Iran. Econ. Rev. Vol. 22, No. 1, 2018. pp. 253-293

Foreign Exchange Rate Pricing at the Future Contract (Case of I.R. of Iran)

Hossein Bastanzad*[1], Pedram Davoudi[2], Hossein Tavakolian[3]

Received: February 27, 2017 Accepted: July 11, 2017

Abstract

The RER which is theoretically influenced by the real interest rate differential (RRE) and currency excess return (CER), is statistically examined during 1990-2016. Accordingly, the stationarity of RER as null hypothesis is not approved in the Iranian economy. Therefore, the TVAR method is examined to analyze the nonstationary RER sample to two sub-periods stationary process which are both statistically recognized trend stationary and mean reversion in the context of flexible and inflexible regimes. The impacts of the RRE and CER on the RER are examined by TVAR method. The results indicate that the expected value of RER significantly explains the real interest rate differential given the fact that the estimated parameters is approximately considered non-zero. Thus, the hypothesis of real interest rate parity (RRE) is rejected in both flexible and inflexible regimes in Iran. Eventually, future contracts should be introduced at the foreign exchange market to reduce risks and uncertainty.

Keyword: Foreign Exchange Rate, UIP, RRE, Hedging, Future Contract.

JEL Classification: F31, G13, E42, C12, C15.

1. Introduction

Foreign exchange market which is empirically constituted by onshore/offshore and spot/derivatives markets is usually managed by Central Banks[4] (CBs) in the context of policy, regulation, supervision, operations, and monitoring. In this regards, monetary policy which is

1. Economist in Money and Foreign Exchange Department, Monetary and Banking Research Institute of the Central Bank of Iran (MBRI) Tehran, Iran (Corresponding Author: HBastanzad@mbri.ac.ir).
2. Institute for management and planning studies (IMPS), Tehran, Iran (P.Davoudi@imps.ac.ir).
3. Faculty of Economics, Allameh Tabataba'i University, Tehran, Iran (Hossein.Tavakolian@atu.ac.ir).
4. Central bank is presumably considered as monetary authority in this paper although monetary policy committee is recognized as policy maker in some economies.

mainly conducted by the changes of policy interest rates affects foreign trade and financial transactions as well as foreign exchange rates through respectively inspiring aggregate demand, fiscal gap, and external balance. In other words, foreign exchange rates are empirically motivated by the monetary policy and specifically policy interest rate to achieve three main macroeconomic goals including price stability, sustainable non-inflationary growth and financial stability. Anyway, policy interest rates influence foreign exchange rates at the both spot and derivatives markets via interest rates differential route in the short and medium term. Ironically, policy interest rate is sometimes replaced by the foreign exchange rate as nominal anchor to achieve the key goal of price stability whereas the economy faces with weak monetary policy instruments and high-sustainable inflation. Accordingly, foreign exchange stability facilitates price stability goal in such economies. Foreign exchange rate also serves as nominal anchor in Iran. Thus the Central Bank of Iran (CBI) is keen on the exchange rate stability and external sustainability while empirically exposing with lack of effective monetary policy instruments. In this regard, the stability of foreign exchange rate as nominal anchor is also enriched via enhancing external soundness prudential measures, improving debt sustainability benchmarks, and augmenting disposable international reserves safeguards as well as establishing foreign exchange derivative market.

Foreign exchange future contracts as popular high-regulated derivative tool play critical role to monitor the gap between spot and future rates as well as the demand distribution of short and medium term contracts, and exchange rate upcoming expectations. Future contracts also enhances foreign exchange rate stability through shifting speculative demand from spot to future contracts, highlighting future rates pressures, smoothing the gap between interest rates differential and the spread of spot/future rates as well as extending the policy makers response time to finance external sector contingent deficit. Moreover, future contracts insure the contingent upcoming exchange rate risks for non-speculative applicants in compliance with Islamic sharia. Similarly, future market is ultimately recognized as a reliable buffer for market agents to improve foreign exchange market resiliency against contingent shocks mainly through transferring and

clearing speculative contracts from spot to future accrual-based market.

The CBI as money market regulatory-supervisory body is functionally expected to establish foreign exchange future market and introduce future contracts to hedge the exchange rate contingent volatilities against temporary external imbalances or sudden-speculative attacks while monitoring the outlook of foreign exchange supply and demand composition in the context of transactional, precautionary, and speculative contracts. The foreign exchange future contracts as an important derivative instrument should evidently reduce market uncertainties as well. The future contracts are evidently conducted (proceeded) by the market brokers as representative of foreign exchange applicants and suppliers which should be just settled cash-based by foreign currency at the end of contracts in compliance with Islamic Sharia while also discounted by the third party before ending the contract. In other words, all the futures contracts should not be alternatively cleared by the domestic currency or any other foreign currencies which are not noticeably registered in the original future contract.

Given the fact that CBI is lawfully recognized in charge of Balance of Payments (BoP) sustainability the CBI should articulately introduce a comprehensively set of transactional regulations for both spot and future contracts, institutional prudential measures, auditing and monitoring rules, cash-based settlement system, and institutional license requirements. In this regard, the impact of foreign exchange market on the outside money and domestic currency interbank market should be also monitored by the CBI to maintain the main monetary policy goals over price stability, external sustainability, and financial stability while simultaneously minimizing the contagion-contingent risk of foreign exchange future contacts on the credit institutions soundness indicators as well as off balance sheet stance. Furthermore, supplementary policy tools are also required to consider by the CBI to enhance foreign exchange future market as a well- organized and well-supervised market which are discussed in this paper.

The rest of the paper is designed as follows. The first section illustrates the conventional structure of foreign exchange market and the contingent upside risks which jeopardize external sustainability

and foreign exchange rate stability. A consistent foreign exchange regime and future contracts as an efficient derivative tool are functionally discussed for Iranian economy in the second section. The methods which are utilized to test uncovered interest rate parity and real rate equality are technically discussed in the third section and the tests results are expressed in the fourth section. The concluding remarks are also highlighted in the last section.

2. Foreign Exchange Market Structure

Foreign exchange market is considerably influenced by the exchange rate regime, the effectiveness of monetary policy instruments, the indicator (origination) of nominal anchor, external sector vulnerability against contingent-periodical shocks, depth of financial markets as well as foreign exchange market institutional concentration, the ratio of local to foreign currency transactions, openness, and capital account liberalization. The spot and future contracts are respectively affected by the same indicators which should be timely monitored by the CBI as monetary policy authority. The value and volume of future contracts also utilize as leading indicator to underscore the market expectations, upcoming foreign exchange flows, and the policy reactions as well. Eventually, future contracts are considered crucial to smooth and reduce spot foreign exchange demand.

Foreign exchange market is empirically categorized into the two tiers including foreign exchange interbank and retail markets for respectively wholesale and retail transactions which are also characterized by the size, policy impressionable, and depth for both spot and accrual transactions (figure 1). The foreign exchange interbank market is functionally designed for large amount of external trade and financial transactions as well as large foreign exposures which are institutionally underlined at the financial statements of central banks, commercial banks, specialized banks, investment banks, development banks, multinational corporations, hedge funds, mutual funds and investment entities as primary dealers. In this regard, foreign exchange retail transactions are usually conducted by the Bureau de Change which are mainly included cash transactions or small amount of debit and credit cards ceilings.

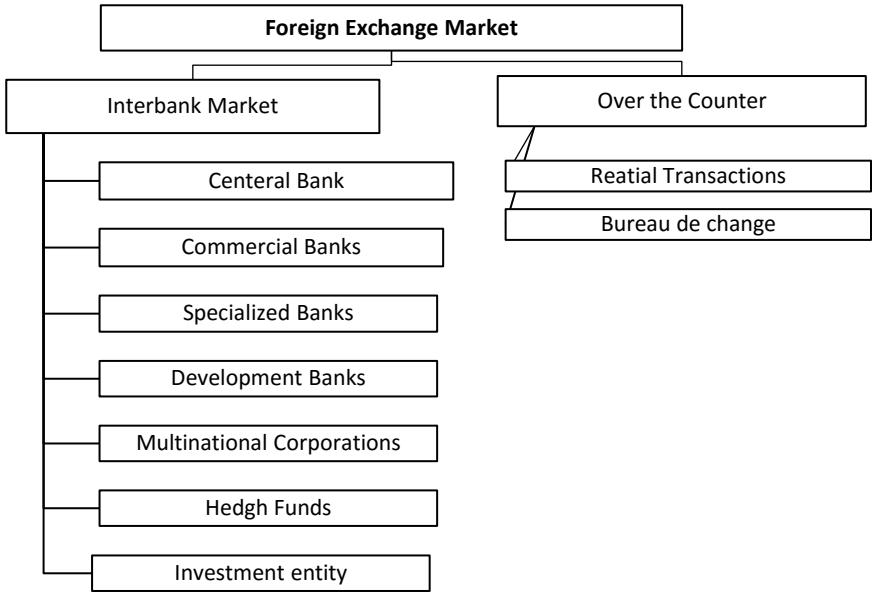

Figure 1: Foreign Exchange Market Structure

The other institutional pillars who contribute to construct the markets are respectively involved brokers, regulatory bodies, dealers, hedge funds, payment and settlement system, and financial institutions supervisory bodies. Accordingly, central banks could be sometimes recognized as a key multifunctional pillar such as CBI which serves as foreign exchange (FEX) supervisory and regulatory body, main supplier, broker, and superintendent (controller) of settlement system while simultaneously considering in charge of monetary policy to achieve the main goals of external sustainability and financial stability (figure 2).

