.8b, A4.11b, and A4.14b, respectively.

For three-month maturity IV (hypothesis 6), the total PCPs of AUD, CAD, CHF, EUR, and GBP options are reported in columns 12, 13, 14, 15, and 16, respectively. In column 12, the appendix Table A4.2c in the parenthesis below AUD shows the details of AUD options data for testing hypothesis 6. For example, the three-month maturity opening period IV_AUD (0.1343) in column 13 is calculated for the PCP pair on 19-Apr-10 (Monday) to forecast the RV_AUD (0.0723) in the last column on 26-Apr-10 (Monday) for one-week forecast horizon. It continues to 240 trading days or 240 PCP pairs. Similarly, the CAD, CHF EUR, and GBP options data details are presented in the appendix Tables A4.5c, A4.8c, A4.11c, and A4.14c, respectively.

Table 3. 2: Put-call pair for hypothesis 4, hypothesis 5 and hypothesis 6
(IV forecast RV of currency for one-week forecast horizon)

One-week	One-month maturity IV (hypothesis 4)					Two-month maturity IV (hypothesis 5)					Three-month maturity IV (hypothesis 6)				
	AUD (A4.2a)	CAD (A4.5a)	CHF (A4.8a)	EUR (A4.11a)	GBP (A4.14a)	AUD (A4.2b)	CAD (A4.5b)	CHF (A4.8b)	EUR (A4.11b)	GBP (A4.14b)	AUD (A4.2c)	CAD (A4.5c)	CHF (A4.8c)	EUR (A4.11c)	GBP (A4.14c)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Panel A: Opening period (9:30-10:00)															
Mon-Mon	366	330	249	351	293	268	315	226	345	270	240	266	206	291	243
Tue-Tue	363	327	243	356	298	283	333	225	364	279	188	222	150	239	195
Wed-Wed	380	344	247	367	310	269	363	221	351	265	187	221	148	235	191
Thu-Thu	390	354	261	370	310	251	298	201	334	240	195	228	154	252	197
Fri-Fri	379	329	251	358	300	253	303	209	334	251	192	229	156	253	196
Panel B: Midday period (12:30-13:00)															
Mon-Mon	354	355	355	355	355	370	372	368	366	367	372	372	366	364	363
Tue-Tue	359	357	359	358	360	396	396	392	391	392	362	362	355	355	352
Wed-Wed	364	359	364	367	370	384	383	379	379	379	363	362	355	379	353
Thu-Thu	373	372	371	374	372	363	363	359	358	359	362	361	355	354	354
Fri-Fri	357	356	358	359	361	362	362	359	358	360	359	360	355	352	355
Panel C: Closing period (15:30-16:00)															
Mon-Mon	355	353	355	356	355	371	372	368	366	367	372	372	366	364	363
Tue-Tue	359	357	358	360	360	396	396	392	391	392	363	362	355	354	352
Wed-Wed	362	362	359	367	365	384	385	379	379	380	363	362	355	355	354
Thu-Thu	378	367	372	375	374	365	364	360	360	360	364	363	356	356	355
Fri-Fri	359	358	359	359	361	363	362	360	358	360	361	362	356	354	355

Notes: This table describes the PCP in estimating the IV based on the price of call and put options with one-month, two-month, and three-month maturity to test hypotheses 4, 5, and 6, respectively. The PCPs of each currency for the one-week forecast horizon (Mon-Mon, Tue-Tue, Wed-Wed, Thu-Thu, and Fri-Fri) during the opening, midday, and closing period are presented in panel A, B, and C, respectively.
IV and RV represents implied volatility and realized volatility, respectively. The appendix table reference is in the parenthesis below the each of currency symbol. For example, A4.2a in the parenthesis below AUD is the appendix table which provides details of AUD options data for testing hypothesis 4. Similarly, A4.2b and A4.2c provides details of AUD options data for testing hypothesis 5 and hypothesis 6, respectively. The total sets/series of put-call pair is 225 [{panel A = 75 (5x15)} + {panel B = 75 (5x15)} + {panel C = 75 (5x15)}]

Table 3.3 describes the PCP in estimating the IV based on the price of call and put options with one-month, two-month, and three-month maturity to test hypotheses 7, 8, and 9, respectively. The PCPs of each currency for one-month forecast horizon (Mon-Mon, Tue-Tue, Wed-Wed, Thu-Thu, and Fri-Fri) during the opening, midday, and closing period are presented in panel A, B, and C, respectively. For one-month maturity IV (hypothesis 7), the total PCPs of AUD, CAD, CHF, EUR, and GBP options are reported in columns 2, 3, 4, 5, and 6, respectively. In column 2, the appendix Table A4.3a in the parenthesis below AUD provides the details of AUD options data for testing hypothesis 7. For example, the one-month maturity opening period IV_AUD (0.1689) in column 13 is estimated using the PCP pair on 21-Jun-10 (Monday) to forecast the RV_AUD (0.0792) in the last column on 19-Jul-10 (Monday) for one-month forecast horizon. It continues to 364 trading days or 364 PCP pairs. Similarly, the CAD, CHF EUR, and GBP options data details are explained in the appendix Tables A4.6a, A4.9a, A4.12a, and A4.15a, respectively.

For two-month maturity IV (hypothesis 8), the total PCPs of AUD, CAD, CHF, EUR, and GBP options are reported in columns 7, 8, 9, 10, and 11, respectively. In column 7, the appendix Table A4.3b in the parenthesis below AUD shows the details of AUD options data for testing hypothesis 8. For example, the two-month maturity opening period IV_AUD (0.2115) in column 13 is calculated based on the PCP pair on 31-May-10 (Monday) to forecast the RV_AUD (0.0741) in the last column on 28-Jun-10 (Monday) for one-month forecast horizon. It continues to 268 trading days or 268 PCP pairs. Similarly, the CAD, CHF EUR, and GBP options data details are described in the appendix Tables A4.6b, A4.9b, A4.12b, and A4.15b, respectively.

For three-month maturity IV (hypothesis 9), the total PCPs of AUD, CAD, CHF, EUR, and GBP options are reported in columns 12, 13, 14, 15 and 16, respectively. In column 12, the appendix Table A4.3c in the parenthesis below AUD presents the details of AUD options data for testing hypothesis 9. For example, the three-month maturity opening period IV_AUD (0.1343) in column 13 is computed for the PCP pair on 19-Apr-10 (Monday) to forecast the RV_AUD (0.1082) in the last column on 17-May-10 (Monday) for one-month forecast horizon. It continues to 239 trading days or 239 PCP pairs. Similarly, the CAD, CHF EUR, and GBP options data details are given in the appendix Tables A4.6c, A4.9c, A4.12c, and A4.15c, respectively.

Table 3. 3: Put-call pair for hypothesis 7, hypothesis 8 and hypothesis 9
(IV forecast RV of currency for one-month forecast horizon)

One-month	One-month maturity IV (hypothesis 7)					Two-month maturity IV (hypothesis 8)					Three-month maturity IV (hypothesis 9)				
	AUD (A4.3a)	CAD (A4.6a)	CHF (A4.9a)	EUR (A4.12a)	GBP (A4.15a)	AUD (A4.3b)	CAD (A4.6b)	CHF (A4.9b)	EUR (A4.12b)	GBP (A4.15b)	AUD (A4.3c)	CAD (A4.6c)	CHF (A4.9c)	EUR (A4.12c)	GBP (A4.15c)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Panel A: Opening period (9:30-10:00)															
Mon-Mon	364	328	349	349	393	268	313	226	345	270	239	265	206	290	247
Tue-Tue	361	325	244	354	289	282	331	225	364	279	187	221	150	238	195
Wed-Wed	378	342	247	365	310	269	318	221	351	265	186	220	148	234	191
Thu-Thu	388	352	262	369	310	251	297	201	334	248	194	227	154	251	197
Fri-Fri	378	327	252	357	300	253	300	209	334	251	191	228	156	352	196
Panel B: Midday period (12:30-13:00)															
Mon-Mon	352	353	353	353	354	367	369	368	366	367	369	369	367	363	362
Tue-Tue	357	355	357	356	358	393	393	392	391	392	359	359	353	353	351
Wed-Wed	362	356	362	365	368	381	380	379	379	379	360	359	354	354	352
Thu-Thu	371	371	370	373	371	360	361	359	358	359	359	359	354	353	353
Fri-Fri	355	354	357	358	360	359	359	359	358	360	356	359	354	351	354
Panel C: Closing period (15:30-16:00)															
Mon-Mon	353	351	353	354	354	368	369	368	366	367	369	369	365	363	362
Tue-Tue	357	355	356	358	358	393	393	392	391	392	359	359	354	353	351
Wed-Wed	358	361	357	365	363	381	381	379	379	380	360	360	354	354	353
Thu-Thu	376	366	371	374	373	362	362	360	360	360	361	361	355	355	354
Fri-Fri	357	356	358	358	360	359	359	360	358	360	358	359	355	353	354

Notes: This table describes the PCP in estimating the IV based on the price of call and put options with one-month, two-month, and three-month maturity to test hypotheses 7, 8, and 9, respectively. The PCPs of each currency for one-month forecast horizon (Mon-Mon, Tue-Tue, Wed-Wed, Thu-Thu, and Fri-Fri) during the opening, midday, and closing period are presented in panel A, B, and C, respectively. IV and RV represents implied volatility and realized volatility, respectively. The appendix table reference is in the parenthesis below the each of currency symbol. For example, A4.3a in the parenthesis below AUD is the appendix table which provides details of AUD option data for testing hypothesis 7. Similarly, A4.3b and A4.3c provides details of AUD options data for testing hypothesis 8 and hypothesis 9, respectively. The total sets/series of put-call pair is 225 [{panel A = 75 (5x15)} + {panel B = 75 (5x15)} + {panel C = 75 (5x15)}]

Table 3.4 explains the PCP in estimating the IV based on the price of call and put options with one-month, two-month, and three-month maturity to test hypotheses 10, 11, and 12, respectively. The PCPs of each currency for the within-week estimate horizon (Mon-Fri, Tue-Fri, Wed-Fri, and Thu-Fri) during the opening, midday, and closing period are presented in panel A, B, and C, respectively. The within-week estimate horizon indicates that the IV is estimated one day to four days before the date of pricing currency options. For one-month maturity IV (hypothesis 10), the total PCPs of AUD, CAD, CHF, EUR, and GBP options are reported in columns 2, 3, 4, 5, and 6, respectively. In column 2, the appendix Table A5.1a in the parenthesis below AUD presents the details of AUD options data for testing hypothesis 10. For example, the one-month maturity opening period IV_AUD (0.1689) in column 13 is calculated using the PCP pair on 21-Jun-10 (Monday) to estimate the AUDC_MOD (1.92) and AUDP_MOD (1.00) in columns 17 and 18, respectively, on 25-Jun-10 (Friday) for within-week estimate horizon. It continues to 224 trading days or 224 PCP pairs. Similarly, the CAD, CHF EUR, and GBP options data details are described in the appendix Tables A5.4a, A5.7a, A5.10a, and A5.13a, respectively.

For two-month maturity IV (hypothesis 11), the total PCPs of AUD, CAD, CHF, EUR, and GBP options are reported in columns 7, 8, 9, 10, and 11, respectively. In column 7, the appendix Table A5.1b in the parenthesis below AUD provides the details of AUD options data for testing hypothesis 11. For example, the two-month maturity opening period IV_AUD (0.1951) in column 13 is estimated for the PCP pair on 07-Jun-10 (Monday) to estimate the AUDC_MOD (2.18) and AUDP_MOD (1.43) in columns 17 and 18, respectively, on 11-Jun-10 (Friday) for within-week estimate horizon. It continues to 234 trading days or 234 PCP pairs. Similarly, the CAD, CHF EUR, and GBP options data details are given in the appendix Tables A5.4b, A5.7b, A5.10b, and A5.13b, respectively.

For three-month maturity IV (hypothesis 12), the total PCPs of AUD, CAD, CHF, EUR, and GBP options are reported in columns 12, 13, 14, 15, and 16, respectively. In column 12, the appendix Table A5.1c in the parenthesis below AUD shows the details of AUD options data for testing hypothesis 12. For example, the three-month maturity opening period IV_AUD (0.1099) in column 13 is computed based on the PCP pair on 03-May-10 (Monday) to estimate the AUDC_MOD (0.31) and AUDP_MOD (5.08) in columns 17 and 18, respectively, on 07-May-10 (Friday) for within-week estimate horizon. It continues to 186 trading days or 186 PCP

pairs. Similarly, the CAD, CHF EUR, and GBP options data details are presented in the appendix Tables A5.4c, A5.7c, A5.10c, and A5.13c, respectively.

Table 3. 4: Put-call pair for hypothesis 10, hypothesis 11 and hypothesis 12
(IV estimate currency options price for within-week estimate horizon)

Within-week	One-month maturity IV (hypothesis 10)					Two-month maturity IV (hypothesis 11)					Three-month maturity IV (hypothesis 12)				
	AUD (A5.1a)	CAD (A5.4a)	CHF (A5.7a)	EUR (A5.10a)	GBP (A5.13a)	AUD (A5.1b)	CAD (A5.4b)	CHF (A5.7b)	EUR (A5.10b)	GBP (A5.13b)	AUD (A5.1c)	CAD (A5.4c)	CHF (A5.7c)	EUR (A5.10c)	GBP (A5.13c)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Panel A: Opening period (9:30-10:00)															
Mon-Fri	224	193	208	211	158	234	270	187	301	210	186	206	146	237	183
Tue-Fri	263	207	153	224	188	268	304	194	339	245	178	206	135	224	182
Wed-Fri	277	248	165	248	209	261	305	199	337	244	184	212	141	229	183
Thu-Fri	332	284	126	294	256	238	274	168	314	235	185	213	143	238	184
Panel B: Midday period (12:30-13:00)															
Mon-Fri	206	191	137	187	164	359	346	283	340	317	367	364	350	357	352
Tue-Fri	221	203	154	197	182	389	371	321	369	354	357	356	347	347	346
Wed-Fri	240	233	171	214	200	381	372	327	365	349	357	355	348	348	350
Thu-Fri	299	303	145	286	277	359	352	328	346	343	357	354	349	349	351
Panel C: Closing period (15:30-16:00)															
Mon-Fri	200	184	136	199	162	364	347	285	345	322	372	368	351	361	358
Tue-Fri	312	199	141	196	176	387	379	318	372	350	361	360	349	353	348
Wed-Fri	234	225	166	214	203	376	367	325	364	351	362	361	348	354	353
Thu-Fri	303	302	248	296	280	360	355	322	351	350	362	361	355	353	355

Notes: This table explains the PCP in estimating the IV based on the price of call and put options with one-month, two-month, and three-month maturity to test hypotheses 10, 11, and 12, respectively. The PCPs of each currency for the within-week estimate horizon (Mon-Fri, Tue-Fri, Wed-Fri, and Thu-Fri) during the opening, midday, and closing period are presented in panel A, B, and C, respectively. IV and RV represents implied volatility and realized volatility, respectively. The appendix table reference is in the parenthesis below the each of currency symbol. For example, A5.1a in the parenthesis below AUD is the appendix table which provides details of AUD options data for testing hypothesis 10. Similarly, A5.1b and A5.1c provides details of AUD options data for testing hypothesis 11 and hypothesis 12, respectively. The total sets/series of put-call pair is 180 [{panel A = 60 (4x15)} + {panel B = 60 (4x15)} + {panel C = 60 (4x15)}]. The within-week estimate horizon indicates that the IV is estimated one day to four days before the date of pricing currency options.

Table 3.5 describes the PCP in estimating the IV based on the price of call and put options with one-month, two-month, and three-month maturity to test hypotheses 13, 14, and 15, respectively. The PCPs of each currency for the one-week estimate horizon (Mon-Mon, Tue-Tue, Wed-Wed, Thu-Thu, and Fri-Fri) during the opening, midday, and closing period are presented in panel A, B, and C, respectively. The one-week estimate horizon implies that the IV is estimated one-week before the date of pricing currency options. For one-month maturity IV (hypothesis 13), the total PCPs of AUD, CAD, CHF, EUR, and GBP options are reported in columns 2, 3, 4, 5, and 6, respectively. In column 2, the appendix Table A5.2a in the parenthesis below AUD provides the details of AUD options data for testing hypothesis 13. For example, the one-month maturity opening period IV_AUD (0.1697) in column 13 is estimated using the PCP pair on 21-Jun-10 (Monday) to calculate the AUDC_MOD (3.16) and AUDP_MOD (0.38) in columns 17 and 18, respectively, on 28-Jun-10 (Monday) for one-week estimate horizon. It continues to 201 trading days or 201 PCP pairs. Similarly, the CAD, CHF EUR, and GBP options data details are given in the appendix Tables A5.5a, A5.8a, A5.11a, and A5.14a, respectively.

For two-month maturity IV (hypothesis 14), the total PCPs of AUD, CAD, CHF, EUR, and GBP options are reported in columns 7, 8, 9, 10, and 11, respectively. In column 7, the appendix Table A5.2b in the parenthesis below AUD presents the details of AUD options data for testing hypothesis 14. For example, the two-month maturity opening period IV_AUD (0.2314) in column 13 is computed for the PCP pair on 24-May-10 (Monday) to estimate the AUDC (3.99) and AUDP (0.30) in columns 17 and 18, respectively, on 31-May-10 (Monday) for one-week estimate horizon. It continues to 233 trading days or 233 PCP pairs. Similarly, the CAD, CHF EUR, and GBP options data details are described in the appendix Tables A5.5b, A5.8b, A5.11b, and A5.14b, respectively.

For three-month maturity IV (hypothesis 15), the total PCPs of AUD, CAD, CHF, EUR, and GBP options are reported in columns 12, 13, 14, 15 and 16, respectively. In column 12, the appendix Table A5.2c in the parenthesis below AUD shows the details of AUD options data for testing hypothesis 15. For example, the three-month maturity opening period IV_AUD (0.1366) in column 13 is calculated based on the PCP pair on 19-Apr-10 (Monday) to estimate the AUDC_MOD (4.02) and AUDP_MOD (0.67) in columns 17 and 18, respectively, on 26-Apr-10 (Monday) for one-week estimate horizon. It continues to 185 trading days or 185 PCP

pairs. Similarly, the CAD, CHF EUR, and GBP options data details are presented in the appendix Tables A5.5c, A5.8c, A5.11c, and A5.14c, respectively.

Table 3. 5: Put-call pairs for hypothesis 13, hypothesis 14 and hypothesis 15 (IV estimate currency options price for one-week estimate horizon)

One-week	One-month maturity IV (hypothesis 13)					Two-month maturity IV (hypothesis 14)					Three-month maturity IV (hypothesis 15)				
	AUD (A5.2a)	CAD (A5.5a)	CHF (A5.8a)	EUR (A5.11a)	GBP (A5.14a)	AUD (A5.2b)	CAD (A5.5b)	CHF (A5.8b)	EUR (A5.11b)	GBP (A5.14b)	AUD (A5.2c)	CAD (A5.5c)	CHF (A5.8c)	EUR (A5.11c)	GBP (A5.14c)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Panel A: Opening period (9:30-10:00)															
Mon-Mon	201	172	110	184	138	223	262	157	292	206	185	202	150	240	186
Tue-Tue	226	172	118	178	150	260	282	180	325	221	172	199	133	221	174
Wed-Wed	217	186	119	197	160	258	297	182	332	226	181	209	135	226	174
Thu-Thu	230	190	129	205	175	233	270	161	302	208	182	214	140	235	181
Fri-Fri	244	180	123	211	167	239	275	170	298	210	178	207	135	240	174
Panel B: Midday period (12:30-13:00)															
Mon-Mon	175	171	124	165	149	354	339	275	326	309	364	361	343	354	344
Tue-Tue	179	165	127	165	153	381	356	301	359	334	359	357	340	352	343
Wed-Wed	186	186	125	168	151	379	357	288	355	314	361	357	340	351	342
Thu-Thu	200	186	143	199	188	349	331	281	328	308	360	354	334	347	341
Fri-Fri	199	180	129	189	174	348	325	274	330	312	353	350	329	344	342
Panel C: Closing period (15:30-16:00)															
Mon-Mon	178	164	119	173	140	357	334	271	332	310	365	360	348	355	346
Tue-Tue	180	158	112	168	136	383	370	296	358	331	360	359	344	351	337
Wed-Wed	168	171	117	160	147	374	348	275	346	314	361	358	341	349	343
Thu-Thu	203	185	128	197	173	354	343	281	335	304	362	358	337	347	346
Fri-Fri	196	178	125	180	162	351	327	263	327	313	359	357	333	348	348

Notes: This table describes the PCP in estimating the IV based on the price of call and put options with one-month, two-month, and three-month maturity to test hypotheses 13, 14, and 15, respectively. The PCPs of each currency for the one-week estimate horizon (Mon-Mon, Tue-Tue, Wed-Wed, Thu-Thu, and Fri-Fri) during the opening, midday, and closing period are presented in panel A, B, and C, respectively. IV and RV represents implied volatility and realized volatility, respectively. The appendix table reference is in the parenthesis below the each of currency symbol. For example, A5.2a in the parenthesis below AUD is the appendix table which provides details of AUD options data for testing hypothesis 13. Similarly, A5.2b and A5.2c provides details of AUD options data for testing hypothesis 14 and hypothesis 15, respectively. The total sets/series of put-call pair is 225 [{panel A = 75 (5x15)} + {panel B = 75 (5x15)} + {panel C = 75 (5x15)}]. The one-week estimate horizon implies that the IV is estimated one-week before the date of pricing currency options.

Table 3.6 explains the PCP in estimating the IV based on the price of call and put options with one-month, two-month, and three-month maturity to test hypotheses 16, 17, and 18, respectively. The PCPs of each currency for the one-month estimate horizon (Mon-Mon, Tue-Tue, Wed-Wed, Thu-Thu, and Fri-Fri) during the opening, midday, and closing period are presented in panel A, B, and C, respectively. The one-month estimate horizon implies that the IV is estimated one-month before the date of pricing currency options. For one-month maturity IV (hypothesis 16), the total PCPs of AUD, CAD, CHF, EUR, and GBP options are reported in columns 2, 3, 4, 5, and 6, respectively. In column 2, the appendix Table A5.3a in the parenthesis below AUD provides the details of AUD options data for testing hypothesis 16. For example, the one-month maturity opening period IV_AUD (0.2663) in column 13 is calculated based on the PCP pair on 21-Jun-10 (Monday) to estimate the AUDC_MOD (1.18) and AUDP_MOD (1.68) in columns 17 and 18, respectively, 12-Jul-10 (Monday) for one-month estimate horizon. It continues to 151 trading days or 151 PCP pairs. Similarly, the CAD, CHF EUR, and GBP options data details are given in the appendix Tables A5.6a, A5.9a, A5.12a, and A5.15a, respectively.

For two-month maturity IV (hypothesis 17), the total PCPs of AUD, CAD, CHF, EUR, and GBP options are reported in columns 7, 8, 9, 10, and 11, respectively. In column 7, the appendix Table A5.3b in the parenthesis below AUD shows the details of AUD options data for testing hypothesis 17. For example, the two-month maturity opening period IV_AUD (0.1951) in column 13 is calculated using the PCP pair on 07-Jun-10 (Monday) to estimate the AUDC_MOD (1.69) and AUDP_MOD (0.78) in columns 17 and 18, respectively, on 05-Jul-10 (Monday) for one-month forecast horizon. It continues to 161 trading days or 161 PCP pairs. Similarly, the CAD, CHF EUR, and GBP options data details are described in the appendix Tables A5.6b, A5.9b, A5.12b, and A5.15b, respectively.

For three-month maturity IV (hypothesis 18), the total PCPs of AUD, CAD, CHF, EUR, and GBP options are reported in columns 12, 13, 14, 15 and 16, respectively. In column 12, the appendix Table A5.3c in the parenthesis below AUD presents the details of AUD options data for testing hypothesis 18. For example, the three-month maturity opening period IV_AUD (0.1289) in column 13 is computed for the PCP pair on 17-May-10 (Monday) to estimate the AUDC_MOD (0.16) and AUDP_MOD (4.51) in columns 17 and 19, respectively, on 14-Jun-10 (Monday) for one-month estimate horizon. It continues to 178 trading days or 178 PCP

pairs. Similarly, the CAD, CHF EUR, and GBP options data details are given in the appendix Tables A5.6c, A5.9c, A5.12c, and A5.15c, respectively.

Table 3. 6: Put-call pair for hypothesis 16, hypothesis 17 and hypothesis 18
(IV estimate currency options price for one-month estimate horizon)

One-month	One-month maturity IV (hypothesis 16)					Two-month maturity IV (hypothesis 17)					Three-month maturity IV (hypothesis 18)				
	AUD (A5.3a)	CAD (A5.6a)	CHF (A5.9a)	EUR (A5.12a)	GBP (A5.15a)	AUD (A5.3b)	CAD (A5.6b)	CHF (A5.9b)	EUR (A5.12b)	GBP (A5.15b)	AUD (A5.3c)	CAD (A5.6c)	CHF (A5.9c)	EUR (A5.12c)	GBP (A5.15c)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Panel A: Opening period (9:30-10:00)															
Mon-Mon	151	153	96	212	137	161	173	86	202	137	178	193	109	221	142
Tue-Tue	165	162	84	232	146	185	182	88	212	146	165	191	110	207	141
Wed-Wed	170	173	92	242	138	180	183	99	222	138	167	196	109	206	139
Thu-Thu	167	154	90	255	139	177	184	92	225	139	169	201	110	219	139
Fri-Fri	158	180	88	269	145	178	170	90	209	145	171	197	106	216	135
Panel B: Midday period (12:30-13:00)															
Mon-Mon	237	191	121	198	161	227	191	111	188	161	354	326	276	323	284
Tue-Tue	241	212	117	254	184	251	212	127	214	184	351	325	263	326	290
Wed-Wed	260	201	128	252	178	250	201	138	212	178	347	323	265	319	284
Thu-Thu	229	202	141	249	191	249	202	131	219	191	344	315	269	320	290
Fri-Fri	221	204	121	204	179	241	204	131	214	179	344	313	260	316	287
Panel C: Closing period (15:30-16:00)															
Mon-Mon	212	184	118	154	158	232	184	108	184	158	356	322	266	325	282
Tue-Tue	247	200	134	234	167	257	200	124	204	167	348	323	271	322	286
Wed-Wed	224	186	124	217	170	234	186	134	207	170	345	318	265	319	280
Thu-Thu	223	194	113	218	171	243	194	123	212	171	348	317	270	324	293
Fri-Fri	220	183	120	200	152	230	183	119	199	152	337	313	261	311	282

Notes: This table explains the PCP in estimating the IV based on the price of call and put options with one-month, two-month, and three-month maturity to test hypotheses 16, 17, and 18, respectively. The PCPs of each currency for the one-month estimate horizon (Mon-Mon, Tue-Tue, Wed-Wed, Thu-Thu, and Fri-Fri) during the opening, midday, and closing period are presented in panel A, B, and C, respectively.IV and RV represents implied volatility and realized volatility, respectively. The appendix table reference is in the parenthesis below the each of currency symbol. For example, A5.3a in the parenthesis below AUD is the appendix table which provides details of AUD options data for testing hypothesis 16. Similarly, A5.3b and A5.3c provides details of AUD options data for testing hypothesis 17 and hypothesis 18, respectively. The total sets/series of put-call pair is 225 [{panel A = 75 (5x15)} + {panel B = 75 (5x15)} + {panel C = 75 (5x15)}]. The one-month estimate horizon implies that the IV is estimated one-month before the date of pricing currency options.

3.8 Conclusion

Chapter 3 provides the methodology for testing the eighteen (18) hypotheses through the following five empirical methods. First, estimate the IV based on the price of options with one-month, two-month, and three-month maturity during the opening, midday, and closing period of a trading day. The BSM options pricing model estimates IV using ATM call and put options price through Newton-Raphson iterative search procedure. Second, estimate the RV for the underlying currency of options and using it as the proxy for the actual foreign exchange volatility. The RV is constructed by summing the squared five-minute intraday returns of the underlying currency of options. Third, analyse the performance of IV to forecast RV for the within-week, one-week, and one-month forecast horizon. The RV is regressed on IV in the MZ regression test and the higher value of R^2 that leading to the superior performance of IV to forecast RV. Fourth, calculate the CMOD and PMOD using the estimated IV in the first empirical method as input for the BSM options pricing model. Fifth, compute the OPE as the difference between the observed ATM options market price and the estimated options model price in the fourth empirical method. The OPE is generated under MAE, MSE, and RMSE measures to evaluate the performance of IV for pricing currency options for the within-week, one-week, and one-month estimate horizon.

This study uses the intraday data for AUD, CAD, CHF, EUR, and GBP European currency options provided by the OPRA as the last-sale options quotations. The sample period begins on 01 January 2010 and ends on 31 December 2017 for all currencies. The options are traded on Monday to Friday, excluding public holidays from 9:30 to 16:00 (US Eastern standard time) and expire on the third Friday of each month. The contract size of five sample currency options is AUD10,000, CAD10,000, CHF10,000, EUR10,000, and GBP 10,000, and settle in US dollar. The option with the time to maturity ranging from 2 days to less than or equal to 30 days is considered to be a one-month maturity option. The two-month maturity options include those that have time to maturity is between 31 days to less than or equal to 60 days. The options that have time to maturity covering from 61 days to 90 days are considered to be the three-month maturity options. All sample options are used to construct the intraday IV for the opening period (9:30 to 10:00), midday period (12:30 to 13:00), and closing period (15:30 to 16:00) of a trading day.

CHAPTER 4

Implied Volatility Forecasting Realized Volatility

4.1 Introduction

This chapter conducts an empirical analysis of IV to forecast the RV through testing hypothesis 01 to hypothesis 09. The analysis includes three steps. First, estimate the IV for ATM price of currency options with one-month, two-month, and three-month maturity during opening, midday, and closing period. Second, estimate the RV of currency to use as the proxy for the actual volatility. Finally, assess the performance of IV to forecast RV accurately for the within-week, one-week, and one-month forecast horizon.

4.2 Implied and realized volatility estimation

Volatility has become a critical issue for investors, portfolio managers, asset valuation, hedging strategy, risk management purposes (Barunik et al., 2016; Charles, 2010; Christodoulakis, 2007; Fuertes et al., 2009). It is essential for the options market participants dealing with financial instruments to grasp risk, accurately predict it, and control the impact of risk on their investment portfolios. The current option pricing philosophy, beginning with BS, plays a central role in assessing the fair value of an option. The volatility of the underlying assets is one of five parameters in the BS options pricing model, but its value is further amplified by the fact that it is the only one not directly observable. The spot price, strike price, trade date, expiration date, domestic interest rate, and foreign currency interest rate are readily available on the market, but volatility must be forecasted. While the observed variance can accurately be calculated using historical data from past years, the option's theoretical price today depends on the volatility that will be experienced in the future, over the entire lifetime of the options. Thus, volatility forecasting is crucial for the options pricing.

Currently, the attention of researchers and practitioners has lied on the IV deriving from options market prices. Empirical studies indicate that IV contains more useful information than that based on historical prices (Frijin et al., 2010). The ranges of volatility prediction horizons examined vary; however, one week, one month, and three months are the most popular choice. The IV of ATM options price provides a reasonably accurate forecast in the FX market. The IV tends to be low and high in the early and later part of the week, respectively. It follows due to the weekday pattern of scheduled news releases, the IV falls on Fridays and rises on Mondays. The empirical studies on IV often find that all the relevant information for forecasting volatility of an underlying asset can be found in the options market prices. However, IV holds the discrete information regarding the FX movement at a specific time of the trading day (Hoque & Kalev, 2015). Therefore, IV that captures the intraday level aggregate information related to FX behaviour, that changes every five minutes, needs to be tested to find out whether intraday IV holds appropriate information in forecasting FX volatility.

Appendix Table A4.1a describes the data to estimate one-month maturity IV_AUD during the opening, midday, and closing period of AUD options price for the within-week forecast horizon. The IV_AUDC is computed in column 11 using the time-to-maturity (expiry date – trade date), call price, strike price, spot price, IR_AUD, IR_USD as inputs for the equation

(3.5). Similarly, the IV_AUDP is calculated in column 12 using time-to-maturity, put price, strike price, spot price, IR_AUD, IR_USD as inputs for the equation (3.6). The IV_AUD in column 13 is the average of IV_AUDC and IV_AUDP, as in the equation (3.7). Similarly, the appendix Tables A4.1b and A4.1c show the details of data to calculate the two-month and three-month maturity IV_AUD, respectively, for the within-week forecast horizon. Further, the appendix Tables A4.2a, A4.2b, and A4.2c illustrate the details of data to estimate the one-month, two-month, and three-month maturity IV_AUD, respectively, during the opening, midday, and closing period for the one-week forecast horizon. Finally, the appendix Tables A4.3a, A4.3b, and A4.3c describe the details of data to estimate one-month, two-month, and three-month maturity IV_AUD, respectively, during the opening, midday, and closing period for the one-month forecast horizon.

Appendix Table A4.4a explains the data to estimate one-month maturity IV_CAD during the opening, midday, and closing period of CAD options price for the within-week forecast horizon. The IV_CADC is computed in column 11 using the time-to-maturity (expiry date – trade date), call price, strike price, spot price, IR_CAD, IR_USD as inputs for the equation (3.5). Similarly, the IV_CADP is calculated in column 12 using time-to-maturity, put price, strike price, spot price, IR_CAD, IR_USD as inputs for the equation (3.6). The IV_CAD in column 13 is the average of IV_CADC and IV_CADP, as in the equation (3.7). Similarly, the appendix Tables A4.4b and A4.4c show the details of data to estimate the two-month and three-month maturity IV_CAD, respectively, for the within-week forecast horizon. Further, the appendix Tables A4.5a, A4.5b, and A4.5c discuss the details of data to estimate the one-month, two-month, and three-month maturity IV_CAD, respectively, during the opening, midday, and closing period for the one-week forecast horizon. Finally, the appendix Tables A4.6a, A4.6b, and A4.6c describe the details of data to estimate one-month, two-month, and three-month maturity IV_CAD, respectively, during the opening, midday, and closing period for the one-month forecast horizon.

Appendix Table A4.7a describes the data to estimate one-month maturity IV_CHF during the opening, midday, and closing period of CHF options price for the within-week forecast horizon. The IV_CHFC is estimated in column 11 using the time-to-maturity (expiry date – trade date), call price, strike price, spot price, IR_CHF, IR_USD as inputs for the equation (3.5). Similarly, the IV_CHFP is calculated in column 12 using time-to-maturity, put price, strike price, spot price, IR_CHF, IR_USD as inputs for the equation (3.6). The IV_CHF in column 13 is the

average of IV_CHFC and IV_CHFP, as in the equation (3.7). Similarly, the appendix Tables A4.7b and A4.7c provide the details of data to estimate the two-month and three-month maturity IV_CHF, respectively, for the within-week forecast horizon. Further, the appendix Tables A4.8a, A4.8b, and A4.8c discuss the details of data to calculate the one-month, two-month, and three-month maturity IV_CHF, respectively, during the opening, midday, and closing period for the one-week forecast horizon. Finally, the appendix Tables A4.9a, A4.9b, and A4.9c illustrate the details of data to estimate one-month, two-month, and three-month maturity IV_CHF, respectively, during the opening, midday, and closing period for the one-month forecast horizon.

Appendix Table A4.10a explain the data to estimate one-month maturity IV_EUR during the opening, midday, and closing period of EUR options price for the within-week forecast horizon. The IV_EURC is computed in column 11 using the time-to-maturity (expiry date – trade date), call price, strike price, spot price, IR_EUR, IR_USD as inputs for the equation (3.5). Similarly, the IV_EURP is calculated in column 12 using time-to-maturity, put price, strike price, spot price, IR_EUR, IR_USD as inputs for the equation (3.6). The IV_EUR in column 13 is the average of IV_EURC and IV_EURP, as in the equation (3.7). Similarly, the appendix Tables A4.10b and A4.10c provide the details of data to estimate the two-month and three-month maturity IV_EUR, respectively, for the within-week forecast horizon. Further, the appendix Tables A4.11a, A4.11b, and A4.11c discuss the details of data to estimate the one-month, two-month, and three-month maturity IV_EUR, respectively, during the opening, midday, and closing period for the one-week forecast horizon. Finally, the appendix Tables A4.12a, A4.12b, and A4.12c describe the details of data to estimate one-month, two-month, and three-month maturity IV_EUR, respectively, during the opening, midday, and closing period for the one-month forecast horizon.

Appendix Table A4.13a explains the data to estimate one-month maturity IV_GBP during the opening, midday, and closing period of GBP options price for the within-week forecast horizon. The IV_GBPC is compute in column 11 using the time-to-maturity (expiry date – trade date), call price, strike price, spot price, IR_GBP, IR_USD as inputs for the equation (3.5). Similarly, the IV_GBPP is calculated in column 12 using time-to-maturity, put price, strike price, spot price, IR_GBP, IR_USD as inputs for the equation (3.6). The IV_GBP in column 13 is the average of IV_GBPC and IV_GBPP, as in the equation (3.7). Similarly, the appendix Tables A4.13b and A4.13c provide the details of data to calculate the two-month and three-month

maturity IV_GBP, respectively, for the within-week forecast horizon. Further, the appendix Tables A4.14a, A4.14b, and A4.14c present the details of data to estimate the one-month, two-month, and three-month maturity IV_GBP, respectively, during the opening, midday, and closing period for the one-week forecast horizon. Finally, the appendix Tables A4.15a, A4.15b, and A4.15c describe the details of data to estimate one-month, two-month, and three-month maturity IV_GBP, respectively, during the opening, midday, and closing period for the one-month forecast horizon.

The availability of intraday data for financial assets has led to the increasing developments in econometrics and quantitative finance (Qiao at el., 2019). High-frequency data that provides more intraday trading information is vital for all market participants. Andersen and Bollerslev (1998) first introduced the RV that based on the sum of squared intraday returns of an asset and showed that it is a more practical approach to modelling the volatility. The most valuable feature of RV is that it provides a consistent non-parametric estimation of volatility with a less influenced by the measurement error. Since the actual volatility is unobservable, Kourtis et al. (2016) use RV as the proxy for the actual volatility. Therefore, this study considers RV as the actual volatility of the underlying currency of options. Appendix Table A4.1a estimates the RV_AUD in column 16 (last column) for the five-minute interval AUD spot rate reported in column 8 using the equation (3.11). Similarly, the RV_CAD, RV_CHF, RV_EUR, and RV_GBP is calculated for the five-minute interval Canadian dollar, Swiss franc, Euro, and British pound spot price, respectively.

4.3 Implied volatility forecasting evaluation

The performance of IV to forecast the RV of the underlying currency of options is evaluated for the within-week, one-week, and one-month forecast horizon. For the within-week forecast horizon, the opening period, midday period, and closing period IV of Monday, Tuesday, Wednesday, and Thursday are used to forecast the RV at the corresponding time on Friday in the same week. Appendix Table A4.1a shows the one-month maturity IV_AUD in column 13 of Monday, Tuesday, Wednesday, and Thursday forecast RV_AUD in column 16 of Friday for the opening, midday, and closing period in panels A, B, and C, respectively. Further, the two-month maturity IV_AUD forecast RV_AUD and three-month maturity IV_AUD forecast RV_AUD is illustrated in the Tables A4.1b and A4.1c, respectively. Similarly, one-month, two-month and three-month maturity IV forecast RV for the CAD options (appendix Tables A4.4a, A4.4b, and A4.4c), CHF options (appendix Tables A4.7a, A4.7b, Table A4.7c), EUR options (appendix Tables A4.10a, A4.10b, and A4.10c), and GBP options (appendix Tables A4.13a, A4.13b, and A4.13c) are explained.

For the one-week forecast horizon, the opening period, midday period, and closing period IV of Monday, Tuesday, Wednesday, Thursday, and Friday of a week are used to forecast the RV at the corresponding time on Monday, Tuesday, Wednesday, Thursday, and Friday of the next week, respectively. Appendix Table A4.2a explains the one-month maturity IV_AUD in column 13 of Monday, Tuesday, Wednesday, Thursday, and Friday forecast RV_AUD in column 16 of Monday, Tuesday, Wednesday, Thursday, and Friday for the opening, midday, and closing period in panels A, B, and C, respectively. Further, the two-month maturity IV_AUD forecast RV_AUD and three-month maturity IV_AUD forecast RV_AUD is presented in the Tables A4.2b and A4.2c, respectively. Similarly, one-month, two-month and three-month maturity IV forecast RV for the CAD options (appendix Tables A4.5a, A4.5b, and A4.5c), CHF options (appendix Tables A4.8a, A4.8b, Table A4.8c), EUR options (appendix Tables A4.11a, A4.11b, and A4.11c), and GBP options (appendix Tables A4.14a, A4.14b, and A4.14c) are described.

For the one-month forecast horizon, the opening period, midday period, and closing period IV of Monday, Tuesday, Wednesday, Thursday, and Friday of a month are used to forecast the RV at the corresponding time on Monday, Tuesday, Wednesday, Thursday, and Friday of the next month, respectively. Appendix Table A4.3a explains the one-month maturity IV_AUD in

column 13 of Monday, Tuesday, Wednesday, Thursday, and Friday forecast RV_AUD in column 16 of Monday, Tuesday, Wednesday, Thursday, and Friday for the opening, midday, and closing period in panels A, B, and C, respectively. Further, the two-month maturity IV_AUD forecast RV_AUD and three-month maturity IV_AUD forecast RV_AUD is reported in the Tables A4.3b and A4.3c, respectively. Similarly, one-month, two-month and three-month maturity IV forecast RV for the CAD options (appendix Tables A4.6a, A4.6b, and A4.6c), CHF options (appendix Tables A4.9a, A4.9b, Table A4.9c), EUR options (appendix Tables A4.12a, A4.12b, and A4.12c), and GBP options (appendix Tables A4.15a, A4.15b, and A4.15c) are explained.

4.4 Empirical analysis

The empirical analysis is conducted through Mincer-Zarnowitz (MZ) regression model, as in equation (3.12), evaluating the performance of IV to forecast RV. The total 630 regression analysis has performed based on the 630 sets of put-call pairs (PCPs) (180, 225, and 225 sets of PCPs in Tables 3.1, 3.2, and 3.3). The joint test is examined the hypothesis: $\beta_0 = 0$ and $\beta_1 = 1$. The R^2 (goodness-of-fit) of the regression is employed as the measurement of the predictive power of the IV. Therefore, the high R^2 value is expected that leading to the superior performance of IV to forecast RV.

Table 4.1 shows the performance of IV_AUD to forecast RV_AUD for the within-week forecast horizon. Hypothesis 1, hypothesis 2, and hypothesis 3 are tested for the opening, midday, and closing period, and results are given in panels A, B, and C, respectively. For the opening period, one-month maturity IV_AUD ($R^2 = 0.1958$) of Tuesday performs better than that of Monday, Wednesday, and Thursday to forecast RV_AUD on Friday in the same week. The two-month maturity IV_AUD ($R^2 = 0.3362$) and three-month maturity IV_AUD ($R^2 = 0.2888$) of Tuesday are also better to forecast RV_AUD. However, two-month maturity IV_AUD outperforms one-month and three-month maturity IV_AUD in forecasting RV_AUD. Similarly, two-month maturity IV_AUD ($R^2 = 0.2809$) of Tuesday is superior to forecast RV_AUD for the midday period. However, two-month maturity IV_AUD ($R^2 = 0.3796$) of Monday is better to forecast RV_AUD for the closing period.

Table 4.1: IV_AUD forecast RV_AUD for within-week forecast horizon

Forecast Horizon	One-month maturity IV_AUD (hypothesis 1)			Two-month maturity IV_AUD (hypothesis 2)			Three-month maturity IV_AUD (hypothesis 3)		
	Intercept (P-value)	Slope (P-value)	R^2	Intercept (P-value)	Slope (P-value)	R^2	Intercept (P-value)	Slope (P-value)	R^2
Panel A: Opening period (9:30 – 10:00)									
Mon to Fri	0.0455 (0.0000)	0.2075 (0.0000)	0.1337	0.0232 (0.0001)	0.4151 (0.0000)	0.2949	0.0032 (0.6486)	0.5541 (0.0000)	0.2214
Tue to Fri	0.0399 (0.0000)	0.2488 (0.0000)	0.1958*	0.0156 (0.0073)	0.4797 (0.0000)	0.3362*	0.0045 (0.5110)	0.5489 (0.0000)	0.2888*
Wed to Fri	0.0483 (0.0000)	0.1877 (0.0000)	0.1141	0.0150 (0.0101)	0.4837 (0.0000)	0.3358	0.0015 (0.8367)	0.5693 (0.0000)	0.2888
Thu to Fri	0.0517 (0.0000)	0.1522 (0.0000)	0.1021	0.0193 (0.0010)	0.4439 (0.0000)	0.3001	0.0088 (0.1982)	0.5089 (0.0000)	0.2703
Panel B: Midday period (12:30 – 13:00)									
Mon to Fri	0.0386 (0.0000)	0.2487 (0.0000)	0.1986	0.0191 (0.0000)	0.4277 (0.0000)	0.2462	0.0156 (0.0050)	0.4702 (0.0000)	0.2506
Tue to Fri	0.0391 (0.0000)	0.2450 (0.0000)	0.2149*	0.0210 (0.0000)	0.4118 (0.0000)	0.2809*	0.0140 (0.0080)	0.4867 (0.0000)	0.2628*
Wed to Fri	0.0454 (0.0000)	0.2073 (0.0000)	0.1422	0.0245 (0.0000)	0.3902 (0.0000)	0.2441	0.0171 (0.0020)	0.4651 (0.0000)	0.2194
Thu to Fri	0.0399 (0.0000)	0.2532 (0.0000)	0.1724	0.0201 (0.0001)	0.4258 (0.0000)	0.2571	0.0149 (0.0067)	0.4796 (0.0000)	0.2403
Panel C: Closing period (15:30 – 16:00)									
Mon to Fri	0.0360 (0.0000)	0.2743 (0.0000)	0.3130*	0.0187 (0.0003)	0.4328 (0.0000)	0.3796*	0.0099 (0.0719)	0.5132 (0.0000)	0.3529*
Tue to Fri	0.0395 (0.0000)	0.2471 (0.0000)	0.2074	0.0194 (0.0001)	0.4278 (0.0000)	0.2738	0.0118 (0.0328)	0.5009 (0.0000)	0.2589
Wed to Fri	0.0431 (0.0000)	0.2244 (0.0000)	0.1600	0.0193 (0.0001)	0.4262 (0.0000)	0.2523	0.0128 (0.0263)	0.4899 (0.0000)	0.2489
Thu to Fri	0.0374 (0.0000)	0.2727 (0.0000)	0.2133	0.0159 (0.0015)	0.4581 (0.0000)	0.2945	0.0114 (0.0352)	0.5016 (0.0000)	0.2928

Notes: This table shows the performance of IV_AUD to forecast RV_AUD for the within-week forecast horizon. Hypothesis 1, hypothesis 2, and hypothesis 3 are tested for the opening, midday, and closing period, and results are given in panels A, B, and C, respectively.IV_AUD and RV_AUD represent the implied volatility of Australian dollar options and the realized volatility of the Australian dollar, respectively.
The intercept and slope coefficient of the regression equation (3.12) with p-value in the parenthesis and R^2 are reported. The p-value of 0000 in the parenthesis, indicating that the null hypothesis is rejected at any level of significance. It implies that the slope coefficient is other than zero and one.
* denotes a higher value of R^2 for each situation (e.g., one-month maturity IV_AUD during the opening period) that leading to better performance of IV_AUD to forecast RV_AUD.

Table 4.2 presents the performance of IV_AUD to forecast RV_AUD for the one-week forecast horizon. Hypothesis 4, hypothesis 5, and hypothesis 6 are tested for the opening, midday, and closing period, and results are given in panels A, B, and C, respectively. For the opening period, one-month maturity IV_AUD (R^2 = 0. 4659) of Tuesday performs better than that of Monday, Wednesday, Thursday, and Friday to forecast RV_AUD at the corresponding time on Tuesday of the next week. The two-month maturity IV_AUD (R^2 = 0.3658) and three-month maturity IV_AUD (R^2 = 0. 2845) of Tuesday are also better to forecast RV_AUD. However, one-month maturity IV_AUD outperforms two-month and three-month maturity IV_AUD in forecasting RV_AUD. Similarly, one-month maturity IV_AUD (R^2 = 0.4328) of Tuesday performs better to forecast RV_AUD for the midday period. However, one-month maturity IV_AUD (R^2 = 0.4721) of Monday is superior to forecast RV_AUD for the closing period.

Table 4.2: IV_AUD forecast RV_AUD for one-week forecast horizon

Forecast Horizon	One-month maturity IV_AUD (hypothesis 4)			Two-month maturity IV_AUD (hypothesis 5)			Three-month maturity IV_AUD (hypothesis 6)		
	Intercept (P-value)	Slope (P-value)	R^2	Intercept (P-value)	Slope (P-value)	R^2	Intercept (P-value)	Slope (P-value)	R^2
Panel A: Opening period (9:30 – 10:00)									
Mon to Mon	0.0286 (0.0000)	0.2043 (0.0000)	0.4050	0.0116 (0.0068)	0.3666 (0.0000)	0.3082	-0.0012 (0.7936)	0.4727 (0.0000)	0.2532
Tue to Tue	0.0332 (0.0000)	0.2278 (0.0000)	0.4659*	0.0139 (0.0006)	0.4149 (0.0000)	0.3658*	0.0092 (0.0354)	0.4356 (0.0000)	0.2845*
Wed to Wed	0.0328 (0.0000)	0.2490 (0.0000)	0.3079	0.0044 (0.4350)	0.5047 (0.0000)	0.3210	0.0048 (0.4670)	0.4957 (0.0000)	0.1615
Thu to Thu	0.0430 (0.0000)	0.1939 (0.0000)	0.2625	0.0147 (0.0030)	0.4456 (0.0000)	0.3429	0.0115 (0.1078)	0.4827 (0.0000)	0.1836
Fri to Fri	0.0352 (0.0000)	0.2906 (0.0000)	0.3059	0.0198 (0.0019)	0.4452 (0.0000)	0.2381	0.0059 (0.4128)	0.5404 (0.0000)	0.2128
Panel B: Midday period (12:30 – 13:00)									
Mon to Mon	0.0257 (0.0000)	0.2169 (0.0000)	0.4008	0.0096 (0.0047)	0.3643 (0.0000)	0.3565	0.0069 (0.0346)	0.3965 (0.0000)	0.2992
Tue to Tue	0.0332 (0.0000)	0.2177 (0.0000)	0.4328*	0.0189 (0.0000)	0.3538 (0.0000)	0.3751*	0.0119 (0.0003)	0.4195 (0.0000)	0.3177*
Wed to Wed	0.0340 (0.0000)	0.2279 (0.0000)	0.2850	0.0153 (0.0005)	0.3972 (0.0000)	0.2745	0.0751 (0.1367)	0.4735 (0.0000)	0.1894
Thu to Thu	0.0278 (0.0000)	0.3109 (0.0000)	0.3495	0.0139 (0.0009)	0.4369 (0.0000)	0.3471	0.0062 (0.1919)	0.5134 (0.0000)	0.3159
Fri to Fri	0.0387 (0.0000)	0.2608 (0.0000)	0.2350	0.0243 (0.0000)	0.3902 (0.0000)	0.2188	0.0154 (0.0086)	0.4796 (0.0000)	0.1910
Panel C: Closing period (15:30 – 16:00)									
Mon to Mon	0.0228 (0.0000)	0.2441 (0.0000)	0.4721*	0.0081 (0.0151)	0.3785 (0.0000)	0.3962*	0.0015 (0.6261)	0.4380 (0.0000)	0.3358*
Tue to Tue	0.0333 (0.0000)	0.2215 (0.0000)	0.4355	0.0158 (0.0000)	0.3806 (0.0000)	0.3799	0.0091 (0.0076)	0.4389 (0.0000)	0.3103
Wed to Wed	0.0296 (0.0000)	0.2604 (0.0000)	0.3171	0.0113 (0.0107)	0.4239 (0.0000)	0.2982	0.0008 (0.8836)	0.5176 (0.0000)	0.2400
Thu to Thu	0.0309 (0.0000)	0.2875 (0.0000)	0.3297	0.0146 (0.0003)	0.4305 (0.0000)	0.3539	0.0075 (0.1231)	0.4964 (0.0000)	0.2904
Fri to Fri	0.0336 (0.0000)	0.3014 (0.0000)	0.2573	0.0187 (0.0004)	0.4346 (0.0000)	0.2519	0.0104 (0.0795)	0.5123 (0.0000)	0.2289

Notes: This table presents the performance of IV_AUD to forecast RV_AUD for the one-week forecast horizon. Hypothesis 4, hypothesis 5, and hypothesis 6 are tested for the opening, midday, and closing period, and results are given in panels A, B, and C, respectively. IV_AUD and RV_AUD represent the implied volatility of Australian dollar options and the realized volatility of the Australian dollar, respectively.
The intercept and slope coefficient of the regression equation (3.12) with p-value in the parenthesis and R^2 are reported. The p-value of 0000 in the parenthesis, indicating that the null hypothesis is rejected at any level of significance. It implies that the slope coefficient is other than zero and one. * denotes a higher value of R^2 for each situation (e.g., one-month maturity IV_AUD during the opening period) that leading to better performance of IV_AUD to forecast RV_AUD.

Table 4.3 explains the performance of IV_AUD to forecast RV_AUD for the one-month forecast horizon. Hypothesis 7, hypothesis 8, and hypothesis 9 are tested for the opening, midday, and closing period, and results are given in panels A, B, and C, respectively. For the opening period, one-month maturity IV_AUD (R^2 = 0.2284) of Tuesday performs better than that of Monday, Wednesday, Thursday, and Friday to forecast RV_AUD at the corresponding time on Tuesday of the next month. The two-month maturity IV_AUD (R^2 = 0. 3861) and three-month maturity IV_AUD (R^2 = 0. 2959) of Tuesday are also better to forecast RV_AUD. However, two-month maturity IV_AUD outperforms one-month and three-month maturity IV_AUD in forecasting RV_AUD. Similarly, two-month maturity IV_AUD (R^2 = 0.3328) of Tuesday performs better to forecast RV_AUD for the midday period. The two-month maturity IV_AUD (R^2 = 0.3933) of Tuesday is also superior to forecast RV_AUD for the closing period.

Table 4.3: IV_AUD forecast RV_AUD for one-month forecast horizon

Forecast Horizon	One-month maturity IV_AUD (hypothesis 7)			Two-month maturity IV_AUD (hypothesis 8)			Three-month maturity IV_AUD (hypothesis 9)		
	Intercept (P-value)	Slope (P-value)	R^2	Intercept (P-value)	Slope (P-value)	R^2	Intercept (P-value)	Slope (P-value)	R^2
Panel A: Opening period (9:30 – 10:00)									
Mon to Mon	0.0288 (0.0000)	0.1999 (0.0000)	0.2273	0.0164 (0.0002)	0.3246 (0.0000)	0.3569	0.0058 (0.1956)	0.4092 (0.0000)	0.2499
Tue to Tue	0.0358 (0.0000)	0.1975 (0.0000)	0.2284*	0.0227 (0.0000)	0.3378 (0.0000)	0.3861*	0.0077 (0.1352)	0.4548 (0.0000)	0.2959*
Wed to Wed	0.0355 (0.0000)	0.2271 (0.0000)	0.1629	0.0108 (0.0592)	0.4494 (0.0000)	0.2634	0.0109 (0.2301)	0.4478 (0.0000)	0.1629
Thu to Thu	0.0510 (0.0000)	0.1388 (0.0000)	0.0923	0.0240 (0.0000)	0.3578 (0.0000)	0.2178	0.0211 (0.0022)	0.3859 (0.0000)	0.2026
Fri to Fri	0.0388 (0.0000)	0.2578 (0.0000)	0.1519	0.0287 (0.0000)	0.3612 (0.0000)	0.1774	0.0205 (0.0154)	0.4396 (0.0000)	0.1707
Panel B: Midday period (12:30 – 13:00)									
Mon to Mon	0.0284 (0.0000)	0.1940 (0.0000)	0.2248	0.0167 (0.0000)	0.3043 (0.0000)	0.2615	0.0148 (0.0002)	0.3320 (0.0000)	0.2413
Tue to Tue	0.0355 (0.0000)	0.1963 (0.0000)	0.2604*	0.0228 (0.0000)	0.3172 (0.0000)	0.3328*	0.0157 (0.0000)	0.3853 (0.0000)	0.3279*
Wed to Wed	0.0365 (0.0000)	0.2058 (0.0000)	0.1569	0.0186 (0.0000)	0.3642 (0.0000)	0.2412	0.0148 (0.0070)	0.4133 (0.0000)	0.2083
Thu to Thu	0.0399 (0.0000)	0.2157 (0.0000)	0.1597	0.0234 (0.0000)	0.3472 (0.0000)	0.2321	0.0176 (0.0007)	0.4155 (0.0000)	0.2302
Fri to Fri	0.0423 (0.0000)	0.2248 (0.0000)	0.1412	0.0361 (0.0000)	0.2903 (0.0000)	0.1359	0.0297 (0.0000)	0.3622 (0.0000)	0.1251
Panel C: Closing period (15:30 – 16:00)									
Mon to Mon	0.0243 (0.0000)	0.2285 (0.0000)	0.2109	0.0148 (0.0000)	0.3208 (0.0000)	0.2851	0.0099 (0.0133)	0.3702 (0.0000)	0.2848
Tue to Tue	0.0381 (0.0000)	0.1813 (0.0000)	0.2757*	0.0225 (0.0000)	0.3220 (0.0000)	0.3933*	0.0142 (0.0003)	0.3947 (0.0000)	0.3103*
Wed to Wed	0.0370 (0.0000)	0.2007 (0.0000)	0.1463	0.0193 (0.0000)	0.3537 (0.0000)	0.2158	0.0120 (0.0367)	0.4269 (0.0000)	0.2074
Thu to Thu	0.0409 (0.0000)	0.2074 (0.0000)	0.1583	0.0227 (0.0000)	0.3509 (0.0000)	0.2481	0.0163 (0.0017)	0.4204 (0.0000)	0.2381
Fri to Fri	0.0398 (0.0000)	0.2474 (0.0000)	0.1446	0.0316 (0.0000)	0.3259 (0.0000)	0.1587	0.0243 (0.0001)	0.3999 (0.0000)	0.1466

Notes: This table explains the performance of IV_AUD to forecast RV_AUD for the one-month forecast horizon. Hypothesis 7, hypothesis 8, and hypothesis 9 are tested for the opening, midday, and closing period, and results are given in panels A, B, and C, respectively.IV_AUD and RV_AUD represent the implied volatility of Australian dollar options and the realized volatility of the Australian dollar, respectively.
The intercept and slope coefficient of the regression equation (3.12) with p-value in the parenthesis and R^2 are reported. The p-value of 0000 in the parenthesis, indicating that the null hypothesis is rejected at any level of significance. It implies that the slope coefficient is other than zero and one. * denotes a higher value of R^2 for each situation (e.g., one-month maturity IV_AUD during the opening period) that leading to better performance of IV_AUD to forecast RV_AUD.

Table 4.4 shows the performance of IV_CAD to forecast RV_CAD for the within-week forecast horizon. Hypothesis 1, hypothesis 2, and hypothesis 3 are tested for the opening, midday, and closing period, and results are given in panels A, B, and C, respectively. For the opening period, one-month maturity IV_CAD (R^2 = 0.1749) of Monday performs better than that of Tuesday, Wednesday, and Thursday to forecast RV_CAD on Friday in the same week. The two-month maturity IV_CAD (R^2 = 0. 2769) and three-month maturity IV_CAD (R^2 = 0. 2106) of Monday are also better to forecast RV_CAD. However, two-month maturity IV_CAD outperforms one-month and three-month maturity IV_CAD in forecasting RV_CAD. Further, two-month maturity IV_CAD (R^2 = 0.2437) of Wednesday performs better to forecast RV_CAD for the midday period. However, two-month maturity IV_CAD (R^2 = 0.2978) of Tuesday is superior to forecast RV_AUD for the closing period.

Table 4.4: IV_CAD forecast RV_CAD for within-week forecast horizon

Forecast Horizon	One-month maturity IV_CAD (hypothesis 1)			Two-month maturity IV_CAD (hypothesis 2)			Three-month maturity IV_CAD (hypothesis 3)		
	Intercept (P-value)	Slope (P-value)	R^2	Intercept (P-value)	Slope (P-value)	R^2	Intercept (P-value)	Slope (P-value)	R^2
Panel A: Opening period (9:30 – 10:00)									
Mon to Fri	0.0354 (0.0000)	0.3589 (0.0000)	0.1749*	0.0302 (0.0000)	0.4525 (0.0000)	0.2769*	0.0071 (0.2625)	0.6704 (0.0000)	0.2106*
Tue to Fri	0.0405 (0.0000)	0.3048 (0.0000)	0.1677	0.0242 (0.0000)	0.5137 (0.0000)	0.2534	0.0087 (0.2256)	0.6591 (0.0000)	0.2008
Wed to Fri	0.0439 (0.0000)	0.2805 (0.0000)	0.1663	0.0297 (0.0000)	0.4549 (0.0000)	0.2724	0.0089 (0.1992)	0.6676 (0.0000)	0.1948
Thu to Fri	0.0575 (0.0000)	0.1457 (0.0000)	0.0606	0.0269 (0.0000)	0.4932 (0.0000)	0.2592	0.0112 (0.0944)	0.6421 (0.0000)	0.1679
Panel B: Midday period (12:30 – 13:00)									
Mon to Fri	0.0399 (0.0000)	0.3005 (0.0000)	0.1549	0.0321 (0.0000)	0.4064 (0.0000)	0.2069	0.0203 (0.0002)	0.5359 (0.0000)	0.1707
Tue to Fri	0.0432 (0.0000)	0.2609 (0.0000)	0.1586	0.0338 (0.0000)	0.3809 (0.0000)	0.2141	0.0222 (0.0000)	0.5112 (0.0000)	0.1756
Wed to Fri	0.0453 (0.0000)	0.2542 (0.0000)	0.1657*	0.0274 (0.0000)	0.4525 (0.0000)	0.2437*	0.0189 (0.0003)	0.5467 (0.0000)	0.2379*
Thu to Fri	0.0421 (0.0000)	0.2916 (0.0000)	0.1585	0.0267 (0.0000)	0.4632 (0.0000)	0.2239	0.0188 (0.0006)	0.5498 (0.0000)	0.2151
Panel C: Closing period (15:30 – 16:00)									
Mon to Fri	0.0371 (0.0000)	0.3319 (0.0000)	0.1391	0.0301 (0.0000)	0.4254 (0.0000)	0.2136	0.0179 (0.0016)	0.5580 (0.0000)	0.1741
Tue to Fri	0.0505 (0.0000)	0.1999 (0.0000)	0.2169*	0.0277 (0.0000)	0.4496 (0.0000)	0.2978*	0.0166 (0.0030)	0.5699 (0.0000)	0.2952*
Wed to Fri	0.0439 (0.0000)	0.2753 (0.0000)	0.1832	0.0222 (0.0000)	0.5015 (0.0000)	0.2494	0.0137 (0.0132)	0.5952 (0.0000)	0.2370
Thu to Fri	0.0409 (0.0000)	0.3148 (0.0000)	0.1615	0.0242 (0.0000)	0.4863 (0.0000)	0.2194	0.0188 (0.0007)	0.5442 (0.0000)	0.2334

Notes: This table shows the performance of IV_CAD to forecast RV_CAD for the within-week forecast horizon. Hypothesis 1, hypothesis 2, and hypothesis 3 are tested for the opening, midday, and closing period, and results are given in panels A, B, and C, respectively.IV_CAD and RV_CAD represent the implied volatility of Canadian dollar options and the realized volatility of the Canadian dollar, respectively.
The intercept and slope coefficient of the regression equation (3.12) with p-value in the parenthesis and R^2 are reported. The p-value of 0000 in the parenthesis, indicating that the null hypothesis is rejected at any level of significance. It implies that the slope coefficient is other than zero and one.
* denotes a higher value of R^2 for each situation (e.g., one-month maturity IV_CAD during the opening period) that leading to better performance of IV_CAD to forecast RV_CAD.

Table 4.5 presents the performance of IV_CAD to forecast RV_CAD for the one-week forecast horizon. Hypothesis 4, hypothesis 5, and hypothesis 6 are tested for the opening, midday, and closing period, and results are given in panels A, B, and C, respectively. For the opening period, one-month maturity IV_CAD (R^2 = 0.4899) of Monday performs better than that of Tuesday, Wednesday, Thursday, and Friday to forecast RV_CAD at the corresponding time on Monday of the next week. The two-month maturity IV_CAD (R^2 = 0.3629) and three-month maturity IV_CAD (R^2 = 0.3435) of Monday are also better to forecast RV_CAD. However, one-month maturity IV_CAD outperforms two-month and three-month maturity IV_CAD in forecasting RV_CAD. Similarly, one-month maturity IV_CAD (R^2 = 0.4076) of Monday performs better to forecast RV_CAD for the midday period. The one-month maturity IV_CAD (R^2 = 0.4911) of Monday is also superior to forecast RV_CAD for the closing period.

Table 4.5: IV_CAD forecast RV_CAD for one-week forecast horizon

Forecast Horizon	One-month maturity IV_CAD (hypothesis 4)			Two-month maturity IV_CAD (hypothesis 5)			Three-month maturity IV_CAD (hypothesis 6)		
	Intercept (P-value)	Slope (P-value)	R^2	Intercept (P-value)	Slope (P-value)	R^2	Intercept (P-value)	Slope (P-value)	R^2
Panel A: Opening period (9:30 – 10:00)									
Mon to Mon	0.0202 (0.0000)	0.3052 (0.0000)	0.4899*	0.0111 (0.0004)	0.4321 (0.0000)	0.3629*	-0.0006 (0.8491)	0.5536 (0.0000)	0.3435*
Tue to Tue	0.0337 (0.0000)	0.2412 (0.0000)	0.3593	0.0098 (0.0007)	0.5156 (0.0000)	0.3621	0.0057 (0.2294)	0.5574 (0.0000)	0.2042
Wed to Wed	0.0376 (0.0000)	0.2539 (0.0000)	0.2321	0.0137 (0.0000)	0.5952 (0.0000)	0.2494	0.0098 (0.1399)	0.5739 (0.0000)	0.1588
Thu to Thu	0.0459 (0.0000)	0.1558 (0.0000)	0.4259	0.0122 (0.0016)	0.5365 (0.0000)	0.3687	-3E-05 (0.9949)	0.6695 (0.0000)	0.1003
Fri to Fri	0.0409 (0.0000)	0.3148 (0.0000)	0.2683	0.0317 (0.0000)	0.4379 (0.0000)	0.1375	0.0067 (0.3437)	0.6816 (0.0000)	0.1397
Panel B: Midday period (12:30 – 13:00)									
Mon to Mon	0.0247 (0.0000)	0.2513 (0.0000)	0.4076*	0.0176 (0.0000)	0.3438 (0.0000)	0.3667*	0.0069 (0.0181)	0.4599 (0.0000)	0.3108*
Tue to Tue	0.0309 (0.0000)	0.2584 (0.0000)	0.4026	0.0185 (0.0000)	0.4057 (0.0000)	0.3103	0.0115 (0.0003)	0.4868 (0.0000)	0.2900
Wed to Wed	0.0414 (0.0000)	0.2091 (0.0000)	0.1754	0.0266 (0.0000)	0.3766 (0.0000)	0.1728	0.0209 (0.0001)	0.4415 (0.0000)	0.1035
Thu to Thu	0.0316 (0.0000)	0.2926 (0.0000)	0.3436	0.0167 (0.0000)	0.4634 (0.0000)	0.3571	0.0102 (0.0098)	0.5372 (0.0000)	0.2611
Fri to Fri	0.0379 (0.0000)	0.3363 (0.0000)	0.1976	0.0358 (0.0000)	0.3763 (0.0000)	0.1741	0.0250 (0.0000)	0.4986 (0.0000)	0.1758
Panel C: Closing period (15:30 – 16:00)									
Mon to Mon	0.0238 (0.0000)	0.2629 (0.0000)	0.4911*	0.0139 (0.0000)	0.3784 (0.0000)	0.4003*	0.0031 (0.2824)	0.4959 (0.0000)	0.3140*
Tue to Tue	0.0412 (0.0000)	0.1689 (0.0000)	0.4225	0.0124 (0.0000)	0.4745 (0.0000)	0.3501	0.0065 (0.0535)	0.5392 (0.0000)	0.1565
Wed to Wed	0.0344 (0.0000)	0.2819 (0.0000)	0.2298	0.0183 (0.0000)	0.4587 (0.0000)	0.2094	0.0105 (0.0478)	0.5426 (0.0000)	0.1433
Thu to Thu	0.0276 (0.0000)	0.3396 (0.0000)	0.3441	0.0140 (0.0000)	0.4883 (0.0000)	0.3895	0.0096 (0.0156)	0.5379 (0.0000)	0.3078
Fri to Fri	0.0359 (0.0000)	0.3599 (0.0000)	0.2293	0.0241 (0.0000)	0.4963 (0.0000)	0.2242	0.0161 (0.0047)	0.5836 (0.0000)	0.2101

Notes: This table presents the performance of IV_CAD to forecast RV_CAD for the one-week forecast horizon. Hypothesis 4, hypothesis 5, and hypothesis 6 are tested for the opening, midday, and closing period, and results are given in panels A, B, and C, respectively.IV_CAD and RV_CAD represent the implied volatility of Canadian dollar options and the realized volatility of the Canadian dollar, respectively.
The intercept and slope coefficient of the regression equation (3.12) with p-value in the parenthesis and R^2 are reported. The p-value of 0000 in the parenthesis, indicating that the null hypothesis is rejected at any level of significance. It implies that the slope coefficient is other than zero and one.
* denotes a higher value of R^2 for each situation (e.g., one-month maturity IV_CAD during the opening period) that leading to better performance of IV_CAD to forecast RV_CAD.

Table 4.6 shows the performance of IV_CAD to forecast RV_CAD for the one-month forecast horizon. Hypothesis 7, hypothesis 8, and hypothesis 9 are tested for the opening, midday, and closing period, and results are given in panels A, B, and C, respectively. For the opening period, one-month maturity IV_CAD (R^2 = 0.1872) of Monday performs better than that of Tuesday, Wednesday, Thursday, and Friday to forecast RV_CAD at the corresponding time on Monday of the next month. The two-month maturity IV_CAD (R^2 = 0.3471) and three-month maturity IV_CAD (R^2 = 0.2723) of Monday are also better to forecast RV_CAD. However, two-month maturity IV_CAD outperforms one-month and three-month maturity IV_CAD in forecasting RV_CAD. Further, two-month maturity IV_CAD (R^2 = 0.3442) of Tuesday performs better to forecast RV_CAD for the midday period. Similarly, two-month maturity IV_CAD (R^2 = 0.3519) of Tuesday is superior to forecast RV_CAD for the closing period.

Table 4.6: IV_CAD forecast RV_CAD for one-month forecast horizon

Forecast Horizon	One-month maturity IV_CAD (hypothesis 7)			Two-month maturity IV_CAD (hypothesis 8)			Three-month maturity IV_CAD (hypothesis 9)		
	Intercept (P-value)	Slope (P-value)	R^2	Intercept (P-value)	Slope (P-value)	R^2	Intercept (P-value)	Slope (P-value)	R^2
Panel A: Opening period (9:30 – 10:00)									
Mon to Mon	0.0274 (0.0000)	0.2341 (0.0000)	0.1872*	0.0181 (0.0000)	0.3476 (0.0000)	0.3471*	0.0083 (0.0267)	0.4605 (0.0000)	0.2723*
Tue to Tue	0.0364 (0.0000)	0.2115 (0.0000)	0.1483	0.0227 (0.0000)	0.3770 (0.0000)	0.3390	0.0053 (0.2985)	0.5685 (0.0000)	0.2193
Wed to Wed	0.0429 (0.0000)	0.2044 (0.0000)	0.0888	0.2302 (0.0000)	0.4171 (0.0000)	0.1477	0.0195 (0.0068)	0.4673 (0.0000)	0.2104
Thu to Thu	0.0473 (0.0000)	0.1380 (0.0000)	0.0815	0.0185 (0.0000)	0.4548 (0.0000)	0.3004	0.0104 (0.0447)	0.5514 (0.0000)	0.2549
Fri to Fri	0.0461 (0.0000)	0.2679 (0.0000)	0.1010	0.0349 (0.0000)	0.3969 (0.0000)	0.2134	0.0164 (0.0217)	0.5903 (0.0000)	0.1092
Panel B: Midday period (12:30 – 13:00)									
Mon to Mon	0.0289 (0.0000)	0.2097 (0.0000)	0.2026	0.0230 (0.0000)	0.2839 (0.0000)	0.2887	0.0140 (0.0000)	0.3852 (0.0000)	0.2217
Tue to Tue	0.0331 (0.0000)	0.2302 (0.0000)	0.2356*	0.0241 (0.0000)	0.3442 (0.0000)	0.3442*	0.0134 (0.0001)	0.4639 (0.0000)	0.2809*
Wed to Wed	0.0414 (0.0000)	0.2072 (0.0000)	0.0999	0.0317 (0.0000)	0.3138 (0.0000)	0.1232	0.0278 (0.0000)	0.3712 (0.0000)	0.1307
Thu to Thu	0.0401 (0.0000)	0.2077 (0.0000)	0.1331	0.0264 (0.0000)	0.3542 (0.0000)	0.2411	0.0187 (0.0000)	0.4457 (0.0000)	0.2198
Fri to Fri	0.0498 (0.0000)	0.2188 (0.0000)	0.0743	0.2543 (0.0000)	0.2543 (0.0000)	0.2408	0.0188 (0.0000)	0.4450 (0.0000)	0.0699
Panel C: Closing period (15:30 – 16:00)									
Mon to Mon	0.0258 (0.0000)	0.2428 (0.0000)	0.0967	0.0198 (0.0000)	0.3147 (0.0000)	0.3232	0.0106 (0.0009)	0.4176 (0.0000)	0.2527
Tue to Tue	0.0442 (0.0000)	0.1320 (0.0000)	0.2460*	0.0204 (0.0000)	0.3877 (0.0000)	0.3519*	0.0101 (0.0062)	0.5001 (0.0000)	0.2865*
Wed to Wed	0.0349 (0.0000)	0.2759 (0.0000)	0.1394	0.0258 (0.0000)	0.3725 (0.0000)	0.1583	0.0198 (0.0004)	0.4501 (0.0000)	0.1509
Thu to Thu	0.0379 (0.0000)	0.2329 (0.0000)	0.1451	0.0259 (0.0000)	0.3559 (0.0000)	0.2607	0.0155 (0.0003)	0.4759 (0.0000)	0.2206
Fri to Fri	0.0527 (0.0000)	0.1919 (0.0000)	0.0599	0.0421 (0.0000)	0.3023 (0.0000)	0.1460	0.0286 (0.0000)	0.4451 (0.0000)	0.0839

Notes: This table shows the performance of IV_CAD to forecast RV_CAD for the one-month forecast horizon. Hypothesis 7, hypothesis 8, and hypothesis 9 are tested for the opening, midday, and closing period, and results are given in panels A, B, and C, respectively. IV_CAD and RV_CAD represent the implied volatility of Canadian dollar options and the realized volatility of the Canadian dollar, respectively.
The intercept and slope coefficient of the regression equation (3.12) with p-value in the parenthesis and R^2 are reported. The p-value of 0000 in the parenthesis, indicating that the null hypothesis is rejected at any level of significance. It implies that the slope coefficient is other than zero and one.
* denotes a higher value of R^2 for each situation (e.g., one-month maturity IV_CAD during the opening period) that leading to better performance of IV_CAD to forecast RV_CAD.

Table 4.7 explains the performance of IV_CHF to forecast RV_CHF for the within-week forecast horizon. Hypothesis 1, hypothesis 2, and hypothesis 3 are tested for the opening, midday, and closing period, and results are given in panels A, B, and C, respectively. For the opening period, one-month maturity IV_CHF (R^2 = 0.3419) of Thursday performs better than that of Monday, Tuesday, and Wednesday to forecast RV_CHF on Friday in the same week. The two-month maturity IV_CHF (R^2 = 0.3124) and three-month maturity IV_CHF (R^2 = 0.2304) of Thursday are also better to forecast RV_CHF. However, one-month maturity IV_CHF outperforms two-month and three-month maturity IV_CHF in forecasting RV_CHF. Similarly, one-month maturity IV_CHF (R^2 = 0.3474) of Thursday performs better to forecast RV_CHF for the midday period. The one-month maturity IV_CHF (R^2 = 0.3600) of Thursday is also superior to forecast RV_CHF for the closing period.

Table 4.7: IV_CHF forecast RV_CHF for within-week forecast horizon

Forecast Horizon	One-month maturity IV_CHF (hypothesis 1)			Two-month maturity IV_CHF (hypothesis 2)			Three-month maturity IV_CHF (hypothesis 3)		
	Intercept (P-value)	Slope (P-value)	R^2	Intercept (P-value)	Slope (P-value)	R^2	Intercept (P-value)	Slope (P-value)	R^2
Panel A: Opening period (9:30 – 10:00)									
Mon to Fri	0.0464 (0.0000)	0.2744 (0.0000)	0.2707	0.0283 (0.0000)	0.4341 (0.0000)	0.2083	0.0079 (0.3148)	0.6009 (0.0000)	0.1017
Tue to Fri	0.0315 (0.0000)	0.3976 (0.0000)	0.2657	0.0031 (0.7078)	0.6533 (0.0000)	0.2772	-0.0007 (0.9353)	0.6617 (0.0000)	0.2077
Wed to Fri	0.0368 (0.0000)	0.3541 (0.0000)	0.2986	0.0088 (0.2158)	0.6069 (0.0000)	0.2515	0.0049 (0.5720)	0.6198 (0.0000)	0.2059
Thu to Fri	0.0333 (0.0000)	0.3738 (0.0000)	0.3419*	0.0097 (0.2567)	0.6211 (0.0000)	0.3124*	0.0059 (0.5216)	0.6197 (0.0000)	0.2304*
Panel B: Midday period (12:30 – 13:00)									
Mon to Fri	0.0401 (0.0000)	0.3013 (0.0000)	0.1896	0.0276 (0.0000)	0.4165 (0.0000)	0.1646	0.0100 (0.1786)	0.5871 (0.0000)	0.1415
Tue to Fri	0.0426 (0.0000)	0.2882 (0.0000)	0.1879	0.0224 (0.0002)	0.4674 (0.0000)	0.1854	0.0123 (0.0964)	0.5756 (0.0000)	0.1420
Wed to Fri	0.0471 (0.0000)	0.2459 (0.0000)	0.1893	0.0223 (0.0002)	0.4695 (0.0000)	0.1911	0.0148 (0.0384)	0.5496 (0.0000)	0.1266
Thu to Fri	0.0319 (0.0000)	0.3766 (0.0000)	0.3474*	0.0135 (0.0189)	0.5500 (0.0000)	0.2754*	0.0058 (0.3841)	0.6276 (0.0000)	0.2626*
Panel C: Closing period (15:30 – 16:00)									
Mon to Fri	0.0422 (0.0000)	0.2892 (0.0000)	0.1789	0.0293 (0.0000)	0.4085 (0.0000)	0.1593	0.0116 (0.1220)	0.5787 (0.0000)	0.1277
Tue to Fri	0.0415 (0.0000)	0.2965 (0.0000)	0.2209	0.0164 (0.0058)	0.5232 (0.0000)	0.2049	0.0084 (0.2618)	0.6107 (0.0000)	0.1618
Wed to Fri	0.0438 (0.0000)	0.2829 (0.0000)	0.2102	0.0197 (0.0010)	0.4939 (0.0000)	0.2036	0.0114 (0.1114)	0.5819 (0.0000)	0.1584
Thu to Fri	0.0415 (0.0000)	0.2968 (0.0000)	0.3600*	0.0093 (0.0661)	0.5852 (0.0000)	0.3465*	-0.0022 (0.7186)	0.6954 (0.0000)	0.3295*

Notes: This table explains the performance of IV_CHF to forecast RV_CHF for the within-week forecast horizon. Hypothesis 1, hypothesis 2, and hypothesis 3 are tested for the opening, midday, and closing period, and results are given in panels A, B, and C, respectively.IV_CHF and RV_CHF represent the implied volatility of Swiss Franc options and the realized volatility of the Swiss Franc, respectively.
The intercept and slope coefficient of the regression equation (3.12) with p-value in the parenthesis and R^2 are reported. The p-value of 0000 in the parenthesis, indicating that the null hypothesis is rejected at any level of significance. It implies that the slope coefficient is other than zero and one.
* denotes a higher value of R^2 for each situation (e.g., one-month maturity IV_CHF during the opening period) that leading to better performance of IV_CHF to forecast RV_CHF.

