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IMPACT OF THE PERIODIC CHANGES IN MACROECONOMIC PARAMETERS AND GOLD RESERVES ON THE USD EXCHANGE RATE AGAINST G20′ CURRENCIES

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Abstract

In this study, we examine the determinants of foreign exchange rate, in other words the macroeconomic variables which are affecting the foreign exchange rate and especially whether the foreign exchange rate are influenced by the central banks' gold reserves. The most important feature of the study is to determine the relationships between foreign exchange rate with the various macroeconomic variables such as GDP, M1, Import, Export, Gold Reserve, Total Reserves by panel data modeling, and also to handle the forecasts models for predicting the exchange rate in a summary and understandable way. By way of this thought, in this paper, the relationships between foreign exchange rate with the various macroeconomic variables have been investigated for G20 countries (Argentina, Australia, Brasil, Canada, Chine, Euro Area (19 countries), India, Indonesia, Japan, Korea, Mexico, Russia,Saudi Arabia, South Africa, Turkey, UK, USA) for the period 2000-2017 with two regression models. Data set and methodology were mentioned in part III. According to the results obtained; we claim that the effects of percentage changes of macroeconomic parameters via both quarterly and yearly are statistically significant on the percentage change of USD exchange rate against national currency. In model-1 related with quarterly change; the results could be seen on table-4 and similarly in model-2 related with yearly change; the results could be seen on table-5. In brief; in this paper we see that the periodic changes both in the parameters of macroeconomic indicators and gold reserves within quantity and size directly effect the USD exchange rate against natioanl currency strongly.

Keywords: USD Exchange Rate, GDP, Gold Reserves, Export İmport, Panel Data, Robust Estimators.

1. Introduction

Currency is the general name given to other (foreign) countries' currencies. It can also be said that it is a payment instrument used in international payments. The exchange rate is an mathematical ratio equation of a country's national currency to the other countries' currencies. That is, the exchange rate is the mathematical rate of change between the two national currencies. The changes in the exchange rates in open economies directly affects the prices of goods and services that countries produce, sell or buy from abroad by affecting the efficiency and competitiveness of the producers and traders of that country in international markets. So it can be said that the exchange rate has a direct impact on the basic macroeconomic indicators, especially the trade balance of the countries. For example; an increase in the exchange rate increases the production costs of the sectors using imported inputs, which increases the price of goods and services in that sector and also reduces the competitive advantage. Such basic price increases may also put pressure on inflation. Therefore, it could be thought that the exchange rate is an important economic factor that should be taken into consideration in countries' commercial, economic, and even in political and governmental relations with each other.

To summarize; the increase in the exchange rate means the decrease in the value of the national currency, in other words, it means the purchase of more national currency with a unit of foreign currency. The drop in exchange rate is an indicator of the gaining value of the national currency. When the exchange rate falls, it becomes possible to buy more foreign currencies with the same amount of national currency. In this case, the decline in the value of the currency of an country makes the country's exports cheaper for foreigners, and at the same time the imported products become expensive for the domestic producers. In the same way, if the currency of the country is gaining value, the foreigners will have to pay more money to the goods produced in this country, and consumers in that country can buy foreign products cheaper (Krugman and Obstfeld, 1997). The rate of change between national currencies for international trade operations is vital. Therefore, the exchange rate is one of the important parameters that countries should pay more attention to. Because; exchange rates have a function that mediates country economies to make connection with each other. For this reason, it is inevitable that exchange rates affect countries' foreign trade and therefore competition power.

In this part of the article, it is better to talk a little about the historical process. Namely; exchange rates, exchange rate policies and the history of models that explain exchange rate can be taken up to the first years of economic thought formation. Following the Second World War, Bretton Woods (BW), based on the gold standard of western capitalist countries for the establishment of a new international monetary system under the leadership of the United States of America and United Kingdom, agreed on a fixed exchange rate

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system. However, in the following years, the supply of gold was limited, and doubts about the plundering of the dollar and its transformation into gold caused the BW system to collapse. Following the collapse of the BW system in 1973, the floating exchange rate system has become widespread. Nowadays, the management-fluctuation system, which is open to intervention in the markets throughout the world, has become widespread. From the 1980s onward, international capital flows accelerated with the opening of developing countries and the liberalization of financial markets. Therefore, under the floating exchange rate system, the determinants of financial factors have begun to come to the forefront.

We'll see if we examine this part a little bit more that the models used to explain exchange rates have changed over time. For example, in the 1970s, traditional models were used to determine exchange rates. The key macroeconomic variables such as money supply, inflation and interest rates are important in explaining exchange rate behavior in traditional models (Purchasing Power Parity, Interest Rate Parity, Monetary Models and Portfolio Equity Models). However, it has been observed that the amount of change in the currencies with the breakdown of the Bretton Woods system and the introduction of flexible exchange rate regimes is greater than the change in the underlying macroeconomic variables. This has brought about the view that there are movements in exchange rates that can not be explained by macroeconomic factors. The study of the reason for the deviation of the exchange rate from the macroeconomic variables has resulted in the microstructure of the foreign exchange market. (MacDonald, 1999). It should be known that the topics such as how exchange rates are determined and which exchange rate system is more advantageous are among the topics that are constantly discussed in the economic literature. Foreign exchange theories in general; the structure of exchange rates, how currencies are formed and the mutual relations between exchange rates and macroeconomic variables such as money supply, inflation and interest rates.

2. Exchange Related Approaches

Various foreign exchange theories have been developed in order to explain the reciprocal relations between the various macro-economic variables of exchange rates. The fact that exchange rates are so important has led to the suggesting of different exchange rate approaches to explain exchange rates. The first of the most basic approaches to the exchange rate determination is the Purchasing Power Parity (PPP) approach, which is one of the classical economics concepts. The second of the approaches developed based on the determination of exchange rate is the approach of foreign trade flows, which is one of Keynesian economics concepts argued by Marshall (1923), Lerner (1936) and Harberger (1950). The third approach, developed on the basis of exchange rate determination, is the interest rate parity approach. Fourth among approaches to explain exchange rates, Mundell and Fleming's Mundell-Fleming model, which they created at the beginning of 1960s by adding capital flows to the Keynesian Spending-Income Model. Mundell (1961), Mundell (1962), Fleming (1962) ve Mundell (1963) The approach developed by Mundell-Fleming, which integrates asset markets and capital movements into open economies, and eliminates current account deficits with a capital account, was still insufficient to explain changes in exchange rates.

For this reason, in order to explain the changes in the exchange rates, the approach that the exchange rates are determined by the stocks of these assets is taken as the price of one country's currency as the price of the other country's currency. Flexible Price according to the monetary model approach, the exchange rate can be analyzed in terms of supply and demand of two currencies, since the currency is defined as the price of another country's currency. Since the exchange rate is an asset price, the same concepts can be used to determine the exchange rate such as other asset prices are determined. The monetary substitution approach is regarded as a special form of monetary approach. In the monetary substitution approach, in an environment where foreign currency holding is not hindered, the monetary substitution process begins with holding foreign currency as a means of value storage instead of national currency. In countries with high inflation rates, the national currency's saving value disappears due to weaknesses. Money substitution is also expressed in the form of dollarization.

Portfolio-balanced approach based on Harry Markowitz and James Tobin's portfolio theory and monetary policy tries to explain the daily fluctuations in exchange rates and the changes in the supply and demand of securities. In the portfolio-balance approach, investors are trying to distribute their wealth among various financial assets to create a portfolio at the point where maximum returns and minimum risk are reached. Political and economic decisions taken against expected or emerging developments determine exchange rates. (Pentecost, 1993:151). This approach, fundamentally set out by Dornbusch and Fischer (1980), Dooley and Isard (1982) and Branson (1984), can be explained by the supply and demand of all financial assets in the markets, at least for the short term, Sticky Price The Dornbusch Overshooting model was introduced by Dornbusch (1976a, 1976b). In this model, prices are assumed to be sticky rather than fixed in the short run, while prices are assumed to be flexible in the long run. Equilibrium models for exchange

rates are firstly described by Stockman (1980) and Lucas (1982). The Redux model from the New Open Economy Macroeconomics Models was first described by Obstfeld and Rogoff (1995). Literature and empirical applications of Redux models are presented in the works of Corsetti and Pesenti (2001), Lane (2001). However, these studies have reached different conclusions regarding the determination of exchange rates (Engel, 2014: 456-465). Dynamic Stochastic General Equilibrium, another of the New Open Economy Macroeconomics Models - The theoretical background of DSGE models was established in a study by Obstfeld and Rogoff (2001).

3. Exchange Rate Regimes

The exchange rate is one of the most important prices for the functioning of the market mechanism in the globalized world where countries are increasingly connected with each other by foreign trade, direct investments and capital movements as mentioned in the first part. The exchange rate policy is also defined as a concept used to explain the ways and means of utilizing foreign exchange rates in the provision of the external balance of the economy. Today, different exchange rate policies are applied in the world. These are the fixed exchange rate regime and the floating exchange rate regime which the main two exchange rate regimes are, and also subordinate ones derived from these two regime. The fixed exchange rate regime is the regime in which the external value of the national currency is equalized by the Central Bank against a foreign currency with a certain exchange rate. Once the fixed exchange rate is determined, it remains the same until it is changed by the Central Bank. The floating exchange rate regime is the name of the exchange rate regime in which the relation of the national currency to foreign currencies is determined at the market (according to supply and demand rules). In this regime, the relationship between the national currency and the foreign currency is constantly redefined throughout the day.

There are different types of classification of exchange rate systems. A fixed exchange rate is the exchange rate at which the currency of one country is linked to another currency or exchange rate basket by the central bank. Regardless of the foreign exchange supply and demand conditions in the fixed exchange rate system, the exchange rate is determined by the governments and is not allowed to go beyond the determined limits. In the flexible exchange rate system, the exchange rate is determined by the supply and demand of the market. In this system, the Central Bank does not set any target rate for exchange rates and does not interfere in foreign exchange markets. In this system, it is not possible for any official institution to determine the exchange rates and to affect the developments which the exchange rates show according to the market conditions. The free-floating exchange rate system is called the system in which the money itself is considered as the nominal anchor, the central banks do not intervene in the foreign exchange markets and the value of the country's money is determined by the market.

In the managed exchange systems, the exchange rates have been left to supply and demand conditions, but the central bank has oversight and intervention in exchange rates. In a managed fluctuation regime where there is no target of a pre-announced exchange rate, the monetary authority intervenes in the exchange rate in order to reduce short-term fluctuations in the exchange rate and to protect the liquidity in the market. In a fluctuation system within certain range, currencies are allowed to fluctuate freely within a determined band. If currencies go out of the determined interval, the monetary authority intervenes and can change the width of the band. As the width of the band narrows, it becomes closer to the fixed exchange rate system, and to the floating exchange rate system as it widens. In the slippery band system, unlike the fluctuation system within certain range, the mean value of the band (center rate) is not fixed. This average value is set for an unspecified period of time. Deciding on the slippery parity system, the country has to decide on the amount, frequency and breadth of the changes that will be made in the exchange rate. In the crawling band system, the central parity is determined within a certain range and the parity is adjusted over time. However, the determined fixed value can be adjusted depending on the economic indicators selected, and especially on the balance of payments. One another system namely the Crawling Peg is the exchange rate system in which the exchange rates are changed to the extent that they reach the balance exchange rate frequently and clearly at predetermined intervals or percent. The rate of increase in exchange rates is mostly related to objective measures such as price indices. An adjustable fixed exchange rate system is a fixed amount of national currency on a foreign currency or currency basket at a certain level. It is allowed to fluctuate the exchange rate at maximum 1% around the central parity. Currency Board is a system that requires the exchange of fixed currencies with a foreign currency to be chosen by the country's currency and requires certain legal regulations. In this system, the monetary authority only makes coinage against the foreign exchange inflow. It also puts an end to the traditional functions of the Central Bank, such as monetary regulations and the last lender of credit. Full dollarization is defined as the use of another

country's money for a national currency by that country or the use of a single currency as a monetary union of countries.

