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HKEX
香港交易所

RESEARCH REPORT

THE HKEX USD/CNH OPTIONS CONTRACT — A RMB CURRENCY RISK MANAGEMENT TOOL

CONTENTS

Page

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SUMMARY

The introduction of the HKEX's Renminbi (RMB) currency options is driven by the growing demand from market participants for diversified tools for trading and hedging the offshore RMB (CNH) exchange rate.

HKEX's RMB currency options contracts are complementary to the family of HKEX's RMB currency futures contracts. These options products could serve as risk management tools against non-linear sensitivities and offers volatility trading opportunities on RMB exchange rates, addressing market demand not previously satisfied by HKEX's RMB currency futures [1]. In the course of ongoing RMB exchange rates liberalisation process and the associated policy developments, the exchange rates are in transition from policy rates to market-driven rates. This is expected to create higher volatility in the USD/CNH exchange rate. The one-month implied volatility of USD/CNH was around 1% to 2% in the month before the RMB exchange rate reform in August 2015[2]. It has increased sharply to a range of 4% to 10% in the year subsequent to the reform. The increase in spot USD/CNH volatility could provide an opportunity for the introduction of RMB currency options contracts to enable volatility trading and facilitate hedging for market participants.

Furthermore, the global over-the-counter ("OTC") RMB options market already has a sizeable average daily turnover of approximately US$18 billion[3] with an average transaction size of US$150 million[4] as of 2016. Unlike two to three years ago when CNH structured forward positions dominated the market risk profile in the OTC CNH derivatives market, almost all new volatility risks are now hedged by vanilla options which are standardised calls/puts with no special features.

In light of the relative lack of transparency in the OTC market, the associated margin requirements by new regulations and the counterparty risks, there is an increasing demand for bringing RMB currency options trading onto the exchange market. The USD/CNH Options contracts listed on the Hong Kong Futures Exchange ("HKFE"), and centrally cleared through the HKFE Clearing Corporation Limited ("HKCC"), provide price transparency and reduce counterparty risks in this important and growing CNH options market.

[1] Compared to currency futures which offer linear exposure of the underlying currency rate, currency options offer exposure of non-linear risk sensitivities such as second-order derivative of the underlying (i.e. gamma), volatility (i.e. vega) and time (i.e. theta).

[2] Source: Bloomberg.

[3] Triennial Central Bank Survey of foreign exchange and OTC derivatives markets in 2016, Bank of International Settlement

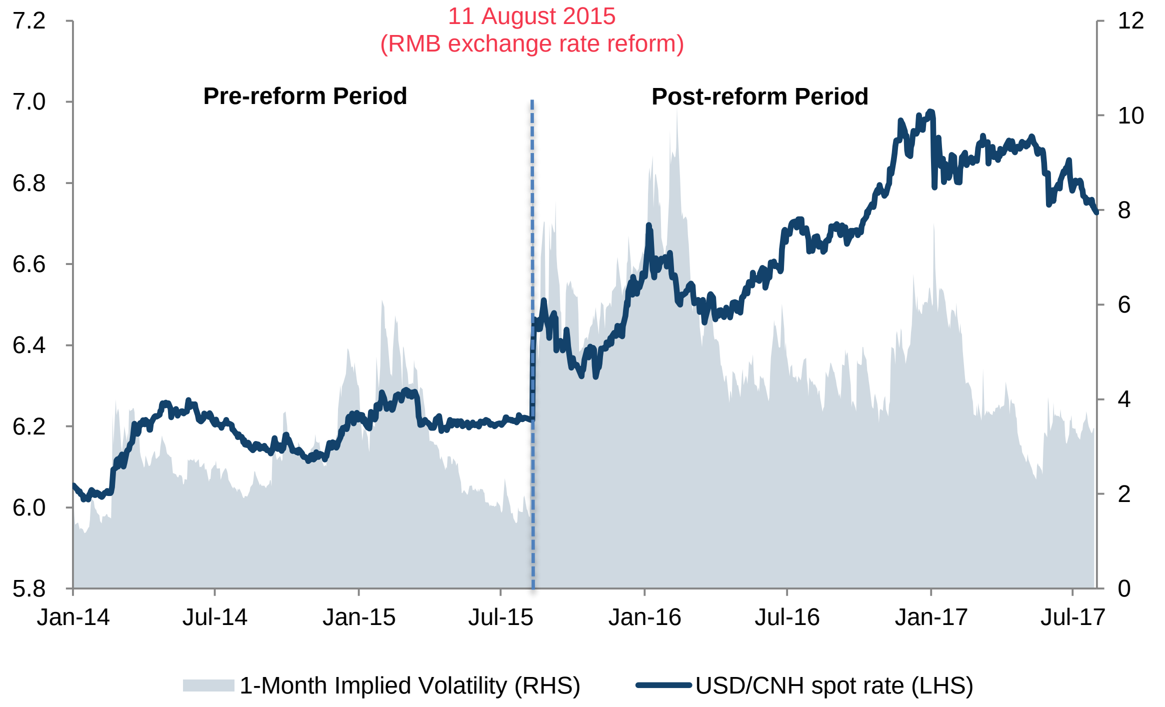
[4] "Emerging Markets Currency Guide 2016", HSBC

1. MACRO ENVIRONMENT: MARKET DEMAND AND CURRENT SUPPORT

1.1 Two-way volatility drives demand for RMB risk management tools

On 11 August 2015 the People's Bank of China (PBOC) introduced a new market-based managed floating framework for RMB exchange rate fixing, which is based on the previous close of the onshore RMB (CNY) rate, together with market supply and demand factors with reference to a basket of currencies (the reform). The 1-month implied volatility of the USD/CNH rate increased from 1%-2% in the month before the August 2015 reform to 4%-10% in the year subsequent to the reform.

Figure 1. Daily USD/CNH spot rate and volatility (1January 2014 – 31 July 2017)



Source: Bloomberg.

The internationalisation of the RMB has entered a new stage. Hong Kong's role as the most critical offshore RMB hub connecting the Mainland and the world has become increasingly important. Hong Kong should continue to build on its own strength and, based on its new role as a "mutual market", open up bigger room for innovation for the better of its long-term development. Such a new role may be perceived from three different angles: (1) an enhanced offshore RMB market; (2) a RMB risk management centre; and (3) a gateway market. These are elaborated below.

