AN APPLICATION OF MULTIPLE REGRESSION IN EXCHANGE RATE ARRANGEMENT

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DECLARATION

I declare that An Application of Multiple Regression in Exchange Rate Arrangements is my own work, meaning that the project has not been submitted for any other examination in another University. All the sources used have been indicated and acknowledged by complete references.

Gachiri Charles Ndiritu November 2007

Signed: …….

Abstract

AN APPLICATION OF MULTIPLE REGRESSION IN EXCHANGE RATE ARRANGEMENT

This project "An application of multiple regression in exchange rate arrangement" focused on the processes followed by different countries when choosing an exchange rate regime for currency stabilization. It analyses the consequences faced by emerging markets as a result of changes in volatility of developed countries' currencies (American Dollar, Japanese Yen, EURO, British Pound and the Canadian Dollar). Multiple regression analysis was used as a tool to determine the best currency that a given country would consider as its nominal anchor. This was done by comparing the standard deviation and weight assigned to currencies of each of the developed countries against those from each of the emerging markets (Indian Rupee, South African Rand, and the Mexican Peso) and developed markets (Australian Dollar and the New Zealand Dollar). For a currency to be a good nominal anchor candidate for currency stabilization the standard deviation of its residuals should be as close to zero as possible and the (weight) coefficient value assigned to it by that particular emerging markets' currency should be as high as possible in comparison to the other developed currencies.

The models of our subject currencies have been determined using the selected developed countries' currencies, by following the same approach used by Kawai and Akiyama (1998). Our findings show that the American Dollar still plays a major role as a nominal anchor.

KEY WORDS

Exchange rate regime

Price stability

Emerging market

Nominal anchor

Exchange rate volatility

Pegged

Currency crisis

Stabilization

Residuals

Multicollinearity

Contents

CHAPTER 1

INTRODUCTION

The issue of selecting an exchange rate regime has been a major topic for a long time and will remain so with all the inequalities between countries and their respective economies. A country has to choose a regime that is internationally competitive and assures price stability (Kateryna, 2004). The exchange rate trilemma states that it is not possible for a country to have open capital markets, a pegged exchange rate and monetary independence at the same time (Budagovska, 1994). In the past there have been many financial crises and even though there are many ways of dealing with these crises, free floating and strict fixation have emerged as two major exchange rate arrangements that are mostly adopted as possible solutions to these crises.

For the emerging markets, fixed exchange rates ensure some degree of certainty but this solution may lead to a banking crisis in unstable times. The fact that emerging countries are associated with high inflation rates means that free floating normally is not seen as a good option for them as it tends to affect the stability of prices. Hence these countries tend to change their exchange rate arrangements over time.

The main goal of this study is to make use of multiple regression analysis to establish the exchange rate arrangements adopted by the emerging markets making use of the analysis of a small group of markets, in this case we consider two developed countries and three emerging countries. A set of five major world currencies will be analyzed as nominal anchors to determine the ones that are preferred by the emerging markets. An examination of the evolution of exchange rate arrangements of a few emerging countries mentioned in this study will be performed following the approach used by Kawai and Akiyama (1998). The study will focus mainly on the role played by exchange rate volatilities of the world's major currencies against that of the emerging markets. Two developed countries will be used as yardsticks in the analysis and procedures used in determining nominal anchors for their exchange rate stabilization will be examined. The two countries that were used include Australia and New Zealand, and South

Africa, India and Mexico constitute the three emerging countries studied. The nominal anchor candidates will be the US Dollar, the Canadian Dollar, the Japanese Yen, the British Pound and the Euro. Many more currencies are considered these days and the recent unfolding of the credit market crisis on international markets in 2007 saw the Arab countries previously pegged to the US Dollar deciding to consider other currencies at the next OPEC summit (Reuters, 2007).

A nominal anchor can be defined as a nominal variable that acts as a target for monetary policy. For the last two centuries there has been three major types of nominal anchors, i.e. fixed, moving and pegged nominal anchors (Adams and Gros, 1986; Bruno, 1986; and Patinkin, 1993). The first one fixes the currency on commodities such as gold and silver. This was mostly applicable before World War II. Under this system the nominal anchor was the standardized price of a given quantity of the commodity. Hence this can be termed as a fixed nominal anchor due to the fact that the prices revolved around a given level for a long period of time. A good example of this regime would be the gold standard. In the 19th century most of the world currencies were pegged to gold prices and global monetary conditions were more dependent on the quantity of gold produced. The California "1849" gold crisis led to an increase in liquidity, which in return resulted in an increase in the world price of gold. The prices fell between 1873 and 1896 due to the fact that there were no major gold mine discoveries. Given that there are no guarantees of a continuous supply of gold it became clear that this system was not stable and hence could not be relied on to provide currency stability. There are arguments that a country that produces some mineral or agricultural commodities should consider pegging its currency to such commodities. In this case, fluctuations in the prices of the world commodity will not be a source of volatility to their currency (Cheol, 2003).

The second type of nominal anchors resulted from the attempt by monetary authorities to keep up with moving nominal targets such as inflation and income, hence it is known as the moving nominal anchor. However, the major drawback of this method is that most of the time, especially for the developing countries, data are normally not available on time for the analysis. This makes it difficult to determine when a financial situation is temporary or permanent, thus making it difficult to decide when to peg (Adams and Gros, 1986; Bruno, 1986; and Patinkin, 1993).

The third type of nominal anchor, which is still widely applied, aims at fixing the price of a currency to that of another country's currency. "Until August 1971 when President Nixon suspended the official convertibility of the US Dollar to gold" (Kawai and Akiyami, 1998), exchange rates of many IMF members had been pegged with a narrow margin around the dollar. However, after this financial shock, the world economy went into a new era of a "generalised floating system" (Kawai and Akiyami, 1998). To prevent exchange rate volatility the emerging economies fixed their currencies to those of the developed countries.

In this paper monetary policies and nominal anchors of two developed and a few emerging countries are briefly discussed in five chapters. The first chapter is the introduction to the project and chapter two gives a brief literature review on the effects of the exchange rate volatility of major economies on the emerging economies and also the history of exchange rate regimes. The different types of exchange rate arrangements that a country can adopt will also be discussed including some of their advantages and disadvantages. In chapter three multiple regression analysis is used to analyse the daily data with the aim of establishing the weights of the Beta coefficients allocated to each major currency by the given emerging markets. This will help to establish the nominal anchors preferred by each of the countries used here as representatives of the emerging markets.

Chapter four presents discussions of the results in which the type of exchange rate arrangements followed by the two developed countries and three emerging countries studied is established. To do this, the R-squared and the standard errors of the residuals will have to be taken into consideration. Chapter five gives the conclusion and is followed by a list of references used in this study and the Appendix.

CHAPTER 2

LITERATURE REVIEW

For many years it has been assumed that exchange rate volatilities in developed countries are one of the major contributing factors to world economic instability. The currency swings in the major economic powers have created a significant global economic impact on the emerging markets where the latter have been associated with high market volatility (Larrain, 2002). There are arguments that the instability of major currencies can be blamed for the recent financial instability and currency crises that have hit many emerging markets. A good example is the appreciation of the US Dollar between mid 1995 and 1998 which led to the Asian crisis in 1997 (Esquivel and Larrain, 2002) and currently the volatility due to a plunging dollar in America's deteriorating housing market which impacts markets globally (Russell, 2007).

Along different economic fields, researches are being performed to establish whether a better and more stable relationship between the emerging and the developed economies can bring about a more stable global economy. Esquivel and Larrain (2002), tried to establish the effects on the exchange rate volatilities of major on emerging economies. In their discussion they took into consideration such channels as trade flows, foreign direct investment, currency crises, debt servicing costs, portfolio composition and commodity prices. Their argument was based on the fact that most international economic transactions take place in such currencies as the US Dollar, the British Pound, the Euro and the Japanese Yen, which are from major economies and this means that any exchange rate instability among these major currencies, combined with activities of risk averse agents, will most likely result in an increased instability in the international markets, thus negatively affecting the emerging markets. To clarify this point, this study attempts to explain what these different channels mean and also give their significance to our study.

2.1 Trade flows

International trade flows as defined by Sutcliffe (2001: 71), means sales that go beyond the juridical borders. Traders want to maximize their profits and a rise in exchange rate volatility will scare the traders from the market, leading to reduced volumes of trade. Alternatively, they will increase their commodity prices to cover the high currency risks and subsequently this action results in decreased demand, which leads to a reduction in trade volume. A rise in volatility of the major currencies will result in a global reduction in trade volumes. Also, since many developing countries tend to peg their currencies to those of the developed countries, any instability amongst the major currencies results in an indirect effect on all currencies pegged to the affected currency.

2.2 Foreign direct investment

This can be defined as the investment made to acquire interest in enterprises operating outside the economy of the investor (FDI magazine, 2007). Greater exchange rate volatility increases the risk on foreign investment and hence investors will only invest in an economy that promises high returns in order to cover the currency risk. Thus, if exchange rate volatilities are high, foreign direct investment volumes will decline.

2.3 Currency crises

A good example would be the case of the US Dollar appreciation relative to other major currencies between 1995 and 1999, which led to the currencies pegged to the dollar to appreciate in the same manner. This destroyed the relative price competitiveness of these countries and lead to the deterioration of external accounts of other major currencies. This was considered to have been the major cause of the Asian financial crisis in 1997 (Esquivel and Larrain, 2002).

2.4 Debt servicing costs

Due to economic hardships that characterize emerging markets, they have a high tendency to borrow from the developed economies. Since these loans are paid in terms of the developed countries' currencies, any change in volatility associated with the developed country's currency will also affect the costs of repaying these loans. The exchange rate can be taken as an asset or investment price and thus fluctuations can be viewed as an indication of the investors' changing perception of prospective capital gains and losses. The importance of a stable exchange rate can be expressed by the fact that a change in its level can affect the prices in the home country of all imported goods that compete with the locally manufactured goods as well as the profits made by the exporters. To prevent business uncertainty that may be caused by an unstable currency, each government has to find a way of controlling and regulating fluctuations to its currency.

The viability of international monetary arrangements relies mostly on three conditions: The ability to effect relative price adjustments, compatibility with the pursuit of robust monetary policies and the capacity to contain market pressures (B Eichengreen, 1995). This is well demonstrated by the past arrangements from the gold standard to Bretton Woods (B Eichengreen, 1994, 5). The Bretton Woods agreement was formed in 1944 when all the allies of the United States, Britain and France met to discuss the future of the world economy after World War I. The main objective for the agreement was to come up with plans that would promote global economic growth through stable currencies (Absa Economic Perspective, Second Quarter 2006). However, it should be noted that changes in technology, market structure and politics have a great effect on such arrangements.

Table 1 explains the trend that has been followed by exchange rate regimes for the past two centuries.

Table 1. The History of Exchange Rate Regimes (Source: Visser, 2007).

The Bi-Metallic Age	-Existed before 1880. -Money exchanges became clearing houses for promissory notes and later developed into banks. - Gold and silver acted as reserves.
Early gold standards	-Between 1880 and 1914. -Currencies were pegged to gold.
Later gold standards	-Existed between 1918 and 1939.
Bretton Woods fixed exchange rate system	-Came into effect in 1947 with the formation of the IMF. -In 1968 SDR was introduced as a reserve currency.
Fluctuation exchange rates	-1961 to 2001. -The US Dollar devaluated against the gold within this period.
Currency blocks	- from 2001 to present - Can be termed as a combination of fixed and free-floating currencies.

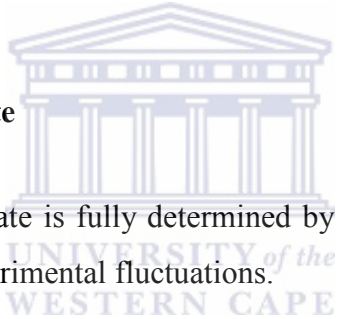
For a better understanding of the purpose and aim of this study, a discussion of some of the exchange rate arrangements that are practiced by different countries will be provided.

2.5 Exchange rate classifications

Determining the type of exchange rate regime that each country follows is not a simple task. Up until 1998 the IMF classified arrangements for its members according to their own official statements on the level of exchange rate flexibility. Before 1998 there were three major categories of classifications: (i) pegs, (ii) limited flexibility and (iii) more flexibility. However, this system of classification had certain limitations as it failed to establish the difference between

what countries claimed to do and what they were actually doing. Also, rigid forms of pegs were grouped together with soft pegs (Darne and Laetita, 2003). To fix these problems a new method of classification was adopted by the IMF, which became official in 1999. In these classifications, the IMF uses monthly exchange rates at five-year intervals, mostly on monthly data - in our application we shall consider shorter periods of daily data to experiment with changes in models over shorter periods. The aim is that of comparing changes in exchange rate arrangements within those intervals on a few cases for which data were available.

