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Effects of volatility shocks on the dynamic linkages between exchange rate, interest rate and the stock market: The case of Turkey ☆

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ABSTRACT

This study analyzes the dynamic relationship between exchange rate (against US dollar), interest rate and the stock market (both in local currency) of Turkey from January 2003 to September 2013. In particular, the paper tries to answer if the correlations between these important variables change abruptly in high volatile periods and if they do, is this change temporary or permanent? In that manner, we first estimate the dynamic correlations between these variables using the VAR(p)–FIAPARCH(1,d,1)–cDCC(1,1) approach. Then, we endogenously detect the volatility shift dates by a novel method of penalized contrast functions and investigate the relation between the dynamic correlations and the high volatile periods. Results reveal that volatility shocks create abrupt changes in the dynamic correlations, however this effect is only short term and do not sustain between consecutive high volatility regimes. Thus, policymakers and investors do not need to be concerned about long run contagion effects.

1. Introduction

For many investors and policymakers, it is crucial to understand the dependencies between the three major financial markets, namely; foreign exchange (fx), bond and stock markets. Considering investors, the correlation structure between these markets can be used to construct portfolio strategies. For the policymakers, it is important to analyze the transmission channel between these markets to adopt proper policies and forecast the full impact of their decisions. Moreover, the importance of this analysis is enhanced considering the fact that correlations are time-varying.

There has been a lot of studies on the dynamics of these markets in the literature and the theoretical background on the subject is solid. Regarding the relation between stock and bond markets, usually a negative correlation is observed (Shiller and Beltratti, 1992). The background behind this phenomena is explained by the discount factor in stock pricing i.e. an increase in the interest rates lowers the present values of the equities. However, recent literature presents counter evidence in special circumstances. For example, according to Andersen et al. (2007) and Baele (2010), such a negative relation holds only during the contraction periods in the business cycle. The authors state that a positive relation can occur due to the cash flow effect i.e. increases in the interest rates could be results of higher growth and hence, greater profits for companies during an expansion in the business cycle. Similar results come from Rigobon and Sack (2003). According to the authors, the correlation may change signs depending on the direction of the information flow between these two markets. This is also validated by Yang et al. (2009) who use monthly stock and bond return data in the past 150 years (1855–2001) for both the US and the UK, and document time-varying stock–bond correlations over the business cycle, the inflation environment and monetary policy stance. Similarly, Hong et al. (2011) try to explain the time-varying relationship between these two markets by income and substitution effects. Recent studies further investigate the time-varying correlations between these two asset classes: For example, Baur (2007) shows empirically that, in emerging markets, the level of stock–bond correlation changes in time and the level depends more on cross country influences than on the stock–bond market interaction. Bianconi et al. (2013) find that the conditional correlations of the stock and bond returns in BRIC countries increased after the Lehman Brothers' collapse in September 2008.

The connection between the fx and bond markets can also be explained by theoretical background. For example, exchange rates and interest rates are connected by the uncovered interest rate

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parity (UIP): Risk-neutral investors will be indifferent among the available interest rates in two countries since the exchange rate between these two countries is expected to adjust resulting in an elimination of a potential interest rate arbitrage. According to Lothian and Wu (2011), there are small deviations from UIP in the short run, however the theory holds much better in the long run. However, the empirical literature on this relationship is highly limited. Bautista (2003) examines interest rate–exchange rate interaction using dynamic conditional correlation (DCC) analysis in the Philippines. The results reveal a strong positive correlation during the turbulent periods. On the other hand, Sanchez (2008) investigates the relationship between interest rates and exchange rates using a simple model that incorporates the role of exchange rate pass-through into domestic prices and distinguishes between cases of expansionary and contractionary depreciations. The model results show that the correlation between exchange rates and interest rates, conditional on an adverse risk premium shock, is negative for expansionary depreciations and positive for contractionary ones.