(1) For the offshore RMB market, the impetus of market growth used to heavily rely on RMB appreciation expectations and arbitrage trading between onshore and offshore markets. Now, the market's depth and breadth have been building up as more and more relevant financial products are introduced and more risk management tools are provided for the use of more and more portfolio management tactics. All these serve appropriately the demand for global allocation of RMB assets and the related cross-border capital flows. In developed countries such as Japan, the UK and the US, the size of their credit, equity and bond markets is more than 5 times of their GDP[5], whereas the corresponding figure

[5] Source: International Monetary Fund (IMF) database.

is around 2.1 times in China. This indicates substantial room for further development in China in terms of financial market deepening and financial product diversification. Together with the inclusion of RMB in the International Monetary Fund's Special Drawing Right (SDR) basket of currencies, two-way volatility is expected to become the new norm. More and more investors have become increasingly aware of this market change and have started to manage their exchange rate risk exposure.

Through further developing and enriching its range of multi-facet financial products and related financial services, **Hong Kong can continue to well position its offshore RMB market** as a major venue for cross-border investments (especially overseas investments from the Mainland) and related risk management. Now is a good time for Hong Kong to further build up the market depth and effectiveness of its offshore RMB market. Through more effective and sensible pricing benchmarks for onshore and offshore RMB markets, segregation in the RMB pricing structure could be improved and a reasonable price difference between the onshore and offshore RMB markets could be maintained. This would require further connectivity between the onshore and offshore RMB bond markets, foreign exchange (FX) markets and derivatives markets, enhanced market liquidity and an increased number and diversity of market participants.

(2) **Hong Kong is well positioned to become a risk management centre** to facilitate the current transformation and adjustment process of the Mainland economic and financial system. For example, greater flexibility in the RMB exchange rate is broadly expected in the next stage of the currency's path towards internationalisation, and in such process the demand for exchange rate risk management is bound to be substantial. Meanwhile, Mainland companies are expanding their global reach and their participation in projects in countries along the Belt and Road[6]. In this process, Hong Kong is also well positioned to serve the demand from these companies for overseas investment risk management and their global presence.

(3) Following the gradual opening of China's financial market, Hong Kong will not only be an active destination market for investment purposes by Mainland entities, but is also becoming **the gateway market** for Mainland entities to invest in other markets. This is becoming more evident after the launch of the Mainland-Hong Kong Mutual Market Access pilot programme. The launch of Shanghai-Hong Kong Stock Connect (Shanghai Connect) in November 2014, the Shenzhen-Hong Kong Stock Connect (Shenzhen Connect) in December 2016, and the mutual bond market access on bond markets (Bond Connect) in July 2017, has linked up Hong Kong, Shenzhen and Shanghai into a sizeable mutual market. With Hong Kong as the gateway, such a mutual market will support the global asset allocation of Mainland funds and provide sound infrastructure and platforms for international funds to invest in the Mainland capital market. Foreseeably, if such a framework of connectivity is expanded to other product types, Hong Kong's key role as a gateway market will be further strengthened. With the increasing cross-border investment activities, the demand for risk management is expected to increase, possibly multi-fold.

1.2 The support offered by HKEX's RMB products and platforms

Against the macro backdrop analysed above, the overseas market saw growing interest in China's fixed income and currency (FIC) market and greater demand for risk management and investment. HKEX has been devoting efforts in multiple dimensions with an aim to be an offshore RMB product trading and risk management centre. HKEX's platforms now have a variety of RMB products including bonds, exchange traded funds (ETFs), real estate investment trust (REIT), equities, RMB fixed income and currency (FIC) derivatives and

[6] A development proposal proposed by Chinese President Xi Jinping in September 2013 that focuses on connectivity and cooperation between Eurasian countries.

commodity derivatives. The HKEX RMB product suite is provided with an aim to match market demands.

HKEX launched its USD/CNH Futures contract in 2012, which has seen turnover take off since 2015 and is now one of the most actively traded RMB futures contract in the world[7]. HKEX then moved to diversify its product offerings by launching new CNH currency pairs against the Japanese yen, Euro, and Australian dollar, which began trading on 30 May 2016 to facilitate cross-currency hedging. In addition to RMB currency risk management tools, RMB interest rate risk management tools on HKEX were also enriched upon the introduction of HKEX's Five-Year China Ministry of Finance Treasury Bond Futures (Bond Futures) on 10 April 2017. The Bond Futures would be useful tools for interest rate hedging, especially upon the launch of the connectivity scheme between the bond markets in Mainland and Hong Kong (Bond Connect) on 3 July 2017. Bond Connect is a pilot scheme that connects China's interbank bond market with the world, giving international investors "Northbound" access to trade bonds directly on the China Foreign Exchange Trading System (CFETS), the Mainland interbank bond market trading platform, for the first time.

There is also tremendous potential market demand for an RMB Currency Index benchmark as the RMB becomes a reserve currency and the market focuses on the relationship between the RMB and global currencies. In June 2016, HKEX launched the TR/HKEX RMB Currency Index series (RXY Indices or RXY Index series) which is jointly developed with Thomson Reuters, allowing market participants to conveniently monitor the RMB's movements. HKEX also plan to introduce futures and options on the index in the future to provide the market with effective RMB risk management tools.

In addition, HKEX plans to launch a full suite of different RMB products. As a start in the commodities segment, HKEX launched dual-currency (USD and RMB pricing and settlement) physical delivery Gold Futures Contracts on 10 July 2017. This new product offers gold producers, users and investors a practical solution to manage risks arising from the gaps between the gold spot and futures markets, as well as the price difference between the RMB and USD.

Furthermore, enhancements in HKEX's infrastructural platforms add to a solid foundation for further development of RMB derivatives in Hong Kong. HKEX's subsidiary, OTC Clearing Hong Kong Ltd (OTC Clear), commenced business in 2013. This is a key piece of infrastructure to serve clearing service needs of FIC market participants, especially in regionally-traded products and in particular RMB-based derivatives.

1.3 HKEX USD/CNH Futures: one of the world's most liquid USD/CNH contracts

There is an increased market awareness of the merits or even necessity of hedging RMB exchange rates. The first RMB derivative product traded on HKEX was the USD/CNH Futures launched in September 2012. Investors, both individuals and institutions, have started to realise how the RMB FX volatility can have an impact on their investment portfolios in terms of RMB assets, liabilities and cash flow. The RMB's two-way movement has become accepted as a metric in investors' risk management framework.

In 2016, the HKEX USD/CNH Futures recorded historical highs of annual contract volume and year-end open interest[8]. The record-breaking total trading volume of the product in 2016 was 538,594 contracts, an annual increase of 105%; and the record high year-end open interest was 45,635 contracts, a year-on-year increase of 98%. Its average daily volume climbed to 4,325 contracts in December 2016. The cash-settled CNH/USD futures also showed a

[7] See HKEX research report, "HKEX towards an offshore RMB product trading and risk management centre", April 2017.