The new system used by the IMF has eight different categories of arrangements which include: regime with no separate legal tender, currency boards, conventional fixed peg (peg against a single currency or a basket of currencies), pegged exchange rates with horizontal bands, crawling pegs, crawling bands and managed floating with no predefined path (IMF December, 2005). A few of these arrangements are discussed below:



2.5.1 Freely floating exchange rate

Under this system, the exchange rate is fully determined by the market. Any foreign exchange intervention is meant to prevent detrimental fluctuations.

This is the simplest option and usually acts as a benchmark against which the other options are weighed. A free-floating rate can be associated with three characteristics. Firstly, nominal exchange rate fluctuations can result into large relative national price levels; this in return leads to persistent real exchange rate movements, which can be very costly especially for the upcoming economies. Secondly, floating rates are normally associated with increased relative price variability, which makes it very difficult to distinguish between temporary and permanent changes thus leading to an inefficient resource allocation. Thirdly, floating exchange rates can remove a nominal anchor, which could be of use when it comes to stabilizing price expectations and disciplining macroeconomic policy-makers. These preceding reasons make the free-floating rate arrangement unsuitable to many economies.

2.5.2 Managed floating rates

Here the monetary authority of a country influences the exchange rate without following any specific path and the intervention may be direct or indirect. Under this method, exchange rates are allowed to fluctuate but are subject to intervention. Most of the IMF member countries follow this type of arrangement in one way or another (Eichengreen, 1994). The majority of these countries peg their currency to a single currency or a currency basket. When the exchange rates weaken, the central bank intervenes to support it and when it strengthens the bank intervenes to limit its appreciation. "This is called leaning against the wind" (Eichengreen, 1994).

2.5.3 Target zones

Under this method the rate is restricted within a particular interval. The currency is allowed to float freely until it reaches the edges of the interval. Further movements are controlled by applying restrictive measures, which result in a combination of both pegged and floating exchange rates. The target zone volatility is limited to the interval and this makes it very attractive to investors (Eichengreen, 1994).

2.5.4 Pegged Exchange Rates

A country under this system pegs its currency at a fixed rate to another currency or a basket of other currencies. This basket is formed by major trading or financial partners and the weights reflect the geographical distribution of the trade. Changes in the value of the currency that the local currency is pegged to, will lead to the same effect on the local currency. A good example of such a case was shown between 1995 and 2001, when the US dollar appreciated and all currencies pegged to it also appreciated with almost the same margin.

Just like the target zones, exchange rate pegs indicate the margin within which the currency is allowed to fluctuate and the conditions under which the peg can be altered or abandoned all together. Before the World War I, many countries had pegged their currencies against a certain amount of gold and this later led to currencies such as the American Dollar, Russian Ruble,

Euro, British Pound, Swiss Franc, etc. to become possible pegging candidates (Eichengreen, 1994).

2.5.5 Monetary union

Under this method countries abandon their respective currencies and replace them with a single currency. This method eliminates all the currency conversion expenses during trade amongst the member countries. However, a major problem is that the member countries may find it hard to respond to national macro- economic shocks. Also, due to the fact that exchange costs are eliminated it means that exchange risks are also eliminated and hence there is a high degree of financial market integration. This means that the interest rates among the member countries must be at the same level and monetary policies become unnecessary in adjusting interest rates to cope with local economic changes. A good example of a successful monetary union is the Euro that was introduced in 1999.

Table 2 gives a clear indication of different countries and the systems that they have adopted to stabilize their currencies. The information in this table has been extracted from the "De Facto Exchange Rate Arrangements and Anchors of Monetary Policy", (IMF, December 2005).

Table 2. Examples of Exchange rate systems. (Source: International Monetary Fund, International Financial Statistics (2005))

Exchange Rate Regime	**Inflation targeting framework**	**Other**
Exchange arrangements with no separate legal tender		Euro area Austria Belgium Finland France Germany Greece Ireland Italy Luxembourg Netherlands Portugal Spain
Independently floating	Australia Brazil Canada Chile Mexico New Zealand South Africa United Kingdom	Japan United States
Managed floating with no pre-determined path for the exchange rate		India

In the above table we only took into consideration countries that we shall be using in our project

but a similar table is available on the IMF website (2005) for all countries in the world. It should be borne in mind that this table gives the arrangements as reported in December 2005 but this analysis shall focus on the period from 2001 to 2007 and determine whether these countries followed similar arrangements over shorter intervals.

It is not easy to say which method of exchange rate arrangement is better than the other given that each one has its own advantages and disadvantages. The differences however, can be explained for example by comparing fixed and flexible exchange rates. The fixed rate minimizes shocks caused by the volatility and checks the more erratic tendency of policy makers. The flexible rate, on the other hand, provides the scope for policy initiatives to insulate the economy from such shocks (Eichengreen, 1994). Friedman (1953), as quoted by Carmen and Kenneth (2002), argued that flexible exchange rates were preferred to fixed rates because they prevented small inflationary differentials from accumulating and forcing a big devaluation. This argument, however, has been opposed by many analysts citing that flexible rates would prove to be more volatile. The latter was well demonstrated by the increased volatility of the US Dollar, Japanese Yen and the Euro, especially after the breakup of the Bretton Woods agreement.

Mundell (2000) defines a fixed exchange rate as a monetary rule that gives the country the monetary policy of a partner country and the flexible rate as a non-committal absence of monetary rule. His argument is that it is impossible to compare the two as they both operate on totally different systems. He goes on to say that some countries are too big to fix their exchange rates while others are too small not to fix. A good example is the United States, which is too large to fix to any currency.

A successful exchange rate arrangement is one that brings about a more positive than negative outcome, given the economic position of any particular country. In general, a good exchange rate arrangement should be in a position to effect relative price adjustments, be compatible with the monetary policies and have the capacity to contain market pressures. Neither the fixed nor the flexible exchange rates can be regarded as the best to minimize adjustment costs brought about by all types of market disturbances. A country must therefore weigh the type and the

seriousness of the disturbances it is exposed to and assess what the system must absorb before considering the type of exchange rate arrangement that is better suited to cope best with the more serious shocks.

The state of the economy plays a major role when it comes to determining the nominal anchor. Countries with plenty of international reserves, high credibility and better prospects for economic development can pursue exchange rates based on free floating technique while those with less national reserves, less credibility and less prospects for future development would most likely adopt the the monetary stabilization technique.

Before 1953 there was a conventional view that floating rates are inferior to fixed rates because they are very unstable and not constant to psychological factors. Friedman (1953) however, identified the main advantages of floating rate arrangements as independence to monetary policy and resistance to real shocks. This made many economists to change their perspectives and in the early 1960s floating arrangements gained support from the economists (Flanders and Helpman, 1978).

The theory of optimal currency areas was founded by Mundell (1961), McKinnon (1963), and Kennen (1969) who found that a fixed exchange rate could lead to current account imbalances but still insisted on cases where the idea would be optimal. The theory dwelt on the future characteristics of the economy that would make fixing of exchange rate preferable. The characteristics given include: high factor mobility, high openness, small size of the economy, substantial domestic monetary shocks and a high level of financial development in the presence of real external shocks.

Free capital movement can characterize today's world and this has made it very difficult to manage a fixed exchange rate in the currency market. Investors are attracted by high interest rates and this has the consequence of large capital inflows. The affected countries have to intervene and regulate their foreign exchange rate to stabilize the nominal exchange rate and prevent it from appreciating (Bénassy-Quéré and Chauvin, 1999).

This is a common phenomenon especially with the emerging as well as the transition markets. These markets are characterized by high inflation and in the process of fighting inflation, interest rates are kept higher than the foreign interest rates which in return leads to capital inflow.

As time goes on the effect of a fixed exchange rate combined with high inflation leads to a deteriorated foreign account, which in most cases leads to speculative attacks. According to Bénassy-Quéré and Chauvin (1999), fixed exchange rates can only work if the process of liberalization and disinflation is completed. These attacks call for intervention which at times is not possible due to market inefficiencies or lack of reserves. Attacks also lead to high volatility in the domestic interest rates. Citing the example of Argentina in 2001, Mexico in 1994 and the Asian crisis between 1997 and 1999 (Wei, 2006), where this is shown to be true even in a Currency Board arrangement. A Currency Board arrangement does not allow the central bank to participate as a lender as a last resort. In case of a speculative attack, it leads to a hike in interest rates, which can bring about depressive effects on the market.

According to Bénassy-Quéré and Chauvin (1999), the complexity of the financial markets has favored the floating exchange rates by reducing their cost while in return increasing the cost of fixed exchange rates. This has led to flexible regimes being seen as more attractive than they were, but still there are critics who feel that these regimes fail to provide insurance against financial crises.

Global changes influence the choice of an exchange rate regime. These changes include:

- Globalization has transformed the world into a global village resulting in increased trade and international competition through a free flow of capital across countries.

- New economic and political forces that have joined the financial system have led to an international instability in the currency market.

- The market volatility level has increased, leading to an uncertain increase due to the fact that many governments have withdrawn from the market because of the market changes

such as deregulation and privatization. This has left most of the world economic activities in the hands of private sectors.

- Many changes have taken place with respect to exchange rate regimes, many currencies have been led to float or have experienced a massive depreciation as a result of the failure of fixed exchange rate systems.

- The emergence of the Euro as an alternative to the US dollar and gold as a reserve currency in the market has increased the number of options to speculators and investors and this has resulted in increased currency instability.

- Technology advancement has led to the use of sophisticated computer hardware and software in the currency market. This has made it possible to gather and process information at a quicker pace. It has not only increased the level of traders' confidence as they are able to carry out most of the trading on their own, but has also made currency trading cheaper leading to an increase in both volume of traders and the amount traded by individuals.

- The introduction of internet trading and automated dealing systems has replaced the telephone and telex trading. These systems are much faster and allow traders to conduct multiple trades at the same time and thus increase the volume of trade.

- Political insecurity that occurs from time to time causes a huge impact on the currency; a good example being Zimbabwe's financial crisis. This has led to the collapse of the country's currency.

Other changes include the rising capital mobility, the movement of developing countries from commodity to manufactured exports and lower inflation in the world as a whole. The following points can be used as the benchmark that acts as a guide in choosing an exchange rate regime. It is advisable for countries with large trading partners to peg their currencies to such partners. This

could also be appropriate for countries with similar financial shocks, flexible labour markets and a willingness to part with monetary independence.

The financial crisis of 1997 to 1998 exposed the need for sustainable exchange rate regimes. The Interim Committee of the Board of Governors of the International Monetary Fund, in their 26 September 1999 report, stated that;

> members should be able to choose a regime that is appropriate to their particular circumstances and longer-term strategy. The choice of exchange rate regime and the implementation of supporting policies are critical for a country's economic development and financial stability, and in some cases potentially for the world economy.

In the current market crises fuelled by the US housing market, Russell (2007) speculates on the situation of a falling US dollar and its impact if left to fall hard. Many countries such as China, Russia and the Mideast hold billions of US securities. If the US dollar continues with the current down trend then these countries are most likely to experience a financail crisis in the near future. Back in the 1980s when many economies were moving towards flexible exchange rate arrangements, most of the Asian economies maintained a peg against the US dollar. This was done so as to ensure price stability and to make sure that foreign finance was available at lower rates through bank loans and foreign investment with minimal interest rates. Controlling inflation predictions brings about market confidence and reduces the overall market risk. The appreciation of the US dollar against other major currencies in 1995 led to great losses in the Asian countries that had pegged their currencies to it.

It is known that fixed exchange rate arrangements can increase systematic risk by providing an implicit guarantee, which brings about a misleading confidence to both local and international investors. On the other hand, pegging to the US dollar enables investors to borrow from foreign banks without having to hedge. During the period of 1998 to 1999 some Asian banks lent without analyzing the risk and the credit worthiness of the debtors and this made some investors to get access to credit that they could not manage to pay (Nanto, 1998). This is similar to what is currently happening in the US.

An apropriate free-floating strategy can make regional co-operation much more difficult by

inhibiting free riding where countries may be tempted to perpetuate the system to gain advantage over its competitors. It should be noted that exchange rate and any financial arrangements should focus on promoting growth and development while at the same time lowering or, where possible, eliminating the risks involved. Also, any measure adopted towards any arrangement should be based on longterm objectives and measures. Precautions should be taken to ensure that these objectives are achieved in a well-ordered manner.

A managed floating exchange rate regime could be a better solution for the emerging markets as it gives space for reconciliation at lower exchange rate volatility and stable inflation with flexibility in relation to external shocks. It is worth to note that even under free floating systems, the major currencies of the industrialized countries continue to play a major role as nominal anchors for emerging economies. Previously the US Dollar and the UK Pound used to act as nominal anchors but recently currencies such as the Euro and the Japanese Yen have also joined the trend as nominal anchors. At present there is a major dilemma facing the emerging markets, this involves making a decision on whether to use the exchange rate as an explicit or implicit nominal anchor. There are strong arguments that fixing an emerging market's currency to a strong major currency can lead to major problems if the developing country lags behind in growth or goes through recession at a different time as compared to the anchor (Reinhart and Rogoff, 2002). This makes a fixed currency arrangement less favorable for the developing economies as a solution to their exchange rate arrangement.