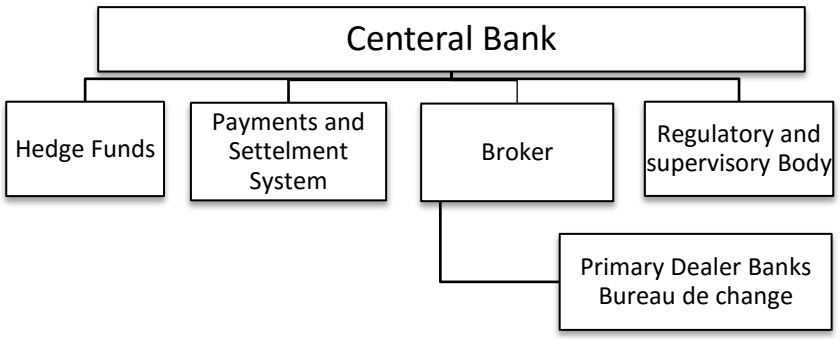

Figure 2: Foreign Exchange Market Pillars

The transactions are mainly categorized in the context of foreign lending and borrowing, remittance, trade of goods and services, and capital flows. Both spot and derivatives tools are similarly transacted by the participants at the interbank markets. The retail fragment of the FEX market is basically constructed to fulfill low-value/high-volume transactions mainly for remittance and tourist which are usually conducted by the bureau de change and less likely by banks at the secondary market. The intervention tools which are necessarily introduced by the market supervisor enhance external sustainability and foreign exchange market stability including through improving the efficiency of monetary policy instruments, increasing the outstanding of foreign assets and international reserves, augmenting the multinational banks financial credit, facilitating the access to reserves and precautionary tranches of international organizations, and building up the international reserves of central banks.

2.1 Foreign Exchange Risk

Foreign exchange risk is empirically recognized based on sudden-vast exchange rate misalignments and specifically extraordinary depreciation at least two standard deviation around the historical mean. The exchange rate risk might be evidently originated from considerable gross domestic saving deficit, negative interest rate differential, and a significant reduction in real domestic assets price which simultaneously lead to a swift rise in the balance of payments deficit[1] and excess demand in the foreign exchange market. Accordingly, gross domestic saving deficit which is usually triggered from public or private sector budget deficit theoretically indicates that gross investment overpass the gross saving which are also hardly financed by the external-financial resources in the short run. Likewise, disadvantage in interest rate differential demotivates financial investment and net capital inflows at the assets market while spurs the exchange rate risk even though the macroeconomy is presumably intervened by the capital account restrictions, multiple currency practice, and price subsidization.

1. It is empirically driven by net capital outflows, minus international investment position and current account deficit.

2.2 Implications of Foreign Exchange Risks

Comprehensive-flexible hedging strategy is empirically associated with macro and micro-supervisory-prudential measures which enhances foreign exchange market resiliency against contingent risks in the context of external trade and financial transactions. Furthermore, hedging strategy as a crucial risk management tool also strengthens institutional foreign exchange exposure (assets/liabilities and earnings/expenses flows) while simultaneously insures contingent upside depreciation risks (Allayannis, Ihrig, and Weston, 2001; Döhring, 2008; Asbury and Jacobs, 2014; Chan, Gan and McGraw, 2015). Accordingly, market participants are obviously motivated to extend the transactions period, frequency and value while utilizing hedging transactional information as a technical-quantitative indicator to determine the impact of possible exchange rates risks on the institutional exposure (Barton, Shenkir, and Walker, 2002; Islam, Alam, and Al-Amin, 2015).

Hedging is constantly considered as an effective instrument for risk management which has been strongly utilized by the global trade and financial entities after Bretton Woods turmoil that also improves the foreign exchange market uncertainties and sentiments (Papaioannou, 2002; Copeland, 2008; Jones and Sackley, 2016). Given the fact that, the exchange rate risks contemporaneously distress both cost/revenue flows and assets/liabilities outstanding through on and off-balance sheet transactions as well as net-worth (Madura, 1989; Berganza, Chang and Herrero, 2004; Jacque, 2013), the foreign exchange contingent risk should be technically hedged by the different sort of derivatives[1]. Although hedging mitigates the foreign exchange risk for global trade and financial market participants, the supervisory body must appropriately monitor the potential risk factors along with enhancing hedging regulations, and hedge funds prudential benchmarks based on the international best practice at the sectoral, markets, and macro financial system level. In this context, the firms and financial intermediaries along with hedge funds should also highlight the stance of exchange rate risk and net open position over the on and off balance sheet items in relation to the maximum

1. The hedging premiums are incorporated into the trade and financial transactions cost/benefit analysis and exchange rate expected risk.

expected depreciation, the longest risk period, the highest FEX duration gap, and the largest foreign exchange risk exposure. Moreover, the exchange rate risk is contrarily characterized based on economy's state differences and exchange rate historical fluctuations ; i.e. 20 percent annual depreciation might be empirically considered a significant exchange rate risk in an economy with low inflation and free capital mobility rather than the economies with high inflation, restricted international capital flows and multiple currency practice. Meanwhile, it is also considered a high source of risk for economies which have usually experienced low exchange rate fluctuations.

2.3 Foreign Exchange Risk Management

Foreign exchange risk management is dynamically comprised of different steps including identification of risks factors, calculation of risk exposures, projection of risks outlook, introduction of safety-net rules, and designation of resolution plan which all contribute to draw a reliable picture for monetary authorities, risk officers, assets market analyst, and hedge funds portfolio managers (Jacque, 1996; Allen, 2003; Saunders and Cornett, 2014). In this regard, foreign exchange risk factors which are mainly driven by fiscal gap, nominal shocks or international financial spillover are ultimately characterized in the context of BoP condition and international investment position. The risks factors as driving forces of contingent shocks are quantitatively projected by the behavioral econometrical models which provide a set of explanatory variables to explain the outlook of exchange rate fluctuations and risks.

Likewise, the institutional foreign exchange balance sheet exposure which is functionally defined based on foreign assets/liabilities decomposition, foreign leverage, foreign exchange duration gap, and net open position is arithmetically affected by the foreign exchange misalignments as risk factors. Ironically, the exchange rate fluctuations are also reflected three main statues, including transaction risk which is functionally included current account transactions and the consequent cash flows (import, export and dividends), translation risk which is quantitatively appeared in the form of institutional balance sheets revaluation over non-resident articles (international affiliations), and economic risk that illustrates the impact of

upcoming[1] exchange rate risks on the present value of firms future cash flows specifically earnings and expenses (Madura, 1989; McNeil and Frey and Embrechts, 2015). Given the fact that the market participants are inevitably exposed to the contingent exchange rate risk so firms, financial intermediaries and supervisory bodies must be equipped by the macro and micro foreign exchange prudential measures to reduce institutional financial statements' vulnerabilities against the risks. Furthermore, a resolution backup is also required to design for transition period in case the economy is abruptly affected by the disorderly foreign exchange crisis.

Foreign exchange rates are empirically behaved too volatile at the efficient foreign exchange market, so the volatilities are gradually incorporated into the derivatives rate premiums and consequently the upcoming spot rates in case they are statistically predictable by the conventional structural or monetary models (Boertje and Garretsen, 1996; Masson, 1999; Jeanne and Rose, 1999; Onur, 2007; Rime, 2009; Kariuki 2016). Nevertheless, unexpected shocks barely motivate the derivatives rate premiums due to the unpredictability, uncertainty, hasty and bulky of shocks. In other words, the monetary variables along with fundamental indicators which usually explain normal volatilities, effectively influence the upcoming derivatives rate premium era post-Bretton Woods whereas the ad hoc- unexpected shocks and intervention policies have also recently recognized as essential indicators to explain nominal exchange rate and derivative price volatilities in the short term (Vander Kraats and Booth, 1983; Wadhwani, 1987; Bernanke, 2016). However, the exchange rate fluctuations which are statistically illustrated by the monetary, fundamental and speculative contributors respectively affect upcoming rates. Therefore, the impact of unexpected shocks and consequently the speculative response is hardly decomposed and recognized from the derivatives prices at the foreign exchange derivatives market (Frankel and Rose, 1996; Jeanne and Masson, 2000; Zhang, Shi and Zhang, 2011). The unexpected-speculative shocks is frequently driven by political, financial, and spill over events

1. The outlook of foreign exchange rate is theoretically driven be short-term monetary and real sector variables (interest rate and inflation) and medium term fundamental variables (productivity, terms of trade, FDI, openness, government size).

which could be rarely formulated into the derivatives prices and premiums so the short run risks which are technically originated from the unexpected-shocks are never hedged by the derivatives contracts although it simultaneously provides a wind-fall gain for speculators.

3. Pegged Exchange Rate Regime in and Derivatives

Foreign exchange regime is evidently driven by the effectiveness of monetary policy instruments and monetary regime[1]. The economies which price stability as important monetary goal is behaviorally influenced by the effective set of monetary policy instruments, the flexible exchange rate regimes are definitely introduced in compliance with the monetary regime. In other word, the spot and derivative exchange rates are flexibly influenced by quantified monetary goals, transmission period, as well as monetary and foreign exchange supervisory prudential measure and the effectiveness of conventional monetary policy instruments including open market operations, rate of requirements ratio, short-term policy interest rate. Specifically, short-term policy interest rate as nominal anchor explains both inflation expectation and the outlook of exchange rate in the context of flexible exchange rate regimes. Notwithstanding, the exchange rate is evidently recognized as nominal anchor in economies which policy interest rate is slightly influenced inflation expectations and output gap while constantly hampered by nominal shocks and fiscal gap (Fischer, 1977; Melvin, 1985; Savvides, 1990 and 1993; Staehr, 2016), high inflation, inefficient monetary policy instruments (Krugman, 1979, Salant and Henderson, 1978; Verbytska, 2016), periodical socio-political instability (Edwards, 1996; Lim, 2014), restricted capital flows (Obstfeld and Rogoff, 1995; Eichengreen, 1998; Edwards, 1996), low credibility of monetary authority and high inflation expectation (Barro and Gordon, 1983; Fratianni and Von Hagen, 1992; Masso and Staehr, 2005), undeveloped and shallow financial system and friable prudential-supervisory system (Eichengreen and Hausmann, 1999; Kayikçi, 2013), inelastic external trade and financial transactions against EXR changes, vulnerable-institutional exposure due to the large-historical exchange rate misalignments (Kenen, 1969), and costly

1. Including monetary targeting, inflation targeting, or light inflation targeting

disinflation mandate over output growth (Rogoff, et al., 2003). Thus, pegged exchange rate regime is evidently-theoretically utilized by the economies which frequently face with nominal shocks such as Iran (Bahmani-Oskooee, 1995; Liu and Adedeji, 2000; Mehrara and Oskoui, 2007; Farzanegan and Markwardt, 2009; Hossain, 2016). In this regard, foreign exchange rate is consequently introduced as effective nominal anchor to achieve the target of price stability and sustainable non-inflationary growth while is simultaneously replaced instead of the ineffective monetary policy instruments.