Table 4.8 shows the performance of IV_CHF to forecast RV_CHF for the one-week forecast horizon. Hypothesis 4, hypothesis 5, and hypothesis 6 are tested for the opening, midday, and closing period, and results are given in panels A, B, and C, respectively. For the opening period, one-month maturity IV_CHF (R^2 = 0.4419) of Tuesday performs better than that of Monday, Wednesday, Thursday, and Friday to forecast RV_CHF at the corresponding time on Tuesday of the next week. The two-month maturity IV_CHF (R^2 = 0.3596) and three-month maturity IV_CHF (R^2 = 0.3745) of Tuesday are also better to forecast RV_CHF. However, one-month maturity IV_CHF outperforms two-month and three-month maturity IV_CHF in forecasting RV_CHF. Similarly, one-month maturity IV_CHF (R^2 = 0.3713) of Tuesday performs better to forecast RV_CHF for the midday period. The one-month maturity IV_CHF (R^2 = 0.4739) of Tuesday is also superior to forecast RV_CHF for the closing period.

Table 4.8: IV_CHF forecast RV_CHF for one-week forecast horizon

Forecast Horizon	One-month maturity IV_CHF (hypothesis 4)			Two-month maturity IV_CHF (hypothesis 5)			Three-month maturity IV_CHF (hypothesis 6)		
	Intercept (P-value)	Slope (P-value)	R^2	Intercept (P-value)	Slope (P-value)	R^2	Intercept (P-value)	Slope (P-value)	R^2
Panel A: Opening period (9:30 – 10:00)									
Mon to Mon	0.0271 (0.0000)	0.2667 (0.0000)	0.3867	0.0161 (0.0029)	0.3875 (0.0000)	0.2488	-0.0043 (0.4481)	0.5587 (0.0000)	0.1927
Tue to Tue	0.0189 (0.0000)	0.3942 (0.0000)	0.4419*	0.0049 (0.3745)	0.5391 (0.0000)	0.3596*	-0.0147 (0.0523)	0.7322 (0.0000)	0.3745*
Wed to Wed	0.0307 (0.0000)	0.3199 (0.0000)	0.3404	0.0178 (0.0026)	0.4398 (0.0000)	0.2606	-0.0014 (0.8621)	0.6247 (0.0000)	0.2509
Thu to Thu	0.0316 (0.0000)	0.3728 (0.0000)	0.2159	0.0107 (0.2266)	0.6154 (0.0000)	0.2361	0.0129 (0.1981)	0.5822 (0.0000)	0.2452
Fri to Fri	0.0297 (0.0000)	0.4264 (0.0000)	0.3581	0.0161 (0.0450)	0.5410 (0.0000)	0.2276	0.0003 (0.9717)	0.6724 (0.0000)	0.2246
Panel B: Midday period (12:30 – 13:00)									
Mon to Mon	0.0243 (0.0000)	0.2773 (0.0000)	0.2903	0.0140 (0.0009)	0.3766 (0.0000)	0.2489	-0.0004 (0.9305)	0.5164 (0.0000)	0.2322
Tue to Tue	0.0309 (0.0000)	0.2773 (0.0000)	0.3713*	0.0120 (0.0019)	0.4560 (0.0000)	0.3422*	-0.0002 (0.9598)	0.5744 (0.0000)	0.2826*
Wed to Wed	0.0432 (0.0000)	0.1910 (0.0000)	0.2607	0.0212 (0.0000)	0.3862 (0.0000)	0.2368	0.0115 (0.0258)	0.4859 (0.0000)	0.1415
Thu to Thu	0.0562 (0.0000)	0.2759 (0.0000)	0.0037	0.0266 (0.6337)	0.5404 (0.2413)	0.0038	0.0191 (0.7663)	0.6209 (0.2536)	0.0028
Fri to Fri	0.0359 (0.0000)	0.3565 (0.0000)	0.1900	0.0274 (0.0000)	0.4267 (0.0000)	0.1744	0.0161 (0.0202)	0.5399 (0.0000)	0.1739
Panel C: Closing period (15:30 – 16:00)									
Mon to Mon	0.0244 (0.0000)	0.2824 (0.0000)	0.2995	0.0137 (0.0008)	0.3847 (0.0000)	0.2616	-0.0016 (0.7425)	0.5322 (0.0000)	0.2358
Tue to Tue	0.0311 (0.0000)	0.2745 (0.0000)	0.4739*	0.0098 (0.0115)	0.4788 (0.0000)	0.3589*	-0.0016 (0.7279)	0.5864 (0.0000)	0.2991*
Wed to Wed	0.0415 (0.0000)	0.2104 (0.0000)	0.2681	0.0215 (0.0000)	0.3856 (0.0000)	0.2351	0.0097 (0.0608)	0.5034 (0.0000)	0.1618
Thu to Thu	0.0661 (0.0274)	0.1914 (0.3865)	0.0037	0.0361 (0.4899)	0.4576 (0.2856)	0.0032	0.0210 (0.7362)	0.6017 (0.2541)	0.0020
Fri to Fri	0.0398 (0.0000)	0.3264 (0.0000)	0.2000	0.0218 (0.0006)	0.4792 (0.0000)	0.1854	0.0112 (0.1188)	0.5804 (0.0000)	0.1469

Notes: This table shows the performance of IV_CHF to forecast RV_CHF for the one-week forecast horizon. Hypothesis 4, hypothesis 5, and hypothesis 6 are tested for the opening, midday, and closing period, and results are given in panels A, B, and C, respectively.IV_CHF and RV_CHF represent the implied volatility of Swiss Franc options and the realized volatility of the Swiss Franc, respectively.
The intercept and slope coefficient of the regression equation (3.12) with p-value in the parenthesis and R^2 are reported. The p-value of 0000 in the parenthesis, indicating that the null hypothesis is rejected at any level of significance. It implies that the slope coefficient is other than zero and one. * denotes a higher value of R^2 for each situation (e.g., one-month maturity IV_CHF during the opening period) that leading to better performance of IV_CHF to forecast RV_CHF.

Table 4.9 shows the performance of IV_CHF to forecast RV_CHF for the one-month forecast horizon. Hypothesis 7, hypothesis 8, and hypothesis 9 are tested for the opening, midday, and closing period, and results are given in panels A, B, and C, respectively. For the opening period, one-month maturity IV_CHF (R^2 = 0.2904) of Tuesday performs better than that of Monday, Wednesday, Thursday, and Friday to forecast RV_CHF at the corresponding time on Tuesday of the next month. The two-month maturity IV_CHF (R^2 = 0.3185) and three-month maturity IV_CHF (R^2 = 0.2027) of Tuesday are also better to forecast RV_CHF. However, two-month maturity IV_CHF outperforms one-month and three-month maturity IV_CHF in forecasting RV_CHF. Similarly, two-month maturity IV_CHF (R^2 = 0.2415) of Tuesday performs better to forecast RV_CHF for the midday period. The two-month maturity IV_CHF (R^2 = 0.3214) of Tuesday is also superior to forecast RV_CHF for the closing period.

Table 4.9: IV_CHF forecast RV_CHF for one-month forecast horizon

Forecast Horizon	One-month maturity IV_CHF (hypothesis 7)			Two-month maturity IV_CHF (hypothesis 8)			Three-month maturity IV_CHF (hypothesis 9)		
	Intercept (P-value)	Slope (P-value)	R^2	Intercept (P-value)	Slope (P-value)	R^2	Intercept (P-value)	Slope (P-value)	R^2
Panel A: Opening period (9:30 – 10:00)									
Mon to Mon	0.0062 (0.0000)	0.2656 (0.0000)	0.2284	0.0279 (0.0000)	0.2710 (0.0000)	0.2156	0.0087 (0.2109)	0.4566 (0.0000)	0.1301
Tue to Tue	0.0249 (0.0000)	0.3402 (0.0000)	0.2904*	0.0205 (0.0009)	0.3997 (0.0000)	0.3185*	0.0038 (0.6025)	0.5421 (0.0000)	0.2027*
Wed to Wed	0.0333 (0.0000)	0.2852 (0.0000)	0.2147	0.0231 (0.0003)	0.4004 (0.0000)	0.2302	0.0089 (0.3075)	0.5284 (0.0000)	0.2018
Thu to Thu	0.0433 (0.0000)	0.2704 (0.0000)	0.1582	0.0424 (0.0000)	0.3080 (0.0006)	0.1109	0.0335 (0.0102)	0.3989 (0.0000)	0.0580
Fri to Fri	0.0419 (0.0000)	0.2889 (0.0000)	0.1258	0.0277 (0.0016)	0.4470 (0.0000)	0.1458	0.0285 (0.0025)	0.4235 (0.0000)	0.1468
Panel B: Midday period (12:30 – 13:00)									
Mon to Mon	0.0319 (0.0000)	0.2103 (0.0000)	0.1390	0.0243 (0.0000)	0.2842 (0.0000)	0.1590	0.0137 (0.0142)	0.3924 (0.0000)	0.1463
Tue to Tue	0.0364 (0.0000)	0.2247 (0.0000)	0.1884*	0.0233 (0.0000)	0.3535 (0.0000)	0.2415*	0.0127 (0.0114)	0.4550 (0.0000)	0.2196*
Wed to Wed	0.0394 (0.0000)	0.2183 (0.0000)	0.1697	0.0284 (0.0000)	0.3224 (0.0000)	0.1726	0.0220 (0.0000)	0.3858 (0.0000)	0.1654
Thu to Thu	0.0774 (0.0308)	0.0955 (0.7275)	0.0003	0.0425 (0.0000)	0.2654 (0.0000)	0.0021	0.0356 (0.5806)	0.4705 (0.3884)	0.0794
Fri to Fri	0.0494 (0.0000)	0.2334 (0.0000)	0.0724	0.0425 (0.0000)	0.2888 (0.0000)	0.0659	0.0414 (0.0000)	0.3227 (0.0000)	0.0841
Panel C: Closing period (15:30 – 16:00)									
Mon to Mon	0.0321 (0.0000)	0.2137 (0.0000)	0.1404	0.0242 (0.0000)	0.2895 (0.0000)	0.1681	0.0122 (0.0285)	0.4095 (0.0000)	0.1526
Tue to Tue	0.0384 (0.0000)	0.2126 (0.0000)	0.1831*	0.0265 (0.0000)	0.3268 (0.0000)	0.3214*	0.0142 (0.0061)	0.4422 (0.0000)	0.1795*
Wed to Wed	0.0457 (0.0000)	0.1704 (0.0000)	0.1126	0.0310 (0.0000)	0.3019 (0.0000)	0.1549	0.0235 (0.0000)	0.3747 (0.0000)	0.1447
Thu to Thu	0.0788 (0.0000)	0.0823 (0.7104)	0.0004	0.0439 (0.0000)	0.2528 (0.0000)	0.0027	0.0301 (0.6307)	0.5164 (0.3285)	0.0831
Fri to Fri	0.0536 (0.0000)	0.1987 (0.0000)	0.0528	0.0413 (0.0000)	0.3016 (0.0000)	0.0829	0.0348 (0.0000)	0.3794 (0.0000)	0.0773

Notes: This table shows the performance of IV_CHF to forecast RV_CHF for the one-month forecast horizon. Hypothesis 7, hypothesis 8, and hypothesis 9 are tested for the opening, midday, and closing period, and results are given in panels A, B, and C, respectively.IV_CHF and RV_CHF represent the implied volatility of Swiss Franc options and the realized volatility of the Swiss Franc, respectively.
The intercept and slope coefficient of the regression equation (3.12) with p-value in the parenthesis and R^2 are reported. The p-value of 0000 in the parenthesis, indicating that the null hypothesis is rejected at any level of significance. It implies that the slope coefficient is other than zero and one. * denotes a higher value of R^2 for each situation (e.g., one-month maturity IV_CHF during the opening period) that leading to better performance of IV_CHF to forecast RV_CHF.

Table 4.10 explains the performance of IV_EUR to forecast RV_EUR for the within-week forecast horizon. Hypothesis 1, hypothesis 2, and hypothesis 3 are tested for the opening, midday, and closing period, and results are given in panels A, B, and C, respectively. For the opening period, one-month maturity IV_EUR (R^2 = 0.1484) of Monday performs better than that of Tuesday, Wednesday, and Thursday to forecast RV_EUR on Friday in the same week. The two-month maturity IV_EUR (R^2 = 0.2241) and three-month maturity IV_EUR (R^2 = 0.2158) of Monday are also better to forecast RV_EUR. However, two-month maturity IV_EUR outperforms one-month and three-month maturity IV_EUR in forecasting RV_EUR. Further, two-month maturity IV_EUR (R^2 = 0.1863) of Tuesday performs better to forecast RV_EUR for the midday period. Similarly, two-month maturity IV_EUR (R^2 = 0.2335) of Tuesday is superior to forecast RV_EUR for the closing period.

Table 4.10: IV_EUR forecast RV_EUR for within-week forecast horizon

Forecast Horizon	One-month maturity IV_EUR (hypothesis 1)			Two-month maturity IV_EUR (hypothesis 2)			Three-month maturity IV_EUR (hypothesis 3)		
	Intercept (P-value)	Slope (P-value)	R^2	Intercept (P-value)	Slope (P-value)	R^2	Intercept (P-value)	Slope (P-value)	R^2
Panel A: Opening period (9:30 – 10:00)									
Mon to Fri	0.0419 (0.0000)	0.2109 (0.0000)	0.1484*	0.0236 (0.0000)	0.3972 (0.0000)	0.2241*	0.0209 (0.0004)	0.4195 (0.0000)	0.2158*
Tue to Fri	0.0480 (0.0000)	0.1594 (0.0000)	0.0822	0.0236 (0.0000)	0.3959 (0.0000)	0.1843	0.0174 (0.0133)	0.4564 (0.0000)	0.1895
Wed to Fri	0.0416 (0.0000)	0.2229 (0.0000)	0.1392	0.0195 (0.0003)	0.4442 (0.0000)	0.1894	0.0133 (0.0508)	0.4919 (0.0000)	0.2038
Thu to Fri	0.0396 (0.0000)	0.2413 (0.0000)	0.1341	0.0283 (0.0000)	0.3730 (0.0000)	0.1824	0.0214 (0.0007)	0.4209 (0.0000)	0.1638
Panel B: Midday period (12:30 – 13:00)									
Mon to Fri	0.0430 (0.0000)	0.1941 (0.0000)	0.1264	0.0266 (0.0000)	0.3512 (0.0000)	0.1779	0.0208 (0.0001)	0.4099 (0.0000)	0.1655
Tue to Fri	0.0412 0.0000	0.2105 (0.0000)	0.1401*	0.0267 (0.0000)	0.3555 (0.0000)	0.1863*	0.0225 (0.0001)	0.4045 (0.0000)	0.1808*
Wed to Fri	0.0463 (0.0000)	0.1719 (0.0000)	0.0927	0.0265 (0.0000)	0.3613 (0.0000)	0.1653	0.0234 (0.0000)	0.3962 (0.0000)	0.1794
Thu to Fri	0.0408 (0.0000)	0.2197 (0.0000)	0.1387	0.0317 (0.0000)	0.3196 (0.0000)	0.1513	0.0271 (0.0000)	0.3638 (0.0000)	0.1455
Panel C: Closing period (15:30 – 16:00)									
Mon to Fri	0.0429 (0.0000)	0.2038 (0.0000)	0.1215	0.0274 (0.0000)	0.3499 (0.0000)	0.1744	0.0196 (0.0003)	0.4204 (0.0000)	0.1594
Tue to Fri	0.0433 (0.0000)	0.1999 (0.0000)	0.1638*	0.0233 (0.0000)	0.3881 (0.0000)	0.2335*	0.0205 (0.0004)	0.4219 (0.0000)	0.2205*
Wed to Fri	0.0415 (0.0000)	0.2154 (0.0000)	0.1328	0.0255 (0.0000)	0.3683 (0.0000)	0.1585	0.0236 (0.0000)	0.3917 (0.0000)	0.1759
Thu to Fri	0.0368 (0.0000)	0.2631 (0.0000)	0.1278	0.0246 (0.0000)	0.3795 (0.0000)	0.1833	0.0198 (0.0005)	0.4249 (0.0000)	0.1829

Notes: This table explains the performance of IV_EUR to forecast RV_EUR for the within-week forecast horizon. Hypothesis 1, hypothesis 2, and hypothesis 3 are tested for the opening, midday, and closing period, and results are given in panels A, B, and C, respectively.IV_EUR and RV_EUR represent the implied volatility of Euro options and the realized volatility of the Euro, respectively.
The intercept and slope coefficient of the regression equation (3.12) with p-value in the parenthesis and R^2 are reported. The p-value of 0000 in the parenthesis, indicating that the null hypothesis is rejected at any level of significance. It implies that the slope coefficient is other than zero and one.
* denotes a higher value of R^2 for each situation (e.g., one-month maturity IV_EUR during the opening period) that leading to better performance of IV_EUR to forecast RV_EUR.

Table 4.11 presents the performance of IV_EUR to forecast RV_EUR for the one-week forecast horizon. Hypothesis 4, hypothesis 5, and hypothesis 6 are tested for the opening, midday, and closing period, and results are given in panels A, B, and C, respectively. For the opening period, one-month maturity IV_EUR (R^2 = 0.4359) of Monday performs better than that of Tuesday, Wednesday, Thursday, and Friday to forecast RV_EUR at the corresponding time on Monday of the next week. The two-month maturity IV_EUR (R^2 = 0.3579) and three-month maturity IV_EUR (R^2 = 0.2679) of Monday are also better to forecast RV_EUR. However, one-month maturity IV_EUR outperforms two-month and three-month maturity IV_EUR in forecasting RV_EUR. Similarly, one-month maturity IV_EUR (R^2 = 0.3659) of Monday performs better to forecast RV_EUR for the midday period. The one-month maturity IV_EUR (R^2 = 0.4406) of Monday is also superior to forecast RV_EUR for the closing period.

Table 4.11: IV_EUR forecast RV_EUR for one-week forecast horizon

Forecast Horizon	One-month maturity IV_EUR (hypothesis 4)			Two-month maturity IV_EUR (hypothesis 5)			Three-month maturity IV_EUR (hypothesis 6)		
	Intercept (P-value)	Slope (P-value)	R^2	Intercept (P-value)	Slope (P-value)	R^2	Intercept (P-value)	Slope (P-value)	R^2
Panel A: Opening period (9:30 – 10:00)									
Mon to Mon	0.0242 (0.0000)	0.2093 (0.0000)	0.4359*	0.0089 (0.0042)	0.3719 (0.0000)	0.3579*	0.0029 (0.3550)	0.4235 (0.0000)	0.2679*
Tue to Tue	0.0343 (0.0000)	0.1823 (0.0000)	0.3825	0.0137 (0.0000)	0.3988 (0.0000)	0.3499	0.0064 (0.1340)	0.4611 (0.0000)	0.2045
Wed to Wed	0.0366 (0.0000)	0.1883 (0.0000)	0.2879	0.0134 (0.0007)	0.4208 (0.0000)	0.2980	0.0092 (0.0847)	0.4648 (0.0000)	0.1480
Thu to Thu	0.0357 (0.0000)	0.2727 (0.0000)	0.1531	0.0299 (0.0000)	0.3661 (0.0000)	0.1353	0.0251 (0.0002)	0.3991 (0.0000)	0.1511
Fri to Fri	0.0479 (0.0000)	0.1698 (0.0000)	0.1879	0.0241 (0.0000)	0.4029 (0.0000)	0.1779	0.0175 (0.0088)	0.4529 (0.0000)	0.0754
Panel B: Midday period (12:30 – 13:00)									
Mon to Mon	0.0267 (0.0000)	0.1806 (0.0000)	0.3659*	0.0120 (0.0002)	0.3197 (0.0000)	0.3081*	0.0058 (0.0700)	0.3834 (0.0000)	0.2174*
Tue to Tue	0.0331 (0.0000)	0.1884 (0.0000)	0.3353	0.0193 (0.0000)	0.3274 (0.0000)	0.2871	0.0125 (0.0004)	0.3908 (0.0000)	0.2031
Wed to Wed	0.0354 (0.0000)	0.1887 (0.0000)	0.3081	0.0163 (0.0000)	0.3714 (0.0000)	0.2917	0.0163 (0.0000)	0.3714 (0.0000)	0.1757
Thu to Thu	0.0415 (0.0000)	0.2132 (0.0000)	0.1157	0.0342 (0.0000)	0.2979 (0.0000)	0.1097	0.0297 (0.0000)	0.3424 (0.0000)	0.1164
Fri to Fri	0.0446 (0.0000)	0.1955 (0.0000)	0.1376	0.0327 (0.0000)	0.3129 (0.0000)	0.1317	0.0275 (0.0000)	0.3683 (0.0000)	0.0951
Panel C: Closing period (15:30 – 16:00)									
Mon to Mon	0.0242 (0.0000)	0.2099 (0.0000)	0.4406*	0.0101 (0.0014)	0.3414 (0.0000)	0.3226*	0.0028 (0.3560)	0.4119 (0.0000)	0.2550*
Tue to Tue	0.0362 (0.0000)	0.1704 (0.0000)	0.3489	0.0154 (0.0000)	0.3637 (0.0000)	0.3135	0.0091 (0.0126)	0.4203 (0.0000)	0.1697
Wed to Wed	0.0373 (0.0000)	0.1794 (0.0000)	0.2854	0.0172 (0.0000)	0.3623 (0.0000)	0.2766	0.0109 (0.0105)	0.4242 (0.0000)	0.1468
Thu to Thu	0.0356 (0.0000)	0.2749 (0.0000)	0.1547	0.0264 (0.0000)	0.3631 (0.0000)	0.1451	0.0204 (0.0011)	0.4207 (0.0000)	0.1555
Fri to Fri	0.0395 (0.0000)	0.2475 (0.0000)	0.1677	0.0268 (0.0000)	0.3599 (0.0000)	0.1543	0.0215 (0.0003)	0.4152 (0.0000)	0.1282

Notes: This table presents the performance of IV_EUR to forecast RV_EUR for the one-week forecast horizon. Hypothesis 4, hypothesis 5, and hypothesis 6 are tested for the opening, midday, and closing period, and results are given in panels A, B, and C, respectively.IV_EUR and RV_EUR represent the implied volatility of Euro options and the realized volatility of the Euro, respectively.
The intercept and slope coefficient of the regression equation (3.12) with p-value in the parenthesis and R^2 are reported. The p-value of 0000 in the parenthesis, indicating that the null hypothesis is rejected at any level of significance. It implies that the slope coefficient is other than zero and one. * denotes a higher value of R^2 for each situation (e.g., one-month maturity IV_EUR during the opening period) that leading to better performance of IV_EUR to forecast RV_EUR.

Table 4.12 shows the performance of IV_EUR to forecast RV_EUR for the one-month forecast horizon. Hypothesis 7, hypothesis 8, and hypothesis 9 are tested for the opening, midday, and closing period, and results are given in panels A, B, and C, respectively. For the opening period, one-month maturity IV_EUR (R^2 = 0.2431) of Monday performs better than that of Tuesday, Wednesday, Thursday, and Friday to forecast RV_EUR at the corresponding time on Monday of the next month. The two-month maturity IV_EUR (R^2 = 0.3721) and three-month maturity IV_EUR (R^2 = 0.2877) of Monday are also better to forecast RV_EUR. However, two-month maturity IV_EUR outperforms one-month and three-month maturity IV_EUR in forecasting RV_EUR. Further, two-month maturity IV_EUR (R^2 = 0.3116) of Tuesday performs better to forecast RV_EUR for the midday period. However, two-month maturity IV_EUR (R^2 = 0.3814) of Monday is superior to forecast RV_EUR for the closing period.

Table 4.12: IV_EUR forecast RV_EUR for one-month forecast horizon

Forecast Horizon	One-month maturity IV_EUR (hypothesis 7)			Two-month maturity IV_EUR (hypothesis 8)			Three-month maturity IV_EUR (hypothesis 9)		
	Intercept (P-value)	Slope (P-value)	R^2	Intercept (P-value)	Slope (P-value)	R^2	Intercept (P-value)	Slope (P-value)	R^2
Panel A: Opening period (9:30 – 10:00)									
Mon to Mon	0.0252 (0.0000)	0.2004 (0.0000)	0.2431*	0.0129 (0.0001)	0.3338 (0.0000)	0.3721*	0.0064 (0.0656)	0.3979 (0.0000)	0.2877*
Tue to Tue	0.0385 (0.0000)	0.1439 (0.0000)	0.1254	0.0190 (0.0000)	0.3468 (0.0000)	0.3708	0.0062 (0.1537)	0.4556 (0.0000)	0.2708
Wed to Wed	0.0303 (0.0000)	0.2413 (0.0000)	0.2422	0.0149 (0.0002)	0.4068 (0.0000)	0.3048	0.0083 (0.1050)	0.4636 (0.0000)	0.2859
Thu to Thu	0.0486 (0.0000)	0.1648 (0.0000)	0.0529	0.0334 (0.0000)	0.3211 (0.0000)	0.1081	0.0354 (0.0000)	0.3124 (0.0000)	0.0883
Fri to Fri	0.0466 (0.0000)	0.1754 (0.0000)	0.0647	0.0351 (0.0000)	0.3006 (0.0000)	0.1740	0.0212 (0.0021)	0.4434 (0.0000)	0.0993
Panel B: Midday period (12:30 – 13:00)									
Mon to Mon	0.0290 (0.0000)	0.1608 (0.0000)	0.1734	0.0148 (0.0000)	0.2942 (0.0000)	0.2781	0.0091 (0.0113)	0.3531 (0.0000)	0.2497
Tue to Tue	0.0036 (0.0000)	0.1823 (0.0000)	0.1894*	0.0203 (0.0000)	0.3151 (0.0000)	0.3116*	0.0129 (0.0004)	0.3831 (0.0000)	0.2753*
Wed to Wed	0.0355 (0.0000)	0.1835 (0.0000)	0.1690	0.0210 (0.0000)	0.3269 (0.0000)	0.2356	0.0159 (0.0003)	0.3816 (0.0000)	0.2412
Thu to Thu	0.0484 (0.0000)	0.1581 (0.0000)	0.0609	0.0342 (0.0000)	0.2836 (0.0000)	0.1029	0.0333 (0.0000)	0.3062 (0.0000)	0.0093
Fri to Fri	0.0503 (0.0000)	0.1412 (0.0000)	0.0467	0.0386 (0.0000)	0.2552 (0.0000)	0.0944	0.0353 (0.0000)	0.2978 (0.0000)	0.0859
Panel C: Closing period (15:30 – 16:00)									
Mon to Mon	0.0277 (0.0000)	0.1792 (0.0000)	0.1877*	0.0123 (0.0001)	0.3198 (0.0000)	0.3814*	0.0074 (0.0388)	0.3713 (0.0000)	0.2864*
Tue to Tue	0.0391 (0.0000)	0.1430 (0.0000)	0.1192	0.0195 (0.0000)	0.3242 (0.0000)	0.2986	0.0114 (0.0030)	0.3969 (0.0000)	0.2577
Wed to Wed	0.0359 (0.0000)	0.1858 (0.0000)	0.1598	0.0251 (0.0000)	0.2905 (0.0000)	0.1872	0.0199 (0.0000)	0.3439 (0.0000)	0.1796
Thu to Thu	0.0461 (0.0000)	0.1855 (0.0000)	0.0693	0.0313 (0.0000)	0.3090 (0.0000)	0.1131	0.0271 (0.0000)	0.3593 (0.0000)	0.1088
Fri to Fri	0.0459 (0.0000)	0.1851 (0.0000)	0.0674	0.0332 (0.0000)	0.2994 (0.0000)	0.1143	0.0305 (0.0000)	0.3351 (0.0000)	0.1047

Notes: This table shows the performance of IV_EUR to forecast RV_EUR for the one-month forecast horizon. Hypothesis 7, hypothesis 8, and hypothesis 9 are tested for the opening, midday, and closing period, and results are given in panels A, B, and C, respectively. IV_EUR and RV_EUR represent the implied volatility of Euro options and the realized volatility of the Euro, respectively.
The intercept and slope coefficient of the regression equation (3.12) with p-value in the parenthesis and R^2 are reported. The p-value of 0000 in the parenthesis, indicating that the null hypothesis is rejected at any level of significance. It implies that the slope coefficient is other than zero and one.
* denotes a higher value of R^2 for each situation (e.g., one-month maturity IV_EUR during the opening period) that leading to better performance of IV_EUR to forecast RV_EUR.

Table 4.13 presents the performance of IV_GBP to forecast RV_GBP for the within-week forecast horizon. Hypothesis 1, hypothesis 2, and hypothesis 3 are tested for the opening, midday, and closing period, and results are given in panels A, B, and C, respectively. For the opening period, one-month maturity IV_GBP (R^2 = 0.3704) of Thursday performs better than that of Monday, Tuesday, and Wednesday to forecast RV_GBP on Friday in the same week. The two-month maturity IV_GBP (R^2 = 0.2749) and three-month maturity IV_GBP (R^2 = 0.2619) of Thursday are also better to forecast RV_GBP. However, one-month maturity IV_GBP outperforms two-month and three-month maturity IV_GBP in forecasting RV_GBP. Further, one-month maturity IV_GBP (R^2 = 0.2890) of Wednesday performs better to forecast RV_GBP for the midday period. However, one-month maturity IV_GBP (R^2 = 0.3865) of Thursday is superior to forecast RV_GBP for the closing period.

Table 4.13: IV_GBP forecast RV_GBP for within-week forecast horizon

Forecast Horizon	One-month maturity IV_GBP (hypothesis 1)			Two-month maturity IV_GBP (hypothesis 2)			Three-month maturity IV_GBP (hypothesis 3)		
	Intercept (P-value)	Slope (P-value)	R^2	Intercept (P-value)	Slope (P-value)	R^2	Intercept (P-value)	Slope (P-value)	R^2
Panel A: Opening period (9:30 – 10:00)									
Mon to Fri	0.0394 (0.0000)	0.1963 (0.0000)	0.3323	0.0277 (0.0000)	0.3294 (0.0000)	0.2386	0.0005 (0.9276)	0.5996 (0.0000)	0.1483
Tue to Fri	0.0369 (0.0000)	0.2253 (0.0000)	0.3558	0.0279 (0.0000)	0.3220 (0.0000)	0.1942	-0.0105 (0.1263)	0.7416 (0.0000)	0.1564
Wed to Fri	0.0392 (0.0000)	0.1979 (0.0000)	0.3459	0.0206 (0.0000)	0.4129 (0.0000)	0.2561	-0.0073 (0.2866)	0.7158 (0.0000)	0.1397
Thu to Fri	0.0251 (0.0000)	0.3531 (0.0000)	0.3704*	0.0111 (0.0395)	0.5353 (0.0000)	0.2749*	-0.0093 (0.1584)	0.7312 (0.0000)	0.2619*
Panel B: Midday period (12:30 – 13:00)									
Mon to Fri	0.0377 (0.0000)	0.2085 (0.0000)	0.2762	0.0272 (0.0000)	0.3245 (0.0000)	0.2018	0.0121 (0.0053)	0.4759 (0.0000)	0.1722
Tue to Fri	0.0396 (0.0000)	0.1903 (0.0000)	0.2673	0.0276 (0.0000)	0.3196 (0.0000)	0.2103	0.0146 (0.0008)	0.4586 (0.0000)	0.1543
Wed to Fri	0.0365 (0.0000)	0.2214 (0.0000)	0.2890*	0.0204 (0.0000)	0.3966 (0.0000)	0.2595*	0.0110 (0.0124)	0.4951 (0.0000)	0.1916*
Thu to Fri	0.0379 (0.0000)	0.2183 (0.0000)	0.2248	0.0253 (0.0000)	0.3564 (0.0000)	0.2058	0.0168 (0.0003)	0.4388 (0.0000)	0.1539
Panel C: Closing period (15:30 – 16:00)									
Mon to Fri	0.0350 (0.0000)	0.2347 (0.0000)	0.2999	0.0237 (0.0000)	0.3584 (0.0000)	0.2756	0.0083 (0.0577)	0.5129 (0.0000)	0.1705
Tue to Fri	0.0372 (0.0000)	0.2143 (0.0000)	0.2903	0.0223 (0.0000)	0.3707 (0.0000)	0.2455	0.0099 (0.0278)	0.5018 (0.0000)	0.1697
Wed to Fri	0.0399 (0.0000)	0.1928 (0.0000)	0.2865	0.0182 (0.0000)	0.4159 (0.0000)	0.2171	0.0107 (0.0159)	0.4938 (0.0000)	0.1799
Thu to Fri	0.0349 (0.0000)	0.2473 (0.0000)	0.3865*	0.0174 (0.0000)	0.4279 (0.0000)	0.2895*	0.0108 (0.0158)	0.4930 (0.0000)	0.1884*

Notes: This table presents the performance of IV_GBP to forecast RV_GBP for the within-week forecast horizon. Hypothesis 1, hypothesis 2, and hypothesis 3 are tested for the opening, midday, and closing period, and results are given in panels A, B, and C, respectively.IV_GBP and RV_GBP represent the implied volatility of British Pound options and the realized volatility of the British Pound, respectively.
The intercept and slope coefficient of the regression equation (3.12) with p-value in the parenthesis and R^2 are reported. The p-value of 0000 in the parenthesis, indicating that the null hypothesis is rejected at any level of significance. It implies that the slope coefficient is other than zero and one.
* denotes a higher value of R^2 for each situation (e.g., one-month maturity IV_GBP during the opening period) that leading to better performance of IV_GBP to forecast RV_GBP.

Table 4.14 explains the performance of IV_GBP to forecast RV_GBP for the one-week forecast horizon. Hypothesis 4, hypothesis 5, and hypothesis 6 are tested for the opening, midday, and closing period, and results are given in panels A, B, and C, respectively. For the opening period, one-month maturity IV_GBP (R^2 = 0.4374) of Monday performs better than that of Tuesday, Wednesday, Thursday, and Friday to forecast RV_GBP at the corresponding time on Monday of the next week. The two-month maturity IV_GBP (R^2 = 0.3897) and three-month maturity IV_GBP (R^2 = 0.3484) of Monday are also better to forecast RV_GBP. However, one-month maturity IV_GBP outperforms two-month and three-month maturity IV_GBP in forecasting RV_GBP. Further, one-month maturity IV_GBP (R^2 = 0.4271) of Tuesday performs better to forecast RV_GBP for the midday period. However, one-month maturity IV_GBP (R^2 = 0.4442) of Monday is superior to forecast RV_GBP for the closing period.

Table 4.14: IV_GBP forecast RV_GBP for one-week forecast horizon

Forecast Horizon	One-month maturity IV_GBP (hypothesis 4)			Two-month maturity IV_GBP (hypothesis 5)			Three-month maturity IV_GBP (hypothesis 6)		
	Intercept (P-value)	Slope (P-value)	R^2	Intercept (P-value)	Slope (P-value)	R^2	Intercept (P-value)	Slope (P-value)	R^2
Panel A: Opening period (9:30 – 10:00)									
Mon to Mon	0.0279 (0.0000)	0.1890 (0.0000)	0.4374*	0.0148 (0.0000)	0.3415 (0.0000)	0.3897*	0.0194 (0.5907)	0.4645 (0.0000)	0.3484*
Tue to Tue	0.0333 (0.0000)	0.1969 (0.0000)	0.3739	0.0179 (0.0000)	0.3725 (0.0000)	0.3238	0.0046 (0.3117)	0.5153 (0.0000)	0.2225
Wed to Wed	0.0391 (0.0000)	0.1538 (0.0000)	0.3469	0.0209 (0.0000)	0.3593 (0.0000)	0.2716	0.0078 (0.0981)	0.4946 (0.0000)	0.1641
Thu to Thu	0.0222 (0.0000)	0.3849 (0.0000)	0.3709	0.0134 (0.0137)	0.5075 (0.0000)	0.2509	-0.0059 (0.3459)	0.6942 (0.0000)	0.2958
Fri to Fri	0.0200 (0.0000)	0.4209 (0.0000)	0.2949	0.0249 (0.0000)	0.3603 (0.0000)	0.2518	0.0088 (0.1132)	0.5179 (0.0000)	0.2704
Panel B: Midday period (12:30 – 13:00)									
Mon to Mon	0.0289 (0.0000)	0.1758 (0.0000)	0.3822	0.0174 (0.0000)	0.2981 (0.0000)	0.3356	0.0065 (0.0265)	0.4068 (0.0000)	0.2344
Tue to Tue	0.0363 (0.0000)	0.1579 (0.0000)	0.4271*	0.0226 (0.0000)	0.3049 (0.0000)	0.3275*	0.0113 (0.0000)	0.4193 (0.0000)	0.2459*
Wed to Wed	0.0364 (0.0000)	0.1773 (0.0000)	0.3775	0.0249 (0.0000)	0.3023 (0.0000)	0.2840	0.0131 (0.0000)	0.4211 (0.0000)	0.2312
Thu to Thu	0.0334 (0.0000)	0.2603 (0.0000)	0.2529	0.0239 (0.0000)	0.3646 (0.0000)	0.2022	0.0127 (0.0062)	0.4732 (0.0000)	0.2003
Fri to Fri	0.0311 (0.0000)	0.2910 (0.0000)	0.3068	0.0326 (0.0000)	0.2779 (0.0000)	0.1927	0.0120 (0.0039)	0.4971 (0.0000)	0.1991
Panel C: Closing period (15:30 – 16:00)									
Mon to Mon	0.0026 (0.0000)	0.2031 (0.0000)	0.4442*	0.0134 (0.0000)	0.3722 (0.0000)	0.3722*	0.0027 (0.3550)	0.4441 (0.0000)	0.2731*
Tue to Tue	0.0337 (0.0000)	0.1836 (0.0000)	0.4256	0.0188 (0.0000)	0.3419 (0.0000)	0.3667	0.0084 (0.0038)	0.4452 (0.0000)	0.2331
Wed to Wed	0.0411 (0.0000)	0.1362 (0.0000)	0.3691	0.0237 (0.0000)	0.3121 (0.0000)	0.2916	0.0131 (0.0000)	0.4177 (0.0000)	0.1697
Thu to Thu	0.0318 (0.0000)	0.2770 (0.0000)	0.2957	0.0184 (0.0000)	0.4126 (0.0000)	0.2413	0.0082 (0.0702)	0.5121 (0.0000)	0.2163
Fri to Fri	0.0279 (0.0000)	0.3235 (0.0000)	0.3332	0.0276 (0.0000)	0.3231 (0.0000)	0.2257	0.0069 (0.1038)	0.5339 (0.0000)	0.2709

Notes: This table explains the performance of IV_GBP to forecast RV_GBP for the one-week forecast horizon. Hypothesis 4, hypothesis 5, and hypothesis 6 are tested for the opening, midday, and closing period, and results are given in panels A, B, and C, respectively.IV_GBP and RV_GBP represent the implied volatility of British Pound options and the realized volatility of the British Pound, respectively.
The intercept and slope coefficient of the regression equation (3.12) with p-value in the parenthesis and R^2 are reported. The p-value of 0000 in the parenthesis, indicating that the null hypothesis is rejected at any level of significance. It implies that the slope coefficient is other than zero and one.
* denotes a higher value of R^2 for each situation (e.g., one-month maturity IV_GBP during the opening period) that leading to better performance of IV_GBP to forecast RV_GBP.

Table 4.15 shows the performance of IV_GBP to forecast RV_GBP for the one-month forecast horizon. Hypothesis 7, hypothesis 8, and hypothesis 9 are tested for the opening, midday, and closing period, and results are given in panels A, B, and C, respectively. For the opening period, one-month maturity IV_GBP (R^2 = 0.2653) of Monday performs better than that of Tuesday, Wednesday, Thursday, and Friday to forecast RV_GBP at the corresponding time on Monday of the next month. The two-month maturity IV_GBP (R^2 = 0.3899) and three-month maturity IV_GBP (R^2 = 0.3594) of Monday are also superior to forecast RV_GBP. However, two-month maturity IV_GBP outperforms one-month and three-month maturity IV_GBP in forecasting RV_GBP. Similarly, two-month maturity IV_GBP (R^2 = 0.3185) of Monday performs better to forecast RV_GBP for the midday period. The two-month maturity IV_GBP (R^2 = 0.3967) of Monday is also superior to forecast RV_GBP for the closing period.

Table 4.15: IV_GBP forecast RV_GBP for one-month forecast horizon

Forecast Horizon	One-month maturity IV_GBP (hypothesis 7)			Two-month maturity IV_GBP (hypothesis 8)			Three-month maturity IV_GBP (hypothesis 9)		
	Intercept (P-value)	Slope (P-value)	R^2	Intercept (P-value)	Slope (P-value)	R^2	Intercept (P-value)	Slope (P-value)	R^2
Panel A: Opening period (9:30 – 10:00)									
Mon to Mon	0.0319 (0.0000)	0.1546 (0.0000)	0.2653*	0.0143 (0.0000)	0.3516 (0.0000)	0.3899*	0.0036 (0.3220)	0.4539 (0.0000)	0.3594*
Tue to Tue	0.0363 (0.0000)	0.1619 (0.0000)	0.1721	0.0246 (0.0000)	0.3019 (0.0000)	0.2847	0.0109 (0.0216)	0.4329 (0.0000)	0.2372
Wed to Wed	0.0411 (0.0000)	0.1351 (0.0000)	0.1271	0.0241 (0.0000)	0.3381 (0.0000)	0.2231	0.0198 (0.0000)	0.3513 (0.0000)	0.2228
Thu to Thu	0.0246 (0.0000)	0.3645 (0.0000)	0.1755	0.0138 (0.0000)	0.4812 (0.0000)	0.2773	0.0173 (0.0041)	0.4401 (0.0000)	0.2048
Fri to Fri	0.0376 (0.0000)	0.2348 (0.0000)	0.1112	0.0232 (0.0000)	0.3928 (0.0000)	0.2639	0.0156 (0.0029)	0.4450 (0.0000)	0.1942
Panel B: Midday period (12:30 – 13:00)									
Mon to Mon	0.0334 (0.0022)	0.1326 (0.0000)	0.1880*	0.0190 (0.0000)	0.2811 (0.0000)	0.3185*	0.0110 (0.0002)	0.3612 (0.0000)	0.2945*
Tue to Tue	0.0401 (0.0021)	0.1183 (0.0000)	0.1211	0.0259 (0.0000)	0.2701 (0.0000)	0.3517	0.0152 (0.0000)	0.3776 (0.0000)	0.2733
Wed to Wed	0.0385 (0.0021)	0.1553 (0.0000)	0.1754	0.0262 (0.0000)	0.2879 (0.0000)	0.3039	0.0185 (0.0000)	0.3655 (0.0000)	0.2608
Thu to Thu	0.0337 (0.0031)	0.2568 (0.0000)	0.1333	0.0242 (0.0000)	0.3464 (0.0000)	0.2642	0.0116 (0.0109)	0.4798 (0.0000)	0.2193
Fri to Fri	0.0431 (0.0033)	0.1671 (0.0000)	0.0818	0.0295 (0.0000)	0.3091 (0.0000)	0.1972	0.0228 (0.0000)	0.3859 (0.0000)	0.1684
Panel C: Closing period (15:30 – 16:00)									
Mon to Mon	0.0308 (0.0000)	0.1580 (0.0000)	0.1968*	0.0152 (0.0000)	0.3183 (0.0000)	0.3967*	0.0071 (0.0166)	0.3988 (0.0000)	0.3376*
Tue to Tue	0.0378 (0.0000)	0.1406 (0.0000)	0.1486	0.0221 (0.0000)	0.3073 (0.0000)	0.3627	0.0108 (0.0003)	0.4172 (0.0000)	0.3068
Wed to Wed	0.0407 (0.0000)	0.1364 (0.0000)	0.1730	0.0246 (0.0000)	0.3007 (0.0000)	0.2873	0.0190 (0.0000)	0.3567 (0.0000)	0.2729
Thu to Thu	0.0328 (0.0000)	0.2668 (0.0000)	0.1647	0.0211 (0.0000)	0.3721 (0.0000)	0.2709	0.0103 (0.0234)	0.4867 (0.0000)	0.2352
Fri to Fri	0.0411 (0.0000)	0.1869 (0.0000)	0.0914	0.0226 (0.0000)	0.3719 (0.0000)	0.2264	0.0177 (0.0001)	0.4256 (0.0000)	0.2114

Notes: This table shows the performance of IV_GBP to forecast RV_GBP for the one-month forecast horizon. Hypothesis 7, hypothesis 8, and hypothesis 9 are tested for the opening, midday, and closing period, and results are given in panels A, B, and C, respectively.IV_GBP and RV_GBP represent the implied volatility of British Pound options and the realized volatility of the British Pound, respectively.
The intercept and slope coefficient of the regression equation (3.12) with p-value in the parenthesis and R^2 are reported. The p-value of 0000 in the parenthesis, indicating that the null hypothesis is rejected at any level of significance. It implies that the slope coefficient is other than zero and one. * denotes a higher value of R^2 for each situation (e.g., one-month maturity IV_GBP during the opening period) that leading to better performance of IV_GBP to forecast RV_GBP.

4.5 Conclusion

This chapter presents the empirical analysis of the performance of IV to forecast the RV of the underlying currency of options through testing hypothesis 01 to hypothesis 09. The empirical analysis includes: estimating the IV based on the ATM price of call and put options with one-month, two-month and three-month maturity during the opening, midday, and closing period of a trading day; estimating the RV and using it as the proxy for the actual volatility; and assessing the performance of IV to forecast RV of underlying currency of options for the within-week, one-week, and one-month forecast horizon. The MZ regression is conducted based on the 630 sets of PCPs evaluating the performance of IV to forecast RV. The p-value (0000) of slope from regression stated that the null hypothesis is rejected at any level of significance. It implies that the slope coefficient is other than zero and one. Therefore, the coefficient of IV suggests it carry information content and has the explanatory power of the RV. It indicates that the IV with different options maturity subsumes the relevant information of underlying currency volatility for different forecast horizons.

Further, the R^2 (goodness-of-fit) of regression analysis measures the predictive power of the IV and the higher R^2 leading to the superior performance of IV to forecast RV. After considering higher R^2 from 630 regression analysis for the different forecast horizons, the overall findings are divided into three groups. First, for the within-week forecast horizon, two-month maturity closing period IV_AUD of Monday, IV_CAD, and IV_EUR of Tuesday, and one-month maturity closing period IV_CHF and IV_GBP of Thursday perform better to forecast RV_AUD, RV_CAD, RV_EUR, RV_CHF, and RV_GBP, respectively. It indicates that the IV obtained from the early of a week (Monday or Tuesday) and later of a week (Thursday) content relevant information to forecast RV for the within-week forecast horizon. Second, for the one-week forecast horizon, one-month maturity closing period IV_AUD, IV_CAD, IV_EUR, and IV_GBP of Monday, and IV_CHF of Tuesday is superior to forecast RV_AUD, RV_CAD, RV_EUR, RV_GBP, and RV_CHF, respectively. It suggests that the IV estimated in the early of a week (Monday or Tuesday) holds appropriate information to forecast RV for the one-week forecast horizon. Third, for the one-month forecast horizon, two-month maturity closing period IV_EUR and IV_GBP of Monday, and IV_AUD, IV_CAD, and IV_CHF of Tuesday perform better to forecast RV_EUR, RV_GBP, RV_AUD, RV_CAD, RV_CHF, respectively. It proves that the information content embedded in IV from early of a week (Monday or Tuesday) is informative to forecast RV for the one-month forecast horizon.

CHAPTER 5

Implied Volatility Estimating Currency Options Price

5.1 Introduction

This chapter conducts empirical analysis in two steps for testing hypothesis 10 to hypothesis 18 through the methodology developed in chapter 3. First, calculate the call options model price (CMOD) and put options model price (PMOD) using the ATM one-month, two-month, and three-month maturity IV obtained during the opening, midday, and closing period of a trading day as input for BS options pricing model. Second, estimate the options model pricing error by comparing the CMOD and PMOD with the call and put options market price, respectively, to evaluate the performance of IV for pricing currency options accurately, for the within-week, one-week, and one-month estimate horizon. Further, the within-week estimate horizon indicates that the IV is estimated one day to four days before the date of pricing currency options. Similarly, the one-week and one-month estimate horizon imply that the IV is estimated one-week and one-month before the date of pricing currency options, respectively.

5.2 Calculate options model price

In this section, the call and put options model prices are calculated for the within-week, one-week, and one-month estimate horizon. For the within-week estimate horizon, the appendix Table A5.1a describes the data of AUD options to compute the call options model price (AUDC_MOD) and put options model price (AUDP_MOD) employing one-month maturity IV_AUD. In column 13, the IV_AUD is calculated as in the equation (3.7), and section 4.2 discusses the calculation details. The IV_AUD of Monday, Tuesday, Wednesday, and Thursday is used as input for the equation (3.13) to estimate AUDC_MOD in column 17 at the corresponding time on Friday in the same week for the opening, midday, and closing period of a trading day in panels A, B, and C, respectively. Similarly, the IV_AUD of Monday, Tuesday, Wednesday, and Thursday is employed as input for the equation (3.14) to estimate AUDP_MOD in column 18 at the corresponding time on Friday in the same week for the opening, midday, and closing period of a trading day in panels A, B, and C, respectively. Further, appendix Tables A5.1b and A5.1c present the details of AUD options data for two-month and three-month maturity IV_AUD, respectively, to estimate AUDC_MOD and AUDP_MOD. Similarly, one-month, two-month and three-month maturity IV is employed to compute the model price of CAD options (appendix Tables A5.4a, A5.4b, and A5.4c), CHF options (appendix Tables A5.7a, A5.7b, and A5.7c), EUR options (appendix Tables A5.10a, A5.10b, and A5.10c), and GBP options (appendix Tables A5.13a, A5.13b, and A5.13c) are described.

For the one-week estimate horizon, the appendix Table A5.2a describes the data of AUD options to estimate AUDC_MOD and AUDP_MOD using one-month maturity IV_AUD. In column 13, the IV_AUD is computed as in the equation (3.7), and section 4.2 discusses the calculation details. The IV_AUD of Monday, Tuesday, Wednesday, Thursday, and Friday is employed as input for the equation (3.13) to calculated AUDC_MOD in column 17 at the corresponding time on Monday, Tuesday, Wednesday, Thursday, and Friday of the next week, respectively, for the opening, midday, and closing period of a trading day in panels A, B, and C, respectively. Similarly, the IV_AUD of Monday, Tuesday, Wednesday, Thursday, and Friday is used as input for the equation (3.14) to calculate AUDP_MOD in column 18 at the corresponding time on Monday, Tuesday, Wednesday, Thursday, and Friday of the next week, respectively, for the opening, midday, and closing period of a trading day in panels A, B, and C, respectively. Further, appendix Tables A5.2b and A5.2c show the details of AUD options

data for two-month and three-month maturity IV_AUD, respectively, to estimate AUDC_MOD and AUDP_MOD. Similarly, one-month, two-month and three-month maturity IV is used to estimate model price for the CAD options (appendix Tables A5.5a, A5.5b, and A5.5c), CHF options (appendix Tables A5.8a, A5.8b, and A5.8c), EUR options (appendix Tables A5.11a, A5.11b, and A5.11c), and GBP options (appendix Tables A5.14a, A5.14b, and A5.14c) are explained.

For the one-month estimate horizon, the appendix Table A5.3a explains the data of AUD options to estimate AUDC_MOD and AUDP_MOD using one-month maturity IV_AUD. In column 13, the IV_AUD is calculated as in the equation (3.7), and section 4.2 discusses the calculation details. The IV_AUD of Monday, Tuesday, Wednesday, Thursday, and Friday is used as input for the equation (3.13) to calculate AUDC_MOD in column 17 at the corresponding time on Monday, Tuesday, Wednesday, Thursday, and Friday of the next month, respectively, for the opening, midday, and closing period of a trading day in panels A, B, and C, respectively. Similarly, the IV_AUD of Monday, Tuesday, Wednesday, Thursday, and Friday is used as input for the equation (3.14) to compute AUDP_MOD in column 18 at the corresponding time on Monday, Tuesday, Wednesday, Thursday, and Friday of the next month, respectively, for the opening, midday, and closing period of a trading day in panels A, B, and C, respectively. Further, appendix Tables A5.3b and A5.3c provide the details of AUD options data for two-month and three-month maturity IV_AUD, respectively, to calculate AUDC_MOD and AUDP_MOD. Similarly, one-month, two-month and three-month maturity IV is employed to compute the model price for the CAD options (appendix Tables A5.6a, A5.6b, and A5.6c), CHF options (appendix Tables A5.9a, A5.9b, and A5.9c), EUR options (appendix Tables A5.12a, A5.12b, and A5.12c), and GBP options (appendix Tables A5.15a, A5.15b, and A5.15c) are explained.

5.3 Estimate options pricing error

The performance of IV to estimate currency options price is evaluated through OPE for the within-week, one-week, and one-month estimate horizon.

For within-week estimate horizon, the appendix Table A5.1a describes the data of AUD options to generate AUDC and AUDP for the one-month maturity IV_AUD. The AUDC_MOD of Friday in column 17 is compared with the call options market price (AUDC_MKT) at the corresponding time on Friday in the same week in column 19 to estimate the call OPE using MAE (equation 3.15), MSE (equation 3.16) and RMSE (equation 3.17) methods for the opening, midday, and closing period of a trading day in panels A, B, and C, respectively. Similarly, the AUDP_MOD of Friday in column 18 comparing with the put options market price (AUDP_MKT) at the corresponding time on Friday in the same week in column 20 to estimate the put OPE using MAE (equation 3.15), MSE (equation 3.16) and RMSE (equation 3.17) methods for the opening, midday, and closing period of a trading day in panels A, B, and C, respectively. Further, appendix Tables A5.1b and A5.1c present the details of AUD options for the one-month and two-month maturity IV_AUD, respectively, to estimate the call OPE and put OPE. Similarly, one-month, two-month and three-month maturity IV estimate call and put OPE for CAD options (Tables A5.4a, A5.4b, and A5.4c), CHF options (Tables A5.7a, A5.7b, and A5.7c), EUR options (Tables A5.10a, A5.10b, and A5.10c), and GBP options (Tables A5.13a, A5.13b, and A5.13c) are described.

For one-week estimate horizon, the appendix Table A5.2a explains the data of AUD options to generate AUDC and AUDP for the one-month maturity IV_AUD. The AUDC_MOD of Monday, Tuesday, Wednesday, Thursday and Friday in column 17 is compared with AUDC_MKT at the corresponding time on Monday, Tuesday, Wednesday, Thursday and Friday of the next week in column 19 to compute the call OPE under MAE (equation 3.15), MSE (equation 3.16) and RMSE (equation 3.17) methods for the opening, midday, and closing period of a trading day in panels A, B, and C, respectively. Similarly, the AUDP_MOD of Monday, Tuesday, Wednesday, Thursday and Friday in column 18 comparing with the AUDP_MKT at the corresponding time on Monday, Tuesday, Wednesday, Thursday and Friday of the next week in column 20 to estimate the put OPE using MAE (equation 3.15), MSE (equation 3.16) and RMSE (equation 3.17) methods for the opening, midday, and closing period of a trading day in panels A, B, and C, respectively. Further, appendix Tables A5.2b and A5.2c

provide the details of AUD options for the one-month and two-month maturity IV_AUD, respectively, to compute the call OPE and put OPE. Similarly, one-month, two-month and three-month maturity IV calculate call and put OPE for CAD options (Tables A5.5a, A5.5b, and A5.5c), CHF options (Tables A5.8a, A5.8b, and A5.8c), EUR options (Tables A5.11a, A5.11b, and A5.11c), and GBP options (Tables A5.14a, A5.14b, and A5.14c) are explained.

For the one-month estimate horizon, the appendix Table A5.3a describes the data of AUD options to generate AUDC and AUDP for the one-month maturity IV_AUD. The AUDC_MOD of Monday, Tuesday, Wednesday, Thursday and Friday in column 17 is compared with AUDC_MKT at the corresponding time on Monday, Tuesday, Wednesday, Thursday and Friday of the next month in column 19 to calculate the call OPE under MAE (equation 3.15), MSE (equation 3.16) and RMSE (equation 3.17) methods for the opening, midday, and closing period of a trading day in panels A, B, and C, respectively. Similarly, the AUDP_MOD of Monday, Tuesday, Wednesday, Thursday and Friday in column 18 is compared with the AUDP_MKT at the corresponding time on Monday, Tuesday, Wednesday, Thursday and Friday of the next month in column 20 to estimate the put OPE using MAE (equation 3.15), MSE (equation 3.16) and RMSE (equation 3.17) methods for the opening, midday, and closing period of a trading day in panels A, B, and C, respectively. Further, appendix Tables A5.3b and A5.3c provide the details of AUD options for the one-month and two-month maturity IV_AUD, respectively, to estimate the call OPE and put OPE. Similarly, one-month, two-month and three-month maturity IV estimate call and put OPE for CAD options (Tables A5.6 a, A5.6b, and A5.6c), CHF options (Tables A5.9a, A5.9b, and A5.9c), EUR options (Tables A5.12a, A5.12b, and A5.12c), and GBP options (Tables A5.15a, A5.15b, and A5.15c) are described.

5.4 Empirical analysis

The empirical analysis is conducted to estimate the currency OPE of one-month, two-month, and three-month maturity IV during the opening, midday, and closing period of a trading day for the within-week, one-week, and one-month estimate horizon. The mean absolute error (MAE), mean squared error (MSE), and root mean squared error (RMSE) methods are employed as in equation (3.15), equation (3.16), and equation (3.17), respectively, to measure OPE. Hypotheses 10 to 18 are examined through evaluating the minimum OPE for the AUD, CAD, CHF, EUR, and GBP options. Table 5.1 analyses the performance of IV_AUD to estimate AUD call (AUDC) and AUD put (AUDP) options price for the within-week estimate horizon. The hypothesis 10, hypothesis 11, and hypothesis 12 are tested for the opening, midday, and closing period of a trading day under MAE, MSE and RMSE measures and results are reported in the panels A, B, and C, respectively. For MAE measure, one-month maturity, Monday, and closing period IV_AUD perform better to calculate AUDC (pricing errors = 0.1389) and AUDP (pricing errors = 0.0687) options price of Friday in the same week. Similarly, two-month maturity, Monday, and closing period IV_AUD is superior to estimate the value of AUDC (pricing error = 0.1374) and AUDP (pricing error = 0.0679) options. Further, the three-month maturity, Monday, and closing period IV_AUD outperform to compute AUDC (pricing error = 0.1397) and AUDP (pricing error = 0.0799) options price. However, two-month maturity, Monday, and closing period IV_AUD provide lower pricing error (AUDC pricing error = 0.1374 and AUDP pricing error = 0.0679) under MAE measure. Similarly, MSE measure generates lower pricing error (AUDC pricing error = 0.0361 and AUDP pricing error = 0.0091) for two-month maturity, Monday, and closing period IV_AUD. The RMSE measure also generates the lower pricing error (AUDC pricing error = 0.1901 and AUDP pricing error = 0.0954) for the two-month maturity, Monday, and closing period IV_AUD. The overall results suggest that two-month maturity, Monday, and closing period IV_AUD is superior to estimate the price of AUDC and AUDP options correctly with a minimum pricing error under all measures.

Table 5. 1: IV_AUD estimate AUD options price for within-week estimate horizon

Horizon	Options	One-month maturity IV_AUD (hypothesis10)			Two-month maturity IV_AUD (hypothesis11)			Three-month maturity IV_AUD (hypothesis12)		
		OP	MD	CL	OP	MD	CL	OP	MD	CL
Panel A: Pricing error under MAE measure										
Mon to	AUDC	0.1949	0.2549	0.1389*	0.1866	0.2413	0.1374*	0.1939	0.2374	0.1397*
Fri	AUDP	0.1338	0.1032	0.0687**	0.1256	0.0873	0.0679**	0.1152	0.1285	0.0799**
Tue to	AUDC	0.2081	0.2481	0.1439	0.1858	0.2352	0.1403	0.1896	0.2231	0.1497
Fri	AUDP	0.1095	0.0948	0.0821	0.1263	0.096	0.0722	0.1179	0.1061	0.0752
Wed to	AUDC	0.2115	0.2335	0.1543	0.2022	0.2328	0.1405	0.1907	0.2259	0.1414
Fri	AUDP	0.1213	0.1027	0.0733	0.131	0.1016	0.0775	0.1212	0.0992	0.0789
Thu to	AUDC	0.1932	0.2374	0.1552	0.1994	0.2427	0.1452	0.1996	0.2212	0.1494
Fri	AUDP	0.1105	0.0957	0.0773	0.1263	0.0932	0.0713	0.1266	0.1032	0.0772
Panel B: Pricing error under MSE measure										
Mon to	AUDC	0.0799	0.1209	0.0382*	0.0663	0.1097	0.0361*	0.0709	0.0955	0.0391*
Fri	AUDP	0.0444	0.0447	0.0108**	0.0339	0.0136	0.0091**	0.0291	0.0267	0.0123**
Tue to	AUDC	0.0776	0.1185	0.0482	0.0663	0.1018	0.0419	0.0589	0.0876	0.0505
Fri	AUDP	0.0273	0.0427	0.0405	0.0318	0.0167	0.0113	0.0276	0.0197	0.0215
Wed to	AUDC	0.0830	0.1201	0.0557	0.0733	0.1011	0.0371	0.0697	0.0889	0.0491
Fri	AUDP	0.0376	0.0343	0.0113	0.0357	0.0183	0.0130	0.0309	0.0191	0.0219
Thu to	AUDC	0.0726	0.1226	0.0443	0.0745	0.1100	0.0414	0.0782	0.0899	0.0454
Fri	AUDP	0.0258	0.0330	0.0327	0.0294	0.0153	0.0104	0.0369	0.0185	0.0232
Panel C: Pricing error under RMSE measure										
Mon to	AUDC	0.2827	0.3478	0.1955*	0.2575	0.3313	0.1901*	0.2663	0.3091	0.1977*
Fri	AUDP	0.2106	0.2115	0.1041**	0.1843	0.1168	0.0954**	0.1706	0.1635	0.1109**
Tue to	AUDC	0.2785	0.3442	0.2195	0.2574	0.3191	0.2047	0.2428	0.2960	0.2247
Fri	AUDP	0.1651	0.2066	0.2012	0.1783	0.1293	0.1063	0.1662	0.1403	0.2072
Wed to	AUDC	0.2881	0.3466	0.2360	0.2708	0.3179	0.1926	0.2641	0.2982	0.2977
Fri	AUDP	0.1939	0.1851	0.1063	0.1891	0.1353	0.1140	0.1759	0.1381	0.2091
Thu to	AUDC	0.2694	0.3501	0.2105	0.2729	0.3317	0.2035	0.2797	0.2998	0.2131
Fri	AUDP	0.1606	0.1816	0.1808	0.1715	0.1236	0.1020	0.1922	0.1361	0.2149

Notes: This table analyses the performance of IV_AUD to estimate AUD call (AUDC) and AUD put (AUDP) options price for the within-week estimate horizon. The hypothesis 10, hypothesis 11, and hypothesis 12 are tested for the opening, midday, and closing period of a trading day under MAE, MSE and RMSE measures and results are reported in the panels A, B, and C, respectively. OP, MD and CL denoting opening period, midday period and closing period, respectively.
The 'mean absolute error', 'mean squared error' and 'root mean squared error' denoting by MAE, MSE and RMSE, respectively.
AUDC and AUDP denoting AUD call and AUD put, respectively.
* indicating minimum pricing error for AUDC options price.
** indicating minimum pricing error for AUDP options price.

Table 5.2 analyses the performance of IV_AUD to estimate AUDC and AUDP options price for the one-week estimate horizon. The hypothesis13, hypothesis14, and hypothesis15 are tested for the opening period, midday period, and closing period under MAE, MSE and RMSE measures and results are reported in the panels A, B, and C, respectively. For MAE measure, one-month maturity, Monday, and closing period IV_AUD perform better to calculate AUDC (pricing errors = 0.1427) and AUDP (pricing errors = 0.0563) options price of Monday in next week. Similarly, two-month maturity, Monday, and closing period IV_AUD is superior to estimate the price of AUDC (pricing error = 0.1497) and AUDP (pricing error = 0.0617) options. Further, the three-month maturity, Monday, and closing period IV_AUD outperform to compute AUDC (pricing error = 0.1551) and AUDP (pricing error = 0.0796) options price. However, one-month maturity, Monday, and closing period IV_AUD show lower pricing error (AUDC pricing error = 0.1427 and AUDP pricing error = 0.0563) under MAE measure. Similarly, MSE measure provides lower pricing error (AUDC pricing error = 0.0441 and AUDP pricing error = 0.0074) for one-month maturity, Monday, and closing period IV_AUD. The RMSE measure also estimates the lower pricing error (AUDC pricing error = 0.2100 and AUDP pricing error = 0.0858) for the one-month maturity, Monday, and closing period IV_AUD. The overall results imply that one-month maturity, Monday, and closing period IV_AUD outperform to estimate the value of AUDC and AUDP options precisely with a minimum pricing error under all measures.

Table 5. 2: IV_AUD estimate AUD options price for one-week estimate horizon

Horizon	Options	One-month maturity IV_AUD (hypothesis 13)			Two-month maturity IV_AUD (hypothesis 14)			Three-month maturity IV_AUD (hypothesis 15)		
		OP	MD	CL	OP	MD	CL	OP	MD	CL
Panel A: Pricing error under MAE measure										
Mon to	AUDC	0.1762	0.1767	0.1427*	0.1750	0.1779	0.1497*	0.1849	0.1912	0.1551*
Mon	AUDP	0.0760	0.0763	0.0563*	0.0745	0.0778	0.0617**	0.1002	0.1006	0.0796**
Tue to	AUDC	0.1824	0.1843	0.1513	0.1760	0.1815	0.1548	0.1593	0.1838	0.1634
Tue	AUDP	0.0706	0.0805	0.0641	0.0813	0.0852	0.0711	0.0942	0.0967	0.0824
Wed to	AUDC	0.1872	0.1802	0.1873	0.2051	0.2090	0.2042	0.1978	0.1936	0.1958
Wed	AUDP	0.0856	0.0866	0.0752	0.0901	0.0908	0.0829	0.0924	0.0961	0.0915
Thu to	AUDC	0.1701	0.1961	0.1560	0.2100	0.2221	0.1584	0.1800	0.2092	0.2598
Thu	AUDP	0.0873	0.0892	0.0766	0.0879	0.0900	0.0834	0.1002	0.1006	0.0903
Fri to	AUDC	0.2091	0.2645	0.1463	0.2310	0.2572	0.1558	0.2329	0.2435	0.2552
Fri	AUDP	0.1185	0.1042	0.0698	0.0793	0.1001	0.0753	0.0756	0.1117	0.0812
Panel B: Pricing error under MSE measure										
Mon to	AUDC	0.0659	0.0661	0.0441*	0.0567	0.0578	0.0502*	0.0670	0.0796	0.0457*
Mon	AUDP	0.0123	0.0123	0.0074**	0.0112	0.0113	0.0084**	0.0202	0.0307	0.0177**
Tue to	AUDC	0.0649	0.0597	0.0497	0.0547	0.0596	0.0647	0.0567	0.0614	0.0546
Tue	AUDP	0.0133	0.0151	0.0096	0.0139	0.0135	0.0114	0.0140	0.0165	0.0239
Wed to	AUDC	0.0885	0.0789	0.0799	0.0889	0.0872	0.0961	0.0801	0.0709	0.0929
Wed	AUDP	0.0165	0.0232	0.0157	0.0165	0.0204	0.0158	0.0180	0.0200	0.0267
Thu to	AUDC	0.0555	0.0735	0.0505	0.0675	0.0902	0.0543	0.0680	0.0796	0.0545
Thu	AUDP	0.0178	0.0191	0.0134	0.0198	0.0152	0.0390	0.0201	0.0204	0.0184
Fri to	AUDC	0.0783	0.1336	0.0468	0.0988	0.1169	0.0544	0.1020	0.1036	0.0498
Fri	AUDP	0.0332	0.0498	0.0108	0.0335	0.0190	0.0394	0.0210	0.0223	0.0244
Panel C: Pricing error under RMSE measure										
Mon to	AUDC	0.2567	0.2571	0.2100*	0.2381	0.2405	0.2139*	0.2588	0.2822	0.2240*
Mon	AUDP	0.1109	0.1109	0.0858**	0.1058	0.1062	0.0919**	0.1421	0.1753	0.1179**
Tue to	AUDC	0.2548	0.2444	0.2229	0.2339	0.2441	0.2544	0.2381	0.2478	0.2337
Tue	AUDP	0.1153	0.1228	0.0980	0.1179	0.1162	0.1068	0.1183	0.1285	0.1279
Wed to	AUDC	0.2975	0.2809	0.2827	0.2982	0.2953	0.3100	0.2830	0.2662	0.3048
Wed	AUDP	0.1285	0.1522	0.1253	0.1285	0.1428	0.1257	0.1342	0.1413	0.1292
Thu to	AUDC	0.2356	0.2712	0.2247	0.2598	0.3003	0.2330	0.2608	0.2821	0.2335
Thu	AUDP	0.1334	0.1380	0.1158	0.1407	0.1232	0.1975	0.1418	0.1427	0.1356
Fri to	AUDC	0.2797	0.3655	0.2229	0.3143	0.3420	0.2544	0.3194	0.3218	0.2332
Fri	AUDP	0.1822	0.2233	0.0980	0.1830	0.1377	0.1068	0.1449	0.1493	0.1200

Notes: This table analyses the performance of IV_AUD to estimate AUDC and AUDP options price for the one-week estimate horizon. The hypothesis13, hypothesis14, and hypothesis15 are tested for the opening period, midday period, and closing period under MAE, MSE and RMSE measures and results are reported in the panels A, B, and C, respectively. OP, MD and CL denoting opening period, midday period and closing period, respectively.

The 'mean absolute error', 'mean squared error' and 'root mean squared error' denoting by MAE, MSE and RMSE, respectively.

AUDC and AUDP denoting AUD call and AUD put, respectively.

* indicating minimum pricing error for AUDC options price.

** indicating minimum pricing error for AUDP options price.

Table 5.3 analyses the performance of IV_AUD to estimate AUDC and AUDP options price for the one-month horizon. The hypothesis 16, hypothesis 17, and hypothesis 18 are tested for the opening period, midday period, and closing period under MAE, MSE and RMSE measures and results are given in the panels A, B, and C, respectively. For MAE measure, one-month maturity, Tuesday, and closing period IV_AUD outperform to estimate AUDC (pricing errors = 0.1467) and AUDP (pricing errors = 0.0912) options price of Tuesday in next month. Similarly, two-month maturity, Tuesday, and closing period IV_AUD is superior to estimate AUDC (pricing error = 0.1447) and AUDP (pricing error = 0.0777) options price. Further, the three-month maturity, Tuesday, and closing period IV_AUD perform better to compute the price of AUDC (pricing error = 0.1521) and AUDP (pricing error = 0.0942) options. However, two-month maturity, Tuesday, and closing period IV_AUD show lower pricing error (AUDC pricing error = 0.1447 and AUDP pricing error = 0.0777) under MAE measure. Similarly, MSE measure generates lower pricing error (AUDC pricing error = 0.0431 and AUDP pricing error = 0.0128) for two-month maturity, Tuesday, and closing period IV_AUD. The RMSE measure also estimates the lower pricing error (AUDC pricing error = 0.2076 and AUDP pricing error = 0.1132) for the two-month maturity, Tuesday, and closing period IV_AUD. The overall results indicate that two-month maturity, Tuesday, and closing period IV_AUD better to estimate AUDC and AUDP options price accurately with a minimum pricing error under all measures.

Table 5. 3: IV_AUD estimate AUD options price for one-month estimate horizon

Horizon	Options	One-month maturity IV_AUD (hypothesis 16)			Two-month maturity IV_AUD (hypothesis 17)			Three-month Maturity IV_AUD (hypothesis 18)		
		OP	MD	CL	OP	MD	CL	OP	MD	CL
Panel A: Pricing error under MAE measure										
Mon to	AUDC	0.1478	0.1763	0.1589	0.1462	0.1839	0.1513	0.1922	0.1845	0.1540
Mon	AUDP	0.1235	0.0873	0.0914	0.1285	0.0856	0.0778	0.1111	0.1086	0.0989
Tue to	AUDC	0.1765	0.1724	0.1467*	0.1838	0.1738	0.1447*	0.2130	0.1858	0.1521*
Tue	AUDP	0.1232	0.1012	0.0912**	0.1123	0.0906	0.0777**	0.1237	0.1088	0.0942**
Wed to	AUDC	0.1890	0.1900	0.1856	0.1837	0.1896	0.1800	0.1900	0.1935	0.1897
Wed	AUDP	0.1204	0.1004	0.1020	0.1106	0.0933	0.0970	0.1470	0.1104	0.1112
Thu to	AUDC	0.1700	0.2120	0.1601	0.1665	0.2100	0.1542	0.2376	0.2057	0.1630
Thu	AUDP	0.1224	0.1144	0.0913	0.1101	0.1070	0.0871	0.1404	0.1180	0.1066
Fri to	AUDC	0.2004	0.2459	0.1659	0.1924	0.2412	0.1546	0.2147	0.2211	0.1722
Fri	AUDP	0.1235	0.1205	0.0862	0.1148	0.1050	0.0780	0.1351	0.1219	0.0983
Panel B: Pricing error under MSE measure										
Mon to	AUDC	0.0512	0.0700	0.0508	0.0478	0.0663	0.0453	0.0736	0.0662	0.0463
Mon	AUDP	0.0805	0.0353	0.0286	0.0666	0.0216	0.0181	0.0263	0.0309	0.0220
Tue to	AUDC	0.0812	0.0702	0.0501*	0.0789	0.0531	0.0431*	0.0862	0.0589	0.0434*
Tue	AUDP	0.0345	0.0375	0.0201**	0.0248	0.0175	0.0128**	0.0299	0.0233	0.0170**
Wed to	AUDC	0.0801	0.0912	0.0977	0.0743	0.0819	0.0775	0.0700	0.0728	0.0877
Wed	AUDP	0.0456	0.0364	0.0401	0.0322	0.0218	0.0241	0.0707	0.0278	0.0279
Thu to	AUDC	0.0741	0.0901	0.0645	0.0611	0.0851	0.0482	0.1120	0.0773	0.0511
Thu	AUDP	0.0512	0.0615	0.0213	0.0315	0.0300	0.0185	0.0441	0.0317	0.0265
Fri to	AUDC	0.0813	0.1086	0.0610	0.0742	0.1097	0.0502	0.0951	0.0883	0.0622
Fri	AUDP	0.0512	0.0312	0.0202	0.0313	0.0295	0.0132	0.0506	0.0310	0.0207
Panel C: Pricing error under RMSE measure										
Mon to	AUDC	0.2263	0.2646	0.2254	0.2185	0.2575	0.2128	0.2713	0.2574	0.2152
Mon	AUDP	0.2837	0.1879	0.1691	0.2580	0.1470	0.1347	0.1622	0.1758	0.1484
Tue to	AUDC	0.2850	0.2650	0.2238*	0.2808	0.2303	0.2076*	0.2935	0.2426	0.2082*
Tue	AUDP	0.1857	0.1936	0.1418**	0.1574	0.1322	0.1132**	0.1728	0.1525	0.1302**
Wed to	AUDC	0.2830	0.3020	0.3126	0.2727	0.2862	0.2784	0.2646	0.2698	0.2961
Wed	AUDP	0.2135	0.1908	0.2002	0.1795	0.1475	0.1552	0.2659	0.1666	0.1670
Thu to	AUDC	0.2722	0.3002	0.2540	0.2472	0.2917	0.2195	0.3347	0.2780	0.2261
Thu	AUDP	0.2263	0.2480	0.1459	0.1775	0.1733	0.1360	0.2101	0.1781	0.1628
Fri to	AUDC	0.2851	0.3295	0.2470	0.2724	0.3312	0.2241	0.3084	0.2971	0.2494
Fri	AUDP	0.2263	0.1766	0.1421	0.1768	0.1719	0.1149	0.2249	0.1761	0.1439

Notes: This table analyses the performance of IV_AUD to estimate AUDC and AUDP options price for the one-month horizon. The hypothesis 16, hypothesis 17, and hypothesis 18 are tested for the opening period, midday period, and closing period under MAE, MSE and RMSE measures and results are given in the panels A, B, and C, respectively.OP, MD and CL denoting opening period, midday period and closing period, respectively.

The 'mean absolute error', 'mean squared error' and 'root mean squared error' denoting by MAE, MSE and RMSE, respectively.

AUDC and AUDP denoting AUD call and AUD put, respectively.

* indicating minimum pricing error for AUDC options price.

** indicating minimum pricing error for AUDP options price.

Table 5.4 analyses the performance of IV_CAD to estimate CAD call (CADC) and CAD put (CADP) options price for the within-week horizon. The hypothesis10, hypothesis11, and hypothesis12 are tested for the opening period, midday period, and closing period under MAE, MSE and RMSE measures and results are reported in the panels A, B, and C, respectively. For MAE measure, one-month maturity, Thursday, and closing period IV_CAD superior to estimate the value of CADC (pricing errors = 0.1247) and CADP (pricing errors = 0.0569) options of Friday in the same week. Similarly, two-month maturity, Thursday, and closing period IV_CAD outperform to the value of CADC (pricing error = 0.1334) and CADP (pricing error = 0.0597) options. Further, the three-month maturity, Thursday, and closing period IV_CAD is superior to compute CADC (pricing error = 0.1389) and CADP (pricing error = 0.0652) options price. However, one-month maturity, Thursday, and closing period IV_CAD provide lower pricing error (CADC pricing error = 0.1247 and CADP pricing error = 0.0569) under MAE measure. Similarly, MSE measure generates lower pricing error (CADC pricing error = 0.0310 and CADP pricing error = 0.0062) for one-month maturity, Thursday, and closing period IV_CAD. The RMSE measure also estimates the lower pricing error (CADC pricing error = 0.1762 and CADP pricing error = 0.0789) for the one-month maturity, Thursday, and closing period IV_CAD. The overall results imply that one-month maturity, Thursday, and closing period IV_CAD outperform to estimate CADC and CADP options price correctly with a minimum pricing error under all measures.

Table 5. 4: IV_CAD estimate CAD options price for within-week estimate horizon

Horizon	Options	One-month maturity IV_CAD (hypothesis 10)			Two-month maturity IV_CAD (hypothesis 11)			Three-month Maturity IV_CAD (hypothesis 12)		
		OP	MD	CL	OP	MD	CL	OP	MD	CL
Panel A: Pricing error under MAE measure										
Mon to	CADC	0.1725	0.1412	0.1317	0.1739	0.1642	0.1396	0.1576	0.2190	0.1448
Fri	CADP	0.0938	0.0895	0.0639	0.0912	0.0886	0.0645	0.0923	0.0872	0.0668
Tue to	CADC	0.1841	0.2179	0.1350	0.1727	0.2191	0.1456	0.1623	0.2270	0.1424
Fri	CADP	0.0942	0.0853	0.0580	0.0951	0.0789	0.0597	0.0925	0.0903	0.0677
Wed to	CADC	0.1862	0.1982	0.1388	0.1816	0.2220	0.1460	0.1596	0.2312	0.1544
Fri	CADP	0.1071	0.0879	0.0629	0.1048	0.0836	0.0631	0.0958	0.0913	0.0752
Thu to	CADC	0.1860	0.1901	0.1247*	0.1770	0.2138	0.1334*	0.1622	0.1553	0.1389*
Fri	CADP	0.1016	0.0931	0.0569**	0.0972	0.0840	0.0597**	0.0859	0.0753	0.0652**
Panel B: Pricing error under MSE measure										
Mon to	CADC	0.0581	0.0520	0.0374	0.0541	0.0435	0.0471	0.0476	0.0851	0.0431
Fri	CADP	0.0203	0.0134	0.0090	0.0172	0.0165	0.0117	0.0403	0.0152	0.0089
Tue to	CADC	0.0681	0.1072	0.0316	0.0554	0.0875	0.0808	0.0494	0.0872	0.0417
Fri	CADP	0.0232	0.0147	0.0082	0.0223	0.0110	0.0090	0.0386	0.0170	0.0093
Wed to	CADC	0.0883	0.0679	0.0349	0.0732	0.0867	0.0475	0.0604	0.0925	0.0458
Fri	CADP	0.0564	0.0187	0.0082	0.0379	0.0141	0.0086	0.0496	0.0175	0.0098
Thu to	CADC	0.0776	0.0671	0.0310*	0.0694	0.0792	0.0397*	0.0599	0.0645	0.0366*
Fri	CADP	0.0334	0.0204	0.0062**	0.0325	0.0129	0.0064**	0.0273	0.0348	0.0088**
Panel C: Pricing error under RMSE measure										
Mon to	CADC	0.2410	0.2280	0.1934	0.2326	0.2086	0.2170	0.2181	0.2918	0.2076
Fri	CADP	0.1426	0.1158	0.0949	0.1310	0.1285	0.1082	0.2008	0.1234	0.0943
Tue to	CADC	0.2609	0.3274	0.1778	0.2353	0.2958	0.2843	0.2223	0.2953	0.2042
Fri	CADP	0.1523	0.1213	0.0909	0.1494	0.1050	0.0949	0.1964	0.1305	0.0964
Wed to	CADC	0.2972	0.2605	0.1868	0.2706	0.2945	0.2179	0.2457	0.3041	0.2140
Fri	CADP	0.2375	0.1366	0.0906	0.1947	0.1186	0.0927	0.2227	0.1324	0.0938
Thu to	CADC	0.2786	0.2591	0.1762*	0.2635	0.2815	0.1994*	0.2448	0.2540	0.1914*
Fri	CADP	0.1828	0.1428	0.0789**	0.1802	0.1135	0.0797**	0.1653	0.1865	0.0938**

Notes: This table analyses the performance of IV_CAD to estimate CAD call (CADC) and CAD put (CADP) options price for the within-week horizon. The hypothesis10, hypothesis11, and hypothesis12 are tested for the opening period, midday period, and closing period under MAE, MSE and RMSE measures and results are reported in the panels A, B, and C, respectively. OP, MD and CL denoting opening period, midday period and closing period, respectively.
The 'mean absolute error', 'mean squared error' and 'root mean squared error' denoting by MAE, MSE and RMSE, respectively.
CADC and CADP denoting CAD call and CAD put, respectively.
* indicating minimum pricing error for CADC options price.
** indicating minimum pricing error for CADP options price.