For a currency to qualify as a good candidate for a nominal anchor, the exchange rate of any given country's currency in comparison to this named currency has to have the smallest volatility with a magnitude close to zero. In this case the major anchor currencies include the US Dollar (USD), the Euro, the Japanese Yen (JPY), the Canadian Dollar (CAD) and the British Pound (GBP). For the emerging markets we investigate the South African Rand (ZAR), Indian Rupee (INR) and the Mexican Peso (MXN), and these will be compared to currencies from two developed countries that include the New Zealand Dollar (NZD) and the Australian Dollar (AUD).

In chapter three we will discuss the methodology applied

CHAPTER 3

METHODOLOGY

3.1 Exchange Rate Volatility

In this chapter we examine the steps followed in transforming the data in preparation for the comparison of the standard deviation and weight assigned to each of the developed countries' currencies by each of our emerging markets (Indian Rupee, South African Rand, and the Mexican Peso) and developed markets (Australian Dollar and the New Zealand Dollar) with an aim of establishing the exchange rate volatilities of these countries . These countries have been selected due to the fact that, they have well established monetary systems as compared to other emerging markets and this makes it easier to get the required data for the analysis. The exchange rate arrangements of the countries used in this analysis can be regarded as a functional source of gathering practical information about the nature of their respective arrangements. However, the main drawback is that the actual practice of exchange rate policies cannot be fully depicted and described by the reported exchange rate arrangements. Moreover, one cannot gather enough information about the currency or basket of currencies used as a target for exchange rate stabilization. Thus, a better way of understanding the function of exchange rate policies is to make use of statistical methods to observe the actual behaviors of the reported exchange rates.

One convenient way of observing exchange rate behaviour is to determine the exchange rate volatility by calculating the standard deviation of the daily change in the rates of the respective country's exchange rates, and then make a comparison of the extent of the volatility per country and this is done for a number of countries. As was mentioned in the previous chapter, for a currency to be considered a nominal anchor, its exchange rate volatility compared to that of all the other countries should be either small or close to zero. Thus, after obtaining the exchange rate volatility of all reported currencies one can determine which country's currency would be a good candidate for a nominal anchor.

To get a good measure of exchange rate volatility, the standard deviation of the first difference in natural logarithms of the daily exchange rates of the emerging currencies against other major currencies, are determined. The formula used here is shown below;

$$\Delta e_t = e_t - e_{t-1} = \ln(E_t) - \ln(E_{t-1}), \quad (1)$$

Where E_t and E_{t-1} represent the level of nominal exchange rate for a given currency at time t and t-1 respectively.

The major currencies that I shall take into consideration include: the US Dollar (USD), the Canadian Dollar (CAD), the Japanese Yen (JPY), the Euro (EUR) and the British Pound (GBP). For this analysis I will use the reported daily exchange rates from the period June thirteenth 2001 through to March second 2007 for which daily data were available. Taking into consideration that countries tend to change their currency arrangement strategies from time to time, the data was divided into three equal sections to study changes in the model during three periods.

3.1.1 Data preparation Procedures

The daily data provided were in the following form:

EURUSD	Euro American Dollar,
GBPUSD	British Pound American Dollar,
USDJPY	American Dollar Japanese Yen,
USDCAD	American Dollar Canadian Dollar,
USDCHF	American Dollar Swiss Franc,
USDINR	American Dollar Indian Rupee,
USDAUD	American Dollar Australian Dollar,
USDNZD	American Dollar New Zealand Dollar,
USDMXN	American Dollar Mexican Peso,
USDZAR	American Dollar South African Rand

The data were sampled as daily closing prices. For the analysis I shall use the daily closing exchange rates from the period of June 13th 2001 through to March 2nd 2007.

I had to check for any missing values and in cases where only one value was missing and I took the average of the values before and after the missing value. Such values were thus not reported as missing in the samples. In cases where more than one value was missing, such occurrences were reported and taken into consideration:

- Mexican Dollar and New Zealand Dollar values from 22nd of June 2004 to 2nd of July 2004.

For these missing values I checked their values from the IMF website. All the currency rates had to be converted to Swiss Franc (CHF), which acts as numeraire currency. The USDCHF was taken as the numerator in each case in making the currency conversions. The resulting data after the division were further transformed by taking the log of the exchange rate of the currency, and the difference of the log values between two consecutive days was computed to remove co-linearity.

ie. $\log E_{(day1)} - \log E_{(day2)}$. (2)

Where $E_{(day1)}$ and $E_{(day2)}$ represents the exchange rates of day one and exchange rate of day two respectfully

3.2 Regression analysis of exchange rate movements

The volatility analysis described above is a helpful tool in determining the regional diversities that exist across the major developed countries and emerging economies. Such analyses are useful in assisting one to better recognize the best candidates for a single nominal anchor that could be adopted by any given individual country. However, the volatility analysis gives better and more accurate information regarding a country's exchange rate arrangement when a given country uses a policy of stabilizing its currency to a single currency. The use of such a policy can be limited when a basket of various currencies is being used as an exchange rate stabilization policy. Regression analysis can be a useful way of dealing with the limitation of the volatility

analysis as one can identify a set of various anchor currencies as well as determine their weighting in exchange rate stabilization. There are exceptional cases that include a situation in which a country uses an individual nominal currency as its exchange rate stabilization policy. In such situations one particular currency is thus given a big positive weighting compared to the weights assigned to other currencies' weights that are relatively very small and insignificant .

3.2.1 Types of regression

There are different types of regression analyses that one can use to analyze the relationship between dependent and independent variables, in an attempt to solve problems as shown in the literature. Only a few of these methods are mentioned here, as well as explaining in detail reasons why the type of regression used in this project was chosen.

1. **Logistic regression** – this type of regression is normally used when the dependent variable is of a binary form and the independent variables are of any type. The dependent variable in this project is not dichotomous hence this regression method is not considered (Garson, 2006).

2. **Ordinary least squares regression** - in this type of regression the parameters are estimated such that the total sum of the squared residual is minimized (Garson, 2006).

3. **Multiple regression** - this is the type of regression applied in this project and it is discussed in more detail below.

3.2.2 Multiple Regression

In this project the multiple regression method is used as a statistical tool to carry analyses. It's major use as stated by Garson (2006), is to establish the relationship between a number of predictor variables and a given dependent variable. The regression line is an indication of the best predictions of the dependent variable (the emerging country's exchange rate with respect to the Swiss Franc) for known values of the independent variables (the major developed countries'

exchange rates with respect to the Swiss Franc). Residual values represent the deviations from the regression line, hence the smaller the variability of the residual values the more accurate our predictions are, meaning that there is a high relationship between our variables. The R-squared coefficient of determination gives the percentage of the original variability that has been explained. This is a good indicator of how well the model fits the data and the closer the value is to one, the better the model. If the Beta coefficient assigned to an independent variable is positive then this means that there exists a positive relationship between the variables and vise versa.

The multiple regression model is stated as:

$$Y = a + b_1 * X_1 + b_2 * X_2 + \ldots\ldots\ldots\ldots + b_n * X_n \qquad (3)$$

Where 'Y' is the dependent variable, 'a' is the y-intercept, X_i stands for a specific independent variable and b_i represents the regression coefficient, which indicates the contribution of the i^{th} variable to the prediction of the dependent variable (Garson D, 2006).

There are some assumptions that are always associated with multiple regression and some of these are described here:

- Linearity – the assumption here is that the relationship between variables is linear. In this case I also assume that there exists a linear relationship between the different currencies that we shall be using. Scatter plots of the residuals are going to be used to make sure that the assumption made above is valid.

- Normal distribution – in this case residuals are assumed to follow a normal distribution. To test for this assumption graphs showing histograms of the plot of the residuals and also normal probability plots are going to be constructed.

The major limitation of this technique is that while the existence of a relationship can be established, the actual cause of the relationship cannot be explained. In this project detailed

explanations of the relationships between different countries will not be given, but this can be linked with trade associations between the two countries that have shown an existence of a relation amongst them, the colonial history and many other reasons. From literature it can be established that a relationship between a country and its colonial master exists Kawai and Akiyama (1998). Other reasons could be associated with geographical location, as neighbouring countries tend to have similar characteristics.

In this project I apply the Frankel and Wei (1994) regression equation for the choice of emerging countries and developed countries as presented in Kawai and Akiyama (1998)

$$\Delta e^{j}_{t} = \alpha + \beta_1 \Delta e_t^{USDCHF} + \beta_2 \Delta e_t^{JPYCHF} + \beta_3 \Delta e_t^{EURCHF} + \beta_4 \Delta e_t^{CADCHF} + \beta_5 \Delta e_t^{GBPCHF} + u_t \qquad (4)$$

where,

Δe^{j}_{t} = the daily change in the logarithmic exchange rate of a given currency 'j' to the Swiss Franc on day 't'

α = constant term

β_k = (k=1,2,3…..), the coefficient on the daily change in the logarithmic exchange rate of currency k to the Swiss Franc

u_t = residual term.

The abbreviations USDCHF, JPYCHF, EURCHF, CADCHF, CHFCHF and GBPCHF refers to the American dollar, Japanese yen, Euro, Canadian dollar and the British pound with the Swiss Frank (CHF) as numeraire currency respectively.

It should be noted that any change in the value of Δe^{j}_{t} represents either a depreciation or appreciation of the given currency with respect to the Swiss Franc. An increase is regarded as a sign of depreciation and a decrease being an indication of appreciation. The β_k coefficient represents the weight of the respective currency in the model.

The estimated standard error of regression residual can be interpreted as a measure of exchange rate volatility. As stated in equation two, the first difference of the natural logarithm of the nominal exchange rate defines a daily change in the exchange rate. Using Frankel and Wei's

(1994) example, I also expressed all the reported exchange rates in terms of the Swiss Franc (CHF).

The primary assumption underlying this analysis is that every country has the policy of stabilizing its exchange rate to a basket of various currencies. The coefficient, β_k, in the the above equation represents the weighting given to the currencies in the currency basket by any country. In cases where the coefficient of the target currency for the exchange rate is exactly unity, it means that the currency is pegged to one specific currency. Also, the coefficients of all the other currencies in such a case should all be equal to zero as well as the value of the standard error of the residual terms. However, if a currency is not specifically pegged to another currency but is just stabilized against the currency, the estimated β_k coefficient of the nominal anchor should be statistically large and almost close to unity and the standard error of the residuals should be relatively small. Unlike the special case of a single currency peg, a number of coefficients should be statistically large and close to unity when a currency is pegged or stabilized against a basket of various other currencies. When a country has a rather flexible exchange rate system, there is no need for the value of β_k coefficients to be statistically large and unlike the previous case the estimate for the standard error of the residual terms would be comparatively significant (Frankel and Wei, 1994).

Based on regression analysis, developing economies can be classified into three categories according to their observed exchange rate arrangements, i.e. pegged, intermediate and flexible in relation to their size of exchange rate volatility. Countries are said to be pegged if their volatility is less than 0.0075, intermediate if their volatility is between 0.0075 and 0.015, and flexible when their volatility is above 0.015.(Kawai, 2002)

For the multiple regressions, currencies from three emerging countries namely the ZARCHF, MXNCHF and INRCHF, and currencies from two developed countries such as the AUDCHF and NZDCHF will be studied against such independent variables as the USDCHF, CADCHF, EURCHF, JPYCHF and GBPCHF.
In chapter four the results of the different regression analyses will be discussed.

CHAPTER 4

RESULTS AND DISCUSSION

The tables that follow in this chapter shows the results obtained after running multiple regression analyses on the data. The main aim was to establish a model to explain the weights assigned to each of the major currencies by a given independent currency for the entire time period and then determine if this model holds for shorter periods. This was performed using the exchange rates of currencies from the emerging markets as dependent variables and those of the major economies as independent variables. The β values, which act as the weight assigned to that specific variable, will be examined. The standard error of regression should be small enough to guarantee that values are not hugely dispersed around the relationship. We would expect the variable with the highest coefficients to be selected and their standard error should be as small as possible in relation to the other variables. Finally I shall check the R- square of the generated model, which is an indication of how well the selected variables explain the dependent variable. (All currencies used the Swiss Franc as numeraire currency.).

Analysis Reports

The analysis has been done in four sections: the first of which is representative of the results of the whole data, portion I represents the results of data between 20th July 2005 and 2nd of August 2007, portion II represents data between 2nd of July 2003 and 19th of June 2005 and portion III represents data between 13th of June 2001 and 1st of July 2003.

