

AN EVALUATION OF RETAIL AND WHOLESALE DUTCH AUCTION SYSTEMS OF
FOREIGN EXCHANGE RATE IN NIGERIA (2002-2010).

BY

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OCTOBER, 2012.

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BY

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DECLARATION

I hereby declare that the work in this thesis titled ‘An evaluation of the Retail and Wholesale Dutch Auction Systems of foreign exchange rate in Nigeria (2002-2010)’ was performed by Musa Aliyu in the Department of Economics under the supervision of Prof. Abdulganiyu Garba and Dr Peter Njiforti. The information derived from the literature has been duly acknowledged and a list of references provided. No part of this work has been published or presented for another degree here or another institution.

Musa Aliyu
Name

.....
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CERTIFICATION

This thesis titled ‘An evaluation of Retail and Wholesale Dutch Auction Systems of foreign exchange rate in Nigeria (2002-2010)’ meets the regulation governing the award of Masters Degree of Science of the Department of Economics of Ahmadu Bello University and is approved for its contribution to knowledge and literary presentation.

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DEDICATION

This thesis is dedicated to Almighty Allah who has bestowed on me knowledge to put this work together and to my dad Alh. Aliyu Umar Kuta for his constant passion for the programme.

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ABSTRACT

The study evaluated Retail Dutch Auction System (RDAS) and Wholesale Dutch Auction System (WDAS) of foreign exchange rate in Nigeria with a view to make comparative analysis between the two phases in terms of volatility of demand, supply and marginal rate, presence or absence of collusive behavior and exchange rate spreads. The study used bi-weekly Dutch Auction results of 824 sessions (comprising of 342 retail sessions and 482 wholesale sessions) between 2002-2010. The GARCH model and descriptive statistics were used to investigate the volatility of demand, supply and marginal rate. Also, descriptive statistics were used to analyze presence of collusive behaviour and exchange rate spreads. The study concluded that although marginal rate, demand and supply remained volatile under both retail and wholesale phase of the auction, they were more volatile under wholesale phase than retail phase of the auction. Also, higher excess demand and higher chance for collusive behaviour among bidders of foreign exchange were more prevalent in the wholesale phase than retail phase of the auction. The trend analysis showed that the introduction of Wholesale Dutch Auction System had led to a sustained convergence of the BDC, IFEM and WDAS rates even though it could not curtail the depreciation of the Naira. The following recommendations were made; firstly, the government should reduce excess demand by embarking on an import substitution strategy that will stimulate the domestic production base of the economy thereby reducing foreign exchange excess demand gap. Secondly, CBN foreign exchange policy shift should be followed-up by timely systematic analysis of its efficacy in yielding results so as to avoid frequent policy reversals. Thirdly, in the long term, the Dutch Auction System should be suspended because despite the modifications it had witnessed overtime, it had failed to stabilize the Naira during both retail and wholesale auction. Fourthly, the CBN should create a more market determined template for foreign exchange determination by devolving more of its monopoly power of foreign exchange supply so that excess demand gap can be narrowed. Finally, further studies should focus on investigating the effectiveness of the recently introduced foreign exchange rate forwards with the aim of evaluating its impact on the stability of the exchange rate.

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CHAPTER ONE GENERAL INTRODUCTION

1.1 BACKGROUND OF THE STUDY

The Dutch Auction System has been used by less developed countries since the 1980's to date with the expectation that it will enthrone an efficient foreign exchange market. The experiences of Ghana and Uganda suggested that the auction system was quite successful. Equally, Ethiopia had achieved a slight depreciation of its currency (Aron, 1998). However, in Nigeria and Zambia, the outcome was unfruitful with rising excess demand pressure, high speculative tendencies, widening premium between the official and the parallel market and frequent policy reversals have all culminated in the monumental failure of auction regimes (Aron and Elbadawi, 1994).

The Retail Dutch Auction System (RDAS) of foreign exchange was first introduced in Nigeria in 1987, and later re-introduced in 1990 and 2002 with the expectation that it will enthrone an efficient exchange rate system by eliminating volatility thereby stabilizing the Naira exchange rate. It was suspended after it failed to realize this goal. An evaluation of the auction system in the experimentation of 1987 and subsequently 1990 suggested that, the exchange rate remain unstable despite using two different instability indexes to evaluate the Retail Dutch Auction System (Ogigio, 1996). In addition, the evaluation of the re-introduced Retail Dutch Auction System in 2002 revealed that distortions have not been eliminated, excessive demand pressure persists and volatility still prevails in the market. In other words, the Retail Dutch Auction System (RDAS) had failed to stabilize the Naira exchange rate (Auwal, 2006).

The Wholesale Dutch Auction System (WDAS) was introduced on the 20th of February, 2006 in Nigeria against the back drop of the failure of the Retail Dutch Auction System (RDAS)

to achieve foreign exchange objectives of stability, reducing excessive demand for the Naira and high premium between the official and the parallel market (Akanji, 2006 and Mordi, 2006).

The Wholesale Dutch Auction System (WDAS) is an auction system where the Central Bank of Nigeria(CBN) sells the foreign exchange to the Authorized Dealers(AD's) who bid on their own account and in turn sell the foreign exchange to End-Users at their current bid rate. Also, the Central Bank of Nigeria (CBN) is at liberty to buy from the Authorized Dealers (AD's) at their quote rate (CBN Brief, 2008).

The structure of the Wholesale Dutch Auction System (WDAS) created a dual relationship between Central Bank of Nigeria (CBN) and the Authorized Dealers (AD's). The Central bank of Nigeria (CBN) assumed a *monopolist* status as the sole supplier of foreign exchange in the market while the buyers are few (Authorized Dealers (AD's)). In the reverse relationship, if the Central Bank of Nigeria(CBN) buys from the Authorized Dealers (AD's) it will assume a *monopsonist* status given that End Users did not buy from the Authorized Dealers (AD's) while the Authorized Dealers (AD's) assume an *oligopolist* status given that they do not collude(Adapted: Auwal,2006 and Mordi,2006).

However, the relationship between the Authorized Dealers (AD's) and the End Users is one way such that the Authorized Dealers (AD's) assume an *oligopolist* status while End Users are many. In all dynamics of these relationships, one unique attribute prevails: an *imperfect market* setting exist. The efficient allocation of scarce resources (foreign exchange) may not be achieved under this setting because the premise for such claim does not exist in the foreign exchange market under the Retail and Wholesale Dutch Auction System (Adapted: Auwal, 2006 and Obadan,2006).

Obadan(2006) further argued that over-reliance on an imperfect market system to determine a crucial price like the foreign exchange rate has been a major cause of exchange rate depreciation. The post reform macroeconomic and external shock leads to widening gap between demand and supply for foreign exchange rate and the excess demand pressure is responsible for its monotonic decline of the nominal exchange rate (Garba, 1997). It is important to note that a three agent distribution channel have emerged under the Wholesale Dutch Auction System (WDAS) with wholesaler (CBN) supplying to retailers(Authorized Dealers(AD's) and Bureau De Change(BDC's)) who in turn sell to final consumers(End Users). However, the market setting that characterized the relationship between wholesaler-retailer and retailer-final consumers are imperfect. To this effect, expecting an outcome that is synonymous with a perfect market (efficient resource allocation) will be out of place. The asymmetry of information can generate rent seeking behaviour given that Central Bank of Nigeria (CBN) is both a regulator and a likely player in the market. Also, the Authorized Dealers (AD's) and Bureau De Change (BDC) can collude to influence market outcomes.

1.2 STATEMENT OF THE RESEARCH PROBLEM

Since the introduction of structural adjustment program (SAP) in July 1986, different exchange rate system and operational procedures have been used. These includes the establishment of Second Tier Foreign Exchange Market(SFEM) in 1986; the change of the pricing method after the first two bidding from the average rate method to the marginal rate pricing; the merger of the first and second tier markets on the 2nd of July 1987; the segmentation of the market in to two in 1988: Autonomous and Inter-Bank Foreign Exchange Market; the merger of the two market to form Inter-Bank Foreign Exchange Market(IFEM) in Jan. 1989; introduction of a pro-rata system of foreign exchange allocation in 1993; CBN

returned to fixed regime in 1994; the policy reversal from regulation to guided de-regulation in 1995; the establishment of Autonomous Foreign Exchange Market (AFEM) in 1995 and Inter-Bank Foreign Exchange Market in 1999(Mordi,2006 and CBN Brief,2008).

The Retail Dutch Auction System (RDAS) was re-introduced in February 2002 against the backdrop of widening premium between the parallel and official market rates and the rising excess demand for foreign exchange. Under this system, the Central Bank of Nigeria (CBN) intervened twice-weekly and the Authorized Dealers (AD's) bought foreign exchange at their bid rates. The rate that cleared the market was adopted as the ruling exchange rate for the period up to the next auction (CBN Brief, 2008).

The objective of Retail Dutch Auction System (RDAS) includes:

- (a) To determine a realistic market-determined exchange rate.
- (b) Conservation of external reserve.
- (c) Elimination of wide premium between the official and parallel market.
- (d) Ensure stability of the Naira

Source :(CBN Brief, 2008).

Under the Retail Dutch Auction System (RDAS), other methods were used singly and combined, operational procedures were also modified like daily, weekly and fortnightly bidding of foreign exchange. Also, in foreign exchange bidding, average and marginal exchange rate determination methods were used with a view to achieving a realistic exchange rate but were unsuccessful (Obadan, 2006). Similarly, Auwal(2006) used the GARCH model and descriptive statistics to investigate the stability of exchange rate and concluded that the Retail Dutch Auction System (RDAS) had not eliminated distortion, speculation, opportunism, sharp practices and excess demand pressure in the foreign exchange market. In other words, the problems still

persist in the foreign exchange market. This study will investigate the volatility of exchange rate under Retail and Wholesale Dutch Auction System with the view to compare outcomes between Retail and Wholesale Dutch Auction System.

Against the backdrop of the ineffectiveness of the Retail Dutch Auction System (RDAS) in achieving its objectives, Central Bank of Nigeria (CBN) introduced the Wholesale Dutch Auction System (WDAS) on the 20th of February 2006 with the aim of achieving the following objectives in addition to the objectives of Retail Dutch Auction System (Obadan, 2006) and (Mordi, 2006). The objectives includes; further liberalization and development of the foreign exchange market so as to facilitate the convertibility of the Naira, the unification of exchange rates between the official and inter-bank markets, resolving multiple currency problems, promote efficient and smooth functioning of the foreign exchange market and achieve a stable and realistic exchange rate(CBN Brief,2008).

Akanji (2006) used trend analysis to investigate the convergence of IFEM, BDC and WDAS market rates and found that convergence of the exchange rate was achieved by the end of May 2006 although by the end of the second quarter in 2006, speculative behaviour created pressure on the parallel market demand for foreign exchange resulting in heavy depreciation of the Naira exchange rate in the market. This study will investigate the sustainability of the convergence of BDC, IFEM and WDAS rates earlier witnessed at the inception of Wholesale Dutch Auction System (WDAS). Furthermore, Akanji argued that the development in the Bureau De Change/parallel market became alarming when the spread between the Bureau De Change rate and Inter-bank Market rate reached N20/US\$ as the Naira was appreciating in the Inter-bank Foreign Exchange Market(IFEM) while it was depreciating at the Bureau De Change /parallel market rates. This study will evaluate the spread within the market with the view to

compare the outcome for Retail Dutch Auction System (RDAS) and Wholesale Dutch Auction System (WDAS).

Since Auwal (2006) study, the Wholesale Dutch Auction System had been introduced and the convergence of the BDC, IFEM and WDAS rates had been achieved from 20th February, 2006 to about July, 2006. However in 2009, it was briefly suspended on Jan 19th 2009 due to its failure to sustain the transient stability at the inception of Wholesale Dutch Auction System (WDAS) and was replaced with the Retail Dutch Auction System (RDAS). Also, the Retail Dutch Auction System (RDAS) was jettisoned and the Wholesale Dutch Auction System (WDAS) was re-introduced in July, 2009 due to the instability that pervaded the foreign exchange market which suggested that the shifts were not anchored in systematic studies of the Retail Dutch Auction System (RDAS) and Wholesale Dutch Auction System (WDAS). Policy success depends on the stability of policies which depend on systematic evidence before policy changes are effected.

The instability and irregular reversal of foreign exchange rate policies is partly responsible for the failure of foreign exchange policies in Nigeria. Also, our inability to learn from our experiences as we reverse back to jettisoned policies intermittently made the exchange rate more unstable (Obadan, 2006). The shift in the auction system between Retail Dutch Auction System (RDAS) to Wholesale Dutch Auction System (WDAS) raises the need for comparative study of the two auction systems with focus on market structures and market outcomes. To avoid repeated reversals between Retail Dutch Auction System (RDAS) and Wholesale Dutch Auction System (WDAS), it is important to undertake a systematic study focusing on the following indicators.

- (a) Volatility of demand, supply and prices.

(b) Presence or absence of collusive behavior.

(c) Exchange rate spreads.

1.3 OBJECTIVES OF THE STUDY

The study has a broad objective of analyzing the Wholesale Dutch Auction System of foreign exchange rate relative to Retail Dutch Auction System of foreign exchange with emphasis on the market structures and outcomes. Specifically, the objectives are:

- i. To estimate and analyze the volatility of demand, supply, prices, successes and failures at both Retail and Wholesale Dutch Auction System.
- ii. To estimate and analyze the exchange rate spreads at both Retail and Wholesale Dutch Auction System (WDAS).
- iii. To investigate the presence of collusive behavior at both Retail and Wholesale Dutch Auction System.
- iv. To draw policy inference on the outcomes of the above objectives.

1.4 JUSTIFICATION FOR THE STUDY

The exchange rate is an important macro-economic variable for policy makers and investors. Since the adoption of structural adjustment programme(SAP) in 1986, the exchange rate had persistently depreciated overtime under different exchange rates regimes and systems (Obadan, 2006). In addition, Obadan further argued that the instability and incessant depreciation of the Naira foreign exchange have wide implication, for Nigerians standard of living, increased cost of inputs, planning, and uncertainties for long term macro-economic management. In spite of 1986 structural reform, the Naira exchange rate is still not competitively determined and the allocation of foreign exchange remains inconsistent with the requirements for the long-term development of the Nigerian economy (Garba, 1997).Also, getting the exchange rate right or

attaining stability is critical for both internal and external balance and hence growth and development of the Nigerian economy (Mordi, 2006).

Unlike Auwal (2006), who investigated volatility of demand and marginal rate under the Retail Dutch Auction System (2002-2006), this study provides a comparative study of Retail and Wholesale Dutch Auction System (2002-2010) in terms of volatility of marginal rate, demand and supply. Auwal further recommended that a study should be conducted on the then recently introduced Wholesale Dutch Auction System to investigate the sustainability of the convergence earlier witnessed.

Unlike Akanji(2006) and Mordi(2006) who evaluated the convergence of Wholesale Dutch Auction System at its inception in 2006, this study investigated the sustainability or otherwise of the convergence achieved from 2006-2010. Akanji concluded that supply shortage is responsible for the depreciation of the Naira. Therefore, the estimation of the volatility of supply is crucial to the analyses of exchange rate stability.

The outcome of the study will be of relevance to the success of exchange rate policy by enhancing the pursuit of stable and realistic exchange rate of the Naira which will lead to an enhanced pursuit of price stability through curtailing imported inflation and consequently leading to the stability of the macro-economic environment in Nigeria. The research output will equally be of relevance to importers, exporters and other operators in the international economic space by aiding their business planning thereby mitigating and managing exchange rate risks.

1.5 SCOPE OF THE STUDY

The research work studied the Dutch Auction Systems (both retail and wholesale) of foreign exchange rate in Nigeria from 2002-2010.

1.6 ORGANISATION OF THE STUDY

The study is organized into five chapters as follows. Chapter one includes the background, statement of problem, research objectives, scope of study and organization of chapters. Chapter two comprises of conceptual, theoretical and empirical literatures. Chapter three is the presentation of the methodology while chapter four constitutes the presentation, analyses and interpretation of results. Chapter five constitutes summary, conclusion and recommendations. Thereafter, the references and appendices are attached.

CHAPTER TWO

LITERATURE REVIEW

2.1 REVIEW OF KEY CONCEPTS

EXCHANGE RATE

Exchange rate has been defined as the price of one currency in terms of another currency. It is the value of a local currency in terms of a foreign currency or the value of a foreign currency in terms of a local currency. Exchange rate is the prices at which currencies trade for each other which can be either spot or forward rates. The main source of foreign exchange demand comes from importers, purchasers of foreign securities, government agencies buying foreign goods or services, basic travelling allowance and personal travelling allowances (Redmond, 2009). Economists have identified three separate concept used for measuring exchange rate which includes :(a) The nominal exchange rate; the price of a currency in terms of another currency. The domestic currency terms defines exchange rate as the units of domestic currency per foreign currency, while the foreign currency term defines exchange rate as the units of a foreign currency in terms of domestic currency (Dwivedi, 2007). (b)The real exchange rate; the relative price of local goods to foreign goods. It is the nominal exchange rate which has been adjusted for price level between countries (Odusola, 2006).The external real exchange rate is the ratio of aggregate foreign price level or cost level to the home countries aggregate price or cost level while the internal real exchange rate measures the relative prices of two broad categories of goods; ratio of domestic price of tradable goods to non tradable goods within a country(Viser, 2004).(c) The effective exchange rate; is associated with a multilateral exchange rate where a country has multiple trading partner .In this case, the rate is weighted and incorporate all forms of taxes charged on import and export (Odusola, 2006).However, multilateral real exchange rate is a

weighted average of the external real exchange rate index with respect to using multiple trading partners (Viser, 2004). The nominal exchange rate in domestic terms will be used throughout this study because it is the unit of measurement in the official foreign exchange rate market.

EXCHANGE RATE MANAGEMENT

Exchange rate management regime refers to different system for the management of exchange rate, which may be rigidly fixed or freely floating and could be operated as a variant of both. Under a fixed exchange rate regime, the monetary authorities determine and fix the exchange rate of the domestic currency to a foreign currency. When the authority decides to strengthen the value of the currency, the process is termed “*revaluation*” and the deliberate decrease in the value of a currency is termed as “*devaluation*” (Dwivedi, 2007). Unlike fixed exchange rate regime, under the floating regime the rate of exchange is market determined and driven by the forces of demand and supply. Where the domestic currency loses its value against a foreign currency is termed as “*depreciation*” and when the reverse occurs it is termed as “*appreciation*” (Viser, 2004).

EXCHANGE RATE VOLATILITY

Exchange rate volatility refers to the swings or fluctuations in the exchange rates over a period of time or the deviations from a benchmark or equilibrium exchange rate. This means that misalignment of the exchange rate could occur where there is multiplicity of market parallel with official market (Mordi, 2006). Empirically, volatility is measured in terms of co-efficient of variation which is the standard deviation divided by the mean for a series (Obadan, 2006 and Mordi, 2006). Although Auwal (2006), used standard deviation as the measure of volatility. The co-efficient of variation was used in this study because it averages the spread.

COLLUSIVE BEHAVIOURS IN MARKETS

Collusion is an agreement among firms to share the market, set price or limit production (Burkett, 2006). It usually takes place within an industry when rival companies cooperate for their mutual benefit. It often takes place within the market structure of oligopoly, where the decision of a few firms to collude can significantly impact the market as a whole (Burkett, 2006). Cartels are a special case of explicit collusion. Collusion which is not overt is known as tacit collusion. If firms collude in oligopoly, the market will become a monopoly and if buyers collude, it will become a monopsony (Cowell, 2004). There can be significant barriers to collusion in any given industry which includes: cost and demand differences between firms, cheating and potential entry (Burkett, 2006). Collusion outcomes are unnatural in the sense that colluding firms act contrary to the economic incentives they face individually. Also, collusive behavior is likely from firms and consumers who operate in an imperfect market (Cowell, 2004). Colluding firms have the incentives to secretly violate the collusion agreement and one of the main issues associated with the sustainability of collusion is to prevent such violations of the collusive agreement from occurring (Cabral, 2008). The presence and characteristics of collusion under auction depends on the nature of object being auctioned. Also, the increase in the size of auction reduces the chances of collusion in auction in most cases (Buccirossi, 2004). The common wisdom is that Ascending and Second Price Auctions are highly susceptible to collusion because the bidder registration procedures and procedures for information revelation during the auction can be designed to completely inhibit or unintentionally facilitate certain types of collusion (Marshall and Marx, 2008).

2.2 REVIEW OF KEY EXCHANGE RATE THEORIES

EXCHANGE RATE REGIMES

Exchange rate regime refers to the condition under which national government and monetary authorities allow exchange rate to be determined. At the extreme end of exchange rate regimes spectrum we have the *freely floating* where exchange rate is determined by the market forces and the *fixed* regime where monetary authorities fix the rate (Dwivedi, 2007). However, there are a number of hybrids or intermediate exchange rate system between rigidly fixed and freely floating exchange rates which includes, adjustable peg, crawling peg, exchange rate band, dirty float and joint float (Viser, 2004). The *adjustable peg* system is a system whereby exchange rate will remain fixed for some period of time until when a balance of payment (BOP) disequilibrium (deficit/surplus) arises then, the currency is devalued/ revalued persistently until the foreign exchange reserve is exhausted in order to restore back balance of payment (BOP) equilibrium (Dwivedi, 2007). The *crawling peg* system rather permits the monetary authorities to adjust the exchange rate gradually. The *dirty float* system also permits the monetary authorities intervene from time to time to control excessive fluctuations in exchange rate in order to establish a realistic exchange rate that the market forces failed to realize (Viser, 2004). Under the *Joint float* system, a group of countries have an adjustable peg system between their own currencies but, they have a joint float against other countries. This is used under the European Monetary System (Dwivedi, 2007). Finally, the *exchange rate band* allowed the exchange rate to fluctuate between an upper and lower exchange rate limit about the established par value. It is also called “snake in the tunnel” (Dwivedi, 2007).

Since the introduction of structural adjustment program (SAP) in July 1986, different exchange rate system and operational procedures have been used. These includes the

establishment of Second Tier Foreign Exchange Market(SFEM) in 1986; the change of the pricing method after the first two bidding from the average rate method to the marginal rate pricing; the merger of the first and second tier markets on the 2nd of July 1987; the segmentation of the market in to two in 1988: Autonomous and Inter-Bank Foreign Exchange Market; the merger of the two market to form Inter-Bank Foreign Exchange Market(IFEM) in Jan. 1989; introduction of a pro-rata system of foreign exchange allocation in 1993; CBN returned to fixed regime in 1994; the policy reversal from regulation to guided de-regulation in 1995; the establishment of Autonomous Foreign Exchange Market (AFEM) in 1995 and Inter-Bank Foreign Exchange Market in 1999(Mordi,2006 and CBN Brief,2008).

FIXED EXCHANGE RATE SYSTEM

The term fixed or pegged exchange rate refers to any system in which a monetary authority announces the buying and selling rates for its currency in terms of a foreign currency and promises to trade at that rate either by legislation or intervention. The rates are not allowed to fluctuate freely on the market and respond to changes in demand for and supply of foreign exchange (Kenen, 2000). Under a fixed system, exchange rate may be fixed by legislation or intervention in the currency market (Kenen, 2000). It may buy/sell currencies according to the need of the country or may take policy decisions to appreciate or depreciate the national currency. In this case, the rate of exchange is fixed by the central bank of a country and if any flexibility is allowed is within the 1% limit under the IMF arrangement. The exchange rate thus fixed is known as currency's par value (Dwivedi, 2007).

The central bank can succeed in holding the exchange rate fixed only if its financial transactions ensure that asset markets and money markets remain in equilibrium when the exchange rate is at fixed level (Krugman and Obstfeld, 2003). The reasons why a government

will sacrifice its monetary freedom and operate a fixed exchange rate regime includes: firstly, volatility of a floating exchange rate can inflict damage on the economy in both the short and the long runs. Secondly, the belief that pegging to a low inflation currency will help to restrain domestic inflation pressure. Finally, fixed rates have the attraction for anchoring price inflation for internationally traded goods and providing a guide for private sector inflation expectation (Krugman and Obstfeld, 2003).

A single country cannot fix its exchange rate comprehensively unless other countries fix their rates too (Kenen, 2000). A fixed exchange rate is likely to face fewer problems if the business cycles of the country they maintain parity with are synchronized and if the external shocks to the economies are symmetric i.e the shocks affect the countries broadly in the same way (Bain and Howells, 2003).

MONETARY POLICY UNDER FIXED EXCHANGE RATE SYSTEM

The monetary authority announces the buying and selling rates for its currency in terms of a foreign currency and promises to trade at that rate under a fixed exchange rate thereby insulating the rate from the influence of market forces. The fundamental problem with a fixed exchange rate is that the government must be prepared to forgo completely the use of monetary policy for stabilization purposes (Rogoff and Obstfeld, 1995). The impact of changes in the money stock on nominal income in a fixed exchange rate system showed that given capital mobility, monetary policy has only a temporary impact on the level of income and in the long run, is completely ineffective (Bain and Howells, 2003).

A country with a fixed exchange rate will import or export money automatically whenever there is a shift in demand or supply thereby keeping monetary shocks away from affecting the real economy. This argument holds only when there is perfect capital mobility

(Kenen, 2000). The key lesson is that a government that fixes its currency's exchange rate will lose control of domestic money supply and monetary policy will be ineffective in this case (Rogoff and Obstfeld, 1995).

FISCAL POLICY UNDER FIXED EXCHANGE RATE SYSTEM

Unlike monetary policy, fiscal policy can be used to largely affect output under a fixed exchange rate system. If fiscal and exchange rate changes occur when there is full employment and the policy changes are maintained indefinitely, they will ultimately cause the domestic price level to move in such a way to restore full employment (Kenen, 2000). The long run price level increase caused by a fiscal expansion under fixed rates seems to be inconsistent with the argument that for a given level of output and interest rate, the price level and money supply should move proportionately in the long run (Krugman and Obstfeld, 2003). A government can fix its currency's exchange rate at a sufficiently depreciated level in order to escape a liquidity trap. To this end, fiscal policy is more effective under a fixed exchange rate than a flexible exchange rate (Dunn and Mutti, 2004).

FLEXIBLE EXCHANGE RATE SYSTEM

Under a flexible exchange rate system, the monetary authority allows the market forces of demand and supply of foreign exchange to determine the rate. This makes the monetary policy a major tool for achieving macroeconomic goals (Viser, 2004). There is no restriction on foreign exchange transactions, i.e. the monetary authorities (Central Banks) do not intervene in the process of exchange rate determination. When there is excess demand, the exchange rate will rise and the value of the currency will depreciate. Also, when there is excess supply, the exchange rate will fall and the value of the currency will appreciate (Dwivedi, 2007).

MONETARY POLICY UNDER FLEXIBLE EXCHANGE RATE SYSTEM

The impact of monetary policy depends on the nature of the exchange rate system in operation. The assumption of perfect capital mobility(domestic and foreign bonds),competitive markets, negligible transaction cost and certainty of expectation under the flexible price monetary model suggest that uncovered interest parity(UIP) will hold; that is a situation where the expected rate of depreciation of a currency equals the interest rate differentials between domestic and foreign bonds(Bain and Howells,2003).

An increase in money supply causes income to rise and the interest rate to fall. The increase in income will cause deterioration in the current account while the fall in interest rate will cause deterioration in the capital account. To this effect, there is a net outflow of currency and the exchange rate depreciates. The depreciation improves international competitiveness of domestically produced goods which leads to a further increase in income. This implied that exchange rate changed to restore the goods, money market and balance of payment to equilibrium (Kenen, 2000).Flexible rates can be very volatile, because they are driven chiefly by volatile capital flows. They do not necessarily move in line with purchasing power parity nor does their movement always foster current account adjustment. In fact, they sometimes move in ways that produce current account imbalances. Furthermore, they transmit asset market shocks directly to goods market (Kenen, 2000).Although monetary policy is effective under the floating exchange rate, it is more effective in an open than closed economy because of monetary independence and the impact of exchange rate movement on international competitiveness of the country's output(Bain and Howells,2003).

FISCAL POLICIES UNDER FLOATING EXCHANGE RATE SYSTEM

An increase in government expenditure tends to increase government demand for goods and services and consequently interest rates. Under a floating exchange rate the rise in interest rates will lead to an increase in the value of the currency. The increase in the value of the domestic currency will reduce net exports, worsening the effects of crowding out. Thus fiscal policy is less effective with floating exchange rates (Kenen, 2000). Expansionary fiscal policy causes an increase in GNP, an appreciation of the currency, and a decrease in the current account balance in a floating exchange rate system while contractionary fiscal policy will cause a reduction in GNP, a depreciation of the currency, and an increase in the current account balance in a floating exchange rate system (Suranovic, 2005).

THEORIES OF EXCHANGE RATE DETERMINATION

PORTFOLIO BALANCE MODEL

This model assumes that residents distribute their wealth among three forms of assets—monetary base, domestic bonds and foreign bonds. The exchange rate is in equilibrium when these assets are held in their desired proportion. An increase in wealth increases demand for foreign bonds or assets leading to a depreciation of exchange rate as a result of capital outflow so generated (Visser, 2004). Unlike the monetary model, the portfolio balance approach allows relative bonds supplies and demands as well as relative money market condition to determine exchange rate. The essential difference between monetary and portfolio based approach is that the monetary model assumed domestic and foreign bonds to be perfect substitutes whereas the portfolio balance model assumed imperfect substitutability of local and foreign bonds (Krugman, 2003).

With imperfect substitutability, investors have preference for distributing their investment portfolio over the asset of different countries. In general, portfolio balance model have risk premiums incentives (Rogoff, 1995). As the supply of country A's financial asset rises relative to B's there will be a higher premium paid on A's asset. The implication of this is that uncovered interest parity will not hold because risk premium will exist at the forward market (Krugman, 2003).

BALANCE OF PAYMENT THEORY

Under free exchange rate regimes, the exchange rate of the currency of a country depends upon its balance of payment. A favourable balance of payment(BOP) raises the value of the exchange rate (appreciation) while an unfavourable balance of payment(BOP) reduces the value of the exchange rate (depreciation).Therefore, when Nigerian demand for a foreign currency (\$) exceeds the supply of the foreign currency (\$) the exchange rate depreciates, conversely it will appreciate(Dwivedi,2007). The balance of payment (BOP) theory views real exchange rate as determined in flow markets. In this case, exchange rate will move to eliminate international trade balance (Krugman, 2003). With the assumption of zero capital account and official reserves balances, the balance of payment will become equals to the current account which is a function of net export (export –import).The export and import are both function of the real exchange rate (R_t), domestic income (Y_d) and foreign income (Y_f).

Therefore, $CA=X-M=f(R_t, Y_d, Y_f)$(2.1)

Where CA=Current account, X=Export, M=Import, R_t =Real exchange rate,

Y_d =Domestic income and Y_f =Foreign income.