3.1. Reasons for the Exchange Rate Deviation

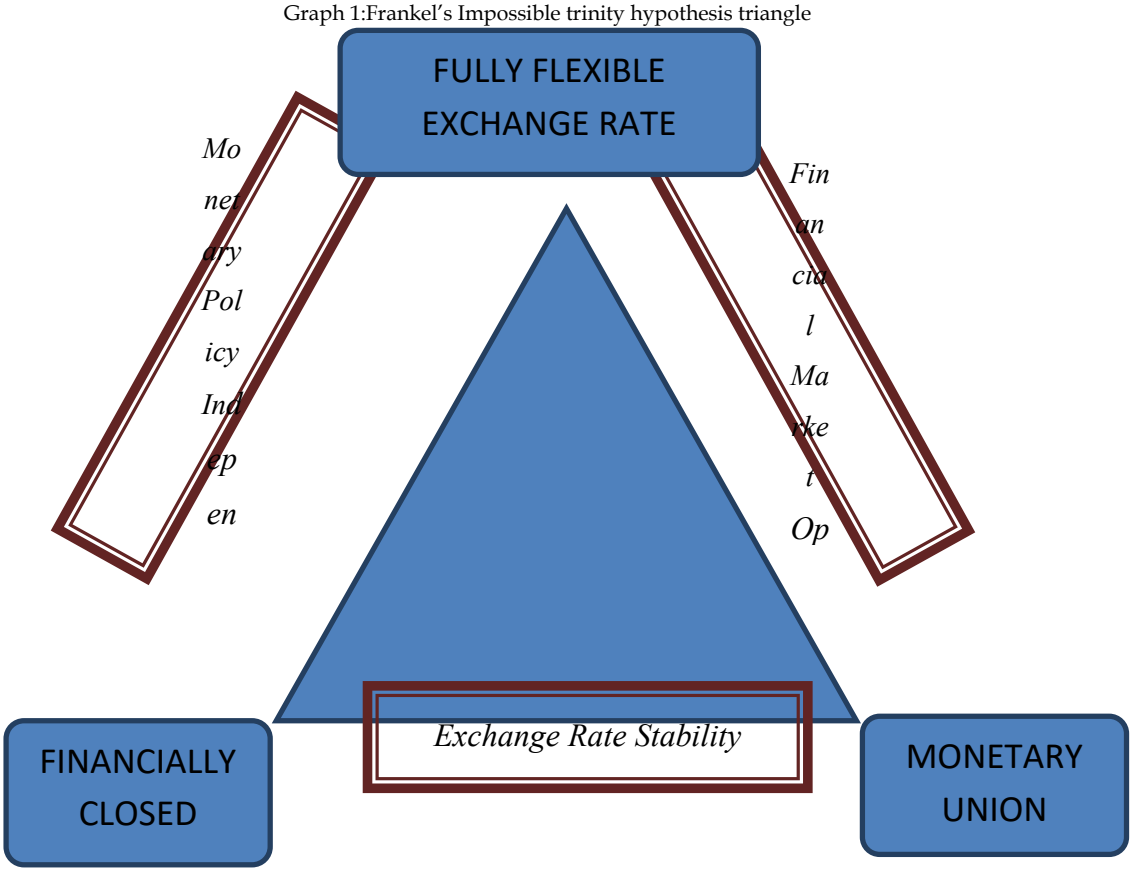
When we examine the studies that show that there is no strong relationship between exchange rate and basic macroeconomic variables in short and medium term, it is seen that market characteristics (customer orders flow, transaction costs), differences in behavior of market participants (technical analysts, fundamental analysts, rumor dealers) (pricing with national currency, pricing according to producer country's money) can be shown as factors causing exchange rate deviation.

After Meese and Rogoff (1983) demonstrated the empirical failure of traditional exchange rate-setting models, exchange rate behavior has been the focus of ongoing discussions. If macroeconomic variables such as money supply, inflation and interest rates are not important in determining the exchange rate, which factors should be focused on. The lack of a relationship between exchange rates and basic macroeconomic variables in short and medium term is one of the important paradoxes in international finance. This paradox has been strongly proven in the work of Meese and Rogoff (1983) and still remains valid today. This was called "exchange rate deviation paradox" by Obstfeld and Rogoff (2001).

3.2. Three Triple Hypothesis

The impossible trinity hypothesis was first proposed by Frankel (1999). According to Frankel, there are two factors to consider when choosing the exchange rate regime. One of these is the subjective conditions that can be different for each country, such as the size of the economy, the level of openness, and the level of economic and financial development. The second factor is the 'impossible triple' hypothesis, which applies to all economies, whatever the subjective conditions. According to the impossible trickery hypothesis, it is not possible to find a triple objective in the form of exchange rate stabilization in a country, independence in monetary policy and integration with international financial markets. At least one of these aims should be abandoned.

Graph 1:Frankel's Impossible trinity hypothesis triangle



This hypothesis states that an economy can not target both financial freedom, an independent monetary policy and currency stability at the same time. At least one of these three objectives must be released. In other words, it is impossible to choose a policy that is both open-ended and independent

monetary policy practitioner (eg inflation targeting) as well as currency stability. If we leave aside for a moment the openness requirement; the choice of exchange rate regime, whether it is an independent monetary policy, directly or indirectly, is becoming more important. At this point, the subjective conditions of the economy come into play.

4. Literature

A number of studies have investigated the relationship between exchange rate and exchange rate with various macroeconomic variables. On subject exchange rates especially fixed exchange rates, there were many earlier paper works could be seen from the literature. Mundell (1961), Fleming (1962), Mckinnon (1963), Niehans (1975), Dornbusch (1976a, 1976b), Frenkel (1976), Kouri (1976), Mussa (1976), Cornell (1977), Stockman (1980), Dornbusch and Fischer (1980), Lucas (1982), Meese and Rogoff (1983), Obstfeld and Stockman (1985), Black (1986) were the early and most citated academic studies that first come to mind. Lucas (1990), Meese and Rose (1991), Grilli and Roubini (1992), MacDonald and Taylor (1993), Throop (1993), Clarida ve Gali (1994), Flood and Rose (1995), Eichenbaum and Evans (1995), Obstfeld and Rogoff (1995), Mark (1995), Taylor ve Peel (2000), Engel and West (2005), Engel, Mark and West (2007), Rossi (2013) were the last and most citated academic studies belong to last decade.

Mundell (1961, 663) had presented his famous theory namely "A Theory of Optimum Currency Areas" and many debates have been done up to now about this theory. He argued that the subject of flexible exchange rates could logically be separated into two different questions. The first was whether a system of flexible exchange rates can work effectively and efficiently in the modern world economy and the second question was to concern how the world should be divided into currency area. He discussed the second question in his paper and argued that the stabilization argument for flexible exchange rates was valid only if it was based on regional currency areas. Fleming (1962) had shown that the expansionary effect of a given increase in money supply will always be greater if the country has a floating exchange rate than if it has a fixed rate. By contrast, it is uncertain whether the expansionary effect on the demand for domestic output of a given increase in budgetary expenditure or a given reduction in tax rates will be larger or smaller with a floating than with a fixed rate. In all but extreme cases, the stimulus to monetary demand arising from an increase in Money supply will be greater, relative to that arising from an expansionary change in budgetary policy, with a floating than with a fixed rate of exchange. Mckinnon (1963) had developped the idea of optimality further beginning with Mundell (1961) by discussing the influence of the openness of the economy, i.e., the ratio of tradable to non-tradable goods, on the problem of reconciling external and internal balance, emphasizing the need for internal price-level stability. Niehans (1975) argued that if the price elasticities of the demands for exports and imports were affected by the transition to flexible rates, and capital flows were assumed to be dependent on the exchange rate, the efficacy of monetary policy under flexible rates would not necessarily follow. Dornbusch (1976a) had presented a theory of exchange rate movements under perfect capital mobility, a slow adjustment of goods markets relative to asset markets, and consistent expectations and he developped a theory that is suggestive of the observed large fluctuations in exchange rates while at the same time establishing that such exchange rate movements are con- sistent with rational expectations formation. Frenkel (1976) dealed with the determinants of the exchange rate and developped a monetary view of exchange rate determination. He studied the close association between monetary developments and the exchange rate during german hyperinflation. While estimating the determinants of the exchange rate he used two structure analyzed in his work. First was to give the foreign price level the purchasing power parity determines the ratio P/S and the second was to give the nominal money stock and the state of expectations, the price level was determined so as to clear the money market. He argued that these two relationships implied the equilibrium exchange rate. Kouri (1976) analyzed the role of momentary asset equilibrium and expectations in the determination of the exchange rate in the short run and the role of the process of asset accumulation in the determination of the time path from momentary to long-run equilibrium. He discussed the various implications of this approach which one of that there was a symmetry between the regime of fixed and flexible exchange rate in the long run, another one was the quite difference of the adjustment process under the two regimes which were fixed exchange rates and flexible exchange rates and one another was the immediate effect of a change in monetary policy was to change the relative price of assets (such as the exchange rate) and the rates of interest. Mussa (1976) argued the extending of the fundamental principles of the monetary approach to balance of payments analysis to floating exchange rates regime with active intervention by the authorities to control rate movements. He discussed this situation in four main points in his paper. (Cornell, 1977) had studied the relationship between forward exchange rates and subsequently observed spot rates. No evidence is found for a liquidity premium on forward exchange, indicating that the forward rate can be used as a proxy of the market's

expectations and that open exchange positions involve little systematic risk. It is also shown that forward exhange is priced as if the exchange rate could be characterized by a diffusion process with a trend, although there is some evidence such a process does not adequately characterize the exchange rate in all cases.
Stockman (1980) developped an equilibrium model of the determination of exchange rates and prices of goods. He expressed that there were two interpretations of the relationship between changes in the terms of trade and changes in the exchange rate. The first one that Dornbusch (1976a, 1976b), Dornbusch and Krugman (1976) also enounced was the forces that cause the change in the exchange rate also cause a change in the terms of trade because prices of goods do not adjust to clear markets. The second one that presented in his paper was an alternative equilibrium interpretation of the elasticity approach to the foreign exchange market and of the relation between the terms of trade and the exchange rate. He argued the demand of domestic money because of providing and allowing the particular services for people to transact (cheaply) in domestic markets to purchase goods and the demand of foreign exchange by importers because of being used to finance imports, purchase foreign assets, and so on. Dornbusch and Fischer (1980) mentioned in their paper that the purchasing power parity or the current account were the chief determinants of the exchange rate shown in early theories. Also in their paper they referred the works of Mundell (1961) and Fleming (1962) who introduced capital mobility as an important aspect of exchange rate determination and who presented of first formulation of the assets market view. Dornbusch and Fischer (1980) developped a model of exchange rate determination that integrates the roles of relative prices, expectations and the assets markets, and emphasizes the relationship between the behavior of the exchange rate and the current account by presenting in two respects which one was assuming the country to be analyzed produces a differentiated product, whose world relative price was endogenous and second one was considering the current effects of anticipated future disturbances. Lucas (1982) This paper is a theoretical study of the determination of prices, interest rates and currency exchange rates, set in an infinitely-lived two-country world which is subject both to stochastic endowment shocks and to monetary instability. Formulas are obtained for pricing all equity claims, nominally-denominated bonds, and currencies, and these formulas are related to earlier, closely related results in the theories of money, finance international trade. Meese and Rogoff (1983) studied time series and structural models of exchange rates which they chose the flexible price monetary model named "Frenkel-Bilson" model, the sticky price monetary model named "Dornbusch-Frankel" model and the "Hooper-Morton" model with monthly observations data of major countries over the period march 1973 to June 1981 and found that a random walk model performed as well as any estimated model at major country exchange rates whereas the structural models failed to improve on the random walk model in spite of the fact that based their forecast on actual realized values of future explanatory variables. Obstfeld and Stockman(1985) discussed the dynamic behavior of exchange rates. It focuses on both the exchange rate's response to exogenous disturbances and the relation between exchange-rate movements and movements in such endogenous variables as nominal and relative prices, interest rates, output, and the current account. The chapter discusses an ideal treatment of exchange-rate dynamics by summarizing the relevant characteristics of the empirical record. All key features of the stochastic processes that appear to govern exchange rates and other statistically related economic variables have been reviewed in the chapter. It also presents a set of models that are compatible with at least some of the observed relationships. The chapter introduces market frictions so that the role of endogenous output fluctuations can be studied. The assumption of domestic price stickiness reinforces both the correlation between exchange-rate and terms-of-trade changes and the high short-run variability of the exchange rate compared to that of international price-level ratios. Finally, the chapter examines deterministic and stochastic models in which individual behavior is derived from an explicit intertemporal optimization problem. Black (1986) argued in his long article that the noise in the form of expactions that need not follow rational rules caused inflation to be what it was, at least in the absence of a gold standard or fixed exchange rates. Also he said that the noise in the form of uncertainty about what relative prices would have been with other exchange rates makes us think incorrectly that changes in exchange rates or inflation rates would cause changes in trade or investment flows or economic activity. Lucas (1990) analyzed a series of models in which money is required for asset transactions as well as for transactions in goods. In these models, government open-market operations induce liquidity effects that lead to interest rate behavior quite different from the behavior one would predict on the basis of Fisherian fundamentals. The paper characterizes these effects under various assumptions about the nature of securities traded and the behavior of shocks. Meese and Rose (1991) examined the empirical relation between nominal exchange rates and macroeconomic fundamentals for five major OECD countries between 1974 and 1987 in their study. They applied parametric and non-parametric techniques to five structural exchange rate models to account for potentially important sources of non-