Each portion will explain the type of exchange rate arrangements that a given dependent variable had in place at that specific time period. Rejection of Ho (a null hypothesis is written in shorthand form as H_0) against a specific exchange rate means that the particular coefficient is significantly different to zero, which is an indication that the independent variable had an effect on the dependent variable. If H_0 is rejected, it means that the coefficient is close to zero and the independent variable has no significant effect on the dependent variable. All the statistical tests were carried out at 5% level of significance.

Results for the currencies of the two developed countries, AUDCHF and NZDCHF will be stated first followed thereafter by results of the three emerging currencies, ZARCHF, MXNCHF and INRCHF. The tables that follow below represent the results obtained after carrying out a multiple regression analysis of different currencies (ZARCHF, INDCHF, MXNCHF, AUDCHF and NZDCHF) with respect to the five major currencies (USDCHF, EUROCHF, GBPCHF, JPYCHF, USDCAD).

Table 4.1: Table of AUDCHF multiple regression model results against the major currencies showing the error value (whole data)

AUDCHF Whole Data	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power -5%
Intercept	1	4.81E-04	4.81E-04			
Model	5	0.161524	3.23E-02	1451.594	0.000001	0.999465
Error	1597	3.55E-02	2.23E-05			
Total(Adjusted)	1602	0.197064	1.23E-04			

In this section the aim is to determine the mean square error which will be used to determine whether the volatility of the specific currency is either Pegged (0<=volatility < 0.0075), Intermediate (0.0075<= Volatility <0.015) or Flexible (Volatility>=0.015).
The mean square error is 0.00355 which is smaller than 0.0075. According to the definition volatility falls in the pegged volatility class for the whole data (see table 8).

Table 4.2: AUDCHF multiple regression results for coefficients against the major currencies (whole data)

Independent Variable	Regression coefficient	Standard Error	T-Value (Ho:B=0)	Prob. Level	Decision at -5%
Intercept	5.35E-05	1.18E-04	0.4529	0.650711	Accept Ho
EURCHF	-0.63162	6.09E-02	-10.3698	0	Reject Ho
GBPCHF	-0.27269	3.63E-02	-7.503	0	Reject Ho
JPYCHF	-0.17821	2.59E-02	-6.8809	0	Reject Ho
CADCHF	-0.37761	2.85E-02	-13.2514	0	Reject Ho
USDCHF	2.094685	3.19E-02	65.5791	0	Reject Ho
R-Squared	0.819649				

As shown in table 4.2, all independent variables were selected, meaning that they all had an effect on the Australian Dollar. The value of the coefficient allocated to the US Dollar is quite high (and positive) with respect to all the others meaning that it has a higher positive contribution towards the final model. Based on this analysis it can be concluded that the US Dollar is a better nominal anchor candidate for the Australian Dollar as compared to the others during the period under study.

The value of the R-square for the general model is quite high at 0.819649, meaning that the model explains approximately 82% of the dependent variable; this is a very good accountability according to the statistical standards.

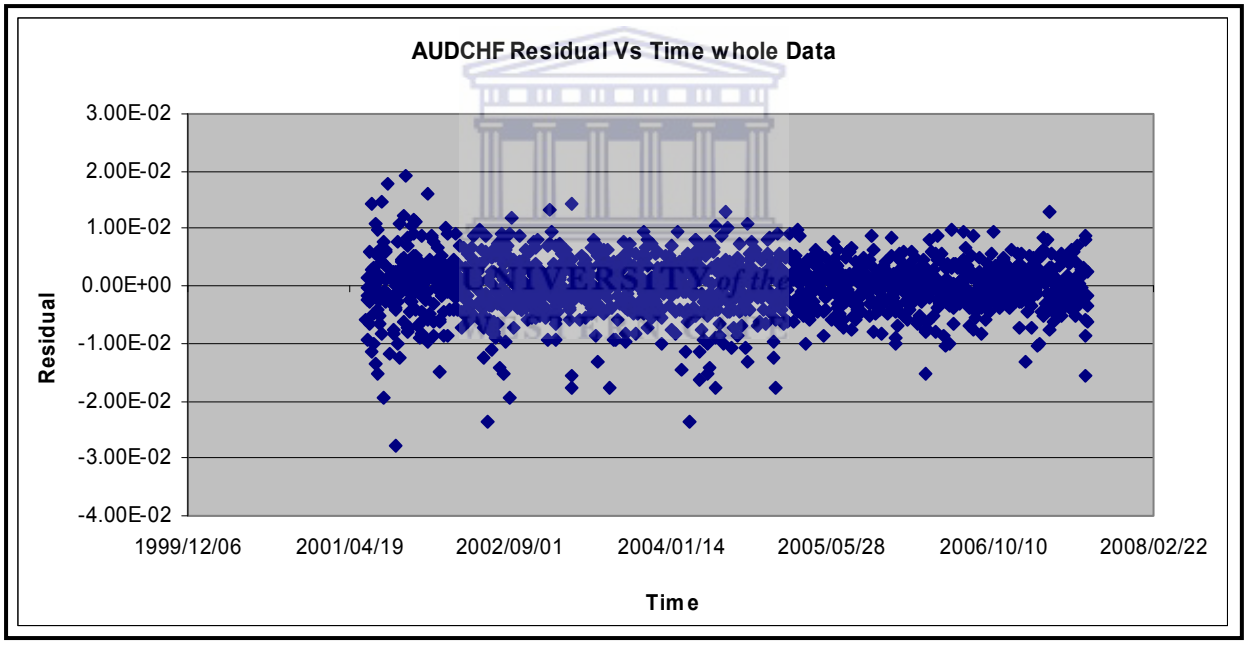


Figure 4.1. Scatter plot of the residuals versus time.

Results of figure 4.1 show that the residuals are close to zero and we do not seem to have a problem with the occurrence of outliers. The residuals seem to be symmetric along the zero line and their mean can thus be expected to be zero. Also, the residuals do not seem to show any trend with respect to time. From these points we can conclude that our model is adequate.

Table 4.3: Table of AUDCHF multiple regression model results against the major currencies showing the error value(first portion).

AUDCHF Portion 1	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power -5%
Intercept	1	6.68E-05	6.68E-05			
Model	5	3.69E-02	7.37E-03	537.5422	0.000001	0.999465
Error	528	7.24E-03	1.37E-05			
Total(Adjusted)	533	4.41E-02	8.27E-05			

Results of table 4.3 show a mean square error of 0.0072 < 0,0075 which indicates that also this portion of the data falls in the pegged volatility class (0<=volatility < 0.0075).

Table 4.4: Multiple regression of AUDCHF against the major currencies (first portion).

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho:B=0)	Prob. Level	Decision at -5%
Intercept	-6.22E-05	1.61E-04	-0.3863	0.699428	Accept Ho
EURCHF	-0.55799	9.83E-02	-5.6757	0	Reject Ho
GBPCHF	-0.4222	5.97E-02	-7.0726	0	Reject Ho
JPYCHF	-5.97E-02	4.06E-02	-1.4701	0.142118	Accept Ho
CADCHF	-0.32482	3.99E-02	-8.1419	0	Reject Ho
USDCHF	2.052783	4.83E-02	42.4867	0	Reject Ho
R-Squared	0.835806				

The Japanese Yen was not included in the analysis shown in table 3.4. A coefficient value of -0.0597 is very small meaning that it's contribution to the value of the Australian Dollar was insignificant. As in the previous case of the whole data section, the US Dollar plays a significant role with a coefficient of 2.052783. The R-square of 0.8358 is an indication of a good prediction of the model.

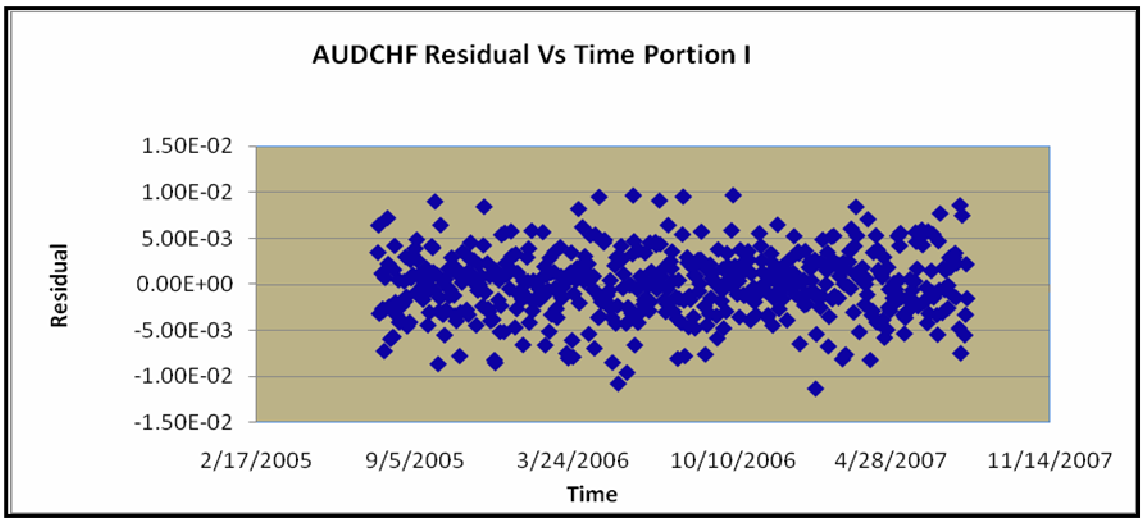


Figure 4.2: Scatter plot of residuals over time for portion 1 of the data

This figure shows that the residuals are close to zero and there are no outliers. The residuals seem to be symmetric along the zero line and their mean can thus be expected to be zero.we cannot associate any tread with time. From these points we can conclude that our model is adequate.

Table 4.5: Multiple regression model results for AUDCHF against the major currencies showing the error value (second portion)

AUDCHF Portion 2	**DF**	**Sum of Squares**	**Mean Square**	**F-Ratio**	**Probability Level**	**Power -5%**
Intercept	1	4.31E-05	4.31E-05			
Model	5	8.22E-02	1.64E-02	800.9892	0.000001	0.999465
Error	528	1.08E-02	2.05E-05			
Total(Adjusted)	533	9.31E-02	1.75E-04			

The mean square error was negligable at 0.0000205, this is an indication that the currency falls under pegged exchange rate during this time period.

Table 4.6: Multiple regression model results for AUDCHF against the major currencies (second portion)

Independent Variable	Regression Coefficient	Standard Error	T-Value (H_0: B=0)	Prob. Level	Decision at - 5%
Intercept	6.60E-05	1.96E-04	0.3364	0.736684	Accept H_0
EURCHF	-0.58162	0.107161	-5.4276	0	Reject H_0
GBPCHF	-0.43116	5.76E-02	-7.4819	0	Reject H_0
JPYCHF	-0.35436	0.04202	-8.4331	0	Reject H_0
CADCHF	-0.22858	4.50E-02	-5.0751	0.000001	Reject H_0
USDCHF	2.250637	4.49E-02	50.1566	0	Reject H_0
R-Squared	0.883519				

Just like the whole data, results of the second portion present similar results except that in this case the value of the R-squared increased to 0.8835, which is an indication of a better prediction of the model than what the whole data indicated.

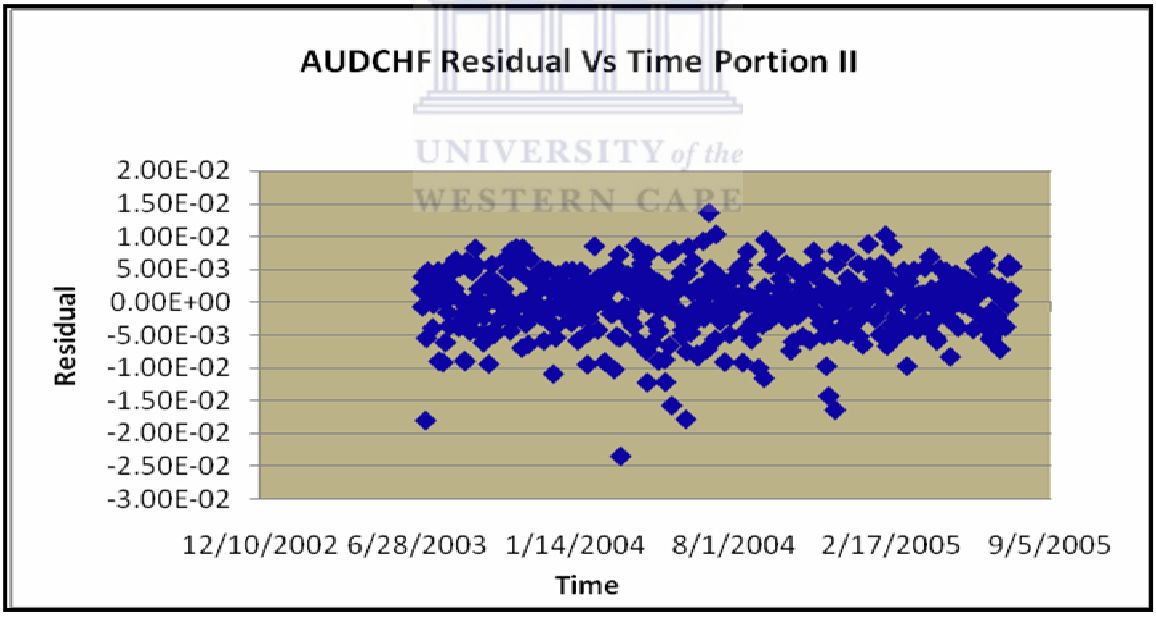


Figure 4.3: Scatter plot of residuals over time for portion 1 of the data

The residual plot of this portion seems to be similar to that of the whole data. A few stray points are detected but the values are still very small.