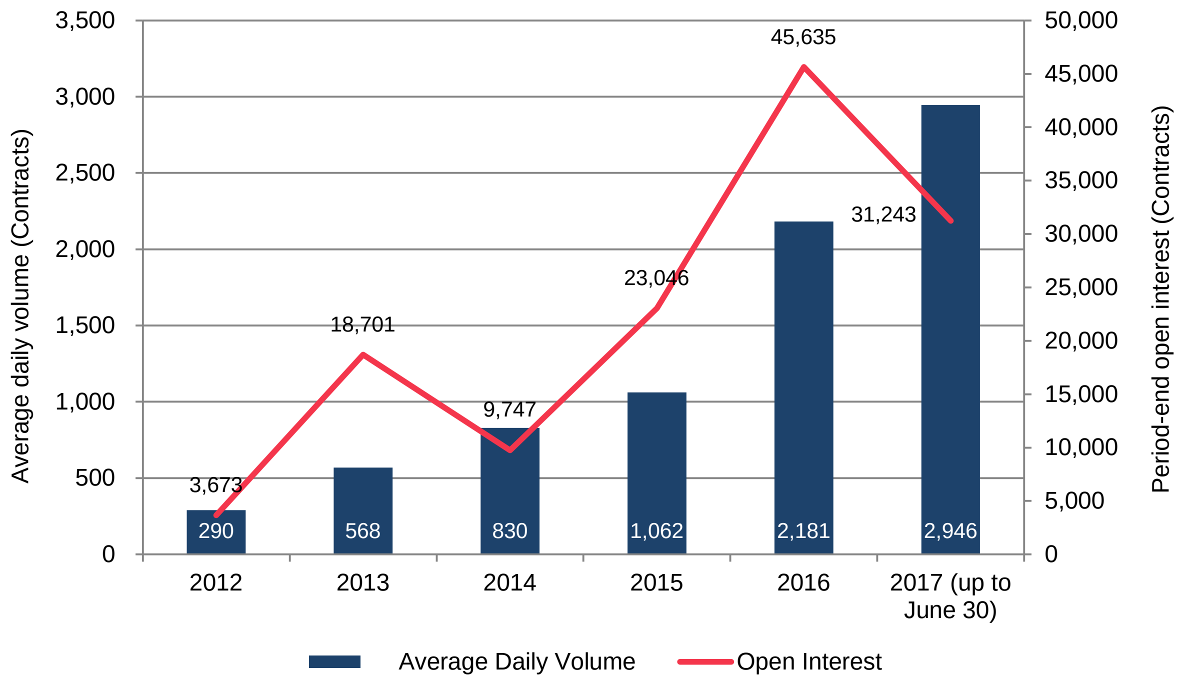
[8] Source: HKEX.

growing contract volume in 2016H2 and its open interest has been continuously building up since launch. Its average daily volume achieved 95 contracts in December 2016; and its open interest reached the highest of 1,494 contracts at year-end.

Entering into 2017, new records of performance were seen in this product:

- Record single-day turnover of 20,338 contracts (notional value of US$2 billion) on 5 January 2017; followed by the second and third record turnovers of over 8,600 contracts (notional value of more than US$860 million) on 31 May and 1 June 2017
- Open interest record of 46,711 contracts (notional value of US$4.7 billion) on 4 January 2017
- Night-session record of 3,642 contracts (notional value of US$360 million) on 4 January 2017
- Increased market participation, bringing the total number of exchange participants (EPs) having traded the product to 112.

Figure 2. HKEX USD/CNH Futures trading performance (2012 – 2017 1H)

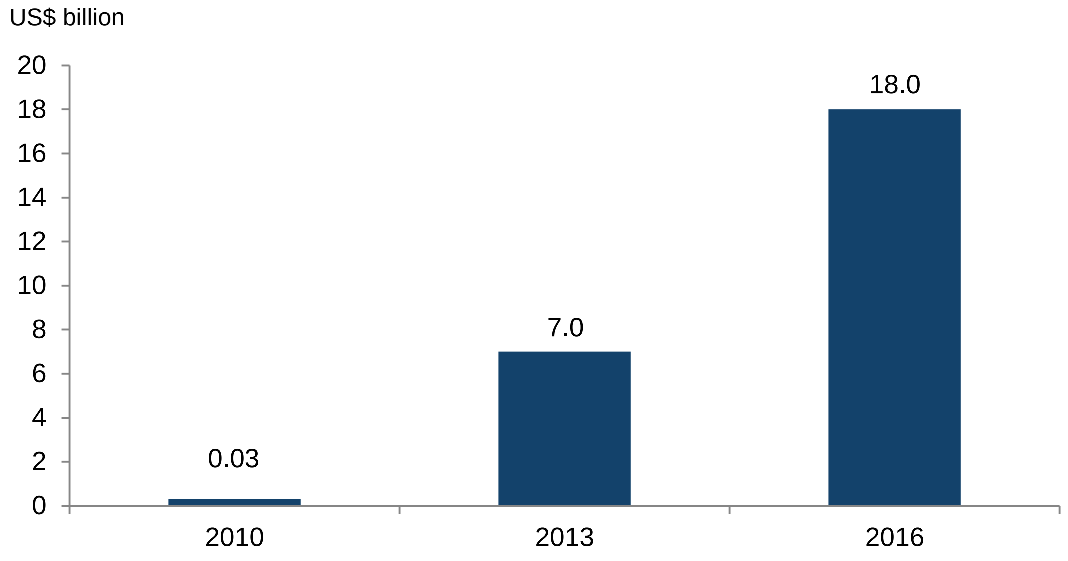


Source: HKEX.

2. HKEX USD/CNH OPTIONS: THE RISK MANAGEMENT TOOL MADE AVAILABLE ON EXCHANGE MARKET

Currently, a sizeable OTC RMB options market already exists, with an average daily trading volume of US$18 billion[9] and an average transaction size US$150 million[10] (see Figure 3). Unlike two to three years ago when CNH structured forward positions dominated the market risk profile in the OTC CNH derivatives market, almost all new volatility risks are now hedged by vanilla options which are standardised calls / puts with no special features. This demonstrates an increasing market demand to hedge currency risk using vanilla options instead of exotic-style options.