linearities in exchange rate models. However they had not found any evidence that time-deformation was responsible for significant non-linearities in structural exchange rate models. Grilli and Roubini (1992) presented a two-country on cash-in-advance constraints in asset markets. In the model there is temporary separation between the goods and asset markets, and money is used for transactions in both. They first found that the exchange rate level depends on the share of money used for asset transactions; a greater share appreciates the currency. Second, stochastic open market operations increasing the domestic bonds' supply appreciate the domestic currency. Third, the liquidity effects of bond supply shocks cause an 'excess' volatility of nominal exchange rates, even when their 'fundamental' value is constant. MacDonald and Taylor (1993) reexamined the monetary approach to the exchange rate from perspectives using the Campbell-Shiller technique with monthly data on the deutsche mark-U.S. dollar change rate from January 1976 to December 1990 and generated some new results such as rejection of the speculative bubbles hypothesis for the dollar-mark exchange rate over this period. But most importantly they showed that imposing the monetary model as a long-run equilibrium condition on a dynamic and error-correction model led to dynamic exchange rate forecasts that were better than the random walk forecast at every horizon considered. Throop (1993) argued that most macroeconometric models stressed the role of real interest rate differentials between the U.S. and abroad in determining the real value of the dollar. However, he showed in his study that productivity growth, the real price of oil and budget deficits also play important roles. Moreover, he said that taking these additional factors into account decreases the estimated effects of interest rates on the dollar and as a result, the influence of monetary policy on the international sector of the economy, operating through interest rates, perhaps is lower than usuallly thought. Clarida and Gali (1994) investigated empirically and attempts to identify the sources of real exchange-rate fluctuations since the collapse of Bretton Woods. The paper's main contribution was to build and estimate a three-equation open macro model in the spirit of Dornbusch (1976b) and Obstfeld (1985) and to identify the model's structural shocks to demand, supply, and money using the approach pioneered by Blanchard and Quah (1989). For two of the four countries they studied, Germany and Japan, their structural estimates implied that monetary shocks to money supply as well as to the demand for real money balances explain a substantial amount of the variance of real exchange rates relative to the dollar. They found that demand shocks explain the majority of the variance in real exchange-rate fluctuations, while supply shocks explain very little. The model's estimated short-run dynamics are strikingly consistent with the predictions of the simple textbook Mundell-Fleming model. Flood and Rose (1995) tried to use a known phenomenon in their study that conditional exchange rate volatility was actually higher in floating rate regimes than fixed rates regimes. They argued that it should have not be surprising not to find any strong compromise between exchange rate volatility and the volatility of a variety of different macroeconomic variables such as interest rates, relative prices, money, reserves, and stock returns when considered that exchange rate volatility frequently seemed to change dramatically when the volatility of macroeconomic variables did not. They believed that it could be seen little empirical evidence that reducing exchange rate volatility compromises the stability of other macroeconomic variables. Eichenbaum and Evans (1995) investigated the effects of shocks to U. S. monetary policy on exchange rates. They found strong evidence that contractionary policy shocks lead to significant and continous appreciations in both nominal and real exchange rates and lead to significant and persistent departures from uncovered interest rate parity. In their study they concluded that shocks to U. S. monetary policy contributed significantly to the total variability of U. S. exchange rates in the post-Bretton Woods era. However also they noted that monetary shocks did not explain the majority of movements in U. S. exchange rates. They argued that monetary policy was important, but it was not only the one determinant of changes in real exchange rates. Obstfeld and Rogoff (1995) believed that existing models, such as traditional static Keynesian models or newer flexible-price intertemporal models, were too incomplete to offer an enough integrative behavior of exchange rates, output and the current account. They developed a structure that offers new basics for thinking about some of the fundamental problems in international finance and developped an analytically workable two-country model that combined a full account of global macroeconomic dynamics to a supply frame- work based on monopolistic competition and sticky nominal prices. Mark (1995) stated the difficulty in predicting the logarithm of exchange rates being a longstanding problem in international economics. For this issue; just to present evidence that long- horizon changes in the logarithm of spot exchange rates are predictable, he studied the currency values that were end-of-quarter U.S. dollar prices of the Canadian dollar, the deutsche mark, the Swiss franc, and the yen from 1973 to 1991. He got the evidence from regressions of long-horizon changes in log exchange rates on the current log exchange rate's deviation from a linear combination of log relative money stocks and log relative real income. These findings were noteworthy because it has been thought for a long time that log exchange rates

were unpredictable. Taylor and Peel (2000) estimated nonlinear time-series models of the deviations of the dollar–sterling and dollar–deutsche mark exchange rates from the level suggested by simple monetary fundamentals appliying the exponential autoregressive model with quarterly data for the UK, Germany and the US for the period 1973i–1996iv. Engel and West (2005) found that exchange rates might incorporate information about future fundamentals, a finding consistent with the present-value models. They stated that the exchange rate was determined by such fundamental variables, but floating exchange rates between countries with roughly similar inflation rates were in fact well approximated as random walks and also stated that fundamental variables do not help predict future changes in exchange rates. Engel, Mark and West (2007) stated that the standard for evaluating exchange rate models had been out of sample fit for many years and exchange rate models had been assumed succesful or unsuccesful based on their ability to produce better forecasts than the random walk model. They argued that many of models in fact implied that the exchange rate should nearly follow a random walk however it should not to be expected the models to have much power to forecast changes in exchange rates. Rossi (2013) had reviewed the recent litrature for both classics as well as newly sugested exchange rate predictors and had evaluated their ability to forecast exchange rates. In his work he studied the answer of question that were exchange rates been predictable or not and if could be predictable, which the predictors were the most useful to forecast exchange rates.

5. Data Set and Methodology

5.1. Data Set Definition

In this study, we tried to find out what the determinants of exchange rate, that is, finding the variables that affect the exchange rate. We consider both industrial and emerging countries by concentrating on fifteen countries or areas belonging to the group of the twenty (G20). More specifically our sample includes Argentina, Australia, Brazil, Canada, China, the United Kingdom, Indonesia, India, Japan, Korea, Mexico, South Africa, Turkey, the United States and the Euro area. Data are quarterly and cover the period 2000Q1-2017Q4. The dependent variable is the "USD value against national currency exchange rate" (q for quarterly; p for yearly) and the explanatory variables are M1 both in national currency and usd currency, Gold Reserves (GR), Total reserves except GOLD (TREG) and Total Reserves (TR) all in usd currency, Gold Reserves in tonnes (GRIT), M1/Gold ratio in usd/usd ($M1_{usd}/G_{usd}$), M1/Gold ratio in usd/gr ($M1_{usd}/G_{gr}$), GDP both in national currency and usd currency, Export both in national currency and usd currency (EXP), Import both in national currency and usd currency (IMP) and foreign trade deficit (FTD) both in national currency and usd currency shown in table-1. The mathematical function with dependent and independent variables can be written for percentage change over the previous quarter and over the previous year seperately as follows equation (1) and equation (2):

(1) $\mathbf{\Delta q_{itq} = f(\Delta M1_{itq}, \Delta GR_{itq}, \Delta TREG_{itq}, \Delta TR_{itq}, \Delta GRIT_{itq}, \Delta(M1_{usd}/G_{usd})_{itq}, \Delta(M1_{usd}/G_{gr})_{itq}, \Delta GDP_{itq}, \Delta EXP_{itq}, \Delta IMP_{itq}, \Delta FTD_{itq})}$,

t_q:quarterly ,

Δ: percentage change over the previous quarter: $\Delta X_{itq} = (X_{itq} - X_{i(tq-1)}) / X_{i(tq-1)}$

(2) $\mathbf{\Delta p_{ity} = f(\Delta M1_{ity}, \Delta GR_{ity}, \Delta TREG_{ity}, \Delta TR_{ity}, \Delta GRIT_{ity}, \Delta(M1_{usd}/G_{usd})_{ity}, \Delta(M1_{usd}/G_{gr})_{ity}, \Delta GDP_{ity}, \Delta EXP_{ity}, \Delta IMP_{ity}, \Delta FTD_{ity})}$,

t_y:yearly ,

Δ: percentage change over the previous year: $\Delta X_{ity} = (X_{ity} - X_{i(ty-1)}) / X_{i(ty-1)}$

The statistical details of macroeconomic variables that assumed to affect exchange rate are mentioned at table-1 in details and the correlation matrix of all variables mentioned at table-4.

5.2. Methodology

In panel data analysis using with stata 12.0, the panel unit root test must be taken first in order to identify the stationary properties of the relevant variables. In this study, we choose both first generation unit root tests Im-Pesaran-Shin unit root test and Fisher Test and also choose second generation panel unit root tests Pesaran (2003) with stata command 'pescadf' and Fisher Test with stata command 'xtfisher'. The null hypothesis of the unit root test is that there exist unit root (i.e. the variables are non-stationary), whereas the alternative hypothesis states that no unit root exists in the series (i.e. the variables are stationary). For this purposes; it can be seen from table-2 that all the variables are statistically significant under both the first generation and second generation unit root tests and indicate that none variables has a unit root.

Defining Panel Models

Model-1: USD value against national currency percentage change over per_quarter

In this section we identify the best panel estimator model that helps us identify the effects of macroeconomics variables on usd foreign exchange rate and then describe our model in mathematical form. The best estimator model whether pooled OLS or random effects or fixed effects model we first test the

classical model by using F-test and/or Likelihood Ratio (LR) test with stata command xtreg and xtmixed. It is not need to use a different command in stata and only enough to predict fixed effect model regression by using 'xtreg var xi, fe' for F test. The pooled OLS model could not be used incase of the test results pointing time effects and/or unit effects. Getting the result of F test that ' F test that all u_i=0: F(14, 1017) = 4.80 Prob > F = 0.0000' , it can be said that unit effects exist, so due to existance of unit effects we eliminated the pooled OLS model. So now it needs to apply Hausman test for the choice the fixed effect (FE) or random effect (RE) with stata command 'hausman'. Getting the result of hausman test that 'chi2(14) = (b-B)'[(V_b-V_B)^(-1)](b-B) = 63,95 Prob>chi2 = 0.0000 (V_b-V_B is not positive definite)', it can be sait that fixed effects (FE) model can be used for an estimator. After defining the FE model, we should check the panel data basic assumptions formerly known as heteroskedasticity, autocorrelation and cross-sectional dependence in panel-data models with tests mentioned table-3.

Heteroskedasticity: Doing Wald test for fixed effects, after estimation of the xtreg regression then we use 'xttest3' command to get Wald test result to check the heteroskedasticity. Getting the result 'chi2 (15) = 41913.57 Prob>chi2 = 0.0000' of wald test it's seen the existance of heteroskedasticity.

Autocorrelation: Baltagi-Wu Test and Durbin-Watson Test: After estimated the 'xtregar var xi,fe lbi' regression in stata we get directly the test result to check the auto-correlation. Getting the result ' F test that all u_i=0: F(14,1002) = 3.67 Prob > F = 0.0000 modified Bhargava et al. Durbin-Watson = 2.2090571, Baltagi-Wu LBI = 2.2227526', it can be said about that because the test statistics 2,2090571 and 2,2227526 are bigger than 2 which refer to chi-square critical value, the existance of autocorrelation with AR(1) could not be said.

Cross-sectional dependence Pesaran Test: After estimated the xtreg regression we use 'xtcsd,pesaran' command to get Pesaran Test result to check the cross-sectional dependence. Getting the result 'Pesaran's test of cross sectional independence = 13.364, Pr = 0.0000', it can be said about the existance of cross-sectional dependence. The same results also obtained with the Friedman Test and Frees Test. In summary; after the tests results it is decided Fixed Effect (FE) model as a panel estimator model but existing with heteroskedasticity and cross-sectional dependence. Due to existance of heteroskedasticity and cross-sectional dependence at the same time the regression model should be estimated with the known robust estimators Huber-Eicker-White Estimator (HU-EI-WH), Arellona-Froot-Rogers Estimator (AR-FR-RO), Driscoll-Kraay Estimator (DR-KR) and the regresion result can be seen on table-5.

Model-2: USD value against national currency percentage change over per_year

In this section we identify the best panel estimator model that helps us identify the effects of macroeconomics variables on usd foreign exchange rate and then describe our model in mathematical form. The best estimator model whether pooled OLS or random effects or fixed effects model we first test the classical model by using F-test and/or Likelihood Ratio (LR) test with stata command xtreg and xtmixed. It is not need to use a different command in stata and only enough to predict fixed effect model regression by using 'xtreg var xi, fe' for F test. The pooled OLS model could not be used incase of the test results pointing time effects and/or unit effects. Getting the result of F test that ' F test that all u_i=0: F(14, 975) = 9.93 Prob > F = 0.0000' , it can be said that unit effects exist, so due to existance of unit effects we eliminated the pooled OLS model. So now it needs to apply Hausman test for the choice the fixed effect (FE) or random effect (RE) with stata command 'hausman'. Getting the result of hausman test that 'chi2(13) = (b-B)'[(V_b-V_B)^(-1)](b-B) = 123.05 Prob>chi2 = 0.0000', it can be sait that fixed effects (FE) model can be used for an estimator. After defining the FE model, we should check the panel data basic assumptions formerly known as heteroskedasticity, autocorrelation and cross-sectional dependence in panel-data models with tests mentioned table-3.

Heteroskedasticity: Doing Wald test for fixed effects, after estimation of the xtreg regression then we use 'xttest3' command to get Wald test result to check the heteroskedasticity. Getting the result 'chi2 (15) = 26144.59 Prob>chi2 = 0.0000' of wald test it's seen the existance of heteroskedasticity.

Autocorrelation: Baltagi-Wu Test and Durbin-Watson Test: After estimated the 'xtregar var xi,fe lbi' regression in stata we get directly the test result to check the auto-correlation. Getting the result 'F test that all u_i=0: F(14,960) = 3.27 Prob > F = 0.0000 modified Bhargava et al. Durbin-Watson = 1.0601105 , Baltagi-Wu LBI = 1.0723314', it can be said about that because the test statistics 1,0601105 and 1,0723314 are smaller than 2 which refer to chi-square critical value, the existance of autocorrelation with AR(1) could be said.