Table 4.7: Multiple regression of AUDCHF against the major currencies showing the error value (third portion).

AUD CHF Portion 3	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power -5%
Intercept	1	5.40E-04	5.40E-04			
Model	5	4.46E-02	8.91E-03	310.8402	0.000001	0.999465
Error	529	1.52E-02	2.87E-05			
Total(Adjusted)	534	5.97E-02	1.12E-04			

The mean square error value was 0.0000112, which falls under the category of pegged exchange rate class (0<=volatility < 0.0075).

Table 4.8: Multiple regression model results of AUDCHF against the major currencies (third portion)

Independent Variable	**Regression Coefficient**	**Standard Error**	**T-Value (Ho: B=0)**	**Prob. Level**	**Decision at -5%**
Intercept	1.69E-04	2.33E-04	0.7256	0.468389	Accept Ho
EURCHF	-0.72114	0.102588	-7.0295	0	Reject Ho
GBPCHF	7.18E-02	6.87E-02	1.0452	0.296398	Accept Ho
JPYCHF	-9.61E-02	4.88E-02	-1.9689	0.049481	Reject Ho
CADCHF	-0.50213	6.17E-02	-8.133	0	Reject Ho
USDCHF	1.877257	7.40E-02	25.366	0	Reject Ho
R-Squared	0.746064				

In this case the British Pound was not included in the model, as its coefficient value of 0.0718 is very small and thus has no significant contribution towards the final model. Though the value of the coefficient of the US Dollar is still the highest, it has reduced considerably in comparison to all the other results. The R-squared of 0.746064 still signifies that the model is adequate for explaining the data.

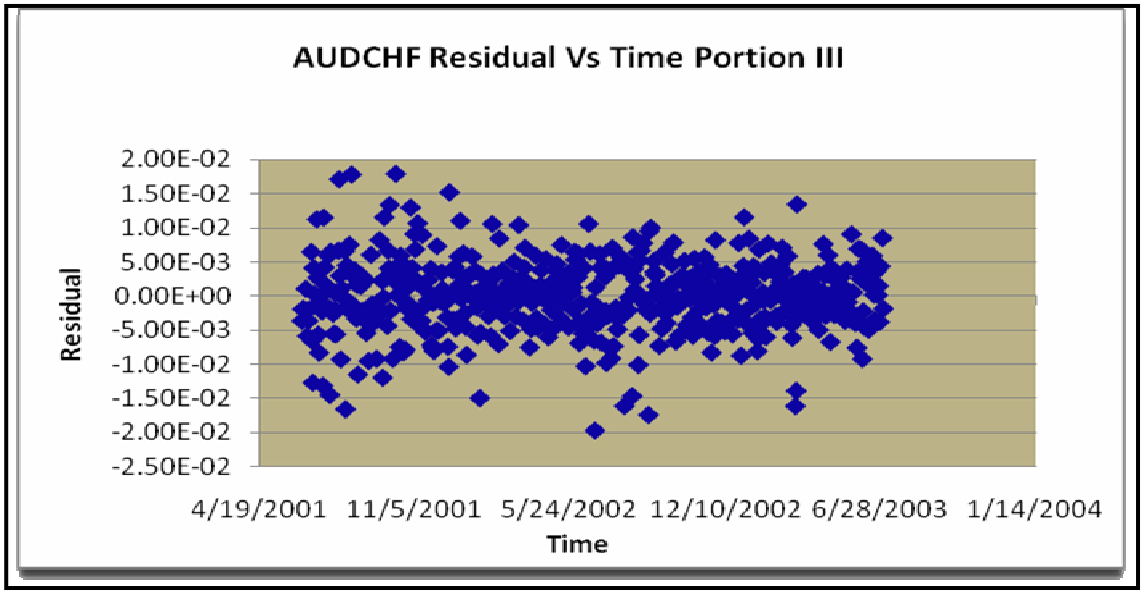


Figure 4.4: Scatter plot of residuals for portion 2 of the data

The residual plots are almost the same as those of the previous sections with no strong pattern being revealed. The results for the NZDCHF analysis are summarised in table 4.9.

Table 4.9: Table of NZDCHF multiple regression against the major currencies showing the error values (whole data, first portion, second portion and third portion)

NZD CHF Whole Data	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power -5%
Intercept	1	6.12E-04	6.12E-04			
Model	5	0.156364	3.13E-02	940.0977	0.000001	0.999465
Error	1597	5.31E-02	3.33E-05			
Total(Adjusted)	1602	0.209489	1.31E-04			
Portion 1	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power -5%
Intercept	1	6.55E-05	6.55E-05			
Model	5	3.51E-02	7.01E-03	224.3206	0.000001	0.999465
Error	528	1.65E-02	3.13E-05			
Total(Adjusted)	533	5.16E-02	9.68E-05			
Portion 2	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power -5%
Intercept	1	5.84E-05	5.84E-05			
Model	5	8.10E-02	1.62E-02	571.0191	0	1
Error	528	1.50E-02	2.84E-05			
Total(Adjusted)	533	9.59E-02	1.80E-04			
Portion 3	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power -5%
Intercept	1	7.34E-04	7.34E-04			
Model	5	4.32E-02	8.64E-03	246.4471	0.000001	0.999465
Error	529	1.85E-02	3.50E-05			
Total(Adjusted)	534	6.17E-02	1.16E-04			

The multiple regression model results are summarized in table 4.10 below.

Table 4.10: Multiple regression of NZDCHF against the major currencies (whole data, first portion, second portion and last portion)

NZDCHF Whole data					
Independent Variable	**Regression Coefficient**	**Standard Error**	**T-Value (Ho: B=0)**	**Prob. Level**	**Decision at -5%**
Intercept	1.24E-04	1.44E-04	0.859	0.39048	Accept Ho
EURCHF	-0.62823	7.45E-02	-8.4363	0	Reject Ho
GBPCHF	-0.39108	4.44E-02	-8.8014	0	Reject Ho
JPYCHF	-0.11977	3.17E-02	-3.7823	0.000161	Reject Ho
CADCHF	-0.2992	3.48E-02	-8.588	0	Reject Ho
USDCHF	2.035369	3.91E-02	52.1199	0	Reject Ho
R-Squared	0.746407				
First portion					
Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob. Level	Decision at -5%
Intercept	-1.25E-04	2.43E-04	-0.5143	0.607237	Accept Ho
EURCHF	-0.50955	0.148454	-3.4324	0.000645	Reject Ho
GBPCHF	-0.66517	9.01E-02	-7.3794	0	Reject Ho
JPYCHF	0.128388	6.14E-02	2.0923	0.036886	Reject Ho
CADCHF	-0.28782	6.02E-02	-4.7778	0.000002	Reject Ho
USDCHF	1.940244	7.30E-02	26.5941	0	Reject Ho
R-Squared	0.679923				
Second portion					
Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob. Level	Decision at -5%
Intercept	1.25E-04	2.31E-04	0.5423	0.587849	Accept Ho
EURCHF	-0.62755	0.125931	-4.9833	0.000001	Reject Ho
GBPCHF	-0.54321	6.77E-02	-8.0213	0	Reject Ho
JPYCHF	-0.3086	4.94E-02	-6.2494	0	Reject Ho
CADCHF	-0.12691	5.29E-02	-2.3979	0.016836	Reject Ho
USDCHF	2.2014	5.27E-02	41.7471	0	Reject Ho
R-Squared	0.84393				
Third portion					
Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob. Level	Decision at -5%
Intercept	3.64E-04	2.58E-04	1.4145	0.157795	Accept Ho
EURCHF	-0.67222	0.113434	-5.9261	0	Reject Ho
GBPCHF	7.10E-03	7.60E-02	0.0935	0.925568	Accept Ho
JPYCHF	-0.13549	5.40E-02	-2.5109	0.012341	Reject Ho
CADCHF	-0.37971	6.83E-02	-5.5622	0	Reject Ho
USDCHF	1.816119	8.18E-02	22.1935	0	Reject Ho
R-Squared	0.699643				

Table 4.10 gives us a summary of the Multiple regression analysis of NZDCHF portions. The Regression Coefficient column indicates the weight allocated to each of the independent currencies at a given time period specified by the different portions, the decision column indicates whether the independent currency should be included in the regression model or not. As in the case of the Australian Dollar, all the independent variables were selected with the R- square having a value of 0.746407. The independent variables are a good predictor of the dependent variable meaning that a change in the independent variable will have a significant effect on the dependent variable as 75% of the variation is explained by the independent variables. Again the US Dollar was presented as the best nominal anchor candidate for the New Zealand Dollar and had a coefficient of 2.035369.

As discussed earlier in the whole data section, the first portion of the New Zealand Dollar had all the independent variables selected for the model. The US Dollar appears to be the best candidate with a weight of 1.940244 assigned to it. The value of the R- squared also dropped to 0.679923 meaning that approximately 68% of the dependent variable can be explained from by the independent variables which is quit adequate.

For the second portion, all the independent variables were included in the model again with the US Dollar acting as the best candidate for the nominal anchor. Compared to the other two sections, the R– square value increased to 0.84393, which is a very good predictor for the model.

In the third portion, the British Pound was excluded from the model with a coefficient of 0.0071. This value is too small to have any significant contribution to the model. Similar to all the previous cases the US Dollar appears to be the best candidate for the New Zealand Dollar.

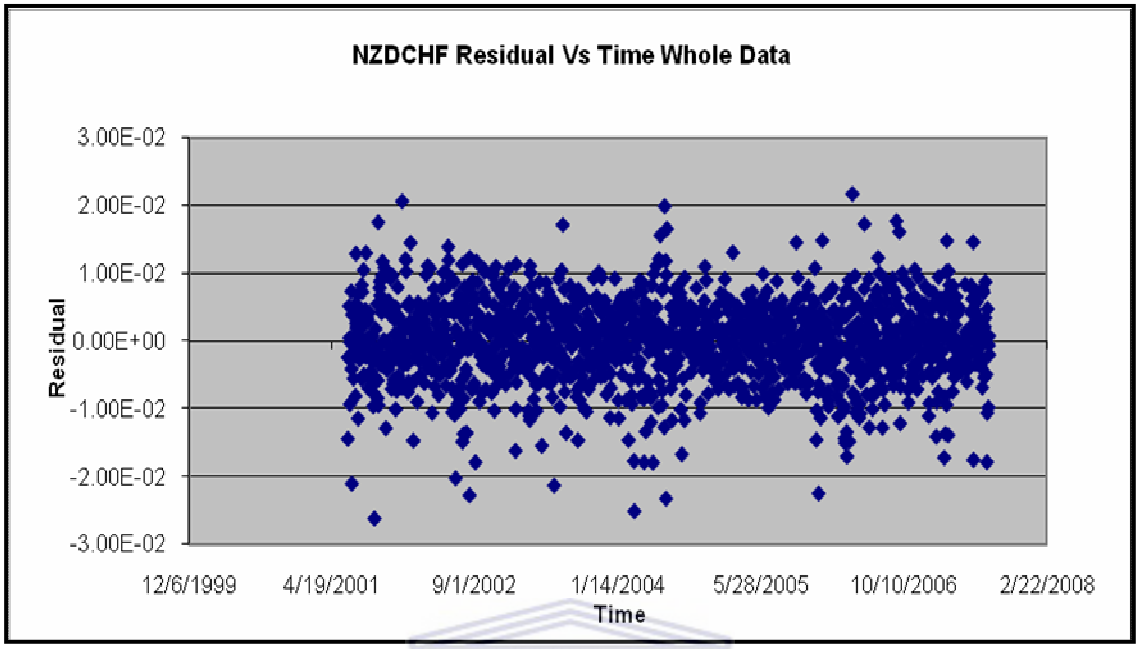


Figure 4.5: Scatter plot of residuals for the data over time

The residual values are almost symmetrical along the zero line and do not seem to follow any specific pattern. This is a good indication that we can rely on our model. The number of stray points is still very small.