In general, at higher real exchange rates we should expect more export and fewer imports and higher current account surpluses; while at lower real exchange rates, the vice versa

occur. The exchange rates moves in the required direction to compensate for trade imbalance (Dunn and Mutti, 2004).The balance of trade needs the estimation of trade elasticities with respect to changes in exchange rate and distinguish between short run and long run elasticities. For example, in the short run imports and exports are quite inelastic to changes in exchange rate. Then, contrary to what the balance of payment theory predicts, devaluation might increase capital account imbalance. Overtime we should expect the shape of the capital account to be reversed (Nelson, 2000). This overtime phenomenon of the capital account is called the J-curve.

During the past twenty years it has become clear that exchange rate did not work in the simple way considered by the balance of payment approach. There have been many situations when countries with trade surpluses have depreciating currencies while countries with trade deficit have appreciating currencies (Krugman, 2003).

ABSORPTION APPROACH

The absorption approach stipulates that a change in real domestic income is a major determinant of a country’s exchange rate. This approach studies how domestic spending on domestic goods changes relative to domestic output. The current account is viewed as the difference between what the economy produces and what it consumes or absorbs for domestic purposes (Nelson, 2000).The domestic absorption equation is stated as thus;

$$A=C+I+G+M.....(2.2)$$

On the other hand, the nation output is stated as thus;

$$Y=C+I+G+X(2.3)$$

Where A=Absorption, C=Consumption, I=Investment, G=Gov’t expenditure, M=Import, Y=Output and X=Export,

If total domestic output (Y) exceeds absorption (A), then the country will export more to the rest of the world and the current account will increase. On the other hand, if absorption (A) exceeds total domestic output(Y) the current account will fall. The absorption approach hypothesized that a nation's current account balances is determined by the difference between real income and absorption, which can be written as;

$$Y-A=(C+I+G+X)-(C+I+G+M) = X-M..... (2.4)$$

$$Y-A=X-M=CA..... (2.5)$$

From eqn(2.4),If real income is rising faster than absorption, then export must be increasing relative to import and the nation's currency will appreciate. The absorption approach can analyze the effect of devaluation on the trade balance. For example if a government devalues its currency, it would tend to increase net export and then domestic output only if the economy is not at full employment level. If the economy is at full employment level, devaluation will result in inflationary pressure (Roggof and Grossman, 1995).

MONETARY MODEL

According to this model, an increase in money supply causes exchange rate to depreciate as a result of inflationary pressure. Therefore, the increase in price level (inflation) consequently leads to the depreciation of the exchange rate and vice versal (Viser, 2004).With the assumption of perfect substitutability of domestic and foreign bonds in the monetary model, investors become indifferent towards the currency of denomination of the bonds to invest as long as the expected returns is the same(Krugman,2003) .In this case, holders of assets do not require a premium to influence their purchase of asset either in country A or B or, the proportion of their investment. This implies that relative supplies of domestic and foreign bonds do not influence exchange rate.

Where; E_t = Real exchange rate, r^* = Domestic interest rate and r_i = Foreign interest rate

Relationship between interest rate and exchange rate:

N1 invested in Nigeria at time t yields: $N(1+r^*)$

The same N1 invested in US yields: $\$(1/E_t)(1+r_i)$

If at time t, the expected N/\$ exchange = E_{t+1}^e , then the Naira value of the US invested at time t is presented below;

$$t=N(1/E_t)(1/r_i)E_{t+1}^e \dots\dots\dots(2.6)$$

The arbitrage relation is thus:

$$1+r^* = (1/E_t) (1+r_i)E_{t+1}^e \dots\dots\dots(2.7)$$

$$= (1+r_i) (E_{t+1}^e/E_t) \dots\dots\dots(2.8)$$

Re-arranging yields

$$1+r^*= (1+r_i) (1+E_{t+1}^e-E_t)/E_t \dots\dots\dots(2.9)$$

Approximately,

$$r^*=r_i +(E_{t+1}^e-E_t)/E_t \dots\dots\dots c (2.10)$$

This implies that the domestic interest rate(r^*) must be equal to the foreign interest rate (r_i) plus the expected depreciation of the domestic currency.

PURCHASING POWER PARITY

The purchasing power parity theory explains the equilibrium value of exchange rate in terms of inflationary differentials between two countries. The theory assumes that the exchange rate of the currencies of two countries move in a manner that seems to offset the inflation differential between the economies by maintaining the real purchasing power of either currency in the other economy. Therefore, if a country has a higher inflation rate relative to its trading partner, the value of the currency of the country will depreciate relative to her trading partner and

vice versa (Cowell, 2004). However, there are two versions of the purchasing power parity: The absolute and relative. The absolute PPP between two countries' currencies is defined as the ratio of the prices of the two countries.

$$PPP_t^a = PL_a / PL_b \dots \dots \dots (2.11)$$

Where : PPP_t^a = Absolute PPP of a country's A currency with respect to country's B currency in period t.

PL_a = Price level for country A

PL_b = Price level for country B

The relative PPP between two countries' currencies is defined as the product of exchange rate in a base period and the ratio of the countries' prices.

$$PPP_t^r = E_0 (P^a / P^b) \dots \dots \dots (2.12)$$

Where:

PPP_t^r = Relative PPP of country A's currency with respect to country B's in period t

E_0 = Actual exchange rate in base period.

P^a = Relative price index of country A at time t.

P^b = Relative price index of country B at time t.

2.3 AUCTION THEORIES

CONCEPT AND ESSENCE OF AUCTION

An auction is a game of incomplete information and an element of set of mechanism design (Jehle and Reny, 2001). In an auction, the seller lacks information about buyer's valuation and the auction design is expected to get buyers reveal their valuation about an item. An auction is essentially a process of determining the value (price) and the buyer (winner) of the commodity by a seller (Jehle and Reny, 2001). Auction is a mechanism whereby a seller of a single object

or more sells it to N number of buyers for the highest possible bid i.e winning bid (Jehle and Reny, 2001). In some cases, if the highest bidder did not reach the minimum reserve price, there is no sale (Klemperer, 1999). Auctions are also used to sell rare collectibles in prestigious auction houses, common household goods in estate auctions, financial instruments, electricity, and confiscated contraband in government-sponsored auctions and nearly anything on the Internet at auction host sites. Indeed, it is hard to identify goods or services that have not been traded at auction (Thomas, 2008).

In many cases, sellers or buyers do not know what an item or service is “worth” and how much should they sell or buy it for. An auction serves as a “market test” (in fact, this very term is used by many companies to describe an auction process) to ascertain the prevailing prices (Thomas, 2008). The bidders’ valuation of auction item is mutually independent among them and the seller is ignorant of the bidders’ valuation which makes the auction imperative (Jehle and Reny, 2001). Unlike the Retail Dutch Auction System where the result (marginal rate and quantity sold) at the auction is announced a day after bidding, the result (marginal rate and quantity sold) at the auction is announced on the day the bidding took place under Wholesale Dutch Auction System. The auction process is used to determine who the object (contract, item, or whatever) should be allocated to, or who “wins” the auction. The bidder with the highest bid is declared the winner for all forms of auction (Jehle and Reny, 2001). In the case of the Retail and Wholesale Dutch Auction System, auction will help determine the marginal rate, quantity sold and the time of payment.

TYPES OF AUCTION

The four main auction types are:

ENGLISH AUCTION

In this auction, the price of auction item is successively raised until one bidder remains. This bidder wins the object at the final price. The auction can be run by the auctioneer calling price, the bidder submitting prices, or electronic bids with the highest bid posted continuously. Once somebody quits the process they are not allowed back in (Klempere, 1999). It is also called ascending bid or open outcry auction. Under the English Auction, the bidder will decide to drop out of the bid when the price reaches his value irrespective of other active bidders who remained in the bidding process (Thomas, 2008). The bidder with the highest value will win in an English Auction and the price he/she will pay depend on the last remaining competitor (bidder with the second highest value) who will also drop out when the price reaches his values. Consequently, the bidder with the highest values wins and pays a price equal to the second highest values. Hence, the English Auction is synonymous with the Second Price Sealed Bid Auction and will yield the same revenue for the seller (Jehle and Reny, 2001).

DUTCH AUCTION

The Dutch Auction was developed in the Netherlands to auction goods with limited lifetime. It is known as descending price auction. The auctioneer open the bid with an initial high price and start lowering it until he gets a successful buyer. In this case, the first bidder to indicate willingness to buy is the eventual winner of the bid. This was how the Dutch flower auctions were managed (Thomas, 2008). It is a non-discriminating auction that recently became popular as an internet auction option where a seller places one or more items to sell and state a minimum

reserve price where necessary. After given time for the bidding where bidders submit their bid on what, the quantity and their bidding price, the winning bidder is then declared (Thomas, 2008). Under the Dutch Auction, the bidder has to make the ultimate choice of deciding at what price to raise his/her hand to acknowledge the price which he/she want to buy the object being bided and the bidder who chooses the highest price wins the bid. This makes the outcome of the Dutch Auction synonymous with that of First Price Sealed Bid and conclude that the First Price Sealed Bid and Dutch Auction will raise the same revenue for the seller (Jehle and Reny, 2001). If N bidders have independent private values from the common distribution F , then bidding given the bidder's values constitute a "*Symmetric Nash Equilibrium*" of Dutch Auction (Jehle and Reny, 2001).

FIRST PRICE SEALED BID AUCTION

The First Price Sealed Bid Auction has the main characteristic of not being an open cry auction like English or Dutch Auction. The auction process has two phases; bidding phase and the resolution phase. The bidding phase is when the bids are collected i.e each bidder submit his bids based on his own valuation and each bidder is ignorant of the other bidder's valuation of the object of auction because of the '*sealed bid rule*'. In the resolution phase, all bids are opened and sorted from the highest to the lowest and the highest bidder is declared winner (Thomas, 2008). When there is more than one item to be sold the next highest bidders are declared winners. This bidding process can be discriminatory when more than one item is sold because bidders will not pay the same price (Klemperer, 1999).

In a First Price Sealed Bid Auction, each bidder's bid with the expectation of the second highest bidder's value conditional on his own value being highest. Given that bidders use the same strictly increasing bidding function, the highest value is equivalent to the highest bid and

the winning bid (Jehle and Reny, 2001). Given the assumption that bidders are ex-ante symmetric and have an increasing bidding function, we can conclude that if N bidders have independent private values from the common distribution F , then bidding given the bidder's value constitutes a "*Symmetric Nash Equilibrium*" of first price sealed bid (Jehle and Reny, 2001).

SECOND PRICE SEALED BID (VICKERY AUCTION)

This auction system was developed by **William Vickery** and it is also called uniform second-price auction. The bids are sealed and each bidder bids from his own expectation and is ignorant of other bidder's bid. In a Second Price Sealed Bid Auction, the price a winning bidder pays is independent of his/her bid but the highest unsuccessful bid. Unlike the First Price Sealed Bid Auction, we should expect the bidders to change their bidding behavior by becoming more aggressive under the Second Price Sealed Bid Auction with the knowledge that they will pay a price less than what they bided. Therefore, there is a high chance that the Second Price Sealed Bid Auction will generate higher revenue than First Price Sealed Bid Auction (Jehle and Reny, 2001). However, the only exception to this position is when the winning bid is high and the highest unsuccessful bid is extremely low. In this case, a First Price Sealed Bid Auction would have yielded more revenue (Jehle and Reny, 2001). If N bidders have independent private values, then bidding one's value is the unique weakly dominant bidding strategy for each bidder in a second price bid auction (Jehle and Reny, 2001).

COLLUSION IN AUCTION

Collusion at an auction usually involves bidders (buyers), sellers and auctioneers. The bidders collude by agreeing not to compete against each other, allowing prices to decrease accordingly. Then, those who were involved in the collusion later divide up or apportion the excess profits made by each buying at a discount; sometimes a second auction follows the

victimized auction involving only the participants in the collusion (Brandly, 2010). On the other hand, sellers collude generally by bidding on their own items, or employing someone to bid for them, to falsely increase the prices buyers are required to pay. While there are few instances where sellers are permitted to bid, usually collusion involves illegal activity, where such bidding is either not disclosed, and/or not permitted (Brandly, 2010). Also, auctioneers can collude by either misrepresenting items they are selling, or selling them quickly to a bidder who is bidding for the auctioneer's interest. Alternately, auctioneers sometimes bid with the sole intent of raising prices that the buyer(s) must pay (Brandly, 2010). If bidders face mutual asymmetric information, they may not effectively coordinate their behaviour and the seller may exploit this to undermine their collusive power. If colluders have complete information about one another, then they can effectively act like a single agent and maximize their joint profit (Che and Kim 2008).

AUCTION BIDDING BEHAVIOURS

INDEPENDENT PRIVATE VALUE AUCTIONS

In this case, buyer's values are mutually independent and the seller is unaware of the buyers' exact values despite knowing the distribution from which each value is drawn. Independent refers to the fact that each bidder's private information is independent on other bidder's information while private values refers to the fact that once a buyer employs his/her own private information to assess the value of the object, this assessment is uninfluenced by other bidder's assessment (Jehle and Reny, 2001). In this model it is assumed that bidder i 's valuation (v_i) is drawn from a probability distribution (f_i) where only bidder i observe the value (v_i) and the distribution (f_i) is itself common knowledge among all the players. Any one bidder's valuation is statistically independent of other bidders valuation (Thomas, 2008). Such a model is

appropriate when the value of an item to a bidder is derived from its consumption alone and not from later resale i.e the item is being purchased for personal use(Klempere,1999).

INTERDEPENDENT VALUE AUCTIONS

This is an auction where the value of the items sold is not known to the bidders. Each bidder has only an estimate (signal) regarding the value (this may be an expert opinion or a test result). If a given bidder would have known the signals of other bidders, his own estimate of the true value may change (Thomas, 2008). An interdependent values auction is an auction where one bidder's information would be informative to another bidder about the latter's valuation for the good.

COMMON VALUE (CV) AUCTIONS

It describes an auction in which the good being auctioned has the same value to every participant, although none may know exactly what this value is. In the common value model, it is assumed that items being bid for has unknown value and the bidders valuation are independently drawn from a probability distribution which is presumed to be common knowledge. One important phenomenon occurring in common value auctions is the winner's curse(Thomas, 2008).Bidders have only estimates of the value of the good. If, on average, bidders are estimating correctly, the *highest* bid will tend to have been placed by someone who overestimated the good's value (Thomas, 2008). Rational bidders will anticipate the adverse selection, so that even though their information will still turn out to have been overly optimistic when they win, they do not pay too much on average. Naive bidders ignore the adverse selection and bid sufficiently more than a fully rational bidder would thereby leading them to actually pay more than the good is worth (Thomas, 2008).The common value model may be applied to markets in which the

commodity is being purchased primarily for re-sale. A special case of interdependent values in which the value of the item *ex post* is the same for all bidders (Klempere, 1999).

AUCTION EVALUATION AND ASSESSMENT

When deciding among various auction mechanisms, the auctioneer has a very large number of auction designs to choose from. Four factors are important in the choice of auction formats. They are revenue optimization, efficiency, time and effort and simplicity. Auctioneers are looking for the auction that will yield the maximum revenue for the item sold. While this is an important tenet of auction theory to auctioneers, other considerations are also important not only to governments but to many corporations (Klempere,1999).If N bidders have independent private values drawn from common distribution F , then all four standard auction forms(First Price, Second Price, Dutch and English Auction) raise the same revenue for the seller. This revenue equivalence result may provide explanation why we see all four auction forms in practice. But for this, we would have seen the dominant of the highest yielding revenue auction only (Jehle and Reny, 2001).An auction is successful if the bidder that values the item most *ex post* - actually gets it. In some contexts, such as government auctions this is important, especially when the government is selling public assets .When the sale involves future delivery of services, as in many procurement auctions, efficiency means that the contract is more likely to be carried out and the service provided at a high level(Thomas, 2008). Many auctions involves the trading of many (sometimes tens of thousands) of items while soliciting bids from many (sometimes hundreds) of suppliers. Auctioning organizations have to devote a great deal of time and effort to such auctions and mechanism design that minimize the time and effort involved. Auctions that uses lesser time and participation cost to the bidders will be more attractive (Klempere, 1999).

One of the objectives of auctioneers in most auctions is to get as many participants as possible. Keeping the rules simple, especially knowing that many suppliers have to respond to hundreds of auctions every month, helps participation in many situations (Thomas, 2008).

AUCTION IN FOREIGN EXCHANGE RATE MANAGEMENT

Auction in foreign exchange rate is a game of incomplete information in that the seller of foreign exchange such as the Central Bank of Nigeria lacks information about the buyers' valuation. The auction design is to get the buyers reveal their valuation so that the price, quantity and the winner of each foreign exchange auction can be determined (Jehle and Reny, 2001). Auction in foreign exchange rate is uniquely different from other commodity auction for five main reasons; Firstly, foreign exchange auctions are multi-units auction which differ from single unit auctions in that bidder select both price and quantity they wish to buy (Bangwayo and Skeete, 2008). Secondly, foreign exchange auction are not a one shot isolated events but repeated and sequential. The learning behaviour attribute of repeated auctions makes the adoption of one shot auction strategy for a repeated auction a misrepresentation of the situation thereby leading to futile outcome (Aron and Elbadawi, 1994). Thirdly, foreign exchange auction determination is not an isolated event but rather determine an integral price (exchange rate) for the whole economy. The outcome of the auction has widespread implication for the whole economy and the auction will also be influenced by a combination of macroeconomic policies. Fourthly, bidders may not be symmetrical in foreign exchange auction as they are grouped in to sub-classes so that instead of drawing their valuation from a single distribution, they draw their valuation from these sub-classes (Aron, 1999). Finally, bidders may be risk averse because foreign exchange rate is a crucial input in highly import dependent African countries and they

face uncertain supply of foreign exchange due to thin markets and terms of trade shocks (Bangwayo and Skeete, 2008).

AUCTION SYSTEMS IN THE MANAGEMENT OF FOREIGN EXCHANGE IN SOME AFRICAN COUNTRIES.

The auctioning of foreign currency for determining exchange rates has been used by some African countries in recent times which includes; Ghana, Nigeria, Ethiopia, Uganda, Zambia and Zimbabwe. The auction had been introduced against the backdrop of devastating financial crises, macroeconomic turbulence, adverse terms of trade, wide disparity between official and parallel market rates, currency depreciation and frequent policy reversal with the expectation that it will enthrone an efficient foreign exchange market and enhance the determination of a realistic value of the respective currencies (Aron, 1999).

TABLE 2.1: CHARACTERISTICS OF EXCHANGE RATE AUCTION IN SOME AFRICAN COUNTRIES. THE CASE OF ZAMBIA, UGANDA, GHANA, ETHIOPIA, NIGERIA AND ZIMBABWE

CHARACTERISTICS OF EXCHANGE RATE AUCTION IN SOME AFRICAN COUNTRIES.						
VARIABLES	ZAMBIA	UGANDA	NIGERIA	GHANA	ETHIOPIA	ZIMBABWE
FREQUENCY OF AUCTION	WEEKLY	WEEKLY	FORTHNIGHTLY, WEEKLY AND CURRENTLY BI-WEEKLY	WEEKLY	FORTHNIGHTLY AND CURRENTLY WEEKLY	BI-WEEKLY
PRICING	COMPETITIVE AND CURRENTLY DUTCH	DUTCH	COMPETITIVE AND CURRENTLY DUTCH	COMPETITIVE AND CURRENTLY DUTCH	DUTCH	DUTCH
SALE	RETAIL	WHOLESALE	RETAIL AND CURRENTLY WHOLESALE	RETAIL AND CURRENTLY WHOLESALE	RETAIL	RETAIL
BIDDERS	IMPORTERS	BANKS ON BEHALF OF IMPORTERS	BANKS, IMPORTERS AND BDC	IMPORTERS AND BANKS	LICENSED IMPORTERS	LICENSED IMPORTERS, GOV'T AND BANKS
ENTRY RESTRICTION	YES	INITIAL, LATER REMOVED	YES	INITIAL, GRADUALLY REMOVED	INITIAL, LATER LIBERALISED	YES, GRADUALLY REMOVED
ALLOCATION	NO	YES	YES	NO	NO	YES

CEILING							
MAJOR SOURCE OF FOREIGN EXCHANGE	FOREIGN AID	FOREIGN AID	FOREIGN AID AND OIL RECEIPT	FOREIGN AID AND COCOA RECEIPT	FOREIGN AID AND COFFEE RECEIPT	FOREIGN AID AND TOBACCO RECEIPT	GOLD AND TOBACCO RECEIPT
RESERVE PRICE	NO	YES	NO	YES	NO	NO	NO
PRE-ANNOUNCED SUPPLY	YES	YES(PRIOR TO OPENING BIDS)	YES(PRIOR TO OPENING BIDS)	NO	YES(A WEEK BEFORE AUCTION)	YES	YES

Source: Adapted from Aron and Elbadawi 1994, Aron, 1999 and Bangwayo and Skeete, 2008.

The experiences of Ghana between 1986-1992 and Uganda between 1992-1993 indicated that exchange rate unification, stabilization, efficient allocation of foreign currency and lower rates of inflation had been achieved. In contrast, experiences of Zimbabwe between 2004-2005, Nigeria in 1987 and Zambia between 1985-1987 indicated that they were not very successful in achieving exchange rate unification, stabilization, efficient allocation of foreign currency and lower inflation (Bangwayo and Skeete, 2008).

RETAIL DUTCH AUCTION SYSTEM (1987, 1990, 2002-2006) IN NIGERIA

The Retail Dutch Auction System (RDAS) was first introduced in 1987 and re-introduced in 1990 and 2002, following the failure of the other mechanism of exchange rate determination that had been implemented to achieve the specified objectives. Specifically, Retail Dutch Auction System (RDAS) was re-introduced in 2002 against the backdrop of widening premium between the parallel and official market exchange rates and the rising demand for foreign exchange (Obadan, 2006, Mordi, 2006 and Auwal, 2006). Under this system, Central Bank of Nigeria (CBN) intervened twice weekly on Mondays and Wednesdays by announcing an amount on offer for auction by 8.30am. The Authorized Dealers (AD's) bought foreign exchange on behalf of their customers by submitting their customers bid duly signed by two authorized signatories for any particular auction session between 9am-12.00noon in excel format inside a diskette to CBN Abuja or Lagos office. Hard copies of the bids should be faxed to CBN Abuja. The result of each auction session would be announced by 1.00pm on Tuesday and Thursday and

the successful Authorized Dealers would have their account debited with the Naira equivalent at the current bid rate. The Central Bank of Nigeria (CBN) will then deliver the foreign exchange purchased by Authorized Dealer within two business days after the auction i.e. (T+2). Authorized Dealers (AD's) shall return to Central Bank of Nigeria (CBN) an un-utilized fund within five business days after delivery at the rate of purchase and the Central Bank of Nigeria (CBN) may also purchase foreign exchange from Authorized Dealers (AD's) and other participants in the market at their offer rate. The Central Bank of Nigeria (CBN) shall deliver the Naira equivalent for US \$ bought from the banks to the bank's current account at the Central Bank of Nigeria (CBN Brief, 2008). Equally, the banks shall deliver US \$ sold to CBN to the Central Bank of Nigeria (CBN) special foreign exchange market account with Chase Manhattan Bank, New York. Travelex global and American express commenced the direct sales of Traveler's Cheque to End-Users in 2002 so as to increase supply of foreign exchange (CBN Brief, 2008). The Retail Dutch Auction System (RDAS) operated for forty three (43) months, Nineteen (19) days as it was halted on the 19th February 2006 when it became obvious that it have failed to achieve its objectives (Akanji, 2006).

WHOLESALE DUTCH AUCTION SYSTEM (WDAS) IN NIGERIA

The Central Bank of Nigeria (CBN) adapted the Wholesale Dutch Auction System (WDAS) on the 20th February 2006 as an improved framework for determining the exchange rate in the foreign exchange market. Under this regime, the CBN adopted a 2 way quote (i.e. quoting the buying price and the selling price) and remain an active market participant. The Wholesale Dutch Auction System (WDAS) session starts by 8.30am and end by 10:30am (2 hours). Authorized Dealers (AD's) who hitherto were not allowed to do transaction on their own accounts are now permitted to do so. Banks buy foreign exchange for themselves and later sell

to customers. Authorized Dealers (AD's) are to submit their bids on Mondays and Wednesdays within 8:30am – 10:30am and the result of successful and unsuccessful bid would be announced by 1.00pm on the day of bidding (CBN Brief, 2008). The minimum amount of bidding shall be \$100,000 and the currency of transaction shall be Naira and the US Dollar. Also, Authorized Dealers (AD's) are expected to have adequate Naira cover in their current account with the Central Bank of Nigeria (CBN) and shall be promptly debited with the naira equivalent of the foreign exchange purchased at their bid rates. The Central Bank of Nigeria (CBN) normally investigates the bids to ensure they are genuine and conform to documentations and auction guidelines. The Central Bank of Nigeria (CBN) shall effect delivery of foreign exchange purchased by each Authorized Dealers within one business day after the day of the auction result (CBN Brief, 2008).

The Central Bank of Nigeria (CBN) also said that funds shall be transferable in the Inter-bank Foreign Exchange Market (IFEM) and the Central Bank of Nigeria (CBN) can equally purchase foreign exchange from Authorized Dealers (AD's) and other participating companies at their offer rates. The Authorized Dealers (AD's) are meant to quote two ways and display in their banking halls, the buying and selling rates conspicuously, while the spread between the buying and selling rates shall not exceed 50kobo(CBN Brief, 2008).Other supplementary measures introduced under the Wholesale Dutch Auction System (WDAS) in order to achieve its objectives include;

- (i) Direct sales of foreign exchange to licensed Bureau De Change (BDC) effective April, 2006.
- (ii) Increase in Basic Travelling Allowance (BTA) from \$2,500.00 bi-annually to \$5,000.00 per quarter and Personal Travelling Allowance (PTA) from \$2,000 bi-annually to \$4,000 per quarter.

(iii) In September, 2008 purchases by licensed bureau de charge was increased from \$200,000 to \$300,000.

The Wholesale Dutch Auction System (WDAS) was implemented using an electronic medium of transaction rather than manual communication through phone, hard copies etc. that were prevalent under Retail Dutch Auction System (RDAS). The Wholesale Dutch Auction System (WDAS) is an E-NOODLES (Electronic Naira/Dollars exchange rate system) i.e. a system where transactions are done electronically on line on a sound ICT platform (CBN Brief, 2008).

DIFFERENCES BETWEEN RETAIL AND WHOLESALE DUTCH AUCTION SYSTEM.

Table 2.2: DIFFERENCES BETWEEN RETAIL AND WHOLESALE DUTCH AUCTION SYSTEM.

RETAIL DUTCH AUCTION SYSTEM(RDAS)	WHOLESALE DUTCH AUCTION SYSTEM(WDAS)
1. Transaction takes place between 9.00am and 12.00 noon.	1. Transaction takes place between 8:30am and 10:30am.
2. CBN announces amount on offer 30 minutes before bidding starts i.e (8.30am)	2. No pre- bidding announcement of amount on offer.
3. Result of Auction is announced 1.00pm a day after bidding.	3. Result of Auction is announced 1.00pm on the day of bidding.
4. CBN effect delivery of foreign exchange two (2) days after the transaction day i.e. T + 2	4.CBN effect delivery of foreign exchange a day after transaction i.e.T + 1
5. The transaction is essentially manual through	5. The transaction is essentially

telephone, hard copies, fax and submission of bids in diskette at CBN Abuja and Lagos.	electronically, using the E-NOODLES ICT platform.
6. Funds purchased from CBN at the auction are not transferable to the inter-bank foreign exchange market.	6. Funds purchased from CBN are transferable to the inter-bank foreign exchange market.
7. Authorized Dealers only transact on behalf of their customers.	7. Authorized Dealers are allowed to transact on their own account.
8. The two-way quote system was not operational.	8. CBN adopted the 2-way quote system.
9. Direct sales to Bureau De Change (BDC's) was not effective.	9. Direct sales to BDC became effective April, 2006.
10. Basic Traveling Allowance (BTA) of \$2,500 bi-annually for end users.	10. Basic Traveling Allowance (BTA) was increased to \$5,000 per quarter.
11. Personal Traveling Allowance (PTA) of \$2,000 bi-annually.	11. Personal Traveling Allowance (PTA) increased to \$4,000 per quarter.

Source: *Compiled by the Researcher.*

IMPLICATION OF THE DIFFERENCES BETWEEN RETAIL AND WHOLESALE DUTCH AUCTION SYSTEM.

The phasing out of 30 minutes pre-auction announcement of amount on offer before bidding will reduce substantially pre-bidding speculation. The release of the results of bidding on the day of bidding is a reflection of an enhanced efficient setting as post bidding speculation time is narrowed and reduced by 24 hours. Also, the effective delivery of foreign exchange by the

Central Bank of Nigeria (CBN) a day after transaction is an indication of improved service delivery by the Central Bank of Nigeria (CBN). The automation of the transaction platform would reduce communication cost, time wasting and enhance transparency of the bidding process. The Authorized Dealers' (ADs') access to transact on their account, increase in basic travelling allowance (BTA) to \$5,000 per quarter, personal travelling allowance (PTA) to \$4,000 per quarter, direct sales to Bureau De Change (BDC's) will go a long way in increasing supply of foreign exchange in the market so as to reduce the excess demand for foreign exchange and tend towards stability of the exchange rate. The two-way quote system will reduce significantly speculation about the exchange rate spread thereby fostering the stability of the Naira exchange rate. Direct sales of *forex* to Bureau De Change (BDC's) became effective April, 2006 with the sole aim of supplying small user of foreign exchange thereby reducing the excess demand gap. The liberalization opened the market for the operations of private BDC's and Authorized Dealer BDC's basically through cash sales of *forex* in all 22 CBN branches nationwide (Akanji, 2006, Mordi, 2006 and CBN Brief, 2008). The licensed Bureau de Change's (BDC's) are required, to open a Naira Current Account with an Authorized Dealer of its choice, for the purpose of buying foreign exchange. A Bureau-de-Change is allowed to purchase foreign exchange from the Central Bank of Nigeria (CBN) through a presentation of the CBN cheque issued by their banks twice a week (Tuesdays and Thursdays). The Private Bureau-de-Change purchase equivalent amount of *forex* from the Central Bank of Nigeria (CBN) up to a maximum limit of US\$200,000.00 twice a week while Authorized Dealers Bureau De Change purchase equivalent amount of *forex* from the Central Bank of Nigeria (CBN) up to a maximum limit of US\$2,000,000.0 (Akanji, 2006, Mordi, 2006 and CBN Brief, 2008).

2.4 REVIEW OF EMPIRICAL STUDIES

STUDIES OF FOREIGN EXCHANGE MANAGEMENT

Sharu (1992) modelled exchange rate determinant in Nigeria between 1971-1990. The researcher used Chi Square (X^2) test to evaluate the response of export ,imports and the rate of inflation to the market exchange rate and the result showed that the depreciation of the Naira had resulted in rising inflation which reduced real income. Also, the researcher found that the PPP holds for Naira/Dollar and Naira/Pounds exchange rate i.e to say the rising general price level have been the force behind the depreciation of the Naira against the Dollar and Pound Sterling for the period under review.