Table 5.5 analyses the performance of IV_CAD to estimate CADC and CADP options price for the one-week horizon. The hypothesis13, hypothesis14, and hypothesis15 are tested for the opening period, midday period, and closing period under MAE, MSE and RMSE measures and results are reported in the panels A, B, and C, respectively. For MAE measure, one-month maturity, Monday, and closing period IV_CAD outperform to compute the value of CADC (pricing errors = 0.1136) and CADP (pricing errors = 0.0551) options of Monday in next week. Similarly, two-month maturity, Monday, and closing period IV_CAD is better to estimate the price of CADC (pricing error = 0.1186) and CADP (pricing error = 0.0573) options. Further, the three-month maturity, Monday, and closing period IV_CAD outperform to calculate CADC (pricing error = 0.1372) and CADP (pricing error = 0.0599) options price. However, one-month maturity, Monday, and closing period IV_CAD provide lower pricing error (CADC pricing error = 0.1136 and CADP pricing error = 0.0551) under MAE measure. Similarly, MSE measure generates lower pricing error (CADC pricing error = 0.0236 and CADP pricing error = 0.0061) for one-month maturity, Monday, and closing period IV_CAD. The RMSE measure also computes the lower pricing error (CADC pricing error = 0.1417 and CADP pricing error = 0.0778) for the one-month maturity, Monday, and closing period IV_CAD. The overall results suggest that one-month maturity, Monday, and closing period IV_CAD perform better to estimate the value of CADC and CADP options precisely with a minimum pricing error under all measures.

Table 5. 5: IV_CAD estimate CAD options price for one-week estimate horizon

Horizon	Options	One-month maturity IV_CAD (hypothesis 13)			Two-month maturity IV_CAD (hypothesis 14)			Three-month Maturity IV_CAD (hypothesis 15)		
		OP	MD	CL	OP	MD	CL	OP	MD	CL
Panel A: Pricing error under MAE measure										
Mon to	CADC	0.1278	0.1348	0.1136*	0.1396	0.1801	0.1186*	0.1565	0.1687	0.1372*
Mon	CADP	0.0780	0.0722	0.0551**	0.0735	0.0717	0.0573**	0.0789	0.0766	0.0599**
Tue to	CADC	0.1452	0.1730	0.1276	0.1480	0.1933	0.1405	0.1442	0.2011	0.1432
Tue	CADP	0.0847	0.0845	0.0570	0.0871	0.0736	0.0580	0.1003	0.0815	0.0649
Wed to	CADC	0.1442	0.1647	0.1288	0.1440	0.2157	0.1680	0.1409	0.2322	0.1690
Wed	CADP	0.1012	0.1023	0.0636	0.1024	0.0832	0.0855	0.0952	0.0919	0.0684
Thu to	CADC	0.1317	0.1520	0.1259	0.1383	0.2042	0.1418	0.1460	0.2049	0.1473
Thu	CADP	0.0836	0.0890	0.0608	0.0752	0.0798	0.0648	0.0895	0.0859	0.0763
Fri to	CADC	0.1720	0.2068	0.1363	0.1766	0.2283	0.1416	0.1693	0.2383	0.1413
Fri	CADP	0.0995	0.0915	0.0554	0.1058	0.0802	0.0615	0.0931	0.0990	0.0702
Panel B: Pricing error under MSE measure										
Mon to	CADC	0.0320	0.0341	0.0236*	0.0377	0.0697	0.0240*	0.0405	0.0493	0.0358*
Mon	CADP	0.0182	0.0119	0.0061**	0.0107	0.0147	0.0075**	0.0091	0.0121	0.0068**
Tue to	CADC	0.0622	0.0586	0.0346	0.0437	0.0694	0.0422	0.0418	0.0768	0.0439
Tue	CADP	0.0164	0.0164	0.0080	0.0155	0.0107	0.0081	0.0250	0.0123	0.0088
Wed to	CADC	0.0758	0.0552	0.0313	0.0593	0.0957	0.0587	0.0576	0.1091	0.0596
Wed	CADP	0.0562	0.0281	0.0081	0.0457	0.0172	0.0365	0.0466	0.0189	0.0087
Thu to	CADC	0.0385	0.0409	0.0308	0.0363	0.0744	0.0341	0.0405	0.0721	0.0401
Thu	CADP	0.0160	0.0198	0.0080	0.0137	0.0137	0.0133	0.0427	0.0163	0.0192
Fri to	CADC	0.0631	0.0715	0.0336	0.0583	0.0882	0.0554	0.0555	0.1024	0.0481
Fri	CADP	0.0250	0.0202	0.0063	0.0265	0.0127	0.0075	0.0238	0.0271	0.0106
Panel C: Pricing error under RMSE measure										
Mon to	CADC	0.1789	0.1847	0.1417*	0.1942	0.2640	0.1549*	0.2012	0.2220	0.1892*
Mon	CADP	0.1349	0.1089	0.0778**	0.1033	0.1213	0.0866**	0.0954	0.1100	0.0824**
Tue to	CADC	0.2493	0.2421	0.1860	0.2091	0.2634	0.2054	0.2043	0.2771	0.2095
Tue	CADP	0.1282	0.1280	0.0894	0.1246	0.1036	0.0900	0.1580	0.1109	0.0938
Wed to	CADC	0.2753	0.2350	0.1769	0.2435	0.3094	0.2423	0.2399	0.3302	0.2441
Wed	CADP	0.2371	0.1677	0.0900	0.2137	0.1313	0.1910	0.2159	0.1373	0.0933
Thu to	CADC	0.1962	0.2023	0.1755	0.1904	0.2727	0.1847	0.2013	0.2685	0.2002
Thu	CADP	0.1266	0.1407	0.0894	0.1170	0.1170	0.1153	0.2066	0.1276	0.1386
Fri to	CADC	0.2511	0.2673	0.1833	0.2415	0.2969	0.2354	0.2356	0.3199	0.1952
Fri	CADP	0.1581	0.1422	0.0794	0.1627	0.1127	0.0866	0.1541	0.1646	0.1030

Notes: This table analyses the performance of IV_CAD to estimate CADC and CADP options price for the one-week horizon. The hypothesis13, hypothesis14, and hypothesis15 are tested for the opening period, midday period, and closing period under MAE, MSE and RMSE measures and results are reported in the panels A, B, and C, respectively.OP, MD and CL denoting opening period, midday period and closing period, respectively.

The 'mean absolute error', 'mean squared error' and 'root mean squared error' denoting by MAE, MSE and RMSE, respectively.

CADC and CADP denoting CAD call and CAD put, respectively.

* indicating minimum pricing error for CADC options price.

** indicating minimum pricing error for CADP options price.

Table 5.6 analyses the performance of IV_CAD to estimate CADC and CADP options price for the one-month horizon. The hypothesis 16, hypothesis 17, and hypothesis 18 are tested for the opening period, midday period, and closing period under MAE, MSE and RMSE measures and results are reported in the panels A, B, and C, respectively. For MAE measure, one-month maturity, Tuesday, and closing period IV_CAD outperform to calculate CADC (pricing errors = 0.1201) and CADP (pricing errors = 0.0709) options price of Tuesday in next month. Similarly, two-month maturity, Tuesday, and closing period IV_CAD is superior to estimate the price of CADC (pricing error = 0.1197) and CADP (pricing error = 0.0649) options. Further, the three-month maturity, Tuesday, and closing period IV_CAD is better to estimate CADC (pricing error = 0.1342) and CADP (pricing error = 0.0691) options price. However, two-month maturity, Tuesday, and closing period IV_CAD show lower pricing error (CADC pricing error = 0.1197 and CADP pricing error = 0.0649) under MAE measure. Similarly, MSE measure provides lower pricing error (CADC pricing error = 0.0273 and CADP pricing error = 0.0103) for two-month maturity, Tuesday, and closing period IV_CAD. The RMSE measure also generates the lower pricing error (CADC pricing error = 0.1651 and CADP pricing error = 0.1014) for the two-month maturity, Tuesday, and closing period IV_CAD. The overall results indicate that two-month maturity, Tuesday, and closing period IV_CAD outperform to calculate the value of CADC and CADP options precisely with a minimum pricing error under all measures.

Table 5. 6: IV_CAD estimate CAD options price for one-month estimate horizon

Horizon	Options	One-month maturity IV_CAD (hypothesis 16)			Two-month maturity IV_CAD (hypothesis 17)			Three-month Maturity IV_CAD (hypothesis 18)		
		OP	MD	CL	OP	MD	CL	OP	MD	CL
Panel A: Pricing error under MAE measure										
Mon to	CADC	0.1301	0.1701	0.1420	0.1234	0.1698	0.1266	0.1380	0.1739	0.1423
Mon	CADP	0.0854	0.0901	0.0724	0.0775	0.0820	0.0656	0.0902	0.0844	0.0737
Tue to	CADC	0.1502	0.1624	0.1201*	0.1593	0.1654	0.1197*	0.1723	0.1909	0.1342*
Tue	CADP	0.0865	0.0901	0.0709**	0.0844	0.0839	0.0649**	0.1010	0.0866	0.0691**
Wed to	CADC	0.1714	0.1924	0.1632	0.1689	0.1982	0.1532	0.1426	0.2170	0.1599
Wed	CADP	0.1089	0.1124	0.0816	0.1073	0.1042	0.0756	0.0991	0.0964	0.0781
Thu to	CADC	0.1423	0.1923	0.1346	0.1415	0.1949	0.1246	0.1453	0.2059	0.1476
Thu	CADP	0.1020	0.0918	0.0761	0.0941	0.0808	0.0661	0.0956	0.0917	0.0772
Fri to	CADC	0.1856	0.1952	0.1421	0.1847	0.1852	0.1350	0.1808	0.2152	0.1381
Fri	CADP	0.1102	0.1180	0.0820	0.1026	0.1080	0.0720	0.1193	0.0917	0.0824
Panel B: Pricing error under MSE measure										
Mon to	CADC	0.0415	0.0651	0.0428	0.0315	0.0561	0.0308	0.0378	0.0517	0.0375
Mon	CADP	0.0196	0.0192	0.0212	0.0136	0.0184	0.0111	0.0176	0.0168	0.0209
Tue to	CADC	0.0852	0.0613	0.0312*	0.0762	0.0530	0.0273*	0.0587	0.0650	0.0310*
Tue	CADP	0.0253	0.0282	0.0203**	0.0143	0.0169	0.0103**	0.0218	0.0158	0.0137**
Wed to	CADC	0.0931	0.0867	0.0582	0.0831	0.0767	0.0482	0.0453	0.0861	0.0495
Wed	CADP	0.0664	0.0501	0.0239	0.0564	0.0401	0.0139	0.0316	0.0260	0.0226
Thu to	CADC	0.0712	0.0969	0.0392	0.0612	0.0890	0.0289	0.0329	0.0750	0.0447
Thu	CADP	0.0320	0.0239	0.0242	0.0210	0.0139	0.0114	0.0268	0.0187	0.0219
Fri to	CADC	0.0816	0.0696	0.0615	0.0716	0.0596	0.0316	0.0593	0.0829	0.0515
Fri	CADP	0.0327	0.0502	0.0231	0.0227	0.0402	0.0131	0.0334	0.0180	0.0257
Panel C: Pricing error under RMSE measure										
Mon to	CADC	0.2037	0.2551	0.2069	0.1774	0.2369	0.1755	0.1943	0.2274	0.1936
Mon	CADP	0.1400	0.1386	0.1456	0.1168	0.1355	0.1052	0.1327	0.1296	0.2042
Tue to	CADC	0.2919	0.2476	0.1766*	0.2761	0.2303	0.1651*	0.2423	0.2550	0.1761*
Tue	CADP	0.1591	0.1679	0.1425**	0.1197	0.1298	0.1014**	0.1475	0.1256	0.1170**
Wed to	CADC	0.3051	0.2944	0.2412	0.2882	0.2770	0.2194	0.2128	0.2935	0.2224
Wed	CADP	0.2577	0.2238	0.1546	0.2376	0.2002	0.1180	0.1779	0.1614	0.2121
Thu to	CADC	0.2668	0.3113	0.1980	0.2474	0.2983	0.1701	0.1815	0.2738	0.2115
Thu	CADP	0.1789	0.1546	0.1556	0.1448	0.1178	0.1067	0.1638	0.1367	0.2092
Fri to	CADC	0.2857	0.2638	0.2480	0.2676	0.2442	0.1778	0.2436	0.2879	0.2269
Fri	CADP	0.1808	0.2241	0.1520	0.1507	0.2006	0.1147	0.1827	0.1343	0.2254

Notes: This table analyses the performance of IV_CAD to estimate CADC and CADP options price for the one-month horizon. The hypothesis 16, hypothesis 17, and hypothesis 18 are tested for the opening period, midday period, and closing period under MAE, MSE and RMSE measures and results are reported in the panels A, B, and C, respectively.OP, MD and CL denoting opening period, midday period and closing period, respectively. The 'mean absolute error', 'mean squared error' and 'root mean squared error' denoting by MAE, MSE and RMSE, respectively.
CADC and CADP denoting CAD call and CAD put, respectively.
* indicating minimum pricing error for CADC options price.
** indicating minimum pricing error for CADP options price.

Table 5.7 analyses the performance of IV_CHF to estimate CHF call (CHFC) and CHF put (CHFP) options price for the within-week horizon. The hypothesis10, hypothesis11, and hypothesis12 are tested for the opening period, midday period, and closing period under MAE, MSE and RMSE measures and results are reported in the panels A, B, and C, respectively. For MAE measure, one-month maturity, Monday, and closing period IV_CHF perform better to compute CHFC (pricing errors = 0.1792) and CHFP (pricing errors = 0.0945) options price of Friday in the same week. Similarly, two-month maturity, Monday, and closing period IV_CHF is superior to calculate the value of CHFC (pricing error = 0.1744) and CHFP (pricing error = 0.0902) options. Further, the three-month maturity, Monday, and closing period IV_CHF outperform to estimate CHFC (pricing error = 0.2110) and CHFP (pricing error = 0.1060) options price. However, two-month maturity, Monday, and closing period IV_CHF generate lower pricing error (CHFC pricing error = 0.1744 and CHFP pricing error = 0.0902) under MAE measure. Similarly, MSE measure shows lower pricing error (CHFC pricing error = 0.0749 and CHFP pricing error = 0.0154) for two-month maturity, Monday, and closing period IV_CHF. The RMSE measure also estimates the lower pricing error (CHFC pricing error = 0.2737 and CHFP pricing error = 0.1240) for the two-month maturity, Monday, and closing period IV_CHF. The overall results imply that two-month maturity, Monday, and closing period IV_CHF superior to compute the value of CHFC and CHFP options correctly with a minimum pricing error under all measures.

Table 5. 7: IV_CHF estimate CHF options price for within-week estimate horizon

Horizon	Options	One-month maturity IV_CHF (hypothesis 10)			Two-month maturity IV_CHF (hypothesis 11)			Three-month Maturity IV_CHF (hypothesis 12)		
		OP	MD	CL	OP	MD	CL	OP	MD	CL
Panel A: Pricing error under MAE measure										
Mon to	CHFC	0.2111	0.3056	0.1792*	0.2307	0.3147	0.1744*	0.2201	0.3004	0.2110*
Fri	CHFP	0.1577	0.1122	0.0945**	0.1342	0.1091	0.0902**	0.1179	0.1196	0.1060**
Tue to	CHFC	0.2077	0.2803	0.3011	0.2268	0.2843	0.2562	0.2116	0.2960	0.2842
Fri	CHFP	0.1560	0.1395	0.1325	0.1361	0.1189	0.1071	0.1168	0.1357	0.1256
Wed to	CHFC	0.1972	0.2654	0.2465	0.2422	0.2798	0.1844	0.3012	0.3018	0.3121
Fri	CHFP	0.1503	0.1324	0.2101	0.1471	0.1082	0.0945	0.1060	0.1242	0.1325
Thu to	CHFC	0.2113	0.2566	0.2556	0.2286	0.3103	0.2461	0.2525	0.2981	0.2845
Fri	CHFP	0.1421	0.1124	0.1324	0.1385	0.1208	0.1254	0.1215	0.1325	0.1302
Panel B: Pricing error under MSE measure										
Mon to	CHFC	0.1104	0.1759	0.0912*	0.1079	0.1878	0.0749*	0.0992	0.1737	0.0804*
Fri	CHFP	0.0777	0.0352	0.0201**	0.0431	0.0286	0.0154**	0.0330	0.0279	0.0213**
Tue to	CHFC	0.0874	0.1457	0.1432	0.1056	0.1472	0.0907	0.0846	0.1747	0.0925
Fri	CHFP	0.0758	0.0831	0.0581	0.0418	0.0304	0.0421	0.0261	0.0316	0.0424
Wed to	CHFC	0.1525	0.1335	0.1435	0.1456	0.1426	0.0821	0.1253	0.1799	0.1514
Fri	CHFP	0.0699	0.0451	0.0256	0.0601	0.0217	0.0254	0.0213	0.0289	0.0325
Thu to	CHFC	0.1155	0.1218	0.1513	0.1029	0.1905	0.1356	0.1783	0.1633	0.1725
Fri	CHFP	0.0721	0.0395	0.0857	0.0410	0.0380	0.0425	0.0315	0.0334	0.0542
Panel C: Pricing error under RMSE measure										
Mon to	CHFC	0.3322	0.4194	0.3020*	0.3285	0.4333	0.2737*	0.3150	0.4167	0.2835*
Fri	CHFP	0.2787	0.1877	0.1418**	0.2076	0.1692	0.1240**	0.1816	0.1672	0.1459**
Tue to	CHFC	0.2957	0.3817	0.3784	0.3249	0.3837	0.3012	0.2909	0.4179	0.3041
Fri	CHFP	0.2754	0.2883	0.2410	0.2044	0.1743	0.2052	0.1617	0.1779	0.2059
Wed to	CHFC	0.3905	0.3654	0.3788	0.3816	0.3776	0.2865	0.3540	0.4242	0.3891
Fri	CHFP	0.2643	0.2123	0.1601	0.2451	0.1474	0.1594	0.1461	0.1701	0.1803
Thu to	CHFC	0.3398	0.3490	0.3913	0.3209	0.4365	0.3682	0.4222	0.4041	0.4153
Fri	CHFP	0.2685	0.1987	0.2927	0.2025	0.1949	0.2062	0.1775	0.1828	0.2328

Notes: This table analyses the performance of IV_CHF to estimate CHF call (CHFC) and CHF put (CHFP) options price for the within-week horizon. The hypothesis10, hypothesis11, and hypothesis12 are tested for the opening period, midday period, and closing period under MAE, MSE and RMSE measures and results are reported in the panels A, B, and C, respectively.OP, MD and CL denoting opening period, midday period and closing period, respectively.
The 'mean absolute error', 'mean squared error' and 'root mean squared error' denoting by MAE, MSE and RMSE, respectively.
CHFC and CHFP denoting CHF call and CHF put, respectively.
* indicating minimum pricing error for CHFC options price.
** indicating minimum pricing error for CHFP options price.

Table 5.8 analyses the performance of IV_CHF to estimate CHFC and CHFP options price for the one-week horizon. The hypothesis13, hypothesis14, and hypothesis15 are tested for the opening period, midday period, and closing period under MAE, MSE and RMSE measures and results are reported in the panels A, B, and C, respectively. For MAE measure, one-month maturity, Monday, and closing period IV_CHF perform better to estimate the value of CHFC (pricing errors = 0.1385) and CHFP (pricing errors = 0.0838) options of Monday in next week. Similarly, two-month maturity, Monday, and closing period IV_CHF outperform to compute CHFC (pricing error = 0.1646) and CHFP (pricing error = 0.0965) options price. Further, the three-month maturity, Monday, and closing period IV_CHF is superior to calculate the price of CHFC (pricing error = 0.1679) and CHFP (pricing error = 0.1060) options, However, one-month maturity, Monday, and closing period IV_CHF show lower pricing error (CHFC pricing error = 0.1385 and CHFP pricing error = 0.0838) under MAE measure. Similarly, MSE measure shows lower pricing error (CHFC pricing error = 0.0358 and CHFP pricing error = 0.0170) for one-month maturity, Monday, and closing period IV_CHF. The RMSE measure also estimates the lower pricing error (CHFC pricing error = 0.1893 and CHFP pricing error = 0.1303) for the one-month maturity, Monday, and closing period IV_CHF. The overall results indicate that one-month maturity, Monday, and closing period IV_CHF outperform to estimate CHFC and CHFP options price precisely with a minimum pricing error under all measures.

Table 5. 8: IV_CHF estimate CHF options price for one-week estimate horizon

Horizon	Options	One-month maturity IV_CHF (hypothesis 13)			Two-month maturity IV_CHF (hypothesis 14)			Three-month Maturity IV_CHF (hypothesis 15)		
		OP	MD	CL	OP	MD	CL	OP	MD	CL
Panel A: Pricing error under MAE measure										
Mon to	CHFC	0.1671	0.2152	0.1385*	0.1922	0.2253	0.1646*	0.2237	0.1785	0.1679*
Mon	CHFP	0.1161	0.0893	0.0838**	0.1119	0.1083	0.0965**	0.1196	0.1352	0.1060**
Tue to	CHFC	0.1472	0.2328	0.1755	0.2003	0.2707	0.2181	0.2235	0.2245	0.2120
Tue	CHFP	0.1337	0.1125	0.0952	0.1276	0.1068	0.1059	0.1118	0.1515	0.1260
Wed to	CHFC	0.1759	0.2284	0.2181	0.2293	0.2723	0.2350	0.2097	0.2312	0.2414
Wed	CHFP	0.1412	0.1204	0.0982	0.1307	0.1175	0.1028	0.1142	0.1411	0.1303
Thu to	CHFC	0.2342	0.2101	0.1940	0.2485	0.3370	0.2233	0.2983	0.2856	0.2058
Thu	CHFP	0.1348	0.1014	0.0950	0.1449	0.1293	0.1141	0.1435	0.1354	0.1268
Fri to	CHFC	0.2358	0.1684	0.1583	0.2319	0.1786	0.1754	0.2391	0.3142	0.1704
Fri	CHFP	0.1644	0.1523	0.0849	0.1509	0.0989	0.0977	0.1362	0.1384	0.1267
Panel B: Pricing error under MSE measure										
Mon to	CHFC	0.0516	0.0855	0.0358*	0.0872	0.1278	0.0663*	0.0962	0.0865	0.0620*
Mon	CHFP	0.0277	0.0198	0.0170**	0.0248	0.0327	0.0245**	0.0243	0.0421	0.0221**
Tue to	CHFC	0.0424	0.0982	0.0938	0.0751	0.1341	0.1615	0.1034	0.1317	0.1499
Tue	CHFP	0.0393	0.0332	0.0331	0.0356	0.0261	0.0485	0.0221	0.0542	0.0507
Wed to	CHFC	0.0716	0.0953	0.1103	0.1416	0.1459	0.1177	0.0736	0.0811	0.1233
Wed	CHFP	0.0449	0.0624	0.0292	0.0724	0.0459	0.0318	0.0249	0.0425	0.0542
Thu to	CHFC	0.1766	0.0784	0.0755	0.1716	0.2332	0.2020	0.1803	0.1645	0.0960
Thu	CHFP	0.0392	0.0512	0.0489	0.0411	0.0605	0.0555	0.0472	0.0512	0.0468
Fri to	CHFC	0.1324	0.1254	0.0443	0.1070	0.1101	0.0974	0.1340	0.1970	0.0672
Fri	CHFP	0.0863	0.0954	0.0173	0.0475	0.0542	0.0317	0.0469	0.0447	0.0636
Panel C: Pricing error under RMSE measure										
Mon to	CHFC	0.2272	0.2924	0.1893*	0.2954	0.3576	0.2575*	0.3101	0.2941	0.2490*
Mon	CHFP	0.1666	0.1407	0.1303**	0.1575	0.1808	0.1567**	0.1560	0.2052	0.1487**
Tue to	CHFC	0.2058	0.3134	0.3063	0.2741	0.3662	0.4018	0.3216	0.3629	0.3872
Tue	CHFP	0.1983	0.1823	0.1820	0.1887	0.1615	0.2203	0.1487	0.2328	0.2253
Wed to	CHFC	0.2676	0.3087	0.3321	0.3763	0.3819	0.3430	0.2713	0.2848	0.3511
Wed	CHFP	0.2119	0.2498	0.1709	0.2691	0.2142	0.1784	0.1579	0.2062	0.2328
Thu to	CHFC	0.4202	0.2800	0.2748	0.4142	0.4829	0.4494	0.4246	0.4056	0.3098
Thu	CHFP	0.1981	0.2263	0.2211	0.2028	0.2459	0.2356	0.2173	0.2263	0.2163
Fri to	CHFC	0.3639	0.3541	0.2106	0.3271	0.3318	0.3121	0.3661	0.4439	0.2593
Fri	CHFP	0.2937	0.3089	0.1314	0.2179	0.2328	0.1779	0.2165	0.2114	0.2522

Notes: This table analyses the performance of IV_CHF to estimate CHFC and CHFP options price for the one-week horizon. The hypothesis13, hypothesis14, and hypothesis15 are tested for the opening period, midday period, and closing period under MAE, MSE and RMSE measures and results are reported in the panels A, B, and C, respectively.OP, MD and CL denoting opening period, midday period and closing period, respectively.

The 'mean absolute error', 'mean squared error' and 'root mean squared error' denoting by MAE, MSE and RMSE, respectively.

CHFC and CHFP denoting CHF call and CHF put, respectively.

* indicating minimum pricing error for CHFC options price.

** indicating minimum pricing error for CHFP options price.

Table 5.9 analyses the performance of IV_CHF to estimate CHFC and CHFP options price for the one-month horizon. The hypothesis 16, hypothesis 17, and hypothesis 18 are tested for the opening period, midday period, and closing period under MAE, MSE and RMSE measures and results are reported in the panels A, B, and C, respectively. For MAE measure, one-month maturity, Tuesday, and closing period IV_CHF better to estimate CHFC (pricing errors = 0.1625) and CHFP (pricing errors = 0.1425) options price of Tuesday in next month. Similarly, two-month maturity, Tuesday, and closing period IV_CHF is superior to calculate CHFC (pricing error = 0.1576) and CHFP (pricing error = 0.1308) options price. Further, the three-month maturity, Tuesday, and closing period IV_CHF outperform to estimate the value of CHFC (pricing error = 0.1891) and CHFP (pricing error = 0.1442) options. However, two-month maturity, Tuesday, and closing period IV_CHF provide lower pricing error (CHFC pricing error = 0.1576 and CHFP pricing error = 0.1308) under MAE measure. Similarly, MSE measure provides lower pricing error (CHFC pricing error = 0.0482 and CHFP pricing error = 0.0330) for two-month maturity, Tuesday, and closing period IV_CHF. The RMSE measure also estimates the lower pricing error (CHFC pricing error = 0.2195 and CHFP pricing error = 0.1817) for the two-month maturity, Tuesday, and closing period IV_CHF. The overall results suggest that two-month maturity, Tuesday, and closing period IV_CHF outperform to calculate CHFC and CHFP options price accurately with a minimum pricing error under all measures.

Table 5. 9: IV_CHF estimate CHF options price for one-month estimate horizon

Horizon	Options	One-month maturity IV_CHF (hypothesis 16)			Two-month maturity IV_CHF (hypothesis 17)			Three-month Maturity IV_CHF (hypothesis 18)		
		OP	MD	CL	OP	MD	CL	OP	MD	CL
Panel A: Pricing error under MAE measure										
Mon to	CHFC	0.2218	0.2354	0.2214	0.2187	0.2293	0.2106	0.2484	0.2331	0.2160
Mon	CHFP	0.1513	0.1642	0.1590	0.1497	0.1512	0.1490	0.1334	0.1500	0.1505
Tue to	CHFC	0.1956	0.2415	0.1625*	0.1842	0.2362	0.1576*	0.2651	0.2561	0.1891*
Tue	CHFP	0.1635	0.1425	0.1425**	0.1531	0.1385	0.1308**	0.1169	0.1433	0.1442**
Wed to	CHFC	0.2657	0.2842	0.2112	0.2357	0.2702	0.2005	0.2567	0.2660	0.2180
Wed	CHFP	0.1458	0.1575	0.1452	0.1345	0.1474	0.1325	0.1725	0.1748	0.2335
Thu to	CHFC	0.2642	0.3654	0.2102	0.2540	0.3586	0.2023	0.2994	0.3382	0.2155
Thu	CHFP	0.1717	0.1641	0.1430	0.1628	0.1502	0.1345	0.1701	0.1745	0.1674
Fri to	CHFC	0.2541	0.2953	0.2142	0.2441	0.2840	0.2063	0.2574	0.3033	0.2078
Fri	CHFP	0.2210	0.1613	0.1428	0.2105	0.1553	0.1378	0.1609	0.1810	0.1579
Panel B: Pricing error under MSE measure										
Mon to	CHFC	0.1424	0.1274	0.1021	0.0961	0.1174	0.0912	0.1359	0.1167	0.1354
Mon	CHFP	0.2010	0.1221	0.0897	0.0542	0.0968	0.0450	0.0396	0.0790	0.1020
Tue to	CHFC	0.0845	0.1021	0.0542*	0.0746	0.0958	0.0482*	0.1305	0.1155	0.0831*
Tue	CHFP	0.0612	0.0985	0.0428**	0.0552	0.0850	0.0330**	0.0430	0.0423	0.0380**
Wed to	CHFC	0.1845	0.1654	0.1021	0.1713	0.1532	0.0945	0.1298	0.1546	0.1233
Wed	CHFP	0.0626	0.0654	0.0578	0.0564	0.0631	0.0395	0.1183	0.1121	0.0478
Thu to	CHFC	0.2845	0.3008	0.0986	0.2717	0.2969	0.0876	0.2478	0.2483	0.0976
Thu	CHFP	0.0754	0.0854	0.0942	0.0860	0.0745	0.0644	0.1463	0.1245	0.0677
Fri to	CHFC	0.1642	0.1845	0.1201	0.1184	0.1799	0.0998	0.1364	0.1980	0.1027
Fri	CHFP	0.1257	0.0752	0.0842	0.1185	0.0741	0.0698	0.1097	0.1325	0.0770
Panel C: Pricing error under RMSE measure										
Mon to	CHFC	0.3774	0.3569	0.3195	0.3100	0.3427	0.3020	0.3687	0.3415	0.3680
Mon	CHFP	0.4483	0.3494	0.3194	0.2328	0.3111	0.2122	0.1991	0.2810	0.2995
Tue to	CHFC	0.2907	0.3195	0.2328*	0.2731	0.3094	0.2195*	0.3612	0.3399	0.2883*
Tue	CHFP	0.2474	0.3138	0.2069**	0.2349	0.2915	0.1817**	0.1816	0.2056	0.1950**
Wed to	CHFC	0.4295	0.4067	0.3195	0.4139	0.3914	0.3074	0.3603	0.3933	0.3511
Wed	CHFP	0.2502	0.2557	0.2404	0.2376	0.2511	0.1988	0.3439	0.3347	0.2186
Thu to	CHFC	0.5334	0.5485	0.3140	0.5213	0.5449	0.2960	0.4978	0.4983	0.3123
Thu	CHFP	0.2746	0.2922	0.3069	0.2933	0.2730	0.2538	0.3825	0.3529	0.2582
Fri to	CHFC	0.4052	0.4295	0.3466	0.3440	0.4241	0.3159	0.3694	0.4450	0.3204
Fri	CHFP	0.3545	0.2742	0.2902	0.3442	0.2723	0.2642	0.3311	0.3640	0.2775

Notes: This table analyses the performance of IV_CHF to estimate CHFC and CHFP options price for the one-month horizon. The hypothesis 16, hypothesis 17, and hypothesis 18 are tested for the opening period, midday period, and closing period under MAE, MSE and RMSE measures and results are reported in the panels A, B, and C, respectively.OP, MD and CL denoting opening period, midday period and closing period, respectively. The 'mean absolute error', 'mean squared error' and 'root mean squared error' denoting by MAE, MSE and RMSE, respectively.
CHFC and CHFP denoting CHF call and CHF put, respectively.
* indicating minimum pricing error for CHFC options price.
** indicating minimum pricing error for CHFP options price.

Table 5.10 analyses the performance of IV_EUR to estimate EUR call (EURC) and EUR put (EURP) options price for the within-week horizon. The hypothesis10, hypothesis11, and hypothesis12 are tested for the opening period, midday period, and closing period under MAE, MSE and RMSE measures and results are reported in the panels A, B, and C, respectively. For MAE measure, one-month maturity, Monday, and closing period IV_EUR outperform to calculate EURC (pricing errors = 0.1761) and EURP (pricing errors = 0.1021) options price of Friday in the same week. Similarly, two-month maturity, Monday, and closing period IV_EURF is superior to estimate the value of EURC (pricing error = 0.1736) and EURP (pricing error = 0.0830) options. Further, the three-month maturity, Monday, and closing period IV_EUR superior to compute the value of EURC (pricing error = 0.2326) and EURP (pricing error = 0.1302) options. However, two-month maturity, Monday, and closing period IV_EUR generate lower pricing error (EURC pricing error = 0.1736 and EURP pricing error = 0.0830) under MAE measure. Similarly, MSE measure generates lower pricing error (EURC pricing error = 0.0595 and EURP pricing error = 0.0219) for two-month maturity, Monday, and closing period IV_EUR. The RMSE measure also estimates the lower pricing error (EURC pricing error = 0.2439 and EURP pricing error = 0.1481) for the two-month maturity, Monday, and closing period IV_EUR. The overall results indicate that two-month maturity, Monday, and closing period IV_EUR better to estimate the price of EURC and EURP options precisely with a minimum pricing error under all measures.

Table 5. 10: IV_EUR estimate EUR options price for within-week estimate horizon

Horizon	Options	One-month maturity IV_EUR (hypothesis 10)			Two-month maturity IV_EUR (hypothesis 11)			Three-month maturity IV_EUR (hypothesis 12)		
		OP	MD	CL	OP	MD	CL	OP	MD	CL
Panel A: Pricing error under MAE measure										
Mon to Fri	EURC	0.3023	0.3556	0.1761*	0.2764	0.3385	0.1736*	0.2541	0.3260	0.2326*
	EURP	0.1288	0.1158	0.1021**	0.1336	0.1149	0.0830**	0.1404	0.1365	0.1302**
Tue to Fri	EURC	0.3012	0.3411	0.2896	0.2851	0.3306	0.2703	0.2651	0.3211	0.2556
	EURP	0.1423	0.1305	0.1422	0.1269	0.1196	0.1250	0.1421	0.1370	0.1345
Wed to Fri	EURC	0.2639	0.3374	0.1919	0.3012	0.3297	0.2673	0.2542	0.3237	0.2401
	EURP	0.1475	0.1222	0.1220	0.1359	0.1284	0.1021	0.1320	0.1327	0.1310
Thu to Fri	EURC	0.3012	0.3175	0.2694	0.2603	0.3418	0.1790	0.2612	0.3320	0.2512
	EURP	0.1296	0.1297	0.1291	0.1467	0.1384	0.0993	0.1420	0.1490	0.1373
Panel B: Pricing error under MSE measure										
Mon to Fri	EURC	0.1940	0.2427	0.0599*	0.1525	0.2077	0.0595*	0.1220	0.1849	0.0935*
	EURP	0.0465	0.0343	0.0246**	0.0356	0.0250	0.0219**	0.0392	0.0320	0.0320**
Tue to Fri	EURC	0.2012	0.2124	0.1668	0.1824	0.1951	0.1202	0.1542	0.1797	0.1394
	EURP	0.0737	0.0429	0.0421	0.0330	0.0275	0.0292	0.0399	0.0412	0.0327
Wed to Fri	EURC	0.1443	0.2137	0.0798	0.1652	0.1922	0.1102	0.1376	0.1794	0.1210
	EURP	0.0684	0.0369	0.0263	0.0422	0.0472	0.0260	0.0512	0.0359	0.0344
Thu to Fri	EURC	0.1542	0.1929	0.1478	0.1319	0.2056	0.0648	0.1752	0.1899	0.1254
	EURP	0.0510	0.0463	0.0483	0.0541	0.0514	0.0246	0.0432	0.0443	0.0400
Panel C: Pricing error under RMSE measure										
Mon to Fri	EURC	0.4404	0.4926	0.2447*	0.3905	0.4558	0.2439*	0.3493	0.4300	0.3058*
	EURP	0.2156	0.1852	0.1568**	0.1888	0.1581	0.1481**	0.1981	0.1790	0.1789**
Tue to Fri	EURC	0.4486	0.4608	0.4084	0.4271	0.4417	0.3467	0.3927	0.4239	0.3734
	EURP	0.2714	0.2070	0.2052	0.1817	0.1657	0.1709	0.1998	0.2030	0.1809
Wed to Fri	EURC	0.3798	0.4623	0.2825	0.4064	0.4384	0.3319	0.3709	0.4235	0.3479
	EURP	0.2615	0.1920	0.1622	0.2055	0.2172	0.1612	0.2263	0.1895	0.1854
Thu to Fri	EURC	0.3927	0.4392	0.3845	0.3631	0.4534	0.2545	0.4186	0.4357	0.3541
	EURP	0.2258	0.2152	0.2197	0.2325	0.2268	0.1568	0.2078	0.2105	0.2000

Notes: This table analyses the performance of IV_EUR to estimate EUR call (EURC) and EUR put (EURP) options price for the within-week horizon. The hypothesis10, hypothesis11, and hypothesis12 are tested for the opening period, midday period, and closing period under MAE, MSE and RMSE measures and results are reported in the panels A, B, and C, respectively. OP, MD and CL denoting opening period, midday period and closing period, respectively.
The 'mean absolute error', 'mean squared error' and 'root mean squared error' denoting by MAE, MSE and RMSE, respectively.
EURC and EURP denoting EUR call and EUR put, respectively.
* indicating minimum pricing error for EURC options price.
** indicating minimum pricing error for EURP options price.

Table 5.11 analyses the performance of IV_EUR to estimate EURC and EURP options price for the one-week horizon. The hypothesis13, hypothesis14, and hypothesis15 are tested for the opening period, midday period, and closing period under MAE, MSE and RMSE measures and results are reported in the panels A, B, and C, respectively. For MAE measure, one-month maturity, Monday, and closing period IV_EUR is superior to compute the price of EURC (pricing errors = 0.1798) and EURP (pricing errors = 0.0746) options of Monday in next week. Similarly, two-month maturity, Monday, and closing period IV_EUR outperform to estimate the value of EURC (pricing error = 0.1826) and EURP (pricing error = 0.0821) options price. Further, the three-month maturity, Monday, and closing period IV_EUR outperform to estimate EURC (pricing error = 0.1848) and EURP (pricing error = 0.1013) options price. However, one-month maturity, Monday, and closing period IV_EUR generate lower pricing error (EURC pricing error = 0.1798 and EURP pricing error = 0.0746) under MAE measure. Similarly, MSE measure provides lower pricing error (EURC pricing error = 0.0658 and EURP pricing error = 0.0121) for one-month maturity, Monday, and closing period IV_EUR. The RMSE measure also generates the lower pricing error (EURC pricing error = 0.2565 and EURP pricing error = 0.1101) for the one-month maturity, Monday, and closing period IV_EUR. The overall results imply that one-month maturity, Monday, and closing period IV_EUR outperform to estimate the price of EURC and EURP options correctly with a minimum pricing error under all measures.

Table 5. 11: IV_EUR estimate EUR options price for one-week estimate horizon

Horizon	Options	One-month maturity IV_EUR (hypothesis 13)			Two-month maturity IV_EUR (hypothesis 14)			Three-month Maturity IV_EUR (hypothesis 15)		
		OP	MD	CL	OP	MD	CL	OP	MD	CL
Panel A: Pricing error under MAE measure										
Mon to Mon	EURC	0.1907	0.2444	0.1798*	0.2162	0.2528	0.1826*	0.2098	0.2412	0.1848*
	EURP	0.1137	0.1073	0.0746**	0.1173	0.1032	0.0821**	0.1341	0.1298	0.1013**
Tue to Tue	EURC	0.2412	0.2536	0.1900	0.2126	0.2686	0.1955	0.2111	0.2710	0.2009
	EURP	0.1124	0.1059	0.1096	0.1274	0.1130	0.1129	0.1337	0.1341	0.1135
Wed to Wed	EURC	0.2023	0.2268	0.1999	0.2342	0.2781	0.2258	0.2072	0.2713	0.2012
	EURP	0.1300	0.1110	0.1002	0.1285	0.1242	0.1189	0.1284	0.1403	0.1266
Thu to Thu	EURC	0.2564	0.3308	0.1912	0.2541	0.3607	0.2192	0.2576	0.3480	0.2130
	EURP	0.1216	0.1224	0.0761	0.1498	0.1289	0.0990	0.1421	0.1572	0.1202
Fri to Fri	EURC	0.3532	0.3421	0.2278	0.3541	0.3542	0.3437	0.2392	0.3454	0.2347
	EURP	0.1524	0.1512	0.1415	0.1521	0.1421	0.1416	0.1524	0.1467	0.1447
Panel B: Pricing error under MSE measure										
Mon to Mon	EURC	0.0727	0.1165	0.0658*	0.0978	0.1256	0.0686*	0.0736	0.1069	0.0672*
	EURP	0.0429	0.0532	0.0121**	0.0302	0.0194	0.0136**	0.0434	0.0314	0.0193**
Tue to Tue	EURC	0.0912	0.1394	0.0755	0.1283	0.1330	0.1219	0.0821	0.1325	0.0802
	EURP	0.0291	0.0297	0.0162	0.0340	0.0272	0.0230	0.0440	0.0348	0.0244
Wed to Wed	EURC	0.1030	0.1127	0.0832	0.0958	0.1463	0.1012	0.0789	0.1351	0.1344
	EURP	0.0355	0.0375	0.0312	0.0465	0.0300	0.0421	0.0367	0.0392	0.0317
Thu to Thu	EURC	0.1381	0.2370	0.0728	0.1342	0.2782	0.0911	0.1302	0.2453	0.0932
	EURP	0.0354	0.0351	0.0122	0.0462	0.0324	0.0197	0.0391	0.0439	0.0270
Fri to Fri	EURC	0.0925	0.1957	0.0723	0.2120	0.1987	0.2002	0.2212	0.2014	0.1994
	EURP	0.0412	0.0417	0.0320	0.0756	0.0513	0.0612	0.0754	0.0842	0.0579
Panel C: Pricing error under RMSE measure										
Mon to Mon	EURC	0.2696	0.3413	0.2565*	0.3127	0.3544	0.2619*	0.2712	0.3270	0.2592*
	EURP	0.2071	0.2307	0.1101**	0.1738	0.1391	0.1165**	0.2083	0.1771	0.1388**
Tue to Tue	EURC	0.3019	0.3733	0.2747	0.3582	0.3646	0.3491	0.2865	0.3641	0.2832
	EURP	0.1706	0.1722	0.1273	0.1843	0.1648	0.1517	0.2098	0.1865	0.1562
Wed to Wed	EURC	0.3209	0.3357	0.2884	0.3096	0.3825	0.3181	0.2809	0.3675	0.3666
	EURP	0.1885	0.1936	0.1767	0.2156	0.1733	0.2052	0.1916	0.1979	0.1779
Thu to Thu	EURC	0.3716	0.4868	0.2698	0.3664	0.5274	0.3018	0.3608	0.4953	0.3053
	EURP	0.1882	0.1873	0.1103	0.2149	0.1801	0.1403	0.1977	0.2096	0.1643
Fri to Fri	EURC	0.3041	0.4424	0.2689	0.4604	0.4458	0.4474	0.4793	0.4488	0.4465
	EURP	0.2030	0.2041	0.1788	0.2750	0.2265	0.2474	0.2746	0.2902	0.2405

Notes: This table analyses the performance of IV_EUR to estimate EURC and EURP options price for the one-week horizon. The hypothesis13, hypothesis14, and hypothesis15 are tested for the opening period, midday period, and closing period under MAE, MSE and RMSE measures and results are reported in the panels A, B, and C, respectively.OP, MD and CL denoting opening period, midday period and closing period, respectively. The 'mean absolute error', 'mean squared error' and 'root mean squared error' denoting by MAE, MSE and RMSE, respectively.
EURC and EURP denoting EUR call and EUR put, respectively.
* indicating minimum pricing error for EURC options price.
** indicating minimum pricing error for EURP options price.

Table 5.12 analyses the performance of IV_EUR to estimate EURC and EURP options price for the one-month horizon. The hypothesis 16, hypothesis 17, and hypothesis 18 are tested for the opening period, midday period, and closing period under MAE, MSE and RMSE measures and results are reported in the panels A, B, and C, respectively. For MAE measure, one-month maturity, Tuesday, and closing period IV_EUR better to estimate the price of EURC (pricing errors = 0.2065) and EURP (pricing errors = 0.1094) options of Tuesday in next month. Similarly, two-month maturity, Tuesday, and closing period IV_EUR is superior to estimate EURC (pricing error = 0.1965) and EURP (pricing error = 0.0994) options price. Further, the three-month maturity, Tuesday, and closing period IV_EUR outperform to estimate the value of EURC (pricing error = 0.2063) and EURP (pricing error = 0.1224) options price. However, two-month maturity, Tuesday, and closing period IV_EUR provide lower pricing error (EURC pricing error = 0.1965 and EURP pricing error = 0.0994) under MAE measure. Similarly, MSE measure generates lower pricing error (EURC pricing error = 0.0760 and EURP pricing error = 0.0219) for two-month maturity, Tuesday, and closing period IV_EUR. The RMSE measure also estimates the lower pricing error (EURC pricing error = 0.2757 and EURP pricing error = 0.1480) for the two-month maturity, Tuesday, and closing period IV_EUR. The overall results indicate that two-month maturity, Tuesday, and closing period IV_EUR superior to estimate the value of EURC and EURP options precisely with a minimum pricing error under all measures.

Table 5. 12: IV_EUR estimate EUR options price for one-month estimate horizon

Horizon	Options	One-month maturity IV_EUR (hypothesis 16)			Two-month maturity IV_EUR (hypothesis 17)			Three-month Maturity IV_EUR (hypothesis 18)		
		OP	MD	CL	OP	MD	CL	OP	MD	CL
Panel A: Pricing error under MAE measure										
Mon to Mon	EURC	0.2345	0.2674	0.2335	0.2265	0.2574	0.2148	0.2236	0.2492	0.2235
	EURP	0.2435	0.2263	0.2121	0.1435	0.1163	0.1021	0.1500	0.1414	0.1307
Tue to Tue	EURC	0.2365	0.2686	0.2065*	0.2265	0.2586	0.1965*	0.2448	0.2799	0.2063*
	EURP	0.1416	0.1319	0.1094**	0.1306	0.1219	0.0994**	0.1392	0.1365	0.1224**
Wed to Wed	EURC	0.2628	0.2538	0.2305	0.2658	0.2528	0.2206	0.2541	0.2777	0.2242
	EURP	0.1574	0.1520	0.1417	0.1474	0.1377	0.1310	0.1442	0.1483	0.1432
Thu to Thu	EURC	0.2845	0.3420	0.2219	0.2719	0.3500	0.2119	0.3032	0.3507	0.2282
	EURP	0.1580	0.1355	0.1158	0.1690	0.1315	0.1088	0.1478	0.1546	0.1358
Fri to Fri	EURC	0.3011	0.3336	0.2096	0.2921	0.3236	0.1996	0.2737	0.3226	0.2164
	EURP	0.1705	0.1708	0.1126	0.1685	0.1608	0.1026	0.1790	0.1605	0.1280
Panel B: Pricing error under MSE measure										
Mon to Mon	EURC	0.1021	0.1315	0.0941	0.0975	0.1250	0.0831	0.1894	0.1166	0.0864
	EURP	0.0684	0.0397	0.0354	0.0584	0.0297	0.0251	0.0534	0.0433	0.0411
Tue to Tue	EURC	0.2150	0.1319	0.0912*	0.1136	0.1269	0.0760*	0.1004	0.1476	0.0813*
	EURP	0.0496	0.0452	0.0319**	0.0396	0.0366	0.0219**	0.0425	0.0421	0.0357**
Wed to Wed	EURC	0.1435	0.1414	0.1147	0.1335	0.1314	0.1047	0.1303	0.1499	0.1256
	EURP	0.0553	0.0581	0.0420	0.0443	0.0491	0.0370	0.0464	0.0580	0. 0458
Thu to Thu	EURC	0.1623	0.2870	0.0926	0.1529	0.2930	0.0816	0.1794	0.2561	0.0977
	EURP	0.0754	0.0679	0.0518	0.0648	0.0591	0.0318	0.0607	0.0629	0.0390
Fri to Fri	EURC	0.1866	0.2132	0.1028	0.1766	0.2040	0.0978	0.1398	0.1794	0.0892
	EURP	0.0750	0.0738	0.0358	0.0670	0.0638	0.0258	0.0832	0.0573	0.0445
Panel C: Pricing error under RMSE measure										
Mon to Mon	EURC	0.3195	0.3626	0.3068	0.3123	0.3536	0.2883	0.4352	0.3414	0.2939
	EURP	0.2615	0.1992	0.1881	0.2417	0.1722	0.1584	0.2311	0.2080	0.2028
Tue to Tue	EURC	0.4637	0.3632	0.3020*	0.3370	0.3562	0.2757*	0.3168	0.3842	0.2851*
	EURP	0.2227	0.2126	0.1786**	0.1991	0.1912	0.1480**	0.2061	0.2051	0.1890**
Wed to Wed	EURC	0.3788	0.3760	0.3387	0.3654	0.3625	0.3235	0.3610	0.3871	0.3545
	EURP	0.2352	0.2410	0.2049	0.2105	0.2216	0.1923	0.2154	0.2408	0.2140
Thu to Thu	EURC	0.4029	0.5357	0.3043	0.3911	0.5413	0.2856	0.4236	0.5060	0.3126
	EURP	0.2746	0.2606	0.2276	0.2545	0.2430	0.1783	0.2463	0.2507	0.1975
Fri to Fri	EURC	0.4320	0.4617	0.3206	0.4202	0.4517	0.3128	0.3739	0.4236	0.3814
	EURP	0.2739	0.2717	0.1892	0.2589	0.2526	0.1606	0.2884	0.2393	0.2110

Notes: This table analyses the performance of IV_EUR to estimate EURC and EURP options price for the one-month horizon. The hypothesis 16, hypothesis 17, and hypothesis 18 are tested for the opening period, midday period, and closing period under MAE, MSE and RMSE measures and results are reported in the panels A, B, and C, respectively. OP, MD and CL denoting opening period, midday period and closing period, respectively.
The 'mean absolute error', 'mean squared error' and 'root mean squared error' denoting by MAE, MSE and RMSE, respectively.
EURC and EURP denoting EUR call and EUR put, respectively.
* indicating minimum pricing error for EURC options price.
** indicating minimum pricing error for EURP options price.

Table 5.13 analyses the performance of IV_GBP to estimate GBP call (GBPC) and GBP put (GBPP) options price for the within-week horizon. The hypothesis 10, hypothesis 11, and hypothesis 12 are tested for the opening period, midday period, and closing period under MAE, MSE and RMSE measures and results are reported in the panels A, B, and C, respectively. For MAE measure, one-month maturity, Thursday, and closing period IV_GBP perform better to compute GBPC (pricing errors = 0.0762) and GBPP (pricing errors = 0.0914) options price of Friday in the same week. Similarly, two-month maturity, Thursday, and closing period IV_GBP outperform to estimate GBPC (pricing error = 0.1985) and GBPP (pricing error = 0.0954) options price. Further, the three-month maturity, Thursday, and closing period IV_GBP is superior to calculate GBPC (pricing error = 0.2010) and GBPP (pricing error = 0.1051) options price. However, one-month maturity, Thursday, and closing period IV_GBP provide lower pricing error (GBPC pricing error = 0.0762 and GBPP pricing error = 0.0914) under MAE measure. Similarly, MSE measure provides lower pricing error GBPC (pricing error = 0.0314 and GBPP pricing error = 0.0201) for one-month maturity, Thursday, and closing period IV_GBP. The RMSE measure also generates the lower pricing error (GBPC pricing error = 0.2670 and GBPP pricing error = 0.1417) for the one-month maturity, Thursday, and closing period IV_GBP. The overall results suggest that one-month maturity, Thursday, and closing period IV_GBP outperform to estimate GBPC and GBPP options price precise with a minimum pricing error under all measures.

Table 5. 13: IV_ GBP estimate GBP options price for within-week estimate horizon

Horizon	Options	One-month maturity IV_GBP (hypothesis 10)			Two-month maturity IV_GBP (hypothesis 11)			Three-month Maturity IV_GBP (hypothesis 12)		
		OP	MD	CL	OP	MD	CL	OP	MD	CL
Panel A: Pricing error under MAE measure										
Mon to Fri	GBPC	0.3003	0.2031	0.1956	0.2769	0.3492	0.2022	0.2566	0.2548	0.2035
	GBPP	0.1497	0.1254	0.1031	0.1575	0.1308	0.1032	0.1576	0.1432	0.1134
Tue to Fri	GBPC	0.2756	0.3486	0.1928	0.2737	0.3432	0.2056	0.2742	0.2312	0.2038
	GBPP	0.1581	0.1433	0.1074	0.1684	0.1318	0.1092	0.1640	0.1520	0.1195
Wed to Fri	GBPC	0.3077	0.3287	0.2042	0.2784	0.2578	0.2137	0.2979	0.2984	0.2064
	GBPP	0.1602	0.1336	0.1098	0.1557	0.1552	0.1078	0.1681	0.1742	0.1172
Thu to Fri	GBPC	0.2723	0.3172	0.0762*	0.2567	0.2564	0.1985*	0.2733	0.2465	0.2010*
	GBPP	0.1416	0.1267	0.0914**	0.1667	0.1724	0.0954**	0.1661	0.1771	0.1051**
Panel B: Pricing error under MSE measure										
Mon to Fri	GBPC	0.1774	0.1778	0.0720	0.1462	0.2107	0.0838	0.1202	0.1325	0.0752
	GBPP	0.0472	0.0542	0.0262	0.0535	0.0355	0.0275	0.0540	0.0542	0.0275
Tue to Fri	GBPC	0.1556	0.2289	0.0619	0.1645	0.2116	0.0761	0.1559	0.1654	0.0741
	GBPP	0.0626	0.0726	0.0221	0.0600	0.0362	0.0286	0.0575	0.0621	0.0290
Wed to Fri	GBPC	0.2011	0.2180	0.0712	0.1572	0.1655	0.0744	0.1762	0.1740	0.0799
	GBPP	0.0613	0.0471	0.0326	0.0509	0.0521	0.0328	0.0763	0.0642	0.0388
Thu to Fri	GBPC	0.1566	0.1985	0.0314*	0.1410	0.1321	0.0736*	0.1509	0.1452	0.0713*
	GBPP	0.0405	0.0429	0.0201**	0.0563	0.0652	0.0256**	0.0507	0.0421	0.0226**
Panel C: Pricing error under RMSE measure										
Mon to Fri	GBPC	0.4212	0.4217	0.2683	0.3823	0.4591	0.2895	0.3468	0.3640	0.2743
	GBPP	0.2171	0.2328	0.1617	0.2313	0.1884	0.1659	0.2323	0.2328	0.1658
Tue to Fri	GBPC	0.3945	0.4784	0.2488	0.4056	0.4600	0.2758	0.3948	0.4067	0.2722
	GBPP	0.2503	0.2694	0.1487	0.2449	0.1902	0.1692	0.2397	0.2492	0.1704
Wed to Fri	GBPC	0.4484	0.4670	0.2668	0.3964	0.4068	0.2727	0.4197	0.4171	0.2827
	GBPP	0.2476	0.2171	0.1806	0.2256	0.2283	0.1810	0.2762	0.2534	0.1970
Thu to Fri	GBPC	0.3957	0.4456	0.2670*	0.3755	0.3635	0.2760*	0.3884	0.3811	0.2713*
	GBPP	0.2013	0.2070	0.1417**	0.2374	0.2553	0.1600**	0.2251	0.2052	0.1502**

Notes: This table analyses the performance of IV_GBP to estimate GBP call (GBPC) and GBP put (GBPP) options price for the within-week horizon. The hypothesis 10, hypothesis 11, and hypothesis 12 are tested for the opening period, midday period, and closing period under MAE, MSE and RMSE measures and results are reported in the panels A, B, and C, respectively. OP, MD and CL denoting opening period, midday period and closing period, respectively.
The 'mean absolute error', 'mean squared error' and 'root mean squared error' denoting by MAE, MSE and RMSE, respectively.
GBPC and GBPP denoting GBP call and GBP put, respectively.
* indicating minimum pricing error for GBPC options price.
** indicating minimum pricing error for GBPP options price.

Table 5.14 analyses the performance of IV_GBP to estimate GBPC and GBPP options price for the one-week horizon. The hypothesis 13, hypothesis 14, and hypothesis 15 are tested for the opening period, midday period, and closing period under MAE, MSE and RMSE measures and results are reported in the panels A, B, and C, respectively. For MAE measure, one-month maturity, Monday, and closing period IV_GBP outperform to estimate the value of GBPC (pricing errors = 0.1987) and GBPP (pricing errors = 0.0899) options of Monday in next week. Similarly, two-month maturity, Monday, and closing period IV_GBP is better to compute GBPC (pricing error = 0.2000) and GBPP (pricing error = 0.1010) options price. Further, the three-month maturity, Monday, and closing period IV_GBP is superior to estimate GBPC (pricing error = 0.2012) and GBPP (pricing error = 0.1112) options price. However, one-month maturity, Monday, and closing period IV_GBP provide lower pricing error (GBPC pricing error = 0.1987 and GBPP pricing error = 0.0899) under MAE measure. Similarly, MSE measure generates lower pricing error (GBPC pricing error = 0.0616 and GBPP pricing error = 0.0172) for one-month maturity, Monday, and closing period IV_GBP. The RMSE measure also estimates the lower pricing error (GBPC pricing error = 0.2556 and GBPP pricing error = 0.1311) for the one-month maturity, Monday, and closing period IV_GBP. The overall results imply that one-month maturity, Monday, and closing period IV_GBP outperform to estimate the value of GBPC and GBPP options price precisely with a minimum pricing under all measures.

Table 5. 14: IV_GBP estimate GBP options price for one-week estimate horizon

Horizon	Options	One-month maturity IV_GBP (hypothesis 14)			Two-month maturity IV_GBP (hypothesis 14)			Three-month Maturity IV_GBP (hypothesis 15)		
		OP	MD	CL	OP	MD	CL	OP	MD	CL
Panel A: Pricing error under MAE measure										
Mon to Mon	GBPC	0.2571	0.2533	0.1987*	0.2319	0.2826	0.2000*	0.2340	0.2789	0.2012*
	GBPP	0.1407	0.1333	0.0899**	0.1389	0.1177	0.1010**	0.1530	0.1433	0.1112**
Tue to Tue	GBPC	0.2578	0.2795	0.2652	0.2726	0.3330	0.2720	0.2934	0.3245	0.2712
	GBPP	0.1300	0.1261	0.1221	0.1808	0.1380	0.1342	0.1688	0.1432	0.1325
Wed to Wed	GBPC	0.2623	0.2880	0.2263	0.2655	0.2891	0.2654	0.2723	0.2978	0.2717
	GBPP	0.1600	0.1390	0.1133	0.1494	0.1292	0.1224	0.1613	0.1404	0.1294
Thu to Thu	GBPC	0.2813	0.2940	0.2018	0.2584	0.3469	0.2404	0.2936	0.3342	0.2283
	GBPP	0.1514	0.1556	0.1010	0.1556	0.1448	0.1028	0.1623	0.1604	0.1186
Fri to Fri	GBPC	0.3017	0.3384	0.2212	0.2861	0.3533	0.2721	0.2808	0.3604	0.2373
	GBPP	0.1695	0.1692	0.1124	0.1725	0.1434	0.1210	0.1795	0.1595	0.1543
Panel B: Pricing error under MSE measure										
Mon to Mon	GBPC	0.1220	0.1242	0.0616*	0.1127	0.1483	0.0710*	0.0992	0.1390	0.0746*
	GBPP	0.0699	0.0701	0.0172**	0.0397	0.0289	0.0248**	0.0489	0.0426	0.0284**
Tue to Tue	GBPC	0.1290	0.1129	0.0821	0.1491	0.1870	0.0994	0.1580	0.1837	0.1116
	GBPP	0.0442	0.0436	0.0350	0.0709	0.0397	0.0358	0.0690	0.0447	0.0395
Wed to Wed	GBPC	0.1332	0.1573	0.1144	0.1524	0.1614	0.1685	0.1371	0.1639	0.1358
	GBPP	0.0904	0.0641	0.0481	0.0446	0.0436	0.0542	0.0677	0.0437	0.0498
Thu to Thu	GBPC	0.1770	0.1756	0.0837	0.1379	0.2177	0.1102	0.1856	0.2043	0.1022
	GBPP	0.0447	0.0843	0.0182	0.0476	0.0587	0.0345	0.0527	0.0653	0.0395
Fri to Fri	GBPC	0.2009	0.2249	0.1624	0.1883	0.2123	0.1756	0.1802	0.2195	0.1790
	GBPP	0.0626	0.0461	0.0234	0.0632	0.0413	0.0253	0.0631	0.0499	0.0359
Panel C: Pricing error under RMSE measure										
Mon to Mon	GBPC	0.3493	0.3525	0.2556*	0.3357	0.3851	0.2664*	0.3150	0.3729	0.2732*
	GBPP	0.2644	0.2647	0.1311**	0.1994	0.1701	0.1574**	0.2212	0.2063	0.1685**
Tue to Tue	GBPC	0.3592	0.3360	0.2865	0.3862	0.4324	0.3153	0.3974	0.4286	0.3341
	GBPP	0.2054	0.2089	0.1871	0.2662	0.1993	0.1892	0.2626	0.2115	0.1988
Wed to Wed	GBPC	0.3650	0.3967	0.3383	0.3904	0.4017	0.3702	0.3703	0.4049	0.3685
	GBPP	0.3007	0.2531	0.2192	0.2112	0.2088	0.2328	0.2603	0.2092	0.2232
Thu to Thu	GBPC	0.4207	0.4190	0.2893	0.3713	0.4666	0.3319	0.4308	0.4520	0.3197
	GBPP	0.2115	0.2904	0.1332	0.2182	0.2423	0.1857	0.2295	0.2554	0.1717
Fri to Fri	GBPC	0.4483	0.4743	0.4030	0.4340	0.4608	0.4190	0.4245	0.4685	0.4231
	GBPP	0.2501	0.2148	0.1530	0.2515	0.2033	0.1589	0.2512	0.2233	0.1894

Notes: This table analyses the performance of IV_GBP to estimate GBPC and GBPP options price for the one-week horizon. The hypothesis 13, hypothesis 14, and hypothesis 15 are tested for the opening period, midday period, and closing period under MAE, MSE and RMSE measures and results are reported in the panels A, B, and C, respectively.OP, MD and CL denoting opening period, midday period and closing period, respectively. The 'mean absolute error', 'mean squared error' and 'root mean squared error' denoting by MAE, MSE and RMSE, respectively.
GBPC and GBPP denoting GBP call and GBP put, respectively.
* indicating minimum pricing error for GBPC options price.
** indicating minimum pricing error for GBPP options price.

Table 5.15 analyses the performance of IV_GBP to estimate GBPC and GBPP options price for the one-month horizon. The hypothesis 16, hypothesis 17, and hypothesis 18 are tested for the opening period, midday period, and closing period under MAE, MSE and RMSE measures and results are reported in the panels A, B, and C, respectively. For MAE measure, one-month maturity, Tuesday, and closing period IV_GBP perform better to estimate GBPC (pricing errors = 0.1908) and GBPP (pricing errors = 0.1261) options price of Tuesday in next month. Similarly, two-month maturity, Tuesday, and closing period IV_GBP is superior to estimate the value of GBPC (pricing error = 0.1898) and GBPP (pricing error = 0.1161) options. Further, the three-month maturity, Tuesday, and closing period IV_GBP outperform to compute GBPC (pricing error = 0.2308) and GBPP (pricing error = 0.1388) options price. However, two-month maturity, Tuesday, and closing period IV_GBP show lower pricing error (GBPC pricing error = 0.1898 and GBPP pricing error = 0.1161) under MAE measure. Similarly, MSE measure generates lower pricing error (GBPC pricing error = 0.0714 and GBPP pricing error = 0.0322) for two-month maturity, Tuesday, and closing period IV_GBP. The RMSE measure also estimates the lower pricing error (GBPC pricing error = 0.2672 and GBPP pricing error = 0.1794) for the two-month maturity, Tuesday, and closing period IV_GBP. The overall results indicate that two-month maturity, Tuesday, and closing period IV_GBP superior to estimate GBPC and GBPP options price correctly with a minimum pricing error under all measures.

Table 5. 15: IV_GBP estimate GBP options price for one-month estimate horizon

Horizon	Options	One-month maturity IV_GBP (hypothesis 16)			Two-month maturity IV_GBP (hypothesis 17)			Three-month Maturity IV_GBP (hypothesis 18)		
		OP	MD	CL	OP	MD	CL	OP	MD	CL
Panel A: Pricing error under MAE measure										
Mon to Mon	GBPC	0.2725	0.2947	0.2369	0.2628	0.2847	0.2269	0.2765	0.3069	0.2387
	GBPP	0.2003	0.1319	0.1291	0.1913	0.1209	0.1191	0.1809	0.1541	0.1479
Tue to Tue	GBPC	0.2618	0.2970	0.1908*	0.2508	0.2860	0.1898*	0.2962	0.3140	0.2308*
	GBPP	0.1994	0.1518	0.1261**	0.1971	0.1408	0.1161**	0.2027	0.1611	0.1388**
Wed to Wed	GBPC	0.2923	0.3012	0.2589	0.2833	0.2992	0.2479	0.3056	0.3275	0.2648
	GBPP	0.2038	0.1591	0.1625	0.1938	0.1481	0.1515	0.1720	0.1537	0.1480
Thu to Thu	GBPC	0.2829	0.3182	0.2653	0.2719	0.3072	0.2543	0.3588	0.3648	0.2510
	GBPP	0.1898	0.1842	0.1296	0.1788	0.1732	0.1186	0.1947	0.1725	0.1442
Fri to Fri	GBPC	0.3124	0.3296	0.2543	0.3014	0.3186	0.2443	0.3321	0.3472	0.2469
	GBPP	0.1919	0.1825	0.1284	0.1809	0.1725	0.1184	0.1942	0.1742	0.1476
Panel B: Pricing error under MSE measure										
Mon to Mon	GBPC	0.1427	0.1825	0.1347	0.1327	0.1625	0.1131	0.1459	0.1722	0.1169
	GBPP	0.1422	0.0422	0.0487	0.1312	0.0322	0.0346	0.0738	0.0544	0.0539
Tue to Tue	GBPC	0.1482	0.1625	0.0824*	0.1372	0.1515	0.0714*	0.1527	0.1652	0.1065*
	GBPP	0.0950	0.0722	0.0422**	0.0910	0.0612	0.0322**	0.1085	0.0786	0.0519**
Wed to Wed	GBPC	0.1924	0.1941	0.1595	0.1814	0.1831	0.1485	0.1675	0.1948	0.1492
	GBPP	0.1145	0.1191	0.1023	0.1035	0.0981	0.0913	0.0985	0.0977	0.0973
Thu to Thu	GBPC	0.1655	0.1983	0.1544	0.1545	0.1883	0.1235	0.2397	0.2435	0.1434
	GBPP	0.0828	0.1144	0.0523	0.0718	0.1004	0.0403	0.0888	0.0799	0.0650
Fri to Fri	GBPC	0.2187	0.1984	0.1341	0.2077	0.1884	0.1247	0.2238	0.2080	0.1292
	GBPP	0.0943	0.0845	0.0426	0.0813	0.0775	0.0387	0.1068	0.0743	0.0643
Panel C: Pricing error RMSE measure										
Mon to Mon	GBPC	0.3778	0.4272	0.3523	0.3643	0.4031	0.3363	0.3820	0.4149	0.3419
	GBPP	0.3771	0.2054	0.2207	0.3622	0.1794	0.1859	0.2716	0.2332	0.2399
Tue to Tue	GBPC	0.3850	0.4031	0.2871*	0.3704	0.3892	0.2672*	0.3908	0.4065	0.3264*
	GBPP	0.3082	0.2687	0.2054**	0.3016	0.2474	0.1794**	0.3294	0.2803	0.2278**
Wed to Wed	GBPC	0.4386	0.4406	0.3994	0.4259	0.4278	0.3853	0.4093	0.4413	0.3863
	GBPP	0.3384	0.3451	0.3198	0.3218	0.3132	0.3022	0.3138	0.3126	0.3119
Thu to Thu	GBPC	0.4068	0.4453	0.3929	0.3931	0.4340	0.3514	0.4896	0.4935	0.3787
	GBPP	0.2877	0.3382	0.2287	0.2680	0.3168	0.2008	0.2980	0.2826	0.3344
Fri to Fri	GBPC	0.4677	0.4454	0.3662	0.4557	0.4340	0.3531	0.4731	0.4560	0.3595
	GBPP	0.3071	0.2907	0.2207	0.2852	0.2785	0.1968	0.3268	0.2726	0.2535

Notes: This table analyses the performance of IV_GBP to estimate GBPC and GBPP options price for the one-month horizon. The hypothesis 16, hypothesis 17, and hypothesis 18 are tested for the opening period, midday period, and closing period under MAE, MSE and RMSE measures and results are reported in the panels A, B, and C, respectively. OP, MD and CL denoting opening period, midday period and closing period, respectively. The 'mean absolute error', 'mean squared error' and 'root mean squared error' denoting by MAE, MSE and RMSE, respectively.
GBPC and GBPP denoting GBP call and GBP put, respectively.
* indicating minimum pricing error for GBPC options price.
** indicating minimum pricing error for GBPP options price.

5.5 Conclusion

This chapter presents the empirical analysis for evaluating the performance of IV to estimate the call and put options price through testing hypothesis 10 to hypothesis 18. The empirical analysis includes: calculating the CMOD and PMOD using the ATM one-month, two-month, and three-month maturity IV obtained during the opening, midday, and closing period of a trading day as input for BS options pricing model; and estimating the OPE by comparing the CMOD and PMOD with the call and put options market price, respectively. The MAE, MSE, and RMSE measures estimate the call and put OPEs employing 1260 sets (630 sets for each call and put options) of options model price and options market price for the within-week, one-week, and one-month estimate horizon.

After considering the minimum call and put OPE, this chapter presents three groups of findings. First, for the within-week estimate horizon, two-month maturity closing period IV_AUD, IV_CHF, and IV_EUR of Monday is superior to generate the call and put OPE for AUD, CHF, and EUR options, respectively, under all measures. Further, the one-month maturity closing period IV_CAD and IV_GBP of Thursday is significant to estimate the call and put OPE for CAD and GBP options, respectively, under all measures. It indicates that the two-month maturity IV from early of a week (Monday or Tuesday) and one-month maturity IV from later of a week (Thursday) in the closing trading period contain relevant information to calculate the value of currency options for the within-week estimate horizon. Second, for the one-week estimate horizon, one-month maturity closing period IV_AUD, IV_CAD, IV_CHF, IV_EUR, and IV_GBP of Monday is superior to estimate the call and put OPE for AUD, CAD, CHF, EUR, GBP options, respectively, under all measures. It reveals that the one-month maturity IV from early of a week (Monday or Tuesday) in the closing trading period holds appropriate information to price currency options price for the one-week estimate horizon. Third, for the one-month estimate horizon, two-month maturity closing period IV_AUD, IV_CAD, IV_CHF, IV_EUR, and IV_GBP of Tuesday is excellent to generate the call and put OPE for AUD, CAD, CHF, EUR, GBP options, respectively, under all measures. It suggests that the two-month maturity IV from early of a week (Monday or Tuesday) in the closing trading period subsumes vital information to compute the value of currency options for the one-month estimate horizon.

CHAPTER 6
Conclusion of Thesis

6.1 Introduction

The empirical analysis is conducted for testing hypotheses 01 to 09 and hypotheses 10 to 18 in chapters 4 and 5, respectively, and a summary of the results is discussed in this chapter to conclude the thesis. The empirical findings in chapter 4 based on the analysis (i) IV forecast RV for the underlying currency of options for the within-week horizon, (ii) IV forecast RV for the underlying currency of options for the one-week horizon, and (ii) IV forecast RV for the underlying currency of options for the one-month horizon. Further, chapter 5 provides empirical results based on the analysis (i) IV estimate currency options price for the within-week estimate horizon, (ii) IV estimate currency options price for the one-week estimate horizon, and (iii) IV estimate currency options price for the one-month estimate horizon. This chapter also includes research significance, research limitations, and recommendations for future research.

6.2 Research findings

Table 6.1 is developed based on the empirical findings from chapter 4. The significant results from the analysis of IV forecast RV of underlying currency of options for the within-week horizon in Tables 4.1, 4.4, 4.7, 4.10, and 4.13 for AUD, CAD, CHF, EUR, and GBP, respectively, are reproduced in panel A. For example, the R^2 values 0.3362, 0.2809, and 0.3796 reported in column 5 are obtained from Table 4.1 for two-month maturity IV in the opening, midday, and closing period, respectively. Similarly, the key empirical results based on the analysis of IV forecast RV of underlying currency for the one-week horizon in Tables 4.2, 4.5, 4.8, 4.11, and 4.14 for AUD, CAD, CHF, EUR, and GBP, respectively, are presented in panel B. Further, the key findings from the investigation of IV forecast RV of underlying currency for the one-month horizon in Tables 4.3, 4.6, 4.9, 4.12, and 4.15 for AUD, CAD, CHF, EUR, and GBP, respectively, are given in panel C.

In Panel A for IV_AUD, the higher value of R^2 (0.3796) indicates that the 2-month maturity, Monday (begin-week day), and closing period IV is superior to forecast RV_AUD, which is reported in column 6. Similarly, a summary of the results from the analysis of IV to forecast RV with a higher value of R^2 for each currency is given in column 6. The overall mixed results leading to two critical findings in the last column: (i) two-month maturity, begin-week day, and closing period IV_AUD, IV_CAD, and IV_EUR are superior to forecast RV_AUD, RV_CAD, and RV_EUR for within-week forecast horizon, and (ii) one-month maturity, end-week day, and closing period IV_CHF and IV_GBP are superior to forecast RV_CHF and RV_GBP for within-week forecast horizon. In panel B, column 6 provides consistent results for all currencies with a critical finding in the last column that 1-month maturity, begin-week day, and closing period IV is superior to forecast RV of all underlying currency for the one-week forecast horizon. Finally, panel C reported consistent results for underlying currency in column 6 and provided a significant finding in the last column that two-month maturity, begin-week day, and closing period IV is superior to forecast RV of all underlying currency for one-month forecast horizon.

Table 6.1: Analysis IV to forecast RV of currency for different forecast horizons

Table	IV maturity	Day	Period	R^2	IV forecast RV	Key findings
Panel A: Within-week forecast horizon						
Table 4.1 IV_AUD	2-month	Tue	Opening	0.3362	two-month maturity, begin-week day, closing period	two-month maturity, begin-week day, and closing period IV_AUD, IV_CAD, and IV_EUR is superior to forecast RV_AUD, RV_CAD, and RV_EUR, respectively, for within-week forecast horizon. two-month maturity, end-week day, and closing period IV_CHF and IV_GBP is superior to forecast RV_CHF and RV_GBP, respectively, for within-week forecast horizon.
	2-month	Tue	Midday	0.2809		
	2-month	Mon	Closing	0.3796*		
Table 4.4 IV_CAD	2-month	Mon	Opening	0.2769	two-month maturity, begin-week day, closing period	
	2-month	Wed	Midday	0.2437		
	2-month	Tue	Closing	0.2978*		
Table 4.7 IV_CHF	1-month	Thu	Opening	0.3419	one-month maturity, end-week day, closing period	
	1-month	Thu	Midday	0.3474		
	1-month	Thu	Closing	0.3600*		
Table 4.10 IV_EUR	2-month	Mon	Opening	0.2241	two-month maturity, begin-week day, closing period	
	2-month	Tue	Midday	0.1863		
	2-month	Tue	Closing	0.2335*		
Table 4.13 IV_GBP	1-month	Thu	Opening	0.3704	one-month maturity, end-week day, closing period	
	1-month	Wed	Midday	0.2890		
	1-month	Thu	Closing	0.3865*		
Panel B: One-week forecast horizon						
Table 4.2 IV_AUD	1-month	Tue	Opening	0.4659	one-month maturity, begin-week day, closing period	one-month maturity, begin-week day, and closing period IV is superior to forecast RV of all sample currency for one-week forecast horizon.
	1-month	Tue	Midday	0.4328		
	1-month	Mon	Closing	0.4721*		
Table 4.5 IV_CAD	1-month	Mon	Opening	0.4899	one-month maturity, begin-week day, closing period	
	1-month	Mon	Midday	0.4076		
	1-month	Mon	Closing	0.4911*		
Table 4.8 IV_CHF	1-month	Tue	Opening	0.4419	one-month maturity, begin-week day, closing period	
	1-month	Tue	Midday	0.3713		
	1-month	Tue	Closing	0.4739*		
Table 4.11 IV_EUR	1-month	Mon	Opening	0.4359	one-month maturity, begin-week day, closing period	
	1-month	Mon	Midday	0.3659		
	1-month	Mon	Closing	0.4406*		
Table 4.14 IV_GBP	1-month	Mon	Opening	0.4374	one-month maturity, begin-week day, closing period	
	1-month	Tue	Midday	0.4271		
	1-month	Mon	Closing	0.4442*		
Panel C: One-month forecast horizon						
Table 4.3 IV_AUD	2-month	Tue	Opening	0.3861	two-month maturity, begin-week day, closing period	two-month maturity, begin-week day, and closing period IV is superior to forecast RV of all sample currency for one-month forecast horizon.
	2-month	Tue	Midday	0.3328		
	2-month	Tue	Closing	0.3933*		
Table 4.6 IV_CAD	2-month	Mon	Opening	0.3471	two-month maturity, begin-week day, closing period	
	2-month	Tue	Midday	0.3442		
	2-month	Tue	Closing	0.3519*		
Table 4.9 IV_CHF	2-month	Tue	Opening	0.3185	two-month maturity, begin-week day, closing period	
	2-month	Tue	Midday	0.2415		
	2-month	Tue	Closing	0.3214*		
Table 4.12 IV_EUR	2-month	Mon	Opening	0.3721	two-month maturity, begin-week day, closing period	
	2-month	Tue	Midday	0.3116		
	2-month	Mon	Closing	0.3814*		
Table 4.15 IV_GBP	2-month	Mon	Opening	0.3899	two-month maturity, begin-week day, closing period	
	2-month	Mon	Midday	0.3185		
	2-month	Mon	Closing	0.3967*		

Notes: This table is developed based on the empirical findings from chapter 4. The significant results from the analysis of IV forecast RV of underlying currency of options for the within-week horizon in Tables 4.1, 4.4, 4.7, 4.10, and 4.13 for AUD, CAD, CHF, EUR, and GBP, respectively, are reproduced in panel A.Monday and Tuesday, Wednesday, and Thursday and Friday are begin-week day, mid-week day, and end-week day, respectively. 9.30 to 10.00, 12.30 to 13.00, and 15:30 to 16.00 are opening, midday, and closing period, respectively.
* denotes higher value of R^2 among opening, midday, and closing period that is leading to the performance of IV to forecast RV.