Figure 3. Average daily turnover OTC RMB currency options globally



Source: Bank of International Settlement, Triennial Central Bank Survey of foreign exchange and OTC derivatives markets

Compared to the OTC RMB currency options market, HKEX's currency options market has several characteristics, explained in sub-sections below.

2.1 Continuous quotation

Traditionally, OTC RMB currency options market is operated on a bilateral dealing, request-for-quote (RFQ) basis. Investors have to source, contact and negotiate with price providers individually to get a quote on options price and compare the prices among themselves, which might not be the most efficient way for price discovery.

In this regard, HKEX's USD/CNH Options offer a different role on trade execution and price discovery. Typically, continuous quotations on around 150 option series are available provided by dedicated liquidity providers, with the average spreads of 12-40 pips for short tenors and 80-160 pips for long tenors[11]. Such streaming of bid/ask quotations allows investors to freely execute trades at their desired strike and tenor, facilitating liquidity development. In addition to continuous quotation, investors can also submit quote requests to dedicated liquidity providers on specific strike and tenor.

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9 Triennial Central Bank Survey of foreign exchange and OTC derivatives markets in 2016, Bank of International Settlement.

10 "Emerging Markets Currency Guide 2016", HSBC.

11 Source: HKEX, July 2017; "pip" refers to percentage in point (0.0001), which is the minimum price fluctuation for a currency pair.

One of the special characteristics of an exchange-traded market for RMB derivatives traditionally traded OTC is that it acts as a liquidity aggregator offering continuous and tight bid/ask liquidity. The regulatory and capital benefits (see Section 2.2 below) of trading listed products have become more pronounced. The exchange market offers a marketplace for orderly and transparent trading on an equal basis.

2.2 Capital efficiency

New rules in Europe (EMIR[12]) and the United States (CFTC[13]) are affecting existing OTC participants. From 1 March 2017, all in-scope counterparties (primarily financial entities and systemically important non-financial entities) with uncleared OTC portfolios must exchange variation margin daily. This requirement is relatively new for many users of OTC products, and the requirement to exchange initial margin is being made mandatory in stages over time towards full implementation by September 2020.

RMB exchange-traded derivatives provide capital efficiency to investors as a result of their comparative advantages in various aspects vis-à-vis the OTC market. Table 1 presents a table of comparison between exchange-traded RMB derivative products and OTC products.

Table 1. Comparison between RMB exchange-traded derivatives products and RMB OTC derivatives products

Item	RMB OTC derivatives	RMB exchange-traded derivatives
Price transparency	Relatively less transparent — Need to contact each counterparty to get the price	Highly transparent — option prices are available on the HKEX website, and through information vendors and trading platforms of brokers
Central clearing	Bilateral and no central clearing	Central clearing counterparty for both sides of transactions
Credit and collateral	Need to negotiate credit lines and collateral arrangements with banks	Margin-based and cash collateral is accepted
Settlement risk	RMB is not an eligible currency in CLS[14], therefore cannot utilise the CLS system for position netting	Position netting is available for exchange traded derivatives

Source: HKEX analysis.

2.3 Versatile hedging tool due to unique risk and reward profile

HKEX's USD/CNH Options contract is designed to mirror the characteristics of the USD/CNH futures contract to allow for cross-product hedging and cross-margining benefits, as well as to provide alternative product payoff structures for the same notional contract size.

(i) Cross-product hedging

USD/CNH options are directly complementary to the existing HKEX USD/CNH Futures, which together could allow investors to deploy trading and hedging strategies under various market conditions with relatively low counterparty risk in comparison to OTC derivatives. They provide investors a hedging tool against RMB volatility amid the ongoing

12 European market infrastructure regulation ("EMIR") is the regulatory technical standards pursuant to Article 11 European Market Infrastructure Regulation (EU) No. 648/2012 of the European Parliament and of the Council.

13 Commodity Exchange Act of the U.S. Commodity Futures Trading Commission ("CFTC").

14 Continuous Linked Settlement System — a global clearing and settlement system for cross-border foreign exchange transactions.

RMB liberalisation process and policy development towards a market-driven framework. (See Table 2 for a comparison between options and futures.)

(ii) Cross-margining benefits

HKEX's USD/CNH Options contract is traded on a margin-basis under the SPAN methodology[15] adopted by HKCC, where net delta is a key determinant of margin requirement for futures and options of the same underlying. A client can therefore enjoy cross-margining benefits when holding USD/CNH Futures and Options positions at the same time, paying less margin compared to those required for separate outrights.

From a risk management perspective, Options contract is a versatile tool due to options' unique risk and reward profile. With a variety of options/futures strategies deployable, Options contracts provide exposure to multiple market parameters, e.g. spot rate, volatility and time.

Options contract is suitable for various RMB market conditions, providing flexibility of strategies to cater for various market conditions — they can be utilised in bullish, bearish, range-bound or volatile markets. (See section 3.2 on the basic applications of the product.)

Table 2. Options versus futures

Options	Futures
• Gives the buyer the right, but not the obligation, on or before a pre-determined date, to buy (or sell) an underlying asset at a pre-determined price (the "strike price"); and the seller the obligation to sell (or buy) the asset at the strike price if the buyer exercise the right • The option price has a non-linear relationship with the underlying asset, and has a unique risk and reward structure • The buyer pays upfront price as the option's premium	• Gives the buyer the obligation to buy an asset at a pre-determined price and the seller the obligation to sell at the pre-determined price, at a specified time in the future • Futures prices have linear relationship with the underlying assets • No upfront cost (apart from margin and other fees related to trading)
Illustrations	
• **Options:** An investor buys a (European-style) call option on the USD/CNH rate with the strike price at 7.0 expiring in three months. Three months' later on the option's expiry date, the investor will have the right, but not the obligation, to buy USD at the exchange rate of RMB 7.0 per USD. • **Futures:** An investor enters into a long position of USD/CNH futures at 7.0 expiring in three months. Three months' later on the futures' expiry date, the investor will have the obligation to buy USD at the exchange rate of RMB 7.0 per USD. • Currency options are more complex than options on other asset classes, due to the fact that a call on one currency is also a put on the other currency.	

Source: HKEX analysis.

2.4 Other characteristics of exchange trading

- **Cost effectiveness**: In general options contract traded on exchange provides leverage[16] and cost effectiveness as it is traded on an option premium and margin basis, and requires upfront payment of only a fraction of the notional value. For the HKEX USD/CNH Options, related transaction cost is further reduced as the trading fee is waived for the first six months (20 March 2017 – 29 September 2017) and the SFC levy is not applied.