Abraham (1995) studied the effects of a nominal devaluation on inflation, trade balance and output in Kenya. Annual data between 1972-1992 was used in the study .The Error Correction Model showed that devaluation had significant impact on the inflationary process both in the short run as well as in the long run. A percentage point devaluation was found to lead to 0.2% and 0.13% rise in the price level in the long run and the short run respectively. Also, devaluation was found to lead to an improvement in trade balance in the year of devaluation but this improvement is quickly eroded in the year following devaluation. The erosion is blamed largely on the inflationary effect arising from unrestrained monetary and fiscal policies. The study therefore showed a potential tradeoff between policies of exchange rate depreciation and inflation.

Odubogun (1995) studied institutional reforms and management of foreign exchange in Nigeria from 1960 to 1990. The outcome of each policy regime was compared in terms of the trend in exchange rate, degree of exchange rate premium and structure of *forex* allocation. Evidence suggested that in spite of the reform of 1986, the Naira exchange rate is still not

competitively determined and the allocation of *forex* remains inconsistent with the requirements for the long-term development of the Nigerian economy. Evidence from the descriptive statistics used indicated that the post-reform exchange rate policy has been adversely affected by government's expansive fiscal and monetary policy. The major conclusion of the study is that given government's macroeconomic policy and the character of the markets within which *forex* was traded and the linkages between them, the naira exchange rate has little chance of convergence and as a result, the possibilities for distortions in the allocation of *forex* remain very high.

Garba (1997) evaluated the possibility of exchange rate convergence through the institutional difference that segmented the market in Nigeria foreign exchange market. Descriptive procedures were used to show that there was no tendency towards exchange rate convergence as at December 1993 and it may not be possible unless the institutional barriers segmenting the markets were removed and the official market operate competitively. Finally, the study concludes that post reform macroeconomic and external shock leads to widening gap between demand and supply for foreign exchange rate and the excess demand pressure is responsible for its monotonic decline of the nominal exchange rate.

Sesay(1999) studied the relationship between exchange rate, budget deficit and inflation in Sierra Leone (1970-1996) using annual data. A dynamic error correction model was used and the results suggest that exchange rate policies plays significant role in the process of inflation in the country. Furthermore, the regression results demonstrated that exchange rate movement had the greatest impact on inflation in Sierra Leone. In addition, the bivariate causality test indicates that growth in money supply, budget deficit and exchange rate had useful

information on the causes of inflation in Sierra Leone. Finally, the study asserts that the rebellion war had no statistical significant effect on inflation in the country.

Obadan (2002) in his study towards exchange rate stability in Nigeria used generated instability index for trending the Inter-Bank Foreign Exchange Rate (IFEM), BDC and parallel market. The outcome of the study showed that since the introduction of structural adjustment programme, the exchange rate has been volatile in these segments of the foreign exchange market. Obadan, asserted that factors responsible for the instability includes, weak domestic production, import dependent, speculative activities, over-reliance on an imperfect market system amongst others.

Akilu(2006) studied the effect of exchange rate variation on some selected Nigerian Agricultural export commodities. The researcher used annual time series data covering the period 1986-2002. The result obtained from descriptive statistics and ordinary least square(OLS) regression analysis indicated that exchange rate variation were significant in determining Nigeria agricultural export.

STUDIES OF FOREIGN EXCHANGE AUCTION

Aron and Elbadawi(1994) presented a typology of Sub-Saharan auction by comparing and contrasting the design and conduct of auction at micro levels. They used cointegration(Error Correction Mechanism) framework on weekly data in Nigeria, Uganda, Zambia and Ghana. They found that auction were successful in Ghana and Uganda due to credible and stable macroeconomic environment but where unsuccessful in Nigeria and Zambia due to frequent policy intervention, policy incredibility, lack of transparency and collusive behavior. The study confirmed that increased competition leads to an exchange rate depreciation in Nigeria's auction.

Ogiogio (1996) undertook a statistical analysis of foreign exchange behaviour under Nigeria's auction system. In order to analyze the relative stability of the Naira under the auction, the researcher generated an exchange rate instability index which he used to analyze stability. While the co-efficient of variation in the exchange rate indicates that the Naira/Dollar rates show uniform instability in all phases of DAS, the exchange rate instability index showed that instability exist and it was not uniform in the different phases of the auction system. Ogiogio, asserted that lack of monetary and fiscal discipline was responsible for the instability of the Naira although he cautioned that it was not sufficient enough to account for the sharp depreciation of the Naira.

Aron (1998) study evaluated the rules, regimes shifts and auction outcomes of over four years in Ethiopia. The dynamic error correction mechanism was used to show that although bidders learned the supply rules, the learning was faster where the exchange rate target was more transparent and under certainty. Aron emphasized that micro design have wide implication for foreign exchange auction during liberalization. The study concludes that a fairly stable depreciation was achieved despite regime shifts from trade liberalization, increased frequency of auction, lifting of auction entry barriers and temporary price shocks in coffee export earnings.

Durdunoo (2002) in evaluating the foreign exchange market and the auction system in Ghana used descriptive statistics to show that the widened premium between the official and the parallel market was significantly reduced after the introduction of auction system in Ghana. Evidence of weekly data auction data from 1986-1991 studied corroborated by suggesting that convergence was achieved after six years of auction (four years retail and two years wholesale).

Janvier (2002) studied exchange rate policy and the parallel market for foreign currency in Burundi. He used descriptive statistics to show that from 1970-1998 widening premium

between the official and parallel segment still prevail and the parallel market is still thriving despite introducing foreign currency auction system in July 2000. The central bank auctions were done weekly at the beginning but due to the scarcity of foreign exchange, the frequency has to be changed to only once every two weeks. Auctioning foreign exchange is an important step towards unification of the country's foreign exchange markets. However, the outcome of the study suggests that this step has not fundamentally changed the nature of the currency market. As a result, the parallel market is still thriving and the auction remains ineffective in achieving its objectives in Burundi during the period of study.

Auwal (2006) evaluated the re-introduction of the Dutch Auction System as a means of attaining stable and realistic exchange rate for the Naira. He used 354 Dutch auction sessions covering the period 2002-2006 to evaluate the effect of Dutch Auction System (DAS) in generating efficiency and stability for the Naira/Dollar exchange rate. GARCH model of demand and marginal price were estimated to analyse stability. Also, foreign exchange spread was estimated and their trend evaluated to determine the effect on efficiency. The study found that DAS series exhibited different patterns of volatility. Despite Dutch Auction System (DAS) spread declining, the parallel exchange rate premium increased and both demand and marginal rate were volatile. In essence DAS seems not to have made foreign exchange more efficient or stable. i.e it have failed to meet its objectives. However, the researcher recommended a further study in to the recent phase of DAS i.e Wholesale Dutch Auction System (WDAS) to determine if the seeming convergence witnessed in 2006 was sustainable and to see whether it will make exchange rate more stable and efficient.

Akanji (2006) in studying the achievement of convergence in the Nigerian foreign exchange market confirmed that convergence was achieved after 12-13 weeks of the

commencement of Wholesale Dutch Auction System (WDAS). Descriptive statistics was used to show how convergence of Wholesale Dutch Auction System (WDAS) and interbank rates occurred. Also, convergence of the Wholesale Dutch Auction System (WDAS), Interbank (IFEM) and the Bureau De Change (BDC'S) rates was achieved as at the twenty fifth (25th) auction session. However, Akanji pointed out that in the third (3rd) Quarter of 2006, the speculative behaviour prevalent in the market created pressure on BDC/parallel market which widened the spread as the Naira was appreciating in the official market while it was depreciating in the BDC/parallel market and she concluded that supply shortages was responsible for the depreciation.

Mordi (2006) in studying challenges of exchange rate volatility in economic management in Nigeria used the GARCH model for a high frequency monthly data for the period 1992-2005 confirmed high volatility of the Naira over the estimation period. Also, trend analysis of Nigeria's foreign exchange rate shows that there exists a causal relationship between exchange rates and some macro-economic variables. During periods of high inflation rate, volatility in the exchange rate is high and period of stability is synonymous with low inflation. Mordi added, that the introduction of Wholesale Dutch Auction System (WDAS) have narrowed arbitrage premium to below 5.0 percent benchmark and the challenge is to sustain the convergence achieved.

Bangwayo and Skeete(2008) analyzed Zimbabwe's exchange rate auction reform and the evolution of the intervention process that contributed to its failure. The Reserve Bank of Zimbabwe introduced the auction in 2004 in response to macro economic crisis centered on the shortage of foreign currency. They used 120 auction samples from January 2004 to March 2005. Conclusion arrived from both descriptive statistics and co-integration technique indicated that

the Reserve Bank was using disqualification as a mechanism for rationing excess demand and controlling bid spread.

Auwal and Hamzat (2009) studied the foreign exchange in Nigeria: convergence or divergence using monthly data (2000-2008) of Inter-Bank Foreign Exchange Rate (IFEM) and Dutch Auction System to show whether they converge to long-run equilibrium or not. The outcome of the study using Auto Regressive Distributed Lag Model show that DAS rates converge to long run equilibrium while the Inter-Bank Foreign Exchange Rate (IFEM) do not converge to long run equilibrium.

IMPLICATION OF THE LITERATURE

Under the Wholesale Dutch Auction System (WDAS), asymmetry of information exists as the CBN is both a regulator and a likely player in the primary segment of the market. However, this gives the CBN a more pivotal role to play in stabilizing the exchange rate and to take responsibility when it fails to do so because it can now influence both supply and slightly demand through the exercise of the option to buy foreign exchange at the primary segment of Wholesale Dutch Auction System. The tendency to collude exists in both primary and secondary segment of the Wholesale Dutch Auction System (WDAS) as AD's are profit making organization. Unlike Auwal, 2006 who studied Retail Dutch Auction System; this study provides a comparative study between Retail and Wholesale Dutch Auction System .Also, the estimation of the supply function will aid the better understanding of the source of instability of the exchange rate. This study investigated the sustainability of the convergence witnessed in the earlier phase of WDAS as positioned in Auwal,2006 and Mordi,2006.The GARCH model was adopted for this study to estimate the demand, supply and marginal rate function. Co-efficient of variation will be used as a measure of volatility because it averages the spread.

CHAPTER THREE
METHODOLOGY

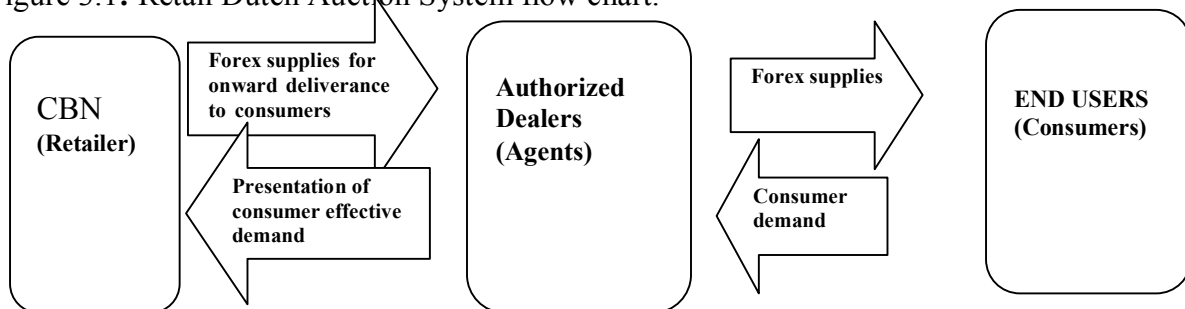
3.1 CONCEPTUAL FRAMEWORK

THE RETAIL DUTCH AUCTION SYSTEM (RDAS) FRAMEWORK

The transaction in this market is between the Central Bank of Nigeria (CBN) and End Users with Central Bank of Nigeria (CBN) supplying and End Users demanding. The Central Bank of Nigeria (CBN) is the *retailer* while the End Users are the *consumers*. The agents (AD's) don't influence the outcome of the transaction directly as they don't buy or sell foreign exchange but only intermediate on behalf of their customers at their request. This implies that market setting that characterized the behavior of the players is typical of a *monopoly* with Central Bank of Nigeria (CBN) as the sole supplier of foreign exchange (Auwal, 2006).

The flow chart below comprises of two key players; the CBN as the *Retailers* and the *End Users* as final consumers. The Authorized Dealers collect their customers' (End Users) effective demand for foreign exchange and forward to the CBN who will in turn sell to the End Users. The foreign exchange supplies will then be conveyed through the Authorized Dealers to the End Users.

Figure 3.1: Retail Dutch Auction System flow chart.



Source: Adapted from Auwal, 2006.

THE WHOLESALE DUTCH AUCTION SYSTEM (WDAS) FRAMEWORK

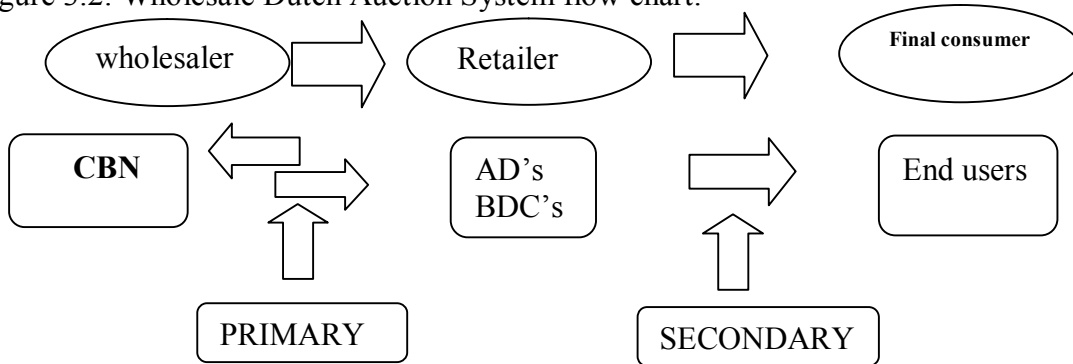
The CBN introduced the Wholesale Dutch Auction System (WDAS) on the 20th February 2006 against the backdrop of the failure of the Retail Dutch Auction System (RDAS) to achieve its objectives after operating it for 43 months 19 days. The foreign exchange market have other sub-markets which include, Inter-bank Foreign Exchange Market (IFEM), Bureau De Change (BDC) and the un-official (parallel market).The structure of Wholesale Dutch Auction System (WDAS) established a two-way transaction between the CBN and Authorized Dealers (licensed banks). The Authorized Dealers are not only inter-mediators but dominant players in the market setting as they can influence demand or supply directly by trading on their own account.

The Central Bank of Nigeria (CBN) request Authorized Dealers (AD's) to submit their bids on Mondays and Wednesdays between 8:30am and 10:30am. The CBN reserve the right to reject the bids that are deemed to be unrealistic or failed to conform to trading guideline. The minimum bid amount by an Authorized Dealer shall be \$100,000.00 and the currencies of transaction shall be the Naira and the \$US. The Central Bank of Nigeria (CBN) shall announce the result of each Auction by 1.00pm on the day of the auction. Thereafter, promptly debit the current account of Authorized Dealers (AD's) and deliver the foreign exchange to their correspondent bank account used for Interbank Foreign Exchange Market (IFEM) 24 hours after the end of the transaction (CBN Brief, 2008).

The flow chart below shows that the Wholesale Dutch Auction System market has two segments (primary and secondary) and three key players (Wholesaler, Retailer and final consumers).In the primary segment, CBN (wholesaler) sells foreign exchange to Authorized Dealers and Bureau De Change (retailers) who in turn sell foreign exchange to End Users (consumers) in the secondary segment of the market. However, the CBN can buy from AD's and

BDC's at their quote rate given that the Wholesale Dutch Auction System is a two way quote system.

Figure 3.2: Wholesale Dutch Auction System flow chart.



Source: *Constructed by the Researcher.*

This study shows how exchange rate is determined under Wholesale Dutch Auction System (WDAS) given the structural differences it has institutionalized in comparison to Retail Dutch Auction System (RDAS). According to the procedure; the operators in the market are to submit their bids in a two-way quote during the trading session (8:30am – 10:30am) on Mondays and Wednesdays. Central Bank of Nigeria (CBN) evaluates all bids with utmost confidentiality to determine the acceptability of their bids (CBN Brief, 2008).

Thereafter, Central Bank of Nigeria (CBN) determines the ruling rate using the marginal pricing method. However, the marginal rate lies between the highest and lowest bid rates. The result of the auction is released at 1.00pm on the day of auction and successful bidders are notified and their current accounts with Central Bank of Nigeria (CBN) promptly debited. The Central Bank of Nigeria (CBN) consequently effect delivery of foreign exchange within the next 24 hours of releasing the bid results (CBN Brief, 2008). There are two types of solution that can emerge from the Wholesale Dutch Auction System (WDAS) which are collusive and non-collusive solutions.

RETAIL AND WHOLESALE DUTCH AUCTION SYSTEMS: FRAMEWORK COMPARATIVE ANALYSES.

The Retail Dutch Auction System(RDAS) is a **two** agent (*Retailer –Consumer*) distribution channel with the Central Bank of Nigeria (CBN) acting as the *retailer* and End Users as *consumers* .On the other hand, under the Wholesale Dutch Auction System the market becomes a **three** agent(*Wholesaler- Retailer –Consumer*) distribution channel where the Central Bank of Nigeria (CBN) becomes the *Wholesaler* with Authorized Dealer’s (AD’s) as *Retailers* who in turn sell to End Users(*Consumer*).The expectations that the change of status of the Central Bank of Nigeria (CBN) from retailer to wholesaler and the permission of Authorized Dealers (AD’s) to bid on their own account is that it would reduce the excess demand gap that hitherto pervaded the system under the retail auction.

The *two ways quote* system introduced under the wholesale auction creates an opportunity for the Central Bank of Nigeria (CBN) to influence both demand and supply of foreign exchange rate. This implies that CBN is more positioned to stabilize the Naira under the Wholesale Dutch Auction System (WDAS) than Retail Dutch Auction System (RDAS) where it can only influence the supply only. To this effect, Central Bank of Nigeria (CBN) will take more responsibility when it fails to stabilize the value of the Naira under the Wholesale than Retail Dutch Auction System. The elimination of pre-bidding announcement of amount on offer under Wholesale Dutch Auction System (WDAS) will reduce the chances of collusion by AD’s given that bidders have no prior knowledge of amount on offer for sale.

Essentially, the market setting that characterized the Retail Dutch Auction System(RDAS) is a *monopoly* and it constitute of the primary segment only(Auwal,2006).On the other hand, the structure of Wholesale Dutch Auction System(WDAS) market has two

segment(primary and secondary).The primary transaction is between a wholesaler (CBN) and retailers (AD's and BDC's).When Central Bank of Nigeria (CBN) is selling, it assumes the status of a *monopolist* but, when it is buying it assumes the status of a *monopsonist* given that AD's and BDC's sell all their foreign exchange in the primary segment of the Wholesale Dutch Auction System (WDAS).On the other hand, the secondary transaction is between retailers (AD's, BDC's) and final consumers (End Users). The retailers will assume the status of an *oligopolist* given that collusive behaviour is ruled-out otherwise, they will be a *monopolist*(Adapted:Auwal,2006)

The result of every Retail and Wholesale Dutch Auction session generates the following data:

- i. Marginal rate (MR)
- ii. Quantity traded (QT)
- iii. Successful bid (SB)
- iv. Un-Successful bid (UB)
- v. Demand (DD)
- vi. Supply (SS)
- vii. Highest bid rate (HB)
- viii. Lowest bid rate (LB)

3.2 EMPIRICAL FRAMEWORK

TREND ANALYSES

The trend analysis was used to show whether convergence of the submarkets (WDAS, IFEM, and BDC) in the foreign exchange had been achieved under Wholesale Dutch Auction System or not and whether the convergence had been sustained throughout the Wholesale Dutch

Auction System. Also, the trend analysis was used to analyze the exchange rate spread and excess demand in the market.

MEASURE OF VOLATILITIES

The measure of volatility to be used in this studies is the coefficient of variation which is the standard deviation divided by the mean. Mordi, (2006) and Obadan, (2006) used co-efficient of variation to measure volatility in their studies of exchange rate volatility because it averages the spread and it was adopted for this study.

$$\text{Coefficient of Variation} = \frac{\text{Standard Deviation}}{\text{Mean}}$$

DETECTING COLLUSIVE BEHAVIOUR

The exchange rate spread volatility among highest bids-lowest bids; highest bids-marginal rate and marginal rate-lowest bids will aid the researcher in ascertaining the chances of collusion. The lower the volatility in these spreads, the higher the chances of collusive behavior and the higher the volatility of these spreads, the lower the chances of collusive behavior.

TEST FOR STATIONARITY

The Augmented Dickey Fuller(ADF) stationary test was used to investigate whether the data generated at both the Retail and Wholesale Dutch Auction System is stationary or not.

MEASUREMENT AND ANALYSIS OF SPREADS

The exchange rate spread among the Inter-bank, DAS and BDC's rates and the spread of excess demand were used by the researcher to assert empirically the pattern of spread of exchange rate under both Retail and Wholesale Dutch Auction System with a view of making a detail comparative analysis. The trend analysis will be used to analyze the exchange rate spread and excess demand in the market.

From the series, price spread, sub market spread and excess demand spread can be generated as thus respectively;

Price spreads;

$$PGAP_1 = HB - MR \dots\dots\dots(3.1)$$

$$PGAP_2 = HB - LB \dots\dots\dots(3.2)$$

$$PGAP_3 = MR - LB \dots\dots\dots(3.3)$$

Where: HB = Highest bids, LB = Lowest bids and MR = Marginal rate, PGAP=Price Gap.

Sub market spreads;

$$FOREX_1 = IFEM - BDC \dots\dots\dots(3.4)$$

$$FOREX_2 = DAS - BDC \dots\dots\dots(3.5)$$

$$FOREX_3 = DAS - IFEM \dots\dots\dots(3.6)$$

Excess demand spreads;

$$ED_1 = Demand - Sold \dots\dots\dots(3.7)$$

$$ED_2 = Demand - Amount traded \dots\dots\dots(3.8)$$

$$ED_3 = Amount Traded - Sold \dots\dots\dots(3.9)$$

ANALYSIS OF SOLUTIONS

COLLUSIVE SOLUTION

If the Authorized Dealers learn from their experiences and collude under the Retail Dutch Auction System, then the spread between the highest and lowest bid is likely to be close. This will lead to the stability of the exchange rate. If the Authorized Dealers collude, a bilateral monopoly market setting would evolve in the primary segment of the Wholesale Dutch Auction System (WDAS) and the likely outcome will be that the marginal rate determined will fall

between the *monopolist* and *monopsonist* price. Also, the bid rates band would become widened and in this situation, one would expect the marginal rate to be unstable. However, if the Authorized Dealers (AD's) collude in the secondary segment of the market a monopoly situation will arise. Given that Authorized Dealers (AD's) are being driven by profit motive, the exploitation of full monopoly power will become their goal and this implies higher rates for End Users and a widened premium. Hence, exchange rate will be unstable (Adapted: Auwal, 2006).

NON-COLLUSIVE SOLUTION

The pre-bidding announcement of amount on offer thirty(30) minutes before the bidding starts is an opportunity for speculative collusion but the inexperience of the bidders in the early phase of bidding under Retail Dutch Auction System may have this opportunity unutilized. The spread between the highest and lowest bid may be wide and exchange rate will be unstable (Auwal, 2006). Under the Wholesale Dutch Auction System, If the AD's compete the bid rates band (highest bid – lowest bid) might be too wide and unstable thereby creating some positive premium for lowest bidders and negative premium for the highest bidders which is typical of a price war(Auwal,2006). The Central Bank of Nigeria (CBN) would be in position to wield full monopoly power if the Authorized Dealers (AD's) don't collude but it traditional mandate of maximizing social welfare by maintaining a sound and stable macro-economic environment may have this opportunity thwarted.

3.3 REGRESSION ANALYSES

Guided by the market model, the regression analysis modeled the demand, supply and price functions. The goal was to analyze the differences between RDAS and WDAS. The three functions were modeled using the GARCH scheme. The adoption of the GARCH scheme recognized that the data set were financial and high frequency data set in which the assumption

of homo-scedasticity was more likely to be violated. Thus, following Engel (1982); Bollarslev (1986); and (Auwal (2006) and Mordi(2006)) to study volatility of stock prices, inflation and exchange rate respectively, the GARCH specification was adopted. The GARCH (1,1) process for demand, supply and marginal rate model can be specified as thus:

$$Y_t = x_t Y + E_t \quad \text{- Conditional mean eqn.....(3.10)}$$

$$\sigma_t^2 = \alpha + \beta E_{t-1}^2 + \Pi \sigma_{t-1}^2 \quad \text{.Conditional variance eqn (3.11)}$$

The mean equation is a function of an exogenous variable ($X_t Y$) and an error term E_t . While the conditional variance is a function of mean (α), the ARCH term (βE_{t-1}^2) and the GARCH term ($\Pi \sigma_{t-1}^2$).

MARGINAL RATE

$$MR_t = F(D_t, MR_{t-1}) \dots\dots\dots(3.12)$$

$$\text{Log}MR_t = \Pi_0 + \lambda_1 D_t + \lambda_2 MR_{t-1} + \mu_t \dots\dots\dots (3.13)$$

$$\sigma_t^2 = \beta_1 + \beta_2 E_{t-1}^2 + \lambda \sigma_{t-1}^2 \dots\dots\dots(3.14)$$

Where: MR_t -Marginal rate at time t; D_t -Demand at time t; MR_{t-1} -Marginal rate at time t-1 and μ_t -Error term at time t.

Expected signs in eqn (3.13) ; $\lambda_1 < 0$ and $\lambda_2 > 0$.

DEMAND

$$DD_t = f(DD_{t-1}, MR_{t-1}, AM_{t-1}, SB_{t-1}) \dots\dots\dots(3.15)$$

$$\text{Log}DD_t = \alpha_0 + \alpha_1 MR_{t-1} + \alpha_2 DD_{t-1} + \alpha_3 SB_{t-1} + \alpha_4 AM_{t-1} + E_t \dots\dots\dots (3.16)$$

$$\sigma_t^2 = \beta_1 + \beta_2 E_{t-1}^2 + \lambda \sigma_{t-1}^2 \dots\dots\dots(3.17)$$

Where: DD_t =Demand at time t; MR_{t-1} =Marginal rate at time t-1; SB_{t-1} =Successful bids; AM_{t-1} =Amount offered at time t-1 and E_t =Error term at time t.

Expected signs in eqn (3.10); $\alpha_1 < 0$, $\alpha_2 > 0$, $\alpha_3 < 0$ and $\alpha_4 > 0$

SUPPLY

$$SS_t = f(SS_{t-1}, MR_t, AM_t, SB_t) \dots \dots \dots (3.18)$$

$$\text{Log}SS_t = \Omega_0 + \Omega_1 MR_t + \Omega_2 SS_{t-1} + \Omega_3 SB_t + \Omega_4 AM_t + E_t \dots \dots \dots (3.19)$$

$$\sigma_t^2 = \beta_1 + \beta_2 E_{t-1}^2 + \lambda \sigma_{t-1}^2 \dots \dots \dots (3.20)$$

Where: SS_t =Quantity Sold at time t, MR_{t-1} =Marginal rate at time t-1; SB_{t-1} = Successful bids at time t-1 , AM_{t-1} =Amount offered at time t-1 and E_t =Error term at time t.

Expected signs in eqn (3.13); $\Omega_1, \Omega_2, \Omega_3$ and $\Omega_4, >0$

3.4 SOURCES OF DATA AND ESTIMATES

The data used was basically secondary. The results of the bi-weekly Dutch Auction System (WDAS) from 2002-2010 will be sourced from the CBN website. Also, secondary data on monthly exchange rate in the Bureau De Change (BDC's), RDAS/WDAS and the Inter Bank Foreign Exchange Market will be sourced from the Central Bank of Nigeria (CBN) website. The E-views soft ware version 4.0 was used in the estimation of the ARCH and GARCH model and Augmented Dicker Fuller stationary test. It will be used because it has a comprehensive set of estimating procedures.

CHAPTER FOUR

DATA PRESENTATION, ANALYSES AND INTERPRETATION OF RESULTS

4.1 STOCHASTIC PROPERTIES OF THE SERIES

The result presented in this section includes:

1. Descriptive statistics (Table 4.1).
2. Test of stationary (Table 4.2).
3. Graph of the eight series (Figure 4.1 -4.8).

The results are based on the 824 session of the DAS. The retail phase comprises of 342 sessions (from 27th July 2002- to 15th February 2006) while the wholesale phase comprises of 482 sessions (from 20th February 2006-to 15th December 2010).

SUMMARY OF DESCRIPTIVE STATISTIC

TABLE 4.1: Coefficient of Variation of the DAS series.

COEFFICIENT OF VARIATION		
VARIABLE	RDAS	WDAS
AMOUNT OFFERED In million \$	4.73	89.55
SOLD In million \$	4.4	97.07
DEMAND In million \$	27.34	73.68
HIGHEST BID	2.41	9.94
LOWEST BID	2.25	10.08
MARGINAL RATE	2.36	10.0
SUCCESSFUL BID	32.68	72.09
UN-SUCCESSFUL BID	147.36	154.09

Source: *Computed from CBN data.*

When coefficients of variation are compared in the two Phases (RDAS and WDAS) one pattern can be observed. The amount offered, quantity sold, quantity demanded, highest bid, lowest bid, successful bid, unsuccessful bid and marginal rate all had higher co-efficient of variation in the wholesale phase than in the retail phase of the auction system. This shows that

demand, marginal rate and quantity sold were more volatile under wholesale auction than under retail auction.

RESULTS OF TEST FOR STATIONARITY

TABLE 4.2: SUMMARY OF DAS SERIES STATIONARITY TEST

VARIABLES	RDAS ADF Level of significant at 5% (-2.8702)	RDAS ORDER OF INTEGRATION	WDAS ADF Level of significant at 5% (-2.8679)	WDAS ORDER OF INTEGRATION
AMOUNT	-8.7870	I(0)	-11.79912	I(0)
DEMAND	-5.5806	I(0)	-8.4256	I(0)
SOLD	-8.5981	I(0)	-8.4353	I(0)
HIGHEST BID	-2.1378	I(1)	-1.2651	I(1)
LOWEST BID	-2.5307	I(1)	-1.2210	I(1)
MARGINAL RATE	-0.9160	I(1)	-1.2758	I(1)
SUCCESSFUL BID	-8.3022	I(0)	-12.8915	I(0)
UNSUCCESSFUL BID	-6.4309	I(0)	-9.5003	I(0)

Source: *Result of test for stationarity.*

The result of the stationary test of the DAS series suggests that the demand, amount offered, amount sold, successful bid and unsuccessful bid are stationary at their level form during both the retail and wholesale auction periods. On the other hand, highest bids, lowest bids and marginal rate are non-stationary at their level form during both retail and wholesale auction period. The results lead to the conclusion that the behavior of prices may not be fully accounted for by demand and supply function.