Cross-sectional dependence Pesaran Test: After estimated the xtreg regression we use 'xtcsd,pesaran' command to get Pesaran Test result to check the cross-sectional dependence. Getting the result 'Pesaran's test of cross sectional independence = 16.347, Pr = 0.0000', it can be said about the existance of cross-sectional dependence. The same results also obtained with the Friedman Test and Frees Test. In summary; after the tests results it is decided Fixed Effect (FE) model as a panel estimator model but existing with

Heteroskedasticity, auto-correlation and cross-sectional dependence. Due to existance of Heteroskedasticity, auto-correlation and cross-sectional dependence at the same time the regression model should be estimated with the known robust estimators Huber-Eicker-White Estimator (HU-EI-WH), Arellona-Froot-Rogers Estimator (AR-FR-RO), Driscoll-Kraay Estimator (DR-KR) and the regresion result can be seen on table-6.

6. Discussion and Conclusion

Exchange rates, exchange rate policies and the history of models that explain exchange rate can be taken up to the first years of economic thought formation. Following the Second World War, Bretton Woods (BW), based on the gold standard of western capitalist countries for the establishment of a new international monetary system, agreed on a fixed exchange rate system. However, in the following years, the supply of gold was limited, and doubts about the plundering of the dollar and its transformation into gold caused the BW system to collapse. (95925) Following the collapse of the BW system in 1973, the floating exchange rate system has become widespread. Nowadays, the management-fluctuation system, which is open to intervention in the markets throughout the world, has become widespread. From the 1980s onward, international capital flows accelerated with the opening of developing countries and the liberalization of financial markets. Therefore, under the floating exchange rate system, the determinants of financial factors have begun to come to the forefront.

In this study, we examine the determinants of foreign exchange rate, in other saying the macroeconomic variables which are affecting the foreign exchange rate and especially whether the foreign exchange rate are influenced by the central banks' gold reserves or not. We know that from earlier time up to nowadays there were many studies that have investigated the relationship between exchange rate and exchange rate with various macroeconomic variables. Also we even know that after Messe and Rogoff (1983) saying the unimportance of money supply, inflation and interest rates for determining the exchange rate then the question which factors should be considered or taken into account was always been asked. For that question, the lack of a relationship between exchange rates and basic macroeconomic variables in short and medium term is one of the important paradoxes in international finance. To solve this paradox various foreign exchange theories mentioned at section 2 in this paper have been developed in order to explain the reciprocal relations between the various macro-economic variables of exchange rates. The fact that exchange rates are so important has led to the suggesting of different exchange rate approaches to explain exchange rates. But we believe that as time goes, the central bank's and the economic governance of countries have learned and been able to better manage the economic processes in the light of the serious experiences they have gained in spite of the crises. Despite the difficult problems that may arise, they can now able to produce efficient solutions quickly with the common mind. Most of the time; we have seen the most popular but effective fundamental macroeconomic policies that prioritize growth, control foreign trade deficit, focus on money supply, and strengthen central bank reserves, as a savior.

By going out of here; as an approach we have studied the relationships between USD exchange rate versus national currencies with the various macroeconomic variables such as GDP, M1, Import, Export, Gold Reserve, Reserves without Gold and Total Reserves via the percentage change over per quarter and per year between the period 2000q1-2017q4 for G20'.

According to the "percentage change over the previous quarter", that's model-1; estimation with the known robust estimators the results of regression are really strong with high %98,6 R^2 value. Especially the percentage change of M1, GDP, Export both as national currency and USD value, Gold reserves both as quantity (ton) and value (mio USD) ,foreign trade deficit as national currency and M1/Gold (usd/kg) and (usd/usd) ratios are statistically significant in order to estimate the usd exhange value change over the previous quarter, meanly short term.

However we do not get similar results according to the "percentage change over the previous year", that's model-2.The estimation with the same estimators although the results of regression are really strong with highly %98,6 R^2 value, only the percentage change of Export both as national currency and USD value and import as national currency are statistically significant in order to estimate the usd exhange value change over the previous year, meanly long term. So, for long term maybe it could be difficult to estimate the variation of usd exchange rate via the alteration of macroeconomic variables but in short term it's seen that it could be more possible. Especially in short term, the gold reserves both as quantity (ton) and value (mio usd), M1/Gold (usd/usd) and M1/Gold (usd/kg) ratios are statistically significant on effecting the usd exchange rate against national currency. M1/Gold (usd/usd) ratio means the amount of money that is printed against the gold of 1 usd and M1/Gold (usd/kg) ratio means the amount of money that is printed against the gold of 1 gram. So, the variables related with gold are really attracted our attention more than the results related with GDP, export and import variables. According to the regression results from model-1; we

claim that if a central bank circulates its M1-money supply against the usd value of its gold reserves not the quantity of gold, the variation of usd exchange rate against the national currency can be decreases.

Table 5: (Model-1) USD value against national currency percentage change over per_quarter

	HU_EI_WH		AR_FR_RO		DR_KR	
var9_q	Coef.	Std. err.	Coef.	Std. err.	Coef.	Std. err.
var1_q	.5774713	.4198286	.5774713	.4198286	.5900253***	.0700214
var2_q	-.5781746	.4114959	-.5781746	.4114959	-.5862096***	.0699687
var3_q	-.03697**	.0105233	-.03697**	.0105233	-.0346122**	.0129168
var4_q	.0036332	.0036406	.0036332	.0036406	.0034353	.0095716
var5_q	-.0085071	.0080406	-.0085071	.0080406	-.0082294	.0107247
var6_q	.0376787**	.0106786	.0376787**	.0106786	.0353106**	.0130814
var7_q	-.0416065**	.0121288	-.0416065**	.0121288	-.0389428**	.0123359
var8_q	.0356507**	.0103918	.0356507**	.0103918	.0333682**	.0105684
var10_q	-.1859977	.2878964	-.1859977	.2878964	-.1790903**	.0672469
var11_q	.1894723	.2959126	.1894723	.2959126	.1826247**	.0680311
var12_q	.6326251*	.2791287	.6326251*	.2791287	.6122262***	.0533761
var13_q	-.6392514*	.2792436	-.6392514*	.2792436	-.6210463***	.0544228
var14_q	-.0216331	.3769236	-.0216331	.3769236	-.0161379	.059654
var15_q	.0088554	.3719722	.0088554	.3719722	.0068208	.0597455
var16_q	.0006533*	.0002584	.0006533*	.0002584	.0006945	.0003785
var17_q	-.000666**	.0002168	-.000666**	.0002168	-.0006899*	.0002947
_cons	.0034484***	.0004324	.0034484***	.0004324	.0026503***	.0003169
r2_w	.9868096		.9868096		.986103	
F	.		.		4443.748	
bic	-7307.001		-7307.001		-7131.713	
N	1048		1048		1033	
vce	cluster		cluster			

*p < 0.05, **p < 0.01, ***p < 0.001
(HU-EI-WH):Huber-Eicker-White Estimator,
(AR-FR-RO):Arellona-Froot-Rogers Estimator,
(DR-KR):Driscoll-Kraay Estimator

Table 6: (Model-2) USD value against national currency percentage change over per_year