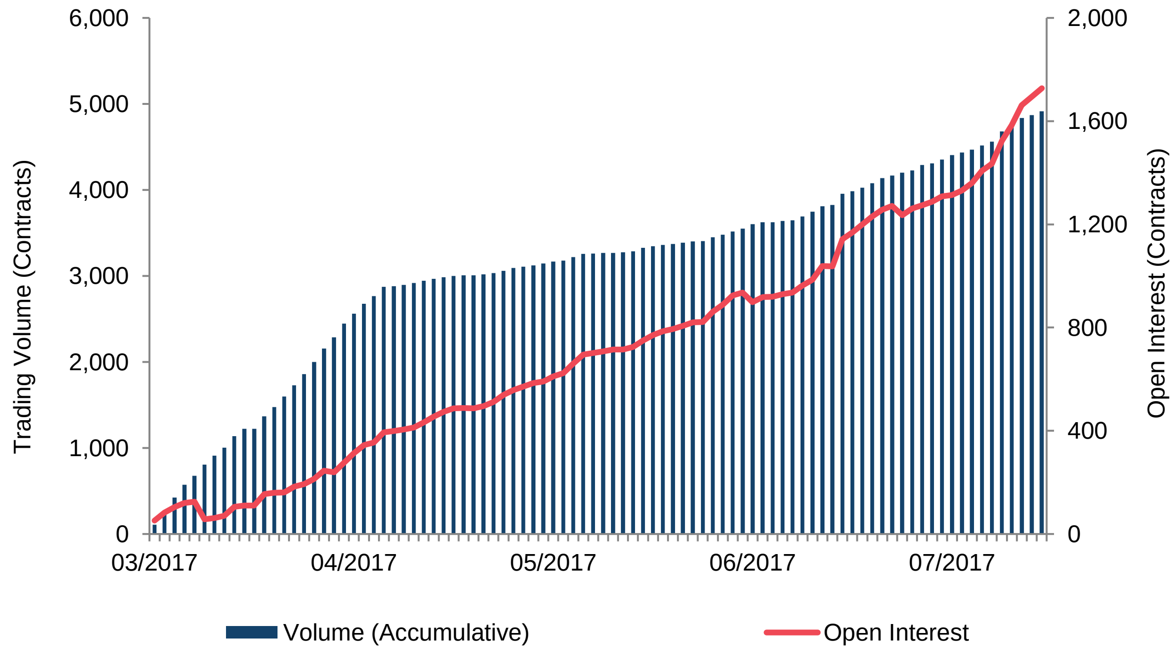
15 SPAN — Standard Portfolio Analysis of Risk. Please refer to the margining methodology document at www.hkex.com.hk/eng/market/rm/rm_dcrm/rm_dcrm_clearing/dmrm_clearing_settlement.htm

16 Currency options and leverage are of high risk and not suitable for inexperienced investors or people who are less risk tolerant. For further information, please refer to HKEX website.

- **Transparency:** Being exchange-traded options, options contract is standardised, trading of which is orderly and transparent. Investors can access real-time exchange-traded options prices via, information vendors (see Appendix 3 for list of source of market information for USD/CNH options) and the trading platforms of brokers.
- **Ease-of-Access:** In general, exchange is available to different investor types, including but not limited to retail investors, corporate users, asset managers and hedge fund managers. For example, in HKEX, investors can access the product through the existing distribution with over 120 RMB-enabled EPs. In comparison, OTC RMB currency options market is restricted to institutional users only.

Supported by the aforementioned characteristics, the trading volume and open interest of HKEX's USD/CNH Options continue to accumulate. Up to 31 July 2017, the total trading volume since launch was 4,914 contracts (i.e. US$491 million in notional amount) and the open interest continues to hit record high. As of 31 July 2017, the open interest across all contract months reached 1,727 contracts (i.e. US$173 million in notional amount).

Figure 4. HKEX's USD/CNH options accumulated volume and open interest (since March 2017)



Source: HKEX, data as of 31 July 2017.

3. HKEX USD/CNH OPTIONS: PRODUCT DESIGN AND APPLICATIONS

HKEX's USD/CNH Options contract is a European-style option on spot, exercisable only at expiration date but not before. This is designed based on the prevailing OTC market practice (where the majority of FX options exist in European-style forms). Exercise at expiry results in the delivery of USD against RMB with full principal amount at the strike price, which meets the demand for principal exchange from options users.

3.1 Pricing behaviours and risk factors to monitor

The option premium, i.e. the option price, is a function of a certain number of factors including the underlying asset's strike price and spot price, interest rates (of the two underlying currencies), tenor and volatility. The Black-Scholes pricing model, commonly used for equity options, was extended by Garman and Kohlhagen[17] to price currency options.

Currency options are multi-dimensional instruments and their prices in the secondary market respond to various market parameters. Due to the diversity in the terms of options, i.e. tenor, strike, etc., it is impractical for a market participant to hedge with exactly the same options in the market. As such, option traders act as risk managers and manage their risks by closely monitoring various market parameters. There are specific measurements of the sensitivity of the option value with respect to different market parameters. These measurements are collectively known as the "Greeks". Analysis of Greeks is crucial to option valuation and risk management.

The Greeks decompose the risks contained in an option price or a portfolio of options into their various constituent parts, which in turn allows traders to decide which risks to retain and which to hedge. The different risk measures in the Greeks include:

- **Delta:** Change in price of the option for a change in the spot price of the underlying
- **Gamma:** Change in delta for a change in the spot price of the underlying
- **Theta:** Time decay of the option, i.e. change in price of the option for the passage of time
- **Vega:** Change in price of the option for a change in volatility of the underlying
- **Phi:** Change in the base currency's risk-free interest rate[18]
- **Rho:** Change in the pricing currency's risk-free interest rate[18]

3.2 Product applications of HKEX USD/CNH options

Main users of RMB currency options and futures would include corporates, asset management firms and fund houses, proprietary trading firms, brokerage firms and professional investors. These different user types could use the RMB currency products for various purposes.

Listed below are hypothetical illustrations of product applications of the RMB currency options (analysis do not include transaction costs and past performance is not an indicator for future performance).

3.2.1 Basic applications

(a) Protection on RMB depreciation

Situation

An investor worries about RMB depreciation. He needs to sell his RMB assets and convert back to USD after 3 months.

Possible application

Buying a 3-month call options (i.e. buy USD, sell RMB) with strike 6.8500 as an example.

[17] "Foreign currency option values", Journal of International Money and Finance, M.B. Garman, S.W. Kohlhagen, 1983, vol. 2.