DAS SERIES GRAPH (FIGURE 4.1-4.8)

Figure 4.1: Amount Offered series at DAS.

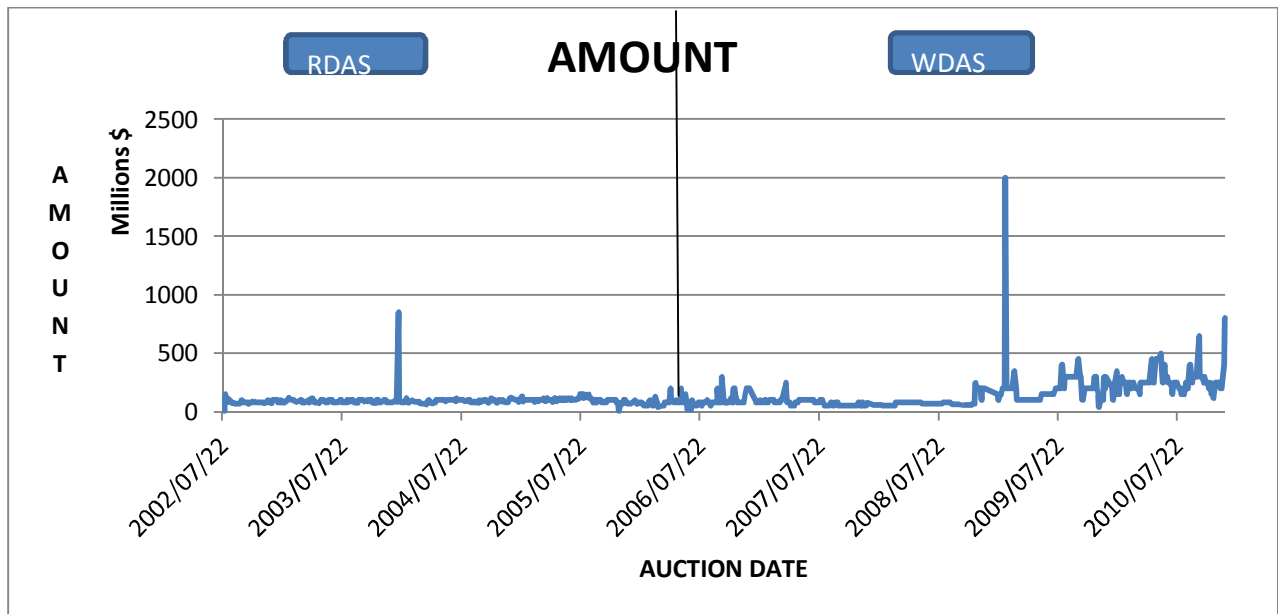


Figure 4.2: Demand for DAS series.

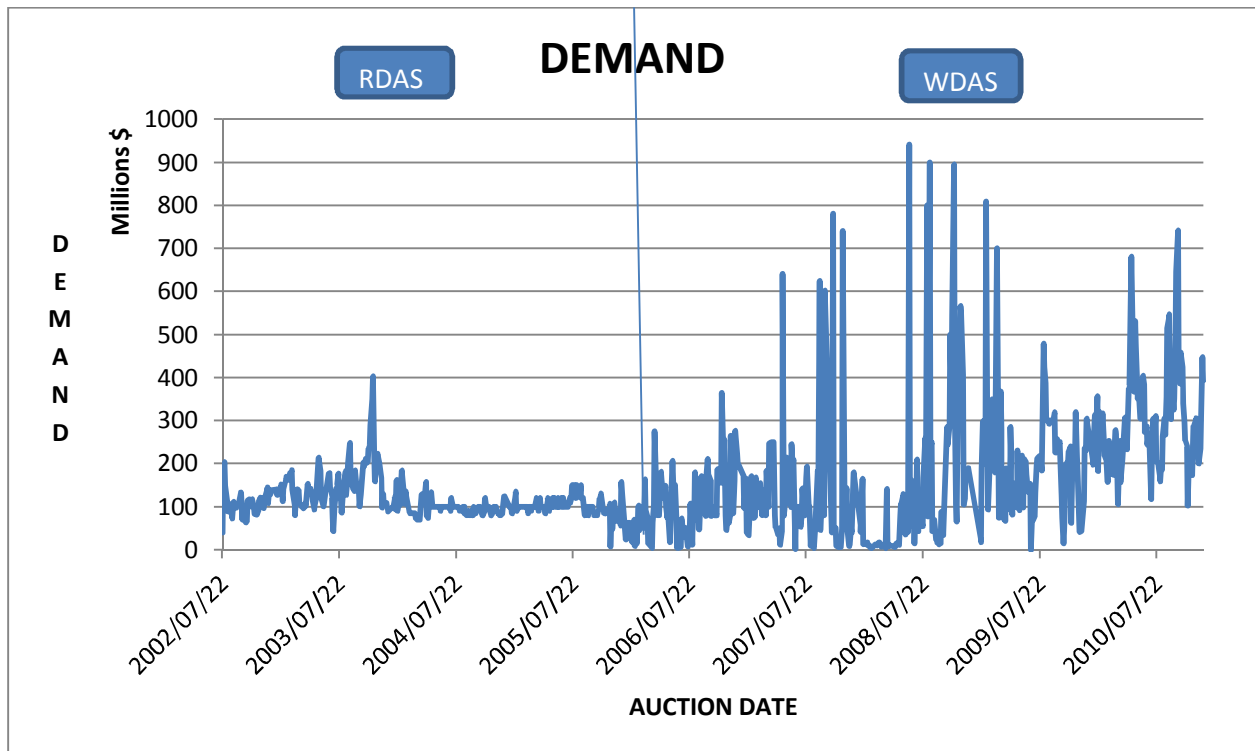


Figure 4.3: Quantity sold for DAS series.

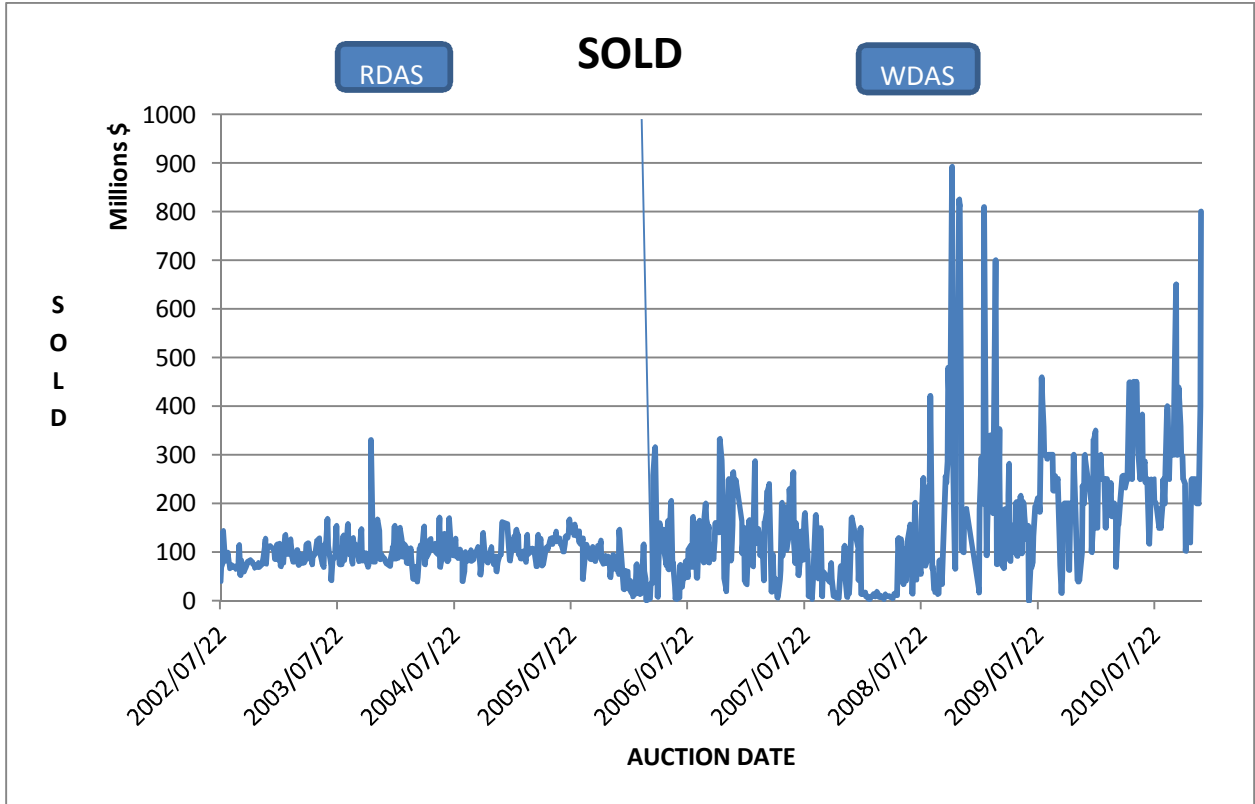


Figure 4.4: Highest bid rate for DAS series.

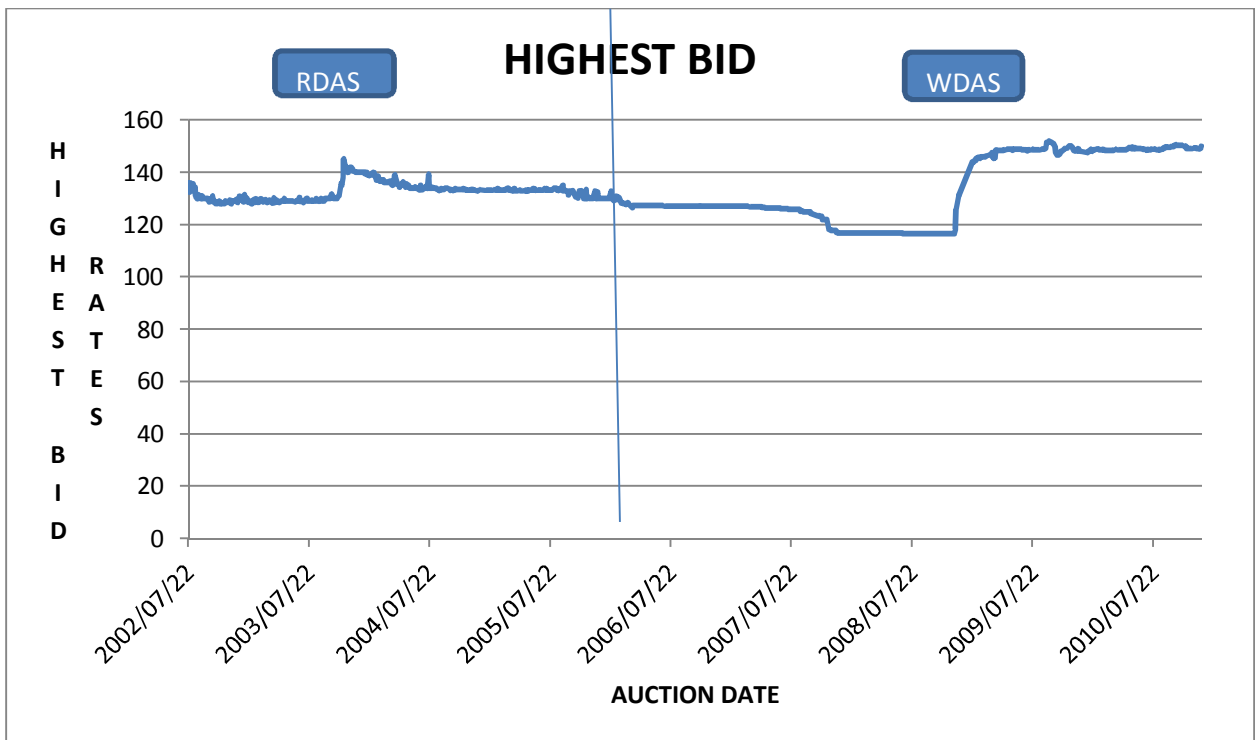


Figure 4.5: Lowest bid series for DAS.

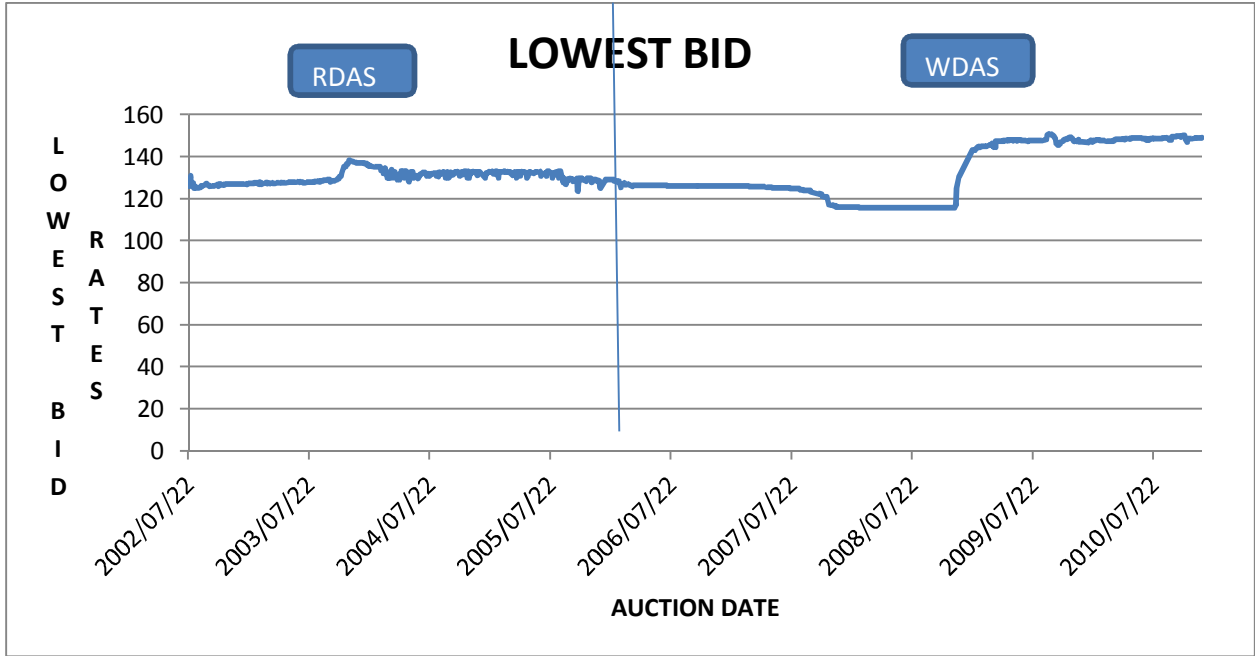


Figure 4.6: Marginal rate series for DAS.

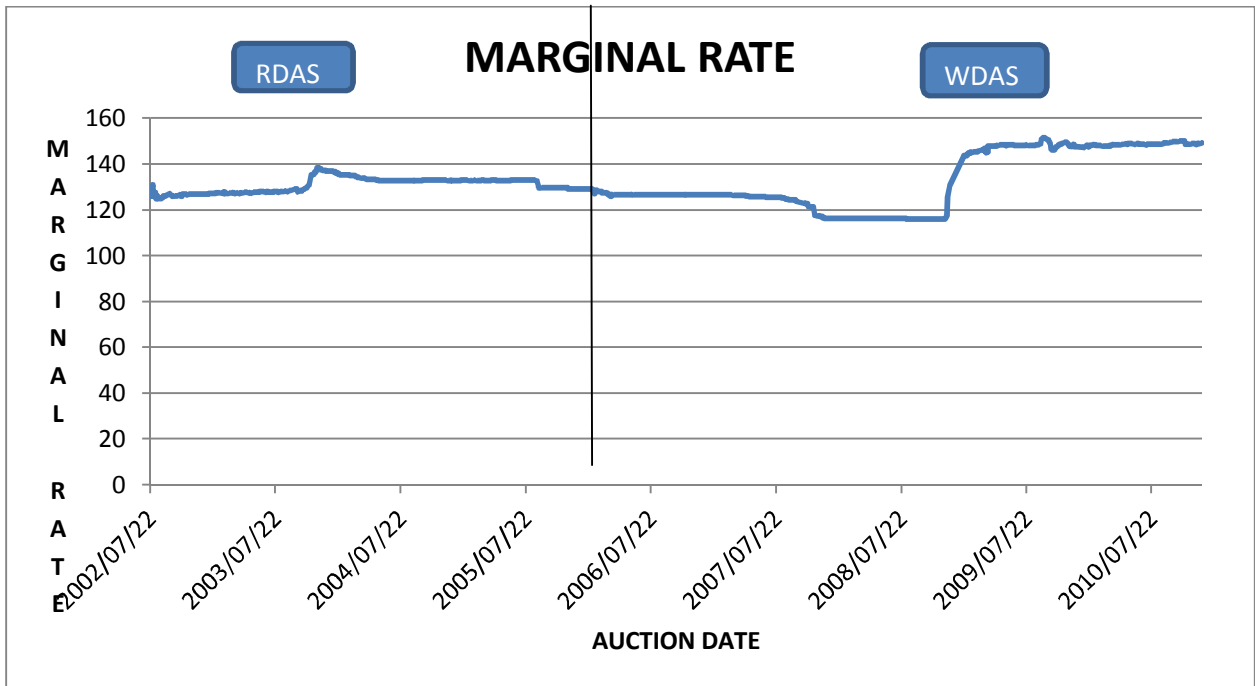


Figure 4.7: Successful bid series for DAS.

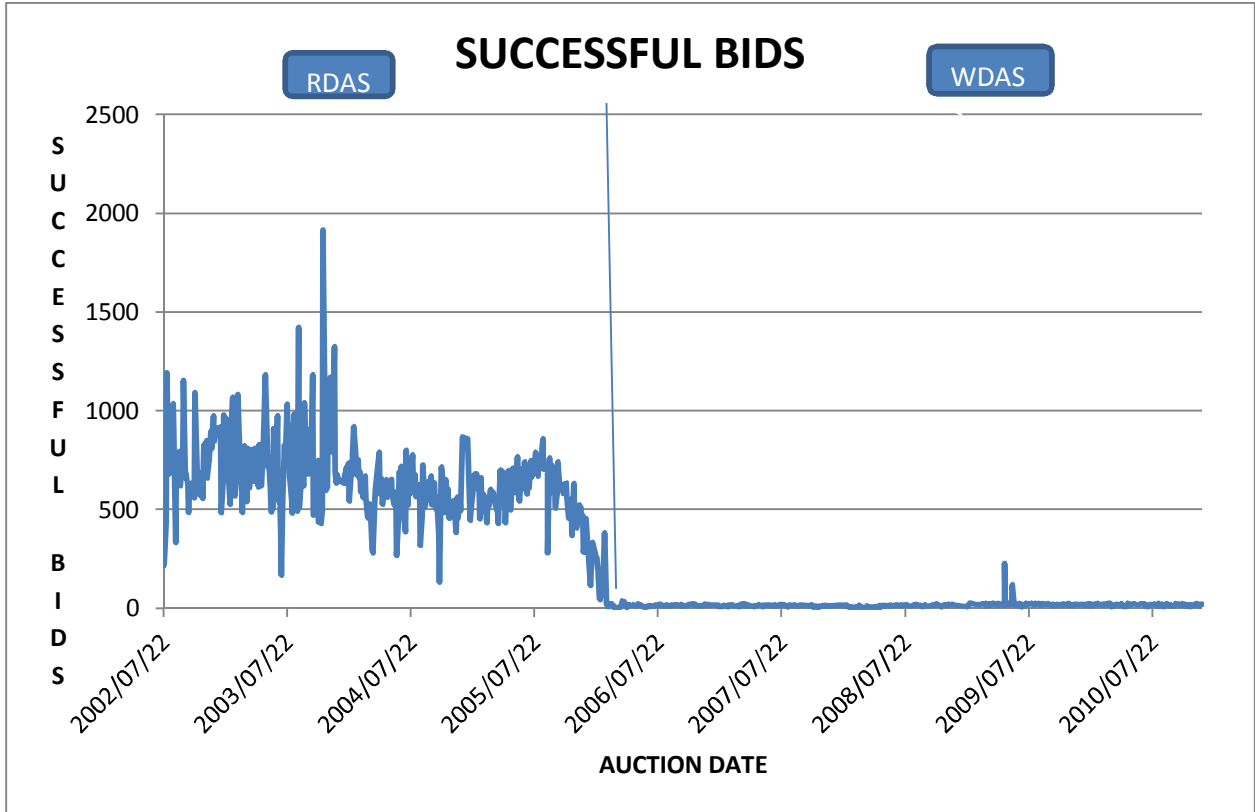
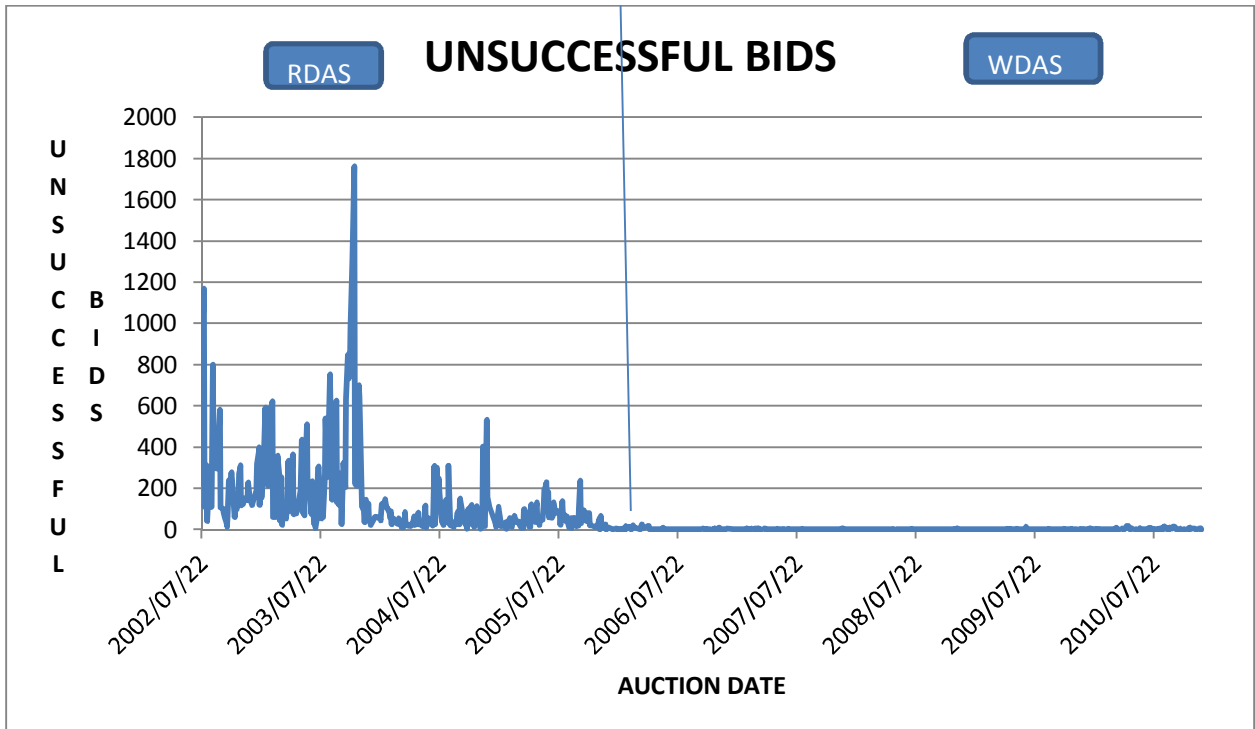


Figure 4.8: Unsuccessful bid for DAS series.



The plot of the series exhibited four patterns; in the first phase, the marginal rate, highest bid and lowest bid follow similar trend which indicated that the rates have depreciated from about N130/\$ at the end of the retail auction in 2006 to about N150/\$ as at December 2010. The movement reflected a band wagon effect. In the second phase, successful and unsuccessful bids had both lower spikes under the wholesale than retail phase because of the introduction of universal banking license and the re-capitalization of banks which prune down the no of participating Authorized Dealers to twenty five (25) when WDAS took off. Also, it implies that speculative tendencies were higher for retail phase than wholesale phase of the auction. In the third phase, the demand, amount and quantity sold exhibited higher spikes in their trend plot under the wholesale period than retail phase of the auction. This implies higher volatility of quantity demand, quantity sold and amount offered under the wholesale phase than the retail phase.

4.2 EXCHANGE RATE SPREAD

This table below shows the coefficient of variation of different spread among the highest bid, lowest bid and the marginal rate at both retail and wholesale phase of the auction. The spread exhibits one pattern, the coefficient of variation for highest bid-lowest bid, highest bid-marginal rate and marginal rate-lowest bid are lower under the wholesale than retail phase of the auction. This implies that there is higher chance of collusive behaviour in the wholesale than retail phase of the auction.

TABLE 4.3: DAS SPREAD COEFFICIENT OF VARIATION.

COEFFICIENT OF VARIATION		
SPREAD	RDAS	WDAS
HB-LB	0.7709	0.28
HB-MR	0.9096	0.2340
MR-LB	2	0.422

Source: *Computed from CBN data.*

PRICE GAP SPREAD

The highest bid-lowest bid, highest bid-marginal rate and marginal rate-lowest bid rates spread plot (figure 4.9- 4.11) showed more remarkable volatility under retail than wholesale which implied that chances for collusive behavior is higher under the wholesale than the retail phase of the auction. However, at the inception of Wholesale Dutch Auction System the spreads narrowed down and stabilized for most of the period between February 2006 and February 2010 and became more turbulent for the rest of the period of 2010.

Figure 4.9: Highest bids-Lowest bids spread series for DAS.

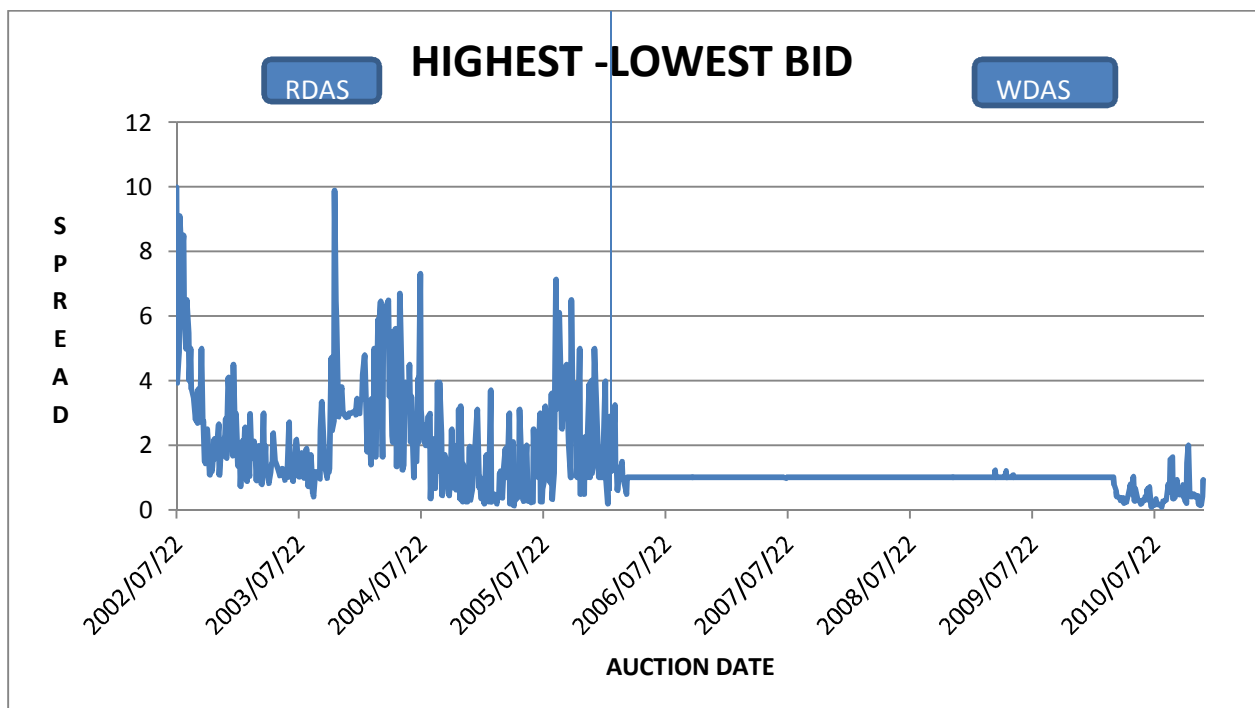


Figure 4.10: Highest bids-Marginal rate spread series for DAS series.