	HU_EI_WH		AR_FR_RO		DR_KR	
var9_y	Coef.	Std. err.	Coef.	Std. err.	Coef.	Std. err.
var1_y	.2852853	.2208869	.2852853	.2208869	.2852853	.2904118
var2_y	-.3159339	.2060017	-.3159339	.2060017	-.3159339	.2843129
var3_y	.0057832	.0074946	.0057832	.0074946	.0057832	.0090222
var4_y	-.010489	.0103384	-.010489	.0103384	-.010489	.008977
var5_y	-.0023335	.0161139	-.0023335	.0161139	-.0023335	.0106617
var6_y	-.0067422	.0089451	-.0067422	.0089451	-.0067422	.0107819
var7_y	-.0000607	.0000439	-.0000607	.0000439	-.0000607	.0000398
var8_y	.0000506	.0000401	.0000506	.0000401	.0000506	.0000361
var10_y	-.0780674	.157158	-.0780674	.157158	-.0780674	.2009746
var11_y	.0712677	.1484933	.0712677	.1484933	.0712677	.1952031
var12_y	.918993***	.1642215	.918993***	.1642215	.918993***	.1815222
var13_y	-.933973***	.1732915	-.933973***	.1732915	-.933973***	.1880013
var14_y	-.2238198	.1204233	-.2238198	.1204233	-.2238198*	.1011096
var15_y	.2054243	.1230734	.2054243	.1230734	.2054243	.1041512
var16_y	-.0016007	.0008125	-.0016007	.0008125	-.0016007	.0009569
var17_y	.0014659	.0007136	.0014659	.0007136	.0014659	.0008387
_cons	.0189219***	.0035825	.0189219***	.0035825	.0189219***	.0048722
r2_w	.9689727		.9689727		.9689727	
F	.		.		661.8545	
bic	-4497.223		-4497.223		.	
N	1006		1006		1006	

```
vce               cluster                     cluster
*p < 0.05, **p < 0.01, ***p < 0.001
(HU-EI-WH):Huber-Eicker-White Estimator,
(AR-FR-RO):Arellona-Froot-Rogers Estimator,
(DR-KR):Driscoll-Kraay Estimator
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REFERENCES

Bjornland, H.C. (2009). Monetary Policy and Exchange Rate Overshooting: Dornbusch was Right After All. *Journal of International Economics*, 79(1), 64-77.
Black, Fischer (1986). Noise. *The Journal of Finance*, XLI(3), 529-543.
Blanchard Olivier J. and Quah Danny (1989). The Dynamic Effects of Aggregate Demand and Supply Disturbances. *The American Economic Review*, Vol.79, No.4 (Sept.,1989) pp:655-673
Branson, W.H. (1984). A Model of Exchange Rate Determination with Policy Reaction: Evidence from Monthly Data, *Contemporary Macroeconomic Modelling*, (pp. 128-150), Oxford: Blackwell.
Clarida, R.H. & Gali, J. (1994). Sources of Real Exchange Rate Fluctuations: How Important Are Nominal Shocks?. *Carnegie-Rochester Conference Series on Public Policy* No: 41, (pp. 1-56), Amsterdam: Elsevier.
Cornell, Bradford. (1977). Spot rates, forward rates and exchange market efficiency. *Journal of Financial Economics*, Volume 5, Issue 1, August 1977, Pages 55-65
Corsetti, G. & Pesenti, P. (2001). Welfare and Macroeconomic Independence. Quarterly *Journal of Economics*, 116(2), 421-445.
Dooley, M.P. & Isard, P. (1982). A Portfolio-balance Rational-expectations Model of the Dollar-mark Exchange Rate. *Journal of International Economics*, 12(3-4), 257-276.
Dornbusch, R. & Fischer, S. (1980). Exchange Rates and the Current Account. *American Economic Review*, 70(5), 960-971.
Dornbusch, Rudiger and Krugman, Paul. *Flexible Exchange Rates in the Short Run*. Brookings Papers E Lon. Activity, no. 3 (1976), pp. 537-75.
Dornbusch, Rudiger. (1976a). The Theory of Flexible Exchange Rate Regimes and Macroeconomic Policy. *Scandinavian J. Econ*. 2 (May 1976): 255-75.
Dornbusch, Rudiger. (1976b). Expectations and Exchange Rate Dynamics. *Journal of Political Economy*, Vol. 84, No. 6 (Dec., 1976), pp. 1161-1176
Eichenbaum, M. & Evans, Charles L. (1995). Some Empirical Evidence on the Effects of Shocks to Monetary Policy on Exchange Rates. *Quarterly Journal of Economics*, 110(4), 975-1010.
Engel, C. & West, Kenneth D. (2005). Exchange Rate and Fundamentals. *Journal of Political Economy*, 113(3), 485-517.
Engel, C. (2014). *Exchange Rates and Interest Parity*. Handbook of International Economics, Vol. 4, (pp. 453-522), Amsterdam: Elsevier.
Engel, Charles & Mark, Nelson C. & West Kenneth D. (2007). *Exchange Rate Models Are Not As Bad As You Think*. NBER Macroeconomics Annual 2007, Volume 22, 381 - 441
Fleming, J. Marcus. (1962). *Domestic Financial Policies under Fixed and Floating Exchange Rates*. LM.F. Staff Papers 9 (November 1962): 369-79.
Flood, Robert P. & Rose, Andrew K. (1995). Fixing Exchange Rates: A Virtual Quest for Fundamentals. *Journal of Monetary Economics*, 36(1), 3-37.
Frenkel, J. A. (1976). A Monetary Approach to the Exchange Rate. *Scandinavian J. Econ*. 2 (May 1976): 200-221.
Grilli, V. & Roubini, N. (1992). Liquidity and Exchange Rates. *Journal of International Economics*, 32(3-4), 339-352.
Harberger, A.C. (1950). Currency Depreciation, Income and the Balance of Trade. *Journal of Political Economy*, 58(1), 47-60.
Kouri, P. (1976). The Exchange Rate and the Balance of Payments in the Short Run and in the Long Run. *Scandinavian J. Econ*. 2 (May 1976): 280-304.
Krugman, P.R. and Obstfeld, M. (1997). *International economics, teory and policy*. (Fourth Edition), (333-402), USA: Addison Wesley.
Lane, P.R. (2001). The New Open Economy Macroeconomics: A Survey. *Journal of International Economics*, 54(2), 235-266.
Lerner, A.P. (1936). The Symmetry between Export and Import Taxes. *Economica*, 3(11), 306-313.
Lucas, Robert E. Jr. (1982). Interest Rates and Currency Prices in A Two-country World. *Journal of Monetary Economics*, 10(3), 335-359.
Lucas, Robert E. Jr. (1990). Liquidity and Interest Rates. *Journal of Economic Theory*, 50(2), 237-264.
MacDonald, R. & Taylor, M.P. (1993). *The Monetary Approach to the Exchange Rate: Rational Expectations, Long-run Equilibrium and Forecasting*. IMF Staff Papers, 40(1), 89-107.
MacDonald, R. (1999). Exchange rate behaviour: Are fundamentals important?. *The Economic Journal*, 109 (459), 673-691.
Mark, Nelson C. (1995). Exchange Rates and Fundamentals: Evidence on Long-horizon Predictability. *American Economic Review*, 85(1), 201-218.
Marshall, A. (1923). *Money, Credit and Commerce*, Londra: Macmillan.
McKinnon, Ronald I. (1963). Optimum Currency Areas. *The American Economic Review*, Vol. 53, No. 4 (Sep., 1963), pp. 717-725
Meese, R.A. & Rogoff, K.S. (1983). Empirical Exchange Rate Models of the Seventies: Do They Fit Out of Sample?. *Journal of International Economics*, 14(1-2), 3-24.
Meese, R.A. & Rose, A.K. (1991). An Empirical Assessment of Nonlinearities in Models of Exchange Rate Determination. *Review of Economic Studies*, 58(3), 603-619.
Mundell, R.A. (1961). A Theory of Optimum Currency Areas. *American Economic Review*, 51(4), 657-665.
Mundell, R.A. (1962). *The Appropriate Use of Monetary and Fiscal Policy for Internal and External Stability*. IMF Staff Papers, 9(1), 70-79.
Mundell, R.A. (1963). Capital Mobility and Stabilization Policy under Fixed and Flexible Exchange Rates. *Canadian Journal of Economics and Political Science*, 29(4), 475-485.
Mussa, M. (1976). The Exchange Rate, the Balance of Payments and Monetary and Fiscal Policy under a Regime of Controlled Floating. *Scandinavian J. Econ*. 2 (May 1976): 229-48.
Mussa, Michael (1992). *Emprical regularities in the behaviour of exchange rates and theories of the foreign exchange market. Exchange Rate Economics*, Volume I, Ed. Ronald MacDonald, Mark P. Taylor, Cambridge: Edward – Elgar Publishing,
Niehans, J. (1975). Some Doubts about the Efficacy of Monetary Policy under Flexible Exchange Rates. *J. International Economy*. 5 (August 1975): 275-81.
Obstfeld, M. & Rogoff, K.S. (1995). Exchange Rate Dynamics Redux. *Journal of Political Economy*, 103(3), 624-660.