3.1 Foreign Exchange Regime in Iran

The CBI lawfully plays multifunctional roles at the foreign exchange market including through providing the foreign exchange prudential regulations, supervising the foreign exchange market pillars, monitoring on-shore and off-shore spot transactions given the multiple currency practice, introducing instrumental intervention set along with contingent-prudential emergency plan, strengthening the external sustainability via fiscal discipline and long term accrual external source/uses management, and finally reviewing the foreign exchange rate trajectory in connection with monetary and fundamental explanatory variables and other financial markets indicators. The CB should also deliberately design a hedging strategy to improve market sentiments and mitigate foreign exchange market risk for participants against abrupt misalignments in order to preserve external sustainability goal. The hedging strategy is articulately designed based on monetary policy instruments and prudential-supervisory measures in compliance with the condition of both fundamental medium term indicators and short term interest rate differential in order to maintain the pegged exchange rate regime. In this regard, the foreign exchange hedging prices are computably captured the impact of short term policy interest rate and medium term fundamental explanatory variables including terms of trade, openness, FDI, and government size as well as intervention capacity via utilizing international reserves and credits. Therefore, the outlook of foreign exchange rates along with future contracts are similarly expected to be induced by the short term policy interest rate and medium term fundamental indicators as well as the macro and micro external supervisory-prudential measures in order to strengthen foreign exchange

market stability. Future contracts are also affected by the outlook of contingent risk factors which might simultaneously influence both spot and future rates as well as speculative transactions.

3.2 Iran Foreign Exchange Market

The external sector has been considered resilient against contingent shocks in Iranian economy due to an accelerated trend in the banking system real net foreign assets, a reduction in the ratio of import to international reserves and the ratio of external debt to GDP as well as a sluggish-plunge in the ratio of absolute-net capital account to export over the past 15 years (Table 1).

Table1: Macro External Soundness Indicators

Year	Real Banking System Net Foreign Assets (Th.Bil.Rls/a)	Ratio Of Capital Account to Export (%)	Ratio of Import to International Reserves (%)	Ratio of External Debt to GDP (%)
1380	16	8.0	96.5	0.7
1384	271	0.2	102.5	1.5
1388	357	13.9	108.2	1.1
1392	316	11.0	61.4	0.3
1394	369	2.0	44.1	0.2

In this regard, a constant current account surplus has also-constantly caused significant accumulation in the international reserves (Figure 1) while simultaneously boosted the public saving in the context of Oil Development Fund which is functionally considered as external stabilizer and development vehicle too.

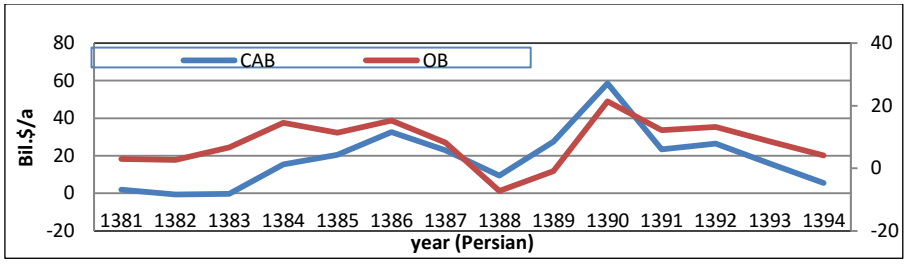

Figure 1: Current Account Balance and Overall BoP Balance

A surge in the international oil price boosted oil export and non-oil subsidized export so the BoP current account experienced a long term surplus while contemporaneously built up international reserves. Accordingly, share of oil sector in total export remained up during 1381-94 although the recent global sanctions have temporary diminished the export volume and share for a while (Figure 2) which has been recently turned back on the term trajectory. However, the extraordinary global oil price has also led to further expansion in the non-oil current account deficit (graph 3) so role of CBI has inevitably enhanced as monopoly supplier at the foreign exchange market to improve external sector vulnerability against contingent-oil market turmoil including through providing external macro and micro prudential-health measure and building up international reserves and intervention capacity.

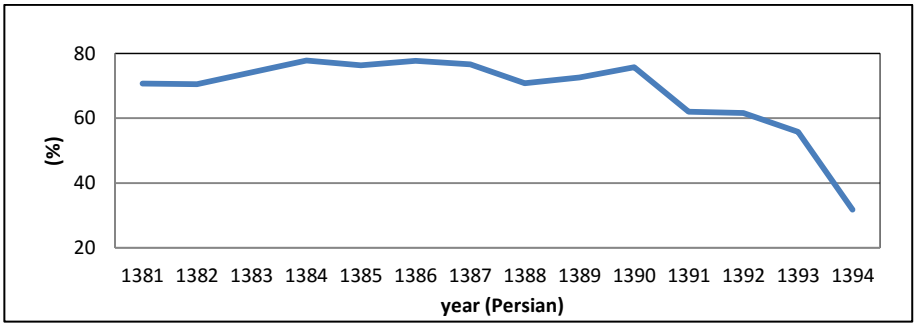

Figure 2: Share of Oil Sector in Total Export

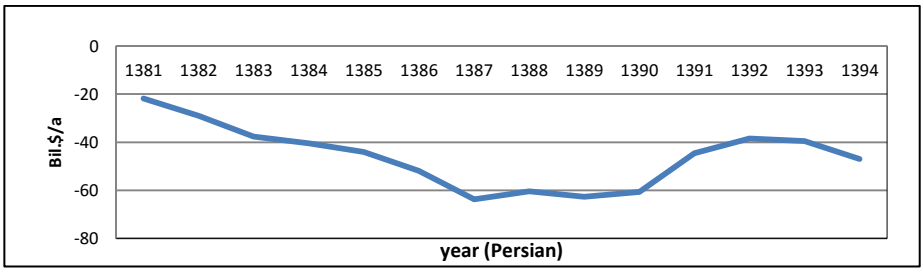

Figure 3: Non-Oil Trade Balance Deficit

Although the capital account transactions are lawfully restricted for non-resident investors and lenders, the financial sectors is obviously considered vulnerable against the external shocks and subsequently foreign exchange misalignments through two key phenomena capital outflows and dollarization. Therefore, the continuous real exchange rate

appreciation which is obviously supported by the favorable international oil prices and consequently the current account surplus has significantly escalated external sector vulnerabilities against the contingent plunge of oil price and domestic nominal shocks (Figure 4).

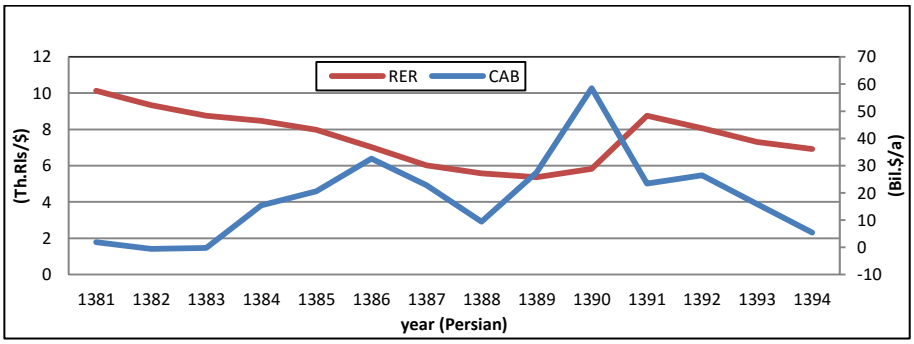

Figure 4: Real Exchange Rate and Current Account Balance

In this context, the rapid growth in non-oil current account deficit is also recognized as a source of concern in the medium term even though it is somehow-simultaneously mitigated by the non-oil export boost and international reserves accumulation. Furthermore, the banks as the core of financial system which can evidently withstand against contingent interest rate shocks are dramatically exposed to the shocks of foreign exchange and assets price markets through foreign assets/liabilities, negative net open position mechanism, and foreign exchange duration gap (graph 5). In this context, foreign exchange depreciation has empirically created higher non-operational cost, bigger NPLs and bad debts via liabilities and assets channels respectively. Furthermore, foreign exchange misalignments have caused more foreign exchange transactional risks and costs for financial institutions and banks as well.

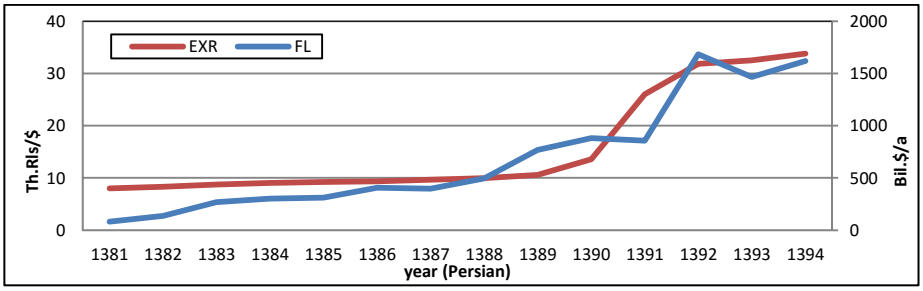

Figure 5: Banks Foreign Liabilities and Nominal Exchange Rate

3.3 Structure of Proposed Derivatives Market in Iran

Foreign exchange market misalignments are substantially moderated by macroeconomic prudential policies, lower nominal shocks as well as higher prudential-supervisory measures over foreign exposure, external debt and international reserves benchmarks to preserve external sustainability goal. Additionally, construction of a well-organized foreign exchange derivatives market as a subcategory of foreign exchange market also hedges foreign exchange contingent risks while mitigates market sentiments and misalignments. Derivatives market is generally expected to construct and regulate by the CBI as policymaker and supervisory body to improve foreign exchange and money market vulnerabilities against contingent shocks. Meanwhile, derivatives market enhances foreign exchange market stability through providing an ample room for speculative transactions and moderating transactional demand at the spot markets via transferring the precautionary and speculative demand from spot to the derivative market in the context of medium term contracts. Derivatives market participants are essentially listed on three main categories including supervisory body, financial intermediaries and market beneficiaries which should be necessarily rated based on credit risk and performance indicators (chart 4).