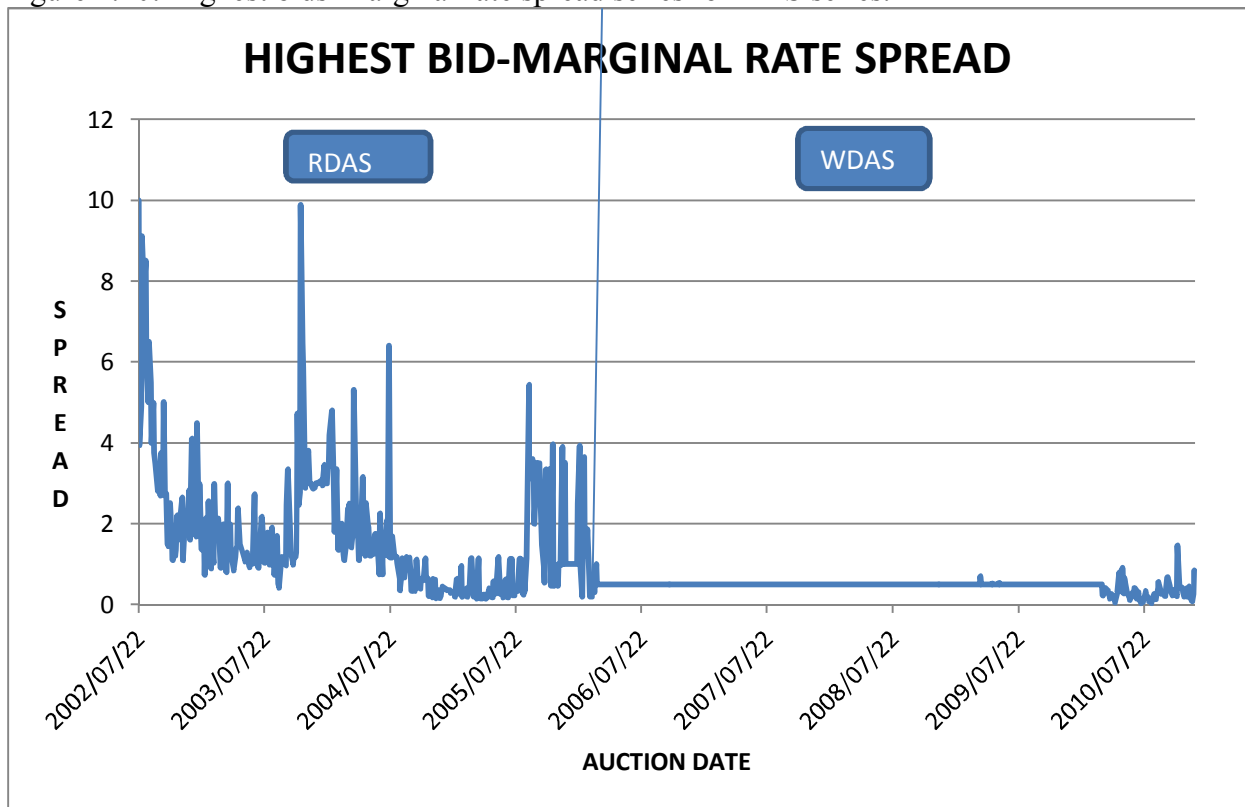
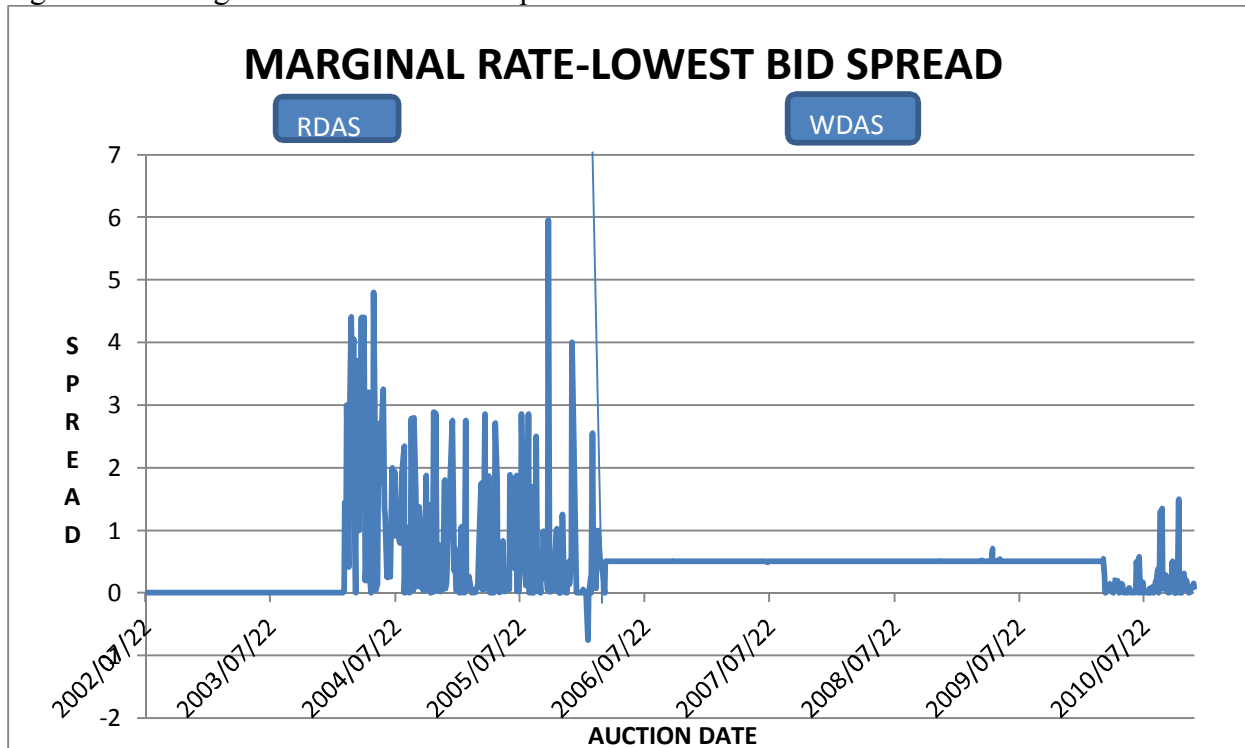
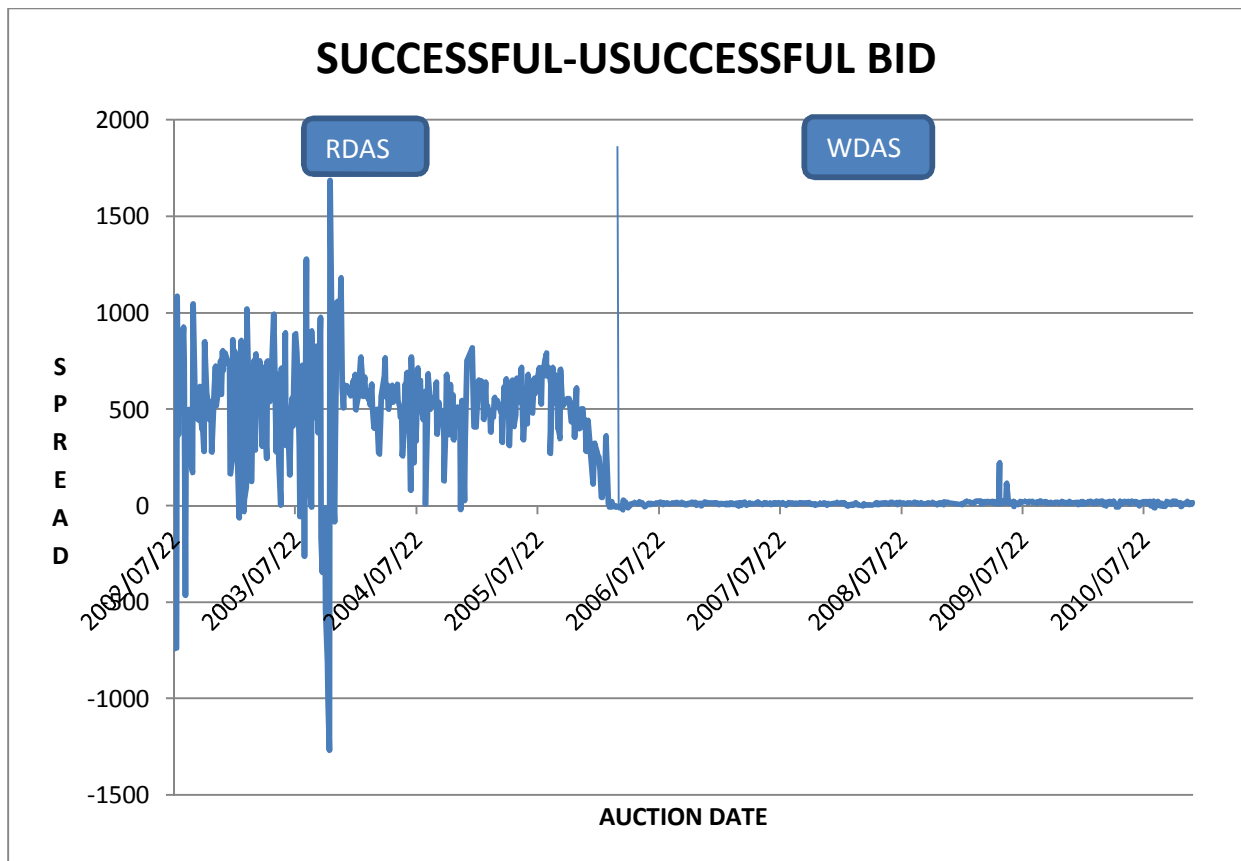


Figure 4.11: Marginal rate-Lowest bids spread series for DAS



The fluctuation of successful and unsuccessful bid spread plot (figure 4.12) is more turbulent in retail phase than wholesale phase of the auction which implied higher competitive bidding in retail phase than wholesale phase of the auction. Also, it can be explained by non-conformity to trading guidelines due to inexperience of the bidders at the early stage of retail auction as this is a reason for rejecting a bid. The spikes remained high and higher for retail than wholesale which is not unconnected with higher number of participant at the retail phase of the auction. Also, the lower spikes of the successful-unsuccesful bid spread at wholesale phase indicated that there is a higher chance of collusive behavior among the bidders in wholesale than retail phase of the auction.

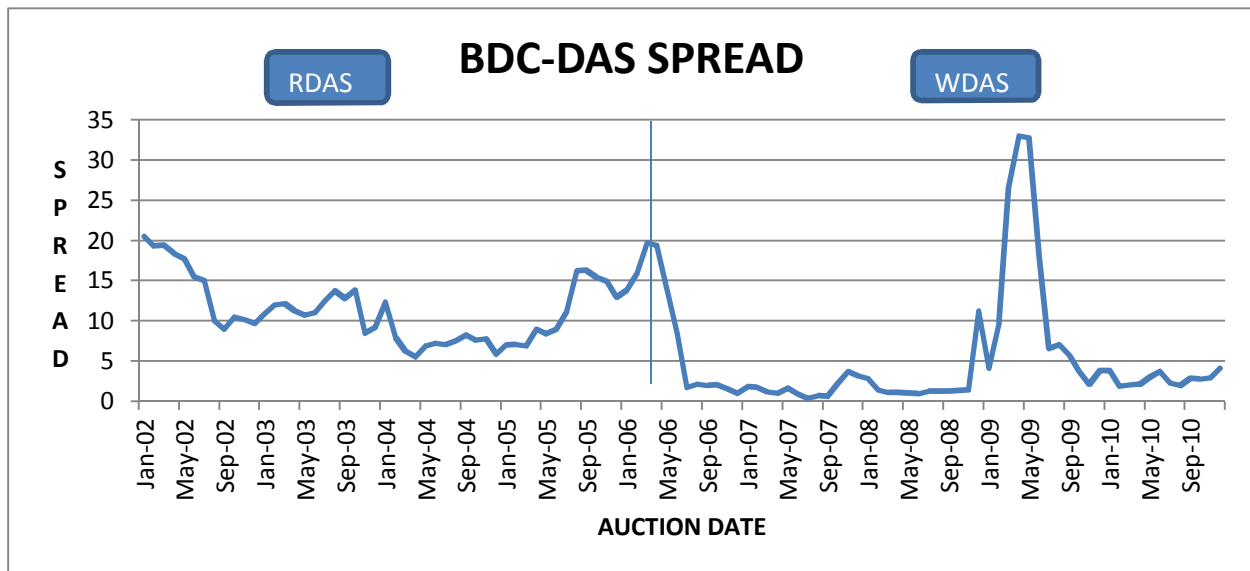
Figure 4.12: Successful –Unsuccessful bid spread series for DAS.



SUB-MARKET SPREAD

The spread here shows the gap that exists among the different segments (Bureau de Change (BDC), Inter Bank Foreign Exchange Market (IFEM) and Dutch Auction System (DAS)) of the foreign exchange market. The oscillation of the BDC-DAS spread plot (figure 4.13) suggests that the rates were not stable with the BDC rate remaining higher than DAS rates throughout. After the inception of the WDAS, the spread since narrowed down around July 2006 up till around January 2009 when it widened creating an arbitrage seeking opportunity for speculators as premium reached over N30.00. In August 2009, the premium narrowed to below N4.00 per Dollar and had remain around so up till December 2010.

Figure 4.13: Bureau De Change-DAS rates spread series.



The IFEM-DAS rate was initially positive and then narrowed down to merely zero. It became negative at some time since the introduction of WDAS in 2006 up till January 2009 which indicate a high degree of convergence between the two rates. Afterwards it widened creating a premium of around N8.00 which later became lower around N2.00 as at December 2010.

Figure 4.14: IFEM-DAS rates.

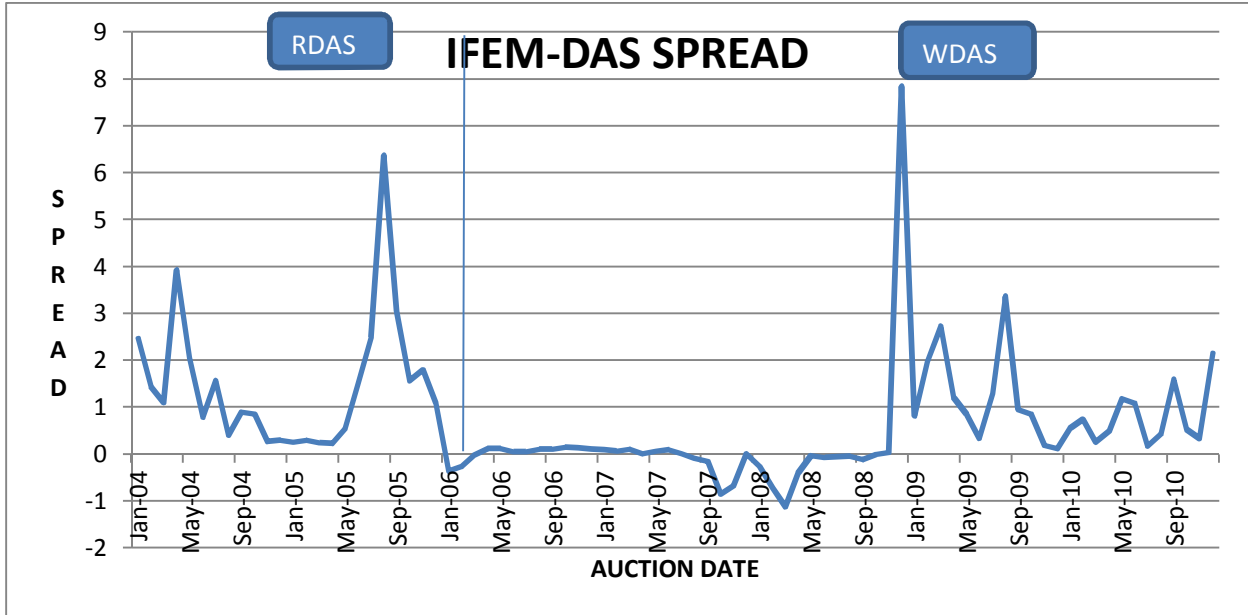
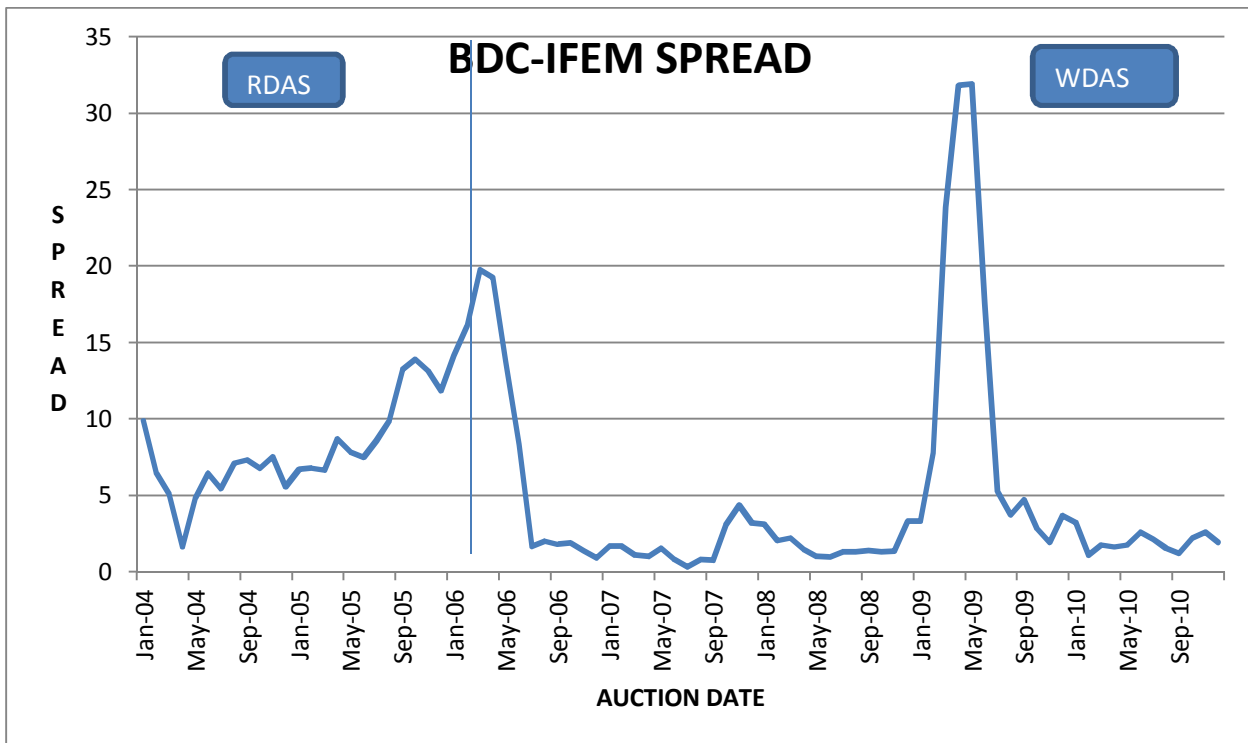


Figure 4.15: Bureau De Change- IFEM rates spread series.



EXCESS DEMAND SPREAD

The excess demand (DD-SS and DD-AM and AM-SS) volatility still persists as evidenced in the trend plot of the series (figure 4.17-4.19) under the retail and wholesale auction. The oscillation showed that excess demand had been largely positive with a bit of negative trend thereby driving the force for the depreciation of the naira. Despite the trend plot showed that volatility is near zero for both retail and wholesale which is tantamount to near stability, the spikes seem to be more in wholesale phase than retail phase of the auction.

Figure 4.16: Demand-Sold (DAS)

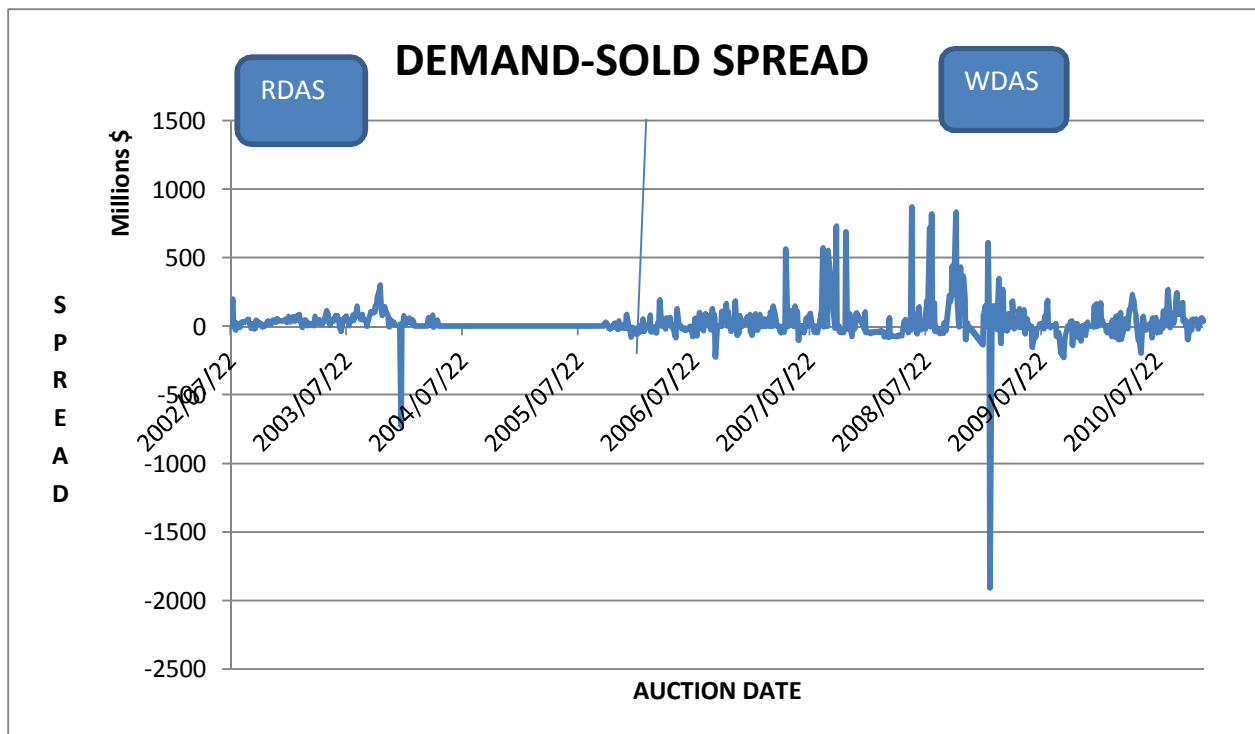


Figure 4.17: Demand-Amount (DAS)

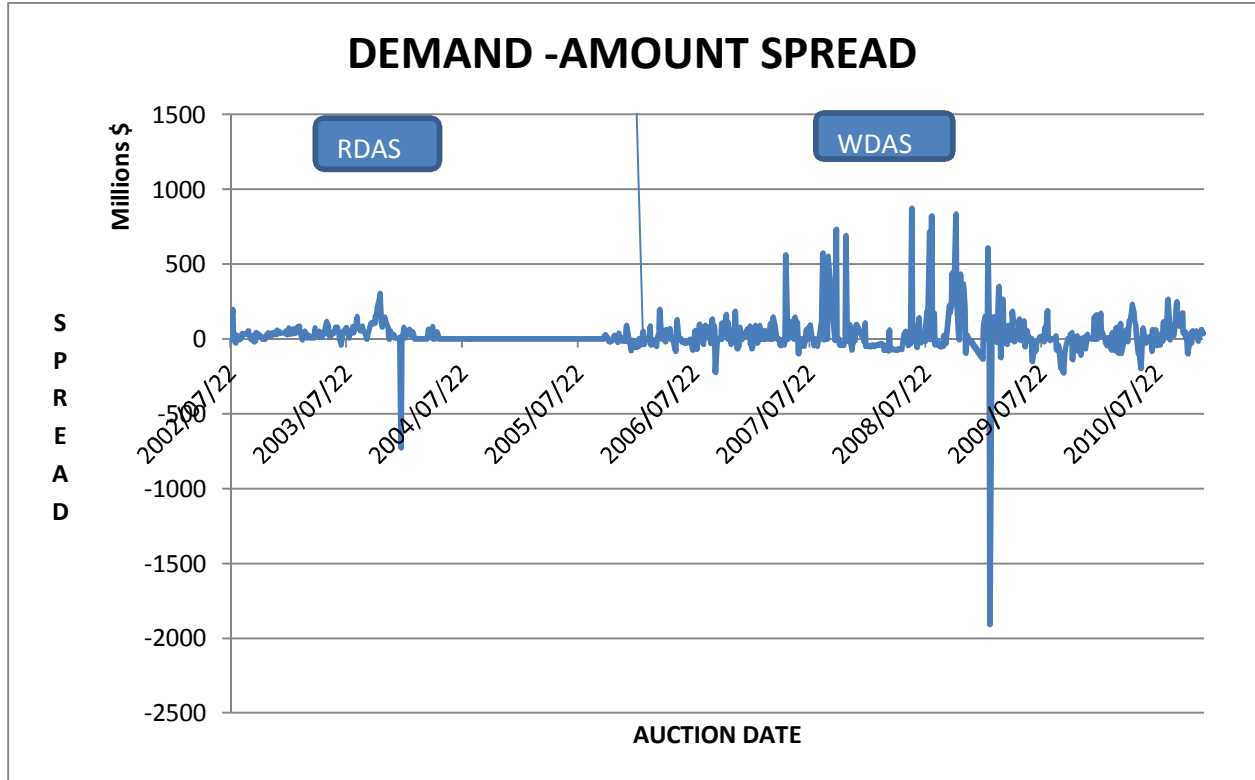
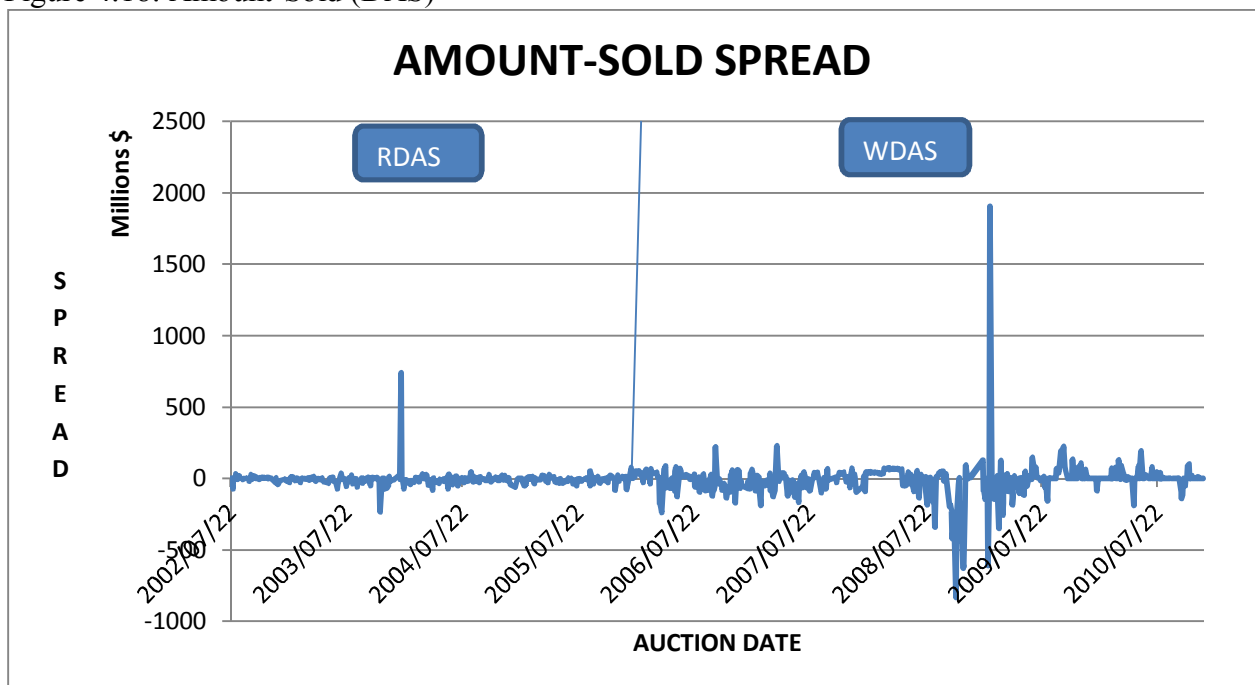


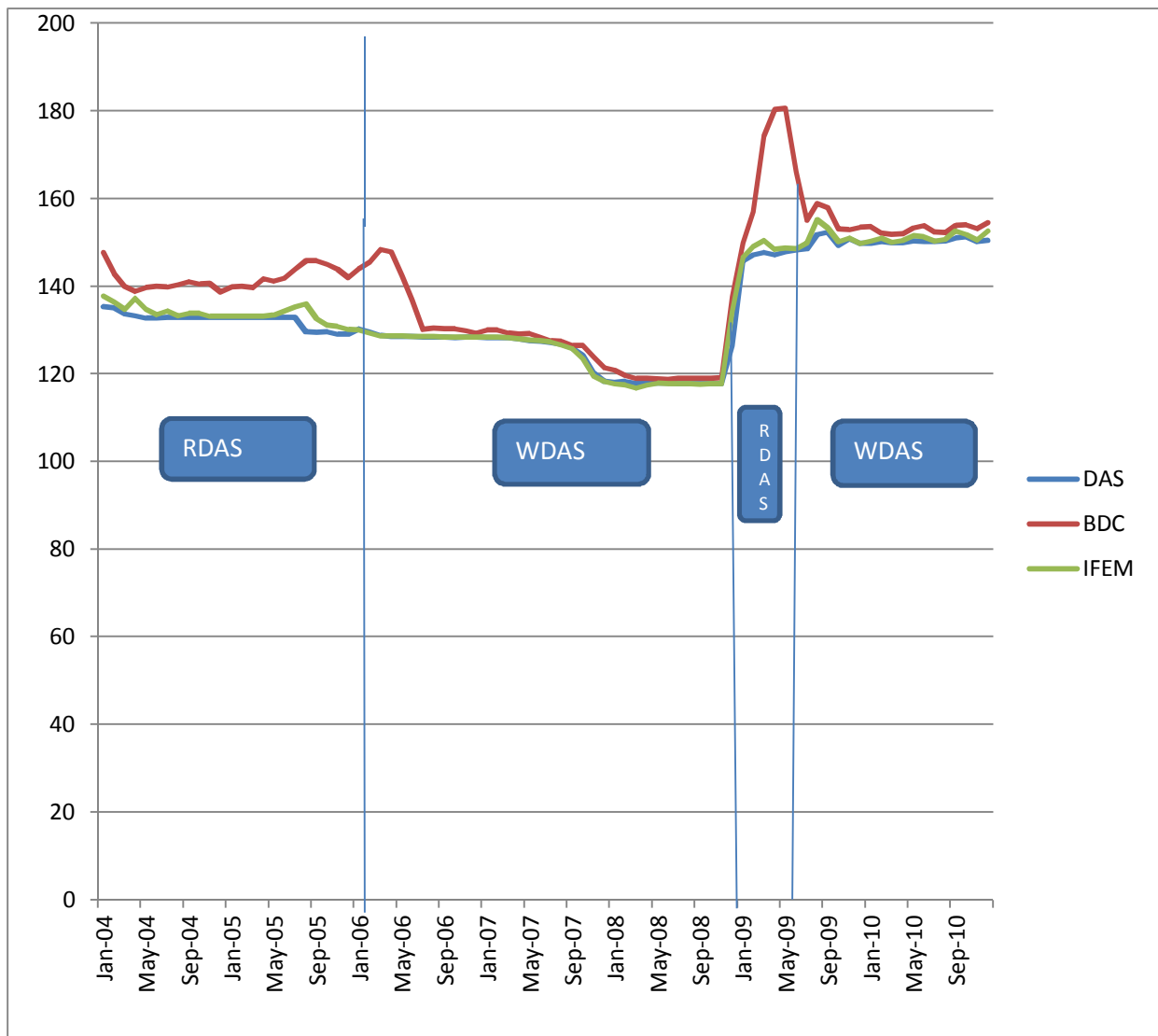
Figure 4.18: Amount-Sold (DAS)



CONVERGENCE TREND

The graph below (figure 4.16) showed that since the start of the WDAS in 2006, the earlier convergence witnessed had been sustained but for a transient hike of BDC rate around January 2009 to August 2009 which have been re-converged. In effect, there is a convergence of the BDC, IFEM and WDAS rate of the foreign exchange segment of the market. Nonetheless, the depreciation of the BDC, IFEM and WDAS rates have prevailed especially after January 2009. This shows that the three segment of the market were mirror image of each other.

Figure 4.19: BDC, IFEM and DAS Market trend series DAS.



4.3 ESTIMATION RESULTS AND ANALYSES

MARGINAL RATE MODEL (RDAS)

$$\text{LogMR}_t = -0.23 - 0.00037D_t + 0.46\text{MR}_{t-1} + \varepsilon_t \dots\dots\dots(4.1)$$

$$\sigma_t^2 = 1.15 + 0.15\varepsilon_{t-1}^2 + 0.60\sigma_{t-1}^2 \dots\dots\dots(4.2)$$

$$R^2=0.97, \text{ S.E}=0.000214, \text{ DW}=2.34$$

The sum of the ARCH and GARCH co-efficient $\alpha+\beta$ (0.15+0.6=0.75) is close to one indicating that volatility is persistent. This implies that the Retail Dutch Auction System (RDAS) had not eliminated volatility of the marginal rate.