Having studied the two developed countries' currencies over the entire data set and also for the three periods, the three emerging countries' currencies are presented below with the same pattern of analysis. The Mexican Peso is presented first, followed by the South African Rand and the section is concluded with the Indian Rupee's results.

Table 4.11: Multiple regression of the MXNCHF model against the major currencies showing the error values (whole data, first portion, second portion and third portion)

MXNCHF Whole Data	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power -5%
Intercept	1	2.16E-04	2.16E-04			
Model	5	7.07E-02	1.41E-02	591.7865	0.000001	0.999465
Error	1597	3.82E-02	2.39E-05			
Total(Adjusted)	1602	0.108918	6.80E-05			
Portion 1						
Intercept	1	1.69E-05	1.69E-05			
Model	5	1.52E-02	3.05E-03	158.6882	0.000001	0.999465
Error	528	1.01E-02	1.92E-05			
Total(Adjusted)	533	2.54E-02	4.76E-05			
Portion 2						
Intercept	1	6.31E-06	6.31E-06			
Model	5	2.46E-02	4.93E-03	239.9837	0.000001	0.999465
Error	528	1.08E-02	2.05E-05			
Total(Adjusted)	533	0.035471	6.65E-05			
Portion 3						
Intercept	1	3.54E-04	3.54E-04			
Model	5	3.23E-02	6.46E-03	219.1024	0.000001	0.999465
Error	529	1.56E-02	2.95E-05			
Total(Adjusted)	534	4.79E-02	8.97E-05			

Table 4.12 : Multiple regression coefficients results of MXNCHF against the major currencies (whole data, first portion , second portion and third portion).

Entire Data					
Independent variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob. Level	Decision at - 5%
Intercept	1.49E-04	1.22E-04	1.2208	0.222355	Accept Ho
EURCHF	0.220923	6.31E-02	3.4995	0.000479	Reject Ho
GBPCHF	1.79E-02	3.77E-02	0.4762	0.634012	Accept Ho
JPYCHF	2.20E-03	0.026844	0.082	0.934686	Accept Ho
CADCHF	0.109141	2.95E-02	3.6954	0.000227	Reject Ho
USDCHF	0.916547	3.31E-02	27.6854	0	Reject Ho
R-Squared First portion	0.649468				
Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob. Level	Decision at - 5%
Intercept	1.67E-04	1.91E-04	0.8739	0.382573	Accept Ho
EURCHF	0.47158	0.11633	4.0538	0.000058	Reject Ho
GBPCHF	3.38E-02	7.06E-02	0.4782	0.632681	Accept Ho
JPYCHF	1.55E-02	4.81E-02	0.3225	0.747185	Accept Ho
CADCHF	0.203541	4.72E-02	4.3118	0.000019	Reject Ho
USDCHF	0.77255	5.72E-02	13.5132	0	Reject Ho
R-Squared Second portion	0.600436				
Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob. Level	Decision at - 5%
Intercept	4.01E-05	1.96E-04	0.2045	0.838047	Accept Ho
EURCHF	7.02E-02	0.107141	0.6552	0.512644	Accept Ho
GBPCHF	8.32E-02	5.76E-02	1.4432	0.14955	Accept Ho
JPYCHF	0.123571	0.042012	2.9413	0.003412	Reject Ho
CADCHF	5.93E-03	4.50E-02	0.1317	0.895235	Accept Ho
USDCHF	0.804106	4.49E-02	17.9233	0	Reject Ho
R-Squared Third portion	0.69443				
Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob. Level	Decision at-5%
Intercept	2.15E-04	2.36E-04	0.9105	0.362983	Accept Ho
EURCHF	0.245736	0.104065	2.3614	0.018569	Reject Ho
GBPCHF	-0.17207	6.97E-02	-2.4692	0.013858	Reject Ho
JPYCHF	-7.36E-02	4.95E-02	-1.4866	0.137703	Accept Ho
CADCHF	1.23E-02	6.26E-02	0.196	0.844652	Accept Ho
USDCHF	1.265746	7.51E-02	16.8603	0	Reject Ho
R-Squared	0.674364				

For the Mexican Peso both the British Pound and the Japanese Yen were not included in the model; both had small coefficients (0.0179 and 0.0022), having no significant influence on the model. In addition, the value of the standard error for the Japanese Yen is relatively high in comparison to those for the other variables. The R-square value of 0.649468 indicates that the model explains the variation adequately. At a coefficient value of 0.916547, the US Dollar can be taken as the best candidate for the Mexican Peso.

The first portion of the Mexican Peso had similar results compared to the previous results for the entire data set and the same interpretations can be used.

Unlike the previous sections for the second portion of data, the Japanese Yen was selected together with the US Dollar. All the other independent variables had coefficient values that were too low to have any significant contribution to the model.

For portion three, the Japanese Yen and the Canadian Dollar had the lowest values for their respective coefficients and they were not included.

Only the residual plot over time for the whole data set is displayed below.

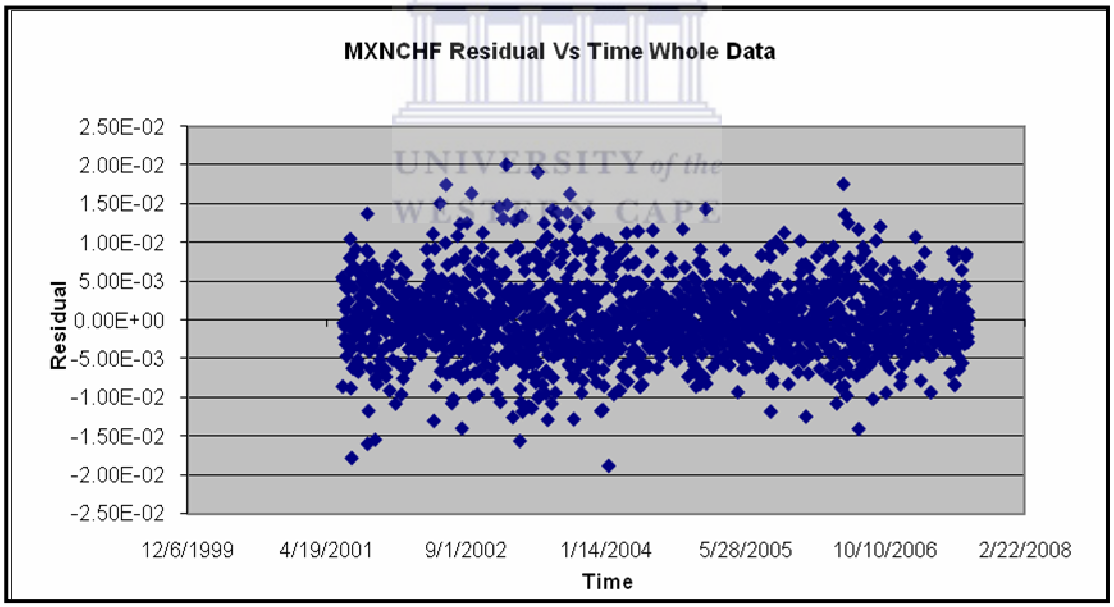


Figure 4.6: Scatterplot of residuals over time

No pattern can be detected and there seems to be no problems with the outliers as the numbers of stray points are quite few. This is an indication that we can relay on our model.

The second emerging country studied was the South African Rand. Results are presented below.

Table 4.13: Multiple regression model results for ZARCHF against the major currencies showing the error values (whole data, first portion, second portion and third portion).

ZARCHF Whole Data	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power -5%
Intercept	1	4.15E-05	4.15E-05			
Model	5	2.50E-02	5.01E-03	40.0288	0.000001	0.999465
Error	1597	0.199734	1.25E-04			
Total(Adjusted)	1602	0.224766	1.40E-04			
Portion 1						
Intercept	1	3.48E-05	3.48E-05			
Model	5	9.33E-03	1.87E-03	31.5134	0.000001	0.999465
Error	528	3.13E-02	5.92E-05			
Total(Adjusted)	533	4.06E-02	7.61E-05			
Portion 2						
Intercept	1	1.06E-05	1.06E-05			
Model	5	4.30E-03	8.60E-04	7.6667	0.000001	0.999465
Error	528	5.92E-02	1.12E-04			
Total(Adjusted)	533	6.35E-02	1.19E-04			
Portion 3						
Intercept	1	7.25E-05	7.25E-05			
Model	5	0.01786	3.57E-03	18.3884	0.000001	0.999465
Error	529	0.102757	1.94E-04			
Total(Adjusted)	534	0.120617	2.26E-04			

Table 4.13 shows Volatilities of 0.000125 for the whole portion, 0.000059 for the first portion, 0.000112 for the second portion and 0.00019 for the last portion of the ZARCHF data which places all the groups in the pegged exchange rate class as they are smaller than 0.0075.

Table 4.14: ZARCHF multiple regression against the major currencies (whole data, first portion, second portion and third portion)

Whole data					
Independent Variable	**Regression Coefficient**	**Standard Error**	**T-Value (Ho: B=0)**	**Prob. Level**	**Decision at -5%**
Intercept	1.54E-04	2.80E-04	0.55	0.582417	Accept Ho
EURCHF	0.497872	0.144393	3.448	0.000579	Reject Ho
GBPCHF	0.251814	8.62E-02	2.9227	0.003519	Reject Ho
JPYCHF	8.58E-02	6.14E-02	1.3972	0.162553	Accept Ho
CADCHF	0.351736	6.76E-02	5.2068	0	Reject Ho
USDCHF	7.74E-03	7.57E-02	0.1022	0.918572	Accept Ho
R-Squared First portion	0.111368				
Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob. Level	Decision at -5%
Intercept	4.94E-04	3.35E-04	1.4762	0.140492	Accept Ho
EURCHF	0.884057	0.204266	4.328	0.000018	Reject Ho
GBPCHF	0.318136	0.124027	2.5651	0.010591	Reject Ho
JPYCHF	-0.20288	8.44E-02	-2.4029	0.01661	Reject Ho
CADCHF	0.388503	8.29E-02	4.687	0.000004	Reject Ho
USDCHF	0.101985	0.100386	1.0159	0.310131	Accept Ho
R-Squared Second portion	0.229835				
Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob. Level	Decision at -5%
Intercept	-1.02E-04	4.58E-04	-0.223	0.823634	Accept Ho
EURCHF	0.348343	0.250384	1.3912	0.164741	Accept Ho
GBPCHF	0.284655	0.134648	2.1141	0.034978	Reject Ho
JPYCHF	0.303098	9.82E-02	3.0871	0.002127	Reject Ho
CADCHF	0.158403	0.105234	1.5052	0.132859	Accept Ho
USDCHF	-0.26672	0.104845	-2.544	0.011243	Reject Ho
R-Squared Third portion	0.067687				
Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob. Level	Decision at -5%
Intercept	-2.85E-05	6.06E-04	-0.047	0.962539	Accept Ho
EURCHF	0.417674	0.267056	1.564	0.118416	Accept Ho
GBPCHF	-1.13E-03	0.178832	-0.0063	0.994956	Accept Ho
JPYCHF	0.206382	0.12704	1.6245	0.104856	Accept Ho
CADCHF	0.247856	0.160719	1.5422	0.12363	Accept Ho
USDCHF	0.452583	0.192654	2.3492	0.01918	Reject Ho
R-Squared	0.148069				

For the South African Rand, the US Dollar and the Japanese Yen were left out from the model; they had coefficient values of 0.00774 and 0.0858 respectively, which means that they had a negligible contribution towards the Rand model. The EURO had the highest coefficient value, which places it as the best nominal anchor candidate for the South African Rand. The value of the R-square was quite small at 0.111368, which means that the dependent variables are poor predictors of the ZARCHF model as they only explain 11% of the model for the whole data set.

For the first portion, the US Dollar was left out from the model; it had a coefficient value of 0.101985, which, though greater than the previous one, has no significant contribution towards the Rand model. Again, the EURO had the highest coefficient value) at 0.884057, which places it as the best candidate for the South African Rand. This value is also very close to one during this period of time. The value of the R-square was quite small at 0.229835, which means that the dependent variables are poor predictors of the ZARCHF model as the model only explain 23% of the variation.

In portion two surprisingly the EURO and the Canadian Dollar were left out of the model, even though the coefficient of the EURO is still the highest at 0.348343; the value of the standard error is quite high at 0.250384. All independent variables have a lesser influence with R-square at 0.067687; this is too low for model adequacy. Other methods will have to be employed but this is beyond the scope of the project.

When portion three was analyzed, only the US Dollar was included in the model. Its coefficient value of 0.452583 is quite high in comparison to the others and this could be an indication that at this period of time the US Dollar had a major influence on the South African Rand. Again the R-square value of 0.148069 is still low and is an indication of poor prediction of the model as only 15% of the model is accounted for by the independent variables.