[18] In a currency pair, the currency used as a reference to quote is the "pricing currency" (bottom), and the currency that is quoted in relation is called the "base currency" (top).For example, for EUR/USD, EUR is the base currency and USD is the pricing currency.

<u>Scenario</u>

At expiry, if USD/CNH fixing rate appreciates to 6.7000, the option expires and is not exercised. The investor can sell his RMB assets and covert RMB to USD at a better level at 6.7000. If USD/CNH fixing rate depreciates to 7.0000, the option is exercised and the investor can sell his RMB assets and covert RMB to USD at the original strike rate (i.e. 6.8500).

<u>Potential Risks and Returns</u>

Potential returns: The investor is able to covert RMB to USD at a better price if the RMB depreciates.

Potential risks: The investor has to pay options premium to buy the protection.

(b) Protection on RMB appreciation

<u>Situation</u>

An investor worries about RMB appreciation. He needs to sell his USD assets and convert back to RMB after 3 months.

<u>Possible application</u>

Buying a 3-month put options (i.e. sell USD, buy RMB) with strike 6.8500 as an example

<u>Scenario</u>

At expiry, if USD/CNH fixing rate depreciates to 7.0000, the option expires and is not exercised. The investor can sell his USD assets and covert USD to RMB at a better level at 7.0000. If USD/CNH fixing rate appreciates to 6.7000, the option is exercised and the investor can sell his USD assets and convert USD to RMB at the original strike rate (i.e. 6.8500).

<u>Potential Risks and Returns</u>

Potential Returns: The investor is able to covert USD to RMB at a better price if the RMB appreciates.

Potential risks: The investor has to pay options premium to buy the protection.

3.2.2 Advanced applications

(a) Yield enhancement — sell covered call

<u>Situation</u>

An exporter has USD receivables due in three months and targets to convert the USD into the CNH at a better rate than futures price. The exporter does not need to sell the USD upon receipt so he would rather sell it at a better rate. The exporter also wants to make some extra yield from this expected cash inflow.

<u>Possible application</u>

The exporter sells a Mar 2017 expiry USD/CNH call option with strike 7.1000 and receives the CNH premium of 775 pips. USD/CNH spot rate: 6.9300, Mar 2017 futures price: 7.0450, Volatility: 7.40 bid.

Scenario

At expiry, if USD/CNH fixing rate is less than 7.1000, the option expires out-of-the-money and is not exercised. The exporter keeps the CNH premium as an extra return from taking the position. If USD/CNH fixing rate is greater than 7.1000, the option is exercised and the exporter sells USD against CNH at 7.1000 which is still better than the futures price if he had hedged three months ago. The exporter keeps the CNH premium which makes his effective selling rate 7.1775.

Potential Risks and Returns

Potential returns: The exporter makes an extra return on the usage of idle cash by selling options. The exporter sells at an effectively better rate even if the option is exercised by the buyer.

Potential risks: Should the USD appreciate significantly against the CNH, the exporter may incur opportunity cost compared to selling at the prevailing market rate.

(b) Cost Reduction — Buy call spread

Situation

A portfolio manager, who has exposure to RMB-denominated assets, plans to hedge CNH depreciation by buying USD/CNH call options. The portfolio manager's hedging horizon is one year. However the long-tenor USD/CNH call option is very costly due to the time value, upward sloping volatility curve and futures curve. For example, Dec 2017 expiry USD/CNH call option with strike 7.2500 is priced at 2,515 pips. (USD/CNH spot rate: 6.9300, Dec 2017 futures price: 7.2650, volatility: 8.85 offer)

Possible application

The portfolio manager can sell Dec 2017 expiry USD/CNH call option with strike 7.5000 and receives a premium of 1,585 pips with the view that USD/CNH may depreciate, but not to the level of 7.5000. (7.5000 strike volatility 9.06 bid). The premium from the 7.5000 strike call reduces the net cost of the hedging strategy of buying USD/CNH call options with a lower strike of 7.2500. The portfolio now pays a net premium of 930 pips.

Scenario

At expiry, if USD/CNH fixing rate is less than 7.2500, both options expire out-of-the-money and are not exercised. The portfolio manager bears the net option premium as hedging cost, but it is cheaper than not having adopting the strategy. If USD/CNH fixing rate is greater than 7.2500, but less than 7.5000, the portfolio manager exercises the option he has bought and let the option he sells to expire. This is the best scenario because he keeps the hedge and has reduced the hedging cost. If USD/CNH fixing rate is greater than 7.5000, both options are exercised. The portfolio manager loses the hedge, however he makes a net cash flow of 2500 pips in the CNH, which helps compensate his hedge in the spot market.

Potential Risks and Returns

Potential returns: The strategy reduces the hedging cost by taking a view on the movement of the USD/CNH exchange rate.

Potential risks: The strategy may become a partial hedge under some circumstances.

(c) Risk reversal

Scenario

A trader has the view that USD/CNH spot rate will go higher in the next three months. He buys a Mar 2017 expiry USD/CNH call with strike 7.1500 and pays option premium 715 pips (volatility 8.35 offer). However he does not want to bear the full amount of option premium nor to be too aggressive in taking positions. He chooses to sell a Mar 2017 expiry USD/CNH put with strike 6.9500 and receives option premium 525 pips (volatility 6.70 bid). His net cost is 190 pips.

Result

USD/CNH spot rate and forward/futures curve both move up. Assuming there is a parallel shift in the spot rate and futures prices by 600 pips, the call option is worth 955 pips and put option is worth 355 pips. Net value of the strategy is priced at 600 pips. The trader has realised 200% profit by taking the right view. Alternatively the trader can choose to wait till expiry date for the call option to be exercised and the put option to expire.

Potential returns

There are several ways to capture potential return from risk reversal:

- If USD/CNH spot rate and forward rates/futures prices go higher, the call option will be worth more than the put option and the trader can choose to take profit by closing the positions.
- If market has more demand for USD/CNH call options than put options, the call option will be worth more than the put option in terms of implied volatility. (This is called the volatility skew.)

Potential risks

If USD/CNH moves to the unfavourable direction, the trader not only loses the option premium he pays for the call option, but also incurs losses from his short position on the put option. In this case, the losses have been enlarged although the initial cost is lower.

(d) Volatility play — Straddle (two options with the same strike)

Scenario

A trader has the view that USD/CNH spot rate will remain volatile trading in the near future so the volatility curve may shift higher. He buys a Dec 2017 expiry USD/CNH call with strike 7.2500 together with a Dec 2017 expiry USD/CNH put with strike 7.2500. The call option is priced at 2,490 pips (volatility 8.85 offer) and put option is priced at 2,350 pips. The total premium is 4,840 pips.