Table 6.2 is constructed with the critical findings of empirical analysis in chapter 5. The results of minimum pricing error analysis are consistent under all measures for all currency options price in chapter 5. However, we have reproduced the minimum pricing error only under the MSE measure in Table 6.2 for illustration purposes. The minimum pricing error from the analysis of IV estimating the price of AUD, CAD, CHF, EUR, and GBP options for the within-week horizon in Tables 5.1, 5.4, 5.7, 5.10, and 5.13 respectively, are reported in Panel A. For example, the minimum pricing errors 0.0361 and 0.0091 for AUDC and AUDP, respectively, are obtained from Table 5.1 for two-month maturity, Monday, and closing period IV under MSE measure, reported in column 6. Similarly, the minimum pricing error from the investigation of IV estimating the price of AUD, CAD, CHF, EUR, and GBP options for the one-week horizon in Tables 5.2, 5.5, 5.8, 5.11, and 5.14, respectively, are given in Panel B. Further, the minimum pricing error from the analysis of IV estimating the price of AUD, CAD, CHF, EUR, and GBP options for the one-month horizon in Tables 5.3, 5.6, 5.9, 5.12, and 5.15 respectively, are presented in Panel C.

Column 7 of Table 6.2 provides a summary of the results from the analysis of IV to estimate options price with a minimum pricing error for each currency options. Panel A shows mixed results in column 7 with two critical findings in the last column. First, two-month maturity, begin-week day, and closing period IV_AUD, IV_CHF, and IV_EUR are superior to estimate the price of AUD, CHF, and EUR options, respectively, for the within-week estimate horizon. Second, one-month maturity, end-week day, and closing period IV_CAD and IV_GBP perform better to compute the value of CAD and GBP, respectively, for the within-week estimate horizon. In panel B, the overall results for all currency options are consistent in column 7 and provided a crucial finding in the last column that one-month maturity, begin-week day, and closing period IV is significant to calculate the value of all currency options for the one-week estimate horizon. Finally, panel C reported consistent results for all currency options in column 7 and provided a critical finding that two-month maturity, begin-week day, and closing period IV is appropriate to estimate the price of all currency options for the one-month estimate horizon.

Table 6.2: Analysis IV to estimate currency options price for different estimate horizons

Table	Options	IV maturity	Day	Period	MSE measure	IV estimate options price	Key findings
Panel A: Within-week estimate horizon							
Table 5.1 IV_AUD	AUDC	2-month	Mon	Closing	0.0361*	two-month maturity begin-week day, closing period	two-month maturity, begin-week day, and closing period IV_AUD, IV_CHF, and IV_EUR are superior to estimate price of AUD, CHF, and EUR options, respectively, the price for within-week estimate horizon.
	AUDP	2-month	Mon	Closing	0.0091*		
Table 5.4 IV_CAD	CADC	1-month	Thu	Closing	0.0310*	one-month maturity end-week day, closing period	
	CADP	1-month	Thu	Closing	0.0062*		
Table 5.7 IV_CHF	CHFC	2-month	Mon	Closing	0.0749*	two-month maturity begin-week day, closing period	
	CHFP	2-month	Mon	Closing	0.0154*		
Table 5.10 IV_EUR	EURC	2-month	Mon	Closing	0.0595*	two-month maturity begin-week day, closing period	one-month maturity, end-week day, and closing period IV_CAD and IV_GBP are superior to estimate the price of CAD and GBP options, respectively, for within-week estimate horizon.
	EURP	2-month	Mon	Closing	0.0219*		
Table 5.13 IV_GBP	GBPC	1-month	Thu	Closing	0.0314*	one-month maturity end-week day, closing period	
	GBPP	1-month	Thu	Closing	0.0201*		
Panel B: One-week estimate horizon							
Table 5.2 IV_AUD	AUDC	1-month	Mon	Closing	0.0441*	one-month maturity begin-week day, closing period	one-month maturity, begin-week day, and closing period IV is superior to estimate the price of all currency options for one-week estimate horizon.
	AUDP	1-month	Mon	Closing	0.0074*		
Table 5.5 IV_CAD	CADC	1-month	Mon	Closing	0.0236*	one-month maturity begin-week day, closing period	
	CADP	1-month	Mon	Closing	0.0061*		
Table 5.8 IV_CHF	CHFC	1-month	Mon	Closing	0.0358*	one-month maturity begin-week day, closing period	
	CHFP	1-month	Mon	Closing	0.0170*		
Table 5.11 IV_EUR	EURC	1-month	Mon	Closing	0.0658*	one-month maturity begin-week day closing period	
	EURP	1-month	Mon	Closing	0.0121*		
Table 5.14 IV_GBP	GBPC	1-month	Mon	Closing	0.0616*	one-month maturity begin-week day closing period	
	GBPP	1-month	Mon	Closing	0.0172*		
Panel C: One-month estimate horizon							
Table 5.3 IV_AUD	AUDC	2-month	Tue	Closing	0.0431*	two-month maturity end-week day closing period	two-month maturity, begin-week day, and closing period IV is superior to estimate the price of all currency options for one-month estimate horizon.
	AUDP	2-month	Tue	Closing	0.0128*		
Table 5.6 IV_CAD	CADC	2-month	Tue	Closing	0.0273*	two-month maturity end-week day closing period	
	CADP	2-month	Tue	Closing	0.0103*		
Table 5.9 IV_CHF	CHFC	2-month	Tue	Closing	0.0482*	two-month maturity end-week day closing period	
	CHFP	2-month	Tue	Closing	0.0330*		
Table 5.12 IV_EUR	EURC	2-month	Tue	Closing	0.0760*	two-month maturity end-week day closing period	
	EURP	2-month	Tue	Closing	0.0219*		
Table 5.15 IV_GBP	GBPC	2-month	Tue	Closing	0.0714*	two-month maturity end-week day closing period	
	GBPP	2-month	Tue	Closing	0.0322*		

Notes: This table is constructed with the critical findings of empirical analysis in chapter 5. The results of minimum pricing error analysis are consistent under all measures for all currency options price in chapter 5. However, we have reproduced the minimum pricing error only under the MSE measure in Table 6.2 for illustration purposes.Monday and Tuesday, Wednesday, and Thursday and Friday are begin-week day, mid-week day, and end-week day, respectively. 9.30 to 10.00, 12.30 to 13.00, and 15:30 to 16.00 are opening, midday, and closing period, respectively. * denotes call and put options minimum pricing error under MSE (mean squared error) measure.

The key findings in Tables 6.1 provide a mixed picture for IV of holding information to forecast RV for the within-week forecast horizon. It suggests that the IV does not hold relevant information to forecast the volatility of the underlying currency of options for one day to four days forecast horizon. Therefore, the IV is not appropriate to estimate the currency options price for the within-week estimate horizon as reported mixed results in Table 6.2

Further, the critical findings in Table 6.1 show that the one-month and two-month maturity, begin-week day, and closing period IV holds relevant information to forecast RV for the one-week and one-month forecast horizon, respectively. It suggests that the information content embedded in one-month and two-month maturity IV is significant to forecast the volatility of the underlying currency of options one-week and one-month forecast horizon, respectively. Therefore, one-month and two-month maturity IV is appropriate to estimate the currency options price for the one-week and one-month estimate horizon, respectively, as reported in Table 6.2.

The overall results provide four critical insights. First, three-month maturity IV does not contain vital information about future volatility of the underlying currency and pricing currency options. Second, IV incorporates all information is not relevant to compute the value of currency options for less than a week estimate horizon. Third, IV of the closing period on Monday or Tuesday subsumes most of the essential information compared to other periods of a trading day and other days of a week to forecast volatility of the underlying currency and estimate the price of currency options. Fourth, the shorter (longer) maturity IV provides essential information to price currency options for the shorter (longer) estimate horizon.

6.3 Research significance

The use of foreign currency options as a hedging tool and for speculative purposes has developed significantly over the past four decades. Therefore, the accuracy of currency options pricing plays a crucial role in managing financial risk, providing a source of financial leverage for speculators as well as preventing the opportunity for abnormal arbitrage profit. If the currency options are overpriced, the hedgers and speculators experience the higher cost for buying or holding currency options. However, the options become profitable for the options seller or writer. Further, the cost of hedging and speculation is less when options are underpriced. It also makes an opportunity cost loss for the options seller. However, the arbitragers make a profit from both underpricing and overpricing of options. Therefore, an accurate prediction of the volatility of the underlying currency is very critical to prevent currency options from being under or overpriced.

The IV is widely used to estimate the volatility of FX. Most of the studies involving IV often find that the most relevant information for predicting the volatility of an underlying asset can be found in the options price. Therefore, this study is particularly interested in FX volatility prediction for pricing currency options. However, it is argued that the daily IV holds the discrete information regarding the FX movement at a specific time of the trading day, which is not sufficient for estimating options prices accurately. For example, the IV holds information based on the closing options price of trading day t-1 may not be relevant for computing the price of options in the opening or midday of trading day t. It means the daily IV weakens the ability to capture the critical intraday information, which is essential for accurately forecasting the FX movement for pricing options. This study, therefore, introduces intraday IV through estimating IV for the price of options with different maturity during the opening, midday, and closing period of a trading day. The intraday IV approach will add a new dimension in the literature for the pricing currency option with higher accuracy.

This study has three significant contributions to this area of research. First, this study develops the intraday IV approach based on the one-month, two-month, and three-month maturity currency options traded during the opening, midday, and closing period of a trading day, to capture the most relevant information from the continuous movement of FX market of a trading day. Second, the research findings confirm that the one-month and two-month maturity intraday IV holds vital information to forecast the volatility of the underlying currency of options for the

one-week and one-month forecast horizon, respectively. Third, this study argues that the information content embedded in the one-month and two-month maturity intraday IV is appropriate to estimate the value of currency options for the one-week and one-month estimate horizon, respectively.

6.4 Research Limitations

This section discusses some limitations of the research. The study has employed the average of bid-ask quotations for options price rather than using trading data due to the unavailability of trading prices at the intraday level. According to Hentschel (2003), errors in options price leads to reasonable errors in IV measure, which is especially true for options far from the money. Depending on the inventory of the dealers, the 'true price' (TP) is closer to the bid price or ask price at any specific point of time. Over time, the TP is expected to be the centre of the bid-ask spread (Ho & Stoll, 1981). However, the TP does not always have to lie between the bid and ask quotes (Vijh, 1990). This study tried to eliminate the effects of the bid-ask spread for the IV estimation by using ATM options price; however, the limitation still exists.

The sample data obtained for this research from the exchange-traded market is not as big as the OTC market. BIS (2019) reported that the currency options are traded not only in the exchanges, but a considerable volume of currency options also traded in the interbank market. Currently, the interest of the currency options traders has shifted from exchanges to OTC trading due to the customisation benefit of OTC currency options over options traded in exchanges. Moreover, the study limits the data sample in the five currency options that represent the developed markets. Consequently, the research findings may not be appropriate to apply for the other FX markets that experience different characteristics such as currency markets of emerging countries.

The sample data period of this study restricts the range from 1 January 2010 to 31 December 2017 due to the large volume of high-frequency data that needs to be collected. Therefore, our research captures particular economic circumstances in the context of the post-GFC crisis period. Thus, the research results may be not suitalbe to apply for different economic circumstances such as for the pre and during cirsis period. However, the information content of the IV during a crisis period is also peculiarly relevant (Bates, 2012; Hilal et al., 2011) as it provides incremental and valuable information to hedge financial risk and to bring us a better understanding of market sentiment and behaviour. Therefore, further reasearch need to be implemented in the future to provide a more comprehensive picture about IV performance in forecasting volatility and pricing curency options price.

6.5 Recommendations for future research

Given the limitation of this research, this study provides some recommendations for future research. An accurate and straightforward estimation framework for calculating volatility and currency options price plays a crucial role in improving volatility forecasting and options price estimating performance. As mentioned earlier, the application of average bid-ask quotations causes errors in measuring volatility, which subsequently leads to errors in pricing currency options. Therefore, it requires more attention to construct a feasible estimator of IV that minimise the noise and bias of IV estimate. It creates room for new lines of future research.

Another avenue for potential further research concerns extending this research to the emerging currency options. As each type of FX market contains peculiar characteristics, the investigations of intraday IV in developing markets is necessary to provide a fully comprehensive view for its performance in forecasting the volatility of the underlying currency and estimating the value of currency options.

Given that the dataset of this study captures the time frame of the post-crisis market, another direction of the future research is to following up study that includes intraday data from a variety of periods of different economic circumstances, such as pre-GFC (for the period before 2008), and the GFC period of 2008/2009. The objective of these future research is to examine how the intraday IV model performs in different market conditions.

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APPENDICES

Table A4.1a: Details of AUD options data for testing hypothesis 1
(One-month maturity IV_AUD forecast RV_AUD for within-week forecast horizon)

Trade date	Trade day	Trade time	Expiry date	Call price	Put price	Strike Price	Spot price	IR_ AUD	IR_USD	IV_AUD	IV_AUDP	IV_AUD	Forecast date	Forecast day	Forecast RV_AUD
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Panel A: Opening period (9:30 - 10:00)															
21-JUN-10 Continue to 367 days	Mon	9:30	17-JUL-10	3.54	0.5	85	88.37	0.0486	0.0042	0.1652	0.1726	0.1689	25-JUN-10	Fri	0.0989
22-JUN-10 Continue to 364 days	Tue	9:30	17-JUL-10	3.18	0.55	85	87.68	0.0486	0.004	0.1895	0.1609	0.1752	25-JUN-10	Fri	0.0989
23-JUN-10 Continue to 381 days	Wed	9:30	17-JUL-10	4.21	0.39	83	87.1	0.0468	0.007	0.1801	0.1894	0.1847	25-JUN-10	Fri	0.0989
17-JUN-10 Continue to 391 days	Thu	9:30	17-JUL-10	4.01	0.58	83	86.55	0.0496	0.0072	0.2044	0.1796	0.192	18-JUN-10	Fri	0.0626
Panel B: Midday period (12:30 - 13:00)															
21-JUN-10 Continue to 355 days	Mon	12:35	17-JUL-10	3.27	0.56	85	88.18	0.0486	0.0035	0.1468	0.1751	0.1609	25-JUN-10	Fri	0.0989
22-JUN-10 Continue to 360 days	Tue	12:30	17-JUL-10	4.41	0.34	83.5	87.7	0.0486	0.004	0.202	0.1772	0.1896	25-JUN-10	Fri	0.0989
23-JUN-10 Continue to 365 days	Wed	12:35	17-JUL-10	3.83	0.45	83.5	87.26	0.0466	0.004	0.165	0.1885	0.1767	25-JUN-10	Fri	0.0989
17-JUN-10 Continue to 374 days	Thu	12:30	17-JUL-10	4.13	0.56	82.5	86.49	0.0496	0.0072	0.1745	0.1916	0.183	18-JUN-10	Fri	0.0626
Panel C: Closing period (15:30 - 16:00)															
21-JUN-10 Continue to 356 days	Mon	15:35	17-JUL-10	2.29	0.85	86	88.22	0.0486	0.0044	0.1121	0.1767	0.1444	25-JUN-10	Fri	0.0989
22-JUN-10 Continue to 360 days	Tue	15:30	17-JUL-10	1.6	1.09	86.5	88	0.0484	0.0028	0.0935	0.1793	0.1364	25-JUN-10	Fri	0.0989
23-JUN-10 Continue to 362 days	Wed	15:50	17-JUL-10	4.95	0.3	82.5	86.82	0.0486	0.0035	0.2758	0.179	0.2274	25-JUN-10	Fri	0.0989
17-JUN-10 Continue to 379 days	Thu	15:30	17-JUL-10	4.33	0.54	82.5	86.42	0.0496	0.004	0.2121	0.1853	0.1987	18-JUN-10	Fri	0.0626

Notes: AUD, IR_AUD, IR_ USD, IV_ AUDC, IV_ AUDP, IV_AUD and RV_AUD represents Australian dollar, interest rate of Australian dollar, interest rate of US dollar, implied volatility of Australian dollar call option price, implied volatility of Australian dollar put option price, implied volatility of Australian dollar options [(IV_AUDC + IV_AUDP)/2] and realized volatility of Australian dollar, respectively.

Table A4.1b: Details of AUD options data for testing hypothesis 2
(Two-month maturity IV_AUD forecast RV_AUD for within-week forecast horizon)

Trade date	Trade day	Trade time	Expiry date	Call price	Put price	Strike price	Spot price	IR_AUD	IR_USD	IV_AUDC	IV_AUDP	IV_AUD	Forecast date	Forecast day	Forecast RV_AUD
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Panel A: Opening period (9:30 - 10:00)															
31-MAY-10 Continue to 269 days	Mon	9:30	17-JUL-10	1.03	4.81	80.5	84.70	0.0501	0.0050	0.2149	0.2081	0.2115	04-JUN-10	Fri	0.2130
18-MAY-10 Continue to 283 days	Tue	9:30	17-JUL-10	0.83	3.66	90	87.30	0.0483	0.0049	0.1459	0.0994	0.1226	21-MAY-10	Fri	0.1932
02-JUN-10 Continue to 269 days	Wed	9:30	17-JUL-10	2.02	2.21	83	83.27	0.0497	0.0041	0.1824	0.1814	0.1819	04-JUN-10	Fri	0.2130
27-MAY-10 Continue to 251 days	Thu	9:30	17-JUL-10	1.41	3.06	85	83.77	0.0499	0.0054	0.1730	0.1647	0.1688	28-MAY-10	Fri	0.1131
Panel B: Midday period (12:30 - 13:00)															
24-MAY-10 Continue to 371 days	Mon	12:30	17-JUL-10	4.99	1.24	79	82.80	0.0500	0.0050	0.2508	0.2056	0.2282	28-MAY-10	Fri	0.1131
18-MAY-10 Continue to 397 days	Tue	12:30	17-JUL-10	4.25	1.10	83.5	87.51	0.0482	0.0049	0.1554	0.1759	0.1656	21-MAY-10	Fri	0.1932
19-MAY-10 Continue to 385 days	Wed	12:30	17-JUL-10	4.50	1.40	80.5	84.61	0.0488	0.0070	0.1753	0.2142	0.1948	21-MAY-10	Fri	0.1932
20-MAY-10 Continue to 364 days	Thu	12:30	17-JUL-10	4.93	1.63	78.5	82.55	0.0492	0.0048	0.2247	0.2398	0.2323	21-MAY-10	Fri	0.1932
Panel C: Closing period (15:30 - 16:00)															
24-MAY-2010 Continue to 372 days	Mon	15:30	17-JUL-10	4.85	1.27	79	83.09	0.0500	0.0052	0.2199	0.2161	0.2180	28-MAY-10	Fri	0.1131
18-MAY-10 Continue to 397 days	Tue	16:00	17-JUL-10	3.75	1.15	83.5	87.09	0.0468	0.0065	0.1358	0.1831	0.1595	21-MAY-10	Fri	0.1932
19-MAY-10 Continue to 385 days	Wed	15:45	17-JUL-10	5.63	1.12	79.5	83.64	0.0488	0.0076	0.2729	0.1932	0.2330	21-MAY-10	Fri	0.1932
20-MAY-10 Continue to 374 days	Thu	15:30	17-JUL-10	5.43	1.60	78.5	82.40	0.0493	0.0029	0.2778	0.2320	0.2549	21-MAY-10	Fri	0.1932

Notes: AUD, IR_AUD, IR_ USD, IV_ AUDC, IV_ AUDP, IV_AUD and RV_AUD represents Australian dollar, interest rate of Australian dollar, interest rate of US dollar, implied volatility of Australian dollar call option price, implied volatility of Australian dollar put option price, implied volatility of Australian dollar options [(IV_AUDC + IV_AUDP)/2] and realized volatility of Australian dollar, respectively.

Table A4.1c: Details of AUD options data for testing hypothesis 3
(Three-month maturity IV_AUD forecast RV_AUD for within-week forecast horizon)

Trade date	Trade day	Trade time	Expiry date	Call price	Put price	Strike price	Spot price	IR_AUD	IR_USD	IV_AUDC	IV_AUDP	IV_AUD	Forecast date	Forecast day	Forecast RV_AUD
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Panel A: Opening period (9:30 - 10:00)															
19-APR-10 Continue to 241 days	Mon	9:30	17-JUL-10	4.50	0.97	87.5	91.83	0.0473	0.0053	0.1391	0.1296	0.1343	23-APR-10	Fri	0.0852
04-MAY-10 Continue to 189 days	Tue	9:45	17-JUL-10	0.84	3.42	93	91.89	0.0489	0.0060	0.0979	0.1418	0.1198	07-MAY-10	Fri	0.1725
28-APR-10 Continue to 188 days	Wed	9:30	17-JUL-10	1.29	2.79	93	91.63	0.0474	0.0040	0.1299	0.0815	0.1057	30-APR-10	Fri	0.0751
29-APR-10 Continue to 196 days	Thu	9:30	17-JUL-10	1.41	2.46	93	92.65	0.0480	0.0023	0.1154	0.1023	0.1088	30-APR-10	Fri	0.0751
Panel B: Midday period (12:30 - 13:00)															
19-APR-10 Continue to 373 days	Mon	12:30	17-JUL-10	4.40	0.99	87.5	91.82	0.0473	0.0054	0.1327	0.1305	0.1316	23-APR-10	Fri	0.0852
20-APR-10 Continue to 363 days	Tue	12:30	17-JUL-10	4.16	1.00	89	93.08	0.0473	0.0054	0.1267	0.1254	0.1260	23-APR-10	Fri	0.0852
21-APR-10 Continue to 364 days	Wed	12:30	17-JUL-10	3.56	1.17	89.5	92.99	0.0477	0.0054	0.1148	0.1253	0.1200	23-APR-10	Fri	0.0852
22-APR-10 Continue to 363 days	Thu	12:30	17-JUL-10	3.75	1.12	89	92.63	0.0477	0.0058	0.1214	0.1267	0.1240	23-APR-10	Fri	0.0852
Panel C: Closing period (15:30 - 16:00)															
19-APR-10 Continue to 373 days	Mon	15:30	17-JUL-10	4.71	0.95	87.5	91.96	0.0473	0.0054	0.1467	0.1303	0.1385	23-APR-10	Fri	0.0852
20-APR-10 Continue to 363 days	Tue	15:30	17-JUL-10	4.15	1.00	89	93.08	0.0474	0.0054	0.1264	0.1253	0.1259	23-APR-10	Fri	0.0852
21-APR-10 Continue to 364 days	Wed	15:30	17-JUL-10	4.21	0.92	88.5	92.65	0.0476	0.0054	0.1277	0.1228	0.1252	23-APR-10	Fri	0.0852
22-APR-10 Continue to 365 days	Thu	15:30	17-JUL-10	4.75	0.85	88	92.49	0.0477	0.0058	0.1484	0.1261	0.1373	23-APR-10	Fri	0.0852

Notes: AUD, IR_ AUD, IR_ USD, IV_ AUDC, IV_ AUDP, IV_AUD and RV_AUD represents Australian dollar, interest rate of Australian dollar, interest rate of US dollar, implied volatility of Australian dollar call option price, implied volatility of Australian dollar put option price, implied volatility of Australian dollar options [(IV_AUDC + IV_AUDP)/2] and realized volatility of Australian dollar, respectively.

Table A4.2a: Details of AUD options data for testing hypothesis 4
(One-month maturity IV_AUD forecast RV_AUD for one-week forecast horizon)

Trade date	Trade day	Trade time	Expiry date	Call price	Put price	Strike price	Spot price	IR_AUD	IR_USD	IV_AUDC	IV_AUDP	IV_AUD	Forecast date	Forecast day	Forecast RV_AUD
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Panel A: Opening period (9:30-10:00)															
21-JUN-10 Continue to 366 days	Mon	9:30	17-JUL-10	3.54	0.5	85	88.37	0.0486	0.0042	0.1652	0.1726	0.1689	28-JUN-10	Mon	0.0741
22-JUN-10 Continue to 363 days	Tue	9:30	17-JUL-10	3.18	0.55	85	87.68	0.0486	0.004	0.1895	0.1609	0.1752	29-JUN-10	Tue	0.1064
23-JUN-10 Continue to 380 days	Wed	9:30	17-JUL-10	4.21	0.39	83	87.1	0.0468	0.007	0.1801	0.1894	0.1847	30-JUN-10	Wed	0.1327
17-JUN-10 Continue to 390 days	Thu	9:30	17-JUL-10	4.01	0.58	83	86.55	0.0496	0.0072	0.2044	0.1796	0.192	24-JUN-10	Thu	0.093
18-JUN-10 Continue to 379	Fri	9:30	17-JUL-10	4.13	0.49	83	86.88	0.0491	0.0056	0.1886	0.1803	0.1844	25-JUN-10	Fri	0.0989
Panel B: Midday period (12:30-13:00)															
21-JUN-10 Continue to 354 days	Mon	12:30	17-JUL-10	3.27	0.56	85	88.18	0.0486	0.0035	0.1468	0.1751	0.1609	28-JUN-10	Mon	0.0741
22-JUN-10 Continue to 359 days	Tue	12:30	17-JUL-10	4.41	0.34	83.5	87.7	0.0486	0.004	0.202	0.1772	0.1896	29-JUN-10	Tue	0.1064
23-JUN-10 Continue to 364 days	Wed	12:35	17-JUL-10	3.83	0.45	83.5	87.26	0.0466	0.004	0.165	0.1885	0.1767	30-JUN-10	Wed	0.1327
17-JUN-10 (Continue to 373 days	Thu	12:30	17-JUL-10	4.13	0.56	82.5	86.49	0.0496	0.0072	0.1745	0.1916	0.183	24-JUN-10	Thu	0.093
18-JUN-10 Continue to 357 days	Fri	12:30	17-JUL-10	4.54	0.41	82.5	86.79	0.0491	0.0073	0.2011	0.1801	0.1906	25-JUN-10	Fri	0.0989
Panel C: Closing period (15:30-16:00)															
21-JUN-10 Continue to 355 days	Mon	15:35	17-JUL-10	2.29	0.85	86	88.22	0.0486	0.0044	0.1121	0.1767	0.1444	28-JUN-10	Mon	0.0741
22-JUN-10 Continue to 359 days	Tue	15:30	17-JUL-10	1.6	1.09	86.5	88	0.0484	0.0028	0.0935	0.1793	0.1364	29-JUN-10	Tue	0.1064
23-JUN-10 Continue to 362 days	Wed	15:50	17-JUL-10	4.945	0.295	82.5	86.82	0.0486	0.0035	0.27582	0.179	0.2274	30-JUN-10	Wed	0.1327
17-JUN-10 Continue to 378 days	Thu	15:30	17-JUL-10	4.33	0.54	82.5	86.42	0.0496	0.004	0.2121	0.1853	0.1987	24-JUN-10	Thu	0.093
18-JUN-10 Continue to 359 days	Fri	15:30	17-JUL-10	4.11	0.46	83	86.96	0.0491	0.0073	0.1755	0.1777	0.1766	25-JUN-10	Fri	0.0989

Notes: AUD, IR_ AUD, IR_ USD, IV_ AUDC, IV_ AUDP, IV_AUD and RV_AUD represents Australian dollar, interest rate of Australian dollar, interest rate of US dollar, implied volatility of Australian dollar call option price, implied volatility of Australian dollar put option price, implied volatility of Australian dollar options [(IV_AUDC + IV_AUDP)/2] and realized volatility of Australian dollar, respectively.

Table A4.2b: Details of AUD options data for testing hypothesis 5
(Two-month maturity IV_AUD forecast RV_AUD for one-week forecast horizon)

Trade date	Trade day	Trade time	Expiry date	Call price	Put price	Strike price	Spot price	IR_AUD	IR_USD	IV_AUDC	IV_AUDP	IV_AUD	Forecast date	Forecast day	Forecast RV_AUD
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Panel A: Opening period (9:30-10:00)															
31-MAY-10 Continue to 268 days	Mon	9:30	17-JUL-10	4.81	1.03	80.5	84.70	0.0501	0.0050	0.2149	0.2081	0.2115	07-JUN-10	Mon	0.1226
18-MAY-10 Continue to 283 days	Tue	9:30	17-JUL-10	0.83	3.66	90	87.30	0.0483	0.0049	0.1459	0.0994	0.1226	25-MAY-10	Tue	0.1466
02-JUN-10 Continue to 269 days	Wed	9:30	17-JUL-10	2.02	2.21	83	83.27	0.0497	0.0041	0.1824	0.1814	0.1819	09-JUN-10	Wed	0.1058
27-MAY-10 Continue to 251 days	Thu	9:30	17-JUL-10	1.41	3.06	85	83.77	0.0499	0.0054	0.1730	0.1647	0.1688	03-JUN-10	Thu	0.1046
28-MAY-10 Continue to 253 days	Fri	9:30	17-JUL-10	2.87	1.73	83	85.34	0.0497	0.0057	0.1465	0.2047	0.1756	04-JUN-10	Fri	0.2130
Panel B: Midday period (12:30-13:00)															
24-MAY-10 Continue to 270 days	Mon	12:30	17-JUL-10	4.99	1.24	79	82.80	0.0500	0.0050	0.2508	0.2056	0.2282	31-MAY-10	Mon	0.1249
18-MAY-10 Continue to 396 days	Tue	12:30	17-JUL-10	4.25	1.10	83.5	87.51	0.0482	0.0049	0.1554	0.1759	0.1656	25-MAY-10	Tue	0.1466
19-MAY-10 Continue to 384 days	Wed	12:30	17-JUL-10	4.50	1.40	80.5	84.61	0.0488	0.0070	0.1753	0.2142	0.1948	26-MAY-10	Wed	0.1657
20-MAY-10 Continue to 363 days	Thu	12:30	17-JUL-10	4.93	1.63	78.5	82.55	0.0492	0.0048	0.2247	0.2398	0.2323	27-MAY-10	Thu	0.1439
21-MAY-10 Continue to 362 days	Fri	12:30	17-JUL-10	5.42	1.49	78.5	82.23	0.0488	0.0037	0.2874	0.2210	0.2542	28-MAY-10	Fri	0.1131
Panel C: Closing period (15:30-16:00)															
24-MAY-10 Continue to 371 days	Mon	15:30	17-JUL-10	4.85	1.27	79	83.09	0.0500	0.0052	0.2199	0.2161	0.2180	31-MAY-10	Mon	0.1249
18-MAY-10 Continue to 396 days	Tue	16:0	17-JUL-10	3.75	1.29	83.5	87.09	0.0468	0.0065	0.1358	0.1831	0.1595	25-MAY-10	Tue	0.1466
19-MAY-10 Continue to 384 days	Wed	15:45	17-JUL-10	5.63	1.12	79.5	83.64	0.0488	0.0076	0.2729	0.1932	0.2330	26-MAY-10	Wed	0.1657
20-MAY-10 Continue to 365 days	Thu	15:30	17-JUL-10	5.43	1.60	78.5	82.40	0.0493	0.0029	0.2778	0.2320	0.2549	27-MAY-10	Thu	0.1439
21-MAY-10 Continue to 363 days	Fri	15:30	17-JUL-10	4.82	1.62	79	82.96	0.0488	0.0037	0.2211	0.2370	0.2291	28-MAY-10	Fri	0.1131

Notes: AUD, IR_ AUD, IR_ USD, IV_ AUDC, IV_ AUDP, IV_AUD and RV_AUD represents Australian dollar, interest rate of Australian dollar, interest rate of US dollar, implied volatility of Australian dollar call option price, implied volatility of Australian dollar put option price, implied volatility of Australian dollar options [(IV_AUDC + IV_AUDP)/2] and realized volatility of Australian dollar, respectively.

Table A4.2c: Details of AUD options data for testing hypothesis 6
(Three-month maturity IV_AUD forecast RV_AUD for one-week forecast horizon)

Trade date	Trade day	Trade time	Expiry date	Call price	Put price	Strike price	Spot price	IR_AUD	IR_USD	IV_AUDC	IV_AUDP	IV_AUD	Forecast date	Forecast day	Forecast RV_AUD
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Panel A: Opening period (9:30-10:00)															
19-APR-10 Continue to 240 days	Mon	9:30	17-JUL-10	4.50	0.97	87.5	91.83	0.0473	0.0053	0.1391	0.1296	0.1343	26-APR-10	Mon	0.0723
04-MAY-10 Continue to 188 days	Tue	9:45	17-JUL-10	0.84	3.42	93	91.89	0.0489	0.0060	0.0979	0.1418	0.1198	11-MAY-10	Tue	0.0834
28-APR-10 Continue to 187 days	Wed	9:30	17-JUL-10	1.29	2.79	93	91.63	0.0474	0.0040	0.1299	0.0815	0.1057	05-MAY-10	Wed	0.0964
29-APR-10 Continue to 195 days	Thu	9:30	17-JUL-10	1.41	2.46	93	92.65	0.0480	0.0023	0.1154	0.1023	0.1088	06-MAY-10	Thu	0.1589
30-APR-10 Continue to 192 days	Fri	9:45	17-JUL-10	1.55	2.20	93	93.22	0.0480	0.0060	0.1078	0.1097	0.1088	07-MAY-10	Fri	0.1725
Panel B: Midday period (12:30-13:00)															
19-APR-10 Continue to 372 days	Mon	12:30	17-JUL-10	4.4	0.985	87.5	91.82	0.0473	0.0054	0.1327	0.1305	0.1316	26-APR-10	Mon	0.0723
20-APR-10 Continue to 362 days	Tue	12:30	17-JUL-10	4.16	1.00	89	93.08	0.0473	0.0054	0.1267	0.1254	0.1260	27-APR-10	Tue	0.0901
21-APR-10 Continue to 363 days	Wed	12:30	17-JUL-10	3.56	1.17	89.5	92.99	0.0477	0.0054	0.1148	0.1253	0.1200	28-APR-10	Wed	0.1068
22-APR-10 Continue to 362 days	Thu	12:30	17-JUL-10	3.75	1.12	89	92.63	0.0477	0.0058	0.1214	0.1267	0.1240	29-APR-10	Thu	0.0589
23-APR-10 Continue to 359 days	Fri	12:30	17-JUL-10	4.81	0.84	87.5	91.98	0.0475	0.0040	0.1551	0.1263	0.1407	30-APR-10	Fri	0.0751
Panel C: Closing period (15:30-16:00)															
19-APR-10 Continue to 372 days	Mon	15:30	17-JUL-10	4.71	0.95	87.5	91.96	0.0473	0.0054	0.1467	0.1303	0.1385	26-APR-10	Mon	0.0723
20-APR-10 Continue to 363 days	Tue	15:30	17-JUL-10	4.15	1.00	89	93.08	0.0474	0.0054	0.1264	0.1253	0.1259	27-APR-10	Tue	0.0901
21-APR-10 Continue to 362 days	Wed	15:30	17-JUL-10	4.21	0.92	88.5	92.65	0.0476	0.0054	0.1277	0.1228	0.1252	28-APR-10	Wed	0.1068
22-APR-10 Continue to 363 days	Thu	15:30	17-JUL-10	4.75	0.85	88	92.49	0.0477	0.0058	0.1484	0.1261	0.1373	29-APR-10	Thu	0.0589
23-APR-10 Continue to 362 days	Fri	15:30	17-JUL-10	4.58	0.91	88	92.24	0.0474	0.0048	0.1496	0.1265	0.1381	30-APR-10	Fri	0.0751

Notes: AUD, IR_ AUD, IR_ USD, IV_ AUDC, IV_ AUDP, IV_AUD and RV_AUD represents Australian dollar, interest rate of Australian dollar, interest rate of US dollar, implied volatility of Australian dollar call option price, implied volatility of Australian dollar put option price, implied volatility of Australian dollar options [(IV_AUDC + IV_AUDP)/2] and realized volatility of Australian dollar, respectively.

Table A4.3a: Details of AUD options data for testing hypothesis 7
(One-month maturity IV_AUD forecast RV_AUD for one-month forecast horizon)

Trade date	Trade day	Trade time	Expiry date	Call price	Put price	Strike price	Spot price	IR_AUD	IR_USD	IV_AUDC	IV_AUDP	IV_AUD	Forecast date	Forecast day	Forecast RV_AUD
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Panel A: Opening period (9:30-10:00)															
21-JUN-10 Continue to 364 days	Mon	9:30	17-JUL-10	3.54	0.50	85	88.37	0.0486	0.0042	0.1652	0.1726	0.1689	19-JUL-10	Mon	0.0792
22-JUN-10 Continue to 361 days	Tue	9:30	17-JUL-10	3.18	0.55	85	87.68	0.0486	0.0040	0.1895	0.1609	0.1752	20-JUL-10	Tue	0.1063
23-JUN-10 Continue to 378 days	Wed	9:30	17-JUL-10	4.21	0.39	83	87.10	0.0468	0.0070	0.1801	0.1894	0.1847	21-JUL-10	Wed	0.0781
17-JUN-10 Continue to 388 days	Thu	9:30	17-JUL-10	4.01	0.58	83	86.55	0.0496	0.0072	0.2044	0.1796	0.1920	15-JUL-10	Thu	0.1178
18-JUN-10 Continue to 378	Fri	9:30	17-JUL-10	4.13	0.49	83	86.88	0.0491	0.0056	0.1886	0.1803	0.1844	16-JUL-10	Fri	0.0948
Panel B: Midday period (12:30-13:00)															
21-JUN-10 Continue to 352 days	Mon	12:30	17-JUL-10	3.27	0.56	85	88.18	0.0486	0.0035	0.1468	0.1751	0.1609	19-JUL-10	Mon	0.0792
22-JUN-10 Continue to 357 days	Tue	12:30	17-JUL-10	4.41	0.34	83.5	87.70	0.0486	0.0040	0.2020	0.1772	0.1896	20-JUL-10	Tue	0.1063
23-JUN-10 Continue to 362 days	Wed	12:35	17-JUL-10	3.83	0.45	83.5	87.26	0.0466	0.0040	0.1650	0.1885	0.1767	21-JUL-10	Wed	0.0781
17-JUN-10 Continue to 371 days	Thu	12:30	17-JUL-10	4.13	0.56	82.5	86.49	0.0496	0.0072	0.1745	0.1916	0.1830	15-JUL-10	Thu	0.1178
18-JUN-10 Continue to 355 days	Fri	12:30	17-JUL-10	4.54	0.41	82.5	86.79	0.0491	0.0073	0.2011	0.1801	0.1906	16-JUL-10	Fri	0.0948
Panel C: Closing period (15:30-16:00)															
21-JUN-10 Continue to 353 days	Mon	15:35	17-JUL-10	2.29	0.85	86	88.22	0.0486	0.0044	0.1121	0.1767	0.1444	19-JUL-10	Mon	0.0792
22-JUN-10 Continue to 357 days	Tue	15:30	17-JUL-10	1.60	1.09	86.5	88.00	0.0484	0.0028	0.0935	0.1793	0.1364	20-JUL-10	Tue	0.1063
23-JUN-10 Continue to 358 days	Wed	15:50	17-JUL-10	4.95	0.30	82.5	86.82	0.0486	0.0035	0.2758	0.1790	0.2274	21-JUL-10	Wed	0.0781
17-JUN-10 Continue to 376 days	Thu	15:30	17-JUL-10	4.33	0.54	82.5	86.42	0.0496	0.0040	0.2121	0.1853	0.1987	15-JUL-10	Thu	0.1178
18-JUN-10 Continue to 357 days	Fri	15:30	17-JUL-10	4.11	0.46	83	86.96	0.0491	0.0073	0.1755	0.1777	0.1766	16-JUL-10	Fri	0.0948

Notes: AUD, IR_ AUD, IR_ USD, IV_ AUDC, IV_ AUDP, IV_AUD and RV_AUD represents Australian dollar, interest rate of Australian dollar, interest rate of US dollar, implied volatility of Australian dollar call option price, implied volatility of Australian dollar put option price, implied volatility of Australian dollar options [(IV_AUDC + IV_AUDP)/2] and realized volatility of Australian dollar, respectively.

Table A4.3b: Details of AUD options data for testing hypothesis 8
(Two-month maturity IV_AUD forecast RV_AUD for one-month forecast horizon)

Trade date	Trade day	Trade time	Expiry date	Call price	Put price	Strike price	Spot price	IR_AUD	IR_USD	IV_AUDC	IV_AUDP	IV_AUD	Forecast date	Forecast day	Forecast RV_AUD
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Panel A: Opening period (9:30-10:00)															
31-MAY-10 Continue to 268 days	Mon	9:30	17-JUL-10	4.81	1.03	80.5	84.70	0.0501	0.0050	0.2149	0.2081	0.2115	28-JUN-10	Mon	0.0741
18-MAY-10 Continue to 282 days	Tue	9:30	17-JUL-10	0.83	3.66	90	87.30	0.0483	0.0049	0.1459	0.0994	0.1226	15-JUN-10	Tue	0.1095
02-JUN-10 Continue to 269 days	Wed	9:30	17-JUL-10	2.02	2.21	83	83.27	0.0497	0.0041	0.1824	0.1814	0.1819	30-JUN-10	Wed	0.1327
27-MAY-10 Continue to 251 days	Thu	9:30	17-JUL-10	1.41	3.06	85	83.77	0.0499	0.0054	0.1730	0.1647	0.1688	24-JUN-10	Thu	0.0930
28-MAY-10 Continue to 253 days	Fri	9:30	17-JUL-10	2.87	1.73	83	85.34	0.0497	0.0057	0.1465	0.2047	0.1756	25-JUN-10	Fri	0.0989
Panel B: Midday period (12:30-13:00)															
24-MAY-10 Continue to 367 days	Mon	12:30	17-JUL-10	4.99	1.24	79	82.80	0.0500	0.0050	0.2508	0.2056	0.2282	21-JUN-10	Mon	0.0618
18-MAY-10 Continue to 393 days	Tue	12:30	17-JUL-10	4.25	1.10	83.5	87.51	0.0482	0.0049	0.1554	0.1759	0.1656	15-JUN-10	Tue	0.1095
19-MAY-10 Continue to 381 days	Wed	12:30	17-JUL-10	4.50	1.40	80.5	84.61	0.0488	0.0070	0.1753	0.2142	0.1948	16-JUN-10	Wed	0.1040
20-MAY-10 Continue to 360 days	Thu	12:30	17-JUL-10	4.93	1.63	78.5	82.55	0.0492	0.0048	0.2247	0.2398	0.2323	17-JUN-10	Thu	0.0973
21-MAY-10 Continue to 359 days	Fri	12:30	17-JUL-10	5.42	1.49	78.5	82.23	0.0488	0.0037	0.2874	0.2210	0.2542	18-JUN-10	Fri	0.0626
Panel C: Closing period (15:30-16:00)															
24-MAY-10 Continue to 369 days	Mon	15:30	17-JUL-10	4.85	1.27	79	83.09	0.0500	0.0052	0.2199	0.2161	0.2180	21-JUN-10	Mon	0.0618
18-MAY-10 Continue to 393 days	Tue	16:0	17-JUL-10	3.75	1.29	83.5	87.09	0.0468	0.0065	0.1358	0.1831	0.1595	15-JUN-10	Tue	0.1095
19-MAY-10 Continue to 381days	Wed	15:45	17-JUL-10	5.63	1.12	79.5	83.64	0.0488	0.0076	0.2729	0.1932	0.2330	16-JUN-10	Wed	0.1040
20-MAY-10 Continue to 362 days	Thu	15:30	17-JUL-10	5.43	1.60	78.5	82.40	0.0493	0.0029	0.2778	0.2320	0.2549	17-JUN-10	Thu	0.0973
21-MAY-10 Continue to 359 days	Fri	15:30	17-JUL-10	4.82	1.62	79	82.96	0.0488	0.0037	0.2211	0.2370	0.2291	18-JUN-10	Fri	0.0626

Notes: AUD, IR_ AUD, IR_ USD, IV_ AUDC, IV_ AUDP, IV_AUD and RV_AUD represents Australian dollar, interest rate of Australian dollar, interest rate of US dollar, implied volatility of Australian dollar call option price, implied volatility of Australian dollar put option price, implied volatility of Australian dollar options [(IV_AUDC + IV_AUDP)/2] and realized volatility of Australian dollar, respectively.

Table A4.3c: Details of AUD options data for testing hypothesis 9
(Three-month maturity IV_AUD forecast RV_AUD for one-month forecast horizon)

Trade date	Trade day	Trade time	Expiry date	Call price	Put price	Strike price	Spot price	IR_AUD	IR_USD	IV_AUDC	IV_AUDP	IV_AUD	Forecast date	Forecast day	Forecast RV_AUD
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Panel A: Opening period (9:30-10:00)															
19-APR-10 Continue to 239 days	Mon	9:30	17-JUL-10	4.50	0.97	87.5	91.83	0.0473	0.0053	0.1391	0.1296	0.1343	17-MAY-10	Mon	0.1082
04-MAY-10 Continue to 187 days	Tue	9:45	17-JUL-10	0.84	3.42	93	91.89	0.0489	0.0060	0.0979	0.1418	0.1198	01-JUN-10	Tue	0.1267
28-APR-10 Continue to 186 days	Wed	9:30	17-JUL-10	1.29	2.79	93	91.63	0.0474	0.0040	0.1299	0.0815	0.1057	26-MAY-10	Wed	0.1657
29-APR-10 Continue to 194 days	Thu	9:30	17-JUL-10	1.41	2.46	93	92.65	0.0480	0.0023	0.1154	0.1023	0.1088	27-MAY-10	Thu	0.1439
30-APR-10 Continue to 191 days	Fri	9:45	17-JUL-10	1.55	2.20	93	93.22	0.0480	0.0060	0.1078	0.1097	0.1088	28-MAY-10	Fri	0.1131
Panel B: Midday period (12:30-13:00)															
19-APR-10 Continue to 369 days	Mon	12:30	17-JUL-10	4.40	0.99	87.5	91.82	0.0473	0.0054	0.1327	0.1305	0.1316	17-MAY-10	Mon	0.1082
20-APR-10 Continue to 359 days	Tue	12:30	17-JUL-10	4.16	1.00	89	93.08	0.0473	0.0054	0.1267	0.1254	0.1260	18-MAY-10	Tue	0.1018
21-APR-10 Continue to 360 days	Wed	12:30	17-JUL-10	3.56	1.17	89.5	92.99	0.0477	0.0054	0.1148	0.1253	0.1200	19-MAY-10	Wed	0.2098
22-APR-10 Continue to 359 days	Thu	12:30	17-JUL-10	3.75	1.12	89	92.63	0.0477	0.0058	0.1214	0.1267	0.1240	20-MAY-10	Thu	0.2146
23-APR-10 Continue to 356 days	Fri	12:30	17-JUL-10	4.81	0.84	87.5	91.98	0.0475	0.0040	0.1551	0.1263	0.1407	21-MAY-10	Fri	0.1932
Panel C: Closing period (15:30-16:00)															
19-APR-10 Continue to 369 days	Mon	15:30	17-JUL-10	4.71	0.95	87.5	91.96	0.0473	0.0054	0.1467	0.1303	0.1385	17-MAY-10	Mon	0.1082
20-APR-10 Continue to 359 days	Tue	15:30	17-JUL-10	4.15	1.00	89	93.08	0.0474	0.0054	0.1264	0.1253	0.1259	18-MAY-10	Tue	0.1018
21-APR-10 Continue to 360 days	Wed	15:30	17-JUL-10	4.21	0.92	88.5	92.65	0.0476	0.0054	0.1277	0.1228	0.1252	19-MAY-10	Wed	0.2098
22-APR-10 Continue to 361 days	Thu	15:30	17-JUL-10	4.75	0.85	88	92.49	0.0477	0.0058	0.1484	0.1261	0.1373	20-MAY-10	Thu	0.2146
23-APR-10 Continue to 358 days	Fri	15:30	17-JUL-10	4.58	0.91	88	92.24	0.0474	0.0048	0.1496	0.1265	0.1381	21-MAY-10	Fri	0.1932

Notes: AUD, IR_ AUD, IR_ USD, IV_ AUDC, IV_ AUDP, IV_AUD and RV_AUD represents Australian dollar, interest rate of Australian dollar, interest rate of US dollar, implied volatility of Australian dollar call option price, implied volatility of Australian dollar put option price, implied volatility of Australian dollar options [(IV_AUDC + IV_AUDP)/2] and realized volatility of Australian dollar, respectively.

Table A4.4a: Details of CAD options data for testing hypothesis 1
(One-month maturity IV_CAD forecast RV_CAD for within-week forecast horizon)

Trade date	Trade day	Trade time	Expiry date	Call price	Put price	Strike price	Spot price	IR_AUD	IR_USD	IV_AUDC	IV_AUDP	IV_AUD	Forecast date	Forecast day	Forecast RV_AUD
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Panel A: Opening period (9:30-10:00)															
21-JUN-10 Continue to 331 days	Mon	9:30	17-JUL-10	4.58	0.21	94	98.34	0.0084	0.0042	0.1531	0.1407	0.1469	25-JUN-10	Fri	0.0836
22-JUN-10 Continue to 364 days	Tue	9:30	17-JUL-10	5.23	0.15	93	97.66	0.0084	0.0040	0.2187	0.1387	0.1787	25-JUN-10	Fri	0.0836
23-JUN-10 Continue to 381 days	Wed	9:30	17-JUL-10	1.47	1.02	95.5	96.85	0.0084	0.0070	0.0565	0.1629	0.1097	25-JUN-10	Fri	0.0836
17-JUN-10 Continue to 391 days	Thu	9:30	17-JUL-10	3.86	0.38	94	97.71	0.0082	0.0072	0.1089	0.1444	0.1267	18-JUN-10	Fri	0.0628
Panel B: Midday period (12:30-13:00)															
21-JUN-10 Continue to 356 days	Mon	12:30	17-JUL-10	2.85	0.43	95.5	98.24	0.0084	0.0035	0.0899	0.1340	0.1119	25-JUN-10	Fri	0.0836
22-JUN-10 Continue to 358 days	Tue	12:30	17-JUL-10	5.09	0.14	93	97.89	0.0082	0.0040	0.1617	0.1411	0.1514	25-JUN-10	Fri	0.0836
23-JUN-10 Continue to 360 days	Wed	12:30	17-JUL-10	2.16	0.74	94.5	96.49	0.0084	0.0033	0.0864	0.1559	0.1212	25-JUN-10	Fri	0.0836
17-JUN-10 Continue to 373 days	Thu	12:30	17-JUL-10	3.13	0.51	94.5	97.53	0.0082	0.0072	0.0854	0.1436	0.1145	18-JUN-10	Fri	0.0628
Panel C: Closing period (15:30-16:00)															
21-JUN-10 Continue to 354 days	Mon	15:30	17-JUL-10	1.89	0.80	96.5	98.20	0.0083	0.0044	0.0753	0.1432	0.1092	25-JUN-10	Fri	0.0836
22-JUN-10 Continue to 358 days	Tue	15:30	17-JUL-10	1.27	1.11	97	98.18	0.0097	0.0028	0.0500	0.1580	0.1040	25-JUN-10	Fri	0.0836
23-JUN-10 Continue to 363 days	Wed	15:30	17-JUL-10	4.96	0.17	91.5	95.79	0.0080	0.0035	0.2297	0.1403	0.1850	25-JUN-10	Fri	0.0836
17-JUN-10 Continue to 368 days	Thu	15:30	17-JUL-10	4.94	0.22	92.5	97.26	0.0082	0.0040	0.1438	0.1447	0.1442	18-JUN-10	Fri	0.0628

Notes: CAD, IR_ CAD, IR_ USD, IV_ CADC, IV_ CADP, IV_CAD and RV_CAD represents Canadian dollar, interest rate of Canadian dollar, interest rate of US dollar, implied volatility of Canadian dollar call option price, implied volatility of Canadian dollar put option price, implied volatility of Canadian dollar options [(IV_CADC + IV_CADP)/2] and realized volatility of Canadian dollar, respectively.

Table A4.4b: Details of CAD options data for testing hypothesis 2
(Two-month maturity IV_CAD forecast RV_CAD for within-week forecast horizon)

Trade date	Trade day	Trade time	Expiry date	Call price	Put price	Strike price	Spot price	IR_CAD	IR_USD	IV_CADC	IV_CADP	IV_CAD	Forecast date	Forecast day	Forecast RV_CAD
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Panel A: Opening period (9:30-10:00)															
24-MAY-10 Continue to 316 days	Mon	9:30	17-JUL-10	3.25	1.58	93	94.44	0.0054	0.0045	0.1720	0.1542	0.1631	28-MAY-10	Fri	0.0942
18-MAY-10 Continue to 334 days	Tue	9:30	17-JUL-10	2.92	1.45	96	96.87	0.0054	0.0049	0.1582	0.1186	0.1384	21-MAY-10	Fri	0.1641
19-MAY-10 Continue to 321 days	Wed	9:30	17-JUL-10	2.17	2.39	96	95.47	0.0053	0.0060	0.1578	0.1382	0.1480	21-MAY-10	Fri	0.1641
20-MAY-10 Continue to 299 days	Thu	9:30	17-JUL-10	1.58	3.63	96	94.84	0.0071	0.0046	0.1402	0.1972	0.1687	21-MAY-10	Fri	0.1641
Panel B: Midday period (12:30-13:00)															
24-MAY-10 Continue to 373 days	Mon	12:30	17-JUL-10	5.38	0.90	90	94.37	0.0050	0.0050	0.1870	0.1769	0.1820	28-MAY-10	Fri	0.0942
18-MAY-10 Continue to 397ays	Tue	12:30	17-JUL-10	5.05	0.74	92.5	97.25	0.0054	0.0049	0.1141	0.1567	0.1354	21-MAY-10	Fri	0.1641
19-MAY-10 Continue to 384 days	Wed	12:30	17-JUL-10	5.33	0.99	91	95.44	0.0053	0.0070	0.1663	0.1770	0.1716	21-MAY-10	Fri	0.1641
20-MAY-10 Continue to 364 days	Thu	12:30	17-JUL-10	5.50	1.27	89.5	93.71	0.0071	0.0048	0.2033	0.1986	0.2010	21-MAY-10	Fri	0.1641
Panel C: Closing period (15:30-16:00)															
24-MAY-10 Continue to 373 days	Mon	15:30	17-JUL-10	5.33	0.88	90	94.36	0.0050	0.0052	0.1826	0.1745	0.1786	28-MAY-10	Fri	0.0942
18-MAY-10 Continue to 397 days	Tue	15:30	17-JUL-10	4.75	0.93	92.5	97.08	0.0054	0.0064	0.0917	0.1699	0.1308	21-MAY-10	Fri	0.1641
19-MAY-10 Continue to 384 days	Wed	15:30	17-JUL-10	6.00	0.82	90.5	95.13	0.0048	0.0076	0.2104	0.1669	0.1886	21-MAY-10	Fri	0.1641
20-MAY-10 Continue to 365 days	Thu	15:30	17-JUL-10	5.73	1.16	89.5	93.95	0.0058	0.0029	0.2077	0.1946	0.2011	21-MAY-10	Fri	0.1641

Notes: CAD, IR_ CAD, IR_ USD, IV_ CADC, IV_ CADP, IV_CAD and RV_CAD represents Canadian dollar, interest rate of Canadian dollar, interest rate of US dollar, implied volatility of Canadian dollar call option price, implied volatility of Canadian dollar put option price, implied volatility of Canadian dollar options [(IV_CADC + IV_CADP)/2] and realized volatility of Canadian dollar, respectively.

Table A4.4c: Details of CAD options data for testing hypothesis 3
(Three-month maturity IV_CAD forecast RV_CAD for within-week forecast horizon)

Trade date	Trade day	Trade time	Expiry date	Call price	Put price	Strike price	Spot price	IR_CAD	IR_USD	IV_CADC	IV_CADP	IV_CAD	Forecast date	Forecast day	Forecast RV_CAD
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Panel A: Opening period (9:30-10:00)															
19-APR-10 Continue to 267 days	Mon	9:30	17-JUL-10	5.25	0.56	93.5	98.27	0.0071	0.0053	0.1111	0.1132	0.1122	23-APR-10	Fri	0.1016
20-APR-10 Continue to 223 days	Tue	9:30	17-JUL-10	2.77	1.32	98.5	98.79	0.0068	0.0053	0.1366	0.0748	0.1057	23-APR-10	Fri	0.1016
21-APR-10 Continue to 222 days	Wed	9:30	17-JUL-10	3.06	1.22	98.5	100.54	0.0077	0.0036	0.0998	0.1054	0.1026	23-APR-10	Fri	0.1016
22-APR-10 Continue to 229 days	Thu	9:30	17-JUL-10	2.71	1.42	98.5	100.04	0.0080	0.0040	0.0987	0.1075	0.1031	23-APR-10	Fri	0.1016
Panel B: Midday period (12:30-13:00)															
19-APR-10 Continue to 374 days	Mon	12:30	17-JUL-10	5.15	0.58	93.5	98.13	0.0070	0.0054	0.1119	0.1129	0.1124	23-APR-10	Fri	0.1016
20-APR-10 Continue to 363 days	Tue	12:30	17-JUL-10	6.50	0.33	94	98.77	0.0043	0.0054	0.1915	0.0947	0.1431	23-APR-10	Fri	0.1016
21-APR-10 Continue to 363 days	Wed	12:30	17-JUL-10	5.27	0.54	95.5	100.42	0.0080	0.0054	0.1028	0.1128	0.1078	23-APR-10	Fri	0.1016
22-APR-10 Continue to 362 days	Thu	12:30	17-JUL-10	5.35	0.51	95	99.94	0.0050	0.0058	0.1035	0.1131	0.1083	23-APR-10	Fri	0.1016
Panel C: Closing period (15:30-16:00)															
19-APR-10 Continue to 373 days	Mon	15:30	17-JUL-10	5.55	0.49	93.5	98.24	0.0069	0.0054	0.1346	0.1077	0.1212	23-APR-10	Fri	0.1016
20-APR-10 Continue to 363 days	Tue	15:30	17-JUL-10	5.10	0.55	95.5	100.23	0.0053	0.0054	0.0967	0.1108	0.1038	23-APR-10	Fri	0.1016
21-APR-10 Continue to 363 days	Wed	15:30	17-JUL-10	5.00	0.58	95.5	100.05	0.0078	0.0054	0.1055	0.1108	0.1081	23-APR-10	Fri	0.1016
22-APR-10 Continue to 364 days	Thu	15:30	17-JUL-10	5.50	0.49	95	99.84	0.0079	0.0058	0.1264	0.1087	0.1176	23-APR-10	Fri	0.1016

Notes: CAD, IR_ CAD, IR_ USD, IV_ CADC, IV_ CADP, IV_CAD and RV_CAD represents Canadian dollar, interest rate of Canadian dollar, interest rate of US dollar, implied volatility of Canadian dollar call option price, implied volatility of Canadian dollar put option price, implied volatility of Canadian dollar options [(IV_CADC + IV_CADP)/2] and realized volatility of Canadian dollar, respectively.

Table A4.5a: Details of CAD options data for testing hypothesis 4
(One-month maturity IV_CAD forecast RV_CAD for one-week forecast horizon)

Trade date	Trade day	Trade time	Expiry date	Call price	Put price	Strike price	Spot price	IR_CAD	IR_USD	IV_CADC	IV_CADP	IV_CAD	Forecast date	Forecast day	Forecast RV_CAD
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Panel A: Opening period (9:30-10:00)															
21-JUN-10 Continue to 330 days	Mon	9:30	17-JUL-10	4.58	0.21	94	98.34	0.0084	0.0042	0.1531	0.1407	0.1469	28-JUN-10	Mon	0.0600
22-JUN-10 Continue to 327 days	Tue	9:30	17-JUL-10	5.23	0.15	93	97.66	0.0084	0.0040	0.2187	0.1387	0.1787	29-JUN-10	Tue	0.0762
23-JUN-10 Continue to 344 days	Wed	9:30	17-JUL-10	1.47	1.02	95.5	96.85	0.0084	0.0070	0.0565	0.1629	0.1097	30-JUN-10	Wed	0.0969
17-JUN-10 Continue to 354 days	Thu	9:30	17-JUL-10	3.86	0.38	94	97.71	0.0082	0.0072	0.1089	0.1444	0.1267	24-JUN-10	Thu	0.0804
18-JUN-10 Continue to 329 days	Fri	9:30	17-JUL-10	4.68	0.23	93	97.13	0.0066	0.0056	0.1846	0.1351	0.1599	25-JUN-10	Fri	0.0836
Panel B: Midday period (12:30-13:00)															
21-JUN-10 Continue to 355 days	Mon	12:30	17-JUL-10	2.845	0.43	95.5	98.24	0.0084	0.0035	0.0899	0.1340	0.1119	28-JUN-10	Mon	0.0600
22-JUN-10 Continue to 357 days	Tue	12:30	17-JUL-10	5.09	0.14	93	97.89	0.0082	0.0040	0.1617	0.1411	0.1514	29-JUN-10	Tue	0.0762
23-JUN-10 Continue to 359 days	Wed	12:30	17-JUL-10	2.16	0.74	94.5	96.49	0.0084	0.0033	0.0864	0.1559	0.1212	30-JUN-10	Wed	0.0969
17-JUN-10 Continue to 372 days	Thu	12:30	17-JUL-10	3.13	0.51	94.5	97.53	0.0082	0.0072	0.0854	0.1436	0.1145	24-JUN-10	Thu	0.0804
18-JUN-10 Continue to 356 days	Fri	12:30	17-JUL-10	5.22	0.17	92.5	97.23	0.0066	0.0073	0.1903	0.1361	0.1632	25-JUN-10	Fri	0.0836
Panel C: Closing period (15:30-16:00)															
21-JUN-10 Continue to 353 days	Mon	15:30	17-JUL-10	1.89	0.80	96.5	98.20	0.0083	0.0044	0.0753	0.1432	0.1092	28-JUN-10	Mon	0.0600
22-JUN-10 Continue to 357 days	Tue	15:30	17-JUL-10	1.27	1.11	97	98.18	0.0097	0.0028	0.0500	0.1580	0.1040	29-JUN-10	Tue	0.0762
23-JUN-10 Continue to 362 days	Wed	15:30	17-JUL-10	4.96	0.17	91.5	95.79	0.0080	0.0035	0.2297	0.1403	0.1850	30-JUN-10	Wed	0.0969
17-JUN-10 Continue to 367 days	Thu	15:30	17-JUL-10	4.94	0.22	92.5	97.26	0.0082	0.0040	0.1438	0.1447	0.1442	24-JUN-10	Thu	0.0804
18-JUN-10 Continue to 358 days	Fri	15:30	17-JUL-10	5.00	0.17	93	97.55	0.0066	0.0073	0.1791	0.1328	0.1559	25-JUN-10	Fri	0.0836

Notes: CAD, IR_ CAD, IR_ USD, IV_ CADC, IV_ CADP, IV_CAD and RV_CAD represents Canadian dollar, interest rate of Canadian dollar, interest rate of US dollar, implied volatility of Canadian dollar call option price, implied volatility of Canadian dollar put option price, implied volatility of Canadian dollar options [(IV_CADC + IV_CADP)/2] and realized volatility of Canadian dollar, respectively.

Table A4.5b: Details of CAD options data for testing hypothesis 5
(Two-month maturity IV_CAD forecast RV_CAD for one-week forecast horizon)

Trade date	Trade day	Trade time	Expiry date	Call price	Put price	Strike price	Spot price	IR_CAD	IR_USD	IV_CADC	IV_CADP	IV_CAD	Forecast date	Forecast day	Forecast RV_CAD
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Panel A: Opening period (9:30-10:00)															
24-MAY-10 Continue to 315 days	Mon	9:30	17-JUL-10	3.25	1.58	93	94.44	0.0054	0.0045	0.1720	0.1542	0.1631	31-MAY-10	Mon	0.0959
18-MAY-10 Continue to 333 days	Tue	9:30	17-JUL-10	2.92	1.45	96	96.87	0.0054	0.0049	0.1582	0.1186	0.1384	25-MAY-10	Tue	0.1144
21-APR-10 Continue to 363 days	Wed	9:30	17-JUL-10	5.00	0.58	95.5	100.05	0.0078	0.0054	0.1055	0.1108	0.1081	23-APR-10	Wed	0.1016
20-MAY-10 Continue to 298 days	Thu	9:30	17-JUL-10	1.58	3.63	96	94.84	0.0071	0.0046	0.1402	0.1972	0.1687	27-MAY-10	Thu	0.1367
21-MAY-10 Continue to 303 days	Fri	9:30	17-JUL-10	2.12	3.35	94.5	94.10	0.0054	0.0033	0.1565	0.2107	0.1836	28-MAY-10	Fri	0.0942
Panel B: Midday period (12:30-13:00)															
24-MAY-10 Continue to 372 days	Mon	12:30	17-JUL-10	5.38	0.9	90	94.37	0.005	0.005	0.1870	0.1769	0.1820	31-MAY-10	Mon	0.0959
18-MAY-10 Continue to 396 days	Tue	12:30	17-JUL-10	5.05	0.74	92.5	97.25	0.0054	0.0049	0.1141	0.1567	0.1354	25-MAY-10	Tue	0.1144
19-MAY-10 Continue to 383 days	Wed	12:30	17-JUL-10	5.33	0.99	91	95.44	0.0053	0.0070	0.1663	0.1770	0.1716	26-MAY-10	Wed	0.1240
20-MAY-10 Continue to 363 days	Thu	12:30	17-JUL-10	5.50	1.27	89.5	93.71	0.0071	0.0048	0.2033	0.1986	0.2010	27-MAY-10	Thu	0.1367
21-MAY-10 Continue to 362 days	Fri	12:30	17-JUL-10	6.43	1.00	89	93.20	0.0071	0.0037	0.2800	0.1782	0.2291	28-MAY-10	Fri	0.0942
Panel C: Closing period (15:30-16:00)															
24-MAY-10 Continue to 372 days	Mon	15:30	17-JUL-10	5.33	0.88	90	94.36	0.0050	0.0052	0.1826	0.1745	0.1786	31-MAY-10	Mon	0.0959
18-MAY-10 Continue to 396 days	Tue	15:30	17-JUL-10	4.75	0.93	92.5	97.08	0.0054	0.0064	0.0917	0.1699	0.1308	25-MAY-10	Tue	0.1144
19-MAY-10 Continue to 385 days	Wed	15:30	17-JUL-10	6.00	0.82	90.5	95.13	0.0048	0.0076	0.2104	0.1669	0.1886	26-MAY-10	Wed	0.1240
20-MAY-10 Continue to 364 days	Thu	15:30	17-JUL-10	5.73	1.16	89.5	93.95	0.0058	0.0029	0.2077	0.1946	0.2011	27-MAY-10	Thu	0.1367
21-MAY-10 Continue to 362 days	Fri	15:30	17-JUL-10	5.30	1.20	90	94.59	0.0071	0.0037	0.1633	0.2009	0.1821	28-MAY-10	Fri	0.0942

Notes: CAD, IR_ CAD, IR_ USD, IV_ CADC, IV_ CADP, IV_CAD and RV_CAD represents Canadian dollar, interest rate of Canadian dollar, interest rate of US dollar, implied volatility of Canadian dollar call option price, implied volatility of Canadian dollar put option price, implied volatility of Canadian dollar options [(IV_CADC + IV_CADP)/2] and realized volatility of Canadian dollar, respectively.

Table A4.5c: Details of CAD options data for testing hypothesis 6
(Three-month maturity IV_CAD forecast RV_CAD for one-week forecast horizon)

Trade date	Trade day	Trade time	Expiry date	Call price	Put price	Strike price	Spot price	IR_CAD	IR_USD	IV_CADC	IV_CADP	IV_CAD	Forecast date	Forecast day	Forecast RV_CAD
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Panel A: Opening period (9:30-10:00)															
19-APR-10 Continue to 266 days	Mon	9:30	17-JUL-10	5.25	0.56	93.5	98.27	0.0071	0.0053	0.1111	0.1132	0.1122	26-APR-10	Mon	0.0837
20-APR-10 Continue to 222 days	Tue	9:30	17-JUL-10	2.77	1.32	98.5	98.79	0.0068	0.0053	0.1366	0.0748	0.1057	27-APR-10	Tue	0.1054
21-APR-10 Continue to 221 days	Wed	9:30	17-JUL-10	3.06	1.22	98.5	100.54	0.0077	0.0036	0.0998	0.1054	0.1026	28-APR-10	Wed	0.1205
22-APR-10 Continue to 228 days	Thu	9:30	17-JUL-10	2.71	1.42	98.5	100.04	0.0080	0.0040	0.0987	0.1075	0.1031	29-APR-10	Thu	0.0660
23-APR-10 Continue to 229 days	Fri	9:30	17-JUL-10	2.49	1.59	98.5	100.15	0.0048	0.0040	0.0803	0.1212	0.1007	30-APR-10	Fri	0.1053
Panel B: Midday period (12:30-13:00)															
19-APR-10 Continue to 372 days	Mon	12:30	17-JUL-10	5.15	0.575	93.5	98.13	0.00695	0.0054	0.1119	0.1129	0.1124	26-APR-10	Mon	0.0837
20-APR-10 Continue to 362 days	Tue	12:30	17-JUL-10	6.50	0.33	94	98.77	0.0043	0.0054	0.1915	0.0947	0.1431	27-APR-10	Tue	0.1054
21-APR-10 Continue to 362 days	Wed	12:30	17-JUL-10	5.27	0.54	95.5	100.42	0.0080	0.0054	0.1028	0.1128	0.1078	28-APR-10	Wed	0.1205
22-APR-10 Continue to 361 days	Thu	12:30	17-JUL-10	5.35	0.51	95	99.94	0.0050	0.0058	0.1035	0.1131	0.1083	29-APR-10	Thu	0.0660
23-APR-10 Continue to 360 days	Fri	12:30	17-JUL-10	5.15	0.55	95	99.64	0.0063	0.0040	0.1129	0.1117	0.1123	30-APR-10	Fri	0.1053
Panel C: Closing period (15:30-16:00)															
19-APR-10 Continue to 372 days	Mon	15:30	17-JUL-10	5.55	0.49	93.5	98.24	0.0069	0.0054	0.1346	0.1077	0.1212	26-APR-10	Mon	0.0837
20-APR-10 Continue to 362 days	Tue	15:30	17-JUL-10	5.10	0.55	95.5	100.23	0.0053	0.0054	0.0967	0.1108	0.1038	27-APR-10	Tue	0.1054
21-APR-10 Continue to 362 days	Wed	15:30	17-JUL-10	5.00	0.58	95.5	100.05	0.0078	0.0054	0.1055	0.1108	0.1081	28-APR-10	Wed	0.1205
22-APR-10 Continue to 363 days	Thu	15:30	17-JUL-10	5.50	0.49	95	99.84	0.0079	0.0058	0.1264	0.1087	0.1176	29-APR-10	Thu	0.0660
23-APR-10 Continue to 362 days	Fri	15:30	17-JUL-10	5.50	0.48	95	99.66	0.0063	0.0048	0.1364	0.1066	0.1215	30-APR-10	Fri	0.1053

Notes: CAD, IR_ CAD, IR_ USD, IV_ CADC, IV_ CADP, IV_CAD and RV_CAD represents Canadian dollar, interest rate of Canadian dollar, interest rate of US dollar, implied volatility of Canadian dollar call option price, implied volatility of Canadian dollar put option price, implied volatility of Canadian dollar options [(IV_CADC + IV_CADP)/2] and realized volatility of Canadian dollar, respectively.

Table A4.6a: Details of CAD options data for testing hypothesis 7
(One-month maturity IV_CAD forecast RV_CAD for one-month forecast horizon)

Trade date	Trade day	Trade time	Expiry date	Call price	Put price	Strike price	Spot price	IR_CAD	IR_USD	IV_CADC	IV_CADP	IV_CAD	Forecast date	Forecast day	Forecast RV_CAD
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Panel A: Opening period (9:30-10:00)															
21-JUN-10 Continue to 328 days	Mon	9:30	17-JUL-10	4.58	0.21	94	98.34	0.0084	0.0042	0.1531	0.1407	0.1469	19-JUL-10	Mon	0.0689
22-JUN-10 Continue to 325 days	Tue	9:30	17-JUL-10	5.23	0.15	93	97.66	0.0084	0.0040	0.2187	0.1387	0.1787	20-JUL-10	Tue	0.1177
23-JUN-10 Continue to 342 days	Wed	9:30	17-JUL-10	1.47	1.02	95.5	96.85	0.0084	0.0070	0.0565	0.1629	0.1097	21-JUL-10	Wed	0.0788
17-JUN-10 Continue to 352 days	Thu	9:30	17-JUL-10	3.86	0.38	94	97.71	0.0082	0.0072	0.1089	0.1444	0.1267	15-JUL-10	Thu	0.1101
18-JUN-10 Continue to 327 days	Fri	9:30	17-JUL-10	4.68	0.23	93	97.13	0.0066	0.0056	0.1846	0.1351	0.1599	16-JUL-10	Fri	0.1074
Panel B: Midday period (12:30-13:00)															
21-JUN-10 Continue to 353 days	Mon	12:30	17-JUL-10	2.85	0.43	95.5	98.24	0.0084	0.0035	0.0899	0.1340	0.1119	19-JUL-10	Mon	0.0689
22-JUN-10 Continue to 355 days	Tue	12:30	17-JUL-10	5.09	0.14	93	97.89	0.0082	0.0040	0.1617	0.1411	0.1514	20-JUL-10	Tue	0.1177
23-JUN-10 Continue to 356 days	Wed	12:30	17-JUL-10	2.16	0.74	94.5	96.49	0.0084	0.0033	0.0864	0.1559	0.1212	21-JUL-10	Wed	0.0788
17-JUN-10 Continue to 371 days	Thu	12:30	17-JUL-10	3.13	0.51	94.5	97.53	0.0082	0.0072	0.0854	0.1436	0.1145	15-JUL-10	Thu	0.1101
18-JUN-10 Continue to 354 days	Fri	12:30	17-JUL-10	5.22	0.17	92.5	97.23	0.0066	0.0073	0.1903	0.1361	0.1632	16-JUL-10	Fri	0.1074
Panel C: Closing period (15:30-16:00)															
21-JUN-10 Continue to 351 days	Mon	15:30	17-JUL-10	1.89	0.80	96.5	98.20	0.0083	0.0044	0.0753	0.1432	0.1092	19-JUL-10	Mon	0.0689
22-JUN-10 Continue to 355 days	Tue	15:30	17-JUL-10	1.27	1.11	97	98.18	0.0097	0.0028	0.0500	0.1580	0.1040	20-JUL-10	Tue	0.1177
23-JUN-10 Continue to 361 days	Wed	15:30	17-JUL-10	4.96	0.17	91.5	95.79	0.0080	0.0035	0.2297	0.1403	0.1850	21-JUL-10	Wed	0.0788
17-JUN-10 Continue to 366 days	Thu	15:30	17-JUL-10	4.94	0.22	92.5	97.26	0.0082	0.0040	0.1438	0.1447	0.1442	15-JUL-10	Thu	0.1101
18-JUN-10 Continue to 356 days	Fri	15:30	17-JUL-10	5.00	0.17	93	97.55	0.0066	0.0073	0.1791	0.1328	0.1559	16-JUL-10	Fri	0.1074

Notes: CAD, IR_ CAD, IR_ USD, IV_ CADC, IV_ CADP, IV_CAD and RV_CAD represents Canadian dollar, interest rate of Canadian dollar, interest rate of US dollar, implied volatility of Canadian dollar call option price, implied volatility of Canadian dollar put option price, implied volatility of Canadian dollar options [(IV_CADC + IV_CADP)/2] and realized volatility of Canadian dollar, respectively.

Table A4.6b: Details of CAD options data for testing hypothesis 8
(Two-month maturity IV_CAD forecast RV_CAD for one-month forecast horizon)

Trade date	Trade day	Trade time	Expiry date	Call price	Put price	Strike price	Spot price	IR_CAD	IR_USD	IV_CADC	IV_CADP	IV_CAD	Forecast date	Forecast day	Forecast RV_CAD
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Panel A: Opening period (9:30-10:00)															
24-MAY-10 Continue to 313 days	Mon	9:30	17-JUL-10	3.25	1.58	93	94.44	0.0054	0.0045	0.1720	0.1542	0.1631	21-JUN-10	Mon	0.0588
18-MAY-10 Continue to 331 days	Tue	9:30	17-JUL-10	2.92	1.45	96	96.87	0.0054	0.0049	0.1582	0.1186	0.1384	15-JUN-10	Tue	0.0757
19-MAY-10 Continue to 318 days	Wed	9:30	17-JUL-10	2.17	2.39	96	95.47	0.0053	0.0060	0.1578	0.1382	0.1480	16-JUN-10	Wed	0.0939
20-MAY-10 Continue to 297 days	Thu	9:30	17-JUL-10	1.58	3.63	96	94.84	0.0071	0.0046	0.1402	0.1972	0.1687	17-JUN-10	Thu	0.0791
21-MAY-10 Continue to 300 days	Fri	9:30	17-JUL-10	2.12	3.35	94.5	94.10	0.0054	0.0033	0.1565	0.2107	0.1836	18-JUN-10	Fri	0.0628
Panel B: Midday period (12:30-13:00)															
24-MAY-10 Continue to 369 days	Mon	12:30	17-JUL-10	5.38	0.90	90	94.37	0.0050	0.0050	0.1870	0.1769	0.1820	21-JUN-10	Mon	0.0588
18-MAY-10 Continue to 393 days	Tue	12:30	17-JUL-10	5.05	0.74	92.5	97.25	0.0054	0.0049	0.1141	0.1567	0.1354	15-JUN-10	Tue	0.0757
19-MAY-10 Continue to 380 days	Wed	12:30	17-JUL-10	5.33	0.99	91	95.44	0.0053	0.0070	0.1663	0.1770	0.1716	16-JUN-10	Wed	0.0939
20-MAY-10 Continue to 361 days	Thu	12:30	17-JUL-10	5.50	1.27	89.5	93.71	0.0071	0.0048	0.2033	0.1986	0.2010	17-JUN-10	Thu	0.0791
21-MAY-10 Continue to 359 days	Fri	12:30	17-JUL-10	6.43	1.00	89	93.20	0.0071	0.0037	0.2800	0.1782	0.2291	18-JUN-10	Fri	0.0628
Panel C: Closing period (15:30-16:00)															
24-MAY-10 Continue to 369 days	Mon	15:30	17-JUL-10	5.33	0.88	90	94.36	0.0050	0.0052	0.1826	0.1745	0.1786	21-JUN-10	Mon	0.0588
18-MAY-10 Continue to 393 days	Tue	15:30	17-JUL-10	4.75	0.93	92.5	97.08	0.0054	0.0064	0.0917	0.1699	0.1308	15-JUN-10	Tue	0.0757
19-MAY-10 Continue to 381 days	Wed	15:30	17-JUL-10	6.00	0.82	90.5	95.13	0.0048	0.0076	0.2104	0.1669	0.1886	16-JUN-10	Wed	0.0939
20-MAY-10 Continue to 362 days	Thu	15:30	17-JUL-10	5.73	1.16	89.5	93.95	0.0058	0.0029	0.2077	0.1946	0.2011	17-JUN-10	Thu	0.0791
21-MAY-10 Continue to 359 days	Fri	15:30	17-JUL-10	5.30	1.20	90	94.59	0.0071	0.0037	0.1633	0.2009	0.1821	18-JUN-10	Fri	0.0628

Notes: CAD, IR_ CAD, IR_ USD, IV_ CADC, IV_ CADP, IV_CAD and RV_CAD represents Canadian dollar, interest rate of Canadian dollar, interest rate of US dollar, implied volatility of Canadian dollar call option price, implied volatility of Canadian dollar put option price, implied volatility of Canadian dollar options [(IV_CADC + IV_CADP)/2] and realized volatility of Canadian dollar, respectively.