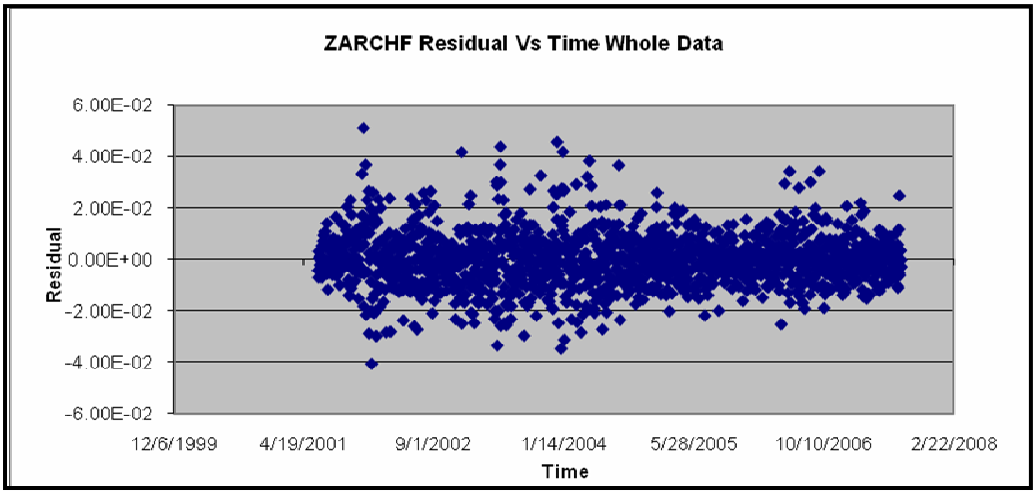


Figure 7: Scatter plot of residuals over time

Results for the analysis of the Indian Rupee follow below.

Table 7: Table of INRCHF multiple regression against the major currencies showing the error values (whole data, first portion, second portion and third portion).

INR CHF Whole Data	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power -5%
Intercept	1	3.63E-05	3.63E-05			
Model	5	6.06E-02	1.21E-02	1522.602	0.000001	0.999465
Error	1597	0.012716	7.96E-06			
Total(Adjusted)	1602	7.33E-02	4.58E-05			
Portion 1						
Intercept	1	4.34E-07	4.34E-07			
Model	5	1.10E-02	2.20E-03	199.6835	0.000001	0.999465
Error	528	5.82E-03	1.10E-05			
Total(Adjusted)	533	0.016815	3.15E-05			
Portion 2	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power -5%
Intercept	1	6.85E-07	6.85E-07			
Model	5	2.65E-02	5.29E-03	612.3862	0.000001	0.999465
Error	528	4.56E-03	8.64E-06			
Total(Adjusted)	533	3.10E-02	5.82E-05			
Portion 3						
Intercept	1	1.42E-04	1.42E-04			
Model	5	2.33E-02	4.66E-03	1177.239	0.000001	0.999465
Error	529	2.09E-03	3.96E-06			
Total(Adjusted)	534	2.54E-02	4.75E-05			

The regression mean square errors are 0.0000079 for the whole data, 0.0000011 for portion 1, 0.0000086 for portion 2 and 0.0000039 for the last portion. These small values all classify the INRCHF as pegged exchange rate arrangements according to this exercise.

Table 7.1: Table of INRCHF multiple regression against the major currencies (whole data, first portion, second portion and third portion)

Whole data					
Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob. Level	Decision at -5%
Intercept	-7.86E-05	7.07E-05	-1.1122	0.266213	Accept Ho
EURCHF	0.033201	0.036433	0.9113	0.362291	Accept Ho
GBPCHF	9.11E-02	2.17E-02	4.1916	0.000029	Reject Ho
JPYCHF	5.69E-02	1.55E-02	3.6717	0.000249	Reject Ho
CADCHF	1.07E-02	1.70E-02	0.6279	0.530159	Accept Ho
USDCHF	0.880798	1.91E-02	46.1004	0	Reject Ho
R-Squared First portion	0.826602				
Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob. Level	Decision at -5%
Intercept	-9.96E-05	1.44E-04	-0.6893	0.490933	Accept Ho
EURCHF	0.138717	0.08812	1.5742	0.116047	Accept Ho
GBPCHF	0.143599	5.35E-02	2.6838	0.007507	Reject Ho
JPYCHF	0.09695	3.64E-02	2.6618	0.00801	Reject Ho
CADCHF	2.65E-02	0.035758	0.7417	0.458626	Accept Ho
USDCHF	0.761766	4.33E-02	17.59	0	Reject Ho
R-Squared Second portion	0.654092				
Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob. Level	Decision at -5%
Intercept	-1.13E-04	1.27E-04	-0.8841	0.377061	Accept Ho
EURCHF	0.110051	6.95E-02	1.5829	0.114048	Accept Ho
GBPCHF	5.69E-02	0.037389	1.5227	0.128445	Accept Ho
JPYCHF	9.04E-02	2.73E-02	3.3152	0.000979	Reject Ho
CADCHF	-1.87E-02	2.92E-02	-0.6391	0.52303	Accept Ho
USDCHF	0.880881	2.91E-02	30.2575	0	Reject Ho
R-Squared Third portion	0.852922				
Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob. Level	Decision at -5%
Intercept	-1.78E-05	8.65E-05	-0.2062	0.836693	Accept Ho
EURCHF	-4.78E-02	3.81E-02	-1.255	0.210019	Accept Ho
GBPCHF	4.65E-02	2.55E-02	1.8219	0.069029	Accept Ho
JPYCHF	1.47E-03	1.81E-02	0.0812	0.935316	Accept Ho
CADCHF	8.44E-03	2.29E-02	0.368	0.712997	Accept Ho
USDCHF	0.981634	2.75E-02	35.7021	0	Reject Ho
R-Squared	0.917539				

The Indian Rupee had the EURO and the Canadian Dollar left out from it's model. Though the Japanese Yen has a relatively small coefficient value, its standard error value is very low in

comparison to the other independent variables. A value of 0.826602 for the R-square means that the model is well predicted for the whole data set.

For portion one, the US Dollar emerged as the best nominal anchor candidate for the Indian Rupee with a coefficient value of 0.761766. Also, 65% of the model can be accounted for by the independent variables, which is an indication of a good model.

In the case of portion two only the Japanese Yen and the US Dollar were selected to fit the model with the US Dollar emerging as the best candidate for the Indian Rupee. The prediction of the model is very good at 85% as indicated by an R-square of 0.852922.

For portion three, only the US Dollar was selected as a possible nominal anchor candidate, the R-square value of 0.917539 is received from the analysis which gives a very good prediction of the model.

Residuals over time of the whole data set are displayed below.

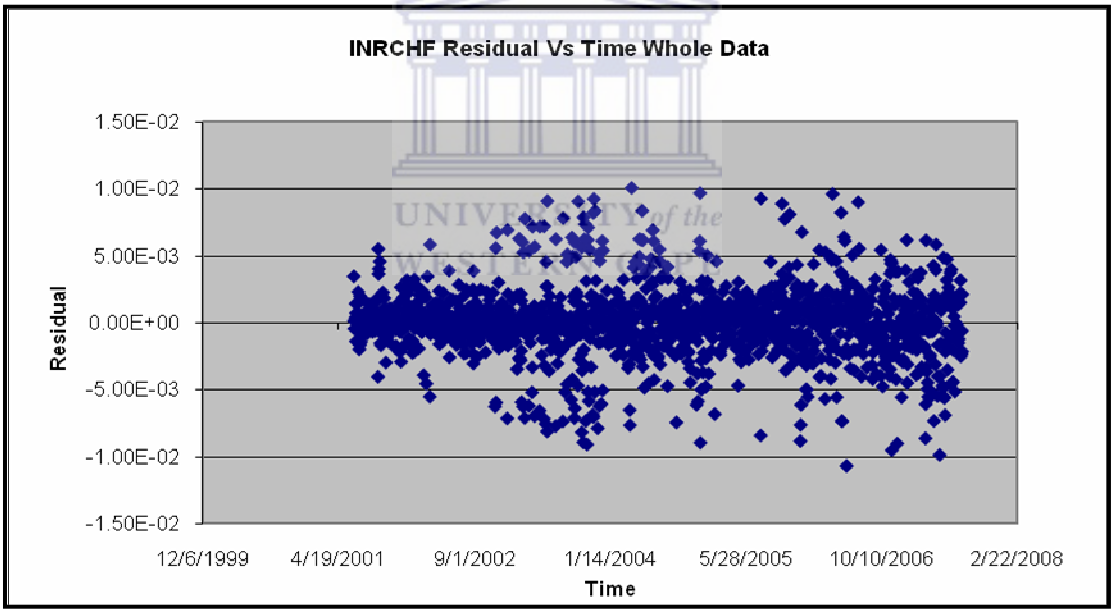


Figure 8: Scatterplot of residuals over time

The residual values are quite close to the zero line and do not follow any specific pattern; this can be taken as an indication that the model given above is explained adequately by the independent variables. The other plots for the individual sections can be explained the same way.

Table 8: A summary of the observed exchange rate arrangements (whole data, first portion, second portion and third portion**).**

	Sample Period	Dependent Variables	Basket of Significance
Pegged 0<=volatility < 0.0075	8/2/2007 -6/13/2001	AUDCHF	EURCHF,GBPCHF, JPYCHF, CADCHF, USDCHF
		NZDCHF	EURCHF,GBPCHF, JPYCHF, CADCHF, USDCHF
		MXNCHF	EURCH, CADCHF, USDCHF
		ZARCHF	EURCHF,GBPCHF, CADCHF
		INRCHF	GBPCHF, JPYCHF, USDCHF
	8/2/2007-7/21/2005	AUDCHF	EURCHF,GBPCHF, CADCHF, USDCHF
		NZDCHF	EURCHF,GBPCHF, JPYCHF, CADCHF, USDCHF
		MXNCHF	EURCHF, CADCHF, USDCHF
		ZARCHF	EURCHF,GBPCHF, JPYCHF, CADCHF
		INRCHF	GBPCHF, JPYCHF, USDCHF
	7/20/2005-7/4/2003	AUDCHF	EURCHF,GBPCHF, JPYCHF, CADCHF, USDCHF
		NZDCHF	EURCHF,GBPCHF, JPYCHF, CADCHF, USDCHF
		MXNCHF	JPYCHF,USDCHF
		ZARCHF	GBPCHF, JPYCHF, USDCHF
		INRCHF	JPYCHF, USDCHF
	7/3/2003-6/13/2001	AUDCHF	EURCHF, JPYCHF, CADCHF, USDCHF
		NZDCHF	EURCHF, JPYCHF, CADCHF, USDCHF
		MXNCHF	EURCHF,GBPCHF, USDCHF
		ZARCHF	USDCHF

		INRCHF	USDCHF
Intermediate 0.0075<= Volatility <0.015		-	
Flexible Volatility>=0.015		-	

The above table gives a summary of the observed exchange rate arrangements of the three emerging markets (AUDCHF, MXNCHF and ZARCHF) and two developed markets (NZDCHF and INRCHF). From the table it can be seen that all the analyzed exchange rates fell under the pegged exchange rate arrangement in all the four periods of data division.

The basket of significance gives a list of all the currencies that appear as significant in the regression equation. It can be noted that most of the economies have used a basket of currencies as their anchor but the South African Rand (ZARCHF) and the Indian Rupee (INRCHF) both used only the American dollar between June 2001 and July 2003.

Chapter five summarizes the study in a conclusion.

CHAPTER 5

CONCLUSION

In the course of this study literature on the exchange rate regimes has been examined. The type of exchange rate arrangements preferred by the currencies of two developed countries (the Australian Dollar and the New Zealand Dollar) and currencies of three emerging markets (the Mexican Peso, South African Rand and the Indian Rupee) has also been analyzed using currencies of five of the major role players in the world. The use of multiple regression processes to analyze patterns of exchange rate volatility and the estimated regression coefficients has been explored in order to establish the contribution of currencies of some of the developed countries as nominal anchors for the exchange rates from the chosen markets for the whole period (June 13th 2001 through to March 2nd 2007) and then broken down in three shorter sets of data. Different types of effects that major currencies have on the assessed currencies have also been discussed; in particular the effect that changes in volatility of a major currency may have on other currencies.

The study has also analyzed the different types of exchange rate arrangements giving advantages and disadvantages of most of them. Using the IMFs' "Recent Economic Developments and International Financial Statistics (2005)" table, countries relevant to this study have been grouped according to the type of exchange rate systems that they were using at that time. Using different time periods it has been shown that the data points to changes in their primary targets for exchange rate stabilization. The Australian Dollar and the New Zealand Dollar had more or less stable models for the whole period between 2001 and 2007 and also when data were broken down into shorter intervals. For the Mexican Peso, the US Dollar appeared to be the most preferred candidate. The trends shows that the South African Rand preferred the EURO and the US Dollar at different time periods .In the case of the Indian Rupee, the US Dollar continued to play a major role in all sections. In general, the US Dollar still plays a major role in the exchange rates of most currencies. One can only surmise how this current situation will change given the current weaknesses developing in the US dollar notwithstanding the fact that it has now reached

its all-time low. The Japanese Yen and the Canadian Dollar did not seem to play a major role as nominal anchors. From the observations of the R-squared values in all the sections it can be deduced that, apart from the South African models, all the other models are well explained by the independent variables as they all have R-square values above 60% with the Indian and the Australian models moving beyond 80%.