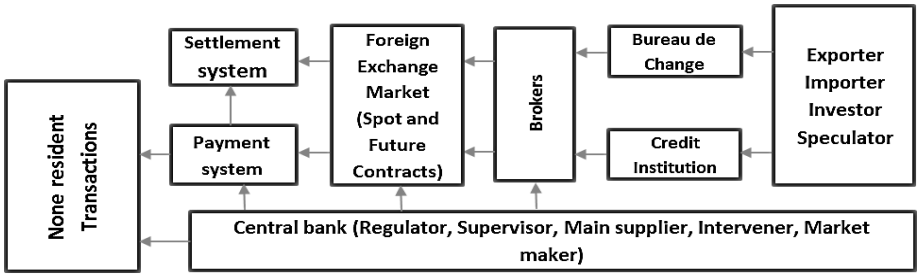

Figure 4: Proposed Foreign Exchange Market for Iran

Although the CBI bank plays multiple roles at the spot foreign exchange market its roles are specifically limited at the derivatives market in the context of supplier or applicant. Whereas the CBI functions are noticeably included the supervisory-regulatory roles, market disciplinary observer, market stabilizer, data storage and clearing room responsible, disputes settler, and ultimately policy

marker at the both spot and derivative markets, the other roles are just limited on the foreign exchange spot markets (interbank, official and unofficial markets) as the last supplier or applicant to settle the market transactions or intervener to maintain market stability. Specifically, the CBI should be definitely prohibited to get involved in the derivative transactions given the high-possible default and credit risk at the derivative market. In other words, the CBI should be just involved at the spot transactions as main supplier to sell the central government oil export revenues as a main source of external sector and foreign exchange supply. The beneficiaries of foreign exchange markets are noticeably comprised of importers, exporters, banks, investment entities, and speculators which submit the demand orders or supply offers through market intermediaries. Meanwhile, financial intermediaries are empirically included hedge funds as main supplier and applicant of derivatives products, brokers as representative of all market beneficiaries, and central bank as multifunctional institution. While financial and credit institutions are able to precede (conduct) both the customers and their own applications to the brokers, customers can also directly submit the applications or offers to the brokers. The regulations which are involved market establishment rules, prudential supervision regulations, communication and transactions bylaw, settlement and monitoring rules, as well as corporate governance and transparency requirements, reporting and publicizing procedures are initially provided by the central bank in the context of code of conducts. Accordingly, code of conducts must be comprehensively-simply introduced by the CBI in order to reflect all the derivatives market regulatory-executive procedures from institutional establishment to the transactions regulations as well as settlement and monitoring procedures as well. The foreign exchange future contracts could be gradually introduced by the CBI as a consistent derivative tool with Iranian economy condition which must be prudently regulated, supervised, monitored, stored, and processed by the CBI as supervisory body in compliance with the prudential supervision regulations, external sustainability requirements, debt sustainability benchmarks, and financial stability necessities as well as Islamic sharia considerations.

However, speculative attacks dramatically destabilize spot market

in the absence of foreign exchange future market and policy coordination[1] while expanding disruption across the financial system via disorderly-destructive-institutional flow of funds among the assets markets (money, real estate, foreign exchange, and stock market). In other words, the economies which have not been yet established the foreign exchange derivatives market are evidently considered more susceptible to be damaged by the contingent risks through weakness of speculative monitoring system, lack of derivative tools, weak effective policy instruments, massive swift-financial flows in the shallow assets market, lack of prudential-supervisory health indicators for the market participants, and consequently feeble (fragile) macro prudential measures.

Foreign exchange future contracts are evidently expected to enhance foreign exchange market stability via transferring speculative and precautionary cash-based transactions from short term spot market to accrual medium term future market while considerably mitigating demand pressure from foreign assets and international reserves. Accordingly, the accrual future contracts as standard derivative tool are periodically-flexibly introduced based on value, settlement period, advance payment, collateral requirements, currency, and discountability, as well as settlement conditions which could be lawfully cleared in the context of refunding by foreign currency or issuing foreign currency certificate of deposit. The foreign currency certificate of deposit is empirically utilized by importers or financial intermediaries to finance import or reimburse international debt respectively. All the accrual future contracts are evidently applied at maturities to settle the international trade and financial transactions so they are functionally considered as Islamic tool in compliance with Islamic Sharia although they are also characterized as differed payment contracts.

Foreign exchange future contracts also moderate exchange rate stability at the both spot and future markets through distributing both speculative and precautionary demand in light of medium term contracts while simultaneously mitigate the both contracts at the sport market. Furthermore, the percentage of advance payment for future contracts reciprocally influences speculative demand pressures at the

1. Disciplinary fiscal and monetary policy

future market which is usually utilized by the policy makers or supervisory body to preserve foreign exchange market stability and prudential soundness indicators as well.

4. Methodology to Test UIP Existence

The UIP expresses that the expected foreign exchange rate is theoretically affected by the differential of interest rates and fundamental indicators between two economies. The UIP rarely exist in the short-run (Mishkin, 1984; Mark and Wu, 1998; Chaboud and Wright, 2005; Gopinath, Helpman and Rogoff, 2014; Herger, 2016), so the global trade and financial dealers along with speculators are strongly motivated to utilize derivatives to respectively hedge market risks or gain from investment on the derivatives instruments. Accordingly, hedging tools insure foreign exchange market risks to streamline international trade and financial flows for Iranian economy while simultaneously provide an ample room for speculative investment on derivatives while also enhance foreign exchange market stability via transforming speculative cash based demand to the accrual medium term demand or deviating spot market demand to the derivatives market accrual demand. Ultimately, the derivatives market has a more critical role in the economies which the UIP does not exist. Thus the UIP and RRE existence are distinctly examined in the rest of this section.

4.1 The UIP Test

The theory of UIP indicates that the interest rate differential between two economies is equal to the expected exchange rate differential (Equation 1), so there is no residual between the interest rate and expected exchange rate differentials which simultaneously underlines foreign exchange market efficiency. In other words, residual term as currency return of the UIP equation is arithmetically expected to be zero ($E(\zeta_{t+1}) = 0$)[1] in case the UIP is theoretically hold. Reciprocally, if the residual term equals non-zero, ex-post Currency Excess Return (CER) will be created at the foreign exchange market (Equation 2) and therefor the UIP does

1. Given the fact that the foreign exchange market is assumed to have perfect competition condition, efficient, and therefore no friction among market agents, the expected value and standard deviation of CER equals zero. $E_t(\zeta_{t+1}) + \frac{1}{2}\mathrm{var}_t(\zeta_{t+1}) = 0$

not exist either ($\zeta_{t+1} \neq 0$). The UIP non-existence provides arbitrage opportunity for risk-neutralized agents through expected return gap between domestic and foreign[1] assets in the short run[2].

$$E(S_{t+1}) - S_t = r_t^f - r_t \quad (1)$$

$$\zeta_{t+1} = S_{t+1} - S_t - r_t^f + r_t = (S_{t+1} - S_t) - dr_t \quad (2)$$

The UIP is evidently recognized as an alternative approach to predict an accurate nominal exchange rate providing that the $\mathrm{E}(\mathrm{CER})$ approximately equals zero. The strong null hypotheses of the UIP existence is statistically accepted in case the expected value of the CER equals zero which presumably indicates the economies structure are similar and consequently there are some speculators who recognized risk neutralized agent in two countries in the short run. Henceforth, speculators are expected to be risk neutralized agent in two economies in order to hold the UIP condition (3) given the CER unpredictability (white noise) and the CER autonomous with economic condition during the time.

$$E_t(\zeta_{t+1}) = E(\zeta_{t+1}) = 0 \quad (3)$$

Notwithstanding, the economies structure are empirically considered different thus speculators are encountered with different sort of risk structure. Henceforth, the expected value of CER should be empirically varied over the time $\mathrm{E}(\zeta_{t+1}) \neq 0$ even though it is considered mean verse around a fixed amount. In this context, the presumption of risk neutralized agents and similar risk structures in the economies are rejected, so a new weak null hypothesis of the UIP is examined (Engle, 2016; Balduzzi, Chiang and Ethan, 2015) to explain that the CER fluctuates around a fixed amount of expected risk during the time whereas the CER is still recognized autonomous in light of economic condition. Accordingly, they empirically realized

1. Expected return of foreign assets is also converted to the local currency by the nominal exchange rate.
2. All the variables are logarithmic

that the CER is stationary while also explained by Real Exchange Rate[1] (RER, Equation (4)). Real exchange rate is introduced as explanatory variable to illuminate the gap between interest rate differential and expected exchange rate differential as residual term of the UIP equation which is also underscored by the CER. In other words, the CER which designates ex-post return of holding foreign currency is evidently explained by the RER in case the UIP does not exist. Equation (5) is arithmetically provided by replacement of equation (4) into the Equation (2) so the CER equals to the summation of real exchange rate growth and the future real interest rate difference between domestic and foreign economy.

$$\tilde{S}_t = S_t + P_t^f - P_t \tag{4}$$

$$\zeta_{t+1} = \Delta(\tilde{S}_{t+1}) + d\tilde{r}_{t+1} \tag{5}$$

Real exchange rate growth is introduced in the context of equation (7) which is arithmetically substituted by equation (4) to highlight the impact of nominal exchange rate growth $(S_{t+1} - S_t)$, foreign $(P_{t+1}^f - P_t^f)$ and domestic log Consumer Price Index (CPI) differences $(P_{t+1} - P_t)$ on the RER growth respectively.

$$\Delta\tilde{S}_{t+1} = \tilde{S}_{t+1} - \tilde{S}_t \tag{6}$$

$$\Delta\tilde{S}_{t+1} = (S_{t+1} - S_t) + (P_{t+1}^f - P_t^f) - (P_{t+1} - P_t) \tag{7}$$

Equation (7) can be rewritten based on inflation rather than CPI in the context of equation (8) which is also re-specified by adding and subtracting foreign and domestic nominal interest rates (9). Equation (10) is exactly same as the previous equation which is comprised of four components including upcoming nominal exchange rate growth $(S_{t+1} - S_t)$, inflation differential$(d\,\pi_{t+1})$, and nominal interest rate differential between foreign and domestic

1. Real exchange rate $(\tilde{S}_t)$ which is calculated from subtraction of nominal exchange rate (S_t) from inflation differential $(P_t^f - P_t)$ between two countries is empirically influenced by the fundamental indicators such as openness, terms of trade, TFP, and net capital flows in the medium term.