Table A4.6c: Details of CAD options data for testing hypothesis 9
(Three-month maturity IV_CAD forecast RV_CAD for one-month forecast horizon)

Trade date	Trade day	Trade time	Expiry date	Call price	Put price	Strike price	Spot price	IR_CAD	IR_USD	IV_CADC	IV_CADP	IV_CAD	Forecast date	Forecast day	Forecast RV_CAD
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Panel A: Opening period (9:30-10:00)															
19-APR-10 Continue to 265 days	Mon	9:30	17-JUL-10	5.25	0.56	93.5	98.27	0.0071	0.0053	0.1111	0.1132	0.1122	17-MAY-10	Mon	0.1108
20-APR-10 Continue to 221 days	Tue	9:30	17-JUL-10	2.765	1.32	98.5	98.79	0.00675	0.0053	0.1366	0.0748	0.1057	18-MAY-10	Tue	0.0864
21-APR-10 Continue to 220 days	Wed	9:30	17-JUL-10	3.06	1.22	98.5	100.54	0.0077	0.0036	0.0998	0.1054	0.1026	19-MAY-10	Wed	0.1353
22-APR-10 Continue to 227 days	Thu	9:30	17-JUL-10	2.71	1.42	98.5	100.04	0.0080	0.0040	0.0987	0.1075	0.1031	20-MAY-10	Thu	0.1655
23-APR-10 Continue to 228 days	Fri	9:30	17-JUL-10	2.49	1.59	98.5	100.15	0.0048	0.0040	0.0803	0.1212	0.1007	21-MAY-10	Fri	0.1641
Panel B: Midday period (12:30-13:00)															
19-APR-10 Continue to 369 days	Mon	12:30	17-JUL-10	5.15	0.58	93.5	98.13	0.0070	0.0054	0.1119	0.1129	0.1124	17-MAY-10	Mon	0.1108
20-APR-10 Continue to 359 days	Tue	12:30	17-JUL-10	6.50	0.33	94	98.77	0.0043	0.0054	0.1915	0.0947	0.1431	18-MAY-10	Tue	0.0864
21-APR-10 Continue to 359 days	Wed	12:30	17-JUL-10	5.27	0.54	95.5	100.42	0.0080	0.0054	0.1028	0.1128	0.1078	19-MAY-10	Wed	0.1353
22-APR-10 Continue to 359 days	Thu	12:30	17-JUL-10	5.35	0.51	95	99.94	0.0050	0.0058	0.1035	0.1131	0.1083	20-MAY-10	Thu	0.1655
22-APR-10 Continue to 359 days	Fri	12:30	17-JUL-10	5.35	0.51	95	99.94	0.0050	0.0058	0.1035	0.1131	0.1083	20-MAY-10	Thu	0.1655
Panel C: Closing period (15:30-16:00)															
19-APR-10 Continue to 369 days	Mon	15:30	17-JUL-10	5.55	0.49	93.5	98.24	0.0069	0.0054	0.1346	0.1077	0.1212	17-MAY-10	Mon	0.1108
20-APR-10 Continue to 359 days	Tue	15:30	17-JUL-10	5.10	0.55	95.5	100.23	0.0053	0.0054	0.0967	0.1108	0.1038	18-MAY-10	Tue	0.0864
21-APR-10 Continue to 360 days	Wed	15:30	17-JUL-10	5.00	0.58	95.5	100.05	0.0078	0.0054	0.1055	0.1108	0.1081	19-MAY-10	Wed	0.1353
22-APR-10 Continue to 361 days	Thu	15:30	17-JUL-10	5.50	0.49	95	99.84	0.0079	0.0058	0.1264	0.1087	0.1176	20-MAY-10	Thu	0.1655
23-APR-10 Continue to 359 days	Fri	15:30	17-JUL-10	5.50	0.48	95	99.66	0.0063	0.0048	0.1364	0.1066	0.1215	21-MAY-10	Fri	0.1641

Notes: CAD, IR_ CAD, IR_ USD, IV_ CADC, IV_ CADP, IV_CAD and RV_CAD represents Canadian dollar, interest rate of Canadian dollar, interest rate of US dollar, implied volatility of Canadian dollar call option price, implied volatility of Canadian dollar put option price, implied volatility of Canadian dollar options [(IV_CADC + IV_CADP)/2] and realized volatility of Canadian dollar, respectively.

Table A4.7a: Details of CHF options data for testing hypothesis 1
(One-month maturity IV_CHF forecast RV_CHF for within-week forecast horizon)

Trade date	Trade day	Trade time	Expiry date	Call price	Put price	Strike price	Spot price	IR_CHF	IR_USD	IV_CHFC	IV_CHFP	IV_CHF	Forecast date	Forecast day	Forecast RV_CHF
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Panel A: Opening period (9:30-10:00)															
21-JUN-10 Continue to 249 days	Mon	10:00	17-JUL-10	1.13	0.95	90	90.15	0.0020	0.0056	0.1081	0.1079	0.1080	25-JUN-10	Fri	0.0833
22-JUN-10 Continue to 243 days	Tue	9:30	17-JUL-10	1.27	0.85	90	90.13	0.0011	0.0040	0.1265	0.0981	0.1123	25-JUN-10	Fri	0.0833
23-JUN-10 Continue to 247 days	Wed	9:30	17-JUL-10	1.04	0.96	90	90.31	0.0014	0.0070	0.0925	0.1218	0.1071	25-JUN-10	Fri	0.0833
24-JUN-10 Continue to 261 days	Thu	9:30	17-JUL-10	1.36	0.66	90	90.53	0.0016	0.0056	0.1174	0.1007	0.1090	25-JUN-10	Fri	0.0833
Panel B: Midday period (12:30-13:00)															
21-JUN-10 Continue to 355 days	Mon	12:30	17-JUL-10	4.22	0.11	86	90.09	0.0020	0.0035	0.1272	0.1240	0.1256	25-JUN-10	Fri	0.0833
22-JUN-10 Continue to 359 days	Tue	12:30	17-JUL-10	4.53	0.09	86	90.17	0.0010	0.0040	0.1797	0.1238	0.1518	25-JUN-10	Fri	0.0833
23-JUN-10 Continue to 364 days	Wed	12:30	17-JUL-10	4.27	0.09	86	90.17	0.0014	0.0033	0.1261	0.1262	0.1261	25-JUN-10	Fri	0.0833
17-JUN-10 Continue to 371 days	Thu	12:30	17-JUL-10	4.43	0.14	85.5	89.77	0.0014	0.0072	0.1245	0.1282	0.1264	18-JUN-10	Fri	0.0567
Panel C: Closing period (15:30-16:00)															
21-JUN-10 Continue to 355 days	Mon	15:30	17-JUL-10	1.88	0.49	88.5	90.32	0.0013	0.0044	0.0513	0.1244	0.0879	25-JUN-10	Fri	0.0833
22-JUN-10 Continue to 358 days	Tue	16:0	17-JUL-10	3.06	0.21	87.5	90.46	0.0013	0.0057	0.0904	0.1202	0.1053	25-JUN-10	Fri	0.0833
23-JUN-10 Continue to 359 days	Wed	15:30	17-JUL-10	5.07	0.06	85.5	89.93	0.0017	0.0035	0.2404	0.1194	0.1799	25-JUN-10	Fri	0.0833
17-JUN-10 Continue to 372 days	Thu	15:30	17-JUL-10	4.51	0.13	85.5	89.83	0.0016	0.0040	0.1356	0.1265	0.1311	18-JUN-10	Fri	0.0567

Notes: CHF, IR_ CHF, IR_ USD, IV_ CHFC, IV_ CHFP, IV_CHF and RV_CHF represents Swiss franc, interest rate of Swiss franc, interest rate of US dollar, implied volatility of Swiss franc call option price, implied volatility of Swiss franc put option price, implied volatility of Swiss franc options [(IV_CHFC + IV_CHFP)/2] and realized volatility of Swiss franc, respectively.

Table A4.7b: Details of CHF options data for testing hypothesis 2
(Two-month maturity IV_CHF forecast RV_CHF for within-week forecast horizon)

Trade date	Trade day	Trade time	Expiry date	Call price	Put price	Strike price	Spot price	IR_CHF	IR_USD	IV_CHFC	IV_CHFP	IV_CHF	Forecast date	Forecast day	Forecast RV_CHF
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Panel A: Opening period (9:30-10:00)															
31-MAY-10 Continue to 226 days	Mon	9:30	17-JUL-10	4.37	0.44	82.5	86.42	0.0015	0.0050	0.1410	0.1450	0.1430	04-JUN-10	Fri	0.1286
20-JUL-10 Continue to 225 days	Tue	9:40	21-AUG-10	1.49	1.11	95	94.91	0.0036	0.0056	0.1361	0.0953	0.1157	23-JUL-10	Fri	0.0867
21-JUL-10 Continue to 221 days	Wed	9:45	21-AUG-10	1.32	1.19	95	95.06	0.0019	0.0064	0.1151	0.1116	0.1134	23-JUL-10	Fri	0.0867
29-JUL-10 Continue to 201 days	Thu	9:30	18-SEP-10	5.21	0.15	91	95.39	0.0031	0.0060	0.1702	0.0969	0.1336	30-JUL-10	Fri	0.0842
Panel B: Midday period (12:30-13:00)															
24-MAY-10 Continue to 368 days	Mon	12:30	17-JUL-10	4.64	0.46	82.5	86.33	0.0010	0.0050	0.1678	0.1354	0.1516	28-MAY-10	Fri	0.0813
18-MAY-10 Continue to 392 days	Tue	13:0	17-JUL-10	4.60	0.45	84	88.42	0.0014	0.0049	0.0943	0.1363	0.1153	21-MAY-10	Fri	0.1049
19-MAY-10 Continue to 379 days	Wed	12:55	17-JUL-10	4.75	0.60	82.5	86.80	0.0010	0.0067	0.1298	0.1550	0.1424	21-MAY-10	Fri	0.1049
20-MAY-10 Continue to 359 days	Thu	12:30	17-JUL-10	4.55	0.70	83	86.95	0.0010	0.0048	0.1424	0.1576	0.1500	21-MAY-10	Fri	0.1049
Panel C: Closing period (15:30-16:00)															
24-MAY-10 Continue to 368 days	Mon	15:30	17-JUL-10	4.44	0.44	82.5	86.44	0.0008	0.0052	0.1367	0.1360	0.1364	28-MAY-10	Fri	0.0813
18-MAY-10 Continue to 392 days	Tue	16:0	17-JUL-10	3.17	0.87	85	88.06	0.0014	0.0065	0.0540	0.1476	0.1008	21-MAY-10	Fri	0.1049
19-MAY-10 Continue to 379 days	Wed	15:30	17-JUL-10	4.93	0.56	82.5	86.52	0.0013	0.0076	0.1712	0.1453	0.1583	21-MAY-10	Fri	0.1049
20-MAY-10 Continue to 360 days	Thu	15:30	17-JUL-10	4.90	0.66	83	87.04	0.0013	0.0029	0.1718	0.1549	0.1633	21-MAY-10	Fri	0.1049

Notes: CHF, IR_ CHF, IR_ USD, IV_ CHFC, IV_ CHFP, IV_CHF and RV_CHF represents Swiss franc, interest rate of Swiss franc, interest rate of US dollar, implied volatility of Swiss franc call option price, implied volatility of Swiss franc put option price, implied volatility of Swiss franc options [(IV_CHFC + IV_CHFP)/2] and realized volatility of Swiss franc, respectively.

Table A4.7c: Details of CHF options data for testing hypothesis 3
(Three-month maturity IV_CHF forecast RV_CHF for within-week forecast horizon)

Trade date	Trade day	Trade time	Expiry date	Call price	Put price	Strike price	Spot price	IR_CHF	IR_USD	IV_CHFC	IV_CHFP	IV_CHF	Forecast date	Forecast day	Forecast RV_CHF
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Panel A: Opening period (9:30-10:00)															
19-APR-10 Continue to 207 days	Mon	9:30	17-JUL-10	5.20	0.48	89	93.68	0.0028	0.0053	0.1117	0.1122	0.1120	23-APR-10	Fri	0.0934
29-JUN-10 Continue to 150 days	Tue	9:30	18-SEP-10	3.69	0.96	89.5	91.95	0.0022	0.0090	0.1266	0.1169	0.1218	02-JUL-10	Fri	0.0896
26-MAY-10 Continue to 148 days	Wed	9:45	21-AUG-10	3.16	1.32	85	86.71	0.0020	0.0058	0.1284	0.1253	0.1268	28-MAY-10	Fri	0.0813
01-JUL-10 Continue to 154 days	Thu	9:30	18-SEP-10	5.00	0.58	89.5	93.33	0.0021	0.0090	0.1501	0.1154	0.1327	02-JUL-10	Fri	0.0896
Panel B: Midday period (12:30-13:00)															
19-APR-10 Continue to 367 days	Mon	12:30	17-JUL-10	5.40	0.44	89	93.61	0.0024	0.0054	0.1317	0.1079	0.1198	23-APR-10	Fri	0.0934
20-APR-10 Continue to 356 days	Tue	12:30	17-JUL-10	4.75	0.49	89.5	94.01	0.0031	0.0054	0.0821	0.1105	0.0963	23-APR-10	Fri	0.0934
21-APR-10 Continue to 356 days	Wed	12:30	17-JUL-10	4.98	0.45	89	93.42	0.0031	0.0054	0.1124	0.1070	0.1097	23-APR-10	Fri	0.0934
22-APR-10 Continue to 356 days	Thu	12:30	17-JUL-10	4.92	0.52	88.5	93.06	0.0030	0.0058	0.0971	0.1165	0.1068	23-APR-10	Fri	0.0934
Panel C: Closing period (15:30-16:00)															
19-APR-10 Continue to 367 days	Mon	15:30	17-JUL-10	5.03	0.49	89.5	93.98	0.0025	0.0054	0.1097	0.1097	0.1097	23-APR-10	Fri	0.0934
20-APR-10 Continue to 356 days	Tue	15:30	17-JUL-10	5.15	0.43	89	93.63	0.0031	0.0054	0.1120	0.1076	0.1098	23-APR-10	Fri	0.0934
21-APR-10 Continue to 356 days	Wed	15:30	17-JUL-10	5.00	0.45	89	93.30	0.0031	0.0054	0.1223	0.1052	0.1138	23-APR-10	Fri	0.0934
22-APR-10 Continue to 357 days	Thu	15:30	17-JUL-10	4.98	0.52	88.5	92.76	0.0030	0.0058	0.1236	0.1120	0.1178	23-APR-10	Fri	0.0934

Notes: CHF, IR_ CHF, IR_ USD, IV_ CHFC, IV_ CHFP, IV_CHF and RV_CHF represents Swiss franc, interest rate of Swiss franc, interest rate of US dollar, implied volatility of Swiss franc call option price, implied volatility of Swiss franc put option price, implied volatility of Swiss franc options [(IV_CHFC + IV_CHFP)/2] and realized volatility of Swiss franc, respectively.

Table A4.8a: Details of CHF options data for testing hypothesis 4
(One-month maturity IV_CHF forecast RV_CHF for one-week forecast horizon)

Trade date	Trade day	Trade time	Expiry date	Call price	Put price	Strike price	Spot price	IR_CHF	IR_USD	IV_CHFC	IV_CHFP	IV_CHF	Forecast date	Forecast day	Forecast RV_CHF
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Panel A: Opening period (9:30-10:00)															
21-JUN-10 Continue to 249 days	Mon	10:0	17-JUL-10	1.13	0.95	90	90.15	0.0020	0.0056	0.1081	0.1079	0.1080	28-JUN-10	Mon	0.0767
22-JUN-10 Continue to 243 days	Tue	9:30	17-JUL-10	1.27	0.85	90	90.13	0.0011	0.0040	0.1265	0.0981	0.1123	29-JUN-10	Tue	0.0713
23-JUN-10 Continue to 247 days	Wed	9:30	17-JUL-10	1.04	0.96	90	90.31	0.0014	0.0070	0.0925	0.1218	0.1071	30-JUN-10	Wed	0.0868
24-JUN-10 Continue to 261 days	Thu	9:30	17-JUL-10	1.36	0.66	90	90.53	0.0016	0.0056	0.1174	0.1007	0.1090	01-JUL-10	Thu	0.1229
25-JUN-10 Continue to 251 days	Fri	9:30	17-JUL-10	1.58	0.54	90	90.82	0.0011	0.0043	0.1256	0.1007	0.1131	02-JUL-10	Fri	0.0896
Panel B: Midday period (12:30-13:00)															
21-JUN-10 Continue to 355 days	Mon	12:30	17-JUL-10	4.215	0.105	86	90.09	0.002	0.0035	0.1272	0.1240	0.1256	28-JUN-10	Mon	0.0767
22-JUN-10 Continue to 359 days	Tue	12:30	17-JUL-10	4.53	0.09	86	90.17	0.0010	0.0040	0.1797	0.1238	0.1518	29-JUN-10	Tue	0.0713
30-JUN-10 Continue to 364 days	Wed	12:30	17-JUL-10	4.42	0.05	88.5	92.44	0.0011	0.0069	0.2274	0.1207	0.1740	07-JUL-10	Wed	0.0727
17-JUN-10 Continue to 371 days	Thu	12:30	17-JUL-10	4.43	0.14	85.5	89.77	0.0014	0.0072	0.1245	0.1282	0.1264	24-JUN-10	Thu	0.0746
18-JUN-10 Continue to 358 days	Fri	12:30	17-JUL-10	4.67	0.10	85.5	89.99	0.0012	0.0073	0.1349	0.1257	0.1303	25-JUN-10	Fri	0.0833
Panel C: Closing period (15:30-16:00)															
21-JUN-10 Continue to 355 days	Mon	15:30	17-JUL-10	1.88	0.49	88.5	90.32	0.0013	0.0044	0.0513	0.1244	0.0879	28-JUN-10	Mon	0.0767
22-JUN-10 Continue to 358 days	Tue	16:0	17-JUL-10	3.06	0.21	87.5	90.46	0.0013	0.0057	0.0904	0.1202	0.1053	29-JUN-10	Tue	0.0713
23-JUN-10 Continue to 359 days	Wed	15:30	17-JUL-10	5.07	0.06	85.5	89.93	0.0017	0.0035	0.2404	0.1194	0.1799	30-JUN-10	Wed	0.0868
17-JUN-10 Continue to 372 days	Thu	15:30	17-JUL-10	4.51	0.13	85.5	89.83	0.0016	0.0040	0.1356	0.1265	0.1311	24-JUN-10	Thu	0.0746
18-JUN-10 Continue to 359 days	Fri	15:30	17-JUL-10	4.29	0.12	86	90.08	0.0012	0.0073	0.1333	0.1219	0.1276	25-JUN-10	Fri	0.0833

Notes: CHF, IR_ CHF, IR_ USD, IV_ CHFC, IV_ CHFP, IV_CHF and RV_CHF represents Swiss franc, interest rate of Swiss franc, interest rate of US dollar, implied volatility of Swiss franc call option price, implied volatility of Swiss franc put option price, implied volatility of Swiss franc options [(IV_CHFC + IV_CHFP)/2] and realized volatility of Swiss franc, respectively.

Table A4.8b: Details of CHF options data for testing hypothesis 5
(Two-month maturity IV_CHF forecast RV_CHF for one-week forecast horizon)

Trade date	Trade day	Trade time	Expiry date	Call price	Put price	Strike price	Spot price	IR_CHF	IR_USD	IV_CHFC	IV_CHFP	IV_CHF	Forecast date	Forecast day	Forecast RV_CHF
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Panel A: Opening period (9:30-10:00)															
31-MAY-10 Continue to 226 days	Mon	9:30	17-JUL-10	4.37	0.44	82.5	86.42	0.0015	0.0050	0.1410	0.1450	0.1430	07-JUN-10	Mon	0.0857
20-JUL-10 Continue to 225 days	Tue	9:40	21-AUG-10	1.49	1.11	95	94.91	0.0036	0.0056	0.1361	0.0953	0.1157	27-JUL-10	Tue	0.0782
21-JUL-10 Continue to 221 days	Wed	9:45	21-AUG-10	1.32	1.19	95	95.06	0.0019	0.0064	0.1151	0.1116	0.1134	28-JUL-10	Wed	0.0658
29-JUL-10 Continue to 201 days	Thu	9:30	18-SEP-10	5.21	0.15	91	95.39	0.0031	0.0060	0.1702	0.0969	0.1336	05-AUG-10	Thu	0.0935
06-AUG-10 Continue to 209 days	Fri	9:35	18-SEP-10	5.50	0.10	91	95.47	0.0038	0.0066	0.2093	0.0966	0.1530	13-AUG-10	Fri	0.0753
Panel B: Midday period (12:30-13:00)															
24-MAY-10 Continue to 368 days	Mon	12:30	17-JUL-10	4.64	0.455	82.5	86.33	0.00095	0.005	0.1678	0.1354	0.1516	31-MAY-10	Mon	0.0469
18-MAY-10 Continue to 392 days	Tue	13:0	17-JUL-10	4.60	0.45	84	88.42	0.0014	0.0049	0.0943	0.1363	0.1153	25-MAY-10	Tue	0.0946
19-MAY-10 Continue to 379 days	Wed	12:55	17-JUL-10	4.75	0.60	82.5	86.80	0.0010	0.0067	0.1298	0.1550	0.1424	26-MAY-10	Wed	0.0715
20-MAY-10 Continue to 359 days	Thu	12:30	17-JUL-10	4.55	0.70	83	86.95	0.0010	0.0048	0.1424	0.1576	0.1500	27-MAY-10	Thu	0.1199
21-MAY-10 Continue to 359 days	Fri	12:30	17-JUL-10	5.24	0.49	82.5	86.78	0.0015	0.0037	0.1892	0.1443	0.1667	28-MAY-10	Fri	0.0813
Panel C: Closing period (15:30-16:00)															
24-MAY-10 Continue to 368 days	Mon	15:30	17-JUL-10	4.44	0.44	82.5	86.44	0.0008	0.0052	0.1367	0.1360	0.1364	31-MAY-10	Mon	0.0469
18-MAY-10 Continue to 392 days	Tue	16:0	17-JUL-10	3.17	0.87	85	88.06	0.0014	0.0065	0.0540	0.1476	0.1008	25-MAY-10	Tue	0.0946
19-MAY-10 Continue to 379 days	Wed	15:30	17-JUL-10	4.93	0.56	82.5	86.52	0.0013	0.0076	0.1712	0.1453	0.1583	26-MAY-10	Wed	0.0715
20-MAY-10 Continue to 360 days	Thu	15:30	17-JUL-10	4.90	0.66	83	87.04	0.0013	0.0029	0.1718	0.1549	0.1633	27-MAY-10	Thu	0.1199
21-MAY-10 Continue to 360 days	Fri	15:30	17-JUL-10	4.67	0.52	83	86.97	0.0012	0.0037	0.1558	0.1400	0.1479	28-MAY-10	Fri	0.0813

Notes: CHF, IR_ CHF, IR_ USD, IV_ CHFC, IV_ CHFP, IV_CHF and RV_CHF represents Swiss franc, interest rate of Swiss franc, interest rate of US dollar, implied volatility of Swiss franc call option price, implied volatility of Swiss franc put option price, implied volatility of Swiss franc options [(IV_CHFC + IV_CHFP)/2] and realized volatility of Swiss franc, respectively.

Table A4.8c: Details of CHF options data for testing hypothesis 6
(Three-month maturity IV_CHF forecast RV_CHF for one-week forecast horizon)

Trade date	Trade day	Trade time	Expiry date	Call price	Put price	Strike price	Spot price	IR_CHF	IR_USD	IV_CHFC	IV_CHFP	IV_CHF	Forecast date	Forecast day	Forecast RV_CHF
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Panel A: Opening period (9:30-10:00)															
19-APR-10 Continue to 206 days	Mon	9:30	17-JUL-10	5.20	0.48	89	93.68	0.0028	0.0053	0.1117	0.1122	0.1120	26-APR-10	Mon	0.0648
29-JUN-10 Continue to 150 days	Tue	9:30	18-SEP-10	3.69	0.96	89.5	91.95	0.0022	0.0090	0.1266	0.1169	0.1218	06-JUL-10	Tue	0.0900
26-MAY-10 Continue to 148 days	Wed	9:45	21-AUG-10	3.16	1.32	85	86.71	0.0020	0.0058	0.1284	0.1253	0.1268	02-JUN-10	Wed	0.0816
01-JUL-10 Continue to 154 days	Thu	9:30	18-SEP-10	5.00	0.58	89.5	93.33	0.0021	0.0090	0.1501	0.1154	0.1327	08-JUL-10	Thu	0.0631
25-JUN-10 Continue to 156 days	Fri	9:40	18-SEP-10	2.91	1.27	89.5	90.74	0.0022	0.0095	0.1237	0.1085	0.1161	02-JUL-10	Fri	0.0896
Panel B: Midday period (12:30-13:00)															
19-APR-10 Continue to 366 days	Mon	12:30	17-JUL-10	5.4	0.435	89	93.61	0.0024	0.0054	0.1317	0.1079	0.1198	26-APR-10	Mon	0.0648
20-APR-10 Continue to 355 days	Tue	12:30	17-JUL-10	4.75	0.49	89.5	94.01	0.0031	0.0054	0.0821	0.1105	0.0963	27-APR-10	Tue	0.0839
21-APR-10 Continue to 355 days	Wed	12:30	17-JUL-10	4.98	0.45	89	93.42	0.0031	0.0054	0.1124	0.1070	0.1097	28-APR-10	Wed	0.1212
22-APR-10 Continue to 355 days	Thu	12:30	17-JUL-10	4.92	0.52	88.5	93.06	0.0030	0.0058	0.0971	0.1165	0.1068	29-APR-10	Thu	0.0661
23-APR-10 Continue to 355 days	Fri	12:45	17-JUL-10	5.57	0.41	88	92.60	0.0028	0.0040	0.1517	0.1081	0.1299	30-APR-10	Fri	0.0737
Panel C: Closing period (15:30-16:00)															
19-APR-10 Continue to 366 days	Mon	15:30	17-JUL-10	5.03	0.49	89.5	93.98	0.0025	0.0054	0.1097	0.1097	0.1097	26-APR-10	Mon	0.0648
20-APR-10 Continue to 355 days	Tue	15:30	17-JUL-10	5.15	0.43	89	93.63	0.0031	0.0054	0.1120	0.1076	0.1098	27-APR-10	Tue	0.0839
21-APR-10 Continue to 355 days	Wed	15:30	17-JUL-10	5.00	0.45	89	93.30	0.0031	0.0054	0.1223	0.1052	0.1138	28-APR-10	Wed	0.1212
22-APR-10 Continue to 356 days	Thu	15:30	17-JUL-10	4.98	0.52	88.5	92.76	0.0030	0.0058	0.1236	0.1120	0.1178	29-APR-10	Thu	0.0661
23-APR-10 Continue to 356 days	Fri	15:30	17-JUL-10	5.24	0.46	88.5	93.10	0.0028	0.0048	0.1244	0.1123	0.1183	30-APR-10	Fri	0.0737

Notes: CHF, IR_ CHF, IR_ USD, IV_ CHFC, IV_ CHFP, IV_CHF and RV_CHF represents Swiss franc, interest rate of Swiss franc, interest rate of US dollar, implied volatility of Swiss franc call option price, implied volatility of Swiss franc put option price, implied volatility of Swiss franc options [(IV_CHFC + IV_CHFP)/2] and realized volatility of Swiss franc, respectively.

Table A4.9a: Details of CHF options data for testing hypothesis 7
(One-month maturity IV_CHF forecast RV_CHF for one-month forecast horizon)

Trade date	Trade day	Trade time	Expiry date	Call price	Put price	Strike price	Spot price	IR_CHF	IR_USD	IV_CHFC	IV_CHFP	IV_CHF	Forecast date	Forecast day	Forecast RV_CHF
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Panel A: Opening period (9:30-10:00)															
21-JUN-10 Continue to 349 days	Mon	10:0	17-JUL-10	1.13	0.95	90	90.15	0.0020	0.0056	0.1081	0.1079	0.1080	28-JUN-10	Mon	0.0767
22-JUN-10 Continue to 244 days	Tue	9:30	17-JUL-10	1.265	0.85	90	90.13	0.00105	0.0040	0.1265	0.0981	0.1123	29-JUN-10	Tue	0.0713
23-JUN-10 Continue to 247 days	Wed	9:30	17-JUL-10	1.04	0.96	90	90.31	0.0014	0.0070	0.0925	0.1218	0.1071	30-JUN-10	Wed	0.0868
24-JUN-10 Continue to 262 days	Thu	9:30	17-JUL-10	1.36	0.66	90	90.53	0.0016	0.0056	0.1174	0.1007	0.1090	01-JUL-10	Thu	0.1229
25-JUN-10 Continue to 252 days	Fri	9:30	17-JUL-10	1.58	0.54	90	90.82	0.0011	0.0043	0.1256	0.1007	0.1131	02-JUL-10	Fri	0.0896
Panel B: Midday period (12:30-13:00)															
21-JUN-10 Continue to 353 days	Mon	12:30	17-JUL-10	4.22	0.11	86	90.09	0.0020	0.0035	0.1272	0.1240	0.1256	19-JUL-10	Mon	0.0698
22-JUN-10 Continue to 357 days	Tue	12:30	17-JUL-10	4.53	0.09	86	90.17	0.0010	0.0040	0.1797	0.1238	0.1518	20-JUL-10	Tue	0.0786
23-JUN-10 Continue to 362 days	Wed	12:30	17-JUL-10	4.27	0.09	86	90.17	0.0014	0.0033	0.1261	0.1262	0.1261	21-JUL-10	Wed	0.0663
17-JUN-10 Continue to 370 days	Thu	12:30	17-JUL-10	4.43	0.14	85.5	89.77	0.0014	0.0072	0.1245	0.1282	0.1264	15-JUL-10	Thu	0.0792
18-JUN-10 Continue to 357 days	Fri	12:30	17-JUL-10	4.67	0.10	85.5	89.99	0.0012	0.0073	0.1349	0.1257	0.1303	16-JUL-10	Fri	0.0912
Panel C: Closing period (15:30-16:00)															
21-JUN-10 Continue to 353 days	Mon	15:30	17-JUL-10	1.88	0.49	88.5	90.32	0.0013	0.0044	0.0513	0.1244	0.0879	19-JUL-10	Mon	0.0698
22-JUN-10 Continue to 356 days	Tue	16:0	17-JUL-10	3.06	0.21	87.5	90.46	0.0013	0.0057	0.0904	0.1202	0.1053	20-JUL-10	Tue	0.0786
23-JUN-10 Continue to 357 days	Wed	15:30	17-JUL-10	5.07	0.06	85.5	89.93	0.0017	0.0035	0.2404	0.1194	0.1799	21-JUL-10	Wed	0.0663
17-JUN-10 Continue to 371 days	Thu	15:30	17-JUL-10	4.51	0.13	85.5	89.83	0.0016	0.0040	0.1356	0.1265	0.1311	15-JUL-10	Thu	0.0792
18-JUN-10 Continue to 358 days	Fri	15:30	17-JUL-10	4.29	0.12	86	90.08	0.0012	0.0073	0.1333	0.1219	0.1276	16-JUL-10	Fri	0.0912

Notes: CHF, IR_ CHF, IR_ USD, IV_ CHFC, IV_ CHFP, IV_CHF and RV_CHF represents Swiss franc, interest rate of Swiss franc, interest rate of US dollar, implied volatility of Swiss franc call option price, implied volatility of Swiss franc put option price, implied volatility of Swiss franc options [(IV_CHFC + IV_CHFP)/2] and realized volatility of Swiss franc, respectively.

Table A4.9b: Details of CHF options data for testing hypothesis 8
(Two-month maturity IV_CHF forecast RV_CHF for one-month forecast horizon)

Trade date	Trade day	Trade time	Expiry date	Call price	Put price	Strike price	Spot price	IR_CHF	IR_USD	IV_CHFC	IV_CHFP	IV_CHF	Forecast date	Forecast day	Forecast RV_CHF
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Panel A: Opening period (9:30-10:00)															
31-MAY-10 Continue to 226 days	Mon	9:30	17-JUL-10	4.37	0.44	82.5	86.42	0.0015	0.0050	0.1410	0.1450	0.1430	07-JUN-10	Mon	0.0857
20-JUL-10 Continue to 225 days	Tue	9:40	21-AUG-10	1.49	1.11	95	94.91	0.00355	0.0056	0.1361	0.0953	0.1157	27-JUL-10	Tue	0.0782
21-JUL-10 Continue to 221 days	Wed	9:45	21-AUG-10	1.32	1.19	95	95.06	0.0019	0.0064	0.1151	0.1116	0.1134	28-JUL-10	Wed	0.0658
29-JUL-10 Continue to 201 days	Thu	9:30	18-SEP-10	5.21	0.15	91	95.39	0.0031	0.0060	0.1702	0.0969	0.1336	05-AUG-10	Thu	0.0935
06-AUG-10 Continue to 209 days	Fri	9:35	18-SEP-10	5.50	0.10	91	95.47	0.0038	0.0066	0.2093	0.0966	0.1530	13-AUG-10	Fri	0.0753
Panel B: Midday period (12:30-13:00)															
24-MAY-10 Continue to 368 days	Mon	12:30	17-JUL-10	4.64	0.46	82.5	86.33	0.0010	0.0050	0.1678	0.1354	0.1516	21-JUN-10	Mon	0.0562
18-MAY-10 Continue to 392 days	Tue	13:0	17-JUL-10	4.60	0.45	84	88.42	0.0014	0.0049	0.0943	0.1363	0.1153	15-JUN-10	Tue	0.0856
19-MAY-10 Continue to 379 days	Wed	12:55	17-JUL-10	4.75	0.60	82.5	86.80	0.0010	0.0067	0.1298	0.1550	0.1424	16-JUN-10	Wed	0.0715
20-MAY-10 Continue to 359 days	Thu	12:30	17-JUL-10	4.55	0.70	83	86.95	0.0010	0.0048	0.1424	0.1576	0.1500	17-JUN-10	Thu	0.0751
21-MAY-10 Continue to 359 days	Fri	12:30	17-JUL-10	5.24	0.49	82.5	86.78	0.0015	0.0037	0.1892	0.1443	0.1667	18-JUN-10	Fri	0.0567
Panel C: Closing period (15:30-16:00)															
24-MAY-10 Continue to 368 days	Mon	15:30	17-JUL-10	4.44	0.44	82.5	86.44	0.0008	0.0052	0.1367	0.1360	0.1364	21-JUN-10	Mon	0.0562
18-MAY-10 Continue to 392 days	Tue	16:0	17-JUL-10	3.17	0.87	85	88.06	0.0014	0.0065	0.0540	0.1476	0.1008	15-JUN-10	Tue	0.0856
19-MAY-10 Continue to 379 days	Wed	15:30	17-JUL-10	4.93	0.56	82.5	86.52	0.0013	0.0076	0.1712	0.1453	0.1583	16-JUN-10	Wed	0.0715
20-MAY-10 Continue to 360 days	Thu	15:30	17-JUL-10	4.90	0.66	83	87.04	0.0013	0.0029	0.1718	0.1549	0.1633	17-JUN-10	Thu	0.0751
21-MAY-10 Continue to 360 days	Fri	15:30	17-JUL-10	4.67	0.52	83	86.97	0.0012	0.0037	0.1558	0.1400	0.1479	18-JUN-10	Fri	0.0567

Notes: CHF, IR_ CHF, IR_ USD, IV_ CHFC, IV_ CHFP, IV_CHF and RV_CHF represents Swiss franc, interest rate of Swiss franc, interest rate of US dollar, implied volatility of Swiss franc call option price, implied volatility of Swiss franc put option price, implied volatility of Swiss franc options [(IV_CHFC + IV_CHFP)/2] and realized volatility of Swiss franc, respectively.

Table A4.9c: Details of CHF options data for testing hypothesis 9
(Three-month maturity IV_CHF forecast RV_CHF for one-month forecast horizon)

Trade date	Trade day	Trade time	Expiry date	Call price	Put price	Strike price	Spot price	IR_CHF	IR_USD	IV_CHFC	IV_CHFP	IV_CHF	Forecast date	Forecast day	Forecast RV_CHF
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Panel A: Opening period (9:30-10:00)															
19-APR-10 Continue to 206 days	Mon	9:30	17-JUL-10	5.20	0.48	89	93.68	0.0028	0.0053	0.1117	0.1122	0.1120	26-APR-10	Mon	0.0648
29-JUN-10 Continue to 150 days	Tue	9:30	18-SEP-10	3.69	0.96	89.5	91.95	0.00215	0.0090	0.1266	0.1169	0.1218	06-JUL-10	Tue	0.0900
26-MAY-10 Continue to 148 days	Wed	9:45	21-AUG-10	3.16	1.32	85	86.71	0.0020	0.0058	0.1284	0.1253	0.1268	02-JUN-10	Wed	0.0816
01-JUL-10 Continue to 154 days	Thu	9:30	18-SEP-10	5.00	0.58	89.5	93.33	0.0021	0.0090	0.1501	0.1154	0.1327	08-JUL-10	Thu	0.0631
25-JUN-10 Continue to 156 days	Fri	9:40	18-SEP-10	2.91	1.27	89.5	90.74	0.0022	0.0095	0.1237	0.1085	0.1161	02-JUL-10	Fri	0.0896
Panel B: Midday period (12:30-13:00)															
19-APR-10 Continue to 367 days	Mon	12:30	17-JUL-10	5.40	0.44	89	93.61	0.0024	0.0054	0.1317	0.1079	0.1198	17-MAY-10	Mon	0.1074
20-APR-10 Continue to 353 days	Tue	12:30	17-JUL-10	4.75	0.49	89.5	94.01	0.0031	0.0054	0.0821	0.1105	0.0963	18-MAY-10	Tue	0.0756
21-APR-10 Continue to 354 days	Wed	12:30	17-JUL-10	4.98	0.45	89	93.42	0.0031	0.0054	0.1124	0.1070	0.1097	19-MAY-10	Wed	0.1522
22-APR-10 Continue to 354 days	Thu	12:30	17-JUL-10	4.92	0.52	88.5	93.06	0.0030	0.0058	0.0971	0.1165	0.1068	20-MAY-10	Thu	0.1053
23-APR-10 Continue to 354 days	Fri	12:45	17-JUL-10	5.57	0.41	88	92.60	0.0028	0.0040	0.1517	0.1081	0.1299	21-MAY-10	Fri	0.1049
Panel C: Closing period (15:30-16:00)															
19-APR-10 Continue to 365 days	Mon	15:30	17-JUL-10	5.03	0.49	89.5	93.98	0.0025	0.0054	0.1097	0.1097	0.1097	17-MAY-10	Mon	0.1074
20-APR-10 Continue to 354 days	Tue	15:30	17-JUL-10	5.15	0.43	89	93.63	0.0031	0.0054	0.1120	0.1076	0.1098	18-MAY-10	Tue	0.0756
21-APR-10 Continue to 354 days	Wed	15:30	17-JUL-10	5.00	0.45	89	93.30	0.0031	0.0054	0.1223	0.1052	0.1138	19-MAY-10	Wed	0.1522
22-APR-10 Continue to 355 days	Thu	15:30	17-JUL-10	4.98	0.52	88.5	92.76	0.0030	0.0058	0.1236	0.1120	0.1178	20-MAY-10	Thu	0.1053
23-APR-10 Continue to 355 days	Fri	15:30	17-JUL-10	5.24	0.46	88.5	93.10	0.0028	0.0048	0.1244	0.1123	0.1183	21-MAY-10	Fri	0.1049

Notes: CHF, IR_ CHF, IR_ USD, IV_ CHFC, IV_ CHFP, IV_CHF and RV_CHF represents Swiss franc, interest rate of Swiss franc, interest rate of US dollar, implied volatility of Swiss franc call option price, implied volatility of Swiss franc put option price, implied volatility of Swiss franc options [(IV_CHFC + IV_CHFP)/2] and realized volatility of Swiss franc, respectively.

Table A4.10a: Details of EUR options data for testing hypothesis 1
(One-month maturity IV_EUR forecast RV_EUR for within-week forecast horizon)

Trade date	Trade day	Trade time	Expiry date	Call price	Put price	Strike price	Spot price	IR_EUR	IR_USD	IV_EURC	IV_EURP	IV_EUR	Forecast date	Forecast day	Forecast RV_EUR
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Panel A: Opening period (9:30-10:00)															
21-JUN-10 Continue to 351 days	Mon	9:30	17-JUL-10	4.76	0.44	119.5	123.95	0.0047	0.0042	0.1291	0.1449	0.1370	25-JUN-10	Fri	0.0685
22-JUN-10 Continue to 356 days	Tue	9:30	17-JUL-10	6.21	0.24	117	122.89	0.0047	0.0040	0.1645	0.1495	0.1570	25-JUN-10	Fri	0.0685
23-JUN-10 Continue to 367 days	Wed	9:30	17-JUL-10	3.66	0.65	119.5	122.82	0.0042	0.0070	0.1123	0.1499	0.1311	25-JUN-10	Fri	0.0685
17-JUN-10 Continue to 370 days	Thu	9:30	17-JUL-10	5.05	0.58	119.5	123.69	0.0043	0.0072	0.1704	0.1454	0.1579	18-JUN-10	Fri	0.0553
Panel B: Midday period (12:30-13:00)															
21-JUN-10 Continue to 355 days	Mon	12:30	17-JUL-10	6.39	0.21	117.5	123.63	0.0043	0.0035	0.1558	0.1456	0.1507	25-JUN-10	Fri	0.0685
22-JUN-10 Continue to 358 days	Tue	12:30	17-JUL-10	6.25	0.23	117	122.78	0.0047	0.0040	0.1829	0.1466	0.1648	25-JUN-10	Fri	0.0685
23-JUN-10 Continue to 367 days	Wed	12:30	17-JUL-10	4.87	0.37	118	122.70	0.0044	0.0033	0.1198	0.1492	0.1345	25-JUN-10	Fri	0.0685
17-JUN-10 Continue to 374 days	Thu	12:30	17-JUL-10	6.49	0.36	117.5	123.61	0.0043	0.0072	0.1577	0.1578	0.1577	18-JUN-10	Fri	0.0553
Panel C: Closing period (15:30-16:00)															
21-JUN-10 Continue to 356 days	Mon	15:30	17-JUL-10	2.70	1.03	121.5	123.93	0.0047	0.0044	0.0827	0.1539	0.1183	25-JUN-10	Fri	0.0685
22-JUN-10 Continue to 360 days	Tue	15:30	17-JUL-10	3.90	0.59	119.5	123.11	0.0045	0.0028	0.1139	0.1464	0.1302	25-JUN-10	Fri	0.0685
23-JUN-10 Continue to 367 days	Wed	15:30	17-JUL-10	6.82	0.19	116.5	122.23	0.0047	0.0035	0.2601	0.1408	0.2005	25-JUN-10	Fri	0.0685
17-JUN-10 Continue to 375 days	Thu	15:30	17-JUL-10	6.63	0.34	117.5	123.66	0.0043	0.0040	0.1735	0.1560	0.1648	18-JUN-10	Fri	0.0553

Notes: EUR, IR_ EUR, IR_ USD, IV_ EURC, IV_ EURP, IV_EUR and RV_EUR represents Euro, interest rate of Euro, interest rate of US dollar, implied volatility of Euro call option price, implied volatility of Euro put option price, implied volatility of Euro options [(IV_EURC + IV_EURP)/2] and realized volatility of Euro, respectively.

Table A4.10b: Details of EUR options data for testing hypothesis 2
(Two-month maturity IV_EUR forecast RV_EUR for within-week forecast horizon)

Trade date	Trade day	Trade time	Expiry date	Call price	Put price	Strike price	Spot price	IR_EUR	IR_USD	IV_EURC	IV_EURP	IV_EUR	Forecast date	Forecast day	Forecast RV_EUR
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Panel A: Opening period (9:30-10:00)															
24-MAY-10 Continue to 345 days	Mon	9:30	17-JUL-10	5.51	1.59	120	124.17	0.0041	0.0045	0.1582	0.1739	0.1661	28-MAY-10	Fri	0.0890
18-MAY-10 Continue to 364 days	Tue	9:30	17-JUL-10	5.65	1.31	120	123.84	0.0044	0.0049	0.1718	0.1435	0.1576	21-MAY-10	Fri	0.1250
19-MAY-10 Continue to 375 days	Wed	9:30	17-JUL-10	4.93	2.05	120	121.83	0.0047	0.0060	0.2028	0.1488	0.1758	21-MAY-10	Fri	0.1250
20-MAY-10 Continue to 334 days	Thu	9:30	17-JUL-10	5.70	1.99	120	123.88	0.0040	0.0046	0.1759	0.1858	0.1809	21-MAY-10	Fri	0.1250
Panel B: Midday period (12:30-13:00)															
24-MAY-10 Continue to 366 days	Mon	12:30	17-JUL-10	7.65	1.00	117.5	123.66	0.0039	0.0050	0.2046	0.1719	0.1883	28-MAY-10	Fri	0.0890
18-MAY-10 Continue to 391 days	Tue	12:30	17-JUL-10	6.73	1.03	118	124.09	0.0047	0.0049	0.1347	0.1632	0.1490	21-MAY-10	Fri	0.1250
19-MAY-10 Continue to 379 days	Wed	12:30	17-JUL-10	7.98	1.15	116.5	122.47	0.0047	0.0070	0.2259	0.1734	0.1997	21-MAY-10	Fri	0.1250
20-MAY-10 Continue to 358 days	Thu	12:30	17-JUL-10	7.53	1.40	117.5	123.20	0.0052	0.0048	0.2126	0.1852	0.1989	21-MAY-10	Fri	0.1250
Panel C: Closing period (15:30-16:00)															
24-MAY-10 Continue to 366 days	Mon	15:30	17-JUL-10	7.13	1.08	118	123.90	0.0042	0.0052	0.1820	0.1726	0.1773	28-MAY-10	Fri	0.0890
18-MAY-10 Continue to 391 days	Tue	15:30	17-JUL-10	4.48	1.98	119.5	123.76	0.0045	0.0064	0.0704	0.1904	0.1304	21-MAY-10	Fri	0.1250
19-MAY-10 Continue to 379 days	Wed	15:30	17-JUL-10	7.60	1.24	117.5	123.20	0.0039	0.0076	0.2119	0.1746	0.1933	21-MAY-10	Fri	0.1250
20-MAY-10 Continue to 361 days	Thu	15:30	17-JUL-10	8.73	1.29	118	123.82	0.0042	0.0029	0.2779	0.1789	0.2284	21-MAY-10	Fri	0.1250

Notes: EUR, IR_ EUR, IR_ USD, IV_ EURC, IV_ EURP, IV_EUR and RV_EUR represents Euro, interest rate of Euro, interest rate of US dollar, implied volatility of Euro call option price, implied volatility of Euro put option price, implied volatility of Euro options [(IV_EURC + IV_EURP)/2] and realized volatility of Euro, respectively.

Table A4.10c: Details of EUR options data for testing hypothesis 3
(Three-month maturity IV_EUR forecast RV_EUR for within-week forecast horizon)

Trade date	Trade day	Trade time	Expiry date	Call price	Put price	Strike price	Spot price	IR_EUR	IR_USD	IV_EURC	IV_EURP	IV_EUR	Forecast date	Forecast day	Forecast RV_EUR
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Panel A: Opening period (9:30-10:00)															
19-APR-10 Continue to 292 days	Mon	9:30	17-JUL-10	7.33	0.92	128	134.40	0.0055	0.0053	0.1224	0.1213	0.1218	23-APR-10	Fri	0.0926
04-MAY-10 Continue to 240 days	Tue	9:30	17-JUL-10	2.27	3.64	132	131.37	0.0050	0.0040	0.1094	0.1398	0.1246	07-MAY-10	Fri	0.1638
05-MAY-10 Continue to 236 days	Wed	9:30	17-JUL-10	5.15	1.85	125	129.87	0.0062	0.0065	0.0757	0.1674	0.1216	07-MAY-10	Fri	0.1638
06-MAY-10 Continue to 253 days	Thu	9:30	17-JUL-10	6.88	1.60	122	127.67	0.0067	0.0070	0.1490	0.1711	0.1601	07-MAY-10	Fri	0.1638
Panel B: Midday period (12:30-13:00)															
19-APR-10 Continue to 367 days	Mon	12:30	17-JUL-10	7.43	0.88	128	134.29	0.0058	0.0054	0.1323	0.1179	0.1251	23-APR-10	Fri	0.0926
20-APR-10 Continue to 355 days	Tue	12:30	17-JUL-10	6.89	0.94	128.5	134.76	0.0050	0.0054	0.1032	0.1213	0.1122	23-APR-10	Fri	0.0926
21-APR-10 Continue to 356 days	Wed	12:30	17-JUL-10	7.29	0.80	127.5	133.84	0.0056	0.0054	0.1246	0.1158	0.1202	23-APR-10	Fri	0.0926
22-APR-10 Continue to 355 days	Thu	12:30	17-JUL-10	6.98	1.00	127	133.32	0.0048	0.0058	0.1071	0.1283	0.1177	23-APR-10	Fri	0.0926
Panel C: Closing period (15:30-16:00)															
19-APR-10 Continue to 365 days	Mon	15:30	17-JUL-10	7.68	0.82	128	134.70	0.0054	0.0054	0.1280	0.1187	0.1234	23-APR-10	Fri	0.0926
20-APR-10 Continue to 355 days	Tue	15:30	17-JUL-10	7.28	0.84	128	134.44	0.0057	0.0054	0.1187	0.1180	0.1183	23-APR-10	Fri	0.0926
21-APR-10 Continue to 356 days	Wed	15:30	17-JUL-10	7.30	0.79	127.5	133.75	0.0047	0.0054	0.1277	0.1143	0.1210	23-APR-10	Fri	0.0926
22-APR-10 Continue to 357 days	Thu	15:30	17-JUL-10	7.53	0.89	126.5	132.90	0.0055	0.0058	0.1361	0.1233	0.1297	23-APR-10	Fri	0.0926

Notes: EUR, IR_ EUR, IR_ USD, IV_ EURC, IV_ EURP, IV_EUR and RV_EUR represents Euro, interest rate of Euro, interest rate of US dollar, implied volatility of Euro call option price, implied volatility of Euro put option price, implied volatility of Euro options [(IV_EURC + IV_EURP)/2] and realized volatility of Euro, respectively.

Table A4.11a: Details of EUR options data for testing hypothesis 4
(One-month maturity IV_EUR forecast RV_EUR for one-week forecast horizon)

Trade date	Trade day	Trade time	Expiry date	Call price	Put price	Strike price	Spot price	IR_EUR	IR_USD	IV_EURC	IV_EURP	IV_EUR	Forecast date	Forecast day	Forecast RV_EUR
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Panel A: Opening period (9:30-10:00)															
21-JUN-10 Continue to 351 days	Mon	9:30	17-JUL-10	4.76	0.44	119.5	123.95	0.0047	0.0042	0.1291	0.1449	0.1370	28-JUN-10	Mon	0.0573
22-JUN-10 Continue to 356 days	Tue	9:30	17-JUL-10	6.21	0.24	117	122.89	0.0047	0.0040	0.1645	0.1495	0.1570	29-JUN-10	Tue	0.0732
23-JUN-10 Continue to 367 days	Wed	9:30	17-JUL-10	3.66	0.65	119.5	122.82	0.0042	0.0070	0.1123	0.1499	0.1311	30-JUN-10	Wed	0.0763
17-JUN-10 Continue to 370 days	Thu	9:30	17-JUL-10	5.05	0.58	119.5	123.69	0.0043	0.0072	0.1704	0.1454	0.1579	24-JUN-10	Thu	0.0916
18-JUN-10 Continue to 358 days	Fri	9:30	17-JUL-10	4.75	0.56	119.5	123.87	0.0056	0.0056	0.1296	0.1489	0.1392	25-JUN-10	Fri	0.0685
Panel B: Midday period (12:30-13:00)															
21-JUN-10 Continue to 355 days	Mon	12:30	17-JUL-10	6.39	0.21	117.5	123.63	0.0043	0.0035	0.1558	0.1456	0.1507	28-JUN-10	Mon	0.0573
22-JUN-10 Continue to 358 days	Tue	12:30	17-JUL-10	6.25	0.23	117	122.78	0.0047	0.0040	0.1829	0.1466	0.1648	29-JUN-10	Tue	0.0732
23-JUN-10 Continue to 367 days	Wed	12:30	17-JUL-10	4.87	0.37	118	122.70	0.0044	0.0033	0.1198	0.1492	0.1345	30-JUN-10	Wed	0.0763
17-JUN-10 Continue to 374 days	Thu	12:30	17-JUL-10	6.49	0.36	117.5	123.61	0.0043	0.0072	0.1577	0.1578	0.1577	24-JUN-10	Thu	0.0916
18-JUN-10 Continue to 359 days	Fri	12:30	17-JUL-10	6.47	0.28	117.5	123.65	0.0046	0.0073	0.1519	0.1502	0.1510	25-JUN-10	Fri	0.0685
Panel C: Closing period (15:30-16:00)															
21-JUN-10 Continue to 356 days	Mon	15:30	17-JUL-10	2.70	1.03	121.5	123.93	0.0047	0.0044	0.0827	0.1539	0.1183	28-JUN-10	Mon	0.0573
22-JUN-10 Continue to 360 days	Tue	15:30	17-JUL-10	3.90	0.59	119.5	123.11	0.0045	0.0028	0.1139	0.1464	0.1302	29-JUN-10	Tue	0.0732
23-JUN-10 Continue to 367 days	Wed	15:30	17-JUL-10	6.82	0.19	116.5	122.23	0.0047	0.0035	0.2601	0.1408	0.2005	30-JUN-10	Wed	0.0763
17-JUN-10 Continue to 375 days	Thu	15:30	17-JUL-10	6.63	0.34	117.5	123.66	0.0043	0.0040	0.1735	0.1560	0.1648	24-JUN-10	Thu	0.0916
18-JUN-10 Continue to 359 days	Fri	15:30	17-JUL-10	6.50	0.27	117.5	123.62	0.0044	0.0073	0.1599	0.1482	0.1540	25-JUN-10	Fri	0.0685

Notes: EUR, IR_ EUR, IR_ USD, IV_ EURC, IV_ EURP, IV_EUR and RV_EUR represents Euro, interest rate of Euro, interest rate of US dollar, implied volatility of Euro call option price, implied volatility of Euro put option price, implied volatility of Euro options [(IV_EURC + IV_EURP)/2] and realized volatility of Euro, respectively.

Table A4.11b: Details of EUR options data for testing hypothesis 5
(Two-month maturity IV_EUR forecast RV_EUR for one-week forecast horizon)

Trade date	Trade day	Trade time	Expiry date	Call price	Put price	Strike price	Spot price	IR_EUR	IR_USD	IV_EURC	IV_EURP	IV_EUR	Forecast date	Forecast day	Forecast RV_EUR
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Panel A: Opening period (9:30-10:00)															
24-MAY-10 Continue to 345 days	Mon	9:30	17-JUL-10	5.51	1.59	120	124.17	0.0041	0.0045	0.1582	0.1739	0.1661	31-MAY-10	Mon	0.0477
18-MAY-10 Continue to 364 days	Tue	9:30	17-JUL-10	5.65	1.31	120	123.84	0.0044	0.0049	0.1718	0.1435	0.1576	25-MAY-10	Tue	0.1009
19-MAY-10 Continue to 351 days	Wed	9:30	17-JUL-10	4.93	2.05	120	121.83	0.0047	0.0060	0.2028	0.1488	0.1758	26-MAY-10	Wed	0.0852
20-MAY-10 Continue to 334 days	Thu	9:30	17-JUL-10	5.70	1.99	120	123.88	0.0040	0.0046	0.1759	0.1858	0.1809	27-MAY-10	Thu	0.1209
21-MAY-10 Continue to 334 days	Fri	9:30	17-JUL-10	6.95	1.56	120	125.44	0.0040	0.0033	0.1867	0.1884	0.1876	28-MAY-10	Fri	0.0890
Panel B: Midday period (12:30-13:00)															
24-MAY-10 Continue to 366 days	Mon	12:30	17-JUL-10	7.645	1	117.5	123.66	0.00385	0.005	0.2046	0.1719	0.1883	31-MAY-10	Mon	0.0477
18-MAY-10 Continue to 391 days	Tue	12:30	17-JUL-10	6.73	1.03	118	124.09	0.0047	0.0049	0.1347	0.1632	0.1490	25-MAY-10	Tue	0.1009
19-MAY-10 Continue to 379 days	Wed	12:30	17-JUL-10	7.98	1.15	116.5	122.47	0.0047	0.0070	0.2259	0.1734	0.1997	26-MAY-10	Wed	0.0852
20-MAY-10 Continue to 358 days	Thu	12:30	17-JUL-10	7.53	1.40	117.5	123.20	0.0052	0.0048	0.2126	0.1852	0.1989	27-MAY-10	Thu	0.1209
21-MAY-10 Continue to 358 days	Fri	12:30	17-JUL-10	8.085	1.26	119	125.2	0.0041	0.0037	0.2237	0.1832	0.2034	28-MAY-10	Fri	0.0890
Panel C: Closing period (15:30-16:00)															
24-MAY-10 Continue to 366 days	Mon	15:30	17-JUL-10	7.13	1.08	118	123.90	0.0042	0.0052	0.1820	0.1726	0.1773	31-MAY-10	Mon	0.0477
18-MAY-10 Continue to 391 days	Tue	15:30	17-JUL-10	4.48	1.98	119.5	123.76	0.0045	0.0064	0.0704	0.1904	0.1304	25-MAY-10	Tue	0.1009
19-MAY-10 Continue to 379 days	Wed	15:30	17-JUL-10	7.60	1.24	117.5	123.20	0.0039	0.0076	0.2119	0.1746	0.1933	26-MAY-10	Wed	0.0852
20-MAY-10 Continue to 360 days	Thu	15:30	17-JUL-10	8.73	1.29	118	123.82	0.0042	0.0029	0.2779	0.1789	0.2284	27-MAY-10	Thu	0.1209
21-MAY-10 Continue to 358 days	Fri	15:30	17-JUL-10	7.53	1.28	119.5	125.54	0.0047	0.0037	0.1959	0.1808	0.1883	28-MAY-10	Fri	0.0890

Notes: EUR, IR_ EUR, IR_ USD, IV_ EURC, IV_ EURP, IV_EUR and RV_EUR represents Euro, interest rate of Euro, interest rate of US dollar, implied volatility of Euro call option price, implied volatility of Euro put option price, implied volatility of Euro options [(IV_EURC + IV_EURP)/2] and realized volatility of Euro, respectively.

Table A4.11c: Details of EUR options data for testing hypothesis 6
(Three-month maturity IV_EUR forecast RV_EUR for one-week forecast horizon)

Trade date	Trade day	Trade time	Expiry date	Call price	Put price	Strike price	Spot price	IR_EUR	IR_USD	IV_EURC	IV_EURP	IV_EUR	Forecast date	Forecast day	Forecast RV_EUR
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Panel A: Opening period (9:30-10:00)															
19-APR-10 Continue to 291 days	Mon	9:30	17-JUL-10	7.33	0.92	128	134.40	0.0055	0.0053	0.1224	0.1213	0.1218	26-APR-10	Mon	0.0581
04-MAY-10 Continue to 239 days	Tue	9:30	17-JUL-10	2.27	3.64	132	131.37	0.0050	0.0040	0.1094	0.1398	0.1246	11-MAY-10	Tue	0.1022
05-MAY-10 Continue to 235 days	Wed	9:30	17-JUL-10	5.15	1.85	125	129.87	0.0062	0.0065	0.0757	0.1674	0.1216	12-MAY-10	Wed	0.0902
06-MAY-10 Continue to 252 days	Thu	9:30	17-JUL-10	6.88	1.60	122	127.67	0.0067	0.0070	0.1490	0.1711	0.1601	13-MAY-10	Thu	0.0878
07-MAY-10 Continue to 253 days	Fri	9:30	17-JUL-10	4.35	2.61	125	127.33	0.0064	0.0085	0.1359	0.1657	0.1508	14-MAY-10	Fri	0.1113
Panel B: Midday period (12:30-13:00)															
19-APR-10 Continue to 364 days	Mon	12:30	17-JUL-10	7.425	0.88	128	134.29	0.00575	0.0054	0.1323	0.1179	0.1251	26-APR-10	Mon	0.0581
20-APR-10 Continue to 355 days	Tue	12:30	17-JUL-10	6.89	0.94	128.5	134.76	0.0050	0.0054	0.1032	0.1213	0.1122	27-APR-10	Tue	0.0927
19-MAY-10 Continue to 379 days	Wed	12:30	17-JUL-10	7.98	1.15	116.5	122.47	0.0047	0.0070	0.2259	0.1734	0.1997	26-MAY-10	Wed	0.0852
22-APR-10 Continue to 354 days	Thu	12:30	17-JUL-10	6.98	1.00	127	133.32	0.0048	0.0058	0.1071	0.1283	0.1177	29-APR-10	Thu	0.0812
23-APR-10 Continue to 352 days	Fri	12:30	17-JUL-10	8.03	0.82	126.5	132.93	0.0048	0.0040	0.1622	0.1200	0.1411	30-APR-10	Fri	0.0652
Panel C: Closing period (15:30-16:00)															
19-APR-10 Continue to 364 days	Mon	15:30	17-JUL-10	7.68	0.82	128	134.70	0.0054	0.0054	0.1280	0.1187	0.1234	26-APR-10	Mon	0.0581
20-APR-10 Continue to 354 days	Tue	15:30	17-JUL-10	7.28	0.84	128	134.44	0.0057	0.0054	0.1187	0.1180	0.1183	27-APR-10	Tue	0.0927
21-APR-10 Continue to 355 days	Wed	15:30	17-JUL-10	7.30	0.79	127.5	133.75	0.0047	0.0054	0.1277	0.1143	0.1210	28-APR-10	Wed	0.1228
22-APR-10 Continue to 356 days	Thu	15:30	17-JUL-10	7.53	0.89	126.5	132.90	0.0055	0.0058	0.1361	0.1233	0.1297	29-APR-10	Thu	0.0812
23-APR-10 Continue to 354 days	Fri	15:30	17-JUL-10	7.65	0.87	127	133.60	0.0052	0.0048	0.1354	0.1244	0.1299	30-APR-10	Fri	0.0652

Notes: EUR, IR_ EUR, IR_ USD, IV_ EURC, IV_ EURP, IV_EUR and RV_EUR represents Euro, interest rate of Euro, interest rate of US dollar, implied volatility of Euro call option price, implied volatility of Euro put option price, implied volatility of Euro options [(IV_EURC + IV_EURP)/2] and realized volatility of Euro, respectively.

Table A4.12a: Details of EUR options data for testing hypothesis 7
(One-month maturity IV_EUR forecast RV_EUR for one-month forecast horizon)

Trade date	Trade day	Trade time	Expiry date	Call price	Put price	Strike price	Spot price	IR_EUR	IR_USD	IV_EURC	IV_EURP	IV_EUR	Forecast date	Forecast day	Forecast RV_EUR
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Panel A: Opening period (9:30-10:00)															
21-JUN-10 Continue to 349 days	Mon	9:30	17-JUL-10	4.76	0.44	119.5	123.95	0.0047	0.0042	0.1291	0.1449	0.1370	19-JUL-10	Mon	0.0510
29-JUN-10 Continue to 354 days	Tue	9:30	17-JUL-10	4.2	0.38	118	122	0.00465	0.0039	0.1301	0.1561	0.1431	27-JUL-10	Tue	0.0797
23-JUN-10 Continue to 365 days	Tue	9:30	17-JUL-10	4.2	0.38	118	122	0.00465	0.0039	0.1301	0.1561	0.1431	27-JUL-10	Tue	0.0797
17-JUN-10 Continue to 369 days	Tue	9:30	17-JUL-10	4.2	0.38	118	122	0.00465	0.0039	0.1301	0.1561	0.1431	27-JUL-10	Tue	0.0797
18-JUN-10 Continue to 357 days	Tue	9:30	17-JUL-10	4.2	0.38	118	122	0.00465	0.0039	0.1301	0.1561	0.1431	27-JUL-10	Tue	0.0797
Panel B: Midday period (12:30-13:00)															
21-JUN-10 Continue to 353 days	Mon	12:30	17-JUL-10	6.39	0.21	117.5	123.63	0.0043	0.0035	0.1558	0.1456	0.1507	19-JUL-10	Mon	0.0510
22-JUN-10 Continue to 356 days	Tue	9:30	17-JUL-10	4.2	0.38	118	122	0.00465	0.0039	0.1301	0.1561	0.1431	27-JUL-10	Tue	0.0797
23-JUN-10 Continue to 365 days	Tue	9:30	17-JUL-10	4.2	0.38	118	122	0.00465	0.0039	0.1301	0.1561	0.1431	27-JUL-10	Tue	0.0797
17-JUN-10 Continue to 373 days	Tue	9:30	17-JUL-10	4.2	0.38	118	122	0.00465	0.0039	0.1301	0.1561	0.1431	27-JUL-10	Tue	0.0797
18-JUN-10 Continue to 358 days	Tue	9:30	17-JUL-10	4.2	0.38	118	122	0.00465	0.0039	0.1301	0.1561	0.1431	27-JUL-10	Tue	0.0797
Panel C: Closing period (15:30-16:00)															
21-JUN-10 Continue to 354 days	Tue	9:30	17-JUL-10	4.2	0.38	118	122	0.00465	0.0039	0.1301	0.1561	0.1431	27-JUL-10	Tue	0.0797
22-JUN-10 Continue to 358 days	Tue	9:30	17-JUL-10	4.2	0.38	118	122	0.00465	0.0039	0.1301	0.1561	0.1431	27-JUL-10	Tue	0.0797
23-JUN-10 Continue to 365 days	Tue	9:30	17-JUL-10	4.2	0.38	118	122	0.00465	0.0039	0.1301	0.1561	0.1431	27-JUL-10	Tue	0.0797
17-JUN-10 Continue to 374 days	Tue	9:30	17-JUL-10	4.2	0.38	118	122	0.00465	0.0039	0.1301	0.1561	0.1431	27-JUL-10	Tue	0.0797
18-JUN-10 Continue to 358 days	Tue	9:30	17-JUL-10	4.2	0.38	118	122	0.00465	0.0039	0.1301	0.1561	0.1431	27-JUL-10	Tue	0.0797

Notes: EUR, IR_ EUR, IR_ USD, IV_ EURC, IV_ EURP, IV_EUR and RV_EUR represents Euro, interest rate of Euro, interest rate of US dollar, implied volatility of Euro call option price, implied volatility of Euro put option price, implied volatility of Euro options [(IV_EURC + IV_EURP)/2] and realized volatility of Euro, respectively.

Table A4.12b: Details of EUR options data for testing hypothesis 8
(Two-month maturity IV_EUR forecast RV_EUR for one-month forecast horizon)

Trade date	Trade day	Trade time	Expiry date	Call price	Put price	Strike price	Spot price	IR_EUR	IR_USD	IV_EURC	IV_EURP	IV_EUR	Forecast date	Forecast day	Forecast RV_EUR
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Panel A: Opening period (9:30-10:00)															
24-MAY-10 Continue to 345days	Mon	9:30	17-JUL-10	5.51	1.59	120	124.17	0.0041	0.0045	0.1582	0.1739	0.1661	21-JUN-10	Mon	0.0610
18-MAY-10 Continue to 364 days	Tue	9:30	17-JUL-10	5.65	1.31	120	123.8	0.00435	0.0049	0.1718	0.1435	0.1576	15-JUN-10	Tue	0.0861
19-MAY-10 Continue to 351 days	Wed	9:30	17-JUL-10	4.93	2.05	120	121.83	0.0047	0.0060	0.2028	0.1488	0.1758	16-JUN-10	Wed	0.0739
20-MAY-10 Continue to 334 days	Thu	9:30	17-JUL-10	5.70	1.99	120	123.88	0.0040	0.0046	0.1759	0.1858	0.1809	17-JUN-10	Thu	0.0706
21-MAY-10 Continue to 334 days	Fri	9:30	17-JUL-10	6.95	1.56	120	125.44	0.0040	0.0033	0.1867	0.1884	0.1876	18-JUN-10	Fri	0.0553
Panel B: Midday period (12:30-13:00)															
24-MAY-10 Continue to 366 days	Mon	12:30	17-JUL-10	7.65	1.00	117.5	123.66	0.0039	0.0050	0.2046	0.1719	0.1883	21-JUN-10	Mon	0.0610
18-MAY-10 Continue to 391 days	Tue	12:30	17-JUL-10	6.73	1.03	118	124.09	0.0047	0.0049	0.1347	0.1632	0.1490	15-JUN-10	Tue	0.0861
19-MAY-10 Continue to 379 days	Wed	12:30	17-JUL-10	7.98	1.15	116.5	122.47	0.0047	0.0070	0.2259	0.1734	0.1997	16-JUN-10	Wed	0.0739
20-MAY-10 Continue to 358 days	Thu	12:30	17-JUL-10	7.53	1.40	117.5	123.20	0.0052	0.0048	0.2126	0.1852	0.1989	17-JUN-10	Thu	0.0706
21-MAY-10 Continue to 358 days	Fri	12:30	17-JUL-10	8.09	1.26	119	125.20	0.0041	0.0037	0.2237	0.1832	0.2034	18-JUN-10	Fri	0.0553
Panel C: Closing period (15:30-16:00)															
24-MAY-10 Continue to 366 days	Mon	15:30	17-JUL-10	7.13	1.08	118	123.90	0.0042	0.0052	0.1820	0.1726	0.1773	21-JUN-10	Mon	0.0610
18-MAY-10 Continue to 391 days	Tue	15:30	17-JUL-10	4.48	1.98	119.5	123.76	0.0045	0.0064	0.0704	0.1904	0.1304	15-JUN-10	Tue	0.0861
19-MAY-10 Continue to 379 days	Wed	15:30	17-JUL-10	7.60	1.24	117.5	123.20	0.0039	0.0076	0.2119	0.1746	0.1933	16-JUN-10	Wed	0.0739
20-MAY-10 Continue to 360 days	Thu	15:30	17-JUL-10	8.73	1.29	118	123.82	0.0042	0.0029	0.2779	0.1789	0.2284	17-JUN-10	Thu	0.0706
21-MAY-10 Continue to 358 days	Fri	15:30	17-JUL-10	7.53	1.28	119.5	125.54	0.0047	0.0037	0.1959	0.1808	0.1883	18-JUN-10	Fri	0.0553

Notes: EUR, IR_ EUR, IR_ USD, IV_ EURC, IV_ EURP, IV_EUR and RV_EUR represents Euro, interest rate of Euro, interest rate of US dollar, implied volatility of Euro call option price, implied volatility of Euro put option price, implied volatility of Euro options [(IV_EURC + IV_EURP)/2] and realized volatility of Euro, respectively.

Table A4.12c: Details of EUR options data for testing hypothesis 9
(Three-month maturity IV_EUR forecast RV_EUR for one-month forecast horizon)

Trade date	Trade day	Trade time	Expiry date	Call price	Put price	Strike price	Spot price	IR_EUR	IR_USD	IV_EURC	IV_EURP	IV_EUR	Forecast date	Forecast day	Forecast RV_EUR
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Panel A: Opening period (9:30-10:00)															
19-APR-10 Continue to 290 days	Mon	9:30	17-JUL-10	7.33	0.92	128	134.40	0.0055	0.0053	0.1224	0.1213	0.1218	17-MAY-10	Mon	0.1141
04-MAY-10 Continue to 279 days	Tue	9:30	17-JUL-10	2.27	3.64	132	131.4	0.00495	0.0040	0.1094	0.1398	0.1246	01-JUN-10	Tue	0.1120
05-MAY-10 Continue to 265 days	Wed	9:30	17-JUL-10	5.15	1.85	125	129.87	0.0062	0.0065	0.0757	0.1674	0.1216	02-JUN-10	Wed	0.0861
06-MAY-10 Continue to 248 days	Thu	9:30	17-JUL-10	6.88	1.60	122	127.67	0.0067	0.0070	0.1490	0.1711	0.1601	03-JUN-10	Thu	0.0633
07-MAY-10 Continue to 251 days	Fri	9:30	17-JUL-10	4.35	2.61	125	127.33	0.0064	0.0085	0.1359	0.1657	0.1508	04-JUN-10	Fri	0.1450
Panel B: Midday period (12:30-13:00)															
19-APR-10 Continue to 367 days	Mon	12:30	17-JUL-10	7.43	0.88	128	134.29	0.0058	0.0054	0.1323	0.1179	0.1251	17-MAY-10	Mon	0.1141
20-APR-10 Continue to 392 days	Tue	12:30	17-JUL-10	6.89	0.94	128.5	134.76	0.0050	0.0054	0.1032	0.1213	0.1122	18-MAY-10	Tue	0.0865
21-APR-10 Continue to 379 days	Wed	12:30	17-JUL-10	7.29	0.80	127.5	133.84	0.0056	0.0054	0.1246	0.1158	0.1202	19-MAY-10	Wed	0.1734
22-APR-10 Continue to 359 days	Thu	12:30	17-JUL-10	6.98	1.00	127	133.32	0.0048	0.0058	0.1071	0.1283	0.1177	20-MAY-10	Thu	0.1272
23-APR-10 Continue to 360 days	Fri	12:30	17-JUL-10	8.03	0.82	126.5	132.93	0.0048	0.0040	0.1622	0.1200	0.1411	21-MAY-10	Fri	0.1250
Panel C: Closing period (15:30-16:00)															
19-APR-10 Continue to 367 days	Mon	15:30	17-JUL-10	7.68	0.82	128	134.70	0.0054	0.0054	0.1280	0.1187	0.1234	17-MAY-10	Mon	0.1141
20-APR-10 Continue to 392 days	Tue	15:30	17-JUL-10	7.28	0.84	128	134.44	0.0057	0.0054	0.1187	0.1180	0.1183	18-MAY-10	Tue	0.0865
21-APR-10 Continue to 380 days	Wed	15:30	17-JUL-10	7.30	0.79	127.5	133.75	0.0047	0.0054	0.1277	0.1143	0.1210	19-MAY-10	Wed	0.1734
22-APR-10 Continue to 360 days	Thu	15:30	17-JUL-10	7.53	0.89	126.5	132.90	0.0055	0.0058	0.1361	0.1233	0.1297	20-MAY-10	Thu	0.1272
23-APR-10 Continue to 360 days	Fri	15:30	17-JUL-10	7.65	0.87	127	133.60	0.0052	0.0048	0.1354	0.1244	0.1299	21-MAY-10	Fri	0.1250

Notes: EUR, IR_ EUR, IR_ USD, IV_ EURC, IV_ EURP, IV_EUR and RV_EUR represents Euro, interest rate of Euro, interest rate of US dollar, implied volatility of Euro call option price, implied volatility of Euro put option price, implied volatility of Euro options [(IV_EURC + IV_EURP)/2] and realized volatility of Euro, respectively.

Table A4.13a: Details of GBP options data for testing hypothesis 1
(One-month maturity IV_GBP forecast RV_GBP for within-week forecast horizon)

Trade date	Trade day	Trade time	Expiry date	Call price	Put price	Strike price	Spot price	IR_GBP	IR_USD	IV_GBPC	IV_GBPP	IV_GBP	Forecast date	Forecast day	Forecast RV_GBP
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Panel A: Opening period (9:30-10:00)															
21-JUN-10 Continue to 293 days	Mon	9:30	17-JUL-10	4.00	0.81	145	148.77	0.0062	0.0042	0.0891	0.1399	0.1145	25-JUN-10	Fri	0.0765
22-JUN-10 Continue to 289 days	Tue	9:30	17-JUL-10	4.00	0.80	145	147.04	0.0062	0.0040	0.1890	0.1058	0.1474	25-JUN-10	Fri	0.0765
23-JUN-10 Continue to 310 days	Wed	9:30	17-JUL-10	4.51	0.61	145	148.98	0.0065	0.0070	0.1255	0.1332	0.1294	25-JUN-10	Fri	0.0765
17-JUN-10 Continue to 310 days	Thu	9:30	17-JUL-10	4.20	0.95	145	147.82	0.0060	0.0072	0.1516	0.1230	0.1373	18-JUN-10	Fri	0.0693
Panel B: Midday period (12:30-13:00)															
21-JUN-10 Continue to 355 days	Mon	12:30	17-JUL-10	7.32	0.28	141	148.26	0.0062	0.0035	0.1136	0.1481	0.1308	25-JUN-10	Fri	0.0765
22-JUN-10 Continue to 360 days	Tue	12:30	17-JUL-10	8.16	0.21	140.5	147.48	0.0062	0.0040	0.2448	0.1359	0.1903	25-JUN-10	Fri	0.0765
23-JUN-10 Continue to 370 days	Wed	12:30	17-JUL-10	7.24	0.24	142	149.10	0.0065	0.0033	0.1331	0.1438	0.1384	25-JUN-10	Fri	0.0765
17-JUN-10 Continue to 372 days	Thu	12:30	17-JUL-10	7.38	0.36	141	148.01	0.0066	0.0072	0.1454	0.1451	0.1452	18-JUN-10	Fri	0.0693
Panel C: Closing period (15:30-16:00)															
21-JUN-10 Continue to 355 days	Mon	15:30	17-JUL-10	3.48	0.95	145	148.26	0.0062	0.0044	0.0791	0.1410	0.1101	25-JUN-10	Fri	0.0765
17-JUN-10 Continue to 360 days	Tue	15:30	17-JUL-10	7.45	0.34	141	148.10	0.0055	0.0040	0.1466	0.1436	0.1451	18-JUN-10	Fri	0.0693
22-JUN-10 Continue to 365 days	Wed	15:30	17-JUL-10	5.70	0.44	143	148.57	0.0062	0.0028	0.1072	0.1423	0.1247	25-JUN-10	Fri	0.0765
23-JUN-10 Continue to 374 days	Thu	15:30	17-JUL-10	7.62	0.19	142	148.96	0.0066	0.0035	0.1982	0.1334	0.1658	25-JUN-10	Fri	0.0765

Notes: GBP, IR_ GBP, IR_ USD, IV_ GBPC, IV_ GBPP, IV_GBP and RV_GBP represents British pound, interest rate of British pound, interest rate of US dollar, implied volatility of British pound call option price, implied volatility of British pound put option price, implied volatility of British pound options [(IV_GBPC + IV_GBPP)/2] and realized volatility of British pound, respectively.

Table A4.13b: Details of GBP options data for testing hypothesis 2 (Two-month maturity IV_GBP forecast RV_GBP for within-week forecast horizon)

Trade date	Trade day	Trade time	Expiry date	Call price	Put price	Strike price	Spot price	IR_GBP	IR_USD	IV_GBPC	IV_GBPP	IV_GBP	Forecast date	Forecast day	Forecast RV_GBP
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Panel A: Opening period (9:30-10:00)															
24-MAY-10 Continue to 270 days	Mon	9:30	17-JUL-10	2.98	4.00	145	144.48	0.0058	0.0045	0.1460	0.1677	0.1569	28-MAY-10	Fri	0.0952
25-MAY-10 Continue to 279 days	Tue	9:30	17-JUL-10	2.69	4.38	145	142.77	0.0063	0.0085	0.1684	0.1449	0.1566	28-MAY-10	Fri	0.0952
26-MAY-10 Continue to 265 days	Wed	9:30	17-JUL-10	2.74	3.90	145	144.09	0.0071	0.0048	0.1467	0.1564	0.1516	28-MAY-10	Fri	0.0952
27-MAY-10 Continue to 248 days	Thu	9:30	17-JUL-10	3.13	3.35	145	145.79	0.0076	0.0054	0.1264	0.1713	0.1488	28-MAY-10	Fri	0.0952
Panel B: Midday period (12:30-13:00)															
24-MAY-10 Continue to 367 days	Mon	12:30	17-JUL-10	8.73	1.42	137	143.88	0.0058	0.0050	0.2084	0.1825	0.1955	28-MAY-10	Fri	0.0952
18-MAY-10 Continue to 392 days	Tue	12:30	17-JUL-10	8.18	1.33	137.5	144.37	0.0065	0.0049	0.1684	0.1670	0.1677	21-MAY-10	Fri	0.1191
19-MAY-10 Continue to 379 days	Wed	12:30	17-JUL-10	9.10	1.33	136	142.99	0.0058	0.0070	0.2150	0.1730	0.1940	21-MAY-10	Fri	0.1191
20-MAY-10 Continue to 359 days	Thu	12:30	17-JUL-10	9.18	1.41	135.5	142.53	0.0061	0.0048	0.2221	0.1795	0.2008	21-MAY-10	Fri	0.1191
Panel C: Closing period (15:30-16:00)															
24-MAY-10 Continue to 368 days	Mon	15:30	17-JUL-10	8.30	1.40	137.5	144.30	0.0071	0.0052	0.1880	0.1795	0.1838	28-MAY-10	Fri	0.0952
18-MAY-10 Continue to 392 days	Tue	15:30	17-JUL-10	7.33	1.67	137.5	144.47	0.0065	0.0064	0.1051	0.1877	0.1464	21-MAY-10	Fri	0.1191
19-MAY-10 Continue to 380 days	Wed	15:30	17-JUL-10	8.93	1.28	136.5	143.50	0.0061	0.0076	0.2042	0.1694	0.1868	21-MAY-10	Fri	0.1191
20-MAY-10 Continue to 360 days	Thu	15:30	17-JUL-10	9.28	1.42	136.5	143.48	0.0068	0.0029	0.2298	0.1774	0.2036	21-MAY-10	Fri	0.1191

Notes: GBP, IR_ GBP, IR_ USD, IV_ GBPC, IV_ GBPP, IV_GBP and RV_GBP represents British pound, interest rate of British pound, interest rate of US dollar, implied volatility of British pound call option price, implied volatility of British pound put option price, implied volatility of British pound options [(IV_GBPC + IV_GBPP)/2] and realized volatility of British pound, respectively.