Result

The vega position from the straddle is 550 pips (275 pips for each option). Assuming implied volatility for Dec 2017 with strike 7.2500 increases to 10.00, the call option is worth 2,810 pips and the put option is worth 2,670 pips. The strategy is now priced at 5,480 pips. The value change is 640 pips (approximately 1.15 vega).

Potential returns

A long-dated straddle gives traders the largest exposure to volatility movement. It is a direct way to trade and realise traders' view on the volatility curve. (Straddle is usually delta-neutral at the inception of the transaction.) Short-dated straddles can be used to trade volatile movement of underlyings (gamma trading).

Potential risks

Traders are exposed to volatility risk by trading straddles. In a situation where the underlying moves but the volatility does not change much, traders have to manage delta while not making money from volatility.

Other possible applications

Trades can trade strangle (long one call and one put with different strikes) for higher volatility movement. This is called "trade the wings". Traders can trade butterfly (long straddle and short strangle) if they expect there will be volatility in certain price range but not too much. So they are "financing" straddle by selling strangles.

3.3 Physical delivery on exercise

3.3.1 Call options

Assumptions:

Strike price (k) = 6.90; Official settlement price (s) = 6.95

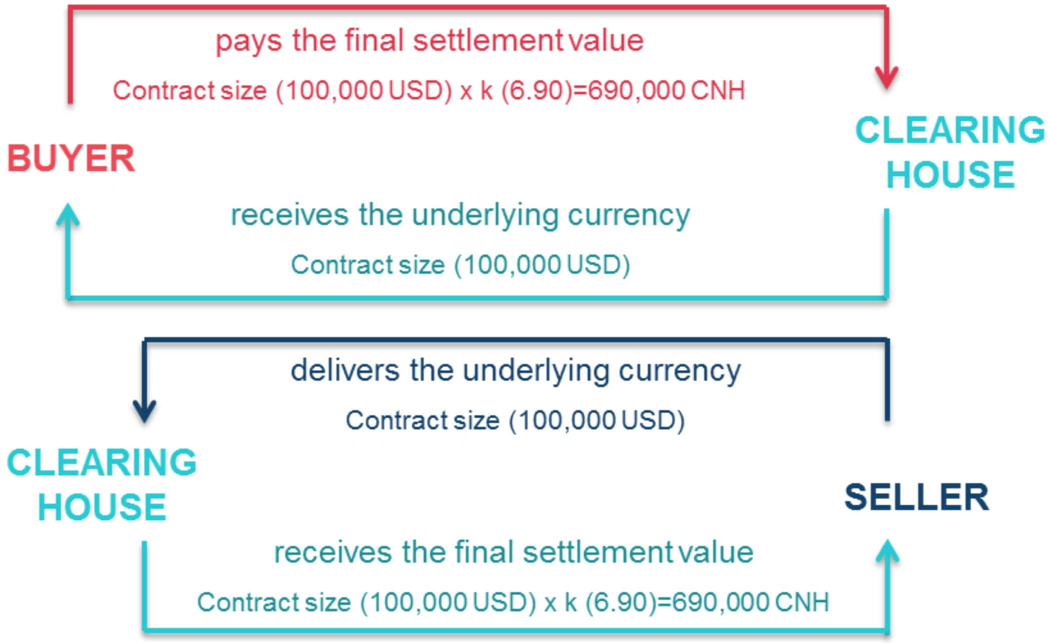
If the settlement price > strike price, the option is exercised, if the settlement price ≤ strike price, the option expires worthless.

Physical delivery process (see Figure 5):

If the call option is exercised, on physical delivery, the buyer pays the final settlement value, i.e. contract size (100,000 USD) x k (6.90) = 690,000 CNH, to the clearing house and receives the underlying currency value equalled to the contract size (100,000 USD) from the clearing house.

On the other hand, the seller delivers the underlying currency value equalled to the contract size (100,000 USD) to the clearing house and receives the final settlement value, i.e. contract size (100,000 USD) x k (6.90) = 690,000 CNH, from the clearing house.

Figure 5. Physical delivery on exercise for call options



Source: HKEX.

3.3.2 Put options

Assumptions:

Strike price (k) = 6.90; Official settlement price (s) = 6.85

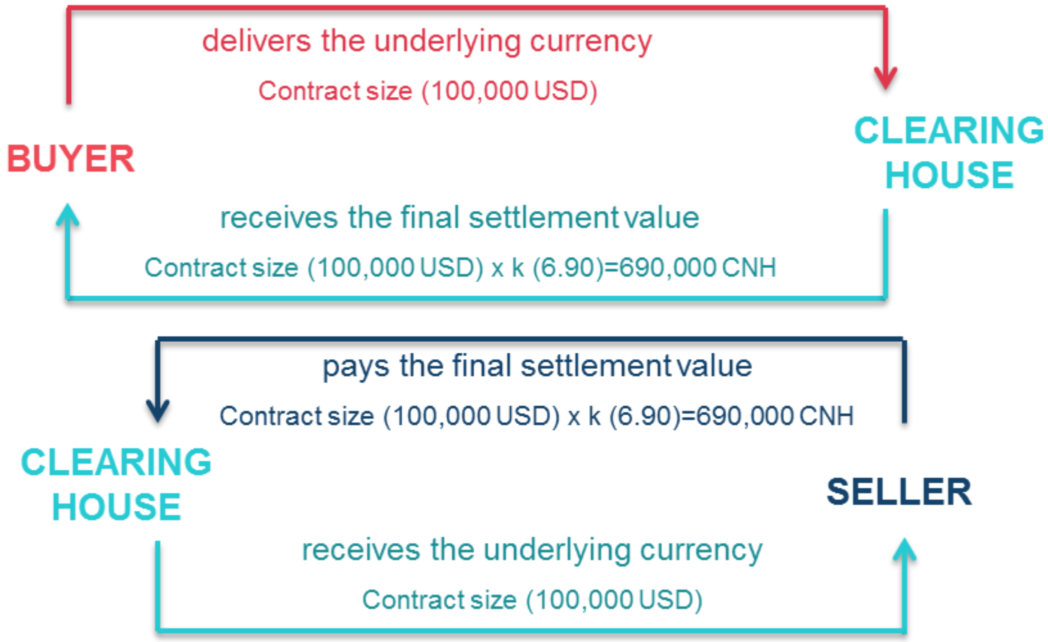
If the settlement price < strike price, the option is exercised, if the settlement price ≥ strike price, the option expires worthless.