economies (dr_t).

$$\Delta\tilde{S}_{t+1} = (S_{t+1} - S_t) + (\pi^f_{t+1}) - (\pi_{t+1}) \quad (8)$$

$$\Delta\tilde{S}_{t+1} = (S_{t+1} - S_t) + (\pi^f_{t+1}) - (\pi_{t+1}) + r_t - r_t + r^f_t - r^f_t \quad (9)$$

$$\Delta\tilde{S}_{t+1} = (S_{t+1} - S_t) + d\pi_{t+1} + dr_t - dr_t \quad (10)$$

The first and third components of the equation (10) equals to the CER which is expressed in Equation (2), therefore the equation (10) is rewritten in the context of equation (11). Given the fact that the difference between nominal interest rate differential (dr_t) from inflation differential ($d\,\pi_{t+1}$) between domestic and foreign economies, equals to real interest rate differential ($d\tilde{r}_{t+1}$) therefore, equation (11) is simplified as equation (12). Anyway, the future amount of CER is arithmetically computed from subtraction of the future real exchange rate growth from upcoming real interest rate differential between domestic and foreign economies.

$$\Delta\tilde{S}_{t+1} = \zeta_{t+1} + d\pi_{t+1} + dr_t \quad (11)$$

$$\Delta\tilde{S}_{t+1} = \zeta_{t+1} + d\tilde{r}_{t+1} \quad (12)$$

$$\zeta_{t+1} = \Delta\tilde{S}_{t+1} - d\tilde{r}_{t+1} \quad (13)$$

Eventually, the future value of CER is approximately influenced by the future real exchange rate growth and future real interest rate differential between two countries (13). Future real exchange rate growth is also arithmetically extended in the context of differential equation system for T period (14) to underscore that real exchange rate is sequentially influenced from real exchange rates growth in the next periods and real exchange rate at the end of period (16). In this regard, after taking conditional expectation, the difference of real exchange rate at t period, from expected value of real exchange rate at period T+1 equals to expected real exchange rates growth in the next periods as well (17).

$$\Delta\tilde{S}_{t+1} = \tilde{S}_{t+1} - \tilde{S}_t \quad (14)$$
$$\Delta\tilde{S}_{t+2} = \tilde{S}_{t+2} - \tilde{S}_{t+1}$$
$$\Delta\tilde{S}_{t+3} = \tilde{S}_{t+3} - \tilde{S}_{t+2}$$
$$\vdots$$
$$\Delta\tilde{S}_{t+j} = \tilde{S}_{t+j} - \tilde{S}_{t+j-1}$$

$$\tilde{S}_t = -\Delta\tilde{S}_{t+1} - \Delta\tilde{S}_{t+2} - \Delta\tilde{S}_{t+3} \ldots - \Delta\tilde{S}_{t+j} - \tilde{S}_{t+j-1} \quad (15)$$

$$\tilde{S}_t = -\sum_{j=1}^{T} \Delta\tilde{S}_{t+j} + \tilde{S}_{t+T-1} \quad (16)$$

$$\tilde{S}_t - E_t(\tilde{S}_{t+T-1}) = -\sum_{j=1}^{T} E_t(\Delta\tilde{S}_{t+j}) \quad (17)$$

Equation (18) again underlines that the conditional expectation of $T \to \infty$ equals to the difference of real exchange rate from expected amount of real exchange during the time should be equal to expected real exchange rates growth throughout the time (18).

$$\tilde{S}_t - E_t(\tilde{S}_{t+\infty}) = -\sum_{j=1}^{\infty} E_t(\Delta\tilde{S}_{t+j}) \quad (18)$$

If Relative Purchasing Power Parity (RPPP) holds the condition of $E_t(\tilde{s}_{t+\infty}) = E(\tilde{s}_t)$ will subsequently exist too. However, RER is random walk in developing economies due to manipulation of foreign exchange market as nominal anchor which subsequently causes the rejection of null hypothesis of the UIP existence (Rogoff, 1996; Balduzzi, Chiang and Ethan 2015). The Iranian RER highlights a regime change (graph 6) so the RER is considered trend stationary process which supports the hypothesis of $E_t(\tilde{s}_{t+\infty}) = E(\tilde{s}_t)$.

$$\sum_{j=1}^{\infty} E_t(\zeta_{t+j}) = \sum_{j=1}^{\infty} E_t(d\tilde{r}_{t+1}) - \left(\tilde{S}_t - E\left(\tilde{S}_t\right)\right) \quad (19)$$

$$\left(\tilde{S}_t - E\left(\tilde{S}_t\right) = \sum_{j=1}^{\infty} E_t(d\tilde{r}_{t+1}) - \sum_{j=1}^{\infty} E_t(\zeta_{t+j})\right) \quad (20)$$

Equation (13) is substituted into the equation (18) therefore equation (19) is concluded which indicates that expected value of CER as deviation of UIP is explained by the RER deviations and real

interest rates differential between two countries (Evans, 2012; Ferreira and Maio, 2014). By the way, RER deviations are driven by economic agents' future expectations on RER, and fundamental indicators given the open capital account. Equation (19) can be simply rewritten as equation (20) in order to illustrate that the deviations of real exchange rate are explained by real interest rate differential between two economies, and CER as residual term of the UIP equation which reflects market sentiments $E\left(\tilde{S}_t\right)$ and risk structure differences between two economies. In other words, there are a set of indicators which explains the RER behavior including the UIP deviations, market sentiments, and fundamental variables such as terms of trade, openness, government size, TFP, and net capital flows.

Given the fact that Iran capital account transactions are lawfully limited and consequently interest rate differential have slightly influenced RER deviations so the role of fundamental variables are significantly expected to upsurge which are also examined in the next section. However, the foreign exchange market risks are theoretically decomposed to the RRE and UIP indicators. Accordingly, the hypothesis of RRE and weak UIP which indicates that the expected value of CER has fixed amount (stationary) are statistically examined by TVAR. Meanwhile, Bootstrap technique is also utilized to inference the significant of explanatory variables. All test implement in 3 horizons included infinite horizon. The acceptance of hypothesis indicates that the RER deviations originated from fundamental variables (RRE) or UIP deviations (CER).

4.2 Finite-Horizon Tests

The first step of the methodology examines a test to realize that is there any method to predict CER by the state variable of economy. The equation (20) expresses that real exchange rate as a key state variable explains CER. The TVAR (threshold vector auto regressive) is utilized to incorporate the impact of lag values of both CER and RER to explain CER while determining a threshold for dependent variable. Furthermore, stock and real estate markets returns, net foreign assets, and inflation differential as explanatory variables are incorporated into the model in order to replace instead of interest rate given the insignificant impact of interest rate differential on the RRE

and CER (See, for example, Engel and West 2005). Hence, we define:

$$z_t = \left[\tilde{s}_t, \zeta_{H,t+H}, dr_{H,t+H}, d\pi_{H,t+H} \right] \tag{21}$$

where $X_{H,t+H}$ is the roll-over H-periods of variable X (see, for example, Ang and Chen, 2010). The TVAR method is applied. The j parameter indicates the regime choice which empirically underlines two fixed and flexible regimes in Iranian foreign exchange market. The regime period is exogenously determined by us based on our intuition about Iran Policy regimes.

$$z_t = A^j + z_{t-1} B^j + \nu_t^j \tag{22}$$

Ultimately, the UIP existence is approved in case the $\beta_{\zeta,j,H}$ of equation (23) equals zero and consequently CER (ζ_{t+1}) is also fixed in expectation.

$$\zeta_{H,t+H} = \alpha_{\zeta,j,H} + z_t \beta_{\zeta,j,H} + e_{\zeta,\mathrm{j,t+h}} \tag{23}$$

The joint null hypothesis is introduced as follow:

$$\beta^T_{\zeta,j,H} = O \tag{24}$$

The RRE existence is also tested while CER (ζ_x) is replaced by real interest rate differential ($d\tilde{r}_x$). In other words, the null hypothesis of RRE $\beta^T_{\zeta,j,H} \neq O$ is statistically rejected in case the UIP is accepted and On the other hand, at least one of the hypotheses (24) or (28) should be rejected.

$$w_t = \left[\tilde{s}_t, d\tilde{r}_{H,t+H}, dr_{H,t+H}, d\pi_{H,t+H} \right] \tag{25}$$

$$w_t = A^j + w_{t-1} B^j + \nu_t^j \tag{26}$$

$$d\tilde{r}_{H,t+H} = \alpha_{\tilde{dr},j,H} + z_t \beta_{\tilde{dr},j,H} + e_{\tilde{dr},j,t+h} \quad (27)$$

$$\beta^T_{\tilde{dr},j,H} = O \quad (28)$$

Given the fact that, finite horizon test is just utilized for high frequent data including monthly and seasonal data, so there are considerable data shortage for Iranian economy. Therefore, infinite horizon tests are inevitably utilized to address low frequency data challenges.

4.3 Infinite Horizon Tests

Although the UIP and RRE hypothesis should be statistically examined in different periods, the sample limit along with low degrees of freedom prevent to examine the tests for long period. Accordingly, infinite horizon tests are inevitably utilized to resolve the sample limit for proceeding the UIP and RRE tests as follows.