Table A4.13c: Details of GBP options data for testing hypothesis 3
(Three-month maturity IV_GBP forecast RV_GBP for within-week forecast horizon)

Trade date	Trade day	Trade time	Expiry date	Call price	Put price	Strike price	Spot price	IR_GBP	IR_USD	IV_GBPC	IV_GBPP	IV_GBP	Forecast date	Forecast day	Forecast RV_GBP
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Panel A: Opening period (9:30-10:00)															
19-APR-10 Continue to 244 days	Mon	9:30	17-JUL-10	8.95	1.38	145	152.17	0.0073	0.0053	0.1559	0.1351	0.1455	23-APR-10	Fri	0.0662
11-MAY-10 Continue to 196 days	Tue	9:30	17-JUL-10	1.88	6.60	153	148.18	0.0085	0.0075	0.1485	0.1434	0.1460	14-MAY-10	Fri	0.1132
12-MAY-10 Continue to 191 days	Wed	9:30	17-JUL-10	1.63	6.18	153	149.28	0.0074	0.0048	0.1236	0.1562	0.1399	14-MAY-10	Fri	0.1132
13-MAY-10 Continue to 197 days	Thu	9:30	17-JUL-10	1.22	6.78	152.5	147.51	0.0074	0.0048	0.1233	0.1473	0.1353	14-MAY-10	Fri	0.1132
Panel B: Midday period (12:30-13:00)															
19-APR-10 Continue to 364 days	Mon	12:30	17-JUL-10	9.10	1.34	145	152.39	0.0073	0.0054	0.1552	0.1356	0.1454	23-APR-10	Fri	0.0662
20-APR-10 Continue to 353 days	Tue	12:30	17-JUL-10	8.50	1.38	146.5	153.81	0.0073	0.0054	0.1312	0.1362	0.1337	23-APR-10	Fri	0.0662
21-APR-10 Continue to 354 days	Wed	12:30	17-JUL-10	8.75	1.31	146.5	153.95	0.0073	0.0054	0.1382	0.1352	0.1367	23-APR-10	Fri	0.0662
22-APR-10 Continue to 355 days	Thu	12:30	17-JUL-10	8.40	1.42	146.5	153.87	0.0073	0.0058	0.1253	0.1403	0.1328	23-APR-10	Fri	0.0662
Panel C: Closing period (15:30-16:00)															
19-APR-10 Continue to 364 days	Mon	15:30	17-JUL-10	9.10	1.32	145.5	152.82	0.0073	0.0054	0.1569	0.1337	0.1453	23-APR-10	Fri	0.0662
20-APR-10 Continue to 353 days	Tue	15:30	17-JUL-10	8.90	1.29	146	153.48	0.0073	0.0054	0.1435	0.1341	0.1388	23-APR-10	Fri	0.0662
21-APR-10 Continue to 355 days	Wed	15:30	17-JUL-10	8.80	1.29	146.5	153.91	0.0073	0.0054	0.1418	0.1339	0.1379	23-APR-10	Fri	0.0662
22-APR-10 Continue to 356 days	Thu	15:30	17-JUL-10	8.60	1.38	146.5	153.78	0.0073	0.0058	0.1378	0.1374	0.1376	23-APR-10	Fri	0.0662

Notes: GBP, IR_ GBP, IR_ USD, IV_ GBPC, IV_ GBPP, IV_GBP and RV_GBP represents British pound, interest rate of British pound, interest rate of US dollar, implied volatility of British pound call option price, implied volatility of British pound put option price, implied volatility of British pound options [(IV_GBPC + IV_GBPP)/2] and realized volatility of British pound, respectively.

Table A4.14a: Details of GBP options data for testing hypothesis 4
(One-month maturity IV_GBP forecast RV_GBP for one-week forecast horizon)

Trade date	Trade day	Trade time	Expiry date	Call price	Put price	Strike price	Spot price	IR_GBP	IR_USD	IV_GBPC	IV_GBPP	IV_GBP	Forecast date	Forecast day	Forecast RV_GBP
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Panel A: Opening period (9:30-10:00)															
21-JUN-10 Continue to 293 days	Mon	9:30	17-JUL-10	4.00	0.81	145	148.77	0.0062	0.0042	0.0891	0.1399	0.1145	28-JUN-10	Mon	0.0519
22-JUN-10 Continue to 298 days	Tue	9:30	17-JUL-10	4.00	0.80	145	147.04	0.0062	0.0040	0.1890	0.1058	0.1474	29-JUN-10	Tue	0.0707
23-JUN-10 Continue to 310 days	Wed	9:30	17-JUL-10	4.51	0.61	145	148.98	0.0065	0.0070	0.1255	0.1332	0.1294	30-JUN-10	Wed	0.0676
17-JUN-10 Continue to 310 days	Thu	9:30	17-JUL-10	4.20	0.95	145	147.82	0.0060	0.0072	0.1516	0.1230	0.1373	24-JUN-10	Thu	0.0667
18-JUN-10 Continue to 300 days	Fri	9:30	17-JUL-10	3.96	0.88	145	148.40	0.0062	0.0056	0.1071	0.1314	0.1192	25-JUN-10	Fri	0.0765
Panel B: Midday period (12:30-13:00)															
21-JUN-10 Continue to 355 days	Mon	12:30	17-JUL-10	7.32	0.28	141	148.26	0.0062	0.0035	0.1136	0.1481	0.1308	28-JUN-10	Mon	0.0519
22-JUN-10 Continue to 360 days	Tue	12:30	17-JUL-10	8.16	0.21	140.5	147.48	0.0062	0.0040	0.2448	0.1359	0.1903	29-JUN-10	Tue	0.0707
23-JUN-10 Continue to 370 days	Wed	12:30	17-JUL-10	7.24	0.24	142	149.10	0.0065	0.0033	0.1331	0.1438	0.1384	30-JUN-10	Wed	0.0676
17-JUN-10 Continue to 372 days	Thu	12:30	17-JUL-10	7.38	0.36	141	148.01	0.0066	0.0072	0.1454	0.1451	0.1452	24-JUN-10	Thu	0.0667
18-JUN-10 Continue to 361 days	Fri	12:30	17-JUL-10	7.27	0.30	141	148.02	0.0062	0.0073	0.1314	0.1396	0.1355	25-JUN-10	Fri	0.0765
Panel C: Closing period (15:30-16:00)															
21-JUN-10 Continue to 355 days	Mon	15:30	17-JUL-10	3.48	0.95	145	148.26	0.0062	0.0044	0.0791	0.1410	0.1101	28-JUN-10	Mon	0.0519
22-JUN-10 Continue to 360 days	Tue	15:30	17-JUL-10	5.70	0.44	143	148.57	0.0062	0.0028	0.1072	0.1423	0.1247	29-JUN-10	Tue	0.0707
23-JUN-10 Continue to 365 days	Wed	15:30	17-JUL-10	7.62	0.19	142	148.96	0.0066	0.0035	0.1982	0.1334	0.1658	30-JUN-10	Wed	0.0676
17-JUN-10 Continue to 374 days	Thu	15:30	17-JUL-10	7.45	0.34	141	148.10	0.0055	0.0040	0.1466	0.1436	0.1451	24-JUN-10	Thu	0.0667
18-JUN-10 Continue to 361 days	Fri	15:30	17-JUL-10	7.35	0.28	141	147.96	0.0062	0.0073	0.1489	0.1361	0.1425	25-JUN-10	Fri	0.0765

Notes: GBP, IR_ GBP, IR_ USD, IV_ GBPC, IV_ GBPP, IV_GBP and RV_GBP represents British pound, interest rate of British pound, interest rate of US dollar, implied volatility of British pound call option price, implied volatility of British pound put option price, implied volatility of British pound options [(IV_GBPC + IV_GBPP)/2] and realized volatility of British pound, respectively.

Table A4.14b: Details of GBP options data for testing hypothesis 5
(Two-month maturity IV_GBP forecast RV_GBP for one-week forecast horizon)

Trade date	Trade day	Trade time	Expiry date	Call price	Put price	Strike price	Spot price	IR_GBP	IR_USD	IV_GBPC	IV_GBPP	IV_GBP	Forecast date	Forecast day	Forecast RV_GBP
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Panel A: Opening period (9:30-10:00)															
24-MAY-10 Continue to 270 days	Mon	9:30	17-JUL-10	2.98	4.00	145	144.48	0.0058	0.0045	0.1460	0.1677	0.1569	31-MAY-10	Mon	0.0498
25-MAY-10 Continue to 279 days	Tue	9:30	17-JUL-10	2.69	4.38	145	142.77	0.0063	0.0085	0.1684	0.1449	0.1566	01-JUN-10	Tue	0.1076
26-MAY-10 Continue to 265 days	Wed	9:30	17-JUL-10	2.74	3.90	145	144.09	0.0071	0.0048	0.1467	0.1564	0.1516	02-JUN-10	Wed	0.1015
27-MAY-10 Continue to 240 days	Thu	9:30	17-JUL-10	3.13	3.35	145	145.79	0.0076	0.0054	0.1264	0.1713	0.1488	03-JUN-10	Thu	0.0762
21-MAY-10 Continue to 251 days	Fri	9:30	17-JUL-10	3.10	4.55	145	144.05	0.0070	0.0033	0.1579	0.1763	0.1671	28-MAY-10	Fri	0.0952
Panel B: Midday period (12:30-13:00)															
24-MAY-10 Continue to 367 days	Mon	12:30	17-JUL-10	8.725	1.415	137	143.88	0.00575	0.005	0.2084	0.1825	0.1955	31-MAY-10	Mon	0.0498
18-MAY-10 Continue to 392 days	Tue	12:30	17-JUL-10	8.18	1.33	137.5	144.37	0.0065	0.0049	0.1684	0.1670	0.1677	25-MAY-10	Tue	0.0846
19-MAY-10 Continue to 379 days	Wed	12:30	17-JUL-10	9.10	1.33	136	142.99	0.0058	0.0070	0.2150	0.1730	0.1940	26-MAY-10	Wed	0.0763
20-MAY-10 Continue to 359 days	Thu	12:30	17-JUL-10	9.18	1.41	135.5	142.53	0.0061	0.0048	0.2221	0.1795	0.2008	27-MAY-10	Thu	0.1223
21-MAY-10 Continue to 360 days	Fri	12:30	17-JUL-10	9.52	1.43	136.5	143.33	0.0078	0.0037	0.2502	0.1771	0.2137	28-MAY-10	Fri	0.0952
Panel C: Closing period (15:30-16:00)															
24-MAY-10 Continue to 367 days	Mon	15:30	17-JUL-10	8.30	1.40	137.5	144.30	0.0071	0.0052	0.1880	0.1795	0.1838	31-MAY-10	Mon	0.0498
18-MAY-10 Continue to 392 days	Tue	15:30	17-JUL-10	7.33	1.67	137.5	144.47	0.0065	0.0064	0.1051	0.1877	0.1464	25-MAY-10	Tue	0.0846
19-MAY-10 Continue to 380 days	Wed	15:30	17-JUL-10	8.93	1.28	136.5	143.50	0.0061	0.0076	0.2042	0.1694	0.1868	26-MAY-10	Wed	0.0763
20-MAY-10 Continue to 360 days	Thu	15:30	17-JUL-10	9.28	1.42	136.5	143.48	0.0068	0.0029	0.2298	0.1774	0.2036	27-MAY-10	Thu	0.1223
21-MAY-10 Continue to 360 days	Fri	15:30	17-JUL-10	8.60	1.63	137.5	144.52	0.0054	0.0037	0.1903	0.1905	0.1904	28-MAY-10	Fri	0.0952

Notes: GBP, IR_ GBP, IR_ USD, IV_ GBPC, IV_ GBPP, IV_GBP and RV_GBP represents British pound, interest rate of British pound, interest rate of US dollar, implied volatility of British pound call option price, implied volatility of British pound put option price, implied volatility of British pound options [(IV_GBPC + IV_GBPP)/2] and realized volatility of British pound, respectively.

Table A4.14c: Details of GBP options data for testing hypothesis 6
(Three-month maturity IV_GBP forecast RV_GBP for one-week forecast horizon)

Trade date	Trade day	Trade time	Expiry date	Call price	Put price	Strike price	Spot price	IR_GBP	IR_USD	IV_GBPC	IV_GBPP	IV_GBP	Forecast date	Forecast day	Forecast RV_GBP
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Panel A: Opening period (9:30-10:00)															
19-APR-10 Continue to 243 days	Mon	9:30	17-JUL-10	8.95	1.38	145	152.17	0.0073	0.0053	0.1559	0.1351	0.1455	26-APR-10	Mon	0.0507
11-MAY-10 Continue to 195 days	Tue	9:30	17-JUL-10	1.88	6.60	153	148.18	0.0085	0.0075	0.1485	0.1434	0.1460	18-MAY-10	Tue	0.0906
12-MAY-10 Continue to 191 days	Wed	9:30	17-JUL-10	1.63	6.18	153	149.28	0.0074	0.0048	0.1236	0.1562	0.1399	19-MAY-10	Wed	0.1388
13-MAY-10 Continue to 197 days	Thu	9:30	17-JUL-10	1.22	6.78	152.5	147.51	0.0074	0.0048	0.1233	0.1473	0.1353	20-MAY-10	Thu	0.1234
07-MAY-10 Continue to 196 days	Fri	9:40	17-JUL-10	1.91	7.50	153	145.99	0.0089	0.0085	0.1746	0.1005	0.1375	14-MAY-10	Fri	0.1132
Panel B: Midday period (12:30-13:00)															
19-APR-10 Continue to 363 days	Mon	12:30	17-JUL-10	9.1	1.335	145	152.39	0.00725	0.0054	0.1552	0.1356	0.1454	26-APR-10	Mon	0.0507
20-APR-10 Continue to 352 days	Tue	12:30	17-JUL-10	8.50	1.38	146.5	153.81	0.0073	0.0054	0.1312	0.1362	0.1337	27-APR-10	Tue	0.0611
21-APR-10 Continue to 353 days	Wed	12:30	17-JUL-10	8.75	1.31	146.5	153.95	0.0073	0.0054	0.1382	0.1352	0.1367	28-APR-10	Wed	0.0792
22-APR-10 Continue to 354 days	Thu	12:30	17-JUL-10	8.40	1.42	146.5	153.87	0.0073	0.0058	0.1253	0.1403	0.1328	29-APR-10	Thu	0.0795
23-APR-10 Continue to 355 days	Fri	12:30	17-JUL-10	8.85	1.30	146	153.39	0.0074	0.0040	0.1485	0.1354	0.1419	30-APR-10	Fri	0.0795
Panel C: Closing period (15:30-16:00)															
19-APR-10 Continue to 363 days	Mon	15:30	17-JUL-10	9.10	1.32	145.5	152.82	0.0073	0.0054	0.1569	0.1337	0.1453	26-APR-10	Mon	0.0507
20-APR-10 Continue to 352 days	Tue	15:30	17-JUL-10	8.90	1.29	146	153.48	0.0073	0.0054	0.1435	0.1341	0.1388	27-APR-10	Tue	0.0611
21-APR-10 Continue to 354 days	Wed	15:30	17-JUL-10	8.80	1.29	146.5	153.91	0.0073	0.0054	0.1418	0.1339	0.1379	28-APR-10	Wed	0.0792
22-APR-10 Continue to 355 days	Thu	15:30	17-JUL-10	8.60	1.38	146.5	153.78	0.0073	0.0058	0.1378	0.1374	0.1376	29-APR-10	Thu	0.0795
23-APR-10 Continue to 355 days	Fri	15:30	17-JUL-10	8.90	1.28	146	153.49	0.0074	0.0048	0.1464	0.1358	0.1411	30-APR-10	Fri	0.0795

Notes: GBP, IR_ GBP, IR_ USD, IV_ GBPC, IV_ GBPP, IV_GBP and RV_GBP represents British pound, interest rate of British pound, interest rate of US dollar, implied volatility of British pound call option price, implied volatility of British pound put option price, implied volatility of British pound options [(IV_GBPC + IV_GBPP)/2] and realized volatility of British pound, respectively.

Table A4.15a: Details of GBP options data for testing hypothesis 7
(One-month maturity IV_GBP forecast RV_GBP for one-month forecast horizon)

Trade date	Trade day	Trade time	Expiry date	Call price	Put price	Strike price	Spot price	IR_GBP	IR_USD	IV_GBPC	IV_GBPP	IV_GBP	Forecast date	Forecast day	Forecast RV_GBP
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Panel A: Opening period (9:30-10:00)															
21-JUN-10 Continue to 393 days	Mon	9:30	17-JUL-10	4.00	0.81	145	148.77	0.0062	0.0042	0.0891	0.1399	0.1145	19-JUL-10	Mon	0.0569
22-JUN-10 Continue to 289 days	Tue	9:30	17-JUL-10	145	4.00	0.8	147	0.0062	0.0040	0.1890	0.1058	0.1474	20-JUL-10	Tue	0.0651
23-JUN-10 Continue to 310 days	Wed	9:30	17-JUL-10	4.51	0.61	145	148.98	0.0065	0.0070	0.1255	0.1332	0.1294	21-JUL-10	Wed	0.0683
17-JUN-10 Continue to 310 days	Thu	9:30	17-JUL-10	4.20	0.95	145	147.82	0.0060	0.0072	0.1516	0.1230	0.1373	15-JUL-10	Thu	0.0592
18-JUN-10 Continue to 300 days	Fri	9:30	17-JUL-10	3.96	0.88	145	148.40	0.0062	0.0056	0.1071	0.1314	0.1192	16-JUL-10	Fri	0.0668
Panel B: Midday period (12:30-13:00)															
21-JUN-10 Continue to 354 days	Mon	12:30	17-JUL-10	7.32	0.28	141	148.26	0.0062	0.0035	0.1136	0.1481	0.1308	19-JUL-10	Mon	0.0569
22-JUN-10 Continue to 358 days	Tue	12:30	17-JUL-10	8.16	0.21	140.5	147.48	0.0062	0.0040	0.2448	0.1359	0.1903	20-JUL-10	Tue	0.0651
23-JUN-10 Continue to 368 days	Wed	12:30	17-JUL-10	7.24	0.24	142	149.10	0.0065	0.0033	0.1331	0.1438	0.1384	21-JUL-10	Wed	0.0683
17-JUN-10 Continue to 371 days	Thu	12:30	17-JUL-10	7.38	0.36	141	148.01	0.0066	0.0072	0.1454	0.1451	0.1452	15-JUL-10	Thu	0.0592
18-JUN-10 Continue to 360 days	Fri	12:30	17-JUL-10	7.27	0.30	141	148.02	0.0062	0.0073	0.1314	0.1396	0.1355	16-JUL-10	Fri	0.0668
Panel C: Closing period (15:30-16:00)															
21-JUN-10 Continue to 354 days	Mon	15:30	17-JUL-10	3.48	0.95	145	148.26	0.0062	0.0044	0.0791	0.1410	0.1101	19-JUL-10	Mon	0.0569
22-JUN-10 Continue to 358 days	Tue	15:30	17-JUL-10	5.70	0.44	143	148.57	0.0062	0.0028	0.1072	0.1423	0.1247	20-JUL-10	Tue	0.0651
23-JUN-10 Continue to 363 days	Wed	15:30	17-JUL-10	7.62	0.19	142	148.96	0.0066	0.0035	0.1982	0.1334	0.1658	21-JUL-10	Wed	0.0683
17-JUN-10 Continue to 373 days	Thu	15:30	17-JUL-10	7.45	0.34	141	148.10	0.0055	0.0040	0.1466	0.1436	0.1451	15-JUL-10	Thu	0.0592
18-JUN-10 Continue to 360 days	Fri	15:30	17-JUL-10	7.35	0.28	141	147.96	0.0062	0.0073	0.1489	0.1361	0.1425	16-JUL-10	Fri	0.0668

Notes: GBP, IR_ GBP, IR_ USD, IV_ GBPC, IV_ GBPP, IV_GBP and RV_GBP represents British pound, interest rate of British pound, interest rate of US dollar, implied volatility of British pound call option price, implied volatility of British pound put option price, implied volatility of British pound options [(IV_GBPC + IV_GBPP)/2] and realized volatility of British pound, respectively.

Table A4.15b: Details of GBP options data for testing hypothesis 8
(Two-month maturity IV_GBP forecast RV_GBP for one-month forecast horizon)

Trade date	Trade day	Trade time	Expiry date	Call price	Put price	Strike price	Spot price	IR_GBP	IR_USD	IV_GBPC	IV_GBPP	IV_GBP	Forecast date	Forecast day	Forecast RV_GBP
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Panel A: Opening period (9:30-10:00)															
24-MAY-10 Continue to 270 days	Mon	9:30	17-JUL-10	2.98	4.00	145	144.48	0.0058	0.0045	0.1460	0.1677	0.1569	21-JUN-10	Mon	0.0635
25-MAY-10 Continue to 279 days	Tue	9:30	17-JUL-10	2.69	4.38	145	142.8	0.0063	0.0085	0.1684	0.1449	0.1566	22-JUN-10	Tue	0.0871
26-MAY-10 Continue to 265 days	Wed	9:30	17-JUL-10	2.74	3.90	145	144.09	0.0071	0.0048	0.1467	0.1564	0.1516	23-JUN-10	Wed	0.0838
27-MAY-10 Continue to 248 days	Thu	9:30	17-JUL-10	3.13	3.35	145	145.79	0.0076	0.0054	0.1264	0.1713	0.1488	24-JUN-10	Thu	0.0667
21-MAY-10 Continue to 251 days	Fri	9:30	17-JUL-10	3.10	4.55	145	144.05	0.0070	0.0033	0.1579	0.1763	0.1671	18-JUN-10	Fri	0.0693
Panel B: Midday period (12:30-13:00)															
24-MAY-10 Continue to 367 days	Mon	12:30	17-JUL-10	8.73	1.42	137	143.88	0.0058	0.0050	0.2084	0.1825	0.1955	21-JUN-10	Mon	0.0635
18-MAY-10 Continue to 392 days	Tue	12:30	17-JUL-10	8.18	1.33	137.5	144.37	0.0065	0.0049	0.1684	0.1670	0.1677	15-JUN-10	Tue	0.0816
19-MAY-10 Continue to 379 days	Wed	12:30	17-JUL-10	9.10	1.33	136	142.99	0.0058	0.0070	0.2150	0.1730	0.1940	16-JUN-10	Wed	0.0805
20-MAY-10 Continue to 359 days	Thu	12:30	17-JUL-10	9.18	1.41	135.5	142.53	0.0061	0.0048	0.2221	0.1795	0.2008	17-JUN-10	Thu	0.0647
21-MAY-10 Continue to 360 days	Fri	12:30	17-JUL-10	9.52	1.43	136.5	143.33	0.0078	0.0037	0.2502	0.1771	0.2137	18-JUN-10	Fri	0.0693
Panel C: Closing period (15:30-16:00)															
24-MAY-10 Continue to 367 days	Mon	15:30	17-JUL-10	8.30	1.40	137.5	144.30	0.0071	0.0052	0.1880	0.1795	0.1838	21-JUN-10	Mon	0.0635
18-MAY-10 Continue to 392 days	Tue	15:30	17-JUL-10	7.33	1.67	137.5	144.47	0.0065	0.0064	0.1051	0.1877	0.1464	15-JUN-10	Tue	0.0816
19-MAY-10 Continue to 380 days	Wed	15:30	17-JUL-10	8.93	1.28	136.5	143.50	0.0061	0.0076	0.2042	0.1694	0.1868	16-JUN-10	Wed	0.0805
20-MAY-10 Continue to 360 days	Thu	15:30	17-JUL-10	9.28	1.42	136.5	143.48	0.0068	0.0029	0.2298	0.1774	0.2036	17-JUN-10	Thu	0.0647
21-MAY-10 Continue to 360 days	Fri	15:30	17-JUL-10	8.60	1.63	137.5	144.52	0.0054	0.0037	0.1903	0.1905	0.1904	18-JUN-10	Fri	0.0693

Notes: GBP, IR_ GBP, IR_ USD, IV_ GBPC, IV_ GBPP, IV_GBP and RV_GBP represents British pound, interest rate of British pound, interest rate of US dollar, implied volatility of British pound call option price, implied volatility of British pound put option price, implied volatility of British pound options [(IV_GBPC + IV_GBPP)/2] and realized volatility of British pound, respectively.

Table A4.15c: Details of GBP options data for testing hypothesis 9
(Three-month maturity IV_GBP forecast RV_GBP for one-month forecast horizon)

Trade date	Trade day	Trade time	Expiry date	Call price	Put price	Strike price	Spot price	IR_GBP	IR_USD	IV_GBPC	IV_GBPP	IV_GBP	Forecast date	Forecast day	Forecast RV_GBP
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Panel A: Opening period (9:30-10:00)															
19-APR-10 Continue to 247 days	Mon	9:30	17-JUL-10	8.95	1.38	145	152.17	0.0073	0.0053	0.1559	0.1351	0.1455	17-MAY-10	Mon	0.1336
11-MAY-10 Continue to 195 days	Tue	9:30	17-JUL-10	1.875	6.60	153	148.2	0.0085	0.0075	0.1485	0.1434	0.1460	08-JUN-10	Tue	0.0810
12-MAY-10 Continue to 191 days	Wed	9:30	17-JUL-10	1.63	6.18	153	149.28	0.0074	0.0048	0.1236	0.1562	0.1399	09-JUN-10	Wed	0.0677
13-MAY-10 Continue to 197 days	Thu	9:30	17-JUL-10	1.22	6.78	152.5	147.51	0.0074	0.0048	0.1233	0.1473	0.1353	10-JUN-10	Thu	0.0795
07-MAY-10 Continue to 196 days	Fri	9:40	17-JUL-10	1.91	7.50	153	145.99	0.0089	0.0085	0.1746	0.1005	0.1375	04-JUN-10	Fri	0.0940
Panel B: Midday period (12:30-13:00)															
19-APR-10 Continue to 362 days	Mon	12:30	17-JUL-10	9.10	1.34	145	152.39	0.0073	0.0054	0.1552	0.1356	0.1454	17-MAY-10	Mon	0.1336
20-APR-10 Continue to 351 days	Tue	12:30	17-JUL-10	8.50	1.38	146.5	153.81	0.0073	0.0054	0.1312	0.1362	0.1337	18-MAY-10	Tue	0.0906
21-APR-10 Continue to 352 days	Wed	12:30	17-JUL-10	8.75	1.31	146.5	153.95	0.0073	0.0054	0.1382	0.1352	0.1367	19-MAY-10	Wed	0.1388
22-APR-10 Continue to 353 days	Thu	12:30	17-JUL-10	8.40	1.42	146.5	153.87	0.0073	0.0058	0.1253	0.1403	0.1328	20-MAY-10	Thu	0.1234
23-APR-10 Continue to 354 days	Fri	12:30	17-JUL-10	8.85	1.30	146	153.39	0.0074	0.0040	0.1485	0.1354	0.1419	21-MAY-10	Fri	0.1191
Panel C: Closing period (15:30-16:00)															
19-APR-10 Continue to 362 days	Mon	15:30	17-JUL-10	9.10	1.32	145.5	152.82	0.0073	0.0054	0.1569	0.1337	0.1453	17-MAY-10	Mon	0.1336
20-APR-10 Continue to 351 days	Tue	15:30	17-JUL-10	8.90	1.29	146	153.48	0.0073	0.0054	0.1435	0.1341	0.1388	18-MAY-10	Tue	0.0906
21-APR-10 Continue to 353 days	Wed	15:30	17-JUL-10	8.80	1.29	146.5	153.91	0.0073	0.0054	0.1418	0.1339	0.1379	19-MAY-10	Wed	0.1388
22-APR-10 Continue to 354 days	Thu	15:30	17-JUL-10	8.60	1.38	146.5	153.78	0.0073	0.0058	0.1378	0.1374	0.1376	20-MAY-10	Thu	0.1234
23-APR-10 Continue to 354 days	Fri	15:30	17-JUL-10	8.90	1.28	146	153.49	0.0074	0.0048	0.1464	0.1358	0.1411	21-MAY-10	Fri	0.1191

Notes: GBP, IR_ GBP, IR_ USD, IV_ GBPC, IV_ GBPP, IV_GBP and RV_GBP represents British pound, interest rate of British pound, interest rate of US dollar, implied volatility of British pound call option price, implied volatility of British pound put option price, implied volatility of British pound options [(IV_GBPC + IV_GBPP)/2] and realized volatility of British pound, respectively.

Table A5.1a: Details of AUD options data for testing hypothesis 10
(One-month maturity IV_AUD estimate AUD options price for within-week estimate horizon)

Trade date	Trade day	Trade Time	Expiry date	Call price	Put price	Strike price	Spot price	IR_AUD	IR_USD	IV_AUDC	IV_AUDP	IV_AUD	Estimate date	Estimate day	Estimate time	AUDC_MOD	AUDP_MOD	AUDC_MKT	AUDP_MKT
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)_	(14)	(15)	(16)	(17)	(18)	(19)	(20)
Panel A: Opening period (9:30-10:00)																			
21-JUN-10 Continue to 224 days	Mon	9:30	17-JUL-10	3.54	0.50	85	88.37	0.0486	0.0042	0.1652	0.1726	0.1689	25-JUN-10	Fri	9:30	1.92	1.00	2.33	0.89
22-JUN-10 Continue to 263 days	Tue	9:30	17-JUL-10	3.18	0.55	85	87.68	0.0486	0.0040	0.1895	0.1609	0.1752	25-JUN-10	Fri	9:30	1.97	1.05	2.33	0.89
23-JUN-10 Continue to 277 days	Wed	9:30	17-JUL-10	4.21	0.39	83	87.10	0.0468	0.0070	0.1801	0.1894	0.1847	25-JUN-10	Fri	9:30	3.41	0.49	3.93	0.49
17-JUN-10 Continue to 332 days	Thu	9:30	17-JUL-10	4.01	0.58	83	86.55	0.0496	0.0072	0.2044	0.1796	0.1920	18-JUN-10	Fri	9:30	4.15	0.57	4.13	0.49
Panel B: Midday period (12:30-13:00)																			
21-JUN-10 Continue to 206 days	Mon	12:30	17-JUL-10	4.42	0.385	83.5	87.7	0.0486	0.0040	0.2037	0.1862	0.1949	25-JUN-10	Fri	12:30	3.35	0.60	3.82	0.49
22-JUN-10 Continue to 221 days	Tue	12:30	17-JUL-10	4.41	0.34	83.5	87.70	0.0486	0.0040	0.2020	0.1772	0.1896	25-JUN-10	Fri	12:30	3.31	0.57	3.83	0.50
23-JUN-10 Continue to 240 days	Wed	12:30	17-JUL-10	4.23	0.61	82.5	86.50	0.0496	0.0073	0.1892	0.1986	0.1939	25-JUN-10	Fri	12:30	4.49	0.49	4.64	0.46
17-JUN-10 Continue to 299 days	Thu	12:30	17-JUL-10	4.13	0.56	82.5	86.49	0.0496	0.0072	0.1745	0.1916	0.1830	18-JUN-10	Fri	12:30	4.42	0.42	4.54	0.41
Panel C: Closing period (15:30-16:00)																			
21-JUN-10 Continue to 200 days	Mon	15:35	17-JUL-10	2.29	0.85	86	88.22	0.0486	0.0044	0.1121	0.1767	0.1444	25-JUN-10	Fri	15:35	1.45	1.02	2.21	0.93
22-JUN-10 Continue to 312 days	Tue	15:30	17-JUL-10	1.60	1.09	86.5	88.00	0.0484	0.0028	0.0935	0.1793	0.1364	25-JUN-10	Fri	15:30	1.15	1.16	1.84	1.09
23-JUN-10 Continue to 234 days	Wed	15:50	17-JUL-10	4.95	0.30	82.5	86.82	0.0486	0.0035	0.2758	0.1790	0.2274	25-JUN-10	Fri	15:50	4.60	0.50	4.99	0.32
17-JUN-10 Continue to 303 days	Thu	15:30	17-JUL-10	4.33	0.54	82.5	86.42	0.0496	0.0040	0.2121	0.1853	0.1987	18-JUN-10	Fri	15:30	4.66	0.49	4.56	0.39

Notes: AUD, IR_AUD, IR_USD, IV_AUDC, IV_AUDP, IV_AUD, AUDC_MOD, AUDP_MOD, AUDC_MKT, and AUDP_MKT represents Australian dollar, interest rate of AUD, interest rate of US dollar, implied volatility of AUD call options price, implied volatility of AUD put options price, implied volatility of AUD options [(IV_AUDC + IV_AUDP)/2], AUD call options model price, AUD put options model price, AUD call options market price, and AUD put options market price, respectively. The within-week estimate horizon indicates that the IV_AUD is calculated one day to four days before the date of estimating AUDC_MOD and AUDP_MOD.

Table A5.1b: Details of AUD options data for testing hypothesis 11
(Two-month maturity IV_AUD estimate AUD options price for within-week estimate horizon)

Trade date	Trade day	Trade Time	Expiry date	Call price	Put price	Strike price	Spot price	IR_AUD	IR_USD	IV_AUDC	IV_AUDP	IV_AUD	Estimate date	Estimate day	Estimate time	AUDC_MOD	AUDP_MOD	AUDC_MKT	AUDP_MKT
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
Panel A: Opening period (9:30-10:00)																			
07-JUN-10 Continue to 234 days	Mon	9:30	17-JUL-10	1.45	3.02	83	81.58	0.0470	0.0064	0.2057	0.1846	0.1951	11-JUN-10	Fri	9:30	2.81	1.43	2.48	1.42
01-JUN-10 Continue to 268 days	Tue	9:30	17-JUL-10	2.18	2.10	83	83.02	0.0501	0.0061	0.2039	0.1599	0.1819	04-JUN-10	Fri	9:30	2.74	1.53	1.97	2.09
02-JUN-10 Continue to 261 days	Wed	9:30	17-JUL-10	2.02	2.21	83	83.27	0.0497	0.0041	0.1824	0.1814	0.1819	04-JUN-10	Fri	9:30	2.74	1.53	1.97	2.09
27-MAY-10 Continue to 238 days	Thu	9:30	17-JUL-10	1.41	3.06	85	83.77	0.0499	0.0054	0.1730	0.1647	0.1688	28-MAY-10	Fri	9:30	2.03	2.20	1.68	2.58
Panel B: Midday period (12:30-13:00																			
24-MAY-10 Continue to 359 days	Mon	12:30	17-JUL-10	4.99	1.24	79	82.80	0.0500	0.0050	0.2508	0.2056	0.2282	28-MAY-10	Fri	12:30	6.28	0.84	6.11	0.76
18-MAY-10 Continue to 389 days	Tue	12:30	17-JUL-10	4.25	1.10	83.5	87.51	0.0482	0.0049	0.1554	0.1759	0.1656	21-MAY-10	Fri	12:30	1.36	3.20	2.20	3.30
19-MAY-10 Continue to 381 days	Wed	12:30	17-JUL-10	4.35	1.15	83.5	87.51	0.0482	0.0048	0.1642	0.1801	0.1721	21-MAY-10	Fri	12:30	1.44	3.28	2.29	3..35
27-MAY-10 Continue to 359 days	Thu	12:30	17-JUL-10	5.09	1.29	79.0	82.80	0.0499	0.0050	0.2596	0.2102	0.2349	28-MAY-10	Fri	12:30	6.34	0.90	6.21	0.81
Panel C: Closing period (15:30-16:00)																			
24-MAY-10 Continue to 364 days	Mon	15:30	17-JUL-10	4.85	1.27	79	83.09	0.0500	0.0052	0.2199	0.2161	0.2180	28-MAY-10	Fri	15:30	5.98	0.81	6.03	0.78
18-MAY-10 Continue to 387 days	Tue	16:0	17-JUL-10	3.75	1.29	83.5	87.09	0.0468	0.0065	0.1358	0.1831	0.1595	21-MAY-10	Fri	16:00	1.58	2.68	2.20	3.14
19-MAY-10 Continue to 376 days	Wed	15:45	17-JUL-10	5.63	1.12	79.5	83.64	0.0488	0.0076	0.2729	0.1932	0.2330	21-MAY-10	Fri	15:45	4.74	1.70	4.54	1.77
20-MAY-10 Continue to 360 days	Thu	15:30	17-JUL-10	5.43	1.60	78.5	82.40	0.0493	0.0029	0.2778	0.2320	0.2549	21-MAY-10	Fri	15:30	5.53	1.65	5.19	1.50

Notes: AUD, IR_AUD, IR_USD, IV_AUDC, IV_AUDP, IV_AUD, AUDC_MOD, AUDP_MOD, AUDC_MKT, and AUDP_MKT represents Australian dollar, interest rate of AUD, interest rate of US dollar, implied volatility of AUD call options price, implied volatility of AUD put options price, implied volatility of AUD options [(IV_AUDC + IV_AUDP)/2], AUD call options model price, AUD put options model price, AUD call options market price, and AUD put options market price, respectively. The within-week estimate horizon indicates that the IV_AUD is calculated one day to four days before the date of estimating AUDC_MOD and AUDP_MOD.

Table A5.1c: Details of AUD options data for testing hypothesis 12
(Three-month maturity IV_AUD estimate AUD options price for within-week estimate horizon)

Trade date	Trade day	Trade Time	Expiry date	Call price	Put price	Strike price	Spot price	IR_AUD	IR_USD	IV_AUDC	IV_AUDP	IV_AUD	Estimate date	Estimate day	Estimate time	AUDC_MOD	AUDP_MOD	AUDC_MKT	AUDP_MKT
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
Panel A: Opening period (9:30-10:00)																			
03-MAY-10 Continue to 186 days	Mon	9:45	17-JUL-10	1.33	2.46	93	92.62	0.0448	0.0040	0.1107	0.1091	0.1099	07-MAY-10	Fri	9:45	0.31	5.08	0.53	5.43
04-MAY-10 Continue to 178 days	Tue	9:45	17-JUL-10	0.84	3.42	93	91.89	0.0489	0.0060	0.0979	0.1418	0.1198	07-MAY-10	Fri	9:45	0.40	5.17	0.53	5.43
28-APR-10 Continue to 184 days	Wed	9:30	17-JUL-10	1.29	2.79	93	91.63	0.0474	0.0040	0.1299	0.0815	0.1057	30-APR-10	Fri	9:30	1.46	2.19	1.57	2.18
29-APR-10 Continue to 185 days	Thu	9:30	17-JUL-10	1.41	2.46	93	92.65	0.0480	0.0023	0.1154	0.1023	0.1088	30-APR-10	Fri	9:30	1.51	2.25	1.57	2.18
Panel B: Midday period (12:30-13:00)																			
03-MAY-10 Continue to 367 days	Mon	12:45	17-JUL-10	2.23	2.36	93.5	93.62	0.0448	0.0040	0.1513	0.1195	0.1354	07-MAY-10	Fri	12:45	1.52	2.82	1.53	3.43
20-APR-10 Continue to 357 days	Tue	12:30	17-JUL-10	4.16	1.00	89	93.08	0.0473	0.0054	0.1267	0.1254	0.1260	23-APR-10	Fri	12:30	3.36	1.31	3.63	1.17
21-APR-10 Continue to 357 days	Wed	12:30	17-JUL-10	3.56	1.17	89.5	92.99	0.0477	0.0054	0.1148	0.1253	0.1200	23-APR-10	Fri	12:30	2.95	1.40	3.26	1.31
22-APR-10 Continue to 357 days	Thu	12:30	17-JUL-10	3.75	1.12	89	92.63	0.0477	0.0058	0.1214	0.1267	0.1240	23-APR-10	Fri	12:30	3.33	1.28	3.63	1.17
Panel C: Closing period (15:30-16:00)																			
19-APR-10 Continue to 372 days	Mon	15:30	17-JUL-10	4.71	0.95	87.5	91.96	0.0473	0.0054	0.1467	0.1303	0.1385	23-APR-10	Fri	15:30	4.77	0.94	5.00	0.80
20-APR-10 Continue to 361 days	Tue	15:30	17-JUL-10	4.15	1.00	89	93.08	0.0474	0.0054	0.1264	0.1253	0.1259	23-APR-10	Fri	15:30	3.54	1.21	3.80	1.07
21-APR-10 Continue to 362 days	Wed	15:30	17-JUL-10	4.21	0.92	88.5	92.65	0.0476	0.0054	0.1277	0.1228	0.1252	23-APR-10	Fri	15:30	3.87	1.04	4.18	0.96
22-APR-10 Continue to 362 days	Thu	15:30	17-JUL-10	4.75	0.85	88	92.49	0.0477	0.0058	0.1484	0.1261	0.1373	23-APR-10	Fri	15:30	4.39	1.07	4.58	0.91

Notes: AUD, IR_AUD, IR_USD, IV_AUDC, IV_AUDP, IV_AUD, AUDC_MOD, AUDP_MOD, AUDC_MKT, and AUDP_MKT represents Australian dollar, interest rate of AUD, interest rate of US dollar, implied volatility of AUD call options price, implied volatility of AUD put options price, implied volatility of AUD options [(IV_AUDC + IV_AUDP)/2], AUD call options model price, AUD put options model price, AUD call options market price, and AUD put options market price, respectively. The within-week estimate horizon indicates that the IV_AUD is calculated one day to four days before the date of estimating AUDC_MOD and AUDP_MOD.

Table A5.2a: Details of AUD options data for testing hypothesis 13
(One-month maturity IV_AUD estimate AUD options price for one-week estimate horizon)

Trade date	Trade day	Trade Time	Expiry date	Call price	Put price	Strike price	Spot price	IR_AUD	IR_USD	IV_AUDC	IV_AUDP	IV_AUD	Estimate date	Estimate day	Estimate time	AUDC_MOD	AUDP_MOD	AUDC_MKT	AUDP_MKT
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
Panel A: Opening period (9:30-10:00)																			
21-JUN-10 Continue to 201 days	Mon	9:30	17-JUL-10	3.26	0.57	84.5	87.50	0.0486	0.0035	0.1676	0.1717	0.1697	28-JUN-10	Mon	9:30	3.16	0.38	3.01	0.43
22-JUN-10 Continue to 226 days	Tue	9:30	17-JUL-10	4.12	0.35	84	87.0	0.0486	0.0040	0.2830	0.1434	0.2132	29-JUN-10	Tue	9:30	3.83	0.21	3.56	0.26
23-JUN-10 Continue to 217 days	Wed	9:30	17-JUL-10	3.92	0.48	84.5	88.0	0.0466	0.0040	0.2110	0.1828	0.1969	30-JUN-10	Wed	9:30	3.76	0.29	3.72	0.31
17-JUN-10 Continue to 230 days	Thu	9:30	17-JUL-10	4.01	0.58	83	86.55	0.0496	0.0072	0.2044	0.1796	0.1920	24-JUN-10	Thu	9:30	4.19	0.39	4.07	0.41
18-JUN-10 Continue to 244 days	Fri	9:30	17-JUL-10	4.13	0.49	83	86.88	0.0491	0.0056	0.1886	0.1803	0.1844	25-JUN-10	Fri	9:30	3.41	0.49	3.93	0.49
Panel B: Midday period (12:30-13:00)																			
21-JUN-10 Continue to 175 days	Mon	12:30	17-JUL-10	3.27	0.56	85	88.18	0.0486	0.0035	0.1468	0.1751	0.1609	28-JUN-10	Mon	12:30	2.63	0.46	2.71	0.61
22-JUN-10 Continue to 179 days	Tue	12:30	17-JUL-10	4.41	0.34	83.5	87.70	0.0486	0.0040	0.2020	0.1772	0.1896	29-JUN-10	Tue	12:30	2.64	0.63	2.43	0.77
23-JUN-10 Continue to 186 days	Wed	12:35	17-JUL-10	3.83	0.45	83.5	87.26	0.0466	0.0040	0.1650	0.1885	0.1767	30-JUN-10	Wed	12:35	2.04	0.73	1.96	0.91
17-JUN-10 Continue to 200 days	Thu	12:30	17-JUL-10	4.13	0.56	82.5	86.49	0.0496	0.0072	0.1745	0.1916	0.1830	24-JUN-10	Thu	12:30	4.23	0.32	4.53	0.39
18-JUN-10 Continue to 199 days	Fri	12:30	17-JUL-10	4.54	0.41	82.5	86.79	0.0491	0.0073	0.2011	0.1801	0.1906	25-JUN-10	Fri	12:30	4.11	0.36	4.68	0.37
Panel C: Closing period (15:30-16:00)																			
21-JUN-10 Continue to 178 days	Mon	15:35	17-JUL-10	2.29	0.85	86	88.22	0.0486	0.0044	0.1121	0.1767	0.1444	28-JUN-10	Mon	15:35	1.90	0.61	1.94	0.85
22-JUN-10 Continue to 180 days	Tue	15:30	17-JUL-10	1.60	1.09	86.5	88.00	0.0484	0.0028	0.0935	0.1793	0.1364	29-JUN-10	Tue	15:30	0.49	1.86	0.59	2.20
23-JUN-10 Continue to 168 days	Wed	15:50	17-JUL-10	4.95	0.30	82.5	86.82	0.0486	0.0035	0.2758	0.1790	0.2274	30-JUN-10	Wed	15:50	2.90	0.79	2.27	0.77
17-JUN-10 Continue to 203 days	Thu	15:30	17-JUL-10	4.33	0.54	82.5	86.42	0.0496	0.0040	0.2121	0.1853	0.1987	24-JUN-10	Thu	15:30	4.36	0.39	4.43	0.40
18-JUN-10 Continue to 196 days	Fri	15:30	17-JUL-10	4.11	0.46	83	86.96	0.0491	0.0073	0.1755	0.1777	0.1766	25-JUN-10	Fri	15:30	3.82	0.34	4.63	0.37

Notes: AUD, IR_AUD, IR_USD, IV_AUDC, IV_AUDP, IV_AUD, AUDC_MOD, AUDP_MOD, AUDC_MKT, and AUDP_MKT represents Australian dollar, interest rate of AUD, interest rate of US dollar, implied volatility of AUD call options price, implied volatility of AUD put options price, implied volatility of AUD options [(IV_AUDC + IV_AUDP)/2], AUD call options model price, AUD put options model price, AUD call options market price, and AUD put options market price, respectively. The one-week estimate horizon indicates that the IV_AUD is calculated one-week before the date of estimating AUDC_MOD and AUDP_MOD.

Table A5.2b: Details of AUD options data for testing hypothesis 14
(Two-month maturity IV_AUD estimate AUD options price for one-week estimate horizon)

Trade date	Trade day	Trade Time	Expiry date	Call price	Put price	Strike price	Spot price	IR_AUD	IR_USD	IV_AUDC	IV_AUDP	IV_AUD	Estimate date	Estimate day	Estimate time	AUDC_MOD	AUDP_MOD	AUDC_MKT	AUDP_MKT
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)_	(14)	(15)	(16)	(17)	(18)	(19)	(20)
Panel A: Opening period (9:30-10:00)																			
24-MAY-10 Continue to 223 days	Mon	9:30	17-JUL-10	5.01	1.22	79.5	83.00	0.0500	0.0050	0.2684	0.1944	0.2314	31-MAY-10	Mon	9:30	3.99	0.30	4.01	0.36
18-MAY-10 Continue to 260 days	Tue	9:30	17-JUL-10	4.21	1.05	83.5	87.50	0.0482	0.0049	0.1529	0.1718	0.1624	25-MAY-10	Tue	9:30	3.94	0.17	4.03	0.21
19-MAY-10 Continue to 258 days	Wed	9:30	17-JUL-10	4.55	1.45	81.0	85.5	0.0488	0.0070	0.1513	0.2268	0.1891	26-MAY-10	Wed	9:30	4.40	0.30	3.55	0.35
20-MAY-10 Continue to 233 days	Thu	9:30	17-JUL-10	4.97	1.68	79.5	83.55	0.0492	0.0048	0.2263	0.2409	0.2336	27-MAY-10	Thu	9:30	4.22	0.41	4.56	0.58
21-MAY-10 Continue to 239 days	Fri	9:30	17-JUL-10	5.48	1.43	79.0	83.31	0.0488	0.0037	0.2583	0.2295	0.2439	28-MAY-10	Fri	9:30	4.58	0.32	5.05	0.41
Panel B: Midday period (12:30-13:00)																			
24-MAY-10 Continue to 354 days	Mon	12:30	17-JUL-10	4.99	1.24	79	82.80	0.0500	0.0050	0.2508	0.2056	0.2282	31-MAY-10	Mon	12:30	5.89	0.87	6.04	0.78
18-MAY-10 Continue to 384 days	Tue	12:30	17-JUL-10	4.25	1.10	83.5	87.51	0.0482	0.0049	0.1554	0.1759	0.1656	25-MAY-10	Tue	12:30	0.99	3.69	1.43	3.81
19-MAY-10 Continue to 379 days	Wed	12:30	17-JUL-10	4.50	1.40	80.5	84.61	0.0488	0.0070	0.1753	0.2142	0.1948	26-MAY-10	Wed	12:30	3.67	1.44	3.55	1.69
20-MAY-10 Continue to 349 days	Thu	12:30	17-JUL-10	4.93	1.63	78.5	82.55	0.0492	0.0048	0.2247	0.2398	0.2323	27-MAY-10	Thu	12:30	5.79	1.04	6.35	0.78
21-MAY-10 Continue to 348 days	Fri	12:30	17-JUL-10	5.42	1.49	78.5	82.23	0.0488	0.0037	0.2874	0.2210	0.2542	28-MAY-10	Fri	12:30	6.89	0.96	6.53	0.69
Panel C: Closing period (15:30-16:00)																			
24-MAY-10 Continue to 357 days	Mon	15:30	17-JUL-10	4.85	1.27	79	83.09	0.0500	0.0052	0.2199	0.2161	0.2180	31-MAY-10	Mon	15:30	5.51	0.86	6.04	0.78
18-MAY-10 Continue to 383 days	Tue	16:0	17-JUL-10	3.75	1.29	83.5	87.09	0.0468	0.0065	0.1358	0.1831	0.1595	25-MAY-10	Tue	16:00	1.13	3.20	1.80	3.35
19-MAY-10 Continue to 374 days	Wed	15:45	17-JUL-10	5.63	1.12	79.5	83.64	0.0488	0.0076	0.2729	0.1932	0.2330	26-MAY-10	Wed	15:45	4.43	1.66	3.94	1.54
20-MAY-10 Continue to 354 days	Thu	15:30	17-JUL-10	5.43	1.60	78.5	82.40	0.0493	0.0029	0.2778	0.2320	0.2549	27-MAY-10	Thu	15:30	6.60	1.08	6.55	0.77
21-MAY-10 Continue to 351 days	Fri	15:30	17-JUL-10	4.82	1.62	79	82.96	0.0488	0.0037	0.2211	0.2370	0.2291	28-MAY-10	Fri	15:30	6.08	0.91	6.03	0.78

Notes: AUD, IR_AUD, IR_USD, IV_AUDC, IV_AUDP, IV_AUD, AUDC_MOD, AUDP_MOD, AUDC_MKT, and AUDP_MKT represents Australian dollar, interest rate of AUD, interest rate of US dollar, implied volatility of AUD call options price, implied volatility of AUD put options price, implied volatility of AUD options [(IV_AUDC + IV_AUDP)/2], AUD call options model price, AUD put options model price, AUD call options market price, and AUD put options market price, respectively. The one-week estimate horizon indicates that the IV_AUD is calculated one-week before the date of estimating AUDC_MOD and AUDP_MOD.

Table A5.2c: Details of AUD options data for testing hypothesis 15
(Three-month maturity IV_AUD estimate AUD options price for one-week estimate horizon)

Trade date	Trade day	Trade Time	Expiry date	Call price	Put price	Strike price	Spot price	IR_AUD	IR_USD	IV_AUDC	IV_AUDP	IV_AUD	Estimate date	Estimate day	Estimate time	AUDC_MOD	AUDP_MOD	AUDC_MKT	AUDP_MKT
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)_	(14)	(15)	(16)	(17)	(18)	(19)	(20)
Panel A: Opening period (9:30-10:00)																			
19-APR-10 Continue to 185 days	Mon	9:30	17-JUL-10	4.43	1.03	88.0	92.10	0.0473	0.0054	0.1444	0.1287	0.1366	26-APR-10	Mon	9:30	4.02	0.67	4.76	0.72
20-APR-10 Continue to 172 days	Tue	9:30	17-JUL-10	4.24	1.12	90	94.08	0.0473	0.0054	0.1313	0.1319	0.1316	27-APR-10	Tue	9:30	3.97	1.18	3.46	1.35
21-APR-10 Continue to 181 days	Wed	9:30	17-JUL-10	3.68	1.27	89.5	91.50	0.0477	0.0054	0.1776	0.1004	0.1390	28-APR-10	Wed	9:30	2.48	1.19	3.01	1.25
22-APR-10 Continue to 182 days	Thu	9:30	17-JUL-10	3.84	1.18	90.0	93.63	0.0477	0.0058	0.1263	0.1292	0.1278	29-APR-10	Thu	9:30	3.54	0.81	3.93	0.97
23-APR-10 Continue to 178 days	Fri	9:30	17-JUL-10	4.85	0.81	87.5	90.88	0.0475	0.0040	0.2041	0.1041	0.1541	30-APR-10	Fri	9:30	3.66	1.05	4.15	0.85
Panel B: Midday period (12:30-13:00)																			
19-APR-10 Continue to 364 days	Mon	12:30	17-JUL-10	4.40	0.99	87.5	91.82	0.0473	0.0054	0.1327	0.1305	0.1316	26-APR-10	Mon	12:30	5.38	0.61	5.00	0.74
20-APR-10 Continue to 359 days	Tue	12:30	17-JUL-10	4.16	1.00	89	93.08	0.0473	0.0054	0.1267	0.1254	0.1260	27-APR-10	Tue	12:30	3.59	1.12	3.16	1.30
21-APR-10 Continue to 361 days	Wed	12:30	17-JUL-10	3.56	1.17	89.5	92.99	0.0477	0.0054	0.1148	0.1253	0.1200	28-APR-10	Wed	12:30	3.12	1.22	3.23	1.29
22-APR-10 Continue to 360 days	Thu	12:30	17-JUL-10	3.75	1.12	89	92.63	0.0477	0.0058	0.1214	0.1267	0.1240	29-APR-10	Thu	12:30	4.00	0.88	3.90	0.97
23-APR-10 Continue to 353 days	Fri	12:30	17-JUL-10	4.81	0.84	87.5	91.98	0.0475	0.0040	0.1551	0.1263	0.1407	30-APR-10	Fri	12:30	5.49	0.67	5.15	0.65
Panel C: Closing period (15:30-16:00)																			
19-APR-10 Continue to 365 days	Mon	15:30	17-JUL-10	4.71	0.95	87.5	91.96	0.0473	0.0054	0.1467	0.1303	0.1385	26-APR-10	Mon	15:30	5.16	0.78	4.98	0.74
20-APR-10 Continue to 360 days	Tue	15:30	17-JUL-10	4.15	1.00	89	93.08	0.0474	0.0054	0.1264	0.1253	0.1259	27-APR-10	Tue	15:30	3.42	1.20	3.09	1.36
21-APR-10 Continue to 361 days	Wed	15:30	17-JUL-10	4.21	0.92	88.5	92.65	0.0476	0.0054	0.1277	0.1228	0.1252	28-APR-10	Wed	15:30	3.83	0.98	4.12	0.98
22-APR-10 Continue to 362 days	Thu	15:30	17-JUL-10	4.75	0.85	88	92.49	0.0477	0.0058	0.1484	0.1261	0.1373	29-APR-10	Thu	15:30	4.71	0.86	4.65	0.80
23-APR-10 Continue to 359 days	Fri	15:30	17-JUL-10	4.58	0.91	88	92.24	0.0474	0.0048	0.1496	0.1265	0.1381	30-APR-10	Fri	15:30	5.03	0.76	4.55	0.79

Notes: AUD, IR_AUD, IR_USD, IV_AUDC, IV_AUDP, IV_AUD, AUDC_MOD, AUDP_MOD, AUDC_MKT, and AUDP_MKT represents Australian dollar, interest rate of AUD, interest rate of US dollar, implied volatility of AUD call options price, implied volatility of AUD put options price, implied volatility of AUD options [(IV_AUDC + IV_AUDP)/2], AUD call options model price, AUD put options model price, AUD call options market price, and AUD put options market price, respectively. The one-week estimate horizon indicates that the IV_AUD is calculated one-week before the date of estimating AUDC_MOD and AUDP_MOD.

Table A5.3a: Details of AUD options data for testing hypothesis 16
(One-month maturity IV_AUD estimate AUD options price for one-month estimate horizon)

Trade date	Trade day	Trade Time	Expiry date	Call price	Put price	Strike price	Spot price	IR_AUD	IR_USD	IV_AUDC	IV_AUDP	IV_AUD	Estimate date	Estimate day	Estimate time	AUDC_MOD	AUDP_MOD	AUDC_MKT	AUDP_MKT
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)_	(14)	(15)	(16)	(17)	(18)	(19)	(20)
Panel A: Opening period (9:30-10:00)																			
21-JUN-10 Continue to 151 days	Mon	9:30	17-JUL-10	3.16	1.57	83.5	83.50	0.0486	0.0035	0.3711	0.1614	0.2663	12-JUL-10	Mon	9:30	1.18	1.68	1.01	1.43
22-JUN-10 Continue to 165 days	Tue	9:30	17-JUL-10	4.22	0.45	84	87.5	0.0486	0.0040	0.2511	0.1748	0.2130	13-JUL-10	Tue	9:30	4.19	0.30	3.86	0.26
23-JUN-10 Continue to 170 days	Wed	9:30	17-JUL-10	3.82	0.38	83.5	87.0	0.0466	0.0040	0.1982	0.1687	0.1834	14-JUL-10	Wed	9:30	3.75	0.40	3.72	0.31
17-JUN-10 Continue to 167 days	Thu	9:30	17-JUL-10	4.11	0.68	84	87.55	0.0496	0.0072	0.2148	0.1913	0.2030	07-JUL-10	Thu	9:30	3.89	0.60	4.17	0.51
18-JUN-10 Continue to 158 days	Fri	9:30	17-JUL-10	4.23	0.59	84	87.28	0.0491	0.0056	0.2561	0.1743	0.2152	08-JUL-10	Fri	9:30	3.55	0.62	3.63	0.59
Panel B: Midday period (12:30-13:00)																			
21-JUN-10 Continue to 237 days	Mon	12:30	17-JUL-10	4.37	0.66	85.5	89.18	0.0486	0.0035	0.2461	0.2039	0.2250	12-JUL-10	Mon	12:30	3.64	0.37	3.71	0.61
22-JUN-10 Continue to 241 days	Tue	12:30	17-JUL-10	4.31	0.45	85.5	88.70	0.0486	0.0040	0.2850	0.1624	0.2237	13-JUL-10	Tue	12:30	3.50	0.50	3.43	0.77
23-JUN-10 Continue to 260 days	Wed	12:35	17-JUL-10	3.93	0.55	86.5	89.26	0.0466	0.0040	0.2759	0.1647	0.2203	14-JUL-10	Wed	12:35	2.94	0.61	2.96	0.91
17-JUN-10 Continue to 229 days	Thu	12:30	17-JUL-10	3.13	0.26	85.5	87.49	0.0496	0.0072	0.2214	0.0861	0.1538	07-JUL-10	Thu	12:30	2.55	1.17	2.53	1.39
18-JUN-10 Continue to 221 days	Fri	12:30	17-JUL-10	3.45	1.41	83.0	85.79	0.0491	0.0073	0.2057	0.2601	0.2329	08-JUL-10	Fri	12:30	3.25	0.75	3.68	1.37
Panel C: Closing period (15:30-16:00)																			
21-JUN-10 Continue to 212 days	Mon	15:35	17-JUL-10	2.19	0.95	86.5	87.22	0.0486	0.0044	0.2123	0.1256	0.1689	12-JUL-10	Mon	15:35	1.17	1.28	1.34	0.85
22-JUN-10 Continue to 247 days	Tue	15:30	17-JUL-10	1.63	1.19	85.5	87.00	0.0484	0.0028	0.0983	0.1931	0.1457	13-JUL-10	Tue	15:30	1.55	0.88	1.59	1.20
23-JUN-10 Continue to 224 days	Wed	15:50	17-JUL-10	4.54	0.33	83.5	86.32	0.0486	0.0035	0.3565	0.1385	0.2475	14-JUL-10	Wed	15:50	3.60	0.61	3.27	0.77
17-JUN-10 Continue to 223 days	Thu	15:30	17-JUL-10	4.12	0.44	83.5	86.12	0.0496	0.0040	0.2919	0.1314	0.2117	07-JUL-10	Thu	15:30	3.23	0.93	3.43	0.40
18-JUN-10 Continue to 220 days	Fri	15:30	17-JUL-10	3.11	1.46	83.5	85.96	0.0491	0.0073	0.1915	0.2516	0.2216	08-JUL-10	Fri	15:30	2.84	0.81	3.63	0.47

Notes: AUD, IR_AUD, IR_USD, IV_AUDC, IV_AUDP, IV_AUD, AUDC_MOD, AUDP_MOD, AUDC_MKT, and AUDP_MKT represents Australian dollar, interest rate of AUD, interest rate of US dollar, implied volatility of AUD call options price, implied volatility of AUD put options price, implied volatility of AUD options [(IV_AUDC + IV_AUDP)/2], AUD call options model price, AUD put options model price, AUD call options market price, and AUD put options market price, respectively. The one-month estimate horizon indicates that the IV_AUD is calculated one-month before the date of estimating AUDC_MOD and AUDP_MOD.

Table A5.3b: Details of AUD options data for testing hypothesis 17
(Two-month maturity IV_AUD estimate AUD options price for one-month estimate horizon)

Trade date	Trade day	Trade Time	Expiry date	Call price	Put price	Strike price	Spot price	IR_AUD	IR_USD	IV_AUDC	IV_AUDP	IV_AUD	Estimate date	Estimate day	Estimate time	AUDC_MOD	AUDP_MOD	AUDC_MKT	AUDP_MKT
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
Panel A: Opening period (9:30-10:00)																			
07-JUN-10 Continue to 161 days	Mon	9:30	17-JUL-10	1.45	3.02	83	81.58	0.0470	0.0064	0.2057	0.1846	0.1951	05-JUL-10	Mon	9:30	1.69	0.78	1.94	0.79
18-MAY-10 Continue to 185 days	Tue	9:30	17-JUL-10	0.83	3.66	90	87.30	0.0483	0.0049	0.1459	0.0994	0.1226	15-JUN-10	Tue	9:30	0.10	4.82	0.23	4.70
02-JUN-10 Continue to 180 days	Wed	9:30	17-JUL-10	2.02	2.21	83	83.27	0.0497	0.0041	0.1824	0.1814	0.1819	30-JUN-10	Wed	9:30	2.78	0.47	2.20	0.86
27-MAY-10 Continue to 177 days	Thu	9:30	17-JUL-10	1.41	3.06	85	83.77	0.0499	0.0054	0.1730	0.1647	0.1688	24-JUN-10	Thu	9:30	2.53	0.72	2.45	0.79
28-MAY-10 Continue to 178 days	Fri	9:30	17-JUL-10	2.87	1.73	83	85.34	0.0497	0.0057	0.1465	0.2047	0.1756	25-JUN-10	Fri	9:30	3.36	0.43	3.93	0.49
Panel B: Midday period (12:30-13:00)																			
24-MAY-10 Continue to 227 days	Mon	12:30	17-JUL-10	4.99	1.24	79	82.80	0.0500	0.0050	0.2508	0.2056	0.2282	21-JUN-10	Mon	12:30	8.98	0.08	8.76	0.10
18-MAY-10 Continue to 251 days	Tue	12:30	17-JUL-10	4.25	1.10	83.5	87.51	0.0482	0.0049	0.1554	0.1759	0.1656	15-JUN-10	Tue	12:30	2.83	0.84	3.18	0.85
19-MAY-10 Continue to 250 days	Wed	12:30	17-JUL-10	4.50	1.40	80.5	84.61	0.0488	0.0070	0.1753	0.2142	0.1948	16-JUN-10	Wed	12:30	5.40	0.34	5.97	0.34
20-MAY-10 Continue to 249 days	Thu	12:30	17-JUL-10	4.93	1.63	78.5	82.55	0.0492	0.0048	0.2247	0.2398	0.2323	17-JUN-10	Thu	12:30	7.89	0.20	7.76	0.19
21-MAY-10 Continue to 241 days	Fri	12:30	17-JUL-10	5.42	1.49	78.5	82.23	0.0488	0.0037	0.2874	0.2210	0.2542	18-JUN-10	Fri	12:30	8.24	0.24	8.26	0.13
Panel C: Closing period (15:30-16:00)																			
24-MAY-10 Continue to 232 days	Mon	15:30	17-JUL-10	4.85	1.27	79	83.09	0.0500	0.0052	0.2199	0.2161	0.2180	21-JUN-10	Mon	15:30	9.05	0.06	8.53	0.10
18-MAY-10 Continue to 257 days	Tue	16:0	17-JUL-10	3.75	1.29	83.5	87.09	0.0468	0.0065	0.1358	0.1831	0.1595	15-JUN-10	Tue	16:0	3.06	0.68	3.50	0.74
19-MAY-10 Continue to 234 days	Wed	15:45	17-JUL-10	5.63	1.12	79.5	83.64	0.0488	0.0076	0.2729	0.1932	0.2330	16-JUN-10	Wed	15:45	7.00	0.32	6.78	0.27
20-MAY-10 Continue to 243 days	Thu	15:30	17-JUL-10	5.43	1.60	78.5	82.40	0.0493	0.0029	0.2778	0.2320	0.2549	17-JUN-10	Thu	15:30	7.91	0.29	7.97	0.19
21-MAY-10 Continue to 230 days	Fri	15:30	17-JUL-10	4.82	1.62	79	82.96	0.0488	0.0037	0.2211	0.2370	0.2291	18-JUN-10	Fri	15:30	7.85	0.18	7.78	0.15

Notes: AUD, IR_AUD, IR_USD, IV_AUDC, IV_AUDP, IV_AUD, AUDC_MOD, AUDP_MOD, AUDC_MKT, and AUDP_MKT represents Australian dollar, interest rate of AUD, interest rate of US dollar, implied volatility of AUD call options price, implied volatility of AUD put options price, implied volatility of AUD options [(IV_AUDC + IV_AUDP)/2], AUD call options model price, AUD put options model price, AUD call options market price, and AUD put options market price, respectively. The one-month estimate horizon indicates that the IV_AUD is calculated one-month before the date of estimating AUDC_MOD and AUDP_MOD.

Table A5.3c: Details of AUD options data for testing hypothesis 18
(Three-month maturity IV_AUD estimate AUD options price for one-month estimate horizon)

Trade date	Trade day	Trade Time	Expiry date	Call price	Put price	Strike price	Spot price	IR_AUD	IR_USD	IV_AUDC	IV_AUDP	IV_AUD	Estimate date	Estimate day	Estimate time	AUDC_MOD	AUDP_MOD	AUDC_MKT	AUDP_MKT
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
Panel A: Opening period (9:30-10:00)																			
17-MAY-10 Continue to 178 days	Mon	9:30	17-JUL-10	0.99	3.45	90	87.73	0.0485	0.0052	0.1475	0.1104	0.1289	14-JUN-10	Mon	9:30	0.16	4.51	0.28	4.25
22-JUN-10 Continue to 165 days	Tue	9:30	18-SEP-10	4.48	1.51	84	87.68	0.0517	0.0060	0.1749	0.1584	0.1666	20-JUL-10	Tue	9:30	4.24	1.05	4.02	1.26
23-JUN-10 Continue to 167 days	Wed	9:45	18-SEP-10	3.93	1.75	84	87.20	0.0513	0.0060	0.1596	0.1651	0.1624	21-JUL-10	Wed	9:45	4.62	0.83	4.50	1.06
13-MAY-10 Continue to 169 days	Thu	9:45	17-JUL-10	1.50	2.47	90	89.90	0.0502	0.0048	0.1246	0.1349	0.1297	10-JUN-10	Thu	9:45	0.06	6.20	0.22	5.84
07-MAY-10 Continue to 171 days	Fri	9:30	17-JUL-10	1.37	3.50	90	88.83	0.0507	0.0085	0.1395	0.1559	0.1477	04-JUN-10	Fri	9:30	0.20	5.98	0.13	7.23
Panel B: Midday period (12:30-13:00)																			
19-APR-10 Continue to 354 days	Mon	12:30	17-JUL-10	4.40	0.99	87.5	91.82	0.0473	0.0054	0.1327	0.1305	0.1316	17-MAY-10	Mon	12:30	1.74	2.02	1.60	2.55
20-APR-10 Continue to 351 days	Tue	12:30	17-JUL-10	4.16	1.00	89	93.08	0.0473	0.0054	0.1267	0.1254	0.1260	18-MAY-10	Tue	12:30	0.93	3.05	1.00	3.33
21-APR-10 Continue to 347 days	Wed	12:30	17-JUL-10	3.56	1.17	89.5	92.99	0.0477	0.0054	0.1148	0.1253	0.1200	19-MAY-10	Wed	12:30	0.19	5.63	0.32	6.22
22-APR-10 Continue to 344 days	Thu	12:30	17-JUL-10	3.75	1.12	89	92.63	0.0477	0.0058	0.1214	0.1267	0.1240	20-MAY-10	Thu	12:30	0.08	7.13	0.36	7.67
23-APR-10 Continue to 344 days	Fri	12:30	17-JUL-10	4.81	0.84	87.5	91.98	0.0475	0.0040	0.1551	0.1263	0.1407	21-MAY-10	Fri	12:30	0.24	6.10	0.77	5.86
Panel C: Closing period (15:30-16:00)																			
19-APR-10 Continue to 356 days	Mon	15:30	17-JUL-10	4.71	0.95	87.5	91.96	0.0473	0.0054	0.1467	0.1303	0.1385	17-MAY-10	Mon	15:30	1.74	2.22	1.73	2.39
20-APR-10 Continue to 348 days	Tue	15:30	17-JUL-10	4.15	1.00	89	93.08	0.0474	0.0054	0.1264	0.1253	0.1259	18-MAY-10	Tue	15:30	0.94	3.02	0.79	3.95
21-APR-10 Continue to 345 days	Wed	15:30	17-JUL-10	4.21	0.92	88.5	92.65	0.0476	0.0054	0.1277	0.1228	0.1252	19-MAY-10	Wed	15:30	0.24	5.43	0.58	5.18
22-APR-10 Continue to 348 days	Thu	15:30	17-JUL-10	4.75	0.85	88	92.49	0.0477	0.0058	0.1484	0.1261	0.1373	20-MAY-10	Thu	15:30	0.20	6.39	0.67	6.33
23-APR-10 Continue to 337 days	Fri	15:30	17-JUL-10	4.58	0.91	88	92.24	0.0474	0.0048	0.1496	0.1265	0.1381	21-MAY-10	Fri	15:30	0.25	5.89	0.58	6.34

Notes: AUD, IR_AUD, IR_USD, IV_AUDC, IV_AUDP, IV_AUD, AUDC_MOD, AUDP_MOD, AUDC_MKT, and AUDP_MKT represents Australian dollar, interest rate of AUD, interest rate of US dollar, implied volatility of AUD call options price, implied volatility of AUD put options price, implied volatility of AUD options [(IV_AUDC + IV_AUDP)/2], AUD call options model price, AUD put options model price, AUD call options market price, and AUD put options market price, respectively. The one-month estimate horizon indicates that the IV_AUD is calculated one-month before the date of estimating AUDC_MOD and AUDP_MOD.

Table A5.4a: Details of CAD options data for testing hypothesis 10
(One-month maturity IV_CAD estimate CAD options price for within-week estimate horizon)

Trade date	Trade day	Trade Time	Expiry date	Call price	Put price	Strike price	Spot price	IR_CAD	IR_USD	IV_CADC	IV_CADP	IV_CAD	Estimate date	Estimate day	Estimate time	CADC_MOD	CADP_MOD	CADC_MKT	CADP_MKT
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
Panel A: Opening period (9:30-10:00)																			
21-JUN-10 Continue to 193 days	Mon	9:30	17-JUL-10	4.58	0.21	94	98.34	0.0084	0.0042	0.1531	0.1407	0.1469	25-JUN-10	Fri	9:30	2.50	0.63	2.79	0.45
22-JUN-10 Continue to 207 days	Tue	9:30	17-JUL-10	5.23	0.15	93	97.66	0.0084	0.0040	0.2187	0.1387	0.1787	25-JUN-10	Fri	9:30	3.47	0.60	3.65	0.30
23-JUN-10 Continue to 248 days	Wed	9:30	17-JUL-10	1.47	1.02	95.5	96.85	0.0084	0.0070	0.0565	0.1629	0.1097	25-JUN-10	Fri	9:30	1.22	0.85	1.70	0.85
17-JUN-10 Continue to 284 days	Thu	9:30	17-JUL-10	3.86	0.38	94	97.71	0.0082	0.0072	0.1089	0.1444	0.1267	18-JUN-10	Fri	9:30	3.45	0.33	3.78	0.34
Panel B: Midday period (12:30-13:00)																			
21-JUN-10 Continue to 191 days	Mon	12:30	17-JUL-10	4.61	0.40	96	99.54	0.0084	0.0042	0.2373	0.1507	0.1940	25-JUN-10	Fri	12:30	4.23	0.22	3.79	0.35
22-JUN-10 Continue to 203 days	Tue	12:30	17-JUL-10	5.09	0.14	93	97.89	0.0082	0.0040	0.1617	0.1411	0.1514	25-JUN-10	Fri	12:30	3.46	0.37	3.85	0.27
23-JUN-10 Continue to 233 days	Wed	12:30	17-JUL-10	2.16	0.74	94.5	96.49	0.0084	0.0033	0.0864	0.1559	0.1212	25-JUN-10	Fri	12:30	2.10	0.51	2.58	0.51
17-JUN-10 Continue to 303 days	Thu	12:30	17-JUL-10	3.13	0.51	94.5	97.53	0.0082	0.0072	0.0854	0.1436	0.1145	18-JUN-10	Fri	12:30	3.05	0.32	3.44	0.38
Panel C: Closing period (15:30-16:00)																			
21-JUN-10 Continue to 184 days	Mon	15:30	17-JUL-10	1.89	0.80	96.5	98.20	0.0083	0.0044	0.0753	0.1432	0.1092	25-JUN-10	Fri	15:30	0.89	1.18	1.14	1.15
22-JUN-10 Continue to 199 days	Tue	15:30	17-JUL-10	1.27	1.11	97	98.18	0.0097	0.0028	0.0500	0.1580	0.1040	25-JUN-10	Fri	15:30	0.64	1.43	0.89	1.40
23-JUN-10 Continue to 225 days	Wed	15:30	17-JUL-10	4.96	0.17	91.5	95.79	0.0080	0.0035	0.2297	0.1403	0.1850	25-JUN-10	Fri	15:30	5.00	0.29	5.12	0.13
17-JUN-10 Continue to 302 days	Thu	15:30	17-JUL-10	4.94	0.22	92.5	97.26	0.0082	0.0040	0.1438	0.1447	0.1442	18-JUN-10	Fri	15:30	5.22	0.17	5.46	0.14

Notes: CAD, IR_CAD, IR_USD, IV_CADC, IV_CADP, IV_CAD, CADC_MOD, CADP_MOD, CADC_MKT, and CADP_MKT represents Canadian dollar, interest rate of CAD, interest rate of US dollar, implied volatility of CAD call options price, implied volatility of CAD put options price, implied volatility of CAD options [(IV_CADC + IV_CADP)/2], CAD call options model price, CAD put options market price, CAD put options model price, and CAD put options market price, respectively. The within-week estimate horizon indicates that the IV_CAD is calculated one day to four days before the date of estimating CADC_MOD and CADP_MOD.

Table A5.4b: Details of CAD options data for testing hypothesis 11
(Two-month maturity IV_CAD estimate CAD options price for within-week estimate horizon)

Trade date	Trade day	Trade Time	Expiry date	Call price	Put price	Strike price	Spot price	IR_CAD	IR_USD	IV_CADC	IV_CADP	IV_CAD	Estimate date	Estimate day	Estimate time	CADC_MOD	CADP_MOD	CADC_MKT	CADP_MKT
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
Panel A: Opening period (9:30-10:00)																			
24-MAY-10 Continue to 270 days	Mon	9:30	17-JUL-10	3.25	1.58	93	94.44	0.0054	0.0045	0.1720	0.1542	0.1631	28-MAY-10	Fri	9:30	3.74	1.23	3.53	1.12
18-MAY-10 Continue to 304 days	Tue	9:30	17-JUL-10	2.92	1.45	96	96.87	0.0054	0.0049	0.1582	0.1186	0.1384	21-MAY-10	Fri	9:30	1.25	3.18	1.48	4.25
19-MAY-10 Continue to 305 days	Wed	9:30	17-JUL-10	2.17	2.39	96	95.47	0.0053	0.0060	0.1578	0.1382	0.1480	21-MAY-10	Fri	9:30	1.38	3.31	1.48	4.25
20-MAY-10 Continue to 274 days	Thu	9:30	17-JUL-10	1.58	3.63	96	94.84	0.0071	0.0046	0.1402	0.1972	0.1687	21-MAY-10	Fri	9:30	1.68	3.61	1.48	4.25
Panel B: Midday period (12:30-13:00)																			
24-MAY-10 Continue to 346 days	Mon	12:30	17-JUL-10	3.45	1.61	94	95.44	0.0054	0.0045	0.1843	0.1551	0.1697	28-MAY-10	Fri	12:30	2.33	0.67	2.53	0.92
18-MAY-10 Continue to 371 days	Tue	12:30	17-JUL-10	5.05	0.74	92.5	97.25	0.0054	0.0049	0.1141	0.1567	0.1354	21-MAY-10	Fri	12:30	2.32	1.67	3.80	1.82
19-MAY-10 Continue to 372 days	Wed	12:30	17-JUL-10	5.33	0.99	91	95.44	0.0053	0.0070	0.1663	0.1770	0.1716	21-MAY-10	Fri	12:30	3.71	1.56	4.85	1.40
20-MAY-10 Continue to 352 days	Thu	12:30	17-JUL-10	5.50	1.27	89.5	93.71	0.0071	0.0048	0.2033	0.1986	0.2010	21-MAY-10	Fri	12:30	5.07	1.43	6.04	1.10
Panel C: Closing period (15:30-16:00)																			
24-MAY-10 Continue to 347 days	Mon	15:30	17-JUL-10	5.33	0.88	90	94.36	0.0050	0.0052	0.1826	0.1745	0.1786	28-MAY-10	Fri	15:30	5.68	0.72	5.73	0.58
18-MAY-10 Continue to 379 days	Tue	15:30	17-JUL-10	4.75	0.93	92.5	97.08	0.0054	0.0064	0.0917	0.1699	0.1308	21-MAY-10	Fri	15:30	3.12	1.08	3.50	1.85
19-MAY-10 Continue to 367 days	Wed	15:30	17-JUL-10	6.00	0.82	90.5	95.13	0.0048	0.0076	0.2104	0.1669	0.1886	21-MAY-10	Fri	15:30	5.23	1.19	4.95	1.30
20-MAY-10 Continue to 355 days	Thu	15:30	17-JUL-10	5.73	1.16	89.5	93.95	0.0058	0.0029	0.2077	0.1946	0.2011	21-MAY-10	Fri	15:30	6.10	1.06	5.70	1.10

Notes: CAD, IR_CAD, IR_USD, IV_CADC, IV_CADP, IV_CAD, CADC_MOD, CADP_MOD, CADC_MKT, and CADP_MKT represents Canadian dollar, interest rate of CAD, interest rate of US dollar, implied volatility of CAD call options price, implied volatility of CAD put options price, implied volatility of CAD options [(IV_CADC + IV_CADP)/2], CAD call options model price, CAD put options market price, CAD put options model price, and CAD put options market price, respectively. The within-week estimate horizon indicates that the IV_CAD is calculated one day to four days before the date of estimating CADC_MOD and CADP_MOD.