MARGINAL RATE MODEL (WDAS)

$$\text{LogMR}_t = -0.245 - 0.000134D_t + 0.47\text{MR}_{t-1} + \varepsilon_t \dots\dots\dots(4.3)$$

$$\sigma_t^2 = 9.35 + 0.14\varepsilon_{t-1}^2 + 0.59\sigma_{t-1}^2 \dots\dots\dots(4.4)$$

$$R^2=0.99, \text{ S.E}=0.00124, \text{ DW}=1.134$$

The sum of the ARCH and GARCH co-efficient $\alpha+\beta$ (0.14+0.59=0.73) is close to one indicating that volatility is persistent. This implies that the introduction of Wholesale Dutch Auction System (WDAS) had not eliminated volatility of the marginal rate.

DEMAND MODEL (RDAS)

$$\text{DD}_t = -46147818 + 492626\text{MR}_{t-1} + 0.64\text{DD}_{t-1} + 3299324\text{SB}_{t-1} - 0.015\text{AM} + \varepsilon_t \dots\dots\dots(4.5)$$

$$\sigma_t^2 = 5.197 + 0.60\varepsilon_{t-1}^2 - 0.007\sigma_{t-1}^2 \dots\dots\dots(4.6)$$

$$R^2=0.55, \text{ DW}=2.17, \text{ S.E}=28816927$$

The sum of the ARCH and GARCH co-efficient $\alpha+\beta$ (0.6+(-0.007)=0.593) is close to one indicating that volatility is persistent. This implies that the Retail Dutch Auction System (RDAS) had not eliminated volatility of demand. This outcome is consistent with (Auwal, 2006), who

found persistent volatility for both demand and marginal rate model under the Retail Dutch Auction System. Also, (Mordi, 2006) and (Obadan, 2006) found that the exchange rate was volatile under the Retail Dutch Auction System.

DEMAND MODEL (WDAS)

$$\text{LogDD}_t = 0.93 - 0.09\text{MR}_{t-1} + 0.045\text{DD}_{t-1} + 0.02\text{SB}_{t-1} + 0.06\text{AM}_t + \varepsilon_t \dots \dots \dots (4.7)$$

(9.12) (1.49) (5.6) (3.19) (6.37)

$$\sigma_t^2 = 7.94 - 0.0075 \varepsilon_{t-1}^2 + 1.01\sigma_{t-1}^2 \dots \dots \dots (4.8)$$

(5.7) (-0.45) (49.89)

DW=2.11, S.E=0.048

The sum of the ARCH and GARCH co-efficient $\alpha + \beta(-0.0075 + 1.010) = 1.002$ is approximately one. This indicates that volatility in demand is persistent suggesting that the introduction of Wholesale Dutch Auction System had not eliminated volatility in demand for foreign exchange.

SUPPLY MODEL (WDAS)

$$\text{LogSS}_t = 1.13 + 0.05\text{SS}_{t-1} + 0.08\text{SB}_t - 0.044\text{MR}_t + 0.06\text{AM}_t + \varepsilon_t \dots \dots \dots (4.9)$$

(12.99) (6.69) (5.89) (-0.81) (5.87)

$$\sigma_t^2 = 8.67 - 0.0084\varepsilon_{t-1}^2 + 1.007\sigma_{t-1}^2 \dots \dots \dots (4.10)$$

(11.34) (-0.52) (52.47)

$R^2=0.64, S.E=0.03, DW=2.01$

The sum of the ARCH and GARCH co-efficient $\alpha + \beta (-0.008 + 1.007 = 0.999)$ is close to one indicating that volatility is persistent. This implies that the introduction of Wholesale Dutch Auction System (WDAS) had not eliminated volatility of supply of exchange rate.

SUPPLY MODEL (RDAS)

$$\text{LogSS}_t = 0.68 + 0.02\text{SS}_{t-1} + 0.07\text{SB}_t + 0.36\text{MR}_t + 0.02\text{AM}_t + \varepsilon_t \dots \dots \dots (4.11)$$

(6.16) (5.64) (15.18) (6.52) (2.43)

$$\sigma_t^2 = 7.11 + 0.03\varepsilon_{t-1}^2 + 0.87\sigma_{t-1}^2 \dots \dots \dots (4.12)$$

(1.59) (1.26) (12.96)

$R^2=0.73, S.E=0.01, DW=1.90$

The sum of the ARCH and GARCH co-efficient $\alpha+\beta$ ($0.03+0.87=0.90$) is close to one indicating that volatility is persistent. This implies that the Retail Dutch Auction System (RDAS) had not eliminated volatility of supply of exchange rate.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 SUMMARY

The study evaluated the Wholesale Dutch Auction Systems relative to Retail Dutch Auction Systems of foreign exchange rate in Nigeria (2002-2010) as an efficient means of determining a stable value of the Naira. The objective of study evaluated the Retail and Wholesale Dutch Auction system of foreign exchange rate with a view to make comparative analysis between the two phases in terms of volatility of demand, supply and marginal rate, presence or absence of collusive behavior and exchange rate spreads. The study used the GARCH model and coefficient of variation to investigate the volatility of demand, supply and marginal rate. Also, descriptive statistics was used to analyze presence of collusive behaviour and exchange rate spreads. The Augmented Dicker Fuller (ADF) stationarity test was conducted to investigate the stationarity of the DAS series. The trend analysis was used to show whether convergence of the DAS, BDC and IFEM rates had been achieved and sustained.

5.2 SUMMARY OF MAJOR FINDINGS

1. The GARCH model of marginal rate, supply and demand indicated that volatility is persistent in both retail and wholesale phase of the auction
2. Amount offered, quantity demanded, quantity sold, highest bid, lowest bid, marginal rate, successful and unsuccessful bids had higher coefficient of variation at the wholesale phase than retail phase of the auction.
3. The coefficient of variation of the exchange rate spreads (highest bid-lowest bid, highest bid-marginal rate and marginal rate-lowest bid) were lower in the wholesale than in the retail phase of the auction.

4. The trend plot of the exchange rate spreads (highest bid-lowest bid, highest bid-marginal rate and marginal rate-lowest bid) showed lower spikes in the wholesale than in the retail phase of the auction.
5. Convergence of the IFEM, BDC and WDAS rates had been achieved and sustained since the introduction of WDAS even though it did not stop the depreciation of the Naira in these sub-markets.

5.3 CONCLUSION

The study concludes that although marginal rate, demand and supply remained volatile under both retail and wholesale phase of the auction, they are more volatile under wholesale phase than retail phase of the auction. Furthermore, higher excess demand and higher chance of collusive behavior is more prevalent in the wholesale phase than retail phase of the auction. The trend analysis also showed that the introduction of Wholesale Dutch Auction System has led to a sustained convergence of the BDC, IFEM and WDAS rates although this had not curtailed the depreciation of the Naira.

5.4 RECOMMENDATIONS

Based on the findings of the study, the following recommendations were made; firstly, the government should reduce foreign exchange excess demand by embarking on an import substitution strategy that will stimulate the domestic production base of the economy thereby reducing the excess demand pressure. Secondly, CBN foreign exchange policy shift should be followed-up by timely systematic analysis of its efficacy in yielding results so as to avoid frequent policy reversals. Thirdly, in the long term, the Dutch Auction System should be suspended because despite the modifications it had witnessed overtime, it had failed to stabilize the Naira during both retail and wholesale auction. Fourthly, the CBN should create a more market determined template for foreign exchange determination by devolving more of its monopoly power of foreign exchange supply so that excess demand gap can be narrowed.

Finally, further studies should focus on investigating the effectiveness of the recently introduced foreign exchange rate forwards with the aim of evaluating its impact on the stability of the exchange rate.

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APPENDIX I

UNIT ROOT RESULT FOR WDAS AMOUNT

ADF Test Statistic	-8.787072	1% Critical Value*	-3.4463
		5% Critical Value	-2.8679
		10% Critical Value	-2.5701

*MacKinnon critical values for rejection of hypothesis of a unit root.

UNIT ROOT RESULT FOR WDAS DEMAND

ADF Test Statistic	-8.425613	1% Critical Value*	-3.4463
		5% Critical Value	-2.8679
		10% Critical Value	-2.5701

*MacKinnon critical values for rejection of hypothesis of a unit root.

UNIT ROOT FOR WDAS SOLD

ADF Test Statistic	-8.435328	1% Critical Value*	-3.4463
		5% Critical Value	-2.8679
		10% Critical Value	-2.5701

*MacKinnon critical values for rejection of hypothesis of a unit root.

UNIT ROOT FOR HIGHEST BID WDAS

ADF Test Statistic	-1.265148	1% Critical Value*	-3.4463
		5% Critical Value	-2.8679
		10% Critical Value	-2.5701

*MacKinnon critical values for rejection of hypothesis of a unit root.

UNIT ROOT FOR LOWEST BID WDAS

ADF Test Statistic	-1.221065	1% Critical Value*	-3.4463
		5% Critical Value	-2.8679
		10% Critical Value	-2.5701

*MacKinnon critical values for rejection of hypothesis of a unit root.

UNIT ROOT FOR SUCESSFUL BID WDAS

ADF Test Statistic	-12.89154	1% Critical Value*	-3.4463
		5% Critical Value	-2.8679
		10% Critical Value	-2.5701

*MacKinnon critical values for rejection of hypothesis of a unit root.

UNIT ROOT FOR UNSUCCESSFUL BID WDAS

ADF Test Statistic	-9.500396	1% Critical Value*	-3.4463
		5% Critical Value	-2.8679
		10% Critical Value	-2.5701

*MacKinnon critical values for rejection of hypothesis of a unit root.

UNIT ROOT FOR MARGINAL RATE WDAS

ADF Test Statistic	-1.275830	1% Critical Value*	-3.4463
		5% Critical Value	-2.8679
		10% Critical Value	-2.5701

*MacKinnon critical values for rejection of hypothesis of a unit root.

UNIT ROOT ON AMOUNT RDAS

ADF Test Statistic	-11.79912	1% Critical Value*	-3.4515
		5% Critical Value	-2.8702
		10% Critical Value	-2.5714

*MacKinnon critical values for rejection of hypothesis of a unit root.

UNIT ROOT ON DEMAND RDAS

ADF Test Statistic	-5.580631	1% Critical Value*	-3.4515
		5% Critical Value	-2.8702
		10% Critical Value	-2.5714

*MacKinnon critical values for rejection of hypothesis of a unit root.

UNIT ROOT ON SOLD RDAS

ADF Test Statistic	-8.598137	1% Critical Value*	-3.4515
		5% Critical Value	-2.8702
		10% Critical Value	-2.5714

*MacKinnon critical values for rejection of hypothesis of a unit root.

UNIT ROOT ON HIGH RDAS

ADF Test Statistic	-2.137841	1% Critical Value*	-3.4515
		5% Critical Value	-2.8702
		10% Critical Value	-2.5714

*MacKinnon critical values for rejection of hypothesis of a unit root.

UNIT ROOT ON LOW RDAS

ADF Test Statistic	-2.530735	1% Critical Value*	-3.4515
		5% Critical Value	-2.8702
		10% Critical Value	-2.5714

*MacKinnon critical values for rejection of hypothesis of a unit root.

UNIT ROOT ON SUCCESSFUL BID RDAS

ADF Test Statistic	-8.302295	1% Critical Value*	-3.4515
		5% Critical Value	-2.8702
		10% Critical Value	-2.5714

*MacKinnon critical values for rejection of hypothesis of a unit root.

UNIT ROOT ON UNSUCCESSFUL BID RDAS

ADF Test Statistic	-6.430904	1% Critical Value*	-3.4515
		5% Critical Value	-2.8702
		10% Critical Value	-2.5714

*MacKinnon critical values for rejection of hypothesis of a unit root.

UNIT ROOT ON MARGINAL RATE RDAS

ADF Test Statistic	-0.916069	1% Critical Value*	-3.4515
		5% Critical Value	-2.8702
		10% Critical Value	-2.5714

*MacKinnon critical values for rejection of hypothesis of a unit root.

APPENDIX II

MARGINAL RATE RDAS

Dependent Variable: LOG(MR)

Method: ML - ARCH (Marquardt)

Date: 12/21/11 Time: 10:35

Sample(adjusted): 2 342

Included observations: 341 after adjusting endpoints

Convergence achieved after 11 iterations

Bollerslev-Wooldrige robust standard errors & covariance

Variance backcast: ON

	Coefficient	Std. Error	z-Statistic	Prob.
C	-0.237534	0.007223	-32.88581	0.0000
MR(-1)	0.467876	0.003121	149.9255	0.0000
DD	-0.000374	0.000240	-1.557999	0.1192
Variance Equation				
C	1.15E-07	3.12E-07	0.368035	0.7128
ARCH(1)	0.150162	0.243393	0.616955	0.5373
GARCH(1)	0.600031	0.419349	1.430864	0.1525
R-squared	0.973281	Mean dependent var		0.749742
Adjusted R-squared	0.972883	S.D. dependent var		0.004858
S.E. of regression	0.000800	Akaike info criterion		-12.19577
Sum squared resid	0.000214	Schwarz criterion		-12.12834
Log likelihood	2085.378	F-statistic		2440.617
Durbin-Watson stat	2.345838	Prob(F-statistic)		0.000000

APPENDIX III

SUPPLY RDAS

Dependent Variable: LOG(SS)

Method: ML - ARCH (Marquardt)

Date: 12/21/11 Time: 10:29

Sample(adjusted): 2 342

Included observations: 341 after adjusting endpoints

Convergence achieved after 5 iterations

Bollerslev-Wooldrige robust standard errors & covariance

Variance backcast: ON

	Coefficient	Std. Error	z-Statistic	Prob.
C	0.689663	0.111883	6.164119	0.0000
SS(-1)	0.029673	0.005257	5.644026	0.0000
SB	0.070742	0.004659	15.18476	0.0000
MR	0.369362	0.056615	6.524143	0.0000
AM	0.021545	0.008842	2.436635	0.0148
Variance Equation				
C	7.11E-06	4.47E-06	1.590992	0.1116
ARCH(1)	0.039847	0.031488	1.265435	0.2057
GARCH(1)	0.875908	0.067540	12.96877	0.0000
R-squared	0.738767	Mean dependent var		2.074854
Adjusted R-squared	0.733275	S.D. dependent var		0.020572
S.E. of regression	0.010624	Akaike info criterion		-6.394234
Sum squared resid	0.037588	Schwarz criterion		-6.304336
Log likelihood	1098.217	F-statistic		134.5319
Durbin-Watson stat	1.902609	Prob(F-statistic)		0.000000

APPENDIX IV

DEMAND MODEL(RDAS)

Dependent Variable: DD

Method: ML - ARCH (Marquardt)

Date: 11/24/11 Time: 02:26

Sample(adjusted): 2 342

Included observations: 341 after adjusting endpoints

Convergence achieved after 101 iterations

Variance backcast: ON

	Coefficient	Std. Error	z-Statistic	Prob.
C	-46147818	57732741	-0.799335	0.4241
DD(-1)	0.641234	0.028629	22.39769	0.0000
MAR(-1)	492626.0	447473.7	1.100905	0.2709
SU(-1)	32993.24	7416.296	4.448749	0.0000
AM(-1)	-0.015163	0.057549	-0.263482	0.7922
Variance Equation				
C	5.19E+14	7.47E+13	6.954722	0.0000
ARCH(1)	0.607063	0.105038	5.779448	0.0000
GARCH(1)	-0.007155	0.024763	-0.288963	0.7726
R-squared	0.561129	Mean dependent var		1.13E+08
Adjusted R-squared	0.551904	S.D. dependent var		43048893
S.E. of regression	28816927	Akaike info criterion		36.90872
Sum squared resid	2.77E+17	Schwarz criterion		36.99861
Log likelihood	-6284.936	F-statistic		60.82364
Durbin-Watson stat	2.151725	Prob(F-statistic)		0.000000

APPENDIX V

MARGINAL RATE WDAS

Dependent Variable: LOG(MR)

Method: ML - ARCH (Marquardt)

Date: 12/21/11 Time: 10:49

Sample(adjusted): 3 482

Included observations: 480 after adjusting endpoints

Convergence achieved after 6 iterations

Bollerslev-Wooldrige robust standard errors & covariance

Variance backcast: ON

	Coefficient	Std. Error	z-Statistic	Prob.
C	-0.245072	0.001363	-179.7420	0.0000
MR(-1)	0.470452	0.000709	663.8588	0.0000
DD	-0.000134	8.43E-05	-1.589349	0.1120
Variance Equation				
C	9.35E-07	4.24E-07	2.204733	0.0275
ARCH(1)	0.149993	0.085152	1.761470	0.0782
GARCH(1)	0.599995	0.081386	7.372211	0.0000
R-squared	0.996377	Mean dependent var	0.753357	
Adjusted R-squared	0.996339	S.D. dependent var	0.020565	
S.E. of regression	0.001244	Akaike info criterion	-10.59877	
Sum squared resid	0.000734	Schwarz criterion	-10.54659	
Log likelihood	2549.704	F-statistic	26070.26	
Durbin-Watson stat	1.134253	Prob(F-statistic)	0.000000	

APPENDIX VI
SUPPLY WDAS

Dependent Variable: LOG(SS)
 Method: ML - ARCH (Marquardt)
 Date: 12/21/11 Time: 10:17
 Sample(adjusted): 2 482
 Included observations: 481 after adjusting endpoints
 Convergence achieved after 85 iterations
 Bollerslev-Wooldrige robust standard errors & covariance
 Variance backcast: ON

	Coefficient	Std. Error	z-Statistic	Prob.
C	1.138630	0.087612	12.99628	0.0000
SS(-1)	0.051847	0.007743	6.696454	0.0000
SB	0.084249	0.014299	5.891879	0.0000
MR	-0.044072	0.054302	-0.811621	0.4170
AM	0.064417	0.010957	5.878953	0.0000

Variance Equation				
C	8.67E-06	7.64E-07	11.34023	0.0000
ARCH(1)	-0.008479	0.016048	-0.528333	0.5973
GARCH(1)	1.007567	0.019201	52.47560	0.0000

R-squared	0.647194	Mean dependent var	2.078109
Adjusted R-squared	0.641972	S.D. dependent var	0.065499
S.E. of regression	0.039192	Akaike info criterion	-3.820638
Sum squared resid	0.726524	Schwarz criterion	-3.751185
Log likelihood	926.8635	F-statistic	123.9541
Durbin-Watson stat	2.016251	Prob(F-statistic)	0.000000

APPENDIX VII

DEMAND WDAS

Dependent Variable: LOG(DD)

Method: ML - ARCH (Marquardt)

Date: 12/21/11 Time: 10:45

Sample(adjusted): 3 482

Included observations: 480 after adjusting endpoints

Convergence achieved after 44 iterations

Bollerslev-Wooldrige robust standard errors & covariance

Variance backcast: ON

	Coefficient	Std. Error	z-Statistic	Prob.
C	0.937772	0.102772	9.124756	0.0000
MR(-1)	0.092320	0.061797	1.493925	0.1352
DD(-1)	0.045121	0.008057	5.600463	0.0000
SB(-1)	0.028970	0.009062	3.196893	0.0014
AM	0.068399	0.010726	6.376873	0.0000
Variance Equation				
C	7.94E-06	1.38E-06	5.753392	0.0000
ARCH(1)	-0.007571	0.016567	-0.456970	0.6477
GARCH(1)	1.010363	0.020248	49.89935	0.0000
R-squared	0.477642	Mean dependent var	2.083048	
Adjusted R-squared	0.469896	S.D. dependent var	0.066158	
S.E. of regression	0.048168	Akaike info criterion	-3.495975	
Sum squared resid	1.095134	Schwarz criterion	-3.426412	
Log likelihood	847.0341	F-statistic	61.65649	
Durbin-Watson stat	2.111885	Prob(F-statistic)	0.000000	

APPENDIX VIII

Auction Date	Auction No	Amount in million \$	Demand in million \$	Sold in million \$	Highest Bid rates	Lowest Bids rates	No of Successful Bids	No of Un-Successful bids	Marginal rate
12/15/2010	96	800	837.786932	800	150	149.06	20	3	149.16
12/13/2010	95	400	447.623518	400	149.34	148.9	17	7	149.06
12/8/2010	94	250	312.192159	250	149.08	148.9	19	5	149
12/6/2010	93	200	236.521196	200	149	148.84	13	6	148.9
12/1/2010	92	200	200.994347	200	149	148.8	19	0	148.8
11/29/2010	91	250	235.361563	235.3616	149.19	148.75	24	0	148.75
11/24/2010	90	250	281.108589	250	149.19	148.8	19	4	149
11/22/2010	89	250	305.765998	250	149.3	148.84	16	6	148.9
11/15/2010	88	250	288.813468	250	149	148.5	16	6	148.81
11/10/2010	87	120	173.399485	120	149	148.58	8	10	148.69
11/8/2010	86	200	175.140973	175.141	149	148.59	18	0	148.59
11/3/2010	85	150	185.231526	150	149	148.5	13	4	148.59
11/1/2010	84	250	208.549052	146.0965	149	147	19	4	148.5
10/27/2010	83	200	102.866432	102.8664	149.96	148.5	11	0	148.5
10/25/2010	82	250	240.324256	240.3243	150.11	149.9	22	0	149.9
10/20/2010	81	250	253.792022	250	150.25	149.94	19	1	149.96
10/18/2010	80	250	297.243308	297.2433	150.31	149.94	24	0	149.94
10/13/2010	79	300	341.128199	300	150.27	149.5	17	5	150
10/11/2010	78	250	423.648516	359.6485	150.19	149.69	14	6	149.96
10/6/2010	77	300	457.532529	438.5325	150.18	149.65	20	3	149.84
10/4/2010	76	300	387.133837	387.1338	150.34	149.87	21	0	149.87
9/29/2010	75	300	399.498063	300	150.5	149.84	23	0	149.84
9/27/2010	74	650	741.382707	650	150.53	149.59	18	6	149.84
9/22/2010	73	400	646.260191	400	150.09	149.59	11	13	149.88
9/20/2010	72	300	501.163122	300	149.83	149.4	10	13	149.62
9/15/2010	71	300	350.492841	300	149.75	149.4	14	5	149.46
9/13/2010	70	300	325.599911	300	149.69	148.05	18	4	149.4
9/8/2010	69	300	387.595783	300	149.58	148	11	10	149.3
9/6/2010	68	250	302.902709	250	149.56	148.87	18	3	149.18
9/1/2010	67	400	394.80442	394.8044	149.62	149.06	24	0	149.06
8/30/2010	66	400	547.558835	400	149.69	148.9	15	9	149.28
8/25/2010	65	250	516.566065	250	149.19	148.87	11	14	149.06
8/23/2010	64	200	355.210948	200	149	148.69	8	16	148.87
8/18/2010	63	250	267.170529	250	149	148.75	22	0	148.75
8/16/2010	62	200	305.622862	200	148.93	148.65	10	12	148.75
8/11/2010	61	150	265.09096	150	148.66	148.56	10	9	148.63
8/9/2010	60	200	188.927972	188.928	148.71	148.56	24	0	148.56

8/4/2010	59	150	183.364377	150	148.65	148.5	13	4	148.56
8/2/2010	58	200	159.591712	159.5917	148.69	148.52	19	0	148.52
7/28/2010	57	200	190.582566	190.5826	148.83	148.59	21	0	148.59
7/26/2010	56	200	202.767556	200	149	148.66	21	0	148.66
7/21/2010	55	250	205.498278	205.4983	148.86	148.71	19	0	148.71
7/19/2010	54	250	311.250083	250	148.75	148.52	17	5	148.69
7/14/2010	53	250	249.302899	249.3029	148.75	148.62	19	0	148.62
7/12/2010	52	250	305.143337	250	148.65	148.56	15	7	148.62
7/7/2010	51	150	214.168156	150	148.65	147.94	7	8	148.52
7/5/2010	50	200	117.103631	117.1036	148.75	148.44	18	0	148.44
6/30/2010	49	250	262.644275	250	148.65	148	13	2	148.5
6/28/2010	48	250	269.123224	250	148.9	148.46	22	2	148.55
6/23/2010	47	250	243.125211	243.1252	149	148.59	20	0	148.59
6/21/2010	46	300	287.53441	287.5344	148.94	148.65	20	0	148.65
6/16/2010	45	300	273.474309	273.4743	149	148.71	21	0	148.71
6/14/2010	44	400	383.701825	383.7018	149.09	148.87	22	0	148.87
6/9/2010	43	350	404.649241	350	149	148.8	17	8	148.88
6/7/2010	42	250	321.611818	250	149	148.72	19	4	148.81
6/2/2010	41	500	304.083866	304.0839	149.05	148.75	22	0	148.75
5/26/2010	40	450	382.992482	450	149.44	148.78	21	0	148.78
5/24/2010	39	450	350.841808	360.0418	149.15	148.87	22	0	148.87
5/19/2010	38	450	474.250235	450	149.84	148.81	18	6	148.93
5/17/2010	37	450	530.799667	450	149.16	148.69	21	4	148.84
5/12/2010	36	250	367.557089	250	149.19	148.66	16	8	148.81
5/10/2010	35	250	427.300633	435.6006	149.5	148.71	24	0	148.71
5/5/2010	34	450	681.07482	450	149.12	148.61	9	16	148.81
4/28/2010	33	250	381.414871	250	148.66	148.4	9	16	148.61
4/26/2010	32	250	376.571085	250	148.65	148.37	15	8	148.5
4/21/2010	31	250	233.688718	233.6887	148.65	148.43	23	0	148.43
4/19/2010	30	250	276.822431	257.5	148.65	148.28	18	6	148.4
4/14/2010	29	250	307.666129	250	148.59	148.25	16	5	148.34
4/12/2010	28	250	282.613215	256.6	148.55	148.25	19	4	148.4
4/7/2010	27	250	209.830595	209.8306	148.65	148.25	22	0	148.3
3/31/2010	26	250	157.770036	157.77	148.71	148.3	19	0	148.3
3/29/2010	25	150	252.450316	154.6	148.81	148.21	11	12	148.5
3/24/2010	24	200	106.090106	70.04011	148.52	147.75	8	5	148.3
3/22/2010	23	200	182.110627	179.4006	148.31	147.31	16	2	147.81
3/17/2010	22	200	267.810551	200	148.4	147.4	24	0	147.9
3/15/2010	21	200	278.471912	200	148.35	147.35	24	0	147.85
3/10/2010	20	250	174.307535	174.3075	148.25	147.25	17	0	147.75
3/8/2010	19	250	242.183471	242.1835	148.31	147.31	23	0	147.81

3/3/2010	18	200	242.183582	200	148.31	147.31	20	2	147.81
3/1/2010	17	250	176.633828	176.6338	148.41	147.41	22	0	147.91
2/24/2010	16	250	253.456621	250	148.61	147.61	16	2	148.11
2/22/2010	15	250	253.454221	250	148.6	147.6	19	2	148.1
2/19/2010	14	150	158.000435	150	148.71	147.71	17	3	148.21
2/15/2010	13	250	206.304725	250	148.48	147.48	19	0	147.98
2/10/2010	12	250	218.048166	250	148.6	147.6	23	0	148.1
2/8/2010	11	250	257.276535	250	148.94	147.94	20	1	148.44
2/3/2010	10	300	316.273774	300	148.94	147.94	21	2	148.44
2/1/2010	9	250	285.478356	250	149	148	19	4	148.5
1/27/2010	8	250	304.759846	250	148.83	147.83	20	3	148.33
1/25/2010	7	150	318.924124	150	148.63	147.63	18	4	148.13
1/20/2010	6	150	182.405155	150	148.63	147.63	13	2	148.13
1/18/2010	5	350	356.350054	350	148.03	147.03	21	1	147.53
1/13/2010	4	250	250	333.5069	148.83	147.83	20	0	148.33
1/11/2010	3	150	313.720607	150	148.41	147.41	16	6	147.91
1/6/2010	2	100	250	100	147.91	146.91	14	7	147.41
1/4/2010	1	200	198.456252	200	147.6	146.6	17	0	147.1
12/16/2009	122	300	304.785582	300	148.1	147.1	18	3	147.6
12/14/2009	121	200	231.478995	200	148	147	17	4	147.5
12/9/2009	120	300	237.080441	237.0804	148	147	22	0	147.5
12/7/2009	119	100	112.456631	100	149.09	148.09	19	4	148.59
11/30/2009	117	100	44.7843768	44.78438	148.31	147.31	17	0	147.81
11/25/2009	116	40	43.178952	40	148.5	147.5	13	1	148
11/23/2009	115	150	42.3258	42.3258	148.4	147.4	17	0	147.9
11/18/2009	114	200	180.873339	180.8733	149.75	148.75	16	0	149.25
11/16/2009	113	300	218.444039	218.444	150.11	149.11	23	0	149.61
11/11/2009	112	300	320.145789	300	150.11	149.11	18	3	149.61
11/9/2009	111	200	217.456325	200	150.02	149.02	18	4	149.52
11/4/2009	110	200	214.578963	200	149.63	148.63	19	2	149.13
11/2/2009	109	200	202.415876	200	149.35	148.35	20	2	148.85
10/28/2009	108	200	62.94919	62.94919	149.14	148.14	16	0	148.64
10/26/2009	107	200	241.451786	200	149.14	148.14	20	3	148.64
10/21/2009	106	200	230.145789	200	148.61	147.61	17	2	148.11
10/19/2009	105	200	202.145652	200	148.21	147.21	18	4	147.71
10/14/2009	104	200	201.456642	200	147.86	146.86	19	2	147.36
10/12/2009	103	200	200.456621	200	147.03	146.03	19	1	146.53
10/7/2009	102	100	46.523415	46.52342	146.51	145.51	13	0	146.01
10/5/2009	101	100	15.31855	15.31855	146.51	145.51	17	0	146.01
9/30/2009	100	300	73.9686153	73.96862	147.32	146.32	15	0	146.82
9/28/2009	99	300	126.146015	126.146	149.51	148.51	20	0	149.01