It is assumed that *Zt* follows a stationary process TVAR (22):

$$\begin{aligned}
\zeta_{H,t+H} &= \sum_{h=1}^{H} \left(\zeta_{h,t+h} \right) \\
&= \sum_{h=1}^{H} \left(\alpha_{\zeta,j,1} + z_{t+h-1} \beta_{\zeta,j,1} + e_{\zeta,j,t+1} \right) \\
&= \alpha_{\zeta,j,1} + \sum_{h=1}^{H} \left(z_{t+h-1} \right) \beta_{\zeta,j,1} + e_{\zeta,j,t+1} \\
&= \alpha_{\zeta,j,1} + z_t \left[I + B^j + \left(B^j \right)^2 + \cdots + \left(B^j \right)^{H-1} \right] \beta_{\zeta,j,1} + e_{\zeta,j,t+1} \xrightarrow{H \to \infty}
\end{aligned} \quad (29)$$

$$\zeta_{\infty,t+\infty} = \alpha_{\zeta,j,1} + z_t \left[I - B^j \right]^{-1} \beta_{\zeta,j,1} + e_{\zeta,j,t+1}$$

where the eigenvalues of B lie inside the unit circle the theoretical regression coefficients are estimated from projecting infinite-horizon cumulative excess returns on the real exchange rate and other instruments:

$$\hat{\beta}_{\zeta,j,\infty} = \left[I - \hat{B}^j \right]^{-1} \hat{\beta}_{\zeta,j,1} \quad (30)$$

Hence, the joint restrictions are consequently tested in the next section.

$$\hat{\beta}_{\zeta,j,\infty} = O \tag{31}$$

Given the fact that the distribution of parameters $\hat{\beta}_{\zeta,j,\infty}$ is statistically considered unknown and complicated so the efficient statistical inference is impossible based on the asymptotic theory. Therefore, Bootstrap approach which creates a better statistical inferences for small samples, is utilized in the study (Balduzzi, Chiang and Ethan, 2015). In other words, the foreign exchange rates data which are categorized into some small sub-samples are analyzed by Bootstrap approach.

5. Estimation Results

The real exchange rate volatilities are theoretically driven by fundamental variables and monetary policy instruments which are articulately examined in Iranian economy as main hypothesis of this study. In this regard, future contracts are empirically noticed as hedging instrument to insure foreign exchange market risks and volatilities. The RER which is presumed to be influenced by the ex-post real interest rate differential and CER (Eq. 20), is statistically tested by TVAR method during 1990-2016. The equation (20) is also assumed that RER is stationary as a presumption to estimate model. However, the RER is not historically observed stationary in the Iran. Thus, the VAR method is alternatively replaced by TVAR method in order to analyze the nonstationary sample to two sub-periods stationary process.

Table 2: Unit Root Test of RER without Structural Break

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		**-1.850442**	**0.6728**
Test critical values"	1% level	-4.049586	
	5% level	-3.454032	
	10% level	-3.152562	

*** Mackinnon (1996) one-sided p-value.**

Given the fact that, the RER is not observed stationary, the

seasonal data span is divided to two different sub-periods which are both recognized trend stationary and mean reversion. In other words, the RER seasonal data are technically separated to two periods based on intervention power of the CBI. The RER was behaviorally considered flexible (inflexible) in case the CBI intervention power mitigated (enhanced) and consequently the market sentiments exacerbated (improved) at the same time. Accordingly, the sample is ultimately divided into two periods which respectively reflects the intervention power of the CBI in two flexible and inflexible regimes while simultaneously fulfills the presumption of mean-reversion of the RER in two periods.

Table 3: Unit Root Test of RER after Removing the Regimes Effects in Intercept and Trend

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.576228	0.0000
Test critical values"	1% level	-2.587607	
	5% level	-1.943974	
	10% level	-1.614676	

*** Mackinnon (1996) one-sided p-value.**

Nominal expected exchange rate is theoretically driven by nominal interest rate differential between two economies in light of UIP theory. Accordingly, the CER is expected to be stationary in case the UIP hypothesis is not statistically rejected in the long run. The CER stationarity also indicates that nominal expected exchange rate changes and interest rate differential are co-integrated in the long run. However, the CER stationarity does not necessarily indicate that the UIP exists too.

In this context, the UIP hypothesis is evidently rejected in many economies due to the short run impacts of fundamental indicators development, differences of political risks structure, lack of currencies perfect substitution, and real sector shocks on the nominal expected exchange rate (Mishkin, 1984; Gopinath, Helpman and Rogoff, 2014). Therefore, the expected value of CER is also observed non-zero in many economies which undermines the UIP theory and consequently the replacement of the weak UIP theory. The weak UIP theory underscores that risks structure differences between two economies

are incorporated in the context of an intercept which is added in equation (1). The weak UIP hypothesis is alternatively examined in order to evaluate foreign exchange market behavior in the short run in compliance with risk structure differences between two economies.

The impact of real interest rate differential on real exchange rate which is examined in the context of UIP hypothesis is statistically incorporated in table (1). Two foreign exchange regimes are evaluated in the estimation process including flexible (R1) and fixed (R2) regimes. In this context, the estimation horizon is respectively divided into single season(H0), two season(H1), and infinite horizon(inf) while the lower and upper bandwidth determine at 1% significance level.

Table 4: UIP Statistical Test Results in Light of Two Different FEX Regimes

Lower Bound	Upper bound	Estimated Coef.	Var. Name	Method	Horizon	Regime
-0.27	0.48	-0.17*	rer	BCa	H0	R1
-0.62	0.41	0.04*	EE0	BCa	H0	R1
-9.73	9.96	-7.87*	dr0	BCa	H0	R1
-1.51	1.20	0.61*	dp0	BCa	H0	R1
-1.06	0.58	0.23*	rer	BCa	H1	R1
-0.62	0.52	0.36*	EE1	BCa	H1	R1
-6.93	3.75	-3.66*	dr1	BCa	H1	R1
-2.09	1.49	1.32*	dp1	BCa	H1	R1
-391.55	335.95	173.96*	rer	BCa	Inf	R1
-111.28	22.20	33.04	EE0	BCa	Inf	R1
-17.55	30.57	-11.29*	dr0	BCa	Inf	R1
-11.22	80.69	-44.58	dp0	BCa	Inf	R1
-0.23	0.24	-0.33	rer	BCa	H0	R2
-0.39	0.33	0.1*	EE0	BCa	H0	R2
-0.52	0.64	0.78	dr0	BCa	H0	R2
-0.34	0.22	0.34	dp0	BCa	H0	R2
-0.24	0.24	-0.41	rer	BCa	H1	R2

Lower Bound	Upper bound	Estimated Coef.	Var. Name	Method	Horizon	Regime
-0.34	0.35	0.43	EE1	BCa	H1	R2
-0.33	0.40	0.58	dr1	BCa	H1	R2
-0.29	0.22	0.34	dp1	BCa	H1	R2
-3.56	1.21	-11.14	rer	BCa	Inf	R2
-0.69	0.54	12.94	EE0	BCa	Inf	R2
-3.41	6.26	10.73	dr0	BCa	Inf	R2
-4.10	4.77	-1.45*	dp0	BCa	Inf	R2
-0.47	0.27	-0.17*	rer	Prc	H0	R1
-0.47	0.51	0.04*	EE0	Prc	H0	R1
-9.52	10.30	-7.87*	dr0	Prc	H0	R1
-1.25	1.43	0.61*	dp0	Prc	H0	R1
-0.85	0.65	0.23*	rer	Prc	H1	R1
-0.56	0.58	0.36*	EE1	Prc	H1	R1
-5.38	4.48	-3.66*	dr1	Prc	H1	R1
-1.63	1.84	1.32*	dp1	Prc	H1	R1
-414.80	323.98	173.96*	rer	Prc	Inf	R1
-25.90	162.92	33.04*	EE0	Prc	Inf	R1
-14.44	35.83	-11.29*	dr0	Prc	Inf	R1
-135.23	15.52	-44.58*	dp0	Prc	Inf	R1
-0.25	0.22	-0.33	rer	Prc	H0	R2
-0.40	0.32	0.1*	EE0	Prc	H0	R2
-0.60	0.53	0.78	dr0	Prc	H0	R2
-0.26	0.26	0.34	dp0	Prc	H0	R2
-0.25	0.23	-0.41	rer	Prc	H1	R2
-0.36	0.33	0.43	EE1	Prc	H1	R2
-0.44	0.34	0.58	dr1	Prc	H1	R2
-0.23	0.25	0.34	dp1	Prc	H1	R2
-1.59	2.85	-11.14	rer	Prc	Inf	R2

Lower Bound	Upper bound	Estimated Coef.	Var. Name	Method	Horizon	Regime
-0.24	1.98	12.94	EE0	Prc	Inf	R2
-4.07	5.04	10.73	dr0	Prc	Inf	R2
-4.98	3.52	-1.45*	dp0	Prc	Inf	R2

* The estimated coefficient statistically equals zero.

The results of two models are driven by percentile and BCa (Bias-Corrected and Accelerated) Bootstrap approaches. In the first regime, foreign exchange rate is explained by real interest rate differential while the UIP deviations impact are transferred into the foreign exchange market in different span including single season, two seasons, and somehow infinite horizon.

Henceforth, the remaining risk at foreign exchange market is driven by the deviations from RRE. The UIP deviations impact are not empirically conveyed into the foreign exchange rate in the second regime due to constant intervention of central bank at the foreign exchange market against the PPP theory which simultaneously accumulate the foreign exchange market instability.

Table 5: RRE Statistical Test Results in Light of Two Different FEX Regimes

lower Bound	Upper bound	Estimated Coef.	Var. Name	Method	Horizon	Regime
-0.03	0.03	0.1	rer	BCa	H0	R1
-0.46	0.53	-6.22	drt0	BCa	H0	R1
-0.19	0.23	3.41	dr0	BCa	H0	R1
-0.16	0.13	-5.97	dp0	BCa	H0	R1
-0.01	0.01	0.19	rer	BCa	H1	R1
-0.44	0.50	1	drt1	BCa	H1	R1
-0.69	0.57	-2.59	dr1	BCa	H1	R1
-0.17	0.15	0.95	dp1	BCa	H1	R1
-19.52	20.74	-232.25	rer	BCa	Inf	R1
-0.34	0.94	-47.3	drt0	BCa	Inf	R1
-2.53	2.23	47.42	dr0	BCa	Inf	R1
-2.04	1.29	79.13	dp0	BCa	Inf	R1
-0.01	0.01	-0.01*	rer	BCa	H0	R2