The dependency between fx and stock markets is also well studied. Indeed, the theory is categorized into three main models to explain this dependency. According to flow-oriented approach, changes in the exchange rate lead to changes in stock prices: Exchange rate movements affect international economic activities, thereby influencing real economic variables, hence affecting costs of a company with considerable exports/imports resulting with an impact on the company's stock price. Stock-oriented approach states that causation is from stock prices to exchange rate by inflows and outflows of foreign capital: Foreign investors are attracted by a persistent increase (decrease) in stock prices leading to capital inflows (outflows) resulting in an appreciation (depreciation) of the local currency. Finally, asset-market approach implies a weak/none relationship between stock prices and exchange rate. Accordingly, the exchange rate is treated like an asset; it's value is determined by the expected future exchange rates and information that affects future value of exchange rate may differ from the ones that cause changes in stock prices.[1] Besides these approaches, stock markets can also influence exchange rates through the wealth effect. Accordingly, increases in equity values will increase the impact on the money demand for a nation's currency by an increase in the aggregate wealth of its citizens. Empirical studies (Chow et al., 1997; Roll, 1992) usually find a positive relation between dollar appreciation against local currencies and stock returns (of that local markets). However, as in the case of the relationship between bond and stock market, some studies (Soenen and Henninger, 1988) argue that the sign of this relationship may be depend on time and be negative in special cases. For example, in a recent study, Lee et al. (2011) examine the interaction between stock prices and exchange rates of several Asia-Pacific countries by dynamic correlations. Their empirical results indicate that the correlation between stock and foreign exchange markets becomes higher when stock market volatility increases. For the same region, negative correlation between these two markets are revealed by Yang et al. (2014).

Considering the complex relationship explained above, the analysis of the dynamic interaction between these three markets is not easy but crucial, not only for investment and risk management issues, but also for the economic and financial stability.

As it can be anticipated, in this study, we aim to understand the dynamic relationship between three main indicators of economic and financial performance of a country, namely exchange rate, interest rate and the benchmark stock market index. In particular, we will analyze the dynamics of the *volatility shift contagion* effect which is defined as a *significant* change in the co-movement of asset returns between consecutive volatility regimes Forbes and Rigobon (2002). In this case, detecting volatility shift contagion is of extreme importance. If such a contagion effect does not exist, then there is no need for pro-active portfolio adjustment in high volatile periods and the possibility of risk diversification among these assets may increase. Similarly, policymakers are not required to react actively to prevent the contagion. On the other hand, if there exists a contagion effect, knowing its existence is crucial for hedging purposes and financial stability as policymakers should understand how volatility is transmitted across these variables in order to formulate appropriate policies to avoid the likely contagion. As we have experienced in the last decade, such policies may be crucial in limiting the impact of global crises.

In this study, we will focus on a leading emerging market, Turkey. Since 1993 to 2001, political and economical instability went hand in hand in Turkey. High inflation and budget deficits were the two main problems causing the severe recessions of 1994, 1999 and 2001. Recessions forced the government to make major policy reforms. In 2002, exchange rate was allowed to float and inflation targeting was adopted. The result was a decade of high and broadly stable economic growth. Moreover, in recent years, Turkey has become one of the most important emerging economies in the world and plays a significant role in global trade and finance. Due to these progresses, we will focus on the last decade in our analysis.

The structure of our analysis will be as follows: We first estimate a VAR model for these variables and detect sudden and gradual changes in the volatility of the VAR return-residual series using a penalized contrast function method of Lavielle (2005) that previously applied on different financial time series by Lavielle and Teyssiere (2007). Since we endogenously detect the shift points, periods of relatively high and low volatility are defined regardless of whether a financial crisis is the true cause. In the next step, we estimate a consistent dynamic conditional correlation (cDCC) model of Aielli (2013) to evaluate co-movements between the return series. Finally, we will analyze if the volatility shifts create significant changes in the dynamic correlations using dummy regression analysis.

The study contributes to the literature in two ways. First, this is the first study that investigates the volatility shock effects on the dynamics of the fx, bond and stock markets in Turkey. Second, the results have important implications considering policymakers and investors. In particular, we show that volatility shift contagion exists between exchange rate, interest rate and the stock market, however the contagion effect is temporary and fades away in a short time interval. Thus, policymakers should not necessarily react to prevent the contagion effect during high volatile periods, if this is what is desired. Similarly, investors that cross hedge using these assets need not to worry as the abruptly changed correlations during high volatile regimes are expected to achieve their regular levels shortly.

2. Data and methodology

The data used in our study covers a period from January 2, 2003 to September 5, 2013 and comes from two different sources. We obtain the daily exchange rates (against US dollar) and interest rates (in local currency) from the Central Bank of the Republic of Turkey and daily BIST100 index values (in local currency) are obtained from Borsa Istanbul database. The interest rates are the annualized compound yield of the highest liquid government bond on a given day.

[1] See Phylaktis and Ravazzolo (2005) for further discussion.