9/23/2009	98	450	251.755804	251.7558	151.01	150.01	19	0	150.51
9/16/2009	97	300	240.260742	240.2607	151.61	150.61	17	0	151.11
9/14/2009	96	300	257.417249	257.4172	151.81	150.81	23	0	151.31
9/9/2009	95	300	225.930453	225.9305	151.91	150.91	22	0	151.41
9/7/2009	94	300	320.145458	300	151.81	150.81	22	2	151.31
9/2/2009	93	300	304.562872	300	151.37	150.37	18	5	150.87
8/31/2009	92	300	300.054787	300	149.29	148.29	23	2	148.79
8/26/2009	91	300	300.400562	300	149.06	148.06	19	1	148.56
8/24/2009	90	300	300.145666	300	148.88	147.88	20	2	148.38
8/19/2009	89	300	292.863952	292.864	148.75	147.75	23	0	148.25
8/17/2009	88	300	300.124566	300	148.75	147.75	22	2	148.25
8/12/2009	87	300	301.010455	300	148.64	147.64	22	2	148.14
8/10/2009	86	200	387.789145	357.7518	148.56	147.56	24	1	148.06
8/5/2009	85	400	425.145689	416.488	148.56	147.56	19	2	148.06
8/3/2009	84	400	478.845962	459.4593	148.52	147.52	22	2	148.02
7/29/2009	83	200	183.744	183.744	148.6	147.6	24	0	148.1
7/27/2009	82	200	199.15	199.15	148.67	147.67	24	0	148.17
7/22/2009	81	200	202.004587	200	148.72	147.72	22	2	148.22
7/20/2009	80	200	218.945624	211.349	148.72	147.72	23	2	148.22
7/15/2009	79	200	214.004781	200.4964	148.62	147.62	20	2	148.12
7/13/2009	78	200	196.268366	196.2684	148.62	147.62	25	0	148.12
7/8/2009	77	150	133.4513	133.4513	148.52	147.52	14	0	148.02
7/6/2009	76	150	80.8975732	80.89757	148.45	147.45	10	2	147.95
7/1/2009	75	150	70.0665984	70.0666	148.5	147.5	9	0	148
6/29/2009	74	150	81.2881483	81.28815	148.55	147.55	20	2	148.05
6/24/2009	73	150	0.24527739	0.245277	148.6	147.6	10	14	148.1
6/22/2009	72	150	153.701028	153.701	148.65	147.65	24	0	148.15
6/17/2009	71	150	133.992999	133.993	148.71	147.71	21	0	148.21
6/15/2009	70	150	145.24528	126.6112	148.88	147.88	17	2	148.38
6/10/2009	69	150	175.486023	175.486	148.89	147.89	20	0	148.39
6/8/2009	68	150	204.157895	198.2673	148.81	147.81	17	3	148.31
6/3/2009	67	150	210.875543	204.5033	148.75	147.75	119	2	148.25
6/1/2009	66	150	98.186233	98.18623	148.78	147.78	20	0	148.28
5/28/2009	65	100	218.541236	215.4446	148.78	147.78	20	1	148.28
5/27/2009	64	100	135.071473	135.0715	148.78	147.78	23	0	148.28
5/26/2009	63	100	109.845145	108.5705	148.87	147.78	20	1	148.325
5/25/2009	62	100	208.641258	205.0837	148.87	147.87	17	4	148.37
5/22/2009	61	100	210.400578	202.4997	148.6	147.6	21	2	148.1
5/21/2009	60	100	184.533989	172.8362	148.93	147.93	20	3	148.43
5/20/2009	59	100	195.252309	195.2523	148.93	147.93	23	0	148.43
5/19/2009	58	100	92.7749235	92.77492	148.93	147.93	24	0	148.43

5/18/2009	57	100	98.3020357	98.30204	148.85	147.85	20	2	148.35
5/15/2009	56	100	111.456789	109.3295	148.85	147.85	17	3	148.35
5/14/2009	55	100	230.456789	202.6678	148.81	147.81	21	3	148.31
5/13/2009	54	100	107.456879	103.1677	148.81	147.81	20	3	148.31
5/12/2009	53	100	98.4806414	98.48064	148.81	147.81	224	0	148.31
5/11/2009	52	100	120.789845	119.6892	148.72	147.72	17	2	148.22
5/8/2009	51	100	140.789542	138.0793	148.72	147.72	20	2	148.22
5/7/2009	50	100	100.45789	124.7188	148.81	147.81	18	4	148.31
5/6/2009	49	100	149.504675	149.5047	148.91	147.88	23	0	148.38
5/5/2009	48	100	138.457545	131.5897	148.81	147.81	20	2	148.31
5/4/2009	47	100	118.547456	114.0464	148.91	147.7	17	2	148.41
4/29/2009	45	100	150.487789	148.6518	148.61	147.61	19	3	148.11
4/28/2009	44	100	156.784578	155.3327	148.61	147.61	17	4	148.11
4/27/2009	43	100	81.6967703	81.69677	148.51	147.51	19	0	148.01
4/24/2009	42	100	154.789458	150.4224	148.51	147.51	22	2	148.01
4/23/2009	41	100	229.456787	228.6267	148.43	147.43	21	1	147.93
4/22/2009	40	100	285.478789	282.1631	148.43	147.43	22	2	147.93
4/21/2009	39	100	217.515196	217.5152	148.43	147.43	24	0	147.93
4/20/2009	38	100	141.005484	130.6671	148.41	147.41	18	2	147.91
4/17/2009	37	100	119.478456	118.7849	148.41	147.41	21	2	147.91
4/16/2009	36	100	95.3167823	95.31678	148.35	147.35	21	0	147.85
4/15/2009	35	100	167.456782	162.2015	148.35	147.35	22	1	147.85
4/14/2009	34	100	147.511142	136.1158	148.35	147.35	21	2	147.85
4/9/2009	33	100	94.1594835	94.15948	148.25	147.25	23	0	147.75
4/8/2009	32	100	189.456548	188.2687	148.25	147.25	23	1	147.75
4/7/2009	31	100	169.784542	167.2367	148.25	147.25	20	3	147.75
4/6/2009	30	100	67.2689519	67.26895	148.3	147.3	19	3	147.8
4/3/2009	29	100	149.785456	148.3723	148.3	147.3	19	2	147.8
4/2/2009	28	100	70.958508	70.95851	148.51	147.28	19	0	147.81
4/1/2009	27	100	88.0009072	88.00091	148.3	147.3	20	0	147.8
3/31/2009	26	100	82.4644218	82.46442	145.7	144.7	17	0	145.2
3/30/2009	25	100	75.8599739	75.85997	145.75	144.75	20	0	145.25
3/30/2009	46	100	101.447902	101.4479	145.75	144.75	21	0	145.25
3/27/2009	24	100	95.9215008	95.9215	145.75	144.75	20	0	145.25
3/26/2009	23	100	148.457459	147.1263	145.5	144.5	19	2	145
3/25/2009	22	100	100	140.5662	145.78	144.78	21	2	145.28
3/24/2009	21	100	279.415451	270.7759	146	145	19	2	145.5
3/23/2009	20	100	366.647855	353.1232	146	145	19	3	145.5
3/20/2009	19	100	86.9913902	86.99139	147.51	146.51	21	2	147.01
3/19/2009	18	100	103.456789	102.6919	147.2	146.2	20	1	146.7
3/18/2009	17	100	132.278945	122.9272	146.95	145.95	13	2	146.45

3/16/2009	16	200	75.0472561	75.04726	146.6	145.6	25	0	146.1
3/11/2009	15	350	699.864772	699.8648	146.6	145.6	22	0	146.1
3/4/2009	14	200	180.535665	180.5357	146.28	145.28	22	0	145.78
3/2/2009	13	200	202.162858	202.1629	146.02	145.02	22	0	145.52
2/25/2009	12	200	257.845877	235.0042	145.9	144.9	18	2	145.4
2/23/2009	11	200	349.789887	341.6393	145.9	144.9	17	3	145.4
2/18/2009	10	200	334.178453	333.8807	145.9	144.9	17	3	145.4
2/16/2009	9	200	210.104788	207.0102	145.9	144.9	19	1	145.4
2/11/2009	8	2000	93.2117232	93.21172	145.5	144.5	21	0	145
2/9/2009	7	200	250.450789	249.169	145.85	144.85	21	2	145.35
2/4/2009	6	200	809.009008	809.0049	145.3	144.3	24	2	144.8
2/2/2009	5	200	200.149844	200.1498	145.3	144.3	25	0	144.8
1/28/2009	4	150	210.457894	205.3435	144.51	143.51	23	2	144.01
1/26/2009	3	150	298.457812	294.3803	144.1	143.1	18	2	143.6
1/21/2009	2	100	188.745785	187.9058	144	143	16	1	143.5
1/19/2009	1	150	17.1704505	17.17045	144.01	143.01	7	0	143.51
12/10/2008	93	200	190	190	131.25	130.25	18	0	130.75
12/3/2008	92	200	180	180	126.1	125.1	18	0	125.6
12/1/2008	91	100	120	100	118.32	117.32	18	2	117.82
11/26/2008	90	200	105.3	105.3	116.62	115.62	21	0	116.12
11/24/2008	89	200	407.587412	392.2626	116.58	115.58	15	7	116.08
11/19/2008	88	200	547.879987	813.3131	116.57	115.57	15	5	116.07
11/17/2008	87	200	566.57889	825	116.57	115.57	19	2	116.07
11/12/2008	86	250	404.1445	422	116.57	115.57	15	2	116.07
11/10/2008	85	70	504.000047	502	116.57	115.57	14	2	116.07
11/5/2008	84	70	66	66	116.57	115.57	8	0	116.07
11/3/2008	83	70	108.41241	107	116.57	115.57	11	1	116.07
10/29/2008	82	60	344	335	116.57	115.57	15	1	116.07
10/27/2008	81	60	894.21254	892	116.57	115.57	17	2	116.07
10/22/2008	80	60	543.455	523	116.57	115.57	20	2	116.07
10/20/2008	79	60	350	348	116.56	115.56	20	2	116.06
10/15/2008	78	60	500.004	479	116.55	115.55	15	3	116.05
10/13/2008	77	60	290.124245	287	116.55	115.55	15	2	116.05
10/8/2008	76	60	245.12454	244.1987	116.55	115.55	14	2	116.05
10/6/2008	75	60	284.78512	257.4487	116.55	115.55	15	2	116.05
9/24/2008	74	65	34.431434	34.43143	116.56	115.56	11	0	116.06
9/22/2008	73	65	84.514569	83.43143	116.56	115.56	13	2	116.06
9/17/2008	72	65	89.4578	82.5	116.56	115.56	17	1	116.06
9/15/2008	71	65	16	16	116.56	115.56	12	0	116.06
9/10/2008	70	65	14	14	116.56	115.56	9	0	116.06
9/8/2008	69	65	20	20	116.56	115.56	12	0	116.06

9/3/2008	68	65	18	18	116.56	115.56	14	0	116.06
9/1/2008	67	65	22	22	116.56	115.56	16	0	116.06
8/27/2008	66	80	69.5	69.5	116.56	115.56	17	0	116.06
8/25/2008	65	80	67.37082	67.37082	116.57	115.57	17	0	116.07
8/20/2008	64	80	43	421	116.57	115.57	17	2	116.07
8/18/2008	63	80	250	244	116.58	115.58	16	2	116.08
8/13/2008	62	80	240	236	116.58	115.58	15	2	116.08
8/11/2008	61	80	900	90	116.58	115.58	15	2	116.08
8/6/2008	60	80	77	77	116.58	115.58	13	0	116.08
8/4/2008	59	80	800	72	116.59	115.59	12	2	116.09
7/30/2008	58	70	172.456002	168	116.59	115.59	15	1	116.09
7/28/2008	57	70	260	253	116.59	115.59	14	1	116.09
7/23/2008	56	70	168.45677	163	116.59	115.59	17	2	116.09
7/21/2008	55	70	55.25	55.25	116.6	115.6	14	0	116.1
7/16/2008	54	70	68	68	116.6	115.6	16	0	116.1
7/14/2008	53	70	57.762874	57.76287	116.6	115.6	16	0	116.1
7/9/2008	52	70	100.5	96	116.6	115.6	10	4	116.1
7/7/2008	51	70	43.5999853	43.59999	116.62	115.62	17	0	116.12
7/2/2008	50	70	210.005874	201.5	116.62	115.62	15	2	116.12
6/30/2008	49	70	120	119.5	116.63	115.63	14	1	116.13
6/25/2008	48	70	14.3	14.3	116.63	115.63	16	0	116.13
6/23/2008	47	70	66.28908	66.28908	116.64	115.64	17	0	116.14
6/18/2008	46	70	55	55	116.64	115.64	16	0	116.14
6/16/2008	45	70	160.00008	157.1053	116.64	115.64	15	2	116.14
6/11/2008	44	70	130.0004	128	116.65	115.65	10	1	116.15
6/9/2008	43	70	941.2	91.2	116.65	115.65	15	1	116.15
6/4/2008	42	70	42	42	116.65	115.65	16	0	116.15
6/2/2008	41	70	108.65241	106.5	116.65	115.65	13	1	116.15
5/28/2008	40	80	35	35	116.66	115.66	12	0	116.16
5/26/2008	39	80	50.2004464	50.20045	116.66	115.66	15	0	116.16
5/21/2008	38	80	121.50008	121	116.66	115.66	11	2	116.16
5/19/2008	37	80	129.854	127	116.66	115.66	15	2	116.16
5/14/2008	36	80	108.040056	106	116.66	115.66	12	4	116.16
5/12/2008	35	80	80	129	116.68	115.68	15	0	116.18
5/7/2008	34	80	12	12	116.68	115.68	6	0	116.18
5/5/2008	33	80	14	14	116.68	115.68	16	0	116.18
4/30/2008	32	80	12	12	116.7	115.7	6	0	116.2
4/28/2008	31	80	15	15	116.7	115.7	8	0	116.2
4/23/2008	30	80	6	6	116.7	115.7	3	0	116.2
4/21/2008	29	80	10	10	116.7	115.7	5	0	116.2
4/16/2008	28	80	9	8	116.7	115.7	4	1	116.2

4/14/2008	27	80	9.5	9.5	116.7	115.7	5	0	116.2
4/9/2008	26	80	9.5	9	116.7	115.7	5	0	116.2
4/7/2008	25	80	12	10	116.73	115.73	5	0	116.23
4/2/2008	24	80	9	9	116.73	115.73	5	0	116.23
3/31/2008	23	80	140.58	13.9	116.73	115.73	12	1	116.23
3/26/2008	22	80	4	4	116.73	115.73	2	0	116.23
3/17/2008	21	80	10.8	10.8	116.73	115.73	5	0	116.23
3/12/2008	20	80	8	8	116.75	115.75	4	0	116.25
3/10/2008	19	50	12	12	116.78	115.78	6	0	116.28
3/5/2008	18	50	18	18	116.78	115.78	16	0	116.28
3/3/2008	17	50	14	14	116.78	115.78	7	0	116.28
2/27/2008	16	50	10	10	116.78	115.78	5	0	116.28
2/25/2008	15	50	14	14	116.78	115.78	7	0	116.28
2/20/2008	14	50	10	10	116.78	115.78	6	0	116.28
2/18/2008	13	50	9	9	116.78	115.78	5	0	116.28
2/13/2008	12	50	8	8	116.78	115.78	4	0	116.28
2/11/2008	11	50	4	4	116.81	115.81	2	0	116.31
2/6/2008	10	50	7	7	116.81	115.81	7	0	116.31
2/4/2008	9	50	10	10	116.81	115.81	9	0	116.31
1/30/2008	8	60	10	10	116.81	115.81	9	0	116.31
1/28/2008	7	60	17.2	17.2	116.81	115.81	17	0	116.31
1/23/2008	6	60	14	14	116.81	115.81	15	0	116.31
1/21/2008	5	60	16	16	116.81	115.81	16	0	116.31
1/16/2008	4	60	14	14	116.81	115.81	12	0	116.31
1/14/2008	3	60	165.00008	150	116.81	115.81	16	2	116.31
1/9/2008	2	60	42	42	116.81	115.81	16	0	116.31
1/7/2008	1	60	60	106.1855	116.8	115.8	16	0	116.3
12/17/2007	94	80	180.4124	171.5	116.8	115.8	13	2	116.3
12/12/2007	93	50	40	40	116.8	115.8	11	0	116.3
12/10/2007	92	50	50	16	116.96	115.96	10	7	116.46
12/5/2007	91	50	13	13	116.96	115.96	11	0	116.46
12/3/2007	90	80	8.5	8.5	117.68	116.68	12	0	117.18
11/28/2007	89	80	51.46	51.46	117.68	116.68	14	0	117.18
11/26/2007	88	50	142.10042	113.0726	117.85	116.85	13	2	117.35
11/21/2007	87	80	65	65	117.85	116.85	12	0	117.35
11/19/2007	86	80	80	69.3	117.97	116.97	15	0	117.47
11/14/2007	85	50	740.0005	71	118.17	117.17	10	2	117.67
11/12/2007	84	50	50	50	118.17	117.17	7	0	117.67
11/7/2007	83	50	7.5	7.5	121.88	120.88	9	0	121.38
11/5/2007	82	50	6	6	121.88	120.88	3	0	121.38
10/31/2007	81	50	6.5	6.5	121.88	120.88	10	0	121.38

10/29/2007	80	50	16	16	121.88	120.88	7	0	121.38
10/24/2007	79	50	9.5	9.5	121.99	120.99	6	0	121.49
10/22/2007	78	50	50	10	123.1	122.1	9	0	122.6
10/17/2007	77	50	46.7090969	46.7091	123.1	122.1	17	0	122.6
10/15/2007	76	50	780.043231	77.81067	123.33	122.33	15	2	122.83
10/10/2007	75	50	40.05	40.05	123.33	122.33	13	0	122.83
9/19/2007	70	50	602.400156	59.9365	124.4	123.4	16	2	123.9
9/17/2007	69	80	80	10	124.75	123.75	16	0	124.25
9/12/2007	68	80	154.258752	146.6063	124.75	123.75	16	2	124.25
9/10/2007	67	80	165.478952	150.5	124.75	123.75	13	2	124.25
9/5/2007	66	50	46.4953837	46.49538	124.81	123.81	15	0	124.31
9/3/2007	65	50	624.008002	61.8	124.83	123.83	13	2	124.33
8/29/2007	64	80	164.547802	157.3	124.95	123.95	14	2	124.45
8/27/2007	63	80	184.025864	175.95	125.02	124.02	17	2	124.52
8/20/2007	61	50	50	49.7	125.05	124.05	14	0	124.55
8/15/2007	60	50	4	4	125.7	124.7	18	0	125.2
8/13/2007	59	50	7.5	7.5	125.7	124.7	15	0	125.2
8/8/2007	58	50	50	35.05411	125.7	124.7	8	4	125.2
8/6/2007	57	50	9	9	125.81	124.81	10	0	125.31
8/1/2007	56	100	100	101.05	125.81	124.81	16	1	125.31
7/30/2007	55	100	100	110	125.86	124.86	18	0	125.36
7/25/2007	54	100	194.00005	180	125.87	124.87	14	3	125.37
7/23/2007	53	80	167.456202	163.3963	125.88	124.88	17	2	125.38
7/18/2007	52	80	84.1277088	84.12771	125.88	124.88	17	0	125.38
7/16/2007	51	80	80	84.04061	125.93	124.95	15	2	125.44
7/11/2007	50	80	143.01245	141.9622	125.95	124.95	16	1	125.45
7/9/2007	49	80	80.412412	78.8681	125.95	124.95	12	2	125.45
7/4/2007	48	100	54.064512	52.64302	126.01	125.01	13	3	125.51
7/2/2007	47	100	100	106.9	126.01	125.01	17	0	125.51
6/27/2007	46	100	100	159.8	126.05	125.05	13	0	125.55
6/25/2007	45	100	100	77.16929	126.05	125.05	11	4	125.55
6/20/2007	44	100	100	120	126.1	125.1	12	0	125.6
6/18/2007	43	100	1	264.75	126.2	125.2	15	3	125.7
6/13/2007	42	100	210.00045	201.9064	126.2	125.2	14	4	125.7
6/11/2007	41	100	190.00028	183.3	126.2	125.2	14	2	125.7
6/6/2007	40	100	245.000498	230.3473	126.2	125.2	15	3	125.7
6/4/2007	39	100	100	135.7	126.23	125.23	16	0	125.73
5/30/2007	38	100	120.4002	113.6	126.23	125.23	14	3	125.73
5/28/2007	37	100	108.412554	105.75	126.23	125.23	8	0	125.73
5/23/2007	36	100	194.128579	192.385	126.25	125.25	15	4	125.75
5/21/2007	35	100	214.785421	191.8767	126.25	125.25	16	3	125.75

5/16/2007	34	80	93.3053857	93.30539	126.26	125.26	19	0	125.76
5/14/2007	33	80	80	201.8699	126.25	125.25	18	0	125.75
5/9/2007	32	80	641.2041	63.2	126.3	125.3	14	2	125.8
5/7/2007	31	50	45	45	126.3	125.3	13	0	125.8
5/2/2007	30	50	12	12	126.6	125.6	10	0	126.1
4/30/2007	29	50	50	6.4	126.6	125.6	9	0	126.1
4/25/2007	28	50	43.83735	43.83735	126.6	125.6	10	1	126.1
4/23/2007	27	80	37.0039628	37.00396	126.72	125.72	13	0	126.22
4/18/2007	26	80	51.35	51.35	126.73	125.73	15	0	126.23
4/16/2007	25	80	80	95.5	126.79	125.79	14	5	126.29
4/11/2007	1001	250	250	19.20828	126.78	125.78	10	6	126.28
4/4/2007	24	160	250	241.5	126.78	125.78	22	1	126.28
3/28/2007	23	100	246.541234	226.5217	126.79	125.79	20	2	126.29
3/26/2007	22	100	100	186.0971	126.79	125.79	11	7	126.29
3/21/2007	21	80	184.512354	162.9972	126.8	125.8	19	2	126.3
3/19/2007	20	80	80	42.3825	126.8	125.8	8	6	126.3
3/14/2007	19	80	140.145214	110.0534	126.96	125.96	11	6	126.46
3/12/2007	18	80	124.78	123.75	126.96	125.96	15	1	126.46
3/7/2007	17	80	80	93.92505	126.98	125.98	12	6	126.48
3/5/2007	16	100	100	130.8434	126.98	125.98	10	4	126.48
2/28/2007	15	100	154.787852	147.9436	127.01	126.01	14	2	126.51
2/26/2007	14	100	100	134.1639	127.01	126.01	17	4	126.51
2/21/2007	13	100	120.44872	118.3142	127	126	16	2	126.5
2/19/2007	12	100	100	286.6413	126.98	125.98	14	7	126.48
2/14/2007	11	80	168.450012	166.5558	126.98	125.98	15	2	126.48
2/12/2007	10	80	80	71.12921	127	126	9	2	126.5
2/7/2007	9	100	75.0680255	75.06803	127	126	13	0	126.5
2/5/2007	8	100	148.324545	135.2232	127.01	126.01	10	2	126.51
1/31/2007	7	80	170.480123	165.8921	127.01	126.01	14	3	126.51
1/24/2007	6	80	34.4478879	34.44789	127	126	9	0	126.5
1/22/2007	5	100	35.0781475	35.07815	127	126	9	0	126.5
1/17/2007	4	80	40.541167	40.54117	127	126	7	0	126.5
1/15/2007	3	80	164.578102	150.4577	127.01	126.01	14	2	126.51
1/10/2007	2	80	96.9269579	96.92696	127.02	126.02	16	0	126.52
1/8/2007	1	100	170.415785	164.85	127.01	126.01	15	1	126.51
12/20/2006	80	200	200	247.5751	127	126	16	4	126.5
12/18/2006	79	200	224.578962	218.2628	127.01	126.01	18	5	126.51
12/13/2006	78	200	276.456789	264.1938	127.01	126.01	17	1	126.51
12/11/2006	77	200	160.21	156.1122	127.03	126.03	16	2	126.53
12/6/2006	76	150	86.884769	86.88477	127.05	126.05	20	0	126.55
12/4/2006	75	80	84.123456	83.5	127.03	126.03	18	2	126.53

11/29/2006	74	80	264.541123	249.9232	127	126	16	2	126.5
11/27/2006	73	80	80	146.6516	127.02	126.02	12	10	126.52
11/22/2006	72	80	64.35	64.35	127	126	13	0	126.5
11/20/2006	71	80	80	19.5	127.01	126.01	10	0	126.51
11/15/2006	70	80	46.3806933	46.38069	127.01	126.01	11	0	126.51
11/13/2006	69	80	80	171.5113	127.01	126.01	11	8	126.51
11/8/2006	68	150	256.145601	240.792	127.02	126.02	20	2	126.52
11/6/2006	67	200	200	289.4306	127.03	126.03	16	6	126.53
11/1/2006	66	200	364.561233	332.9788	127.04	126.04	20	2	126.54
10/30/2006	65	80	156.456145	141.5	127.04	126.04	21	3	126.54
10/25/2006	64	120	160.456	155	127.02	126.02	19	2	126.52
10/18/2006	63	80	187.400452	161.0777	127	126	17	2	126.5
10/16/2006	62	80	80	122.0243	127	126	14	6	126.5
10/11/2006	61	80	86.417295	85.41428	127.01	126.01	13	2	126.51
10/9/2006	60	80	80	112.8325	127.01	126.01	11	5	126.51
10/4/2006	59	100	100	115.5446	127	126	16	4	126.5
9/28/2006	1003	300	79.3	79.3	127	126	11	0	126.5
9/27/2006	58	100	159.457851	152.8023	127.01	126.01	18	1	126.51
9/25/2006	57	80	162.457863	148.9017	127.02	126.02	17	1	126.52
9/20/2006	56	80	174.1145	167.5032	127.02	126.02	16	1	126.52
9/18/2006	55	80	210.457891	200.8339	127.02	126.02	14	2	126.52
9/14/2006	1002	200	172	172	127.02	126.02	18	0	126.52
9/13/2006	54	80	119.747525	117.7177	127.04	126.04	16	2	126.54
9/11/2006	53	80	78.8066545	78.80665	127.03	126.03	16	0	126.53
9/6/2006	52	80	126.645024	124.7674	127.02	126.02	14	1	126.52
9/4/2006	51	80	160.045785	158.4257	127.02	126.02	15	2	126.52
8/30/2006	50	80	131.457896	129.8	127.02	126.02	15	1	126.52
8/28/2006	49	80	170.414587	164.65	127.03	126.03	15	2	126.53
8/23/2006	48	50	50	50.183	127.04	126.04	11	0	126.54
8/21/2006	47	80	47.7	47.7	127.06	126.06	11	0	126.56
8/16/2006	46	80	154.787541	142.2737	127.06	126.06	13	1	126.56
8/14/2006	45	100	119.451132	117.1931	127.07	126.07	19	2	126.57
8/9/2006	44	80	179.451203	172.2	127.07	126.07	16	2	126.57
8/7/2006	43	80	69.39295	69.39295	127.07	126.07	13	0	126.57
8/2/2006	42	80	108.451245	103.16	127.09	126.09	10	2	126.59
7/31/2006	41	80	11.454123	113.1273	127.09	126.09	17	0	126.59
7/26/2006	40	50	107.45678	106.8485	127.1	126.1	21	1	126.6
7/24/2006	39	80	48.4757157	48.47572	127.09	126.09	14	0	126.59
7/17/2006	37	80	8.210456	81.70233	127.1	126.1	15	1	126.6
7/12/2006	36	50	46.77	46.77	127.1	126.1	14	0	126.6
7/10/2006	35	50	50	52.37485	127.15	126.15	13	0	126.65

7/5/2006	34	50	29.4600888	29.46009	127.15	126.15	10	0	126.65
6/28/2006	32	100	73.25	73.25	127.17	126.17	15	0	126.67
6/26/2006	31	20	7.5	7.5	127.19	126.19	7	0	126.69
6/21/2006	30	30	5.4287666	5.428767	127.19	126.19	9	0	126.69
6/19/2006	29	50	35.3960576	35.39606	127.18	126.18	12	0	126.68
6/14/2006	28	20	4.1	4.1	127.19	126.19	4	0	126.69
6/12/2006	27	80	80	30	127.17	126.17	4	3	126.67
6/7/2006	26	150	150	77.43485	127.18	126.18	7	10	126.68
6/5/2006	25	80	80	76.61878	127.19	126.19	7	2	126.69
5/31/2006	24	80	207.41021	205.2437	127.19	126.19	18	1	126.69
5/26/2006	1001	200	118.5	118.5	127.21	126.21	20	0	126.71
5/24/2006	23	120	64.2582337	64.25823	127.2	126.2	20	0	126.7
5/22/2006	22	80	17.456582	164.7758	127.17	126.17	15	1	126.67
5/17/2006	21	80	89.74511	87.71057	127.17	126.17	11	2	126.67
5/15/2006	20	80	74.4540079	74.45401	127.17	126.17	15	0	126.67
5/10/2006	19	100	100	104.0375	127.17	126.17	18	0	126.67
5/8/2006	18	80	149.356456	146.7	127.17	126.17	17	1	126.67
5/3/2006	17	80	120.456789	118.6066	127.18	126.18	14	2	126.68
4/26/2006	16	100	162.456789	159.7468	127.18	126.18	14	3	126.68
4/24/2006	15	200	181.164998	110.165	127.18	126.18	18	16	126.68
4/19/2006	14	80	80	7.407839	127.2	126.2	5	16	126.7
4/12/2006	13	80	80	316.5328	127.2	126.2	33	13	126.7
4/5/2006	12	80	275.217104	259.2171	127.2	126.2	36	7	126.7
4/3/2006	11	50	104.197693	40.02724	127.2	126.2	8	26	126.7
3/29/2006	10	50	64.6	34.1	127.25	126.25	5	13	126.75
3/27/2006	9	50	4.79010333	4.790103	126.5	126	2	0	126
3/15/2006	8	40	15.1	1.1	128	127	2	7	127.5
3/13/2006	7	80	75.9799146	44.71342	128.5	127	12	12	127.5
3/8/2006	6	130	91.785057	62.28506	127.8	126.5	13	15	127.5
3/6/2006	5	80	163.333807	116.3338	128	126.7	20	20	127.5
3/1/2006	4	50	50	30.93276	128.05	127.43	22	1	127.5
2/27/2006	3	50	50	15.97392	128.2	127	7	14	128
2/22/2006	2	80	80	14.39832	128.2	127	7	12	128
2/20/2006	1	100	100	34.76013	128.7	125.45	19	13	128
	RETAIL	DUTCH	AUCTION	SYSTEM					
2/15/2006	12	200	45.5328288	45.39454	130.35	128.5	276	6	128.5
2/13/2006	11	50	102.667683	75.51372	130	128.25	381	18	128.5
2/8/2006	10	50	15.390691	14.04554	129.7	128.5	69	2	128.5
2/6/2006	9	50	50	27.46814	130.9	128	139	7	127.25
2/1/2006	8	50	8.7962901	8.76199	130	128.5	44	1	128.5
1/30/2006	7	70	70	14.53237	129.2	129	48	3	129