lower Bound	Upper bound	Estimated Coef.	Var. Name	Method	Horizon	Regime
-0.28	0.28	0.67	drt0	BCa	H0	R2
-0.29	0.36	0.33*	dr0	BCa	H0	R2
-0.23	0.22	0.28	dp0	BCa	H0	R2
-0.08	0.09	-0.02*	rer	BCa	H1	R2
-0.27	0.38	0.09*	drt1	BCa	H1	R2
-0.55	0.66	0.82	dr1	BCa	H1	R2
-0.32	0.39	-0.5	dp1	BCa	H1	R2
-123.97	205.26	-223.46	rer	BCa	Inf	R2
-0.46	0.40	35.96	drt0	BCa	Inf	R2
-10.14	8.30	30.95	dr0	BCa	Inf	R2
-10.78	8.89	-4.39*	dp0	BCa	Inf	R2
-0.03	0.03	0.1	rer	Prc	H0	R1
-0.57	0.45	-6.22	drt0	Prc	H0	R1
-0.19	0.23	3.41	dr0	Prc	H0	R1
-0.14	0.15	-5.97	dp0	Prc	H0	R1
-0.02	0.01	0.19	rer	Prc	H1	R1
-0.52	0.42	1	drt1	Prc	H1	R1
-0.62	0.63	-2.59	dr1	Prc	H1	R1
-0.16	0.17	0.95	dp1	Prc	H1	R1
-13.96	33.84	-232.25	rer	Prc	Inf	R1
-0.36	0.81	-47.3	drt0	Prc	Inf	R1
-3.65	1.62	47.42	dr0	Prc	Inf	R1
-2.22	1.19	79.13	dp0	Prc	Inf	R1
-0.01	0.01	-0.01*	rer	Prc	H0	R2
-0.32	0.27	0.67	drt0	Prc	H0	R2
-0.34	0.28	0.33	dr0	Prc	H0	R2
-0.22	0.23	0.28	dp0	Prc	H0	R2
-0.08	0.09	-0.02*	rer	Prc	H1	R2
-0.32	0.30	0.09*	drt1	Prc	H1	R2
-0.71	0.52	0.82	dr1	Prc	H1	R2
-0.34	0.35	-0.5	dp1	Prc	H1	R2
-160.51	134.15	-223.46	rer	Prc	Inf	R2
-0.35	0.60	35.96	drt0	Prc	Inf	R2

lower Bound	Upper bound	Estimated Coef.	Var. Name	Method	Horizon	Regime
-8.63	10.49	30.95	dr0	Prc	Inf	R2
-9.27	11.12	-4.39*	dp0	Prc	Inf	R2

* The estimated coefficient statistically equals zero.

The impacts of the real interest rate differential (RRE) and the CER as ex post residual term of the UIP are statistically examined to explain the RER behavior in Iranian economy by TVAR method. The results indicate that the expected value of RER significantly explains the real interest rate differential given the fact that the estimated parameters is approximately considered non-zero. Thus, the hypothesis of real interest rate parity (RRE) is rejected in both flexible and inflexible regimes in Iran. Accordingly, the RER does not explain the CER in flexible regime due to lower intervention of the CBI which underlines the approval of weak UIP. Reciprocally, the RER explains the CER in inflexible regime due to strong intervention of the CBI which underlines the rejection of weak UIP. Ultimately, real interest rate differential is somehow explained by the RER in two regimes which stress the weak impact of real sector and fundamental indicators on the RER behavior.

The ratio of Var-Cov matrix of UIP and RRE residuals to real exchange rate which is underscored in the table (6) indicate that the deviations from the UIP is recognized as a key RER risk factor. In this regard, future contracts insure foreign exchange market risks while augmenting the CBI ability to preserve external sustainability and foreign exchange market stability.

Table 6: Relative Covariance of UIP and RRE with Real Exchange Rates

Regime	*horizon*	$Cov(RER_t, E\{RRE_{t+1}\})$	$Cov(RER_t, E\{\zeta_{t+1}\})$	$Var(RER$	*UIP Factor*	*RRE Factor*
Both	H0	0.01	0.02	0.10	0.21	0.08
R1	H0	-0.03	-0.05	0.09	-0.59	-0.38
R2	H0	0.01	0.04	0.09	0.40	0.10
both	H1	0.01	0.03	0.10	0.27	0.14
R1	H1	-0.04	-0.07	0.09	-0.84	-0.50

Regime	*horizon*	$Cov(RER_t, E\{RRE_{t+1}\})$	$Cov(RER_t, E\{\zeta_{t+1}\})$	$Var(RER$	*UIP Factor*	*RRE Factor*
R2	H1	0.02	0.05	0.09	0.57	0.18
both	Inf	2687.48	0.04	0.10	0.41	27666.40
R1	Inf	20.34	-15.01	0.09	-174.00	235.86
R2	Inf	21.53	1.24	0.09	13.23	229.77

6. Conclusions

The real exchange rate volatilities are theoretically driven by fundamental variables and monetary policy instruments which are articulately examined in Iranian economy as main hypothesis of this study. In this regard, future contracts are empirically noticed as hedging instrument to insure foreign exchange market risks and volatilities. The RER which is presumed to be influenced by the ex-post real interest rate differential and CER (Eq. 20), is statistically tested by utilization of TVAR method during 1990-2016. The equation (20) is also assumed that RER is stationary as a presumption to estimate model. However, the RER is not historically observed stationary in the Iran. Thus, the VAR method is alternatively replaced by TVAR method in order to analyze the nonstationary sample to two sub-periods stationary process.

Given the fact that, the RER is not observed stationary, the seasonal data span is divided to two different sub-periods which are both recognized trend stationary and mean reversion. In other words, the RER seasonal data are technically separated to two periods based on intervention power of the CBI. The RER was behaviorally considered flexible (inflexible) in case the CBI intervention power mitigated (enhanced) and consequently the market sentiments exacerbated (improved) at the same time. Accordingly, the sample is ultimately divided to two periods which respectively reflects the intervention power of the CBI in two flexible and inflexible regimes while simultaneously fulfills the presumption of mean-reversion of the RER in two periods.

Nominal expected exchange rate is theoretically driven by nominal interest rate differential between two economies in light of UIP theory. Accordingly, the CER is expected to be stationary in case the

UIP hypothesis is not statistically rejected in the long run. The CER stationarity also indicates that nominal expected exchange rate changes and interest rate differential are co-integrated in the long run. However, the CER stationarity does not necessarily indicate that the UIP exists too.

In this context, the UIP hypothesis is evidently rejected in many economies due to the short run impacts of fundamental indicators development, differences of political risks structure, lack of currencies perfect substitution, and real sector shocks on the nominal expected exchange rate. Therefore, the expected value of CER is also observed non-zero in many economies which undermines the UIP theory and consequently the replacement of the weak UIP theory. The weak UIP theory underscores that risks structure differences between two economies are incorporated in the context of an intercept which is added in equation (1). The weak UIP hypothesis is alternatively examined in order to evaluate foreign exchange market behavior in the short run in compliance with risk structure differences between two economies. The impacts of the real interest rate differential (RRE) and the CER as residual term of the UIP are statistically examined to explain the RER behavior in Iranian economy by TVAR method.

The results indicate that the expected value of RER significantly explains the real interest rate differential given the fact that the estimated parameters is approximately considered non-zero. Thus, the hypothesis of real interest rate parity (RRE) is rejected in both flexible and inflexible regimes in Iran. Accordingly, the RER does not explain the CER in flexible regime due to lower intervention of the CBI which underlines the approval of weak UIP. Reciprocally, the RER explains the CER in inflexible regime due to strong intervention of the CBI which underlines the rejection of weak UIP. Ultimately, real interest rate differential is somehow explained by the RER in two regimes which stresses the weak impact of real sector and fundamental indicators on the RER behavior.

Although foreign exchange rate is historically considered as nominal anchor in the context of pegged regime in Iran, foreign exchange market has been sometimes motivated by external or internal shocks to settle the accumulated impact of inflation differential and fundamental variables gap so the foreign exchange

rate is occasionally affected by nominal or real sector shocks to absorb periodical accumulated disequilibrium driven by relative price or relative fundamental variables. In the other words, whereas the CBI contains foreign exchange rate volatilities against monetary and real sector differentials in the medium term, the exogenous shocks provide a condition to adjust nominal exchange rate based on long run unreleased accumulated impact of inflation and fundamental indicators differentials. Eventually, both nominal and real sector shocks and differentials are substantially transmitted on the nominal exchange rate to maintain external sustainability in the long run.

Foreign exchange market is evidently exposed to different sort of contingent risks in the short run which need to be hedged by derivatives instruments. In this regard, a new arrangement of the future contract is introduced in this paper which is also in compliance with Islamic sharia. Foreign exchange future contracts are evidently expected to enhance foreign exchange market stability via transferring speculative and precautionary cash-based transactions from short term spot market to accrual medium term future market while considerably mitigating demand pressure from foreign assets and international reserves. Accordingly, the accrual future contracts as standard derivative tool are periodically-flexibly introduced based on value, settlement period, advance payment, collateral requirements, currency, and discountability, as well as settlement conditions which could be lawfully cleared in the context of refunding by foreign currency or issuing foreign currency certificate of deposit. The foreign currency certificate of deposit is empirically utilized by importers or financial intermediaries to finance import or reimburse international debt respectively. All the accrual future contracts are evidently applied at maturities to settle the international trade and financial transactions so they are functionally considered as Islamic tool in compliance with Islamic Sharia although they are also characterized as differed payment contracts.

Foreign exchange future contracts also moderate exchange rate stability at the both spot and future markets through distributing both speculative and precautionary demand in light of medium term contracts while simultaneously mitigate the both contracts at the sport market.

References

Allayannis, G., Ihrig, J., & Weston, J. P. (2001). Exchange-Rate Hedging: Financial versus Operational Strategies. *The American Economic Review, 91*(2), 391–395.

Allen, S. (2003). *Financial Risk Management: A Practitioner's Guide to Managing Market and Credit Risk* (with CD-ROM). New Jersey: John Wiley & Sons.

Asbury, S., & Jacobs, E. (2014). *Dynamic Risk Assessment: The Practical Guide to Making Risk-Based Decisions with the 3-Level Risk Management Model*. London: Routledge.

Bahmani-Oskooee, M. (1995). Source of Inflation in Post-Revolutionary Iran. *International Economic Journal, 9*(2), 61–72.

Balduzzi, P., Chiang, I., & Ethan, H. (2015). Real Exchange Rates and Currency Risk Premia. Retrieved from papers.ssrn.com/sol3/papers.cfm?abstract_id=2439407.

Barro, R. J., & Gordon, D. B. (1983). Rules, Discretion and Reputation in a Model of Monetary Policy. *Journal of Monetary Economics, 12*(1), 101–121.

Barton, T. L., Shenkir, W. G., & Walker, P. L. (2002). *Making Enterprise Risk Management Pay off*. New Jersey: FT Press.