Physical delivery process (see Figure 6):

If the put option is exercised, on physical delivery, the buyer receives the final settlement value, i.e. contract size (100,000 USD) x k (6.90) = 690,000 CNH, from the clearing house and delivers the underlying currency value equalled to the contract size (100,000 USD) to the clearing house.

On the other hand, the seller receives the underlying currency value equalled to the contract size (100,000 USD) from the clearing house and pays the final settlement value, i.e. contract size (100,000 USD) x k (6.90) = 690,000 CNH, to the clearing house.

Figure 6. Physical delivery on exercise for put options



Source: HKEX.

APPENDIX 1. HKEX USD/CNH OPTIONS CONTRACT SPECIFICATIONS

<table>
<tr><th>Item</th><th colspan="3">HKEX USD/CNH Options Contract Features</th><th>Remark</th></tr>
<tr><td>Underlying</td><td colspan="3">USD/CNH currency pair</td><td></td></tr>
<tr><td>Contract Size</td><td colspan="3">US$100,000</td><td>Same as Futures</td></tr>
<tr><td>Options Premium Quotation</td><td colspan="3">Quoted in 4 decimal places (i.e. 0.0001) on amount of RMB per USD.</td><td>Follows current OTC market quotation method</td></tr>
<tr><td>Strike Prices</td><td colspan="3">Strike intervals will be set at 0.05</td><td>Allows liquidity aggregation at specific strikes</td></tr>
<tr><td>Official Settlement Price</td><td colspan="3">USD/CNY (HK) Spot Rate published by Hong Kong Treasury Markets Association (TMA) at or around 11:30 a.m. on the Expiry Day</td><td>Market benchmark in the CNH spot market</td></tr>
<tr><td rowspan="4">Settlement on Exercise</td><td colspan="3">Physical delivery on exercise</td><td rowspan="4">To meet the demand for principal exchange from options users</td></tr>
<tr><td></td><td>Holder</td><td>Writer</td></tr>
<tr><td>Call Options</td><td>Payment of the Final Settlement Value in RMB</td><td>Delivery of US dollars</td></tr>
<tr><td>Put Options</td><td>Delivery of US dollars</td><td>Payment of the Final Settlement Value in RMB</td></tr>
<tr><td>Exercise Style</td><td colspan="3">European style</td><td>Most popular in OTC market</td></tr>
<tr><td>Contract Months</td><td colspan="3">Spot month, the next three calendar months and the next four calendar quarter months</td><td>Same as Futures (except the furthest fifth calendar quarter month)</td></tr>
<tr><td>Final Settlement Day</td><td colspan="3">Third Wednesday of the Contract Month</td><td>Same as Futures</td></tr>
<tr><td>Expiry Day</td><td colspan="3">Two Hong Kong Business Days prior to the Final Settlement Day</td><td>Same as Futures</td></tr>
<tr><td>Position Limit</td><td colspan="3">For the USD/CNH Futures Contract, CNH/USD Futures Contract and USD/CNH Option Contract combined, a position delta of 8,000 long or short in all Contract Months combined provided that:
• Position delta for the Spot Month USD/CNH Futures Contract and the Spot Month USD/CNH Option Contract combined during the five Hong Kong Business Day up to and including the Expiry Day shall not exceed 2,000 long or short; and
• The position for CNH/USD Futures Contract shall not at any time exceed 16,000 net long or short contracts in all Contract Months combined</td><td>Combined position delta is used across RMB currency futures and options</td></tr>
<tr><td>Large Open Positions</td><td colspan="3">500 open contracts in any one series</td><td></td></tr>
</table>

APPENDIX 2. TRADING AND CLEARING ARRANGEMENTS OF HKEX USD/CNH OPTIONS CONTRACTS

Maximum order size

Maximum order size is 1,000 contracts. Exchange Participants are required to submit their requests to HKEX for setting up their order size limits based on their business needs and risk management requirements.

Block trade

Block trade facilities are supported by the exchange's derivatives trading system. The volume threshold for block trades is 50 contracts (notional of US$5 million). The permissible price range is 10% for prices over or equal to 0.4, and 0.0400 for prices below 0.4.

Price makers

Some Liquidity Providers will provide continuous quotes on common strikes on screen, whereas some Liquidity Providers will quote prices upon requests for quote (RFQ).

Clearing arrangements

For clearing, Clearing Participants (CPs) have to arrange for RMB and USD settlement capability. They need to set up RMB and USD account with the Settlement Banks appointed by the HKCC and to maintain relevant mandates. Furthermore, CPs have to ensure these bank accounts are in active status and ready for physical delivery. Meanwhile, non-CPs should contact their General CPs to ascertain eligibility of clearing.

For details, please refer to the HKEX website.

APPENDIX 3. ACCESSING MARKET INFORMATION ON HKEX USD/CNH OPTIONS

(1) Information vendor access codes

Vendor	Access Code
AAStocks	340900
Activ Financial	CUS/1701/9999P.HF
AFE Solution	873181-7
Bloomberg **CQG** **DBPower** **Eastmoney**	CSX Curncy OMON <GO> C/P.CUS CUS CUS
Esunny	CUS
ETNet	CUS
Fidessa	CUS_Osmy.HF
FIS Global	CUS+<STRIKE PRICE>+<MONTH CODE>+<LAST DIGIT OF THE YEAR>
Hexin Flush Financial Information Network Ltd	CUS
Infocast	CUS (Menu > Derivatives > Options > Select ""CUS"")
Interactive Data	O:CUS\MYYDD\[Strike Price]
Market Prizm	CUS <Strikes> my
QPI	P11370-P11375
SIX Financial	CUSmy
Shanghai DZH	CUS[mmyy][C/P][Strike]
Shanghai Pobo	CUSyymm-C/P-SSSSS
Telequote	CUSOmy
Tele-Trend	Open->Options->CUS
Thomson Reuters	0#HCUS*.HF
Wind	Quant -> CUSO.HK

(2) Real-time prices in HKEX website
http://www.hkex.com.hk/eng/ddp/Contract_RT_Details.asp?PId=388

(3) List of Exchange Participants offering trading services for USD/CNH Options
http://www.hkex.com.hk/eng/prod/drprod/rmb/ep-fxo.htm

(4) List of Exchange Participants Enabled for RMB derivatives trading
http://www.hkex.com.hk/eng/prod/drprod/rmb/brokerlist.htm