Obstfel d, M. & Rogoff, K.S. (2001). *The Six Major Puzzles in International Macroeconomics: Is There A Common Cause?*. National Bureau of Economic Research Macroeconomics Annual, Vol. 15, (pp. 339-412), Cambridge, MA: MIT Press.
Obstfeld, M. & Stockman, A.C. (1985). *Exchange-Rate Dynamics*. Handbook of International Economics, Vol. 2, (pp. 917-977), Amsterdam: Elsevier.
Obstfeld, M. (1985). *Floating Exchange Rates: Experience and Prospects*. Brookings Papers on Economic Activity, 16(2), 369-450.
Pentecost, E.J. (1993). *Exchange rate dynamics: A modern analysis of exchange rate theory and evidence*. Vermont, 151.
Rogoff, K.S. (2008). *Comment on Exchange Rate Models Are Not As Bad As You Think*. National Bureau of Economic Research Macroeconomics Annual, Vol. 22, (pp. 443-452), Chicago, IL University of Chicago Press.
Rossi, B., (2013). Exchange rate predictability. *J. Econ*. Lit. 51, 1063e1119.
Stockman, Alan C. (1980). A Theory of Exchange Rate Determination. *Journal of Political Economy*, 88(4), 673-698.
Taylor, M.P. & Peel, D.A. (2000). Nonlinear Adjustment, Long-run Equilibrium and Exchange Rate Fundamentals. *Journal of International Money and Finance*, 19(1), 33-53.
Throop, Adrian W. (1993). *A Generalized Uncovered Interest Parity Model of Exchange Rates*. Federal Reserve Bank of San Francisco Economic Review, 93(2), 3-16.

Appendix A:

Table 1:Data Set Definitions

Variable	Obs	Mean	Std. Dev.	Min	Max	Variable Definition
var1	1292	8.61E+13	2.06E+14	4.02E+09	1.35E+15	M1_national_currency_FRED
var1_q	1275	0.0311137	0.0433924	-0.29	0.33	M1_national_currency_FRED percentage_change_over_pre_quarter
var1_y	1224	0.1321324	0.1159776	-0.22	0.97	M1_national_currency_FRED percentage_change_over_pre_year
var2	1292	1063961	1827107	6696.73	9342597	M1_mio_usd_currency_FRED
var2_q	1275	0.0260784	0.0704582	-0.57	0.38	M1_mio_usd_currency_FRED percentage_change_over_pre_quarter
var2_y	1224	0.1094363	0.1648253	-0.67	1.03	M1_mio_usd_currency_FRED percentage_change_over_pre_year
var3	1224	40190.06	99621.17	0	616738.6	Gold_Reserves_mio_usd
var3_q	1202	0.1230948	2.929614	-1	100.6	Gold_Reserves_mio_usd percentage_change_over_pre_quarter
var3_y	1154	0.7888821	10.45374	-1	204.24	Gold_Reserves_mio_usd percentage_change_over_pre_year
var4	1292	283245.6	567234.5	0	4010834	Total_Reserve_except_gold_mio usd
var4_q	1247	0.0286768	0.1081922	-0.44	2.68	Total_Reserve_except_gold_mio usd percentage_change_over_pre_quarter
var4_y	1196	0.1286371	0.3203428	-0.65	4.8	Total_Reserve_except_gold_mio usd percentage_change_over_pre_year
var5	1264	328438.3	585989.4	7485.07	4055399	Total_Reserves_mio_usd
var5_q	1247	0.0296391	0.1014309	-0.42	2.49	Total_Reserves_mio_usd percentage_change_over_pre_quarter
var5_y	1196	0.1327759	0.2993038	-0.65	4.43	Total_Reserves_mio_usd percentage_change_over_pre_year
var6	1224	1393.955	3131.72	0	12657.68	Gold_Reserves_Tonnes
var6_q	1202	0.09698	2.877279	-1	98.82	Gold_Reserves_Tonnes percentage_change_over_pre_quarter
var6_y	1154	0.6127296	9.517205	-1	191.1	Gold_Reserves_Tonnes percentage_change_over_pre_year
var7	1218	13911.78	334818.5	1.8	8928861	M1/GOLD (usd/usd)
var7_q	1202	0.6374043	21.50214	-1	745.3	M1/GOLD (usd/usd) percentage_change_over_pre_quarter
var7_y	1154	2.696326	63.4956	-1	1612.73	M1/GOLD (usd/usd) percentage_change_over_pre_year
var8	1218	567087.2	1.38E+07	21.89	3.79E+08	M1/GOLD (usd/gr)
var8_q	1202	0.7605324	25.09472	-1	869.92	M1/GOLD (usd/gr) percentage_change_over_pre_quarter
var8_y	1154	3.017244	69.26304	-1	1819.09	M1/GOLD (usd/gr) percentage_change_over_pre_year
var9	1292	674.8694	2412.768	0.37	14650	USD value against national currency
var9_q	1275	0.0088	0.0791917	-0.22	1.81	USD value against national currency percentage_change_over_pre_quarter

var9_y	1224	0.04	0.1996489	-0.34	2.81	USD value against national currency percentage_change_over_pre_year
var10	1122	1.42E+14	4.21E+14	1.56E+11	2.52E+15	GDP in national currency
var10_q	1109	0.0105771	0.0586524	-1	0.15	GDP in national currency percentage_change_over_pre_quarter
var10_y	1064	0.0444267	0.0638411	-1	0.24	GDP in national currency percentage_change_over_pre_year
var11	1292	1.37E+12	3.40E+12	0	1.73E+13	GDP in USD currency
var11_q	1109	0.0077187	0.0828831	-1	0.29	GDP in USD currency percentage_change_over_pre_quarter
var11_y	1064	0.0332895	0.1471251	-1	0.56	GDP in USD currency percentage_change_over_pre_year
var12	1212	2.77E+13	8.76E+13	2.33E+09	6.07E+14	Export in national currency
var12_q	1197	0.0248371	0.0792919	-1	0.64	Export in national currency percentage_change_over_pre_quarter
var12_y	1152	0.102066	0.1788701	-1	1.23	Export in national currency percentage_change_over_pre_year
var13	1292	1.09E+11	1.41E+11	0	6.75E+11	Export in USD currency
var13_q	1197	0.0211696	0.0872823	-1	0.45	Export in USD currency percentage_change_over_pre_quarter
var13_y	1152	0.0830816	0.1796095	-1	0.72	Export in USD currency percentage_change_over_pre_year
var14	1212	2.42E+13	8.05E+13	6.12E+08	5.97E+14	Import in national currency
var14_q	1197	0.0260234	0.0813621	-1	0.52	Import in national currency percentage_change_over_pre_quarter
var14_y	1152	0.1084635	0.1998609	-1	1.35	Import in national currency percentage_change_over_pre_year
var15	1292	9.72E+10	1.23E+11	0	6.10E+11	Import in USD currency
var15_q	1197	0.0221053	0.0907738	-1	0.55	Import in USD currency percentage_change_over_pre_quarter
var15_y	1152	0.0908247	0.2073998	-1	1.01	Import in USD currency percentage_change_over_pre_year
var16	1292	1.18E+10	9.16E+10	-2.17E+11	4.75E+11	Foreign Trade Deficit (var13-var15) in USD currency
var16_q	1197	-0.2697076	6.425631	-204.82	20.33	Foreign Trade Deficit (var13-var15) in USD currency percentage_change_over_pre_quarter
var16_y	1152	-0.5983247	12.32371	-382.95	57.76	Foreign Trade Deficit (var13-var15) in USD currency percentage_change_over_pre_year
var17	1292	3.28E+12	1.30E+13	-2.53E+13	9.68E+13	Foreign Trade Deficit (var13-var15) in National currency
var17_q	1197	-0.3249708	8.24619	-271.44	21.65	Foreign Trade Deficit (var13-var15) in National currency percentage_change_over_pre_quarter
var17_y	1152	-0.6312153	14.08885	-445.97	69.65	Foreign Trade Deficit (var13-var15) in National currency percentage_change_over_pre_year

Table 2:Unit Root test results.

Variable	Variable Definition	Im–Pesaran–Shin	Fisher-type
		p-value	p-value
var1_q	M1_national_currency_FRED percentage_change_over_pre_quarter	0.0000	0.0000
var1_y	M1_national_currency_FRED percentage_change_over_pre_year	0.0000	0.0000
var2_q	M1_mio_usd_currency_FRED percentage_change_over_pre_quarter	0.0000	0.0000
var2_y	M1_mio_usd_currency_FRED percentage_change_over_pre_year	0.0000	0.0000
var3_q	Gold_Reserves_mio_usd percentage_change_over_pre_quarter	0.0000	0.0000
var3_y	Gold_Reserves_mio_usd percentage_change_over_pre_year	0.0000	0.0000
var4_q	Total_Reserve_except_gold_mio usd percentage_change_over_pre_quarter	0.0000	0.0000
var4_y	Total_Reserve_except_gold_mio usd percentage_change_over_pre_year	0.0000	0.0000
var5_q	Total_Reserves_mio_usd percentage_change_over_pre_quarter	0.0000	0.0000

var5_y	Total_Reserves_mio_usd percentage_change_over_pre_year	0.0000	0.0000
var6_q	Gold_Reserves_Tonnes percentage_change_over_pre_quarter	0.0000	0.0000
var6_y	Gold_Reserves_Tonnes percentage_change_over_pre_year	0.0000	0.0000
var7_q	M1/GOLD (usd/usd) percentage_change_over_pre_quarter	0.0000	0.0000
var7_y	M1/GOLD (usd/usd) percentage_change_over_pre_year	0.0000	0.0000