The residual versus time plots figures gave a clear indication of accuracy of the models proposed here as they all seem to be adequate due to the fact that the values are all close to zero meaning that there was very little divergence from the model. They seem to be symmetrical around the zero line for al the figures although the residuals do not follow any specific pattern. The analysis of exchange rate arrangements will continue to play a major role in the years to come, where every country will seek to stabilize its currency for various economic reasons. In this case monthly data, at five- year intervals, were used mostly by the IMF until now for analyzing these types of trends, even the time period chosen in future will have a crucial effect on the different countries' analyses. For South Africa, SADC and the whole continent of Africa where it has often been mentioned that the continent should adopt one currency, these discussions will become even more relevant.

REFERENCES

Bénassy-Quéré . Chauvin, S. 1999. Exchange Rate Regimes in Emerging Market Economies.

Carmen, M., Reinhart, Kenneth S. Rogoff. 2002. The Modern History of Exchange Rate arrangements.

Cheol, S. Eun. 2003. International Financial Management. MCGRAW-HILL.

Chow,K,H. Kim, Y. Wei S. 2007.Characterizing exchange rate policy in East Asia.

Darne, O. Laetitia, R, B. 2002.Exchange Rate Regime Classification And Real Performances.

Eichengreen, B. 1994. International Monetary Arrangements for The 21st Century. The Brookings Institution Washington, DC.

Esquivel, G. Larraín, F, B. 2002.The Impact of G-3 Exchange Rate Volatility on Developing Countries.

Fox, J. 2002. Nonlinear Regression and Nonlinear Least Squares.

Garson, G, D. 2007. Multiple Regression.

Herin J. Lindbeck A.Myhrman J. Flexible Exchange Rates and Stabilization Policy. Robert Z A. The Firm Under Pegged and Floating Exchange Rates. University of Chicago.

Kateryna, B.2004. Determinants Of Exchange Rate Regime Choice In CIS Countries.

Kawai, M. Akiyama, S. 1998. Implications of The Currency Crisis For Exchange Rate arrangements In Emerging East Asia.

Kawai, M. 2002. Exchange Rate Arrangements in East Asia: Lessons from the 1997-1998 Currency Crisis.

Krugman,P. Miller, M. 1991. Exchange Rate Targets and Currency Bands. Centre for Economic Policy Research.

Mendenhall, W.Sincich, T. 2003.A Second Course in Statistics: Regression Analysis, sixth edition. Pearson Education International.

Melamed L. 1988.The Flexible Exchange Rate. Murphy C J Reflexions on the Exchange Rate System. George Mason University Press.

Mundell, R. 2000. Currency Areas, Exchange Rate Systems and International Monetary Reform.Columbia University.

Nanto, D, K. 1998. The 1997-98 Asian Financial Crisis.

Reinhart, M, C. Rogoff, K, S. 2002. The Modern History Rate Arrangements.

Russell, R. 2007.Dow Theory Letters.

Sohmen E. Flexible Exchange Rates Revised Edition.Capital Movement. The University of Chicago Press Chicago and London.

Visser, S. 2007. Currency Risk. University of The Western Cape.

Wei, S, J. 2006. Connecting two views on financial globalization.

Zeileis, A. Shah, A. and Patnaik, I. 2007. Exchange Rate Regime Analysis Using Structural Change Methods.Department of Statistics and Mathematics Wirtschafts universität Wien.

Internet references

Absa Group Limited 1 Economic Perspective – Second Quarter 2006.

http://www.finforum.co.za/absa . 3rd November 2003.

African Single currency www.mg.co.za/articlepage.aspx? 24th September 2007.

Foreign Direct Investment Magazine. www.fdimagazine.com. 25th October 2007

Globalization and single currency http://econ.tu.ac.th/iccg/papers/hazel.doc. 24th September 2007.

Hard currency pegs and economic performance.
www.imf.org/external/ap/res/seminars/2004/calvol/pdf/edwar. 10th October 2007.

De Facto Exchange Rate Arrangement and Anchors of Monetary policy.
http://www.imf.org/external/np/mfd/er/2005/eng/1203.htm. 18th October 2007.

Journal of the Japanese and International Economies 12. 1989 Article No. jj980419.

http://en.wikipedia.org/wiki/Euro 2007. 14th October 2007.

Reuters 2007. International Trade Flows.

Appendix

The figures below show both the histograms of the residuals as well as the normal probability plots of the residuals. In this case I only reported the histograms and the normal probability plots of the residuals of the whole data. The histograms and the normal probability curves of the residuals of the divided sections portrayed similar partens like those of the whole data hence I did not report on them . From the histogram figures it is derived that the residuals of the two developed countries, Australia and New Zealand followed a normal distribution curve better than the emerging countries. This can be taken to mean that the New Zealand and the Australian models are more reliable than those of other countriels. The major cause of this could be the fact that these two countries are developed and hence their currencies are not easily affected by the market noises, this lead to the data having less outliers and hence leading to a more acculate model.The same holds for the normal probability plots where the errors of the residuals also followed a straight line better than for the emerging countries' currencies. The deviation at the tails of most emerging markets could be explained to have been caused by frequent changes in exchange rates as a result of market noise.

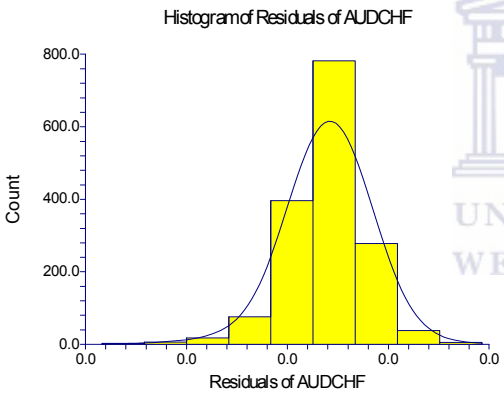


Figure 9a.

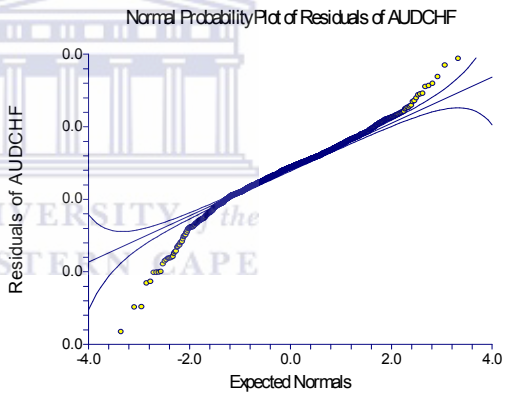


Figure 9b.

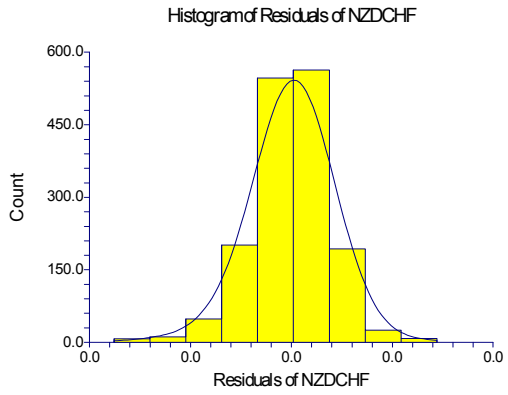


Figure 10a.

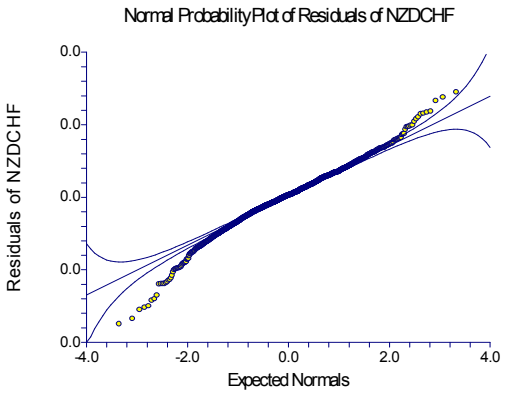


Figure 10b.

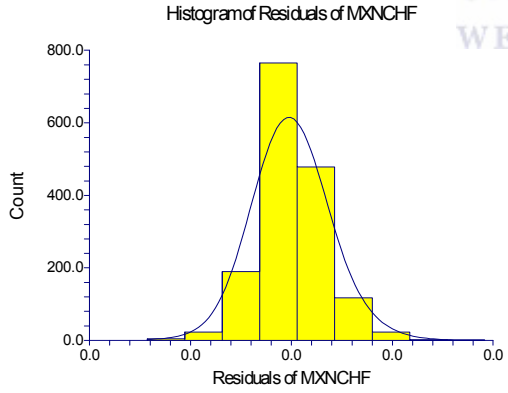


Figure 11a.

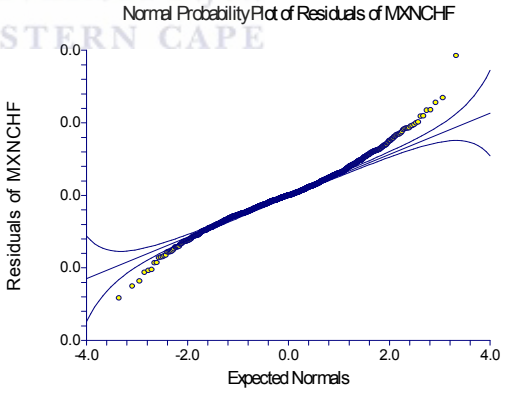


Figure 11b.

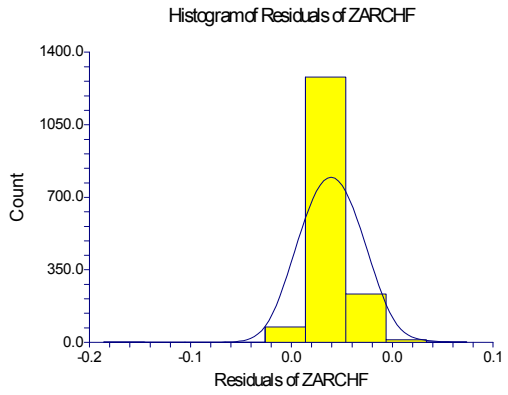


Figure 12a.

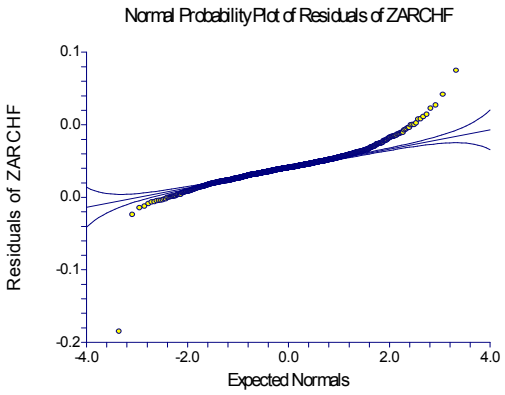


Figure 12b.

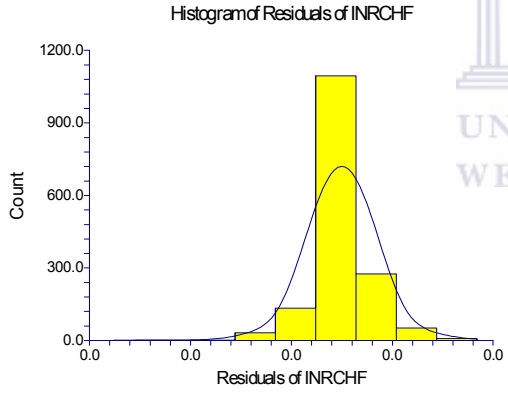


Figure 13a.

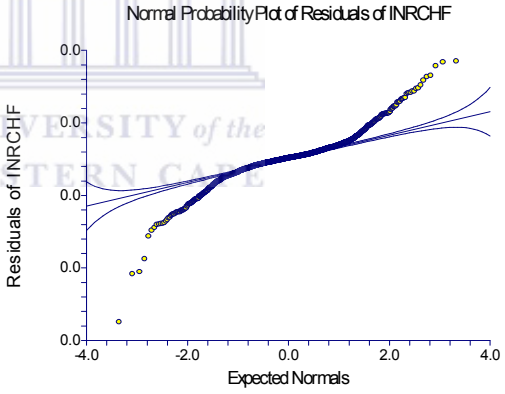


Figure 13b