1/25/2006	6	70	18.1701959	18.10467	130	129	185	2	129
1/23/2006	5	80	43.3075065	41.20604	132.93	128.95	253	5	129
1/18/2006	4	80	25.1860654	24.96051	131.5	129	264	1	129
1/16/2006	3	80	62.1855917	61.08057	130	129	285	6	129
1/9/2006	2	70	63.2037716	62.46745	130	129	332	6	129
1/4/2006	1	100	24.4974457	24.44124	130	129	115	3	129
12/21/2005	95	70	157.847501	146.103	130	125	452	10	129
12/19/2005	94	70	56.3811012	55.53517	130	128.5	380	9	129
12/14/2005	93	70	65.2934043	65.10018	130	128.85	285	3	129
12/12/2005	92	80	89.3863099	80.27026	132.5	128.5	470	26	129
12/7/2005	91	80	67.484691	66.60324	130	129	446	10	129
12/5/2005	90	100	89.3797713	88.85376	132.9	129	508	7	129
11/30/2005	89	100	97.7268858	94.50407	131	129	523	21	129.01
11/28/2005	88	70	109.571187	86.30995	130	129	473	67	129.01
11/23/2005	87	70	48.492289	48.44582	130	127.75	406	3	129
11/21/2005	86	80	91.1235018	79.93065	130	129.5	485	52	129.53
11/16/2005	85	8	8	87.30047	130.5	129.53	465	17	129.53
11/15/2005	84	80	107.04755	91.61837	130.2	129.53	632	21	129.53
11/9/2005	83	80	87.9107294	78.16127	130	129.5	369	13	129.53
11/7/2005	82	100	93.1531765	91.64599	133.5	128.5	552	17	129.53
10/31/2005	81	100	84.8794835	76.37196	130	129	456	21	129.53
10/26/2005	80	100	87.0260798	84.01677	132.9	129	567	20	129.55
10/24/2005	79	100	100	124.5069	132.5	129.5	634	80	129.55
10/17/2005	77	100	130.993961	97.6791	132.9	129.53	632	79	129.55
10/13/2005	76	100	119.960291	113.8864	130.1	123.6	581	41	129.55
10/11/2005	75	100	100	102.2164	130.5	129.5	613	77	129.54
10/5/2005	74	80	80	82.34502	131	129	613	95	129.53
9/28/2005	73	80	80	111.1807	133	128.51	740	33	129.5
9/26/2005	72	80	80	102.6664	133	129.3	585	237	129.54
9/21/2005	71	100	100	85.58292	132.61	129.3	509	110	129.51
9/20/2005	70	100	100	99.18472	133	129.5	687	19	129.5
9/14/2005	69	100	100	97.46476	131.5	128.99	631	18	129.5
9/12/2005	68	100	100	109.4003	133	129.48	723	47	129.5
9/7/2005	67	80	80	116.4014	133.1	127	590	58	129.5
9/6/2005	65	100	100	92.57468	133.1	129	586	39	129.57
9/5/2005	66	100	100	101.0689	133	129.45	759	42	129.57
8/29/2005	64	80	80	128.8415	135	127.87	689	56	129.57
8/29/2005	63	100	100	45.0134	133	129.87	281	7	129.87
8/22/2005	62	120	120	117.644	134	132.85	727	10	132.85
8/17/2005	61	120	120	122.9351	133.2	132.86	706	32	132.86
8/16/2005	60	150	150	143.5152	133.6	130	858	65	132.86

8/12/2005	59	130	130	132.4764	133.1	132.25	800	42	132.86
8/8/2005	58	130	130	134.4331	134	132.76	783	72	132.88
8/3/2005	57	150	150	156.7639	134	132	744	69	132.88
8/1/2005	56	120	120	135.9918	134	131.7	668	139	132.86
7/27/2005	55	150	150	149.1375	133.2	130	741	24	132.86
7/25/2005	54	150	150	155.1949	133.25	132.28	789	79	132.86
7/20/2005	53	150	150	151.4117	133.25	132.57	739	81	132.86
7/18/2005	52	120	120	167.2799	133.1	132.85	740	93	132.87
7/13/2005	51	110	110	138.0888	133.1	132.85	666	82	132.87
7/11/2005	50	120	120	130.0171	134	131	746	85	132.87
7/6/2005	49	100	100	133.7337	133.5	132.5	611	131	132.89
7/4/2005	48	100	100	118.8986	134	132.1	705	69	132.87
6/29/2005	47	100	100	101.0032	133.05	131.8	578	57	132.87
6/27/2005	46	100	100	101.0231	133.1	131.8	647	64	132.88
6/22/2005	45	120	120	115.453	133.5	131	740	59	132.88
6/20/2005	44	100	100	117.5865	133.1	132.85	606	181	132.9
6/15/2005	43	120	120	128.6902	133.06	132.83	705	117	132.88
6/13/2005	42	110	110	128.106	133.1	132.83	689	231	132.88
6/8/2005	41	100	100	123.1794	133.4	132.83	543	201	132.86
6/6/2005	40	120	120	142.3296	133.1	132.83	571	123	132.85
6/2/2005	39	100	100	130.2226	134	132	766	49	132.83
5/25/2005	38	120	120	116.8029	133.1	132.5	585	48	132.83
5/23/2005	37	100	100	129.3256	133.1	132.82	653	24	132.83
5/18/2005	36	120	120	128.1488	133.4	132.8	710	48	132.83
5/16/2005	35	100	100	124.4754	133.01	131	607	133	132.83
5/11/2005	34	100	100	106.569	133.2	130.1	499	87	132.81
5/9/2005	33	90	90	110.2911	133	132.5	591	38	132.8
5/5/2005	32	120	120	107.0542	133.2	132.8	694	43	132.8
4/27/2005	31	85	85	77.03633	133	132.7	434	123	132.83
4/25/2005	30	100	100	96.22228	133	132.86	551	15	132.86
4/22/2005	29	100	100	72.0199	133.1	131	520	15	132.86
4/18/2005	28	100	100	127.2925	133.1	132.7	693	36	132.86
4/13/2005	27	100	100	112.5693	133	132.8	573	46	132.86
4/11/2005	26	120	120	135.7303	133	130	699	80	132.86
4/6/2005	25	90	90	71.50867	133.1	132.1	430	102	132.85
4/4/2005	24	90	90	71.59857	134	132.8	477	8	132.85
3/30/2005	23	120	120	97.06062	133	131.1	508	9	132.85
3/24/2005	22	100	100	108.6737	133.2	132	555	22	132.85
3/21/2005	21	100	100	107.0286	133.06	132.68	584	40	132.86
3/16/2005	20	100	100	107.1351	134	132.8	549	35	132.86
3/14/2005	19	90	90	99.4469	134	132.85	602	42	132.86

3/9/2005	18	100	100	96.57042	133.3	132.8	516	53	132.85
3/7/2005	17	100	100	136.058	133.25	132.85	562	68	132.85
3/3/2005	16	85	85	79.99423	133.05	132.85	433	50	132.85
2/28/2005	15	100	100	87.41323	133.25	132.8	484	15	132.85
2/23/2005	14	100	100	98.01452	133.1	132.6	499	20	132.86
2/21/2005	13	100	100	101.4379	133.1	132.8	576	57	132.86
2/16/2005	12	100	100	86.42638	133.05	132.8	540	39	132.85
2/14/2005	11	100	100	101.4158	133.8	130.1	659	17	132.85
2/9/2005	10	100	100	95.48284	133.1	132.85	453	6	132.85
2/8/2005	9	100	100	134.0148	133.2	132.85	626	35	132.85
2/7/2005	8	100	100	130.4453	133.2	132.8	602	25	132.85
2/1/2005	7	100	100	146.1565	133.5	131.8	680	31	132.86
1/26/2005	6	90	90	105.0198	133.05	132.86	621	16	132.86
1/25/2005	5	135	135	132.3901	133.2	132.75	680	30	132.86
1/17/2005	4	100	100	100.3027	133.2	132.85	519	111	132.88
1/12/2005	3	85	85	83.67876	133.15	132.15	447	40	132.86
1/10/2005	2	100	100	101.9247	133.2	132.5	552	15	132.85
1/5/2005	1	100	100	158.71	133.2	130.1	859	39	132.85
12/20/2004	99	125	125	162.06	133.3	132.67	866	110	132.85
12/15/2004	98	100	100	96.54433	133.12	132.8	493	158	132.88
12/13/2004	97	85	85	98.14408	133.02	131.05	558	532	132.85
12/8/2004	96	80	80	85.40897	133.2	132.8	458	18	132.85
12/6/2004	95	80	80	80.40339	133.05	132.8	564	18	132.85
12/1/2004	94	85	85	60.33104	133.05	132.8	384	402	132.88
11/29/2004	93	85	85	90.76184	133.5	132.86	483	29	132.88
11/24/2004	92	100	100	75.6186	133.5	132.1	465	5	132.87
11/22/2004	91	90	90	90.08108	133.05	132.8	544	32	132.87
11/17/2004	90	100	100	88.00174	133.2	130	466	30	132.87
11/15/2004	89	100	100	111.1946	133.2	132.86	502	47	132.89
11/11/2004	88	85	85	95.04926	133.1	130	455	113	132.89
11/8/2004	87	80	80	85.80216	133.5	132.85	604	28	132.86
11/3/2004	86	90	90	78.74331	133.5	132.86	517	13	132.86
11/1/2004	85	100	100	95.1675	134	132.83	649	21	132.86
10/27/2004	84	100	100	100.1195	133.5	131.5	485	118	132.9
10/25/2004	83	100	100	107.6002	133.5	132.81	629	30	132.87
10/20/2004	82	120	120	139.0376	133.5	131	714	33	132.87
10/18/2004	81	90	90	91.95141	133.3	131.8	539	100	132.9
10/13/2004	80	80	80	54.03032	133.3	132.85	133	4	132.88
10/12/2004	79	85	85	68.39714	133.3	132.8	372	16	132.88
10/7/2004	78	90	90	103.128	134	132.8	561	71	132.88
10/5/2004	77	100	100	110.9504	133.5	132	500	32	132.87

9/30/2004	76	100	100	103.5267	133.2	131.5	542	79	132.87
9/28/2004	75	100	100	101.9712	133.5	131.88	635	99	132.87
9/22/2004	74	90	90	93.4907	133.2	132.75	523	150	132.86
9/20/2004	73	85	85	86.20119	133.6	131.25	668	26	132.84
9/15/2004	72	100	100	83.45365	134	130.05	581	42	132.84
9/13/2004	71	80	80	104.6177	134	132.8	648	85	132.84
9/8/2004	70	90	90	82.7564	134	130.05	548	25	132.83
9/6/2004	69	80	80	96.97462	134	131.84	574	34	132.83
9/1/2004	68	80	80	82.55281	133.5	132.83	515	15	132.83
8/30/2004	67	90	90	81.41174	133.5	132.83	609	16	132.83
8/25/2004	66	80	80	99.89883	134	131.8	725	42	132.85
8/23/2004	65	80	80	61.85477	133.5	131.9	469	20	132.84
8/18/2004	64	85	85	40.93889	133.2	132.84	318	309	132.84
8/17/2004	63	100	100	93.60334	133.5	130.5	629	34	132.84
8/11/2004	62	100	100	98.32578	133.85	130.95	594	114	132.84
8/9/2004	61	90	90	105.5393	134	132	591	144	132.82
8/4/2004	60	90	90	88.02847	134	132	567	44	132.8
8/2/2004	59	90	90	90.86738	134.05	131.99	675	23	132.8
7/28/2004	58	100	100	92.54626	134.5	131.88	652	35	132.82
7/26/2004	57	100	100	127.7687	134	131.75	777	64	132.84
7/21/2004	56	100	100	101.3387	134	130.9	612	182	132.84
7/19/2004	55	100	100	93.5235	139.21	131.9	581	246	132.81
7/14/2004	54	100	100	115.9436	134	131.9	724	114	132.8
7/13/2004	53	100	100	112.0673	134.9	130.8	523	300	132.8
7/7/2004	52	120	120	170.0905	134	132.5	798	27	132.76
7/5/2004	51	90	90	86.11634	134	132.5	388	309	132.76
6/30/2004	50	100	100	81.85209	134	132.4	478	35	132.75
6/29/2004	49	100	100	101.641	133.5	132.5	616	21	132.75
6/23/2004	48	100	100	95.46669	135	131.5	719	30	132.75
6/21/2004	47	100	100	138.9725	133.5	131.4	676	54	132.75
6/16/2004	46	100	100	136.2231	134	129.5	688	56	132.75
6/14/2004	45	100	100	91.72324	134	130	453	34	132.75
6/9/2004	44	100	100	69.32131	134.5	131	269	11	132.75
6/7/2004	43	100	100	171.7328	134.5	131	588	115	132.75
6/3/2004	42	90	90	106.456	134	130.05	519	60	132.75
5/31/2004	41	100	100	95.86653	134	132.6	532	17	132.75
5/26/2004	40	100	100	100.4303	134	132.76	566	20	132.8
5/24/2004	39	100	100	116.98	134	130	652	22	132.8
5/19/2004	38	100	100	107.9371	134.7	128	631	30	132.8
5/17/2004	37	100	100	106.5533	135	131.9	632	83	133
5/12/2004	36	100	100	105.3773	135.5	133	563	25	133

5/10/2004	35	100	100	128.1955	134.5	133.16	651	26	133.3
5/5/2004	34	100	133.444151	125.0176	135.7	130.1	587	23	133.3
5/3/2004	33	80	125.829367	100.7762	136.45	132.9	630	64	133.3
4/28/2004	32	80	95.6320857	91.77913	135	132.9	528	27	133.3
4/26/2004	31	75	75	96.2551	135.5	133.2	654	31	133.4
4/21/2004	30	80	78.2313319	75.2499	134.5	129	580	17	133.4
4/19/2004	29	75	157.342418	152.3513	135	131.5	789	23	133.4
4/14/2004	28	100	111.760559	107.513	135.5	129	694	20	133.4
4/7/2004	27	80	117.474078	114.704	139	132.7	606	36	133.7
4/5/2004	26	65	129.548746	109.884	135.55	130	542	86	133.7
3/31/2004	25	70	70	50.08268	135.11	130	282	12	133.7
3/29/2004	24	70	70	40.14479	135.5	133.85	291	20	133.85
3/24/2004	23	70	70	58.73475	136.5	132.56	518	15	134
3/22/2004	22	70	70	69.44183	136.5	130.05	528	30	134.1
3/17/2004	21	75	75	44.37583	136	130.5	457	54	134.24
3/15/2004	20	85	85	60.39234	136	130.09	460	29	134.5
3/10/2004	19	85	85	87.41941	136	132.56	559	35	134.9
3/8/2004	18	85	85	108.4278	136.15	134.5	668	37	134.91
3/3/2004	17	85	85	78.05205	137	132	559	35	135
3/1/2004	16	85	85	99.34587	136.5	134.15	598	54	135
2/25/2004	15	90	90	78.26118	137	133.55	590	27	135
2/23/2004	14	100	100	109.49	136.5	135.1	688	90	135.15
2/18/2004	13	90	123.588116	115.6717	137.6	135.15	662	62	135.15
2/16/2004	12	90	135.060109	116.8487	138.5	135.15	751	85	135.15
2/11/2004	11	80	107.022267	91.48732	137	135.2	675	107	135.2
2/9/2004	10	85	136.945974	125.8227	138	135.2	788	108	135.2
/4/2004	9	120	184.611989	150.1211	140	135.2	918	148	135.2
1/28/2004	8	80	104.724743	88.29638	139.5	135.3	680	115	135.3
1/26/2004	7	80	116.738129	102.906	139	135.5	680	126	135.5
1/21/2004	6	80	90.0210178	86.71327	138.88	135.5	544	46	135.5
1/19/2004	5	85	162.113513	153.6436	139	136	735	56	136
1/14/2004	4	90	93.5133628	86.52697	139	136	645	58	136
1/12/2004	3	850	122.796973	111.4326	140	136.55	713	61	136.55
1/7/2004	2	85	99.3504325	88.67014	139.5	136.55	675	60	136.55
1/5/2004	1	100	100.332203	72.91725	139.9	136.83	635	65	136.83
12/22/2003	96	80	89.4525442	78.7257	140	137	647	23	137
12/17/2003	95	80	107.904763	86.17298	140	137	677	48	137
12/15/2003	94	80	109.075608	87.96656	140	137.1	634	126	137.1
12/10/2003	93	80	105.334631	92.87947	140	137.13	693	79	137.13
12/8/2003	92	80	129.235719	95.05172	140.2	137.3	1325	143	137.3
12/3/2003	91	100	97.7769358	85.26048	140.5	137.5	789	35	137.5

12/1/2003	90	100	166.851498	143.0167	141	138	946	90	138
11/26/2003	89	100	201.23833	166.7439	142	138.2	1169	109	138.2
11/19/2003	88	80	223.213939	152.1478	141.5	138.2	951	646	138.2
11/17/2003	87	80	209.638376	79.97103	140	137.11	618	699	137.11
11/12/2003	86	80	159.559741	80.60974	142	136.12	599	445	136.12
11/10/2003	85	100	216.554158	182.9742	142	135.52	1015	213	135.52
11/5/2003	84	100	402.821053	330.7718	145.11	135.22	1913	226	135.22
11/3/2003	83	75	351.239584	102.8962	138	135.22	493	1761	135.22
10/29/2003	82	75	290.316128	73.50458	135	132.52	430	1456	132.52
10/27/2003	81	80	244.140187	70.5466	135.73	131.01	499	1309	131.01
10/22/2003	80	80	236.295043	78.25093	131.5	130.2	437	977	130.2
10/20/2003	79	100	207.588051	97.06694	130.9	129.71	747	755	129.71
10/15/2003	78	100	202.309214	98.05768	130.5	129.35	705	735	129.35
10/13/2003	77	100	211.504033	90.83807	130	129.02	502	848	129.02
10/8/2003	76	90	194.736846	83.38279	130	128.73	471	636	128.73
10/6/2003	75	100	203.87273	147.9467	130	128.36	1183	208	128.36
9/29/2003	74	90	127.577303	82.06901	131.7	128.36	704	325	128.36
9/24/2003	73	100	100.554763	93.60513	130.5	128.02	853	26	128.02
9/22/2003	72	100	138.050276	100.5999	130	129.03	680	226	129.03
9/17/2003	71	100	147.521114	115.8798	130	128.98	910	120	128.98
9/15/2003	70	100	153.261993	100.4828	130	128.98	826	275	128.98
9/10/2003	69	100	184.044947	129.3301	130	128.82	1039	132	128.82
9/9/2003	68	80	136.891305	75.91315	130	128.82	620	627	128.82
9/3/2003	67	90	144.557062	100.358	129.06	128.65	648	545	128.65
9/1/2003	66	80	152.984163	95.15264	129.01	128.5	641	523	128.5
8/27/2003	65	90	183.252306	112.472	130	128.3	510	386	128.3
8/25/2003	64	100	249.04028	158.3455	129.5	128	1422	143	128
8/20/2003	63	100	201.465514	100.895	129.06	128.33	491	752	128.33
8/18/2003	62	90	161.654261	99.64262	129.5	128.2	810	620	128.2
8/13/2003	61	85	128.343616	84.19496	130	128.1	657	388	128.1
8/11/2003	60	100	182.579377	133.8467	129	128.01	984	256	128.01
8/6/2003	59	100	150.299774	74.67591	129	128.01	482	538	128.01
8/4/2003	58	80	130.102248	82.96061	129	127.92	552	252	127.92
7/30/2003	57	80	86.6004924	75.63173	129.5	127.73	670	61	127.73
7/28/2003	56	80	117.480058	99.94669	129	127.93	884	89	127.93
7/23/2003	55	80	121.691645	111.7044	129	127.9	948	55	127.9
7/21/2003	54	100	176.764971	154.5092	129	127.97	1034	144	127.97
7/16/2003	53	100	149.63539	99.31257	130	127.97	723	307	127.97
7/14/2003	52	90	146.109839	92.53191	130	127.82	827	267	127.82
7/9/2003	51	80	101.976749	84.94932	129	127.65	539	44	127.65
7/5/2003	50	80	43.4182083	42.4609	128.5	127.6	167	8	127.6

7/2/2003	49	85	74.5726424	72.15937	128.91	127.78	383	27	127.78
6/30/2003	48	80	122.321205	83.66202	129.2	127.92	518	130	127.92
6/25/2003	47	80	143.662147	115.2468	129	127.98	547	235	127.98
6/23/2003	46	100	178.632936	168.3347	130.5	127.78	973	77	127.78
6/18/2003	45	100	177.408579	119.7588	129	127.98	616	205	127.98
6/11/2003	43	100	137.742159	116.3491	129	127.92	911	197	127.92
6/9/2003	42	80	126.699832	70.5344	128.85	127.92	514	511	127.92
6/4/2003	41	80	104.497227	78.98556	129.01	127.86	488	256	127.86
6/2/2003	40	90	101.675305	85.8272	129	127.72	598	71	127.72
5/28/2003	39	90	116.873481	97.30076	129	127.82	765	84	127.82
5/26/2003	37	100	183.399865	129.5193	128.88	127.82	714	436	127.82
5/19/2003	36	100	213.910329	124.5116	129	127.72	1183	189	127.72
5/12/2003	35	75	118.693267	96.53824	129	127.5	841	111	127.5
5/7/2003	34	80	105.310198	91.89957	130	127.62	627	78	127.62
5/5/2003	33	80	94.0798108	75.66609	129	127.53	622	82	127.53
4/30/2003	32	90	112.361987	88.75168	129	127.6	827	76	127.6
4/28/2003	31	80	129.75861	85.51013	129	127.81	613	366	127.81
4/23/2003	30	120	143.364303	118.2095	128.5	127.66	642	246	127.66
4/16/2003	29	100	139.100431	116.1507	128.71	127.51	808	92	127.51
4/14/2003	28	80	153.794878	87.02448	129.5	127.51	643	333	127.51
4/9/2003	27	95	102.37684	79.69457	128.5	127.27	671	78	127.27
4/7/2003	26	95	108.218269	94.33692	130.1	127.1	803	54	127.1
4/2/2003	25	90	99.3343889	78.20718	128.3	127.51	650	123	127.51
3/31/2003	24	80	96.5183025	82.29896	129.21	127.37	612	124	127.37
3/26/2003	23	90	101.170772	96.54037	128.68	127.22	808	22	127.22
3/24/2003	22	80	104.92121	74.48809	129.5	127.52	541	252	127.52
3/19/2003	21	100	108.63169	104.2033	128.7	127.3	795	42	127.3
3/17/2003	20	100	135.419307	103.9909	128.61	127.7	821	260	127.7
3/12/2003	19	90	140.856326	87.18481	129.5	127.52	486	360	127.52
3/10/2003	18	90	122.547069	89.28314	129.5	127.38	649	144	127.38
3/5/2003	17	85	79.9702468	79.97025	128.8	127.2	688	68	127.2
3/3/2003	16	90	103.577126	90.13945	129	127.2	782	62	127.2
2/26/2003	15	100	139.692864	126.2061	130	127.02	1080	60	127.02
2/24/2003	14	100	185.453515	107.5899	129	127.96	723	622	127.96
2/19/2003	13	100	175.046958	106.7037	128.5	127	591	560	127
2/17/2003	12	100	178.76139	96.2608	128.5	127.61	568	596	127.61
2/10/2003	11	125	162.651037	135.7372	130	127.45	1068	212	127.45
2/5/2003	10	100	170.16342	100.4333	128.5	127.5	890	473	127.5
2/3/2003	9	95	160.4295	79.75913	129.5	127.36	528	592	127.36
1/29/2003	8	85	142.689688	83.64008	128	127.27	696	391	127.27
1/27/2003	7	80	113.046502	71.79903	129	127.21	707	343	127.21

1/22/2003	6	90	139.258334	117.8362	128.5	127.12	957	156	127.12
1/20/2003	5	80	151.556536	84.71036	128.5	127.13	693	376	127.13
1/15/2003	4	100	131.3892	115.5248	130	127.02	979	120	127.02
1/13/2003	3	80	133.565985	86.36415	129	127.11	645	398	127.11
1/8/2003	2	80	128.039873	85.12502	131.5	127.01	486	321	127.01
1/6/2003	1	100	140.870441	104.7784	128.65	126.97	918	201	126.97
12/23/2002	44	100	140.038174	113.3732	131	126.9	909	118	126.9
12/18/2002	43	75	128.849766	112.5449	128.5	126.9	849	145	126.9
12/16/2002	42	80	138.512881	112.6693	129.76	126.92	974	170	126.92
12/11/2002	41	80	108.871744	76.12622	129.11	126.8	808	229	126.8
12/9/2002	40	100	145.215927	127.9004	129.1	126.91	897	145	126.91
12/2/2002	39	80	124.735128	88.10449	128.9	126.91	748	153	126.91
11/27/2002	38	75	97.3328569	74.90192	128	126.91	659	137	126.91
11/25/2002	37	80	111.334676	73.92677	129.5	126.85	848	125	126.85
11/20/2002	36	80	106.50393	70.29812	129	126.85	718	120	126.85
11/18/2002	35	80	121.288611	78.02322	128.5	126.85	827	312	126.85
11/13/2002	34	80	115.43127	70.74379	128.5	126.9	555	275	126.9
11/11/2002	33	78	94.3761942	70.38487	129	126.8	690	150	126.8
11/6/2002	32	80	81.7331152	68.64396	128	126.65	639	101	126.65
11/4/2002	31	80	93.5595127	75.38442	128	126.8	577	130	126.8
10/30/2002	30	85	83.5225592	76.85658	128.5	126.75	621	61	126.75
10/28/2002	29	85	98.9643382	81.00439	128	126.91	745	154	126.91
10/23/2002	28	90	117.207589	84.94235	129	126.81	1090	241	126.81
10/21/2002	27	80	107.733298	81.96375	128.5	126	561	277	126
10/16/2002	26	80	101.225446	80.31817	128	126.55	588	173	126.55
10/14/2002	25	80	117.533748	80.55252	128	126.5	635	241	126.5
10/9/2002	24	70	114.166689	70.50345	129	126.25	573	67	126.25
10/7/2002	23	80	68.1739816	67.27138	128.7	126	632	14	126
10/3/2002	22	80	64.5784854	61.07809	131	126	484	40	126
9/30/2002	21	80	77.4922513	70.66639	129	126	628	56	126
9/25/2002	20	80	102.444852	82.94321	130	126.25	678	83	126.25
9/23/2002	19	80	69.7562781	52.32935	128.7	126	659	104	126
9/18/2002	18	100	130.673287	114.8237	130	126.76	1152	106	126.76
9/16/2002	17	80	133.427982	79.66131	130	127.2	755	581	127.2
9/9/2002	15	70	103.663901	66.09227	130	126.51	622	391	126.51
9/4/2002	14	70	103.993116	70.54812	130	126.25	794	295	126.25
9/2/2002	13	70	98.0338269	69.55655	131	126.01	657	386	126.01
8/28/2002	12	70	102.002691	72.21479	130	126	785	419	126
8/26/2002	11	75	110.976455	74.09672	131	125.51	334	799	125.51
8/21/2002	10	75	73.0787742	68.27477	131.5	125	870	112	125
8/19/2002	9	85	79.7970136	67.24537	130	125	1037	110	125

8/14/2002	8	100	93.9223844	98.48749	131	125	841	113	125
8/12/2002	7	85	107.022351	88.14702	134.5	126	726	168	126
8/7/2002	6	115	89.3590383	83.61079	133	125	784	42	125
8/5/2002	5	85	113.847707	85.01915	135.5	127.66	679	311	127.66
7/31/2002	4	150	150.045913	143.7008	135.1	126	1193	109	126
7/29/2002	3	7.5	203.494117	77.49026	135.9	131.01	434	1169	131.01
7/24/2002	2	70	184.152183	70.42022	132.5	128.55	229	968	128.55
7/22/2002	1	40	40	41.0529	135.99	126	216	225	126

APPENDIX IX

DATE	DAS	BDC	IFEM
Jan-04	135.3	147.65	137.76
Feb-04	135	142.95	136.44
Mar-04	133.7	139.92	134.8
Apr-04	133.3	138.85	137.23
May-04	132.75	139.64	134.81
Jun-04	132.75	140	133.54
Jul-04	132.82	139.84	134.39
Aug-04	132.83	140.33	133.23
Sep-04	132.87	141.08	133.77
Oct-04	132.9	140.54	133.76
Nov-04	132.88	140.69	133.15
Dec-04	132.85	138.71	133.14
Jan-05	132.85	139.8	133.11
Feb-05	132.85	139.93	133.15
Mar-05	132.85	139.73	133.09
Apr-05	132.83	141.77	133.06
May-05	132.83	141.21	133.37
Jun-05	132.87	141.85	134.35
Jul-05	132.86	143.94	135.35
Aug-05	129.57	145.82	135.94
Sep-05	129.5	145.8	132.55
Oct-05	129.53	144.99	131.09
Nov-05	129.01	143.94	130.8
Dec-05	129	141.93	130.08
Jan-06	130.29	144.09	129.93
Feb-06	129.59	145.47	129.33
Mar-06	128.7	148.46	128.68
Apr-06	128.47	147.85	128.58
May-06	128.45	142.33	128.57
Jun-06	128.45	136.82	128.5
Jul-06	128.38	130.12	128.43
Aug-06	128.33	130.46	128.43
Sep-06	128.29	130.21	128.39
Oct-06	128.28	130.3	128.42
Nov-06	128.29	129.82	128.42
Dec-06	128.29	129.32	128.39
Jan-07	128.28	130.04	128.37

Feb-07	128.27	130	128.33
Mar-07	128.15	129.34	128.25
Apr-07	127.98	129	127.99
May-07	127.56	129.16	127.62
Jun-07	127.41	128.32	127.5
Jul-07	127.19	127.52	127.2
Aug-07	126.68	127.39	126.59
Sep-07	125.88	126.5	125.73
Oct-07	124.28	126.5	123.43
Nov-07	120.12	123.8	119.45
Dec-07	118.21	121.39	118.22
Jan-08	117.98	120.8	117.72
Feb-08	118.21	119.57	117.5
Mar-08	117.92	119	116.79
Apr-08	117.87	118.93	117.47
May-08	117.83	118.8	117.79
Jun-08	117.81	118.7	117.74
Jul-08	117.77	119	117.71
Aug-08	117.74	119	117.69
Sep-08	117.73	119	117.62
Oct-08	117.72	119	117.72
Nov-08	117.74	119.1	117.78
Dec-08	126.48	137.65	134.33
Jan-09	145.78	149.88	146.59
Feb-09	147.14	156.93	149.12
Mar-09	147.72	174.32	150.45
Apr-09	147.23	180.27	148.44
May-09	147.84	180.63	148.7
Jun-09	148.2	166.14	148.54
Jul-09	148.59	155.13	149.88
Aug-09	151.86	158.95	155.23
Sep-09	152.3	158	153.25
Oct-09	149.36	153.05	150.22
Nov-09	150.85	152.95	151.03
Dec-09	149.69	153.48	149.8
Jan-10	149.78	153.55	150.33
Feb-10	150.22	152.08	150.97
Mar-10	149.83	151.85	150.08
Apr-10	149.89	152	150.38

May-10	150.31	153.26	151.49
Jun-10	150.19	153.87	151.27
Jul-10	150.1	152.41	150.27
Aug-10	150.27	152.23	150.7
Sep-10	151.03	153.85	152.62
Oct-10	151.25	153.98	151.78
Nov-10	150.22	153.13	150.55
Dec-10	150.48	154.57	152.63