var8_q	M1/GOLD (usd/gr) percentage_change_over_pre_quarter	0.0000	0.0000
var8_y	M1/GOLD (usd/gr) percentage_change_over_pre_year	0.0000	0.0000
var9_q	USD value against national currency percentage_change_over_pre_quarter	0.0000	0.0000
var9_y	USD value against national currency percentage_change_over_pre_year	0.0000	0.0000
var10_q	GDP in national currency percentage_change_over_pre_quarter	0.0000	0.0000
var10_y	GDP in national currency percentage_change_over_pre_year	0.0001	0.0000
var11_q	GDP in USD currency percentage_change_over_pre_quarter	0.0000	0.0000
var11_y	GDP in USD currency percentage_change_over_pre_year	0.0000	0.0000
var12_q	Export in national currency percentage_change_over_pre_quarter	0.0000	0.0000
var12_y	Export in national currency percentage_change_over_pre_year	0.0000	0.0000
var13_q	Export in USD currency percentage_change_over_pre_quarter	0.0000	0.0000
var13_y	Export in USD currency percentage_change_over_pre_year	0.0000	0.0000
var14_q	Import in national currency percentage_change_over_pre_quarter	0.0000	0.0000
var14_y	Import in national currency percentage_change_over_pre_year	0.0000	0.0000
var15_q	Import in USD currency percentage_change_over_pre_quarter	0.0000	0.0000
var15_y	Import in USD currency percentage_change_over_pre_year	0.0000	0.0000
var16_q	Foreign Trade Deficit (var13-var15) in USD currency percentage_change_over_pre_quarter	0.0000	0.0000
var16_y	Foreign Trade Deficit (var13-var15) in USD currency percentage_change_over_pre_year	0.0000	0.0000
var17_q	Foreign Trade Deficit (var13-var15) in National currency percentage_change_over_pre_quarter	0.0000	0.0000
var17_y	Foreign Trade Deficit (var13-var15) in National currency percentage_change_over_pre_year	0.0000	0.0000

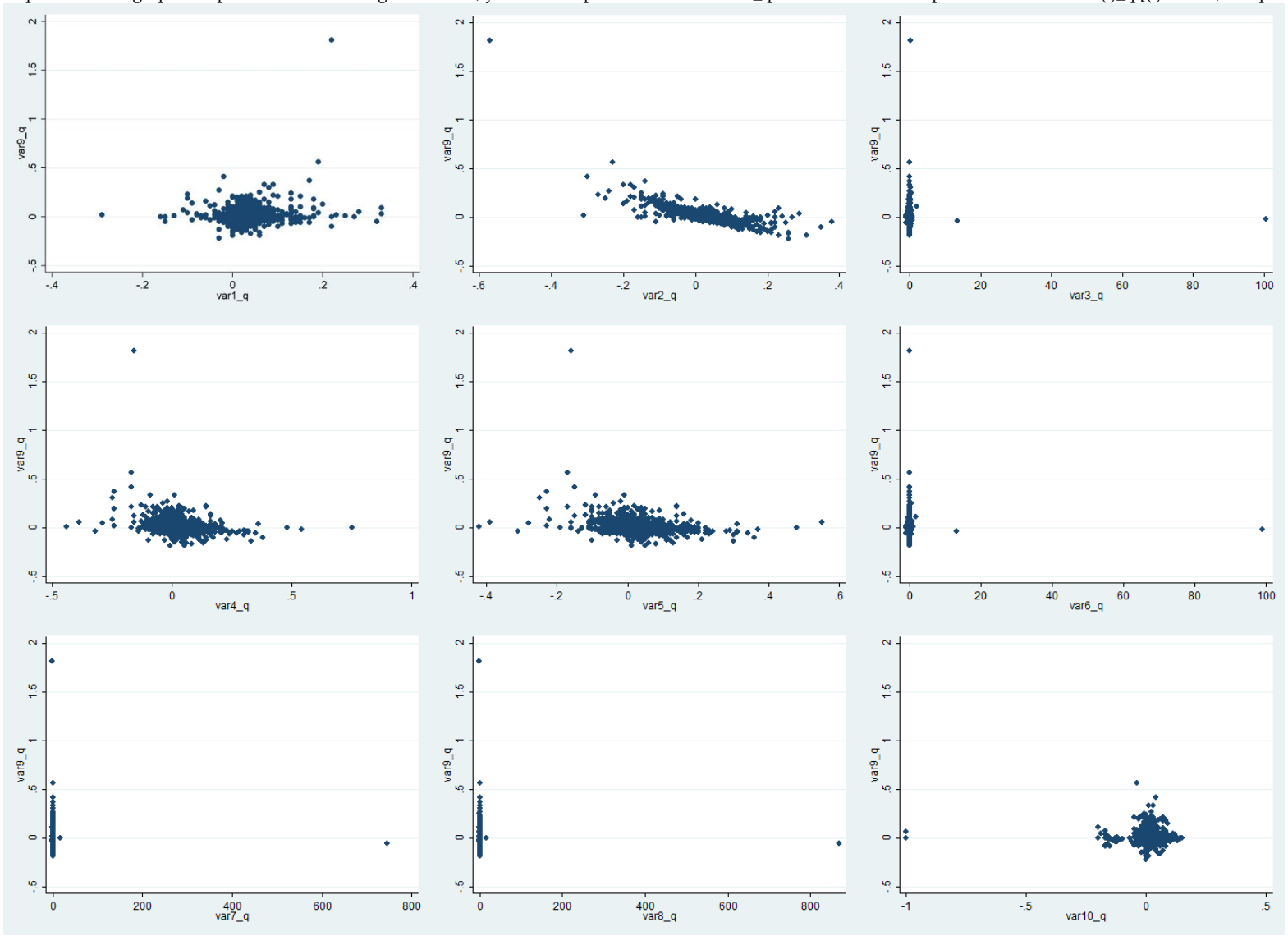
Table 3: Tests for heteroskedasticity, autocorrelation and cross-sectional dependence in FE model

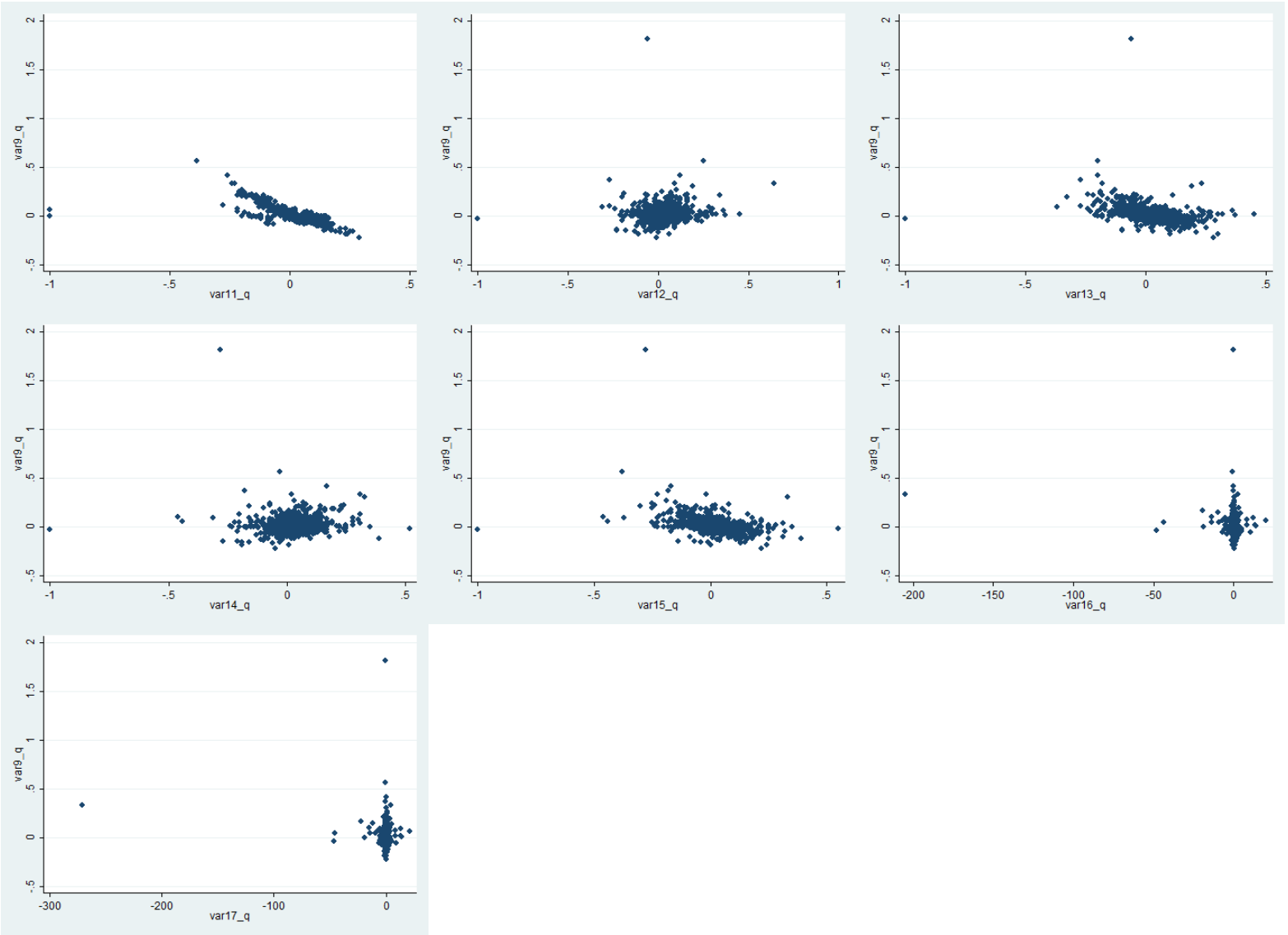
Heteroskedasticity	Autocorrelation	Cross-sectional Dependence
Wald Test	Baltagi-Wu test	Breusch-Pagan LM test
	Durbin-Watson Test	Pesaran Test
		Friedman Test
		Frees Test

Table 4:Corelation Matrix

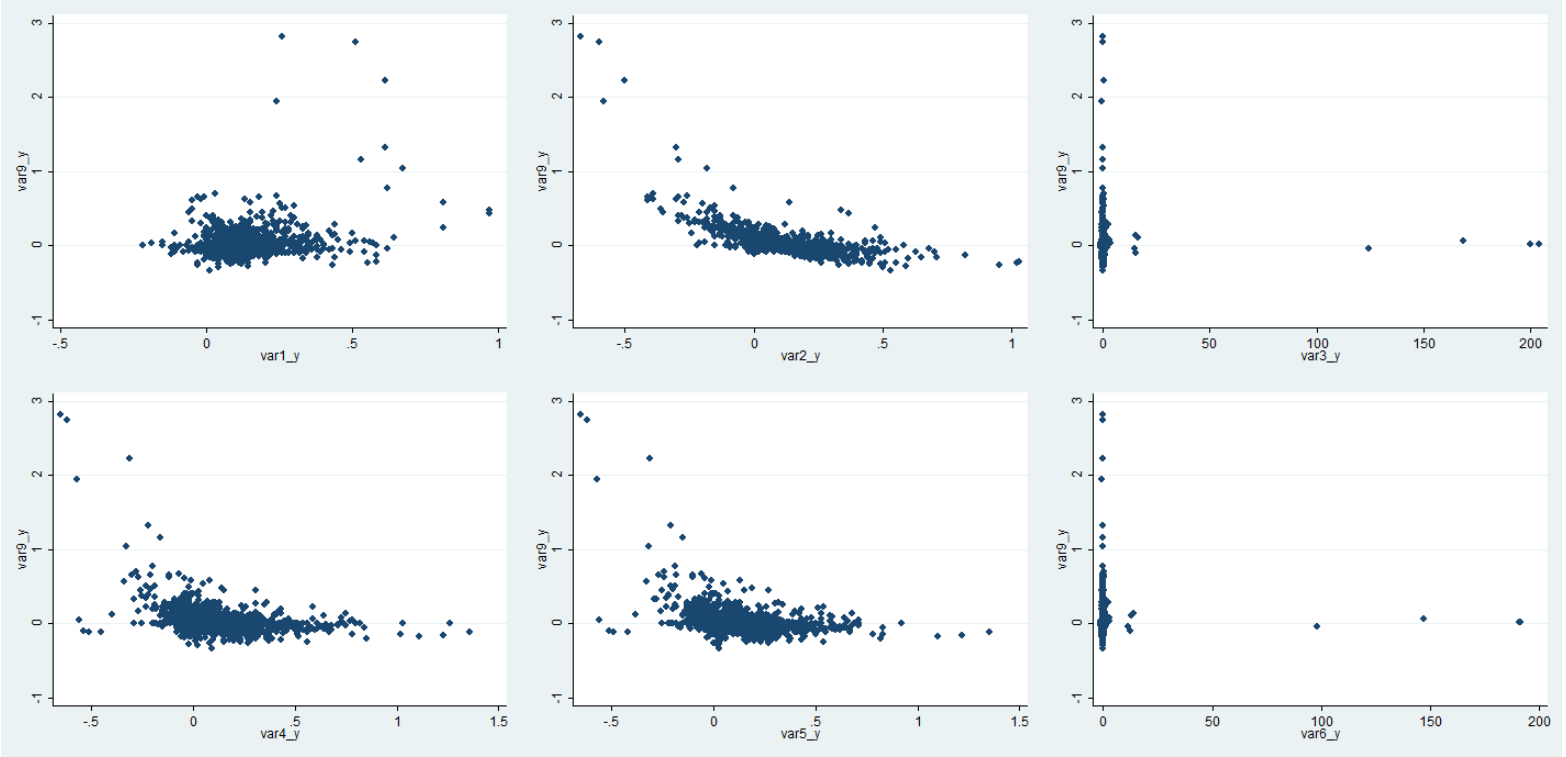
	var1	var1_q	var1_y	var2	var2_q	var2_y	var3	var3_q	var3_y	var4	var4_q	var4_y	var5	var5_q	var5_y	var6	var6_q	var6_y	var7	var7_q	var7_y	var8	var8_q	var8_y	var9	var9_q	var9_y	var10	var11	var11_q	var11_y	var12	var13	var13_q	var13_y	var14	var15	var15_q	var15_y	var16	var16_q	var16_y	var10_q	var10_y	var12_q	var12_y	var14_q	var14_y	var17	var17_q	var17_y
var1	1																																																		
var1_q	-0.0574	1																																																	
var1_y	-0.0863	0.6216	1																																																
var2	0.1415	-0.138	-0.2181	1																																															
var2_q	-0.0201	0.3967	0.2219	-0.0246	1																																														
var2_y	-0.0455	0.3088	0.4528	-0.062	0.5241	1																																													
var3	-0.1525	-0.0857	-0.1452	0.6293	-0.0297	-0.0618	1																																												
var3_q	-0.0113	0.0251	0.0183	-0.024	0.059	0.0422	-0.0171	1																																											
var3_y	-0.0229	0.0313	0.0414	-0.0503	0.0073	0.0582	-0.0371	0.4868	1																																										
var4	0.1149	-0.0318	-0.0401	0.5691	0.0036	0.0147	0.0341	-0.0009	-0.0031	1																																										
var4_q	-0.0402	0.1287	0.1545	-0.0932	0.3332	0.2915	-0.0847	0.0278	0.0375	-0.0346	1																																										
var4_y	-0.0664	0.1902	0.2915	-0.1569	0.2261	0.5073	-0.1387	0.0412	0.0672	-0.0372	0.5715	1																																									
var5	0.0868	-0.0456	-0.0639	0.664	-0.0015	0.0039	0.2024	-0.0038	-0.0093	0.9834	-0.0482	-0.0599	1																																								
var5_q	-0.05	0.1262	0.1488	-0.0898	0.3583	0.3016	-0.0703	0.0672	0.0568	-0.0407	0.9405	0.5583	-0.0518	1																																							
var5_y	-0.0806	0.186	0.2825	-0.1486	0.2346	0.5196	-0.1153	0.0566	0.1006	-0.0421	0.5365	0.9944	-0.0608	0.5718	1																																						
var6	-0.1719	-0.0966	-0.1658	0.5724	-0.0177	-0.0409	0.9738	-0.0174	-0.039	-0.0021	-0.0972	-0.1661	0.1455	-0.0692	-0.1206	1																																					
var6_q	-0.006	0.0171	0.0089	-0.0187	0.015	0.0067	-0.0142	0.9285	0.4827	0.0067	-0.0039	0.0149	0.0042	0.0145	0.0249	-0.0174	1																																					
var6_y	-0.01	0.0261	0.0264	-0.0404	-0.0193	-0.0096	-0.0322	0.4433	0.9825	0.0133	0.009	0.0143	0.0076	0.0184	0.035	-0.0395	0.4524	1																																				
var7	-0.0208	-0.0102	-0.0157	-0.0149	0.0155	-0.0145	-0.02	-0.0581	-0.0528	-0.0178	-0.0005	-0.0081	-0.0208	-0.0012	-0.0096	-0.0218	-0.0604	-0.0577	1																																				
var7_q	-0.0147	-0.0063	-0.0088	-0.0105	0.0286	-0.0083	-0.0139	-0.0765	-0.0386	-0.0125	0.0025	-0.0083	-0.0146	0.0017	-0.0097	-0.0152	-0.077	-0.0419	0.6452	1																																				
var7_y	-0.0208	-0.0096	-0.0149	-0.0147	0.0167	-0.0132	-0.0197	-0.0601	-0.0545	-0.0177	-0.0001	-0.0078	-0.0207	-0.001	-0.0095	-0.0215	-0.0623	-0.0592	0.9997	0.6641	1																																				
var8	-0.0207	-0.0101	-0.0157	-0.0147	0.0147	-0.0145	-0.0197	-0.0565	-0.0526	-0.0176	-0.0006	-0.0079	-0.0206	-0.0013	-0.0094	-0.0216	-0.0588	-0.0574	0.9995	0.6203	0.9984	1																																				
var8_q	-0.0148	-0.0062	-0.0086	-0.0106	0.0291	-0.0078	-0.0139	-0.0758	-0.0383	-0.0126	0.003	-0.0079	-0.0147	0.0026	-0.0091	-0.0152	-0.0768	-0.0418	0.6452	1	0.6641	0.6204	1																																				
var8_y	-0.0209	-0.0095	-0.0147	-0.0149	0.0163	-0.0123	-0.0197	-0.0581	-0.054	-0.0179	0.0001	-0.0069	-0.0208	-0.0006	-0.0085	-0.0215	-0.0605	-0.0591	0.9999	0.6343	0.9992	0.9998	0.6344	1																																				
var9	0.6459	0.0356	0.0593	-0.1758	0.0052	0.0064	-0.1246	-0.0119	-0.0271	-0.1093	-0.014	-0.031	-0.1281	-0.0204	-0.0401	-0.1362	-0.0106	-0.0233	-0.0137	-0.0095	-0.0134	-0.0136	-0.0095	-0.0134	1																																				
var9_q	-0.0121	0.0983	0.091	-0.0567	-0.8624	-0.4153	-0.0264	-0.0505	0.0092	-0.0262	-0.2977	-0.1556	-0.0301	-0.3261	-0.1669	-0.0435	-0.0079	0.0345	-0.0273	-0.0345	-0.0283	-0.0266	-0.0351	-0.0279	0.0103	1																																				
var9_y	-0.0242	0.0697	0.1712	-0.1025	-0.426	-0.773	-0.0511	-0.0349	-0.0411	-0.0597	-0.2176	-0.3639	-0.0671	-0.2321	-0.3837	-0.0838	-0.0037	0.0208	0.0009	0	0	0.001	-0.0004	-0.0008	0.0211	0.5237	1																																				
var10	0.7422	0.027	0.0422	-0.147	0.0056	0.0076	-0.1287	-0.0114	-0.0248	-0.084	-0.0131	-0.0243	-0.104	-0.0195	-0.0334	-0.1419	-0.0092	-0.02	-0.0153	-0.0106	-0.0151	-0.0152	-0.0107	-0.0151	0.98	0.0045	0.0067	1																																				
var11	-0.1304	-0.1001	-0.1589	0.2844	-0.0297	-0.0554	0.6357	-0.0145	-0.0314	0.0123	-0.0625	-0.1056	0.1195	-0.0411	-0.072	0.6666	-0.0135	-0.0311	-0.0159	-0.0111	-0.0157	-0.0157	-0.0111	-0.0158	-0.1185	-0.0355	-0.0735	-0.1169	1																																				
var11_q	-0.0177	-0.0365	-0.0173	0.0258	0.7382	0.3988	-0.0144	0.0464	-0.0004	0.0746	0.2858	0.1822	0.0707	0.3105	0.1936	0.0018	0.0147	-0.0268	0.014	0.0281	0.015	0.0132	0.0285	0.0145	-0.0104	-0.814	-0.4517	-0.0082	-0.0042	1																																				
var11_y	-0.0373	0.0038	-0.0134	0.0249	0.4258	0.8422	-0.0381	0.0317	0.0391	0.124	0.2554	0.4448	0.115	0.2758	0.4689	-0.0032	-0.0026	-0.031	-0.0166	-0.0099	-0.0155	-0.0167	-0.0094	-0.0146	-0.0243	-0.4714	-0.9118	-0.018	-0.0196	0.4607	1																																				