Berganza, J. C., Chang, R., & Herrero, A. G. (2004). Balance Sheet Effects and the Country Risk Premium: An Empirical Investigation. *Review of World Economics, 140*(4), 592–612.

Bernanke, B. S. (2016). Federal Reserve Policy in an International Context. *IMF Economic Review, 65*(1), 5-36.

Boertje, B., & Garretsen, H. (1996). Volatility, Fundamentals and Economic Policy. Retrieved from bis.org/publ/confp01j.pdf.

Chaboud, A. P., & Wright, J. H. (2005). Uncovered Interest Parity: It Works, but not for Long. *Journal of International Economics, 66*(2), 349–362.

Chan, K. F., Gan, C., & McGraw, P. A. (2015). A Hedging Strategy for New Zealand's Exporters in Transaction Exposure to Currency Risk. Retrieved from http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.196.5848&rep=rep1&type=pdf.

Copeland, L. S. (2008). *Exchange Rates and International Finance*, *Pearson Education*. London: Pearson Education.

Döhring, B. (2008). Hedging and Invoicing Strategies to Reduce Exchange Rate Exposure-A Euro-Area Perspective. Retrieved from http://ec.europa.eu/economy_finance/publications/pages/publication11475_en.pdf.

Edwards, F. R. (1996). *The New Finance: Regulation and Financial Stability*. Washington, DC: American Enterprise Institute.

Eichengreen, B. J. (1998). *Globalizing Capital: A History of the International Monetary System.* Princeton, New Jersey: Princeton University Press.

Eichengreen, B., & Hausmann, R. (1999). Exchange Rates and Financial Fragility (w7418). *National Bureau of Economic Research*, Retrieved from http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.368.1226&rep=rep1&type=pdf.

Engel, C. (2016). Exchange Rates, Interest Rates, and the Risk Premium. *The American Economic Review, 106*(2), 436–474.

Engel, C., & West, K. D. (2005). Exchange Rates and Fundamentals. *Journal of Political Economy, 113*(3), 485–517.

Evans, M. D. (2012). *Exchange-Rate Dark Matter*. Washington, DC: International Monetary Fund.

Farzanegan, M. R., & Markwardt, G. (2009). The Effects of Oil Price Shocks on the Iranian Economy. *Energy Economics, 31*(1), 134–151.

Ferreira Filipe, S., & Maio, P. F. (2014). What Drives Exchange Rates? Reassessing Currency Return Predictability. Retrieved from dx.doi.org/10.2139/ssrn.2496439.

Fischer, S. (1976). Comment on R. Dornbusch. *Scandinavian Journal of Economics, 78*, 276–279.

Frankel, J. A., & Rose, A. K. (1996). A Panel Project on Purchasing Power Parity: Mean Reversion Within and Between Countries. *Journal of International Economics, 40*(1), 209–224.

Fratianni, M., & Von Hagen, J. (1992). The European Monetary System and European Monetary Union. *Financial and Monetary Policy Studies, 22*, 337-359

Gopinath, G., Helpman, E., & Rogoff, K. (Eds.). (2014). *Handbook of International Economics (4).* Amsterdam: Elsevier.

---------- (2014). *Handbook of International Economics*. Amsterdam: Elsevier.

Herger, N. (2016). Panel Data Models and the Uncovered Interest Parity Condition: The Role of Two-Way Unobserved Components. *International Journal of Finance & Economics, 21*(3), 294–310.

Hossain, A. A. (2016). Inflationary Shocks and Real Output Growth in Nine Muslim-Majority Countries: Implications for Islamic Banking and Finance. *Journal of Asian Economics, 45*, 56–73.

Islam, K. A., Alam, I., & Al-Amin, D. M. (2015). Foreign Exchange Operation of Private Commercial Banks in Bangladesh: A Case Study on AB Bank Limited. *International Journal of Innovative Research and Creative Technology*, Retrieved from http://www.ijirct.org/downloadtotal.php?a_pub_filename=IJIRCT1201061.pdf&download=7&a_pid=IJIRCT1201061.

Jacque, L. L. (2013). *Management and Control of Foreign Exchange Risk*. Berlin: Springer Science & Business Media.

Jeanne, O., & Masson, P. (2000). Currency Crises, Sunspots and Markov-Switching Regimes. *Journal of International Economics, 50*(2), 327–350.

Jeanne, O., & Rose, A. K. (2002). Noise Trading and Exchange Rate Regimes. *The Quarterly Journal of Economics, 117*(2), 537–569.

Jones, A. T., & Sackley, W. H. (2016). An Uncertain Suggestion for Gold-Pricing Models: The Effect of Economic Policy Uncertainty on Gold Prices. *Journal of Economics and Finance, 40*(2), 367–379.

Kariuki, B. W. (2016). *Effect of Fluctuation in Foreign Currency Exchange Rates on Financial Performance of Five Star Hotels in Nairobi* (Doctoral Dissertation, University of Nairobi, Kenya). Retrieved from http://erepository.uonbi.ac.ke/bitstream/handle/11295/99571/KARIUKI%20BELINDA%20WANJIKU.pdf?sequence=1&isAllowed=y.

Kayikçi, F. (2013). Disinflation Programs: Lessons from 2001 Crisis in Turkey. *Asian Journal of Empirical Research, 3*(3), 266–278.

Kenen, P. (1969). The Theory of Optimum Currency Areas: An Eclectic View. In: Mundell, R., & Swoboda, A. (Eds.) .*Monetary Problems of the International Economy* .Chicago: The University of Chicago Press.

Krugman, P. (1979). A Model of Balance-of-Payments Crises. *Journal of Money, Credit and Banking, 11*(3), 311–325.

Lim, D. (2014). *Economic Growth and Employment in Vietnam*. Abingdon: Routledge.

Liu, O., & Adedeji, O. (2000). Determinants of Inflation in the Islamic Republic Of Iran-A Macroeconomic Analysis. *International Monetary Fund*, Retrieved from imf.org/en/Publications/WP/Issues/2016/12/30/Determinants-of-Inflation-in-the-Islamic-Republic-of-Iran-A-Macroeconomic-Analysis-3684.

Madura, J., & McDaniel, W. R. (1989). Market Reaction to Increased Loan Loss Reserves at Money-Center Banks. *Journal of Financial Services Research, 3*(4), 359–369.

Mark, N. C., & Wu, Y. (1998). Rethinking Deviations from Uncovered Interest Parity: The Role of Covariance Risk and Noise. *The Economic Journal, 108*(451), 1686–1706.

Masso, J., & Staehr, K. (2005). Inflation Dynamics and Nominal Adjustment in the Baltic States. *Research in International Business and Finance, 19*(2), 281–303.

Masson, M. P. R. (1999). Multiple Equilibria, Contagion, and the Emerging Market Crises. *International Monetary Fund*, Retrieved from imf.org/external/pubs/ft/wp/1999/wp99164.pdf.

McNeil, A. J., Frey, R., & Embrechts, P. (2015). *Quantitative Risk Management: Concepts, Techniques and Tools.* Princeton, New Jersey: Princeton University Press.

Mehrara, M., & Oskoui, K. N. (2007). The Sources of Macroeconomic Fluctuations in Oil Exporting Countries: A Comparative Study. *Economic Modelling, 24*(3), 365–379.

Melvin, M. (1985). Currency Substitution and Western European Monetary Unification. *Economica, 52*(205), 79–91.

Mishkin, F. S. (1984). Are Real Interest Rates Equal Across Countries? An Empirical Investigation of International Parity Conditions. *The Journal of Finance, 39*(5), 1345–1357.

Obstfeld, M., & Rogoff, K. (1995). Exchange Rate Dynamics Redux. *Journal of Political Economy*, *103*(3), 624–660.

Olivier, J., & Rose, A. K. (1999). Noise Trading and Exchange Rate Regimes. *NBER Working Paper Series*, Retrieved from https://papers.ssrn.com/sol3/papers.cfm?abstract_id=348200.

Onur, E. (2008). The Role of Asymmetric Information among Investors in the Foreign Exchange Market. *International Journal of Finance & Economics, 13*(4), 368-385.

Rime, D. (2009). Bibliography of Microstructure of Foreign Exchange Markets. *Journal of Financial Economics, 94*(2), 192–213.

Rogoff, K. S., Husain, A. M., Mody, A., Brooks, R. J., & Oomes, N. (2003). *Evolution and Performance of Exchange Rate Regimes*. Washington, DC: International Monetary Fund.

Rogoff, K. (1996). The Purchasing Power Parity Puzzle. *Journal of Economic Literature, 34*(2), 647–668.

Salant, S. W., & Henderson, D. W. (1978). Market Anticipations of Government Policies and the Price of Gold. *Journal of Political Economy, 86*(4), 627–648.

Saunders, A., & Cornett, M. M. (2014). *Financial Institutions Management*. New York: McGraw-Hill Education.

Savvides, A. (1990). Real Exchange Rate Variability and the Choice of Exchange Rate Regime by Developing Countries. *Journal of International Money and Finance, 9*(4), 440–454.

Savvides, S. (1994). Risk Analysis in Investment Appraisal. *Project Appraisal, 9*(1), 3–18.

Staehr K. (2015). Currency Reforms in Emerging-Market and Transition Economies. In: Hölscher J., Tomann H. (Eds.). *Palgrave Dictionary of Emerging Markets and Transition Economics* (28-38). London: Palgrave Macmillan.

Vander Kraats, R. H., & Booth, L. D. (1983). Empirical Tests of the Monetary Approach to Exchange-Rate Determination. *Journal of International Money and Finance, 2*(3), 255–278.

Verbytska, A. (2016). *Inflation Targeting as an Effective Method of Ensuring Price Stability* (Doctoral Dissertation, Sumy State University, Ukraine). Retrieved from https://essuir.sumdu.edu.ua/bitstream/123456789/48939/1/Verbytska_global_financial_markets.pdf.

Wadhwani, S. B. (1987). The Macroeconomic Implications of Profit Sharing: Some Empirical Evidence. *The Economic Journal, 97*, 171–183.

Zhang, Z., Shi, N., & Zhang, X. (2011). China's New Exchange Rate Regime, Optimal Basket Currency and Currency Diversification. Retrieved from ssrn.com/abstract=1914296.