Table A5.4c: Details of CAD options data for testing hypothesis 12
(Three-month maturity IV_CAD estimate CAD options price for within-week estimate horizon)

Trade date	Trade day	Trade Time	Expiry date	Call price	Put price	Strike price	Spot price	IR_CAD	IR_USD	IV_CADC	IV_CADP	IV_CAD	Estimate date	Estimate day	Estimate time	CADC_MOD	CADP_MOD	CADC_MKT	CADP_MKT
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)_	(14)	(15)	(16)	(17)	(18)	(19)	(20)
Panel A: Opening period (9:30-10:00)																			
26-APR-10 Continue to 206 days	Mon	9:30	17-JUL-10	2.82	1.30	98.5	100.02	0.0076	0.0040	0.1075	0.1032	0.1054	30-APR-10	Fri	9:30	2.39	1.52	2.29	1.61
20-APR-10 Continue to 206 days	Tue	9:30	17-JUL-10	2.77	1.32	98.5	98.79	0.0068	0.0053	0.1366	0.0748	0.1057	23-APR-10	Fri	9:30	2.94	1.31	2.49	1.59
21-APR-10 Continue to 212 days	Wed	9:30	17-JUL-10	3.06	1.22	98.5	100.54	0.0077	0.0036	0.0998	0.1054	0.1026	23-APR-10	Fri	9:30	2.88	1.25	2.49	1.59
22-APR-10 Continue to 213 days	Thu	9:30	17-JUL-10	2.71	1.42	98.5	100.04	0.0080	0.0040	0.0987	0.1075	0.1031	23-APR-10	Fri	9:30	2.89	1.26	2.49	1.59
Panel B: Midday period (12:30-13:00)																			
19-APR-10 Continue to 364 days	Mon	12:30	17-JUL-10	5.15	0.58	93.5	98.13	0.0070	0.0054	0.1119	0.1129	0.1124	23-APR-10	Fri	12:30	6.40	0.32	6.50	0.36
20-APR-10 Continue to 356 days	Tue	12:30	17-JUL-10	6.50	0.33	94	98.77	0.0043	0.0054	0.1915	0.0947	0.1431	23-APR-10	Fri	12:30	6.33	0.75	6.00	0.41
21-APR-10 Continue to 355 days	Wed	12:30	17-JUL-10	5.27	0.54	95.5	100.42	0.0080	0.0054	0.1028	0.1128	0.1078	23-APR-10	Fri	12:30	4.69	0.60	4.75	0.64
22-APR-10 Continue to 354 days	Thu	12:30	17-JUL-10	2.93	1.54	99.5	101.05	0.0080	0.0040	0.1096	0.1130	0.1113	23-APR-10	Fri	12:30	1.90	1.39	2.29	1.59
Panel C: Closing period (15:30-16:00)																			
19-APR-10 Continue to 368 days	Mon	15:30	17-JUL-10	5.55	0.49	93.5	98.24	0.0069	0.0054	0.1346	0.1077	0.1212	23-APR-10	Fri	15:30	6.52	0.40	6.78	0.31
20-APR-10 Continue to 360 days	Tue	15:30	17-JUL-10	5.10	0.55	95.5	100.23	0.0053	0.0054	0.0967	0.1108	0.1038	23-APR-10	Fri	15:30	4.66	0.54	5.05	0.56
21-APR-10 Continue to 361 days	Wed	15:30	17-JUL-10	5.00	0.58	95.5	100.05	0.0078	0.0054	0.1055	0.1108	0.1081	23-APR-10	Fri	15:30	4.72	0.60	5.05	0.56
22-APR-10 Continue to 361 days	Thu	15:30	17-JUL-10	5.50	0.49	95	99.84	0.0079	0.0058	0.1264	0.1087	0.1176	23-APR-10	Fri	15:30	5.24	0.62	5.50	0.48

Notes: CAD, IR_CAD, IR_USD, IV_CADC, IV_CADP, IV_CAD, CADC_MOD, CADP_MOD, CADC_MKT, and CADP_MKT represents Canadian dollar, interest rate of CAD, interest rate of US dollar, implied volatility of CAD call options price, implied volatility of CAD put options price, implied volatility of CAD options [(IV_CADC + IV_CADP)/2], CAD call options model price, CAD put options market price, CAD put options model price, and CAD put options market price, respectively. The within-week estimate horizon indicates that the IV_CAD is calculated one day to four days before the date of estimating CADC_MOD and CADP_MOD.

Table A5.5a: Details of CAD options data for testing hypothesis 13
(One-month maturity IV_CAD estimate CAD options price for one-week estimate horizon)

Trade date	Trade day	Trade Time	Expiry date	Call price	Put price	Strike price	Spot price	IR_CAD	IR_USD	IV_CADC	IV_CADP	IV_CAD	Estimate date	Estimate day	Estimate time	CADC_MOD	CADP_MOD	CADC_MKT	CADP_MKT
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
Panel A: Opening period (9:30-10:00)																			
21-JUN-10 Continue to 172 days	Mon	9:30	17-JUL-10	2.86	0.45	96.5	99.24	0.0084	0.0035	0.0918	0.1352	0.1135	28-JUN-10	Mon	9:30	2.79	0.36	1.95	0.56
22-JUN-10 Continue to 172 days	Tue	9:30	17-JUL-10	5.23	0.15	93	97.66	0.0084	0.0040	0.2187	0.1387	0.1787	29-JUN-10	Tue	9:30	3.06	0.56	2.76	0.42
23-JUN-10 Continue to 186 days	Wed	9:30	17-JUL-10	1.47	1.02	95.5	96.85	0.0070	0.0565	0.1629	0.1097	0.0084	30-JUN-10	Wed	9:30	0.84	0.96	0.67	1.74
17-JUN-10 Continue to 190 days	Thu	9:30	17-JUL-10	3.86	0.38	94	97.71	0.0082	0.0072	0.1089	0.1444	0.1267	24-JUN-10	Thu	9:30	2.61	0.41	2.46	0.57
18-JUN-10 Continue to 180 days	Fri	9:30	17-JUL-10	4.68	0.23	93	97.13	0.0066	0.0056	0.1846	0.1351	0.1599	25-JUN-10	Fri	9:30	3.33	0.47	3.65	0.30
Panel B: Midday period (12:30-13:00)																			
21-JUN-10 Continue to 171 days	Mon	12:30	17-JUL-10	2.85	0.43	95.5	98.24	0.0084	0.0035	0.0899	0.1340	0.1119	28-JUN-10	Mon	12:30	1.64	0.52	1.81	0.66
22-JUN-10 Continue to 165 days	Tue	12:30	17-JUL-10	5.09	0.14	93	97.89	0.0082	0.0040	0.1617	0.1411	0.1514	29-JUN-10	Tue	12:30	2.75	0.43	2.57	0.50
23-JUN-10 Continue to 186 days	Wed	12:30	17-JUL-10	2.16	0.74	94.5	96.49	0.0084	0.0033	0.0864	0.1559	0.1212	30-JUN-10	Wed	12:30	1.23	0.78	1.07	1.28
17-JUN-10 Continue to 186 days	Thu	12:30	17-JUL-10	3.13	0.51	94.5	97.53	0.0082	0.0072	0.0854	0.1436	0.1145	24-JUN-10	Thu	12:30	1.91	0.54	2.12	0.72
18-JUN-10 Continue to 180 days	Fri	12:30	17-JUL-10	5.22	0.17	92.5	97.23	0.0066	0.0073	0.1903	0.1361	0.1632	25-JUN-10	Fri	12:30	3.94	0.34	4.28	0.21
Panel C: Closing period (15:30-16:00)																			
21-JUN-10 Continue to 164 days	Mon	15:30	17-JUL-10	1.89	0.80	96.5	98.20	0.0083	0.0044	0.0753	0.1432	0.1092	28-JUN-10	Mon	15:30	1.10	0.84	1.11	1.07
22-JUN-10 Continue to 158 days	Tue	15:30	17-JUL-10	1.27	1.11	97	98.18	0.0097	0.0028	0.0500	0.1580	0.1040	29-JUN-10	Tue	15:30	0.24	2.14	0.32	2.57
23-JUN-10 Continue to 171 days	Wed	15:30	17-JUL-10	4.96	0.17	91.5	95.79	0.0080	0.0035	0.2297	0.1403	0.1850	30-JUN-10	Wed	15:30	3.27	0.49	2.85	0.39
17-JUN-10 Continue to 185 days	Thu	15:30	17-JUL-10	4.94	0.22	92.5	97.26	0.0082	0.0040	0.1438	0.1447	0.1442	24-JUN-10	Thu	15:30	3.47	0.33	3.66	0.31
18-JUN-10 Continue to 178 days	Fri	15:30	17-JUL-10	5.00	0.17	93	97.55	0.0066	0.0073	0.1791	0.1328	0.1559	25-JUN-10	Fri	15:30	3.58	0.37	3.75	0.25

Notes: CAD, IR_CAD, IR_USD, IV_CADC, IV_CADP, IV_CAD, CADC_MOD, CADP_MOD, CADC_MKT, and CADP_MKT represents Canadian dollar, interest rate of CAD, interest rate of US dollar, implied volatility of CAD call options price, implied volatility of CAD put options price, implied volatility of CAD options [(IV_CADC + IV_CADP)/2], CAD call options model price, CAD put options market price, CAD put options model price, and CAD put options market price, respectively. The one-week estimate horizon indicates that the IV_CAD is calculated one-week before the date of estimating CADC_MOD and CADP_MOD.

Table A5.5b: Details of CAD options data for testing hypothesis 14
(Two-month maturity IV_CAD estimate CAD options price for one-week estimate horizon)

Trade date	Trade day	Trade Time	Expiry date	Call price	Put price	Strike price	Spot price	IR_CAD	IR_USD	IV_CADC	IV_CADP	IV_CAD	Estimate date	Estimate day	Estimate time	CADC_MOD	CADP_MOD	CADC_MKT	CADP_MKT
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
Panel A: Opening period (9:30-10:00)																			
24-MAY-10 Continue to 262 days	Mon	9:30	17-JUL-10	3.25	1.58	93	94.44	0.0054	0.0045	0.1720	0.1542	0.1631	31-MAY-10	Mon	9:30	3.49	1.26	3.29	1.21
18-MAY-10 Continue to 282 days	Tue	9:30	17-JUL-10	2.92	1.45	96	96.87	0.0054	0.0049	0.1582	0.1186	0.1384	25-MAY-10	Tue	9:30	0.72	4.16	0.90	4.50
19-MAY-10 Continue to 297 days	Wed	9:30	17-JUL-10	2.17	2.39	96	95.47	0.0053	0.0060	0.1578	0.1382	0.1480	26-MAY-10	Wed	9:30	1.14	3.49	1.15	3.30
20-MAY-10 Continue to 270 days	Thu	9:30	17-JUL-10	1.58	3.63	96	94.84	0.0071	0.0046	0.1402	0.1972	0.1687	27-MAY-10	Thu	9:30	1.86	3.03	1.41	2.70
21-MAY-10 Continue to 275 days	Fri	9:30	17-JUL-10	2.12	3.35	94.5	94.10	0.0054	0.0033	0.1565	0.2107	0.1836	28-MAY-10	Fri	9:30	3.11	2.10	2.50	1.58
Panel B: Midday period (12:30-13:00)																			
24-MAY-10 Continue to 339 days	Mon	12:30	17-JUL-10	5.38	0.90	90	94.37	0.0050	0.0050	0.1870	0.1769	0.1820	31-MAY-10	Mon	12:30	6.22	0.57	5.66	0.58
18-MAY-10 Continue to 356 days	Tue	12:30	17-JUL-10	5.05	0.74	92.5	97.25	0.0054	0.0049	0.1141	0.1567	0.1354	25-MAY-10	Tue	12:30	1.99	1.82	2.44	2.23
19-MAY-10 Continue to 357 days	Wed	12:30	17-JUL-10	5.33	0.99	91	95.44	0.0053	0.0070	0.1663	0.1770	0.1716	26-MAY-10	Wed	12:30	4.16	1.19	4.10	1.06
20-MAY-10 Continue to 331 days	Thu	12:30	17-JUL-10	5.50	1.27	89.5	93.71	0.0071	0.0048	0.2033	0.1986	0.2010	27-MAY-10	Thu	12:30	6.07	0.91	6.18	0.58
21-MAY-10 Continue to 325 days	Fri	12:30	17-JUL-10	6.43	1.00	89	93.20	0.0071	0.0037	0.2800	0.1782	0.2291	28-MAY-10	Fri	12:30	7.36	0.89	6.76	0.44
Panel C: Closing period (15:30-16:00)																			
24-MAY-10 Continue to 334 days	Mon	15:30	17-JUL-10	5.33	0.88	90	94.36	0.0050	0.0052	0.1826	0.1745	0.1786	31-MAY-10	Mon	15:30	5.95	0.59	5.66	0.58
18-MAY-10 Continue to 370 days	Tue	15:30	17-JUL-10	4.75	0.93	92.5	97.08	0.0054	0.0064	0.0917	0.1699	0.1308	25-MAY-10	Tue	15:30	1.88	1.80	2.74	1.88
19-MAY-10 Continue to 348 days	Wed	15:30	17-JUL-10	6.00	0.82	90.5	95.13	0.0048	0.0076	0.2104	0.1669	0.1886	26-MAY-10	Wed	15:30	4.63	1.27	4.20	1.08
20-MAY-10 Continue to 343 days	Thu	15:30	17-JUL-10	5.73	1.16	89.5	93.95	0.0058	0.0029	0.2077	0.1946	0.2011	27-MAY-10	Thu	15:30	6.35	0.84	6.13	0.58
21-MAY-10 Continue to 327 days	Fri	15:30	17-JUL-10	5.30	1.20	90	94.59	0.0071	0.0037	0.1633	0.2009	0.1821	28-MAY-10	Fri	15:30	5.71	0.75	5.73	0.58

Notes: CAD, IR_CAD, IR_USD, IV_CADC, IV_CADP, IV_CAD, CADC_MOD, CADP_MOD, CADC_MKT, and CADP_MKT represents Canadian dollar, interest rate of CAD, interest rate of US dollar, implied volatility of CAD call options price, implied volatility of CAD put options price, implied volatility of CAD options [(IV_CADC + IV_CADP)/2], CAD call options model price, CAD put options market price, CAD put options model price, and CAD put options market price, respectively. The one-week estimate horizon indicates that the IV_CAD is calculated one-week before the date of estimating CADC_MOD and CADP_MOD.

Table A5.5c: Details of CAD options data for testing hypothesis 15
(Three-month maturity IV_CAD estimate CAD options price for one-week estimate horizon)

Trade date	Trade day	Trade Time	Expiry date	Call price	Put price	Strike price	Spot price	IR_CAD	IR_USD	IV_CADC	IV_CADP	IV_CAD	Estimate date	Estimate day	Estimate time	CADC_MOD	CADP_MOD	CADC_MKT	CADP_MKT
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)_	(14)	(15)	(16)	(17)	(18)	(19)	(20)
Panel A: Opening period (9:30-10:00)																			
19-APR-10 Continue to 202 days	Mon	9:30	17-JUL-10	5.25	0.78	94.5	99.15	0.0070	0.0054	0.1172	0.1269	0.1220	26-APR-10	Mon	9:30	4.67	0.34	5.57	0.31
20-APR-10 Continue to 199 days	Tue	9:30	17-JUL-10	2.77	1.32	98.5	98.79	0.0068	0.0053	0.1366	0.0748	0.1057	27-APR-10	Tue	9:30	2.63	1.42	2.29	1.65
21-APR-10 Continue to 209 days	Wed	9:30	17-JUL-10	3.06	1.22	98.5	100.54	0.0077	0.0036	0.0998	0.1054	0.1026	28-APR-10	Wed	9:30	1.64	2.15	2.13	1.88
22-APR-10 Continue to 214 days	Thu	9:30	17-JUL-10	2.71	1.42	98.5	100.04	0.0080	0.0040	0.0987	0.1075	0.1031	29-APR-10	Thu	9:30	2.31	1.52	2.56	1.43
23-APR-10 Continue to 207 days	Fri	9:30	17-JUL-10	2.49	1.59	98.5	100.15	0.0048	0.0040	0.0803	0.1212	0.1007	30-APR-10	Fri	9:30	2.31	1.43	2.29	1.61
Panel B: Midday period (12:30-13:00)																			
19-APR-10 Continue to 361 days	Mon	12:30	17-JUL-10	5.15	0.58	93.5	98.13	0.0070	0.0054	0.1119	0.1129	0.1124	26-APR-10	Mon	12:30	6.89	0.24	6.70	0.30
20-APR-10 Continue to 357 days	Tue	12:30	17-JUL-10	6.50	0.33	94	98.77	0.0043	0.0054	0.1915	0.0947	0.1431	27-APR-10	Tue	12:30	6.31	0.70	4.90	0.60
21-APR-10 Continue to 357 days	Wed	12:30	17-JUL-10	5.27	0.54	95.5	100.42	0.0080	0.0054	0.1028	0.1128	0.1078	28-APR-10	Wed	12:30	4.07	0.72	4.08	0.83
22-APR-10 Continue to 354 days	Thu	12:30	17-JUL-10	5.35	0.51	95	99.94	0.0050	0.0058	0.1035	0.1131	0.1083	29-APR-10	Thu	12:30	5.22	0.43	5.00	0.54
23-APR-10 Continue to 350 days	Fri	12:30	17-JUL-10	5.15	0.55	95	99.64	0.0063	0.0040	0.1129	0.1117	0.1123	30-APR-10	Fri	12:30	4.98	0.52	4.18	0.75
Panel C: Closing period (15:30-16:00)																			
19-APR-10 Continue to 360 days	Mon	15:30	17-JUL-10	5.55	0.49	93.5	98.24	0.0069	0.0054	0.1346	0.1077	0.1212	26-APR-10	Mon	15:30	6.70	0.35	6.60	0.31
20-APR-10 Continue to 359 days	Tue	15:30	17-JUL-10	5.10	0.55	95.5	100.23	0.0053	0.0054	0.0967	0.1108	0.1038	27-APR-10	Tue	15:30	3.85	0.72	3.89	0.90
21-APR-10 Continue to 358 days	Wed	15:30	17-JUL-10	5.00	0.58	95.5	100.05	0.0078	0.0054	0.1055	0.1108	0.1081	28-APR-10	Wed	15:30	3.96	0.76	4.36	0.77
22-APR-10 Continue to 358 days	Thu	15:30	17-JUL-10	5.50	0.49	95	99.84	0.0079	0.0058	0.1264	0.1087	0.1176	29-APR-10	Thu	15:30	5.04	0.60	5.00	0.53
23-APR-10 Continue to 357 days	Fri	15:30	17-JUL-10	5.50	0.48	95	99.66	0.0063	0.0048	0.1364	0.1066	0.1215	30-APR-10	Fri	15:30	4.56	0.78	4.18	0.77

Notes: CAD, IR_CAD, IR_USD, IV_CADC, IV_CADP, IV_CAD, CADC_MOD, CADP_MOD, CADC_MKT, and CADP_MKT represents Canadian dollar, interest rate of CAD, interest rate of US dollar, implied volatility of CAD call options price, implied volatility of CAD put options price, implied volatility of CAD options [(IV_CADC + IV_CADP)/2], CAD call options model price, CAD put options market price, CAD put options model price, and CAD put options market price, respectively. The one-week estimate horizon indicates that the IV_CAD is calculated one-week before the date of estimating CADC_MOD and CADP_MOD.

Table A5.6a: Details of CAD options data for testing hypothesis 16
(One-month maturity IV_CAD estimate CAD options price for one-month estimate horizon)

Trade date	Trade day	Trade Time	Expiry date	Call price	Put price	Strike price	Spot price	IR_CAD	IR_USD	IV_CADC	IV_CADP	IV_CAD	Estimate date	Estimate day	Estimate time	CADC_MOD	CADP_MOD	CADC_MKT	CADP_MKT
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)_	(14)	(15)	(16)	(17)	(18)	(19)	(20)
Panel A: Opening period (9:30-10:00)																			
21-JUN-10 Continue to 153 days	Mon	9:30	17-JUL-10	2.72	0.42	96.5	98.24	0.0084	0.0035	0.1675	0.1784	0.1730	12-JUL-10	Mon	9:30	1.92	0.22	1.95	0.56
22-JUN-10 Continue to 162 days	Tue	9:30	17-JUL-10	3.01	1.35	93.5	96.25	0.0084	0.0040	0.1197	0.2501	0.1849	13-JUL-10	Tue	9:30	2.75	0.17	2.76	0.32
23-JUN-10 Continue to 173 days	Wed	9:30	17-JUL-10	2.23	2.02	95.5	95.75	0.0070	0.0565	0.1985	0.2345	0.2165	14-JUL-10	Wed	9:30	0.84	0.67	0.69	0.74
17-JUN-10 Continue to 154 days	Thu	9:30	17-JUL-10	3.96	0.58	94	96.71	0.0082	0.0072	0.2174	0.1446	0.1810	07-JUL-10	Thu	9:30	3.13	0.13	2.96	0.17
18-JUN-10 Continue to 180 days	Fri	9:30	17-JUL-10	4.18	0.53	93.5	96.43	0.0066	0.0056	0.2293	0.2574	0.2434	08-JUL-10	Fri	9:30	3.30	0.49	3.65	0.30
Panel B: Midday period (12:30-13:00)																			
21-JUN-10 Continue to 191 days	Mon	12:30	17-JUL-10	2.15	1.03	94.5	96.24	0.0084	0.0035	0.1075	0.1727	0.1401	12-JUL-10	Mon	12:30	1.77	0.19	1.81	0.26
22-JUN-10 Continue to 212 days	Tue	12:30	17-JUL-10	2.09	0.14	94.5	95.29	0.0082	0.0040	0.1698	0.1505	0.1601	13-JUL-10	Tue	12:30	1.14	0.28	1.57	0.30
23-JUN-10 Continue to 201 days	Wed	12:30	17-JUL-10	1.56	0.84	95.5	96.39	0.0084	0.0033	0.1098	0.1245	0.1171	14-JUL-10	Wed	12:30	0.98	0.13	1.07	0.28
17-JUN-10 Continue to 202 days	Thu	12:30	17-JUL-10	3.23	0.71	94.5	97.40	0.0082	0.0072	0.1192	0.1639	0.1415	07-JUL-10	Thu	12:30	2.95	0.17	2.12	0.12
18-JUN-10 Continue to 204 days	Fri	12:30	17-JUL-10	3.22	0.27	93.5	96.52	0.0066	0.0073	0.1040	0.2338	0.1689	08-JUL-10	Fri	12:30	3.04	0.37	3.28	0.21
Panel C: Closing period (15:30-16:00)																			
21-JUN-10 Continue to 184 days	Mon	15:30	17-JUL-10	2.89	1.80	95.5	97.20	0.0083	0.0044	0.1892	0.2487	0.2190	12-JUL-10	Mon	15:30	1.95	0.47	1.21	0.57
22-JUN-10 Continue to 200 days	Tue	15:30	17-JUL-10	2.47	1.21	96	97.08	0.0097	0.0028	0.1895	0.1664	0.1779	13-JUL-10	Tue	15:30	1.42	2.27	0.32	2.57
23-JUN-10 Continue to 186 days	Wed	15:30	17-JUL-10	4.76	1.57	93.5	96.79	0.0080	0.0035	0.2916	0.2997	0.2957	14-JUL-10	Wed	15:30	3.10	0.22	2.85	0.39
17-JUN-10 Continue to 194 days	Thu	15:30	17-JUL-10	4.14	1.52	93.5	95.26	0.0082	0.0040	0.2970	0.2114	0.2542	07-JUL-10	Thu	15:30	2.95	0.42	3.66	0.31
18-JUN-10 Continue to 183 days	Fri	15:30	17-JUL-10	4.08	0.67	93	95.55	0.0066	0.0073	0.2461	0.1548	0.2004	08-JUL-10	Fri	15:30	3.27	0.15	3.75	0.20

Notes: CAD, IR_CAD, IR_USD, IV_CADC, IV_CADP, IV_CAD, CADC_MOD, CADP_MOD, CADC_MKT, and CADP_MKT represents Canadian dollar, interest rate of CAD, interest rate of US dollar, implied volatility of CAD call options price, implied volatility of CAD put options price, implied volatility of CAD options [(IV_CADC + IV_CADP)/2], CAD call options model price, CAD put options market price, CAD put options model price, and CAD put options market price, respectively. The one-month estimate horizon indicates that the IV_CAD is calculated one-month before the date of estimating CADC_MOD and CADP_MOD.

Table A5.6b: Details of CAD options data for testing hypothesis 17
(Two-month maturity IV_CAD estimate CAD options price for one-month estimate horizon)

Trade date	Trade day	Trade Time	Expiry date	Call price	Put price	Strike price	Spot price	IR_CAD	IR_USD	IV_CADC	IV_CADP	IV_CAD	Estimate date	Estimate day	Estimate time	CADC_MOD	CADP_MOD	CADC_MKT	CADP_MKT
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
Panel A: Opening period (9:30-10:00)																			
24-MAY-10 Continue to 173 days	Mon	9:30	17-JUL-10	3.25	1.58	93	94.44	0.0054	0.0045	0.1720	0.1542	0.1631	21-JUN-10	Mon	9:30	5.52	0.20	5.54	0.14
18-MAY-10 Continue to 182 days	Tue	9:30	17-JUL-10	2.92	1.45	96	96.87	0.0054	0.0049	0.1582	0.1186	0.1384	15-JUN-10	Tue	9:30	2.23	1.06	2.09	0.97
19-MAY-10 Continue to 183 days	Wed	9:30	17-JUL-10	2.17	2.39	96	95.47	0.0053	0.0060	0.1578	0.1382	0.1480	16-JUN-10	Wed	9:30	2.30	1.15	2.04	0.91
20-MAY-10 Continue to 184 days	Thu	9:30	17-JUL-10	1.58	3.63	96	94.84	0.0071	0.0046	0.1402	0.1972	0.1687	17-JUN-10	Thu	9:30	2.84	1.14	2.26	0.79
21-MAY-10 Continue to 170 days	Fri	9:30	17-JUL-10	2.12	3.35	94.5	94.10	0.0054	0.0033	0.1565	0.2107	0.1836	18-JUN-10	Fri	9:30	3.55	0.94	3.34	0.43
Panel B: Midday period (12:30-13:00)																			
24-MAY-10 Continue to 191 days	Mon	12:30	17-JUL-10	5.38	0.90	90	94.37	0.0050	0.0050	0.1870	0.1769	0.1820	21-JUN-10	Mon	12:30	8.29	0.06	7.92	0.05
18-MAY-10 Continue to 212 days	Tue	12:30	17-JUL-10	5.05	0.74	92.5	97.25	0.0054	0.0049	0.1141	0.1567	0.1354	15-JUN-10	Tue	12:30	4.90	0.20	4.92	0.26
19-MAY-10 Continue to 201 days	Wed	12:30	17-JUL-10	5.33	0.99	91	95.44	0.0053	0.0070	0.1663	0.1770	0.1716	16-JUN-10	Wed	12:30	6.24	0.22	6.78	0.13
20-MAY-10 Continue to 202 days	Thu	12:30	17-JUL-10	5.50	1.27	89.5	93.71	0.0071	0.0048	0.2033	0.1986	0.2010	17-JUN-10	Thu	12:30	8.18	0.16	7.68	0.08
21-MAY-10 Continue to 204 days	Fri	12:30	17-JUL-10	6.43	1.00	89	93.20	0.0071	0.0037	0.2800	0.1782	0.2291	18-JUN-10	Fri	12:30	8.46	0.24	8.58	0.05
Panel C: Closing period (15:30-16:00)																			
24-MAY-10 Continue to 184 days	Mon	15:30	17-JUL-10	5.33	0.88	90	94.36	0.0050	0.0052	0.1826	0.1745	0.1786	21-JUN-10	Mon	15:30	8.26	0.06	7.64	0.06
18-MAY-10 Continue to 200 days	Tue	15:30	17-JUL-10	4.75	0.93	92.5	97.08	0.0054	0.0064	0.0917	0.1699	0.1308	15-JUN-10	Tue	15:30	4.71	0.19	5.16	0.25
19-MAY-10 Continue to 186 days	Wed	15:30	17-JUL-10	6.00	0.82	90.5	95.13	0.0048	0.0076	0.2104	0.1669	0.1886	16-JUN-10	Wed	15:30	7.42	0.19	7.10	0.10
20-MAY-10 Continue to 194 days	Thu	15:30	17-JUL-10	5.73	1.16	89.5	93.95	0.0058	0.0029	0.2077	0.1946	0.2011	17-JUN-10	Thu	15:30	7.93	0.18	7.77	0.08
21-MAY-10 Continue to 183 days	Fri	15:30	17-JUL-10	5.30	1.20	90	94.59	0.0071	0.0037	0.1633	0.2009	0.1821	18-JUN-10	Fri	15:30	7.67	0.12	7.86	0.05

Notes: CAD, IR_CAD, IR_USD, IV_CADC, IV_CADP, IV_CAD, CADC_MOD, CADP_MOD, CADC_MKT, and CADP_MKT represents Canadian dollar, interest rate of CAD, interest rate of US dollar, implied volatility of CAD call options price, implied volatility of CAD put options price, implied volatility of CAD options [(IV_CADC + IV_CADP)/2], CAD call options model price, CAD put options market price, CAD put options model price, and CAD put options market price, respectively. The one-month estimate horizon indicates that the IV_CAD is calculated one-month before the date of estimating CADC_MOD and CADP_MOD.

Table A5.6c: Details of CAD options data for testing hypothesis 18
(Three-month maturity IV_CAD estimate CAD options price for one-month estimate horizon)

Trade date	Trade day	Trade Time	Expiry date	Call price	Put price	Strike price	Spot price	IR_CAD	IR_USD	IV_CADC	IV_CADP	IV_CAD	Estimate date	Estimate day	Estimate time	CADC_MOD	CADP_MOD	CADC_MKT	CADP_MKT
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
Panel A: Opening period (9:30-10:00)																			
26-APR-10 Continue to 193 days	Mon	9:30	17-JUL-10	2.82	1.30	98.5	100.02	0.0076	0.0040	0.1075	0.1032	0.1054	24-MAY-10	Mon	9:30	0.30	4.37	0.85	4.55
20-APR-10 Continue to 191 days	Tue	9:30	17-JUL-10	2.77	1.32	98.5	98.79	0.0068	0.0053	0.1366	0.0748	0.1057	18-MAY-10	Tue	9:30	0.97	2.62	1.53	2.58
21-APR-10 Continue to 196 days	Wed	9:30	17-JUL-10	3.06	1.22	98.5	100.54	0.0077	0.0036	0.0998	0.1054	0.1026	19-MAY-10	Wed	9:30	0.52	3.53	1.09	3.81
22-APR-10 Continue to 201 days	Thu	9:30	17-JUL-10	2.71	1.42	98.5	100.04	0.0080	0.0040	0.0987	0.1075	0.1031	20-MAY-10	Thu	9:30	0.37	4.08	0.79	5.33
23-APR-10 Continue to 197 days	Fri	9:30	17-JUL-10	2.49	1.59	98.5	100.15	0.0048	0.0040	0.0803	0.1212	0.1007	21-MAY-10	Fri	9:30	0.24	4.65	0.78	5.85
Panel B: Midday period (12:30-13:00)																			
19-APR-10 Continue to 326 days	Mon	12:30	17-JUL-10	5.15	0.58	93.5	98.13	0.0070	0.0054	0.1119	0.1129	0.1124	17-MAY-10	Mon	12:30	3.54	0.67	3.83	1.24
20-APR-10 Continue to 325 days	Tue	12:30	17-JUL-10	6.50	0.33	94	98.77	0.0043	0.0054	0.1915	0.0947	0.1431	18-MAY-10	Tue	12:30	4.19	0.96	3.90	1.13
21-APR-10 Continue to 323 days	Wed	12:30	17-JUL-10	5.27	0.54	95.5	100.42	0.0080	0.0054	0.1028	0.1128	0.1078	19-MAY-10	Wed	12:30	1.64	1.66	2.29	2.45
22-APR-10 Continue to 315 days	Thu	12:30	17-JUL-10	5.35	0.51	95	99.94	0.0050	0.0058	0.1035	0.1131	0.1083	20-MAY-10	Thu	12:30	1.04	2.39	2.05	3.33
23-APR-10 Continue to 313 days	Fri	12:30	17-JUL-10	5.15	0.55	95	99.64	0.0063	0.0040	0.1129	0.1117	0.1123	21-MAY-10	Fri	12:30	0.90	2.75	2.38	2.83
Panel C: Closing period (15:30-16:00)																			
19-APR-10 Continue to 322 days	Mon	15:30	17-JUL-10	5.55	0.49	93.5	98.24	0.0069	0.0054	0.1346	0.1077	0.1212	17-MAY-10	Mon	15:30	3.57	0.81	4.15	1.07
20-APR-10 Continue to 323 days	Tue	15:30	17-JUL-10	5.10	0.55	95.5	100.23	0.0053	0.0054	0.0967	0.1108	0.1038	18-MAY-10	Tue	15:30	2.54	0.94	2.62	1.82
21-APR-10 Continue to 318 days	Wed	15:30	17-JUL-10	5.00	0.58	95.5	100.05	0.0078	0.0054	0.1055	0.1108	0.1081	19-MAY-10	Wed	15:30	1.49	1.82	2.44	2.25
22-APR-10 Continue to 317 days	Thu	15:30	17-JUL-10	5.50	0.49	95	99.84	0.0079	0.0058	0.1264	0.1087	0.1176	20-MAY-10	Thu	15:30	1.28	2.36	2.16	3.13
23-APR-10 Continue to 313 days	Fri	15:30	17-JUL-10	5.50	0.48	95	99.66	0.0063	0.0048	0.1364	0.1066	0.1215	21-MAY-10	Fri	15:30	1.59	2.06	2.05	2.93

Notes: CAD, IR_CAD, IR_USD, IV_CADC, IV_CADP, IV_CAD, CADC_MOD, CADP_MOD, CADC_MKT, and CADP_MKT represents Canadian dollar, interest rate of CAD, interest rate of US dollar, implied volatility of CAD call options price, implied volatility of CAD put options price, implied volatility of CAD options [(IV_CADC + IV_CADP)/2], CAD call options model price, CAD put options market price, CAD put options model price, and CAD put options market price, respectively. The one-month estimate horizon indicates that the IV_CAD is calculated one-month before the date of estimating CADC_MOD and CADP_MOD.

Table A5.7a: Details of CHF options data for testing hypothesis 10
(One-month maturity IV_CHF estimate CHF options price for within-week estimate horizon)

Trade date	Trade day	Trade Time	Expiry date	Call price	Put price	Strike price	Spot price	IR_CHF	IR_USD	IV_CHFC	IV_CHFP	IV_CHF	Estimate date	Estimate day	Estimate time	CHFC_MOD	CHFP_MOD	CHFC_MKT	CHFP_MKT
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
Panel A: Opening price (9:30-10:00)																			
21-JUN-10 Continue to 208 days	Mon	10:0	17-JUL-10	1.13	0.95	90	90.15	0.0020	0.0056	0.1081	0.1079	0.1080	25-JUN-10	Fri	10:0	1.36	0.64	1.58	0.54
22-JUN-10 Continue to 153 days	Tue	9:30	17-JUL-10	1.27	0.85	90	90.13	0.0011	0.0040	0.1265	0.0981	0.1123	25-JUN-10	Fri	9:30	1.47	0.63	1.58	0.54
23-JUN-10 Continue to 165 days	Wed	9:30	17-JUL-10	1.04	0.96	90	90.31	0.0014	0.0070	0.0925	0.1218	0.1071	25-JUN-10	Fri	9:30	1.43	0.59	1.58	0.54
24-JUN-10 Continue to 126 days	Thu	9:30	17-JUL-10	1.36	0.66	90	90.53	0.0016	0.0056	0.1174	0.1007	0.1090	25-JUN-10	Fri	9:30	1.44	0.60	1.58	0.54
Panel B: Midday price (12:30-13:00)																			
28-JUN-10 Continue to 137 days	Mon	12:40	17-JUL-10	1.79	0.39	90.5	92.23	0.0012	0.0039	0.0587	0.1239	0.0913	02-JUL-10	Fri	12:40	3.46	0.01	3.54	0.08
31-AUG-10 Continue to 154 days	Tue	12:30	18-SEP-10	4.00	0.11	94.5	98.18	0.0043	0.0033	0.1755	0.1269	0.1512	03-SEP-10	Fri	12:30	3.60	0.18	3.77	0.05
04-AUG-10 Continue to 171 days	Wed	12:35	21-AUG-10	0.61	1.08	95.5	96.04	0.0033	0.0027	0.0302	0.1609	0.0956	06-AUG-10	Fri	12:35	0.88	0.62	1.38	0.42
17-JUN-10 Continue to 145 days	Thu	12:30	17-JUL-10	4.43	0.14	85.5	89.77	0.0014	0.0072	0.1245	0.1282	0.1264	18-JUN-10	Fri	12:30	4.63	0.10	4.67	0.10
Panel C: Closing price (15:30-16:00)																			
28-JUN-10 Continue to 136 days	Mon	16:00	17-JUL-10	1.89	0.49	91.5	93.35	0.0012	0.0039	0.0553	0.1424	0.0989	02-JUL-10	Fri	16:00	1.88	0.44	2.54	0.48
22-JUN-10 Continue to 141 days	Tue	16:00	17-JUL-10	3.06	0.21	87.5	90.46	0.0013	0.0057	0.0904	0.1202	0.1053	25-JUN-10	Fri	16:0	3.90	0.05	4.10	0.08
25-AUG-10 Continue to 166 days	Wed	15:30	18-SEP-10	2.91	0.32	94.5	97.29	0.0012	0.0029	0.0902	0.1270	0.1086	27-AUG-10	Fri	15:30	3.04	0.17	2.93	0.26
17-JUN-10 Continue to 248 days	Thu	15:30	17-JUL-10	4.59	0.29	87.5	91.75	0.0014	0.0072	0.1574	0.1558	0.1566	18-JUN-10	Fri	15:30	4.38	0.11	4.67	0.10

Notes: CHF, IR_CHF, IR_USD, IV_CHFC, IV_CHFP, IV_CHF, CHFC_MOD, CHFP_MOD, CHFP_MKT and CHFP_MKT represents Swiss Franc, interest rate of CHF, interest rate of US dollar, implied volatility of CHF call options price, implied volatility of CHF put options price, implied volatility of CHF options [(IV_CHFC + IV_CHFP)/2], CHF call options model price, CHF put options model price, CHF call options market price, CHF put options market price, respectively. The within-week estimate horizon indicates that the IV_CHF is calculated one day to four days before the date of estimating CHFC_MOD and CHFP_MOD.

Table A5.7b: Details of CHF options data for testing hypothesis 11
(Two-month maturity IV_CHF estimate CHF options price for within-week estimate horizon)

Trade date	Trade day	Trade Time	Expiry date	Call price	Put price	Strike price	Spot price	IR_CHF	IR_USD	IV_CHFC	IV_CHFP	IV_CHF	Estimate date	Estimate day	Estimate time	CHFC_MOD	CHFP_MOD	CHFC_MKT	CHFP_MKT
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
Panel A: Opening period (9:30-10:00)																			
19-JUL-10 Continue to 187 days	Mon	9:30	21-AUG-10	1.31	1.26	95	94.99	0.0021	0.0056	0.1137	0.1110	0.1124	23-JUL-10	Fri	9:30	1.65	0.84	1.22	1.14
20-JUL-10 Continue to 194 days	Tue	9:40	21-AUG-10	1.49	1.11	95	94.91	0.0036	0.0056	0.1361	0.0953	0.1157	23-JUL-10	Fri	9:40	1.72	0.86	1.27	1.12
21-JUL-10 Continue to 199 days	Wed	9:45	21-AUG-10	1.32	1.19	95	95.06	0.0019	0.0064	0.1151	0.1116	0.1134	23-JUL-10	Fri	9:45	1.73	0.81	1.27	1.12
29-JUL-10 Continue to 168 days	Thu	9:30	18-SEP-10	5.21	0.15	91	95.39	0.0031	0.0060	0.1702	0.0969	0.1336	30-JUL-10	Fri	9:30	5.39	0.32	5.22	0.16
Panel B: Midday period (12:30-13:00)																			
24-MAY-10 Continue to 283 days	Mon	12:30	17-JUL-10	4.64	0.46	82.5	86.33	0.0010	0.0050	0.1678	0.1354	0.1516	28-MAY-10	Fri	12:30	4.78	0.47	4.74	0.39
18-MAY-10 Continue to 321 days	Tue	13:0	17-JUL-10	4.60	0.45	84	88.42	0.0014	0.0049	0.0943	0.1363	0.1153	21-MAY-10	Fri	13:00	3.48	0.50	3.93	0.76
19-MAY-10 Continue to 327 days	Wed	12:55	17-JUL-10	4.75	0.60	82.5	86.80	0.0010	0.0067	0.1298	0.1550	0.1424	21-MAY-10	Fri	12:55	4.97	0.43	5.18	0.49
20-MAY-10 Continue to 328 days	Thu	12:30	17-JUL-10	4.55	0.70	83	86.95	0.0010	0.0048	0.1424	0.1576	0.1500	21-MAY-10	Fri	12:30	4.46	0.65	4.81	0.56
Panel C: Closing period (15:30-16:00)																			
24-MAY-10 Continue to 285 days	Mon	15:30	17-JUL-10	4.44	0.44	82.5	86.44	0.0008	0.0052	0.1367	0.1360	0.1364	28-MAY-10	Fri	15:30	4.35	0.41	4.39	0.44
18-MAY-10 Continue to 321 days	Tue	13:0	17-JUL-10	4.60	0.45	84	88.42	0.0014	0.0049	0.0943	0.1363	0.1153	21-MAY-10	Fri	13:00	3.48	0.50	3.93	0.76
19-MAY-10 Continue to 327 days	Wed	12:55	17-JUL-10	4.75	0.60	82.5	86.80	0.0010	0.0067	0.1298	0.1550	0.1424	21-MAY-10	Fri	12:55	4.97	0.43	5.18	0.49
20-MAY-10 Continue to 328 days	Thu	12:30	17-JUL-10	4.55	0.70	83	86.95	0.0010	0.0048	0.1424	0.1576	0.1500	21-MAY-10	Fri	12:30	4.46	0.65	4.81	0.56

Notes: CHF, IR_CHF, IR_USD, IV_CHFC, IV_CHFP, IV_CHF, CHFC_MOD, CHFP_MOD, CHFP_MKT and CHFP_MKT represents Swiss Franc, interest rate of CHF, interest rate of US dollar, implied volatility of CHF call options price, implied volatility of CHF put options price, implied volatility of CHF options [(IV_CHFC + IV_CHFP)/2], CHF call options model price, CHF put options model price, CHF call options market price, CHF put options market price, respectively. The within-week estimate horizon indicates that the IV_CHF is calculated one day to four days before the date of estimating CHFC_MOD and CHFP_MOD.

Table A5.7c: Details of CHF options data for testing hypothesis 12
(Three-month maturity IV_CHF estimate CHF options price for within-week estimate horizon)

Trade date	Trade day	Trade Time	Expiry date	Call price	Put price	Strike price	Spot price	IR_CHF	IR_USD	IV_CHFC	IV_CHFP	IV_CHF	Estimate date	Estimate day	Estimate time	CHFC_MOD	CHFP_MOD	CHFC_MKT	CHFP_MKT
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
Panel A: Opening period (9:30-10:00)																			
28-JUN-10 Continue to 146 days	Mon	9:45	18-SEP-10	3.86	0.83	89.5	92.01	0.0025	0.0090	0.1341	0.1082	0.1211	02-JUL-10	Fri	9:45	5.05	0.53	5.19	0.53
29-JUN-10 Continue to 135 days	Tue	9:30	18-SEP-10	3.69	0.96	89.5	91.95	0.0022	0.0090	0.1266	0.1169	0.1218	02-JUL-10	Fri	9:30	4.93	0.57	5.16	0.55
30-JUN-10 Continue to 141 days	Wed	9:45	18-SEP-10	3.91	0.85	89.5	92.48	0.0023	0.0092	0.1164	0.1202	0.1183	02-JUL-10	Fri	9:45	5.02	0.50	5.19	0.53
01-JUL-10 Continue to 143 days	Thu	9:30	18-SEP-10	5.00	0.58	89.5	93.33	0.0021	0.0090	0.1501	0.1154	0.1327	02-JUL-10	Fri	9:30	5.07	0.70	5.16	0.55
Panel B: Midday period (12:30-13:00)																			
19-APR-10 Continue to 350 days	Mon	12:30	17-JUL-10	5.40	0.44	89	93.61	0.0024	0.0054	0.1317	0.1079	0.1198	23-APR-10	Fri	12:30	4.49	0.73	4.79	0.57
20-APR-10 Continue to 347 days	Tue	12:30	17-JUL-10	4.75	0.49	89.5	94.01	0.0031	0.0054	0.0821	0.1105	0.0963	23-APR-10	Fri	12:30	3.80	0.54	4.35	0.64
21-APR-10 Continue to 348 days	Wed	12:30	17-JUL-10	4.98	0.45	89	93.42	0.0031	0.0054	0.1124	0.1070	0.1097	23-APR-10	Fri	12:30	4.36	0.60	4.79	0.57
22-APR-10 Continue to 349 days	Thu	12:30	17-JUL-10	4.92	0.52	88.5	93.06	0.0030	0.0058	0.0971	0.1165	0.1068	23-APR-10	Fri	12:30	4.72	0.46	5.19	0.49
Panel C: Closing period (15:30-16:00)																			
19-APR-10 Continue to 351 days	Mon	15:30	17-JUL-10	5.45	1.04	89.5	92.5	0.0024	0.0054	0.2078	0.1255	0.1666	23-APR-10	Fri	15:30	4.15	1.70	4.39	1.57
20-APR-10 Continue to 349 days	Tue	15:30	17-JUL-10	4.80	1.44	91	94.01	0.0031	0.0054	0.1674	0.1491	0.1582	23-APR-10	Fri	15:30	4.18	1.75	4.25	1.64
21-APR-10 Continue to 348 days	Wed	15:30	17-JUL-10	4.54	1.52	90	93.42	0.0031	0.0054	0.1358	0.1644	0.1501	23-APR-10	Fri	15:30	4.18	1.36	4.49	1.57
22-APR-10 Continue to 355 days	Thu	15:30	17-JUL-10	4.94	0.50	89.5	94.06	0.0030	0.0058	0.0980	0.1140	0.1060	23-APR-10	Fri	15:30	4.92	1.00	5.19	0.89

Notes: CHF, IR_CHF, IR_USD, IV_CHFC, IV_CHFP, IV_CHF, CHFC_MOD, CHFP_MOD, CHFP_MKT and CHFP_MKT represents Swiss Franc, interest rate of CHF, interest rate of US dollar, implied volatility of CHF call options price, implied volatility of CHF put options price, implied volatility of CHF options [(IV_CHFC + IV_CHFP)/2], CHF call options model price, CHF put options model price, CHF call options market price, CHF put options market price, respectively. The within-week estimate horizon indicates that the IV_CHF is calculated one day to four days before the date of estimating CHFC_MOD and CHFP_MOD.

Table A5.8a: Details of CHF options data for testing hypothesis 13
(One-month maturity IV_CHF estimate CHF options price for one-week estimate horizon)

Trade date	Trade day	Trade Time	Expiry date	Call price	Put price	Strike price	Spot price	IR_CHF	IR_USD	IV_CHFC	IV_CHFP	IV_CHF	Estimate date	Estimate day	Estimate time	CHFC_MOD	CHFP_MOD	CHFC_MKT	CHFP_MKT
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
Panel A: Opening period (9:30-10:00)																			
21-JUN-10 Continue to 110 days	Mon	10:0	17-JUL-10	1.13	0.95	90	90.15	0.0020	0.0056	0.1081	0.1079	0.1080	28-JUN-10	Mon	10:0	2.30	0.21	2.60	0.21
22-JUN-10 Continue to 118 days	Tue	9:30	17-JUL-10	1.27	0.85	90	90.13	0.0011	0.0040	0.1265	0.0981	0.1123	29-JUN-10	Tue	9:30	2.21	0.24	2.37	0.26
23-JUN-10 Continue to 119 days	Wed	9:30	17-JUL-10	1.04	0.96	90	90.31	0.0014	0.0070	0.0925	0.1218	0.1071	30-JUN-10	Wed	9:30	2.79	0.10	2.60	0.18
24-JUN-10 Continue to 129 days	Thu	9:30	17-JUL-10	1.36	0.66	90	90.53	0.0016	0.0056	0.1174	0.1007	0.1090	01-JUL-10	Thu	9:30	3.39	0.05	3.88	0.07
25-JUN-10 Continue to 123 days	Fri	9:30	17-JUL-10	1.58	0.54	90	90.82	0.0011	0.0043	0.1256	0.1007	0.1131	02-JUL-10	Fri	9:30	3.77	0.03	4.06	0.06
Panel B: Midday period (12:30-13:00)																			
28-JUN-10 Continue to 124 days	Mon	12:40	17-JUL-10	1.79	0.39	90.5	92.23	0.0012	0.0039	0.0587	0.1239	0.0913	05-JUL-10	Mon	12:40	3.44	0.01	3.49	0.08
03-AUG-10 Continue to 127 days	Tue	12:50	21-AUG-10	3.44	0.08	93	96.38	0.0034	0.0038	0.1025	0.1121	0.1073	10-AUG-10	Tue	12:50	1.64	0.20	1.92	0.18
23-JUN-10 Continue to 125 days	Wed	12:30	17-JUL-10	2.04	0.96	91	92.31	0.0014	0.0070	0.1340	0.1642	0.1491	30-JUN-10	Wed	12:30	1.58	0.56	1.60	0.68
24-JUN-10 Continue to 143 days	Thu	12:30	17-JUL-10	2.36	1.66	91.5	92.10	0.0016	0.0056	0.2213	0.2128	0.2170	01-JUL-10	Thu	12:30	1.24	0.70	1.88	0. 72
25-JUN-10 Continue to 129 days	Fri	12:30	17-JUL-10	1.78	1.54	91	91.82	0.0011	0.0043	0.1474	0.2156	0.1815	02-JUL-10	Fri	12:30	1.40	0.57	1.06	0.46
Panel C: Closing period (15:30-16:00)																			
21-JUN-10 Continue to 119 days	Mon	15:30	17-JUL-10	1.88	0.49	88.5	90.32	0.0013	0.0044	0.0513	0.1244	0.0879	28-JUN-10	Mon	15:30	3.69	0.01	3.65	0.08
03-AUG-10 Continue to 112 days	Tue	15:30	21-AUG-10	3.30	0.08	93	96.23	0.0035	0.0029	0.1060	0.1083	0.1071	10-AUG-10	Tue	15:30	1.70	0.19	2.54	0.10
04-AUG-10 Continue to 117 days	Wed	15:30	21-AUG-10	2.24	0.19	93	95.12	0.0033	0.0029	0.0914	0.1061	0.0987	11-AUG-10	Wed	15:30	1.60	0.14	1.82	0.18
17-JUN-10 Continue to 128 days	Thu	15:30	17-JUL-10	4.51	0.13	85.5	89.83	0.0016	0.0040	0.1356	0.1265	0.1311	24-JUN-10	Thu	15:30	5.29	0.04	5.29	0.05
06-AUG-10 Continue to 125 days	Fri	15:40	21-AUG-10	2.04	0.21	94.5	96.44	0.0030	0.0062	0.0818	0.1096	0.0957	13-AUG-10	Fri	15:40	0.86	0.30	0.87	0.38

Notes: CHF, IR_CHF, IR_USD, IV_CHFC, IV_CHFP, IV_CHF, CHFC_MOD, CHFP_MOD, CHFP_MKT and CHFP_MKT represents Swiss Franc, interest rate of CHF, interest rate of US dollar, implied volatility of CHF call options price, implied volatility of CHF put options price, implied volatility of CHF options [(IV_CHFC + IV_CHFP)/2], CHF call options model price, CHF put options model price, CHF call options market price, CHF put options market price, respectively. The one-week estimate horizon indicates that the IV_CHF is calculated one-week before the date of estimating CHFC_MOD and CHFP_MOD.

Table A5.8b: Details of CHF options data for testing hypothesis 14
(Two-month maturity IV_CHF estimate CHF options price for one-week estimate horizon)

Trade date	Trade day	Trade Time	Expiry date	Call price	Put price	Strike price	Spot price	IR_CHF	IR_USD	IV_CHFC	IV_CHFP	IV_CHF	Estimate date	Estimate day	Estimate time	CHFC_MOD	CHFP_MOD	CHFC_MKT	CHFP_MKT
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
Panel A: Opening period (9:30-10:00)																			
19-JUL-10 Continue to 157 days	Mon	9:30	21-AUG-10	1.31	1.26	95	94.99	0.0021	0.0056	0.1137	0.1110	0.1124	26-JUL-10	Mon	9:30	1.10	1.17	1.32	0.91
20-JUL-10 Continue to 180 days	Tue	9:40	21-AUG-10	1.49	1.11	95	94.91	0.0036	0.0056	0.1361	0.0953	0.1157	27-JUL-10	Tue	9:40	0.92	1.41	0.72	1.32
21-JUL-10 Continue to 182 days	Wed	9:45	21-AUG-10	1.32	1.19	95	95.06	0.0019	0.0064	0.1151	0.1116	0.1134	28-JUL-10	Wed	9:45	0.83	1.41	0.80	1.08
29-JUL-10 Continue to 161 days	Thu	9:30	18-SEP-10	5.21	0.15	91	95.39	0.0031	0.0060	0.1702	0.0969	0.1336	05-AUG-10	Thu	9:30	4.98	0.31	4.88	0.18
06-AUG-10 Continue to 170 days	Fri	9:35	18-SEP-10	5.50	0.10	91	95.47	0.0038	0.0066	0.2093	0.0966	0.1530	13-AUG-10	Fri	9:35	4.51	0.44	4.32	0.21
Panel B: Midday period (12:30-13:00)																			
24-MAY-10 Continue to 275 days	Mon	12:30	17-JUL-10	4.64	0.46	82.5	86.33	0.0010	0.0050	0.1678	0.1354	0.1516	31-MAY-10	Mon	12:30	4.55	0.47	4.37	0.44
18-MAY-10 Continue to 301 days	Tue	13:0	17-JUL-10	4.60	0.45	84	88.42	0.0014	0.0049	0.0943	0.1363	0.1153	25-MAY-10	Tue	13:00	2.50	0.78	3.10	0.81
19-MAY-10 Continue to 288 days	Wed	12:55	17-JUL-10	4.75	0.60	82.5	86.80	0.0010	0.0067	0.1298	0.1550	0.1424	26-MAY-10	Wed	12:55	4.49	0.47	4.40	0.48
20-MAY-10 Continue to 281 days	Thu	12:30	17-JUL-10	4.55	0.70	83	86.95	0.0010	0.0048	0.1424	0.1576	0.1500	27-MAY-10	Thu	12:30	4.20	0.62	4.39	0.49
06-AUG-10 Continue to 274 days	Fri	12:35	18-SEP-10	5.20	0.30	90	94.47	0.0038	0.0066	0.1806	0.1321	0.1563	13-AUG-10	Fri	12:35	5.30	0.26	5.32	0.21
Panel C: Closing period (15:30-16:00)																			
24-MAY-10 Continue to 271 days	Mon	15:30	17-JUL-10	4.44	0.44	82.5	86.44	0.0008	0.0052	0.1367	0.1360	0.1364	31-MAY-10	Mon	15:30	4.47	0.35	4.37	0.44
18-MAY-10 Continue to 296 days	Tue	16:0	17-JUL-10	3.17	0.87	85	88.06	0.0014	0.0065	0.0540	0.1476	0.1008	25-MAY-10	Tue	16:00	2.11	0.74	2.63	0.98
19-MAY-10 Continue to 275 days	Wed	15:30	17-JUL-10	4.93	0.56	82.5	86.52	0.0013	0.0076	0.1712	0.1453	0.1583	26-MAY-10	Wed	15:30	4.40	0.67	4.35	0.49
20-MAY-10 Continue to 281 days	Thu	15:30	17-JUL-10	4.90	0.66	83	87.04	0.0013	0.0029	0.1718	0.1549	0.1633	27-MAY-10	Thu	15:30	4.35	0.74	4.36	0.49
21-MAY-10 Continue to 263 days	Fri	15:30	17-JUL-10	4.67	0.52	83	86.97	0.0012	0.0037	0.1558	0.1400	0.1479	28-MAY-10	Fri	15:30	4.06	0.61	3.96	0.52

Notes: CHF, IR_CHF, IR_USD, IV_CHFC, IV_CHFP, IV_CHF, CHFC_MOD, CHFP_MOD, CHFP_MKT and CHFP_MKT represents Swiss Franc, interest rate of CHF, interest rate of US dollar, implied volatility of CHF call options price, implied volatility of CHF put options price, implied volatility of CHF options [(IV_CHFC + IV_CHFP)/2], CHF call options model price, CHF put options model price, CHF call options market price, CHF put options market price, respectively. The one-week estimate horizon indicates that the IV_CHF is calculated one-week before the date of estimating CHFC_MOD and CHFP_MOD.

Table A5.8c: Details of CHF options data for testing hypothesis 15
(Three-month maturity IV_CHF estimate CHF options price for one-week estimate horizon)

Trade date	Trade day	Trade Time	Expiry date	Call price	Put price	Strike price	Spot price	IR_CHF	IR_USD	IV_CHFC	IV_CHFP	IV_CHF	Estimate date	Estimate day	Estimate time	CHFC_MOD	CHFP_MOD	CHFC_MKT	CHFP_MKT
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
Panel A: Opening period (9:30-10:00)																			
24-MAY-10 Continue to 150 days	Mon	9:35	21-AUG-10	5.25	0.70	82	86.26	0.0013	0.0052	0.1514	0.1342	0.1428	31-MAY-10	Mon	9:35	5.21	0.69	5.20	0.68
29-JUN-10 Continue to 133 days	Tue	9:30	18-SEP-10	3.69	0.96	89.5	91.95	0.0022	0.0090	0.1266	0.1169	0.1218	06-JUL-10	Tue	9:30	5.29	0.45	5.03	0.44
30-JUN-10 Continue to 135 days	Wed	9:45	18-SEP-10	3.91	0.85	89.5	92.48	0.0023	0.0092	0.1164	0.1202	0.1183	07-JUL-10	Wed	9:45	5.42	0.38	5.61	0.34
01-JUL-10 Continue to 140 days	Thu	9:30	18-SEP-10	5.00	0.58	89.5	93.33	0.0021	0.0090	0.1501	0.1154	0.1327	08-JUL-10	Thu	9:30	6.05	0.42	6.08	0.27
25-JUN-10 Continue to 135 days	Fri	9:40	18-SEP-10	2.91	1.27	89.5	90.74	0.0022	0.0095	0.1237	0.1085	0.1161	02-JUL-10	Fri	9:40	4.95	0.49	5.15	0.55
Panel B: Midday period (12:30-13:00)																			
24-MAY-10 Continue to 343 days	Mon	12:35	21-AUG-10	5.35	0.74	82.5	86.36	0.0013	0.0052	0.1792	0.1301	0.1547	31-MAY-10	Mon	12:35	4.87	1.61	5.20	1.68
29-JUN-10 Continue to 340 days	Tue	12:30	18-SEP-10	3.79	0.94	89.0	91.5	0.0022	0.0090	0.1317	0.1172	0.1245	06-JUL-10	Tue	12:30	3.62	1.70	3.03	1.44
30-JUN-10 Continue to 340 days	Wed	12:45	18-SEP-10	3.98	0.89	89.5	91.48	0.0023	0.0092	0.1657	0.1035	0.1346	07-JUL-10	Wed	12:45	3.11	1.90	3.61	1.34
01-JUL-10 Continue to 334 days	Thu	12:30	18-SEP-10	5.05	0.62	90.0	93.50	0.0021	0.0090	0.1692	0.1124	0.1408	08-JUL-10	Thu	12:30	4.66	1.42	5.08	1.27
23-APR-10 Continue to 329 days	Fri	12:45	17-JUL-10	5.57	0.41	88	92.60	0.0028	0.0040	0.1517	0.1081	0.1299	30-APR-10	Fri	12:45	5.48	0.53	5.20	0.42
Panel C: Closing period (15:30-16:00)																			
19-APR-10 Continue to 348 days	Mon	15:30	17-JUL-10	5.03	0.49	89.5	93.98	0.0025	0.0054	0.1097	0.1097	0.1097	26-APR-10	Mon	15:30	4.15	0.63	4.25	0.66
20-APR-10 Continue to 344 days	Tue	15:30	17-JUL-10	5.15	0.43	89	93.63	0.0031	0.0054	0.1120	0.1076	0.1098	27-APR-10	Tue	15:30	4.19	0.60	3.92	0.82
21-APR-10 Continue to 341 days	Wed	15:30	17-JUL-10	5.00	0.45	89	93.30	0.0031	0.0054	0.1223	0.1052	0.1138	28-APR-10	Wed	15:30	3.67	0.82	4.10	0.88
22-APR-10 Continue to 337 days	Thu	15:30	17-JUL-10	4.98	0.52	88.5	92.76	0.0030	0.0058	0.1236	0.1120	0.1178	29-APR-10	Thu	15:30	4.52	0.61	4.50	0.64
23-APR-10 Continue to 333 days	Fri	15:30	17-JUL-10	5.24	0.46	88.5	93.10	0.0028	0.0048	0.1244	0.1123	0.1183	30-APR-10	Fri	15:30	4.83	0.53	4.99	0.48

Notes: CHF, IR_CHF, IR_USD, IV_CHFC, IV_CHFP, IV_CHF, CHFC_MOD, CHFP_MOD, CHFP_MKT and CHFP_MKT represents Swiss Franc, interest rate of CHF, interest rate of US dollar, implied volatility of CHF call options price, implied volatility of CHF put options price, implied volatility of CHF options [(IV_CHFC + IV_CHFP)/2], CHF call options model price, CHF put options model price, CHF call options market price, CHF put options market price, respectively. The one-week estimate horizon indicates that the IV_CHF is calculated one-week before the date of estimating CHFC_MOD and CHFP_MOD.

Table A5.9a: Details of CHF options data for testing hypothesis 16
(One-month maturity IV_CHF estimate CHF options price for one-month estimate horizon)

Trade date	Trade day	Trade Time	Expiry date	Call price	Put price	Strike price	Spot price	IR_CHF	IR_USD	IV_CHFC	IV_CHFP	IV_CHF	Estimate date	Estimate day	Estimate time	CHFC_MOD	CHFP_MOD	CHFC_MKT	CHFP_MKT
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
Panel A: Opening period (9:30-10:00)																			
21-JUN-10 Continue to 96 days	Mon	10:0	17-JUL-10	1.23	0.85	90.5	90.55	0.0020	0.0056	0.1238	0.1958	0.1598	12-JUL-10	Mon	10:0	0.55	0.80	0.60	0.51
22-JUN-10 Continue to 84 days	Tue	9:30	17-JUL-10	2.27	1.85	91.0	91.13	0.0011	0.0040	0.2310	0.2023	0.2166	13-JUL-10	Tue	9:30	0.95	0.70	1.37	0.56
23-JUN-10 Continue to 92 days	Wed	9:30	17-JUL-10	3.04	1.96	91.5	92.31	0.0014	0.0070	0.2763	0.2509	0.2636	14-JUL-10	Wed	9:30	1.38	0.49	2.60	0.18
17-JUN-10 Continue to 90 days	Thu	9:30	17-JUL-10	2.36	1.86	91.0	90.53	0.0016	0.0056	0.2481	0.1571	0.2026	07-JUL-10	Thu	9:30	1.27	1.19	1.88	1.07
18-JUN-10 Continue to 88 days	Fri	9:30	17-JUL-10	2.58	1.54	90.5	91.82	0.0011	0.0043	0.1786	0.2093	0.1940	08-JUL-10	Fri	9:30	1.82	0.65	1.06	0.66
Panel B: Midday period (12:30-13:00)																			
21-JUN-10 Continue to 121 days	Mon	12:40	17-JUL-10	2.79	1.39	91.5	93.23	0.0012	0.0039	0.1812	0.2189	0.2000	12-JUL-10	Mon	12:40	1.94	0.32	1.49	0.28
22-JUN-10 Continue to 117 days	Tue	12:50	21-AUG-10	4.44	1.08	93	96.38	0.0034	0.0038	0.1551	0.1570	0.1561	13-JUL-10	Tue	12:50	4.06	0.70	3.92	0.68
23-JUN-10 Continue to 128 days	Wed	12:30	17-JUL-10	2.04	0.96	91	92.31	0.0014	0.0070	0.1340	0.1642	0.1491	14-JUL-10	Wed	12:30	1.38	0.12	1.60	0.28
17-JUN-10 Continue to 141 days	Thu	12:30	17-JUL-10	2.36	1.66	91.5	92.10	0.0016	0.0056	0.1934	0.1866	0.1900	07-JUL-10	Thu	12:30	1.50	0.85	1.88	0. 72
18-JUN-10 Continue to 121 days	Fri	12:30	17-JUL-10	1.78	1.54	91	91.82	0.0011	0.0043	0.1280	0.1881	0.1580	08-JUL-10	Fri	12:30	1.22	0.71	1.06	0.56
Panel C: Closing period (15:30-16:00)																			
21-JUN-10 Continue to 118 days	Mon	15:30	17-JUL-10	2.88	1.49	89.5	90.32	0.0013	0.0044	0.2547	0.1965	0.2256	12-JUL-10	Mon	15:30	1.53	0.48	1.65	0.38
22-JUN-10 Continue to 134 days	Tue	15:30	21-AUG-10	3.31	1.08	93.5	95.23	0.0035	0.0029	0.1541	0.1188	0.1364	13-JUL-10	Tue	15:30	2.88	0.76	2.54	0.70
23-JUN-10 Continue to 124 days	Wed	15:30	21-AUG-10	3.24	1.19	93.5	96.12	0.0033	0.0029	0.1058	0.1487	0.1272	14-JUL-10	Wed	15:30	2.00	0.80	1.82	0.68
17-JUN-10 Continue to 113 days	Thu	15:30	17-JUL-10	4.51	1.13	86.5	89.83	0.0016	0.0040	0.2467	0.2429	0.2448	07-JUL-10	Thu	15:30	3.68	0.33	3.29	0.35
18-JUN-10 Continue to 120 days	Fri	15:40	21-AUG-10	3.04	1.21	93.5	95.44	0.0030	0.0062	0.1192	0.1303	0.1247	08-JUL-10	Fri	15:40	2.74	0.89	2.87	0.68

Notes: CHF, IR_CHF, IR_USD, IV_CHFC, IV_CHFP, IV_CHF, CHFC_MOD, CHFP_MOD, CHFP_MKT and CHFP_MKT represents Swiss Franc, interest rate of CHF, interest rate of US dollar, implied volatility of CHF call options price, implied volatility of CHF put options price, implied volatility of CHF options [(IV_CHFC + IV_CHFP)/2], CHF call options model price, CHF put options model price, CHF call options market price, CHF put options market price, respectively. The one-month estimate horizon indicates that the IV_CHF is calculated one-month before the date of estimating CHFC_MOD and CHFP_MOD.

Table A5.9b: Details of CHF options data for testing hypothesis 17
(Two-month maturity IV_CHF estimate CHF options price for one-month estimate horizon)

Trade date	Trade day	Trade Time	Expiry date	Call price	Put price	Strike price	Spot price	IR_CHF	IR_USD	IV_CHFC	IV_CHFP	IV_CHF	Estimate date	Estimate day	Estimate time	CHFC_MOD	CHFP_MOD	CHFC_MKT	CHFP_MKT
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
Panel A: Opening period (9:30-10:00)																			
19-JUL-10 Continue to 86 days	Mon	9:30	21-AUG-10	1.31	1.26	95	94.99	0.0021	0.0056	0.1137	0.1110	0.1124	16-AUG-10	Mon	9:30	1.25	0.13	1.41	0.16
20-JUL-10 Continue to 88 days	Tue	9:40	21-AUG-10	1.49	1.11	95	94.91	0.0036	0.0056	0.1361	0.0953	0.1157	17-AUG-10	Tue	9:40	1.13	0.12	1.17	0.16
21-JUL-10 Continue to 99 days	Wed	9:45	21-AUG-10	1.32	1.19	95	95.06	0.0019	0.0064	0.1151	0.1116	0.1134	18-AUG-10	Wed	9:45	1.11	0.07	1.18	0.09
26-AUG-10 Continue to 92 days	Thu	9:30	16-OCT-10	1.75	1.75	97.5	97.22	0.0022	0.0044	0.1290	0.1114	0.1202	23-SEP-10	Thu	9:30	3.83	0.16	4.38	0.12
27-AUG-10 Continue to 90 days	Fri	9:45	16-OCT-10	1.84	1.67	97.5	97.66	0.0025	0.0039	0.1211	0.1217	0.1214	24-SEP-10	Fri	9:45	4.34	0.10	4.61	0.10
Panel B: Midday period (12:30-13:00)																			
27-SEP-10 Continue to 111 days	Mon	12:30	20-NOV-10	5.10	0.37	97	101.79	0.0025	0.0021	0.1161	0.1215	0.1188	25-OCT-10	Mon	12:30	6.01	0.04	6.13	0.08
18-MAY-10 Continue to 127 days	Tue	13:0	17-JUL-10	4.60	0.45	84	88.42	0.0014	0.0049	0.0943	0.1363	0.1153	15-JUN-10	Tue	13:0	4.12	0.12	4.65	0.11
19-MAY-10 Continue to 138 days	Wed	12:55	17-JUL-10	4.75	0.60	82.5	86.80	0.0010	0.0067	0.1298	0.1550	0.1424	16-JUN-10	Wed	12:55	6.09	0.06	6.36	0.06
20-MAY-10 Continue to 131 days	Thu	12:30	17-JUL-10	4.55	0.70	83	86.95	0.0010	0.0048	0.1424	0.1576	0.1500	17-JUN-10	Thu	12:30	6.86	0.05	6.84	0.05
16-JUL-10 Continue to 131 days	Fri	12:30	21-AUG-10	1.61	1.01	94.5	95.94	0.0013	0.0062	0.0497	0.1377	0.0937	13-AUG-10	Fri	12:30	0.84	0.30	0.98	0.34
Panel C: Closing period (15:30-16:00)																			
27-SEP-10 Continue to 108 days	Mon	15:30	20-NOV-10	5.05	0.37	97	101.81	0.0023	0.0033	0.1054	0.1227	0.1141	25-OCT-10	Mon	15:30	6.08	0.03	6.13	0.08
18-MAY-10 Continue to 124 days	Tue	16:0	17-JUL-10	3.17	0.87	85	88.06	0.0014	0.0065	0.0540	0.1476	0.1008	15-JUN-10	Tue	16:0	3.58	0.11	3.60	0.19
19-MAY-10 Continue to 134 days	Wed	15:30	17-JUL-10	4.93	0.56	82.5	86.52	0.0013	0.0076	0.1712	0.1453	0.1583	16-JUN-10	Wed	15:30	6.39	0.09	6.07	0.07
20-MAY-10 Continue to 123 days	Thu	15:30	17-JUL-10	4.90	0.66	83	87.04	0.0013	0.0029	0.1718	0.1549	0.1633	17-JUN-10	Thu	15:30	6.95	0.07	6.93	0.05
24-SEP-10 Continue to 119 days	Fri	15:30	20-NOV-10	4.95	0.42	97	101.80	0.0031	0.0040	0.0898	0.1241	0.1069	22-OCT-10	Fri	15:30	5.48	0.04	5.36	0.13

Notes: CHF, IR_CHF, IR_USD, IV_CHFC, IV_CHFP, IV_CHF, CHFC_MOD, CHFP_MOD, CHFP_MKT and CHFP_MKT represents Swiss Franc, interest rate of CHF, interest rate of US dollar, implied volatility of CHF call options price, implied volatility of CHF put options price, implied volatility of CHF options [(IV_CHFC + IV_CHFP)/2], CHF call options model price, CHF put options model price, CHF call options market price, CHF put options market price, respectively. The one-month estimate horizon indicates that the IV_CHF is calculated one-month before the date of estimating CHFC_MOD and CHFP_MOD.

Table A5.9c: Details of CHF options data for testing hypothesis 18
(Three-month maturity IV_CHF estimate CHF options price for one-month estimate horizon)

Trade date	Trade day	Trade Time	Expiry date	Call price	Put price	Strike price	Spot price	IR_CHF	IR_USD	IV_CHFC	IV_CHFP	IV_CHF	Estimate date	Estimate day	Estimate time	CHFC_MOD	CHFP_MOD	CHFC_MKT	CHFP_MKT
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
Panel A: Opening period (9:30-10:00)																			
19-JUL-10 Continue to 109 days	Mon	9:30	18-SEP-10	4.52	0.41	91	94.99	0.0031	0.0073	0.1202	0.1138	0.1170	16-AUG-10	Mon	9:30	5.20	0.08	5.41	0.12
29-JUN-10 Continue to 110 days	Tue	9:30	18-SEP-10	3.69	0.96	89.5	91.95	0.0022	0.0090	0.1266	0.1169	0.1218	27-JUL-10	Tue	9:30	5.24	0.25	5.22	0.18
30-JUN-10 Continue to 109 days	Wed	9:45	18-SEP-10	3.91	0.85	89.5	92.48	0.0023	0.0092	0.1164	0.1202	0.1183	28-JUL-10	Wed	9:45	5.17	0.23	5.35	0.14
08-JUL-10 Continue to 110 days	Thu	9:30	18-SEP-10	4.78	0.45	91	95.00	0.0022	0.0095	0.1272	0.1103	0.1187	05-AUG-10	Thu	9:30	4.88	0.21	4.88	0.18
25-JUN-10 Continue to 106 days	Fri	9:40	18-SEP-10	2.91	1.27	89.5	90.74	0.0022	0.0095	0.1237	0.1085	0.1161	23-JUL-10	Fri	9:40	6.49	0.12	5.90	0.21
Panel B: Midday period (12:30-13:00)																			
19-APR-10 Continue to 276 days	Mon	12:30	17-JUL-10	5.40	0.44	89	93.61	0.0024	0.0054	0.1317	0.1079	0.1198	17-MAY-10	Mon	12:30	1.31	2.22	1.33	2.25
20-APR-10 Continue to 263 days	Tue	12:30	17-JUL-10	4.75	0.49	89.5	94.01	0.0031	0.0054	0.0821	0.1105	0.0963	18-MAY-10	Tue	12:30	0.95	1.93	1.07	2.29
21-APR-10 Continue to 265 days	Wed	12:30	17-JUL-10	4.98	0.45	89	93.42	0.0031	0.0054	0.1124	0.1070	0.1097	19-MAY-10	Wed	12:30	0.88	2.48	0.90	3.18
22-APR-10 Continue to 269 days	Thu	12:30	17-JUL-10	4.92	0.52	88.5	93.06	0.0030	0.0058	0.0971	0.1165	0.1068	20-MAY-10	Thu	12:30	0.86	2.36	1.24	2.88
23-APR-10 Continue to 260 days	Fri	12:45	17-JUL-10	5.57	0.41	88	92.60	0.0028	0.0040	0.1517	0.1081	0.1299	21-MAY-10	Fri	12:45	1.32	2.35	1.42	2.20
Panel C: Closing period (15:30-16:00)																			
19-APR-10 Continue to 266 days	Mon	15:30	17-JUL-10	5.03	0.49	89.5	93.98	0.0025	0.0054	0.1097	0.1097	0.1097	17-MAY-10	Mon	15:30	0.95	2.45	1.26	2.31
20-APR-10 Continue to 271 days	Tue	15:30	17-JUL-10	5.15	0.43	89	93.63	0.0031	0.0054	0.1120	0.1076	0.1098	18-MAY-10	Tue	15:30	1.27	1.91	0.96	2.70
21-APR-10 Continue to 265 days	Wed	15:30	17-JUL-10	5.00	0.45	89	93.30	0.0031	0.0054	0.1223	0.1052	0.1138	19-MAY-10	Wed	15:30	0.69	3.05	0.93	3.07
22-APR-10 Continue to 270 days	Thu	15:30	17-JUL-10	4.98	0.52	88.5	92.76	0.0030	0.0058	0.1236	0.1120	0.1178	20-MAY-10	Thu	15:30	1.03	2.45	1.40	2.68
23-APR-10 Continue to 261 days	Fri	15:30	17-JUL-10	5.24	0.46	88.5	93.10	0.0028	0.0048	0.1244	0.1123	0.1183	21-MAY-10	Fri	15:30	1.00	2.48	1.09	2.44

Notes: CHF, IR_CHF, IR_USD, IV_CHFC, IV_CHFP, IV_CHF, CHFC_MOD, CHFP_MOD, CHFP_MKT and CHFP_MKT represents Swiss Franc, interest rate of CHF, interest rate of US dollar, implied volatility of CHF call options price, implied volatility of CHF put options price, implied volatility of CHF options [(IV_CHFC + IV_CHFP)/2], CHF call options model price, CHF put options model price, CHF call options market price, CHF put options market price, respectively. The one-month estimate horizon indicates that the IV_CHF is calculated one-month before the date of estimating CHFC_MOD and CHFP_MOD.

Table A5.10a: Details of EUR options data for testing hypothesis 10
(One-month maturity IV_EUR estimate EUR options price for within-week estimate horizon)

Trade date	Trade day	Trade Time	Expiry date	Call price	Put price	Strike price	Spot price	IR_EUR	IR_USD	IV_EURC	IV_EURP	IV_EUR	Estimate date	Estimate day	Estimate time	EURC_MOD	EURP_MOD	EURC_MKT	EURP_MKT
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
Panel A: Opening period (9:30-10:00)																			
21-JUN-10 Continue to 211 days	Mon	9:30	17-JUL-10	4.76	0.44	119.5	123.95	0.0047	0.0042	0.1291	0.1449	0.1370	25-JUN-10	Fri	9:30	3.73	0.49	3.95	0.49
22-JUN-10 Continue to 224 days	Tue	9:30	17-JUL-10	6.21	0.24	117	122.89	0.0047	0.0040	0.1645	0.1495	0.1570	25-JUN-10	Fri	9:30	5.97	0.24	6.17	0.19
23-JUN-10 Continue to 248 days	Wed	9:30	17-JUL-10	3.66	0.65	119.5	122.82	0.0042	0.0070	0.1123	0.1499	0.1311	25-JUN-10	Fri	9:30	3.68	0.44	3.95	0.49
17-JUN-10 Continue to 294 days	Thu	9:30	17-JUL-10	5.05	0.58	119.5	123.69	0.0043	0.0072	0.1704	0.1454	0.1579	18-JUN-10	Fri	9:30	5.01	0.64	4.75	0.56
Panel B: Midday period (12:30-13:00)																			
21-JUN-10 Continue to 187 days	Mon	12:30	17-JUL-10	6.39	0.21	117.5	123.63	0.0043	0.0035	0.1558	0.1456	0.1507	25-JUN-10	Fri	12:30	5.61	0.25	6.20	0.17
22-JUN-10 Continue to 197 days	Tue	12:30	17-JUL-10	6.25	0.23	117	122.78	0.0047	0.0040	0.1829	0.1466	0.1648	25-JUN-10	Fri	12:30	6.13	0.27	6.68	0.14
23-JUN-10 Continue to 214 days	Wed	12:30	17-JUL-10	4.87	0.37	118	122.70	0.0044	0.0033	0.1198	0.1492	0.1345	25-JUN-10	Fri	12:30	5.07	0.21	5.74	0.21
17-JUN-10 Continue to 286 days	Thu	12:30	17-JUL-10	6.49	0.36	117.5	123.61	0.0043	0.0072	0.1577	0.1578	0.1577	18-JUN-10	Fri	12:30	6.50	0.33	6.47	0.28
Panel C: Closing period (15:30-16:00)																			
21-JUN-10 Continue to 199 days	Mon	15:30	17-JUL-10	2.70	1.03	121.5	123.93	0.0047	0.0044	0.0827	0.1539	0.1183	25-JUN-10	Fri	15:30	2.36	0.76	3.04	0.69
22-JUN-10 Continue to 196 days	Tue	15:30	17-JUL-10	6.35	1.33	117.5	122.18	0.0047	0.0040	0.2825	0.2500	0.2663	25-JUN-10	Fri	15:30	6.16	1.77	6.68	1.14
23-JUN-10 Continue to 214 days	Wed	15:30	17-JUL-10	4.97	0.29	118.5	121.70	0.0044	0.0033	0.2540	0.1068	0.1804	25-JUN-10	Fri	15:30	3.54	0.82	3.74	0.71
17-JUN-10 Continue to 296 days	Thu	15:30	17-JUL-10	6.49	0.46	117.0	121.20	0.0043	0.0072	0.2960	0.1363	0.2162	18-JUN-10	Fri	15:30	4.67	0.68	4.47	0.58

Notes: EUR, IR_EUR, IR_USD, IV_EURC, IV_EURP, IV_EUR, EURC_MOD, EURP_MOD, EURC_MKT, and EURP_MKT represents Euro, interest rate of EUR, interest rate of US dollar, implied volatility of EUR call options price, implied volatility of EUR put options price, implied volatility of EUR options [(IV_EURC + IV_EURP)/2], EUR call options model price, EUR put options model price, EUR call options market price, EUR put options market price, respectively. The within-week estimate horizon indicates that the IV_EUR is calculated one day to four days before the date of estimating EURC_MOD and EURP_MOD.