var12	0.7913	0.02	0.0318	-0.1596	-0.0037	-0.0049	-0.1345	-0.0072	-0.0137	-0.0798	-0.0202	-0.0276	-0.1009	-0.027	-0.0374	-0.1489	-0.003	-0.0043	-0.0152	-0.0106	-0.0151	-0.0151	-0.0107	-0.0152	0.9106	0.0101	0.0122	0.9716	-0.1258	-0.0147	-0.0254	1																																				
var13	-0.0772	-0.1155	-0.182	0.842	-0.0133	-0.0283	0.7986	-0.0118	-0.0211	0.5545	-0.1006	-0.1531	0.6783	-0.0909	-0.1295	0.746	-0.0048	-0.011	-0.0106	-0.0067	-0.0105	-0.0105	-0.0069	-0.0107	-0.1835	-0.0621	-0.1227	-0.1695	0.4948	0.0448	0.075	-0.1561	1																																				
var13_q	-0.0332	0.0833	0.1554	-0.0447	0.5905	0.3825	-0.0339	0.0554	0.0485	-0.0129	0.2602	0.2188	-0.0184	0.2838	0.2346	-0.03	0.0136	0.0003	-0.0116	0.0181	-0.0105	-0.0126	0.0187	-0.0112	-0.0111	-0.595	-0.3065	-0.0094	-0.0331	0.5169	0.3715	-0.0119	-0.0253	1																																				
var13_y	-0.076	0.0816	0.2026	-0.0978	0.2943	0.5896	-0.0658	0.0483	0.0859	-0.0191	0.2009	0.4181	-0.0298	0.2412	0.4607	-0.0543	0.0169	0.0008	-0.0359	-0.019	-0.0354	-0.036	-0.0185	-0.0345	-0.0305	-0.2819	-0.5023	-0.0274	-0.064	0.2959	0.6348	-0.026	-0.0415	0.5198	1																																				
var14	0.7946	0.0088	0.0185	-0.1499	-0.0157	-0.0211	-0.1286	-0.0073	-0.0129	-0.0729	-0.0271	-0.0356	-0.0931	-0.0343	-0.0455	-0.1429	-0.0015	-0.0011	-0.0146	-0.0102	-0.0145	-0.0145	-0.0103	-0.0146	0.8798	0.018	0.0209	0.9459	-0.1195	-0.0211	-0.0345	0.9916	-0.1461	-0.0219	-0.0377	1																																				
var15	-0.0667	-0.1296	-0.1953	0.5534	-0.0341	-0.0579	0.5831	-0.0106	-0.0161	0.4902	-0.0956	-0.1396	0.5789	-0.0812	-0.1121	0.5394	-0.003	-0.0064	-0.0057	-0.0037	-0.0057	-0.0056	-0.0039	-0.0059	-0.1919	-0.0508	-0.1104	-0.1721	0.8276	0.0268	0.0433	-0.1605	0.7403	-0.0377	-0.0591	-0.1472	1																																				
var15_q	-0.0195	0.0536	0.1729	-0.0415	0.5655	0.4552	-0.0409	0.0536	0.0565	-0.0162	0.3029	0.3015	-0.0228	0.3278	0.3177	-0.0344	0.0125	0.0022	-0.0047	0.0128	-0.004	-0.0053	0.0134	-0.004	0.0078	-0.5938	-0.3813	0.0132	-0.0379	0.5266	0.4344	0.008	-0.0352	0.7927	0.499	0.001	-0.0388	1																																				
var15_y	-0.047	0.0749	0.2154	-0.091	0.2617	0.6177	-0.0801	0.0395	0.0842	-0.022	0.1819	0.4582	-0.035	0.2218	0.4994	-0.0643	0.0093	-0.0009	-0.0284	-0.0162	-0.028	-0.0285	-0.0157	-0.0271	0.0252	-0.2569	-0.5397	0.0245	-0.0659	0.264	0.6424	0.0192	-0.0576	0.4102	0.8481	0.0093	-0.0579	0.5506	1																																			
var16	-0.0289	-0.0057	-0.0201	0.5347	0.0235	0.0315	0.4337	-0.0039	-0.0106	0.1936	-0.0267	-0.0481	0.263	-0.0306	-0.0483	0.4119	-0.0032	-0.0081	-0.0083	-0.0052	-0.0081	-0.0083	-0.0052	-0.0082	-0.0266	-0.0267	-0.0405	-0.0311	-0.3194	0.0318	0.0551	-0.0261	0.5303	0.0105	0.0137	-0.0283	-0.1774	-0.0026	-0.0112	1																																		
var16_q	0.0236	-0.0255	0.0024	0.0237	0.1184	0.0896	0.0197	-0.0023	0.0063	0.0206	0.0119	0.0146	0.0235	0.0208	0.0164	0.0207	-0.0071	0.0036	0.0049	0.0011	0.005	0.0051	0.0011	0.0052	0.0249	-0.1627	-0.1235	0.0275	0.0189	0.1159	0.0973	0.0285	0.0317	0.0971	0.0848	0.029	0.0313	0.1076	0.0754	0.0069	1																																		
var16_y	0.0284	0.0164	-0.0253	0.0232	0.0171	0.0199	0.0215	-0.0019	0.005	0.0221	0.0072	0.0083	0.0253	0.0097	0.0099	0.0231	-0.0042	0.0062	0.0046	0.0025	0.0047	0.0046	0.0025	0.0047	0.0379	-0.008	-0.0297	0.0369	0.021	0.0186	0.0357	0.0364	0.0341	0.0314	-0.0077	0.036	0.034	-0.0004	0.017	0.007	0.0011	1																																		
var10_q	-0.0404	0.071	0.08	-0.0171	0.0302	0.1124	-0.0459	0.0076	0.0136	0.1094	0.0778	0.1132	0.0995	0.0804	0.1168	-0.0438	0.0152	0.0061	-0.0082	-0.0015	-0.0079	-0.0083	-0.0016	-0.0079	-0.0038	-0.0003	-0.0826	-0.0058	-0.0355	0.5625	0.148	-0.0067	0.0155	0.0355	0.1187	-0.0075	0.0081	0.0746	0.1129	0.0124	0.0065	0.0114	1																																		
var10_y	-0.1095	0.1443	0.28	-0.1179	0.1101	0.3616	-0.182	0.0045	0.0216	0.2764	0.1842	0.3856	0.2401	0.2047	0.4065	-0.1784	-0.0062	-0.0107	-0.0353	-0.0247	-0.0348	-0.0351	-0.0245	-0.0343	0.0348	-0.0498	-0.2357	0.0213	-0.1658	0.189	0.5004	0.018	0.0006	0.2207	0.4981	0.0167	-0.0235	0.244	0.4938	0.0306	0.0323	0.0119	0.2714	1																																	
var12_q	-0.0489	0.1978	0.2719	-0.0985	-0.1403	0.0549	-0.056	0.015	0.0638	-0.0352	0.0222	0.1147	-0.0439	0.0231	0.1221	-0.0689	0.0074	0.0321	-0.039	-0.0117	-0.0386	-0.0395	-0.0115	-0.039	-0.0016	0.2562	0.1306	-0.0051	-0.0611	-0.1769	-0.0089	-0.003	-0.0797	0.6157	0.3458	-0.0076	-0.0787	0.3727	0.2414	-0.0175	-0.0207	0.0294	0.0517	0.2271	1																																
var12_y	-0.0941	0.151	0.386	-0.183	-0.0765	-0.0829	-0.1054	0.0192	0.0549	-0.0668	0.0168	0.1219	-0.0833	0.046	0.1489	-0.1236	0.0146	0.021	-0.0352	-0.0198	-0.0355	-0.0352	-0.0197	-0.0353	-0.0076	0.1704	0.3636	-0.0176	-0.1156	-0.0934	-0.1637	-0.0112	-0.1406	0.2835	0.6088	-0.016	-0.1377	0.1972	0.42	-0.0322	0.0078	-0.0386	0.0602	0.3347	0.5003	1																																
var14_q	-0.0297	0.1475	0.2833	-0.0997	-0.1191	0.1643	-0.0704	0.0183	0.0762	-0.0401	0.0929	0.2271	-0.0511	0.0975	0.2363	-0.0797	0.0083	0.0339	-0.0267	-0.0168	-0.0269	-0.0267	-0.0166	-0.0264	0.0226	0.1923	0.0104	0.0242	-0.0694	-0.1132	0.0926	0.023	-0.0943	0.4126	0.3445	0.0214	-0.0815	0.666	0.4313	-0.0353	0.0066	-0.0087	0.1008	0.257	0.6943	0.3936	1																																
var14_y	-0.0605	0.1323	0.3757	-0.1754	-0.0723	0.04	-0.1228	0.0171	0.0664	-0.0654	0.0147	0.2218	-0.0848	0.0475	0.2527	-0.1348	0.0104	0.0222	-0.0279	-0.0179	-0.0283	-0.0279	-0.0178	-0.0278	0.0643	0.1445	0.19	0.0492	-0.1178	-0.0824	-0.0424	0.0461	-0.1524	0.2045	0.5449	0.0412	-0.1311	0.313	0.7053	-0.0578	0.009	-0.0081	0.0675	0.3951	0.3836	0.7806	0.5141	1																															
var17	0.3988	0.0805	0.1003	-0.1455	0.0732	0.0993	-0.1084	-0.0034	-0.0123	-0.0857	0.0328	0.0353	-0.1023	0.0316	0.0313	-0.1172	-0.0113	-0.0226	-0.0122	-0.0084	-0.0119	-0.0121	-0.0083	-0.0117	0.7376	-0.0441	-0.0483	0.6769	-0.1061	0.0325	0.0437	0.5832	-0.1456	0.0569	0.0595	0.4733	-0.1686	0.048	0.0724	-0.0006	0.0116	0.0216	0.0019	0.018	0.0279	0.0242	0.0219	0.0553	1																															
var17_q	0.0226	-0.0293	-0.0007	0.0231	0.1125	0.0857	0.0185	0.0007	0.0083	0.02	0.009	0.0147	0.0227	0.0183	0.0166	0.0192	-0.0041	0.0057	0.004	0.0009	0.0041	0.0041	0.0009	0.0043	0.0221	-0.159	-0.1221	0.0244	0.0179	0.1114	0.0939	0.0253	0.0308	0.0928	0.0821	0.0258	0.0309	0.1041	0.0738	0.0062	0.9961	0.0004	0.0053	0.0291	-0.0212	0.0074	0.0072	0.0097	0.0109	1																															
var17_y	0.0308	0.0155	-0.0274	0.0224	0.0127	0.0113	0.0202	-0.0011	0.0053	0.0216	0.0049	0.0075	0.0246	0.0072	0.0087	0.0212	-0.003	0.0069	0.0043	0.0023	0.0043	0.0043	0.0024	0.0043	0.0387	-0.0029	-0.0213	0.0376	0.0197	0.014	0.0274	0.0374	0.0322	0.0321	-0.01	0.0372	0.0324	-0.0017	0.0128	0.0063	-0.0003	0.9977	0.0093	0.0096	0.0348	-0.0338	-0.0062	-0.0062	0.0207	-0.0009	1

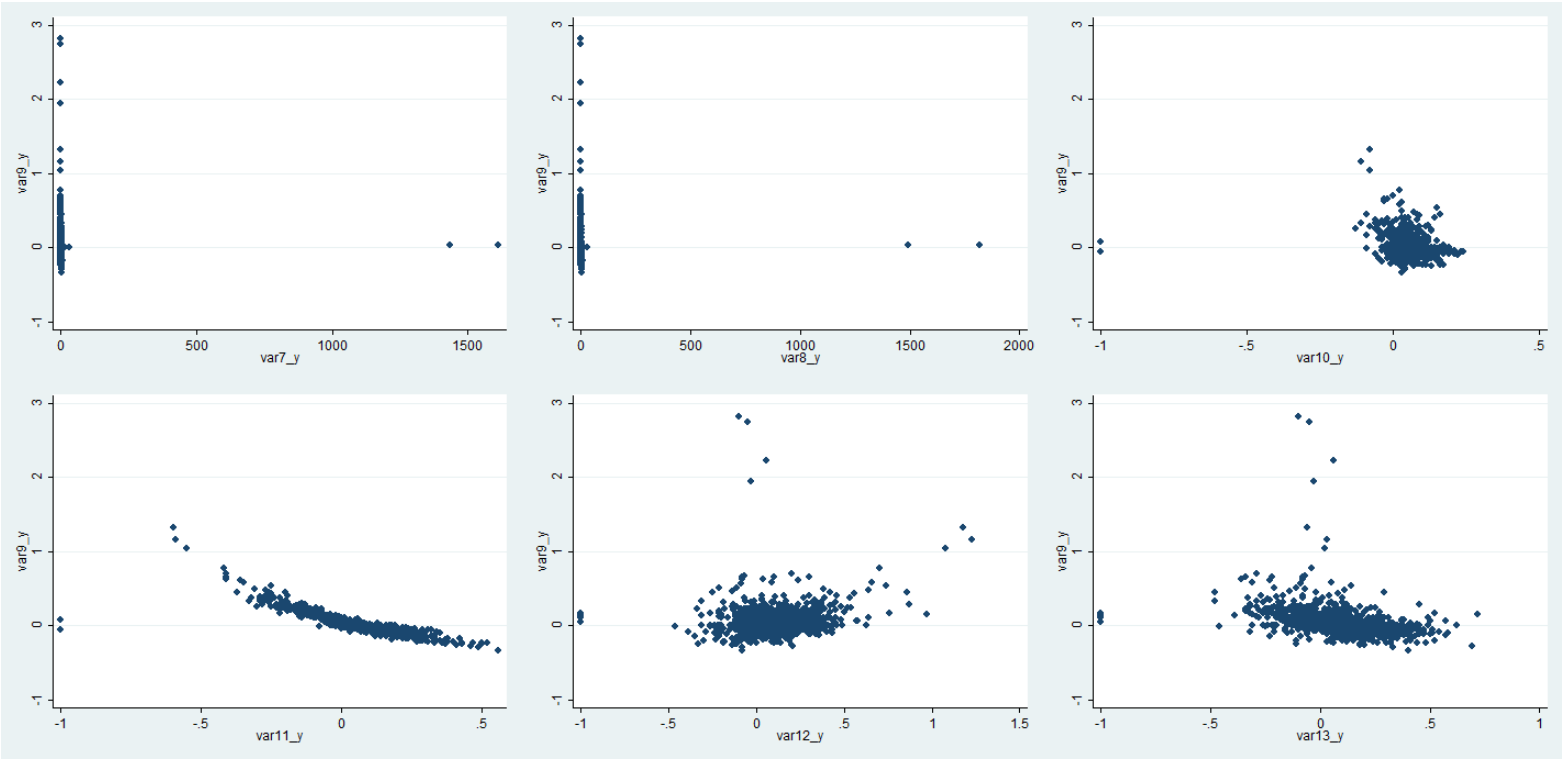
Graphs 1: Scatter graphs for parameters including in Model-1, y-axis:the dependent variable var9_q and x-axis: the independent variables var(i)_q [(i):1 to 17, except:9]

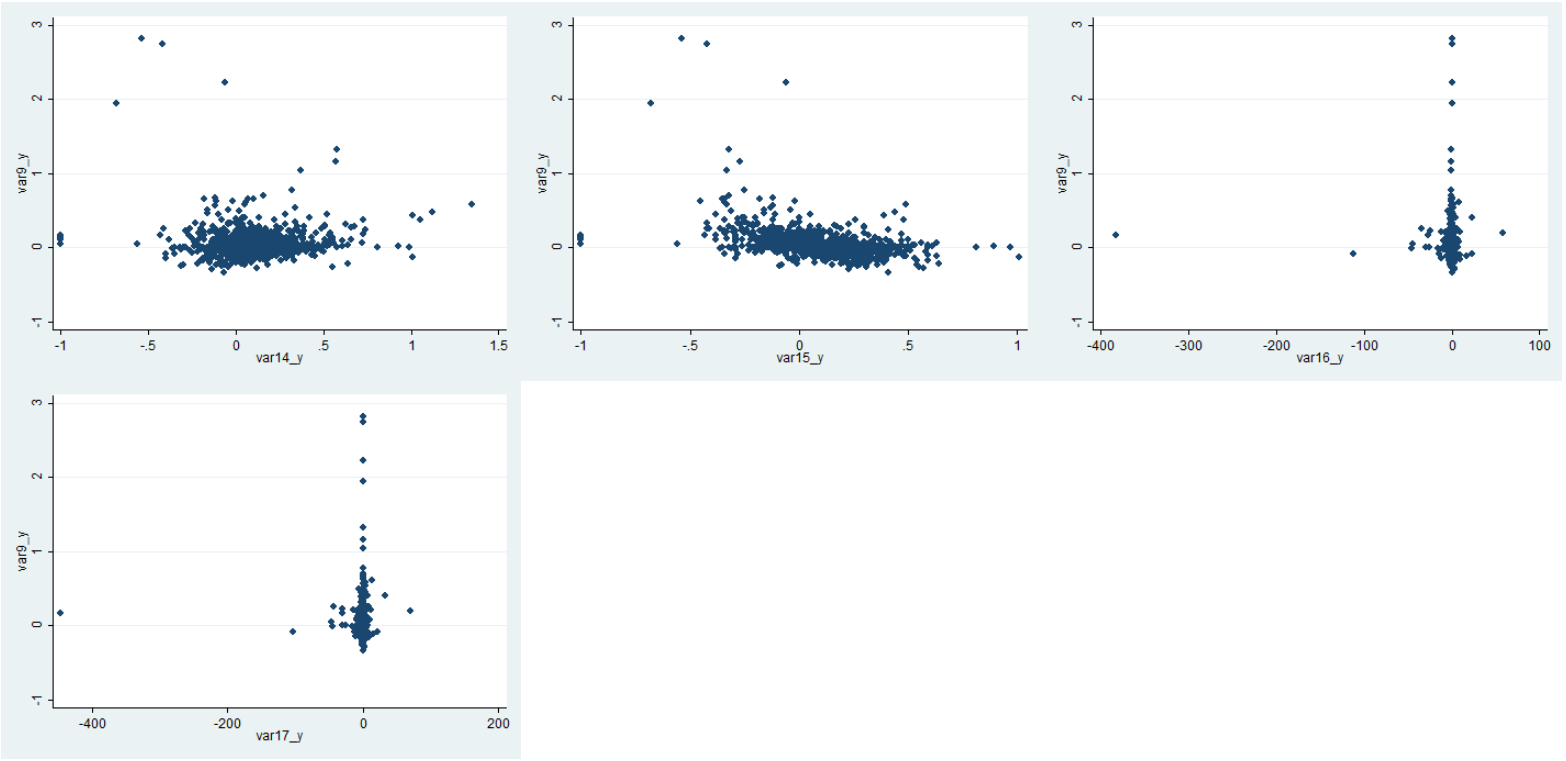



var9_q
var11_q
var12_q
var13_q
var14_q
var15_q
var16_q
var17_q

Graphs 2: Scatter graphs for parameters including in Model-2, y-axis:the dependent variable var9_y and x-axis: the independent variables var(i)_y [(i):1 to 17, except:9]




var9_y
var7_y
var8_y
var10_y
var11_y
var12_y
var13_y


var9_y
var14_y
var15_y
var16_y
var17_y