Table A5.10b: Details of EUR options data for testing hypothesis 11
(Two-month maturity IV_EUR estimate EUR options price for within-week estimate horizon)

Trade date	Trade day	Trade Time	Expiry date	Call price	Put price	Strike price	Spot price	IR_EUR	IR_USD	IV_EURC	IV_EURP	IV_EUR	Estimate date	Estimate day	Estimate time	EURC_MOD	EURP_MOD	EURC_MKT	EURP_MKT
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
Panel A: Opening period (9:30-10:00)																			
24-MAY-10 Continue to 301 days	Mon	9:30	17-JUL-10	5.51	1.59	120	124.17	0.0041	0.0045	0.1582	0.1739	0.1661	28-MAY-10	Fri	9:30	5.47	1.38	5.05	1.63
18-MAY-10 Continue to 339 days	Tue	9:30	17-JUL-10	5.65	1.31	120	123.84	0.0044	0.0049	0.1718	0.1435	0.1576	21-MAY-10	Fri	9:30	6.50	1.07	6.95	1.56
19-MAY-10 Continue to 337 days	Wed	9:30	17-JUL-10	4.93	2.05	120	121.83	0.0047	0.0060	0.2028	0.1488	0.1758	21-MAY-10	Fri	9:30	6.78	1.35	6.95	1.56
20-MAY-10 Continue to 314 days	Thu	9:30	17-JUL-10	5.70	1.99	120	123.88	0.0040	0.0046	0.1759	0.1858	0.1809	21-MAY-10	Fri	9:30	6.86	1.43	6.95	1.56
Panel B: Midday period (12:30-13:00)																			
24-MAY-10 Continue to 340 days	Mon	12:30	17-JUL-10	7.65	1.00	117.5	123.66	0.0039	0.0050	0.2046	0.1719	0.1883	28-MAY-10	Fri	12:30	7.24	1.14	7.20	1.00
18-MAY-10 Continue to 369 days	Tue	12:30	17-JUL-10	6.73	1.03	118	124.09	0.0047	0.0049	0.1347	0.1632	0.1490	21-MAY-10	Fri	12:30	7.78	0.59	8.88	1.09
19-MAY-10 Continue to 365 days	Wed	12:30	17-JUL-10	7.98	1.15	116.5	122.47	0.0047	0.0070	0.2259	0.1734	0.1997	21-MAY-10	Fri	12:30	9.62	0.94	10.19	0.88
20-MAY-10 Continue to 346 days	Thu	12:30	17-JUL-10	7.53	1.40	117.5	123.20	0.0052	0.0048	0.2126	0.1852	0.1989	21-MAY-10	Fri	12:30	8.82	1.13	9.30	1.01
Panel C: Closing period (15:30-16:00)																			
24-MAY-10 Continue to 345 days	Mon	15:30	17-JUL-10	7.55	1.05	117.5	122.66	0.0039	0.0050	0.2443	0.1598	0.2020	28-MAY-10	Fri	15:30	6.78	2.17	7.20	2.00
18-MAY-10 Continue to 372 days	Tue	15:30	17-JUL-10	6.54	1.35	118.5	124.67	0.0047	0.0049	0.1126	0.1849	0.1487	21-MAY-10	Fri	15:30	6.76	1.60	7.88	1.09
19-MAY-10 Continue to 364 days	Wed	15:30	17-JUL-10	7.60	1.24	117.5	123.20	0.0039	0.0076	0.2119	0.1746	0.1933	21-MAY-10	Fri	15:30	9.01	0.99	9.21	0.95
20-MAY-10 Continue to 351 days	Thu	15:30	17-JUL-10	8.73	1.29	118	123.82	0.0042	0.0029	0.2779	0.1789	0.2284	21-MAY-10	Fri	15:30	9.13	1.61	8.80	1.03

Notes: EUR, IR_EUR, IR_USD, IV_EURC, IV_EURP, IV_EUR, EURC_MOD, EURP_MOD, EURC_MKT, and EURP_MKT represents Euro, interest rate of EUR, interest rate of US dollar, implied volatility of EUR call options price, implied volatility of EUR put options price, implied volatility of EUR options [(IV_EURC + IV_EURP)/2], EUR call options model price, EUR put options model price, EUR call options market price, EUR put options market price, respectively. The within-week estimate horizon indicates that the IV_EUR is calculated one day to four days before the date of estimating EURC_MOD and EURP_MOD.

Table A5.10c: Details of EUR options data for testing hypothesis 12
(Three-month maturity IV_EUR estimate EUR options price for within-week estimate horizon)

Trade date	Trade day	Trade Time	Expiry date	Call price	Put price	Strike price	Spot price	IR_EUR	IR_USD	IV_EURC	IV_EURP	IV_EUR	Estimate date	Estimate day	Estimate time	EURC_MOD	EURP_MOD	EURC_MKT	EURP_MKT
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
Panel A: Opening period (9:30-10:00)																			
10-MAY-10 Continue to 237 days	Mon	9:30	17-JUL-10	5.95	1.62	125	130.61	0.0064	0.0078	0.0899	0.1725	0.1312	14-MAY-10	Fri	9:30	2.62	2.85	2.84	2.85
04-MAY-10 Continue to 224 days	Tue	9:30	17-JUL-10	2.27	3.64	132	131.37	0.0050	0.0040	0.1094	0.1398	0.1246	07-MAY-10	Fri	9:30	1.11	5.72	1.15	6.38
05-MAY-10 Continue to 229 days	Wed	9:30	17-JUL-10	5.15	1.85	125	129.87	0.0062	0.0065	0.0757	0.1674	0.1216	07-MAY-10	Fri	9:30	4.05	1.67	4.35	2.61
13-MAY-10 Continue to 238 days	Thu	9:30	17-JUL-10	4.68	1.70	122.5	125.66	0.0063	0.0048	0.1363	0.1441	0.1402	14-MAY-10	Fri	9:30	4.16	1.90	4.38	1.88
Panel B: Midday period (12:30-13:00)																			
19-APR-10 Continue to 357 days	Mon	12:30	17-JUL-10	7.43	0.88	128	134.29	0.0058	0.0054	0.1323	0.1179	0.1251	23-APR-10	Fri	12:30	6.18	1.28	6.78	1.09
20-APR-10 Continue to 347 days	Tue	12:30	17-JUL-10	6.89	0.94	128.5	134.76	0.0050	0.0054	0.1032	0.1213	0.1122	23-APR-10	Fri	12:30	5.55	1.15	6.38	1.19
21-APR-10 Continue to 348 days	Wed	12:30	17-JUL-10	7.29	0.80	127.5	133.84	0.0056	0.0054	0.1246	0.1158	0.1202	23-APR-10	Fri	12:30	6.45	1.05	7.18	0.99
22-APR-10 Continue to 349 days	Thu	12:30	17-JUL-10	6.98	1.00	127	133.32	0.0048	0.0058	0.1071	0.1283	0.1177	23-APR-10	Fri	12:30	6.79	0.88	7.60	0.90
Panel C: Closing period (15:30-16:00)																			
19-APR-10 Continue to 361 days	Mon	15:30	17-JUL-10	7.23	1.78	128.5	133.02	0.0058	0.0054	0.1803	0.1396	0.1600	23-APR-10	Fri	15:30	6.05	2.61	6.78	2.09
20-APR-10 Continue to 353 days	Tue	15:30	17-JUL-10	6.57	1.04	128	132.30	0.0050	0.0054	0.1594	0.1043	0.1319	23-APR-10	Fri	15:30	5.29	2.39	5.38	2.19
21-APR-10 Continue to 354 days	Wed	15:30	17-JUL-10	6.34	0.98	127	132.84	0.0056	0.0054	0.0938	0.1206	0.1072	23-APR-10	Fri	15:30	6.85	1.89	6.18	1.99
22-APR-10 Continue to 353 days	Thu	15:30	17-JUL-10	6.67	1.05	127.5	132.32	0.0048	0.0058	0.1498	0.1130	0.1314	23-APR-10	Fri	15:30	5.77	2.37	6.60	1.90

Notes: EUR, IR_EUR, IR_USD, IV_EURC, IV_EURP, IV_EUR, EURC_MOD, EURP_MOD, EURC_MKT, and EURP_MKT represents Euro, interest rate of EUR, interest rate of US dollar, implied volatility of EUR call options price, implied volatility of EUR put options price, implied volatility of EUR options [(IV_EURC + IV_EURP)/2], EUR call options model price, EUR put options model price, EUR call options market price, EUR put options market price, respectively. The within-week estimate horizon indicates that the IV_EUR is calculated one day to four days before the date of estimating EURC_MOD and EURP_MOD.

Table A5.11a: Details of EUR options data for testing hypothesis 13
(One-month maturity IV_EUR estimate EUR options price for one-week estimate horizon)

Trade date	Trade day	Trade Time	Expiry date	Call price	Put price	Strike price	Spot price	IR_EUR	IR_USD	IV_EURC	IV_EURP	IV_EUR	Estimate date	Estimate day	Estimate time	EURC_MOD	EURP_MOD	EURC_MKT	EURP_MKT
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
Panel A: Opening period (9:30-10:00)																			
21-JUN-10 Continue to 184 days	Mon	9:30	17-JUL-10	4.76	0.44	119.5	123.95	0.0047	0.0042	0.1291	0.1449	0.1370	28-JUN-10	Mon	9:30	4.47	0.26	4.30	0.34
22-JUN-10 Continue to 178 days	Tue	9:30	17-JUL-10	6.21	0.24	117	122.89	0.0047	0.0040	0.1645	0.1495	0.1570	29-JUN-10	Tue	9:30	5.22	0.24	5.05	0.25
23-JUN-10 Continue to 197 days	Wed	9:30	17-JUL-10	3.66	0.65	119.5	122.82	0.0042	0.0070	0.1123	0.1499	0.1311	30-JUN-10	Wed	9:30	3.50	0.33	3.40	0.47
17-JUN-10 Continue to 205 days	Thu	9:30	17-JUL-10	5.05	0.58	119.5	123.69	0.0043	0.0072	0.1704	0.1454	0.1579	24-JUN-10	Thu	9:30	4.03	0.69	4.18	0.49
18-JUN-10 Continue to 211 days	Fri	9:30	17-JUL-10	6.37	1.28	118.5	123.60	0.0046	0.0073	0.2332	0.2362	0.2347	25-JUN-10	Fri	9:30	5.41	0.44	6.10	0.27
Panel B: Midday period (12:30-13:00)																			
21-JUN-10 Continue to 165 days	Mon	12:30	17-JUL-10	6.39	0.21	117.5	123.63	0.0043	0.0035	0.1558	0.1456	0.1507	28-JUN-10	Mon	12:30	6.03	0.14	5.60	0.18
22-JUN-10 Continue to 165 days	Tue	12:30	17-JUL-10	6.25	0.23	117	122.78	0.0047	0.0040	0.1829	0.1466	0.1648	29-JUN-10	Tue	12:30	5.34	0.27	5.20	0.24
23-JUN-10 Continue to 168 days	Wed	12:30	17-JUL-10	4.87	0.37	118	122.70	0.0044	0.0033	0.1198	0.1492	0.1345	30-JUN-10	Wed	12:30	4.78	0.15	5.02	0.19
17-JUN-10 Continue to 199 days	Thu	12:30	17-JUL-10	6.49	0.36	117.5	123.61	0.0043	0.0072	0.1577	0.1578	0.1577	24-JUN-10	Thu	12:30	5.62	0.32	6.44	0.18
18-JUN-10 Continue to 189 days	Fri	12:30	17-JUL-10	6.47	0.28	117.5	123.65	0.0046	0.0073	0.1519	0.1502	0.1510	25-JUN-10	Fri	12:30	5.61	0.25	6.20	0.17
Panel C: Closing period (15:30-16:00)																			
21-JUN-10 Continue to 173 days	Mon	15:30	17-JUL-10	2.70	1.03	121.5	123.93	0.0047	0.0044	0.0827	0.1539	0.1183	28-JUN-10	Mon	15:30	2.42	0.60	2.25	0.90
22-JUN-10 Continue to 168 days	Tue	15:30	17-JUL-10	6.20	1.23	117.5	123.21	0.0047	0.0040	0.1841	0.2655	0.2248	29-JUN-10	Tue	15:30	6.00	0.22	6.20	0.24
23-JUN-10 Continue to 160 days	Wed	15:30	17-JUL-10	6.82	0.19	116.5	122.23	0.0047	0.0035	0.2601	0.1408	0.2005	30-JUN-10	Wed	15:30	6.63	0.27	6.03	0.11
17-JUN-10 Continue to 197 days	Thu	15:30	17-JUL-10	6.63	0.34	117.5	123.66	0.0043	0.0040	0.1735	0.1560	0.1648	24-JUN-10	Thu	15:30	6.05	0.31	6.06	0.19
18-JUN-10 Continue to 180 days	Fri	15:30	17-JUL-10	6.36	1.28	118.5	123.45	0.0046	0.0073	0.2422	0.2328	0.2375	25-JUN-10	Fri	15:30	5.19	0.33	5.26	0.27

Notes: EUR, IR_EUR, IR_USD, IV_EURC, IV_EURP, IV_EUR, EURC_MOD, EURP_MOD, EURC_MKT, and EURP_MKT represents Euro, interest rate of EUR, interest rate of US dollar, implied volatility of EUR call options price, implied volatility of EUR put options price, implied volatility of EUR options [(IV_EURC + IV_EURP)/2], EUR call options model price, EUR put options model price, EUR call options market price, EUR put options market price, respectively. The one-week estimate horizon indicates that the IV_EUR is calculated one-week before the date of estimating EURC_MOD and EURP_MOD.

Table A5.11b: Details of EUR options data for testing hypothesis 14
(Two-month maturity IV_EUR estimate EUR options price for one-week estimate horizon)

Trade date	Trade day	Trade Time	Expiry date	Call price	Put price	Strike price	Spot price	IR_EUR	IR_USD	IV_EURC	IV_EURP	IV_EUR	Estimate date	Estimate day	Estimate time	EURC_MOD	EURP_MOD	EURC_MKT	EURP_MKT
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
Panel A: Opening period (9:30-10:00)																			
24-MAY-10 Continue to 292 days	Mon	9:30	17-JUL-10	5.51	1.59	120	124.17	0.0041	0.0045	0.1582	0.1739	0.1661	31-MAY-10	Mon	9:30	4.58	1.66	4.61	1.81
18-MAY-10 Continue to 325 days	Tue	9:30	17-JUL-10	5.65	1.31	120	123.84	0.0044	0.0049	0.1718	0.1435	0.1576	25-MAY-10	Tue	9:30	4.07	1.97	4.53	2.16
19-MAY-10 Continue to 332 days	Wed	9:30	17-JUL-10	4.93	2.05	120	121.83	0.0047	0.0060	0.2028	0.1488	0.1758	26-MAY-10	Wed	9:30	5.10	1.85	4.71	1.84
20-MAY-10 Continue to 302 days	Thu	9:30	17-JUL-10	5.70	1.99	120	123.88	0.0040	0.0046	0.1759	0.1858	0.1809	27-MAY-10	Thu	9:30	4.83	2.08	4.48	1.99
21-MAY-10 Continue to 298 days	Fri	9:30	17-JUL-10	8.12	2.26	119.5	124.20	0.0041	0.0037	0.2845	0.2186	0.2515	28-MAY-10	Fri	9:30	6.79	2.76	6.40	2.49
Panel B: Midday period (12:30-13:00)																			
24-MAY-10 Continue to 326 days	Mon	12:30	17-JUL-10	7.65	1.00	117.5	123.66	0.0039	0.0050	0.2046	0.1719	0.1883	31-MAY-10	Mon	12:30	6.85	1.16	6.47	1.20
18-MAY-10 Continue to 359 days	Tue	12:30	17-JUL-10	6.73	1.03	118	124.09	0.0047	0.0049	0.1347	0.1632	0.1490	25-MAY-10	Tue	12:30	5.38	1.09	6.28	1.46
19-MAY-10 Continue to 355 days	Wed	12:30	17-JUL-10	7.98	1.15	116.5	122.47	0.0047	0.0070	0.2259	0.1734	0.1997	26-MAY-10	Wed	12:30	7.69	1.26	7.01	1.16
20-MAY-10 Continue to 328 days	Thu	12:30	17-JUL-10	7.53	1.40	117.5	123.20	0.0052	0.0048	0.2126	0.1852	0.1989	27-MAY-10	Thu	12:30	6.62	1.59	7.15	1.09
21-MAY-10 Continue to 330 days	Fri	12:30	17-JUL-10	8.09	1.26	119	125.20	0.0041	0.0037	0.2237	0.1832	0.2034	28-MAY-10	Fri	12:30	6.39	1.79	6.00	1.29
Panel C: Closing period (15:30-16:00)																			
24-MAY-10 Continue to 332 days	Mon	15:30	17-JUL-10	7.13	1.08	118	123.90	0.0042	0.0052	0.1820	0.1726	0.1773	31-MAY-10	Mon	15:30	6.07	1.22	6.07	1.30
18-MAY-10 Continue to 358 days	Tue	15:30	17-JUL-10	4.48	1.98	119.5	123.76	0.0045	0.0064	0.0704	0.1904	0.1304	25-MAY-10	Tue	15:30	4.26	1.16	5.55	1.65
19-MAY-10 Continue to 346 days	Wed	15:30	17-JUL-10	7.45	1.45	117.5	122.05	0.0047	0.0070	0.2508	0.1689	0.2098	26-MAY-10	Wed	15:30	6.77	2.69	6.98	2.16
20-MAY-10 Continue to 335 days	Thu	15:30	17-JUL-10	8.73	1.29	118	123.82	0.0042	0.0029	0.2779	0.1789	0.2284	27-MAY-10	Thu	15:30	7.24	2.01	6.70	1.24
21-MAY-10 Continue to 327 days	Fri	15:30	17-JUL-10	8.19	3.35	119	123.20	0.0041	0.0037	0.3073	0.2715	0.2894	28-MAY-10	Fri	15:30	6.44	2.96	6.30	3.29

Notes: EUR, IR_EUR, IR_USD, IV_EURC, IV_EURP, IV_EUR, EURC_MOD, EURP_MOD, EURC_MKT, and EURP_MKT represents Euro, interest rate of EUR, interest rate of US dollar, implied volatility of EUR call options price, implied volatility of EUR put options price, implied volatility of EUR options [(IV_EURC + IV_EURP)/2], EUR call options model price, EUR put options model price, EUR call options market price, EUR put options market price, respectively. The one-week estimate horizon indicates that the IV_EUR is calculated one-week before the date of estimating EURC_MOD and EURP_MOD.

Table A5.11c: Details of EUR options data for testing hypothesis 15
(Three-month maturity IV_EUR estimate EUR options price for one-week estimate horizon)

Trade date	Trade day	Trade Time	Expiry date	Call price	Put price	Strike price	Spot price	IR_EUR	IR_USD	IV_EURC	IV_EURP	IV_EUR	Estimate date	Estimate day	Estimate time	EURC_MOD	EURP_MOD	EURC_MKT	EURP_MKT
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
Panel A: Opening period (9:30-10:00)																			
10-MAY-10 Continue to 240 days	Mon	9:30	17-JUL-10	5.95	1.62	125	130.61	0.0064	0.0078	0.0899	0.1725	0.1312	17-MAY-10	Mon	9:30	1.82	3.70	2.39	3.63
04-MAY-10 Continue to 221 days	Tue	9:30	17-JUL-10	2.27	3.64	132	131.37	0.0050	0.0040	0.1094	0.1398	0.1246	11-MAY-10	Tue	9:30	0.90	6.07	1.23	5.98
05-MAY-10 Continue to 226 days	Wed	9:30	17-JUL-10	5.15	1.85	125	129.87	0.0062	0.0065	0.0757	0.1674	0.1216	12-MAY-10	Wed	9:30	3.70	1.73	4.00	2.30
13-MAY-10 Continue to 235 days	Thu	9:30	17-JUL-10	4.68	1.70	122.5	125.66	0.0063	0.0048	0.1363	0.1441	0.1402	20-MAY-10	Thu	9:30	3.47	2.12	4.03	2.82
23-APR-10 Continue to 240 days	Fri	9:30	17-JUL-10	8.12	2.56	127.0	131.93	0.0048	0.0040	0.2135	0.1849	0.1992	30-APR-10	Fri	9:30	6.80	2.55	7.25	2.97
Panel B: Midday period (12:30-13:00)																			
19-APR-10 Continue to 354 days	Mon	12:30	17-JUL-10	7.43	0.88	128	134.29	0.0058	0.0054	0.1323	0.1179	0.1251	26-APR-10	Mon	12:30	6.46	1.12	6.35	1.13
20-APR-10 Continue to 352 days	Tue	12:30	17-JUL-10	6.89	0.94	128.5	134.76	0.0050	0.0054	0.1032	0.1213	0.1122	27-APR-10	Tue	12:30	5.62	1.05	5.45	1.59
21-APR-10 Continue to 351 days	Wed	12:30	17-JUL-10	7.29	0.80	127.5	133.84	0.0056	0.0054	0.1246	0.1158	0.1202	28-APR-10	Wed	12:30	5.86	1.14	5.65	1.65
22-APR-10 Continue to 347 days	Thu	12:30	17-JUL-10	6.98	1.00	127	133.32	0.0048	0.0058	0.1071	0.1283	0.1177	29-APR-10	Thu	12:30	6.46	0.87	6.70	1.17
23-APR-10 Continue to 344 days	Fri	12:30	17-JUL-10	8.03	0.82	126.5	132.93	0.0048	0.0040	0.1622	0.1200	0.1411	30-APR-10	Fri	12:30	7.72	1.03	7.25	0.97
Panel C: Closing period (15:30-16:00)																			
19-APR-10 Continue to 355 days	Mon	15:30	17-JUL-10	7.68	0.82	128	134.70	0.0054	0.0054	0.1280	0.1187	0.1234	26-APR-10	Mon	15:30	6.39	1.10	6.58	1.05
20-APR-10 Continue to 351 days	Tue	15:30	17-JUL-10	7.28	0.84	128	134.44	0.0057	0.0054	0.1187	0.1180	0.1183	27-APR-10	Tue	15:30	5.89	1.11	5.50	1.57
21-APR-10 Continue to 349 days	Wed	15:30	17-JUL-10	7.30	0.79	127.5	133.75	0.0047	0.0054	0.1277	0.1143	0.1210	28-APR-10	Wed	15:30	5.34	1.35	6.07	1.53
22-APR-10 Continue to 347 days	Thu	15:30	17-JUL-10	7.53	0.89	126.5	132.90	0.0055	0.0058	0.1361	0.1233	0.1297	29-APR-10	Thu	15:30	6.88	1.02	6.98	1.10
23-APR-10 Continue to 348 days	Fri	15:30	17-JUL-10	7.65	0.87	127	133.60	0.0052	0.0048	0.1354	0.1244	0.1299	30-APR-10	Fri	15:30	6.93	1.00	7.13	0.98

Notes: EUR, IR_EUR, IR_USD, IV_EURC, IV_EURP, IV_EUR, EURC_MOD, EURP_MOD, EURC_MKT, and EURP_MKT represents Euro, interest rate of EUR, interest rate of US dollar, implied volatility of EUR call options price, implied volatility of EUR put options price, implied volatility of EUR options [(IV_EURC + IV_EURP)/2], EUR call options model price, EUR put options model price, EUR call options market price, EUR put options market price, respectively. The one-week estimate horizon indicates that the IV_EUR is calculated one-week before the date of estimating EURC_MOD and EURP_MOD.

Table A5.12a: Details of EUR options data for testing hypothesis 16
(One-month maturity IV_EUR estimate EUR options price for one-month estimate horizon)

Trade date	Trade day	Trade Time	Expiry date	Call price	Put price	Strike price	Spot price	IR_EUR	IR_USD	IV_EURC	IV_EURP	IV_EUR	Estimate date	Estimate day	Estimate time	EURC_MOD	EURP_MOD	EURC_MKT	EURP_MKT
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
Panel A: Opening period (9:30-10:00)																			
21-JUN-10 Continue to 212 days	Mon	9:30	17-JUL-10	4.56	0.54	120.5	123.95	0.0047	0.1894	0.1344	0.1619	0.1370	12-JUL-10	Mon	9:30	3.58	0.03	3.30	0.04
22-JUN-10 Continue to 232 days	Tue	9:30	17-JUL-10	6.31	1.34	118.0	122.89	0.0047	0.2635	0.2552	0.2594	0.1570	13-JUL-10	Tue	9:30	4.99	0.09	5.05	0.05
23-JUN-10 Continue to 242 days	Wed	9:30	17-JUL-10	3.76	0.75	120.0	122.82	0.0042	0.1636	0.1475	0.1555	0.1311	14-JUL-10	Wed	9:30	2.87	0.03	3.10	0.07
17-JUN-10 Continue to 255 days	Thu	9:30	17-JUL-10	5.25	1.38	119.5	123.59	0.0043	0.1949	0.2159	0.2054	0.1579	07-JUL-10	Thu	9:30	4.40	0.40	4.18	0.49
18-JUN-10 Continue to 269 days	Fri	9:30	17-JUL-10	5.37	1.38	119.5	123.20	0.0046	0.2321	0.2101	0.2211	0.2347	08-JUL-10	Fri	9:30	4.20	0.38	4.10	0.27
Panel B: Midday period (12:30-13:00)																			
21-JUN-10 Continue to 198 days	Mon	12:30	17-JUL-10	6.19	1.41	118.5	123.63	0.0043	0.2288	0.2616	0.2452	0.1507	12-JUL-10	Mon	12:30	5.21	0.14	5.60	0.18
22-JUN-10 Continue to 254 days	Tue	12:30	17-JUL-10	5.35	1.33	118.5	122.78	0.0047	0.2138	0.2378	0.2258	0.1648	13-JUL-10	Tue	12:30	4.34	0.10	4.20	0.14
23-JUN-10 Continue to 252 days	Wed	12:30	17-JUL-10	4.97	1.57	119.0	122.70	0.0044	0.2216	0.2483	0.2350	0.1345	14-JUL-10	Wed	12:30	3.77	0.11	3.02	0.19
17-JUN-10 Continue to 249 days	Thu	12:30	17-JUL-10	6.39	1.56	118.5	123.61	0.0043	0.2302	0.2568	0.2435	0.1577	07-JUL-10	Thu	12:30	5.43	0.43	5.44	0.48
18-JUN-10 Continue to 204 days	Fri	12:30	17-JUL-10	6.17	1.38	118.5	122.65	0.0046	0.2743	0.2228	0.2486	0.1510	08-JUL-10	Fri	12:30	4.78	0.36	5.20	0.27
Panel C: Closing period (15:30-16:00)																			
21-JUN-10 Continue to 154 days	Mon	15:30	17-JUL-10	2.87	1.33	122.5	123.93	0.0047	0.1585	0.1496	0.1541	0.1183	12-JUL-10	Mon	15:30	1.80	0.33	1.25	0.50
22-JUN-10 Continue to 234 days	Tue	15:30	17-JUL-10	6.10	1.53	118.5	123.21	0.0047	0.2551	0.2674	0.2613	0.2248	13-JUL-10	Tue	15:30	4.81	0.13	5.20	0.14
23-JUN-10 Continue to 217 days	Wed	15:30	17-JUL-10	5.52	1.39	118.5	122.23	0.0047	0.2710	0.2336	0.2523	0.2005	14-JUL-10	Wed	15:30	3.87	0.08	4.03	0.11
17-JUN-10 Continue to 218 days	Thu	15:30	17-JUL-10	6.43	1.54	119.5	123.66	0.0043	0.2889	0.2301	0.2595	0.1648	07-JUL-10	Thu	15:30	4.97	0.47	4.06	0.39
18-JUN-10 Continue to 200 days	Fri	15:30	17-JUL-10	6.16	1.48	119.5	122.45	0.0046	0.3324	0.1995	0.2659	0.2375	08-JUL-10	Fri	15:30	4.27	0.47	4.26	0.37

Notes: EUR, IR_EUR, IR_USD, IV_EURC, IV_EURP, IV_EUR, EURC_MOD, EURP_MOD, EURC_MKT, and EURP_MKT represents Euro, interest rate of EUR, interest rate of US dollar, implied volatility of EUR call options price, implied volatility of EUR put options price, implied volatility of EUR options [(IV_EURC + IV_EURP)/2], EUR call options model price, EUR put options model price, EUR call options market price, EUR put options market price, respectively. The one-month estimate horizon indicates that the IV_EUR is calculated one-month before the date of estimating EURC_MOD and EURP_MOD.

Table A5.12b: Details of EUR options data for testing hypothesis 17
(Two-month maturity IV_EUR estimate EUR options price for one-month estimate horizon)

Trade date	Trade day	Trade Time	Expiry date	Call price	Put price	Strike price	Spot price	IR_EUR	IR_USD	IV_EURC	IV_EURP	IV_EUR	Estimate date	Estimate day	Estimate time	EURC_MOD	EURP_MOD	EURC_MKT	EURP_MKT
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
Panel A: Opening period (9:30-10:00)																			
24-MAY-10 Continue to 202 days	Mon	9:30	17-JUL-10	5.51	1.59	120	124.17	0.0041	0.0045	0.1582	0.1739	0.1661	21-JUN-10	Mon	9:30	4.67	0.74	4.30	0.52
18-MAY-10 Continue to 212 days	Tue	9:30	17-JUL-10	5.65	1.31	120	123.84	0.0044	0.0049	0.1718	0.1435	0.1576	15-JUN-10	Tue	9:30	3.68	1.24	3.85	0.96
19-MAY-10 Continue to 222 days	Wed	9:30	17-JUL-10	4.93	2.05	120	121.83	0.0047	0.0060	0.2028	0.1488	0.1758	16-JUN-10	Wed	9:30	4.20	1.29	3.90	0.95
20-MAY-10 Continue to 225 days	Thu	9:30	17-JUL-10	5.70	1.99	120	123.88	0.0040	0.0046	0.1759	0.1858	0.1809	17-JUN-10	Thu	9:30	4.80	1.08	4.65	0.67
21-MAY-10 Continue to 209 days	Fri	9:30	17-JUL-10	6.95	1.56	120	125.44	0.0040	0.0033	0.1867	0.1884	0.1876	18-JUN-10	Fri	9:30	4.96	1.08	4.35	0.64
Panel B: Midday period (12:30-13:00)																			
24-MAY-10 Continue to 188 days	Mon	12:30	17-JUL-10	7.65	1.00	117.5	123.66	0.0039	0.0050	0.2046	0.1719	0.1883	21-JUN-10	Mon	12:30	6.62	0.49	6.39	0.21
18-MAY-10 Continue to 214 days	Tue	12:30	17-JUL-10	6.73	1.03	118	124.09	0.0047	0.0049	0.1347	0.1632	0.1490	15-JUN-10	Tue	12:30	5.25	0.54	5.85	0.48
19-MAY-10 Continue to 212 days	Wed	12:30	17-JUL-10	7.98	1.15	116.5	122.47	0.0047	0.0070	0.2259	0.1734	0.1997	16-JUN-10	Wed	12:30	6.90	0.71	7.06	0.32
20-MAY-10 Continue to 219 days	Thu	12:30	17-JUL-10	7.53	1.40	117.5	123.20	0.0052	0.0048	0.2126	0.1852	0.1989	17-JUN-10	Thu	12:30	6.84	0.70	6.49	0.46
21-MAY-10 Continue to 214 days	Fri	12:30	17-JUL-10	8.09	1.26	119	125.20	0.0041	0.0037	0.2237	0.1832	0.2034	18-JUN-10	Fri	12:30	5.72	1.04	5.15	0.46
Panel C: Closing period (15:30-16:00)																			
24-MAY-10 Continue to 184 days	Mon	15:30	17-JUL-10	7.13	1.08	118	123.90	0.0042	0.0052	0.1820	0.1726	0.1773	21-JUN-10	Mon	15:30	6.39	0.44	5.51	0.31
18-MAY-10 Continue to 204 days	Tue	15:30	17-JUL-10	4.48	1.98	119.5	123.76	0.0045	0.0064	0.0704	0.1904	0.1304	15-JUN-10	Tue	15:30	4.26	0.58	4.58	0.73
19-MAY-10 Continue to 207 days	Wed	15:30	17-JUL-10	7.60	1.24	117.5	123.20	0.0039	0.0076	0.2119	0.1746	0.1933	16-JUN-10	Wed	15:30	6.50	0.75	6.00	0.44
20-MAY-10 Continue to 212 days	Thu	15:30	17-JUL-10	8.73	1.29	118	123.82	0.0042	0.0029	0.2779	0.1789	0.2284	17-JUN-10	Thu	15:30	6.78	1.09	6.18	0.40
21-MAY-10 Continue to 199 days	Fri	15:30	17-JUL-10	7.53	1.28	119.5	125.54	0.0047	0.0037	0.1959	0.1808	0.1883	18-JUN-10	Fri	15:30	5.16	1.01	4.70	0.52

Notes: EUR, IR_EUR, IR_USD, IV_EURC, IV_EURP, IV_EUR, EURC_MOD, EURP_MOD, EURC_MKT, and EURP_MKT represents Euro, interest rate of EUR, interest rate of US dollar, implied volatility of EUR call options price, implied volatility of EUR put options price, implied volatility of EUR options [(IV_EURC + IV_EURP)/2], EUR call options model price, EUR put options model price, EUR call options market price, EUR put options market price, respectively. The one-month estimate horizon indicates that the IV_EUR is calculated one-month before the date of estimating EURC_MOD and EURP_MOD.

Table A5.12c: Details of EUR options data for testing hypothesis 18
(Three-month maturity IV_EUR estimate EUR options price for one-month estimate horizon)

Trade date	Trade day	Trade Time	Expiry date	Call price	Put price	Strike price	Spot price	IR_EUR	IR_USD	IV_EURC	IV_EURP	IV_EUR	Estimate date	Estimate day	Estimate time	EURC_MOD	EURP_MOD	EURC_MKT	EURP_MKT
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
Panel A: Opening period (9:30-10:00)																			
19-APR-10 Continue to 221 days	Mon	9:30	17-JUL-10	7.33	0.92	128	134.40	0.0055	0.0053	0.1224	0.1213	0.1218	17-MAY-10	Mon	9:30	0.78	5.66	1.25	5.48
11-MAY-10 Continue to 207 days	Tue	9:30	17-JUL-10	4.60	2.35	125	126.79	0.0061	0.0075	0.1684	0.1479	0.1581	08-JUN-10	Tue	9:30	0.59	6.48	0.61	6.18
05-MAY-10 Continue to 206 days	Wed	9:30	17-JUL-10	5.15	1.85	125	129.87	0.0062	0.0065	0.0757	0.1674	0.1216	02-JUN-10	Wed	9:30	1.05	3.66	1.50	4.34
06-MAY-10 Continue to 219 days	Thu	9:30	17-JUL-10	6.88	1.60	122	127.67	0.0067	0.0070	0.1490	0.1711	0.1601	03-JUN-10	Thu	9:30	3.15	2.31	2.94	2.42
07-MAY-10 Continue to 216 days	Fri	9:30	17-JUL-10	4.35	2.61	125	127.33	0.0064	0.0085	0.1359	0.1657	0.1508	04-JUN-10	Fri	9:30	1.33	4.31	0.96	5.37
Panel B: Midday period (12:30-13:00)																			
19-APR-10 Continue to 323 days	Mon	12:30	17-JUL-10	7.43	0.88	128	134.29	0.0058	0.0054	0.1323	0.1179	0.1251	17-MAY-10	Mon	12:30	0.88	5.55	1.13	5.88
20-APR-10 Continue to 326 days	Tue	12:30	17-JUL-10	6.89	0.94	128.5	134.76	0.0050	0.0054	0.1032	0.1213	0.1122	18-MAY-10	Tue	12:30	0.73	5.15	0.95	5.78
21-APR-10 Continue to 319 days	Wed	12:30	17-JUL-10	7.29	0.80	127.5	133.84	0.0056	0.0054	0.1246	0.1158	0.1202	19-MAY-10	Wed	12:30	0.69	5.67	1.40	5.58
22-APR-10 Continue to 320 days	Thu	12:30	17-JUL-10	6.98	1.00	127	133.32	0.0048	0.0058	0.1071	0.1283	0.1177	20-MAY-10	Thu	12:30	0.90	4.74	1.84	5.20
23-APR-10 Continue to 316 days	Fri	12:30	17-JUL-10	8.03	0.82	126.5	132.93	0.0048	0.0040	0.1622	0.1200	0.1411	21-MAY-10	Fri	12:30	2.19	3.51	2.95	3.65
Panel C: Closing period (15:30-16:00)																			
19-APR-10 Continue to 325 days	Mon	15:30	17-JUL-10	7.68	0.82	128	134.70	0.0054	0.0054	0.1280	0.1187	0.1234	17-MAY-10	Mon	15:30	0.84	5.53	1.26	5.38
20-APR-10 Continue to 322days	Tue	15:30	17-JUL-10	7.28	0.84	128	134.44	0.0057	0.0054	0.1187	0.1180	0.1183	18-MAY-10	Tue	15:30	0.87	5.07	0.81	6.83
21-APR-10 Continue to 319 days	Wed	15:30	17-JUL-10	7.30	0.79	127.5	133.75	0.0047	0.0054	0.1277	0.1143	0.1210	19-MAY-10	Wed	15:30	0.88	5.11	1.61	5.23
22-APR-10 Continue to 324 days	Thu	15:30	17-JUL-10	7.53	0.89	126.5	132.90	0.0055	0.0058	0.1361	0.1233	0.1297	20-MAY-10	Thu	15:30	1.45	4.16	3.01	4.08
23-APR-10 Continue to 311 days	Fri	15:30	17-JUL-10	7.65	0.87	127	133.60	0.0052	0.0048	0.1354	0.1244	0.1299	21-MAY-10	Fri	15:30	1.90	3.40	2.58	3.75

Notes: EUR, IR_EUR, IR_USD, IV_EURC, IV_EURP, IV_EUR, EURC_MOD, EURP_MOD, EURC_MKT, and EURP_MKT represents Euro, interest rate of EUR, interest rate of US dollar, implied volatility of EUR call options price, implied volatility of EUR put options price, implied volatility of EUR options [(IV_EURC + IV_EURP)/2], EUR call options model price, EUR put options model price, EUR call options market price, EUR put options market price, respectively. The one-month estimate horizon indicates that the IV_EUR is calculated one-month before the date of estimating EURC_MOD and EURP_MOD.

Table A5.13a: Details of GBP options data for testing hypothesis 10
(One-month maturity IV_GBP estimate GBP options price for within-week estimate horizon)

Trade date	Trade day	Trade Time	Expiry date	Call price	Put price	Strike price	Spot price	IR_GBP	IR_USD	IV_GBPC	IV_GBPP	IV_GBP	Estimate date	Estimate day	Estimate time	GBPC_MOD	GBPP_MOD	GBPC_MKT	GBPP_MKT
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
Panel A: Opening period (9:30-10:00)																			
21-JUN-10 Continue to 158 days	Mon	9:30	17-JUL-10	4.00	0.81	145	148.77	0.0062	0.0042	0.0891	0.1399	0.1145	25-JUN-10	Fri	9:30	4.35	0.37	4.90	0.46
22-JUN-10 Continue to 188 days	Tue	9:30	17-JUL-10	4.00	0.80	145	147.04	0.0062	0.0040	0.1890	0.1058	0.1474	25-JUN-10	Fri	9:30	4.68	0.70	4.90	0.46
23-JUN-10 Continue to 209 days	Wed	9:30	17-JUL-10	4.51	0.61	145	148.98	0.0065	0.0070	0.1255	0.1332	0.1294	25-JUN-10	Fri	9:30	4.49	0.51	4.90	0.46
17-JUN-10 Continue to 256 days	Thu	9:30	17-JUL-10	4.20	0.95	145	147.82	0.0060	0.0072	0.1516	0.1230	0.1373	18-JUN-10	Fri	9:30	4.35	0.96	3.96	0.88
Panel B: Midday period (12:30-13:00)																			
21-JUN-10 Continue to 164 days	Mon	12:30	17-JUL-10	4.28	1.95	146.5	149.34	0.0062	0.0044	0.1673	0.2009	0.1841	25-JUN-10	Fri	12:30	3.07	1.13	3.70	1.33
22-JUN-10 Continue to 182 days	Tue	12:30	17-JUL-10	8.16	0.21	140.5	147.48	0.0062	0.0040	0.2448	0.1359	0.1903	25-JUN-10	Fri	12:30	8.99	0.32	9.59	0.09
23-JUN-10 Continue to 200 days	Wed	12:30	17-JUL-10	7.24	0.24	142	149.10	0.0065	0.0033	0.1331	0.1438	0.1384	25-JUN-10	Fri	12:30	7.33	0.16	8.16	0.15
17-JUN-10 Continue to 277 days	Thu	12:30	17-JUL-10	7.38	0.36	141	148.01	0.0066	0.0072	0.1454	0.1451	0.1452	18-JUN-10	Fri	12:30	7.37	0.34	7.27	0.30
Panel C: Closing period (15:30-16:00)																			
21-JUN-10 Continue to 162 days	Mon	15:30	17-JUL-10	3.48	0.95	145	148.26	0.0062	0.0044	0.0791	0.1410	0.1101	25-JUN-10	Fri	15:30	5.05	0.22	5.70	0.33
22-JUN-10 Continue to 176 days	Tue	15:30	17-JUL-10	5.70	0.44	143	148.57	0.0062	0.0028	0.1072	0.1423	0.1247	25-JUN-10	Fri	15:30	6.95	0.12	7.52	0.18
23-JUN-10 Continue to 203 days	Wed	15:30	17-JUL-10	7.62	0.19	142	148.96	0.0066	0.0035	0.1982	0.1334	0.1658	25-JUN-10	Fri	15:30	8.09	0.26	8.48	0.14
17-JUN-10 Continue to 280 days	Thu	15:30	17-JUL-10	7.45	0.34	141	148.10	0.0055	0.0040	0.1466	0.1436	0.1451	18-JUN-10	Fri	15:30	7.31	0.34	7.35	0.28

Notes: GBP, IR_GBP, IR_USD, IV_GBPC, IV_GBPP, IV_GBP, GBPC_MOD, GBPP_MOD, GBPC_MKT, and GBPP_MKT represents British Pound, interest rate of GBP, interest rate of US dollar, implied volatility of GBP call options price, implied volatility of GBP put options price, implied volatility of GBP options [(IV_GBPC + IV_GBPP)/2], GBP call options model price, GBP put options model price, GBP call options market price, and GBP put options market price, respectively. The within-week estimate horizon indicates that the IV_GBP is calculated one day to four days before the date of estimating GBPC_MOD and GBPP_MOD.

Table A5.13b: Details of GBP options data for testing hypothesis 11
(Two-month maturity IV_GBP estimate GBP options price for within-week estimate horizon)

Trade date	Trade day	Trade Time	Expiry date	Call price	Put price	Strike price	Spot price	IR_GBP	IR_USD	IV_GBPC	IV_GBPP	IV_GBP	Estimate date	Estimate day	Estimate time	GBPC_MOD	GBPP_MOD	GBPC_MKT	GBPP_MKT
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
Panel A: Opening period (9:30-10:00)																			
24-MAY-10 Continue to 210 days	Mon	9:30	17-JUL-10	2.98	4.00	145	144.48	0.0058	0.0045	0.1460	0.1677	0.1569	28-MAY-10	Fri	9:30	3.64	3.10	3.35	2.90
25-MAY-10 Continue to 245 days	Tue	9:30	17-JUL-10	2.69	4.38	145	142.77	0.0063	0.0085	0.1684	0.1449	0.1566	28-MAY-10	Fri	9:30	3.63	3.09	3.35	2.90
26-MAY-10 Continue to 244 days	Wed	9:30	17-JUL-10	2.74	3.90	145	144.09	0.0071	0.0048	0.1467	0.1564	0.1516	28-MAY-10	Fri	9:30	3.53	2.98	3.35	2.90
27-MAY-10 Continue to 235 days	Thu	9:30	17-JUL-10	3.13	3.35	145	145.79	0.0076	0.0054	0.1264	0.1713	0.1488	28-MAY-10	Fri	9:30	3.47	2.93	3.35	2.90
Panel B: Midday period (12:30-13:00)																			
24-MAY-10 Continue to 317 days	Mon	12:30	17-JUL-10	8.73	1.42	137	143.88	0.0058	0.0050	0.2084	0.1825	0.1955	28-MAY-10	Fri	12:30	9.63	1.16	8.85	1.00
18-MAY-10 Continue to 354 days	Tue	12:30	17-JUL-10	8.18	1.33	137.5	144.37	0.0065	0.0049	0.1684	0.1670	0.1677	21-MAY-10	Fri	12:30	7.26	1.52	8.71	1.61
26-MAY-10 Continue to 349days	Wed	12:30	17-JUL-10	2.13	4.12	145.5	143.09	0.0071	0.0048	0.1479	0.1252	0.1365	28-MAY-10	Fri	12:30	2.05	6.50	3.35	2.90
27-MAY-10 Continue to 343 days	Thu	12:30	17-JUL-10	3.28	3.25	145.5	146.79	0.0076	0.0054	0.1199	0.1299	0.1249	28-MAY-10	Fri	12:30	3.82	4.16	3.35	2.90
Panel C: Closing period (15:30-16:00)																			
24-MAY-10 Continue to 322 days	Mon	15:30	17-JUL-10	8.30	1.40	137.5	144.30	0.0071	0.0052	0.1880	0.1795	0.1838	28-MAY-10	Fri	15:30	8.20	1.33	8.30	1.08
18-MAY-10 Continue to 350 days	Tue	15:30	17-JUL-10	7.33	1.67	137.5	144.47	0.0065	0.0064	0.1051	0.1877	0.1464	21-MAY-10	Fri	15:30	7.86	0.89	8.60	1.63
19-MAY-10 Continue to 351 days	Wed	15:30	17-JUL-10	8.93	1.28	136.5	143.50	0.0061	0.0076	0.2042	0.1694	0.1868	21-MAY-10	Fri	15:30	9.29	1.31	9.40	1.43
20-MAY-10 Continue to 350 days	Thu	15:30	17-JUL-10	9.28	1.42	136.5	143.48	0.0068	0.0029	0.2298	0.1774	0.2036	21-MAY-10	Fri	15:30	9.57	1.60	9.40	1.43

Notes: GBP, IR_GBP, IR_USD, IV_GBPC, IV_GBPP, IV_GBP, GBPC_MOD, GBPP_MOD, GBPC_MKT, and GBPP_MKT represents British Pound, interest rate of GBP, interest rate of US dollar, implied volatility of GBP call options price, implied volatility of GBP put options price, implied volatility of GBP options [(IV_GBPC + IV_GBPP)/2], GBP call options model price, GBP put options model price, GBP call options market price, and GBP put options market price, respectively. The within-week estimate horizon indicates that the IV_GBP is calculated one day to four days before the date of estimating GBPC_MOD and GBPP_MOD.

Table A5.13c: Details of GBP options data for testing hypothesis 12
(Three-month maturity IV_GBP estimate GBP options price for within-week estimate horizon)

Trade date	Trade day	Trade Time	Expiry date	Call price	Put price	Strike price	Spot price	IR_GBP	IR_USD	IV_GBPC	IV_GBPP	IV_GBP	Estimate date	Estimate day	Estimate time	GBPC_MOD	GBPP_MOD	GBPC_MKT	GBPP_MKT
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
Panel A: Opening period (9:30-10:00)																			
10-MAY-10 Continue to 183 days	Mon	9:30	17-JUL-10	2.51	5.55	153	149.89	0.0085	0.0078	0.1486	0.1453	0.1470	14-MAY-10	Fri	9:30	1.03	8.72	0.98	7.78
11-MAY-10 Continue to 182 days	Tue	9:30	17-JUL-10	1.88	6.60	153	148.18	0.0085	0.0075	0.1485	0.1434	0.1460	14-MAY-10	Fri	9:30	1.01	8.70	0.98	7.78
12-MAY-10 Continue to 183 days	Wed	9:30	17-JUL-10	1.63	6.18	153	149.28	0.0074	0.0048	0.1236	0.1562	0.1399	14-MAY-10	Fri	9:30	0.91	8.60	0.98	7.78
13-MAY-10 Continue to 184 days	Thu	9:30	17-JUL-10	1.22	6.78	152.5	147.51	0.0074	0.0048	0.1233	0.1473	0.1353	14-MAY-10	Fri	9:30	0.92	8.11	1.09	7.38
Panel B: Midday period (12:30-13:00)																			
10-MAY-10 Continue to 352 days	Mon	12:30	17-JUL-10	2.67	5.25	153.5	150.45	0.0085	0.0078	0.1538	0.1342	0.1440	14-MAY-10	Fri	12:30	2.43	7.94	2.98	7.35
11-MAY-10 Continue to 346 days	Tue	12:30	17-JUL-10	2.88	6.01	154.0	149.45	0.0085	0.0075	0.1864	0.1244	0.1554	14-MAY-10	Fri	12:30	1.91	9.07	1.35	7.48
12-MAY-10 Continue to 350 days	Wed	12:30	17-JUL-10	2.63	5.18	153.5	149.68	0.0074	0.0048	0.1673	0.1098	0.1386	14-MAY-10	Fri	12:30	1.56	8.29	1.45	7.58
13-MAY-10 Continue to 351 days	Thu	12:30	17-JUL-10	2.12	5.78	153.0	148.51	0.0074	0.0048	0.1574	0.1169	0.1372	14-MAY-10	Fri	12:30	1.34	8.60	1.09	7.38
Panel C: Closing period (15:30-16:00)																			
19-APR-10 Continue to 358 days	Mon	15:30	17-JUL-10	9.10	1.32	145.5	152.82	0.0073	0.0054	0.1569	0.1337	0.1453	23-APR-10	Fri	15:30	9.25	1.36	9.35	1.19
20-APR-10 Continue to 348 days	Tue	15:30	17-JUL-10	8.90	1.29	146	153.48	0.0073	0.0054	0.1435	0.1341	0.1388	23-APR-10	Fri	15:30	8.73	1.34	8.90	1.28
21-APR-10 Continue to 353 days	Wed	15:30	17-JUL-10	8.80	1.29	146.5	153.91	0.0073	0.0054	0.1418	0.1339	0.1379	23-APR-10	Fri	15:30	8.33	1.44	8.50	1.37
22-APR-10 Continue to 355 days	Thu	15:30	17-JUL-10	8.60	1.38	146.5	153.78	0.0073	0.0058	0.1378	0.1374	0.1376	23-APR-10	Fri	15:30	8.33	1.44	8.50	1.37

Notes: GBP, IR_GBP, IR_USD, IV_GBPC, IV_GBPP, IV_GBP, GBPC_MOD, GBPP_MOD, GBPC_MKT, and GBPP_MKT represents British Pound, interest rate of GBP, interest rate of US dollar, implied volatility of GBP call options price, implied volatility of GBP put options price, implied volatility of GBP options [(IV_GBPC + IV_GBPP)/2], GBP call options model price, GBP put options model price, GBP call options market price, and GBP put options market price, respectively. The within-week estimate horizon indicates that the IV_GBP is calculated one day to four days before the date of estimating GBPC_MOD and GBPP_MOD.

Table A5.14a: Details of GBP options data for testing hypothesis 13
(One-month maturity IV_GBP estimate GBP options price for one-week estimate horizon)

Trade date	Trade day	Trade Time	Expiry date	Call price	Put price	Strike price	Spot price	IR_GBP	IR_USD	IV_GBPC	IV_GBPP	IV_GBP	Estimate date	Estimate day	Estimate time	GBPC_MOD	GBPP_MOD	GBPC_MKT	GBPP_MKT
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
Panel A: Opening period (9:30-10:00)																			
21-JUN-10 Continue to 138 days	Mon	9:30	17-JUL-10	4.00	0.81	145	148.77	0.0062	0.0042	0.0891	0.1399	0.1145	28-JUN-10	Mon	9:30	5.60	0.14	5.97	0.29
22-JUN-10 Continue to 150 days	Tue	9:30	17-JUL-10	4.00	0.80	145	147.04	0.0062	0.0040	0.1890	0.1058	0.1474	29-JUN-10	Tue	9:30	5.62	0.34	5.96	0.24
23-JUN-10 Continue to 160 days	Wed	9:30	17-JUL-10	4.51	0.61	145	148.98	0.0065	0.0070	0.1255	0.1332	0.1294	30-JUN-10	Wed	9:30	5.41	0.20	5.00	0.29
17-JUN-10 Continue to 175 days	Thu	9:30	17-JUL-10	4.20	0.95	145	147.82	0.0060	0.0072	0.1516	0.1230	0.1373	24-JUN-10	Thu	9:30	5.38	0.45	5.37	0.42
18-JUN-10 Continue to 167 days	Fri	9:30	17-JUL-10	3.96	0.88	145	148.40	0.0062	0.0056	0.1071	0.1314	0.1192	25-JUN-10	Fri	9:30	4.39	0.41	4.90	0.46
Panel B: Midday period (12:30-13:00)																			
21-JUN-10 Continue to 149 days	Mon	12:30	17-JUL-10	7.32	0.28	141	148.26	0.0062	0.0035	0.1136	0.1481	0.1308	28-JUN-10	Mon	12:30	9.58	0.02	10.03	0.08
22-JUN-10 Continue to 153 days	Tue	12:30	17-JUL-10	8.16	0.21	140.5	147.48	0.0062	0.0040	0.2448	0.1359	0.1903	29-JUN-10	Tue	12:30	10.39	0.12	10.26	0.06
23-JUN-10 Continue to 151 days	Wed	12:30	17-JUL-10	7.24	0.24	142	149.10	0.0065	0.0033	0.1331	0.1438	0.1384	30-JUN-10	Wed	12:30	7.94	0.06	7.61	0.10
17-JUN-10 Continue to 188 days	Thu	12:30	17-JUL-10	7.38	0.36	141	148.01	0.0066	0.0072	0.1454	0.1451	0.1452	24-JUN-10	Thu	12:30	8.90	0.11	8.75	0.12
18-JUN-10 Continue to 174 days	Fri	12:30	17-JUL-10	7.27	0.30	141	148.02	0.0062	0.0073	0.1314	0.1396	0.1355	25-JUN-10	Fri	12:30	8.26	0.09	9.11	0.11
Panel C: Closing period (15:30-16:00)																			
21-JUN-10 Continue to 140 days	Mon	15:30	17-JUL-10	3.48	0.95	145	148.26	0.0062	0.0044	0.0791	0.1410	0.1101	28-JUN-10	Mon	15:30	6.19	0.08	6.31	0.24
22-JUN-10 Continue to 136 days	Tue	15:30	17-JUL-10	6.26	1.11	141.5	145.48	0.0062	0.0040	0.2653	0.2067	0.2360	29-JUN-10	Tue	15:30	10.39	0.12	10.36	0.16
23-JUN-10 Continue to 147 days	Wed	15:30	17-JUL-10	7.62	0.19	142	148.96	0.0066	0.0035	0.1982	0.1334	0.1658	30-JUN-10	Wed	15:30	7.85	0.16	7.60	0.10
17-JUN-10 Continue to 173 days	Thu	15:30	17-JUL-10	7.45	0.34	141	148.10	0.0055	0.0040	0.1466	0.1436	0.1451	24-JUN-10	Thu	15:30	8.87	0.11	8.46	0.14
18-JUN-10 Continue to 162 days	Fri	15:30	17-JUL-10	6.17	0.40	142	147.02	0.0062	0.0073	0.1854	0.1216	0.1535	25-JUN-10	Fri	15:30	5.36	0.60	5.11	0.51

Notes: GBP, IR_GBP, IR_USD, IV_GBPC, IV_GBPP, IV_GBP, GBPC_MOD, GBPP_MOD, GBPC_MKT, and GBPP_MKT represents British Pound, interest rate of GBP, interest rate of US dollar, implied volatility of GBP call options price, implied volatility of GBP put options price, implied volatility of GBP options [(IV_GBPC + IV_GBPP)/2], GBP call options model price, GBP put options model price, GBP call options market price, and GBP put options market price, respectively. The one-week estimate horizon indicates that the IV_GBP is calculated one-week before the date of estimating GBPC_MOD and GBPP_MOD.

Table A5.14b: Details of GBP options data for testing hypothesis 14
(Two-month maturity IV_GBP estimate GBP options price for one-week estimate horizon)

Trade date	Trade day	Trade Time	Expiry date	Call price	Put price	Strike price	Spot price	IR_GBP	IR_USD	IV_GBPC	IV_GBPP	IV_GBP	Estimate date	Estimate day	Estimate time	GBPC_MOD	GBPP_MOD	GBPC_MKT	GBPP_MKT
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
Panel A: Opening period (9:30-10:00)																			
24-MAY-10 Continue to 206 days	Mon	9:30	17-JUL-10	2.98	4.00	145	144.48	0.0058	0.0045	0.1460	0.1677	0.1569	31-MAY-10	Mon	9:30	3.16	3.34	2.93	3.27
25-MAY-10 Continue to 221 days	Tue	9:30	17-JUL-10	2.69	4.38	145	142.77	0.0063	0.0085	0.1684	0.1449	0.1566	01-JUN-10	Tue	9:30	3.02	3.40	3.85	2.53
26-MAY-10 Continue to 226 days	Wed	9:30	17-JUL-10	2.74	3.90	145	144.09	0.0071	0.0048	0.1467	0.1564	0.1516	02-JUN-10	Wed	9:30	4.09	2.27	3.75	2.53
27-MAY-10 Continue to 208 days	Thu	9:30	17-JUL-10	3.13	3.35	145	145.79	0.0076	0.0054	0.1264	0.1713	0.1488	03-JUN-10	Thu	9:30	4.05	2.15	3.75	2.34
21-MAY-10 Continue to 210 days	Fri	9:30	17-JUL-10	3.10	4.55	145	144.05	0.0070	0.0033	0.1579	0.1763	0.1671	28-MAY-10	Fri	9:30	3.86	3.32	3.35	2.90
Panel B: Midday period (12:30-13:00)																			
24-MAY-10 Continue to 309 days	Mon	12:30	17-JUL-10	8.73	1.42	137	143.88	0.0058	0.0050	0.2084	0.1825	0.1955	31-MAY-10	Mon	12:30	9.26	1.14	8.71	1.00
18-MAY-10 Continue to 334 days	Tue	12:30	17-JUL-10	8.18	1.33	137.5	144.37	0.0065	0.0049	0.1684	0.1670	0.1677	25-MAY-10	Tue	12:30	7.25	1.38	7.60	1.63
19-MAY-10 Continue to 314 days	Wed	12:30	17-JUL-10	9.10	1.33	136	142.99	0.0058	0.0070	0.2150	0.1730	0.1940	26-MAY-10	Wed	12:30	9.25	1.28	9.23	1.08
20-MAY-10 Continue to 308 days	Thu	12:30	17-JUL-10	9.18	1.41	135.5	142.53	0.0061	0.0048	0.2221	0.1795	0.2008	27-MAY-10	Thu	12:30	10.39	1.08	10.73	0.80
21-MAY-10 Continue to 312 days	Fri	12:30	17-JUL-10	9.52	1.43	136.5	143.33	0.0078	0.0037	0.2502	0.1771	0.2137	28-MAY-10	Fri	12:30	10.30	1.32	9.25	0.95
Panel C: Closing period (15:30-16:00)																			
24-MAY-10 Continue to 310 days	Mon	15:30	17-JUL-10	6.73	2.42	138.5	142.88	0.0058	0.0050	0.1945	0.1970	0.1958	31-MAY-10	Mon	15:30	6.73	3.29	7.71	3.00
18-MAY-10 Continue to 331 days	Tue	15:30	17-JUL-10	7.33	1.67	137.5	144.47	0.0065	0.0064	0.1051	0.1877	0.1464	25-MAY-10	Tue	15:30	6.87	1.03	7.90	1.52
19-MAY-10 Continue to 314 days	Wed	15:30	17-JUL-10	8.10	2.23	139	143.59	0.0058	0.0070	0.2425	0.1826	0.2126	26-MAY-10	Wed	15:30	7.24	3.43	7.23	3.08
20-MAY-10 Continue to 304 days	Thu	15:30	17-JUL-10	9.28	1.42	136.5	143.48	0.0068	0.0029	0.2298	0.1774	0.2036	27-MAY-10	Thu	15:30	9.91	1.27	10.13	0.88
21-MAY-10 Continue to 313 days	Fri	15:30	17-JUL-10	8.60	1.63	137.5	144.52	0.0054	0.0037	0.1903	0.1905	0.1904	28-MAY-10	Fri	15:30	8.30	1.44	8.30	1.08

Notes: GBP, IR_GBP, IR_USD, IV_GBPC, IV_GBPP, IV_GBP, GBPC_MOD, GBPP_MOD, GBPC_MKT, and GBPP_MKT represents British Pound, interest rate of GBP, interest rate of US dollar, implied volatility of GBP call options price, implied volatility of GBP put options price, implied volatility of GBP options [(IV_GBPC + IV_GBPP)/2], GBP call options model price, GBP put options model price, GBP call options market price, and GBP put options market price, respectively. The one-week estimate horizon indicates that the IV_GBP is calculated one-week before the date of estimating GBPC_MOD and GBPP_MOD.

Table A5.14c: Details of GBP options data for testing hypothesis 15
(Three-month maturity IV_GBP estimate GBP options price for one-week estimate horizon)

Trade date	Trade day	Trade Time	Expiry date	Call price	Put price	Strike price	Spot price	IR_GBP	IR_USD	IV_GBPC	IV_GBPP	IV_GBP	Estimate date	Estimate day	Estimate time	GBPC_MOD	GBPP_MOD	GBPC_MKT	GBPP_MKT
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
Panel A: Opening period (9:30-10:00)																			
10-MAY-10 Continue to 186 days	Mon	9:30	17-JUL-10	2.51	5.55	153	149.89	0.0085	0.0078	0.1486	0.1453	0.1470	17-MAY-10	Mon	9:30	0.78	9.45	0.72	9.05
11-MAY-10 Continue to 174 days	Tue	9:30	17-JUL-10	1.88	6.60	153	148.18	0.0085	0.0075	0.1485	0.1434	0.1460	18-MAY-10	Tue	9:30	0.75	9.43	0.63	8.69
12-MAY-10 Continue to 174 days	Wed	9:30	17-JUL-10	1.63	6.18	153	149.28	0.0074	0.0048	0.1236	0.1562	0.1399	19-MAY-10	Wed	9:30	0.43	10.70	0.52	9.95
13-MAY-10 Continue to 181 days	Thu	9:30	17-JUL-10	1.22	6.78	152.5	147.51	0.0074	0.0048	0.1233	0.1473	0.1353	20-MAY-10	Thu	9:30	0.53	9.43	0.63	9.87
07-MAY-10 Continue to 174 days	Fri	9:40	17-JUL-10	1.91	7.50	153	145.99	0.0089	0.0085	0.1746	0.1005	0.1375	14-MAY-10	Fri	9:40	0.84	8.65	0.88	8.18
Panel B: Midday period (12:30-13:00)																			
19-APR-10 Continue to 344 days	Mon	12:30	17-JUL-10	9.10	1.34	145	152.39	0.0073	0.0054	0.1552	0.1356	0.1454	26-APR-10	Mon	12:30	10.57	0.98	10.40	0.97
20-APR-10 Continue to 343 days	Tue	12:30	17-JUL-10	8.50	1.38	146.5	153.81	0.0073	0.0054	0.1312	0.1362	0.1337	27-APR-10	Tue	12:30	8.12	1.29	7.75	1.57
21-APR-10 Continue to 342 days	Wed	12:30	17-JUL-10	8.75	1.31	146.5	153.95	0.0073	0.0054	0.1382	0.1352	0.1367	28-APR-10	Wed	12:30	7.09	1.70	6.90	1.86
22-APR-10 Continue to 341 days	Thu	12:30	17-JUL-10	8.40	1.42	146.5	153.87	0.0073	0.0058	0.1253	0.1403	0.1328	29-APR-10	Thu	12:30	7.48	1.42	8.16	1.38
23-APR-10 Continue to 342 days	Fri	12:30	17-JUL-10	8.85	1.30	146	153.39	0.0074	0.0040	0.1485	0.1354	0.1419	30-APR-10	Fri	12:30	8.41	1.35	8.15	1.39
Panel C: Closing period (15:30-16:00)																			
19-APR-10 Continue to 346 days	Mon	15:30	17-JUL-10	9.10	1.32	145.5	152.82	0.0073	0.0054	0.1569	0.1337	0.1453	26-APR-10	Mon	15:30	10.21	1.06	10.00	1.02
20-APR-10 Continue to 337 days	Tue	15:30	17-JUL-10	8.90	1.29	146	153.48	0.0073	0.0054	0.1435	0.1341	0.1388	27-APR-10	Tue	15:30	8.35	1.36	8.03	1.47
21-APR-10 Continue to 343 days	Wed	15:30	17-JUL-10	8.80	1.29	146.5	153.91	0.0073	0.0054	0.1418	0.1339	0.1379	28-APR-10	Wed	15:30	6.96	1.79	7.14	1.79
22-APR-10 Continue to 346 days	Thu	15:30	17-JUL-10	8.60	1.38	146.5	153.78	0.0073	0.0058	0.1378	0.1374	0.1376	29-APR-10	Thu	15:30	7.65	1.50	8.16	1.39
23-APR-10 Continue to 348 days	Fri	15:30	17-JUL-10	8.90	1.28	146	153.49	0.0074	0.0048	0.1464	0.1358	0.1411	30-APR-10	Fri	15:30	8.37	1.34	8.18	1.36

Notes: GBP, IR_GBP, IR_USD, IV_GBPC, IV_GBPP, IV_GBP, GBPC_MOD, GBPP_MOD, GBPC_MKT, and GBPP_MKT represents British Pound, interest rate of GBP, interest rate of US dollar, implied volatility of GBP call options price, implied volatility of GBP put options price, implied volatility of GBP options [(IV_GBPC + IV_GBPP)/2], GBP call options model price, GBP put options model price, GBP call options market price, and GBP put options market price, respectively. The one-week estimate horizon indicates that the IV_GBP is calculated one-week before the date of estimating GBPC_MOD and GBPP_MOD.

Table A5.15a: Details of GBP options data for testing hypothesis 16
(One-month maturity IV_GBP estimate GBP options price for one-month estimate horizon)

Trade date	Trade day	Trade Time	Expiry date	Call price	Put price	Strike price	Spot price	IR_GBP	IR_USD	IV_GBPC	IV_GBPP	IV_GBP	Estimate date	Estimate day	Estimate time	GBPC_MOD	GBPP_MOD	GBPC_MKT	GBPP_MKT
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
Panel A: Opening period (9:30-10:00)																			
21-JUN-10 Continue to 137 days	Mon	9:30	17-JUL-10	4.05	1.81	145.5	147.77	0.0062	0.0042	0.1783	0.1789	0.1786	12-JUL-10	Mon	9:30	3.67	1.43	3.97	1.29
22-JUN-10 Continue to 146 days	Tue	9:30	17-JUL-10	4.50	1.80	146.0	148.04	0.0062	0.0040	0.2214	0.1753	0.1983	13-JUL-10	Tue	9:30	4.01	1.41	3.96	1.24
23-JUN-10 Continue to 138 days	Wed	9:30	17-JUL-10	4.59	1.51	145.5	147.98	0.0065	0.0070	0.2130	0.1708	0.1919	14-JUL-10	Wed	9:30	4.11	1.14	4.00	1.29
17-JUN-10 Continue to 139 days	Thu	9:30	17-JUL-10	4.31	1.85	146.0	148.82	0.0060	0.0072	0.1577	0.1816	0.1697	07-JUL-10	Thu	9:30	4.01	1.50	4.37	1.42
18-JUN-10 Continue to 145 days	Fri	9:30	17-JUL-10	3.86	1.88	145.5	147.40	0.0062	0.0056	0.1709	0.1654	0.1682	08-JUL-10	Fri	9:30	3.51	1.54	3.90	1.46
Panel B: Midday period (12:30-13:00)																			
21-JUN-10 Continue to 161 days	Mon	12:30	17-JUL-10	6.32	1.28	141.5	147.26	0.0062	0.0035	0.1604	0.2217	0.1910	12-JUL-10	Mon	12:30	6.11	0.90	6.03	0.85
22-JUN-10 Continue to 184 days	Tue	12:30	17-JUL-10	7.16	1.21	140.0	146.48	0.0062	0.0040	0.1898	0.2369	0.2133	13-JUL-10	Tue	12:30	6.90	0.82	6.26	0.86
23-JUN-10 Continue to 178 days	Wed	12:30	17-JUL-10	6.24	1.24	142.5	148.10	0.0065	0.0033	0.1712	0.2224	0.1968	14-JUL-10	Wed	12:30	5.99	0.84	5.61	0.90
17-JUN-10 Continue to 191 days	Thu	12:30	17-JUL-10	6.38	1.36	142.0	147.01	0.0066	0.0072	0.1987	0.1983	0.1985	07-JUL-10	Thu	12:30	6.05	1.03	6.75	1.12
18-JUN-10 Continue to 179 days	Fri	12:30	17-JUL-10	6.27	1.30	141.5	146.02	0.0062	0.0073	0.2201	0.1884	0.2043	08-JUL-10	Fri	12:30	5.87	0.98	6.11	1.11
Panel C: Closing period (15:30-16:00)																			
21-JUN-10 Continue to 158 days	Mon	15:30	17-JUL-10	3.58	1.95	145.5	147.26	0.0062	0.0044	0.1681	0.1754	0.1717	12-JUL-10	Mon	15:30	3.22	1.57	3.31	1.24
22-JUN-10 Continue to 167 days	Tue	15:30	17-JUL-10	5.26	2.41	142.5	144.48	0.0062	0.0040	0.2811	0.2202	0.2506	13-JUL-10	Tue	15:30	4.64	1.92	4.36	1.16
23-JUN-10 Continue to 170 days	Wed	15:30	17-JUL-10	5.62	1.19	142.5	146.96	0.0066	0.0035	0.1946	0.1945	0.1946	14-JUL-10	Wed	15:30	5.26	0.82	5.60	1.10
17-JUN-10 Continue to 171 days	Thu	15:30	17-JUL-10	6.45	1.34	143.5	149.10	0.0055	0.0040	0.1690	0.2053	0.1871	07-JUL-10	Thu	15:30	6.21	1.00	6.46	1.14
18-JUN-10 Continue to 152 days	Fri	15:30	17-JUL-10	6.37	1.56	144.5	148.02	0.0062	0.0073	0.2665	0.1826	0.2246	08-JUL-10	Fri	15:30	5.84	1.22	5.11	1.51

Notes: GBP, IR_GBP, IR_USD, IV_GBPC, IV_GBPP, IV_GBP, GBPC_MOD, GBPP_MOD, GBPC_MKT, and GBPP_MKT represents British Pound, interest rate of GBP, interest rate of US dollar, implied volatility of GBP call options price, implied volatility of GBP put options price, implied volatility of GBP options [(IV_GBPC + IV_GBPP)/2], GBP call options model price, GBP put options model price, GBP call options market price, and GBP put options market price, respectively. The one-month estimate horizon indicates that the IV_GBP is calculated one-month before the date of estimating GBPC_MOD and GBPP_MOD.

Table A5.15b: Details of GBP options data for testing hypothesis 17
(Two-month maturity IV_GBP estimate GBP options price for one-month estimate horizon)

Trade date	Trade day	Trade Time	Expiry date	Call price	Put price	Strike price	Spot price	IR_GBP	IR_USD	IV_GBPC	IV_GBPP	IV_GBP	Estimate date	Estimate day	Estimate time	GBPC_MOD	GBPP_MOD	GBPC_MKT	GBPP_MKT
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
Panel A: Opening period (9:30-10:00)																			
24-MAY-10 Continue to 137 days	Mon	9:30	17-JUL-10	2.98	4.00	145	144.48	0.0058	0.0045	0.1460	0.1677	0.1569	21-JUN-10	Mon	9:30	4.77	1.02	4.00	0.81
25-MAY-10 Continue to 146 days	Tue	9:30	17-JUL-10	2.69	4.38	145	142.77	0.0063	0.0085	0.1684	0.1449	0.1566	22-JUN-10	Tue	9:30	3.53	1.51	4.00	0.80
26-MAY-10 Continue to 138 days	Wed	9:30	17-JUL-10	2.74	3.90	145	144.09	0.0071	0.0048	0.1467	0.1564	0.1516	23-JUN-10	Wed	9:30	4.79	0.82	4.51	0.61
27-MAY-10 Continue to 139 days	Thu	9:30	17-JUL-10	3.13	3.35	145	145.79	0.0076	0.0054	0.1264	0.1713	0.1488	24-JUN-10	Thu	9:30	5.50	0.55	5.37	0.42
21-MAY-10 Continue to 145 days	Fri	9:30	17-JUL-10	3.10	4.55	145	144.05	0.0070	0.0033	0.1579	0.1763	0.1671	18-JUN-10	Fri	9:30	4.78	1.38	3.96	0.88
Panel B: Midday period (12:30-13:00)																			
24-MAY-10 Continue to 161 days	Mon	12:30	17-JUL-10	8.73	1.42	137	143.88	0.0058	0.0050	0.2084	0.1825	0.1955	21-JUN-10	Mon	12:30	11.45	0.21	11.12	0.09
18-MAY-10 Continue to 184 days	Tue	12:30	17-JUL-10	8.18	1.33	137.5	144.37	0.0065	0.0049	0.1684	0.1670	0.1677	15-JUN-10	Tue	12:30	10.26	0.25	10.87	0.18
19-MAY-10 Continue to 178 days	Wed	12:30	17-JUL-10	9.10	1.33	136	142.99	0.0058	0.0070	0.2150	0.1730	0.1940	16-JUN-10	Wed	12:30	12.00	0.25	12.34	0.10
20-MAY-10 Continue to 191 days	Thu	12:30	17-JUL-10	9.18	1.41	135.5	142.53	0.0061	0.0048	0.2221	0.1795	0.2008	17-JUN-10	Thu	12:30	12.74	0.22	12.58	0.09
21-MAY-10 Continue to 179 days	Fri	12:30	17-JUL-10	9.52	1.43	136.5	143.33	0.0078	0.0037	0.2502	0.1771	0.2137	18-JUN-10	Fri	12:30	11.88	0.35	11.52	0.08
Panel C: Closing period (15:30-16:00)																			
24-MAY-10 Continue to 158 days	Mon	15:30	17-JUL-10	8.30	1.40	137.5	144.30	0.0071	0.0052	0.1880	0.1795	0.1838	21-JUN-10	Mon	15:30	10.96	0.19	10.15	0.12
18-MAY-10 Continue to 167 days	Tue	15:30	17-JUL-10	7.33	1.67	137.5	144.47	0.0065	0.0064	0.1051	0.1877	0.1464	15-JUN-10	Tue	15:30	10.75	0.11	10.78	0.17
19-MAY-10 Continue to 170 days	Wed	15:30	17-JUL-10	8.93	1.28	136.5	143.50	0.0061	0.0076	0.2042	0.1694	0.1868	16-JUN-10	Wed	15:30	12.03	0.21	11.46	0.13
20-MAY-10 Continue to 171 days	Thu	15:30	17-JUL-10	9.28	1.42	136.5	143.48	0.0068	0.0029	0.2298	0.1774	0.2036	17-JUN-10	Thu	15:30	11.93	0.30	11.67	0.11
21-MAY-10 Continue to 152 days	Fri	15:30	17-JUL-10	8.60	1.63	137.5	144.52	0.0054	0.0037	0.1903	0.1905	0.1904	18-JUN-10	Fri	15:30	10.77	0.30		

Notes: GBP, IR_GBP, IR_USD, IV_GBPC, IV_GBPP, IV_GBP, GBPC_MOD, GBPP_MOD, GBPC_MKT, and GBPP_MKT represents British Pound, interest rate of GBP, interest rate of US dollar, implied volatility of GBP call options price, implied volatility of GBP put options price, implied volatility of GBP options [(IV_GBPC + IV_GBPP)/2], GBP call options model price, GBP put options model price, GBP call options market price, and GBP put options market price, respectively. The one-month estimate horizon indicates that the IV_GBP is calculated one-month before the date of estimating GBPC_MOD and GBPP_MOD.

Table A5.15c: Details of GBP options data for testing hypothesis 18
(Three-month maturity IV_GBP estimate GBP options price for one-month estimate horizon)

Trade date	Trade day	Trade Time	Expiry date	Call price	Put price	Strike price	Spot price	IR_GBP	IR_USD	IV_GBPC	IV_GBPP	IV_GBP	Estimate date	Estimate day	Estimate time	GBPC_MOD	GBPP_MOD	GBPC_MKT	GBPP_MKT
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
Panel A: Opening period (9:30-10:00)																			
10-MAY-10 Continue to 142 days	Mon	9:30	17-JUL-10	2.51	5.55	153	149.89	0.0085	0.0078	0.1486	0.1453	0.1470	07-JUN-10	Mon	9:30	0.41	9.05	0.41	8.34
11-MAY-10 Continue to 141 days	Tue	9:30	17-JUL-10	1.88	6.60	153	148.18	0.0085	0.0075	0.1485	0.1434	0.1460	08-JUN-10	Tue	9:30	0.33	9.45	0.28	9.17
12-MAY-10 Continue to 139 days	Wed	9:30	17-JUL-10	1.63	6.18	153	149.28	0.0074	0.0048	0.1236	0.1562	0.1399	09-JUN-10	Wed	9:30	0.34	8.70	0.36	7.80
13-MAY-10 Continue to 139 days	Thu	9:30	17-JUL-10	1.22	6.78	152.5	147.51	0.0074	0.0048	0.1233	0.1473	0.1353	10-JUN-10	Thu	9:30	0.54	6.96	0.50	6.60
07-MAY-10 Continue to 135 days	Fri	9:40	17-JUL-10	1.91	7.50	153	145.99	0.0089	0.0085	0.1746	0.1005	0.1375	04-JUN-10	Fri	9:40	0.69	7.14	0.50	7.75
Panel B: Midday period (12:30-13:00)																			
19-APR-10 Continue to 284 days	Mon	12:30	17-JUL-10	9.10	1.34	145	152.39	0.0073	0.0054	0.1552	0.1356	0.1454	17-MAY-10	Mon	12:30	3.00	3.88	3.13	4.03
20-APR-10 Continue to 290 days	Tue	12:30	17-JUL-10	8.50	1.38	146.5	153.81	0.0073	0.0054	0.1312	0.1362	0.1337	18-MAY-10	Tue	12:30	2.17	4.36	2.30	4.48
21-APR-10 Continue to 284 days	Wed	12:30	17-JUL-10	8.75	1.31	146.5	153.95	0.0073	0.0054	0.1382	0.1352	0.1367	19-MAY-10	Wed	12:30	1.73	5.21	2.26	5.00
12-NOV-15 Continue to 290 days	Thu	12:30	15-JAN-16	7.45	0.25	145	151.87	0.0067	0.0078	0.1101	0.0862	0.0981	10-DEC-15	Thu	12:30	6.32	0.19	6.85	0.08
23-APR-10 Continue to 287 days	Fri	12:30	17-JUL-10	8.85	1.30	146	153.39	0.0074	0.0040	0.1485	0.1354	0.1419	21-MAY-10	Fri	12:30	2.05	4.79	3.06	4.45
Panel C: Closing perio++----d (15:30-16:00)																			
19-APR-10 Continue to 282 days	Mon	15:30	17-JUL-10	9.10	1.32	145.5	152.82	0.0073	0.0054	0.1569	0.1337	0.1453	17-MAY-10	Mon	15:30	2.84	4.09	3.10	3.93
20-APR-10 Continue to 286 days	Tue	15:30	17-JUL-10	8.90	1.29	146	153.48	0.0073	0.0054	0.1435	0.1341	0.1388	18-MAY-10	Tue	15:30	2.55	4.07	2.19	5.03
21-APR-10 Continue to 280 days	Wed	15:30	17-JUL-10	8.80	1.29	146.5	153.91	0.0073	0.0054	0.1418	0.1339	0.1379	19-MAY-10	Wed	15:30	1.93	4.91	2.33	4.70
22-APR-10 Continue to 293 days	Thu	15:30	17-JUL-10	8.60	1.38	146.5	153.78	0.0073	0.0058	0.1378	0.1374	0.1376	20-MAY-10	Thu	15:30	1.86	4.94	2.69	4.80
23-APR-10 Continue to 282 days	Fri	15:30	17-JUL-10	8.90	1.28	146	153.49	0.0074	0.0048	0.1464	0.1358	0.1411	21-MAY-10	Fri	15:30	2.51	4.07	2.98	4.50

Notes: GBP, IR_GBP, IR_USD, IV_GBPC, IV_GBPP, IV_GBP, GBPC_MOD, GBPP_MOD, GBPC_MKT, GBPP_MKT represents British Pound, interest rate of GBP, interest rate of US dollar, implied volatility of GBP call options price, implied volatility of GBP put options price, implied volatility of GBP options [(IV_GBPC + IV_GBPP)/2], GBP call options model price, GBP put options model price, GBP call options market price, and GBP put options market price, respectively. The one-month estimate horizon indicates that the IV_GBP is calculated one-month before the date of estimating GBPC_MOD and GBPP_MOD.