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Foreword

The National Bank of Rwanda's Economic Review is a channel through which results from research conducted essentially by staff of the Bank are published. These technical papers target a cross section of users such as researchers, academicians, policy makers, investors and other interested agencies and organizations that are involved in economic issues.

In this second edition, you will find three papers as well as the monetary policy statement by the Governor. In the monetary policy statement, the Governor highlights on important orientations of the monetary policy and development of the financial sector during 2008 after having made an assessment of the monetary policy conduct and financial system stability in 2007.

The first paper assesses the ability of monetary policy in Rwanda to influence production and the price level, whereas the second one analyses the determinants of spread between lending and deposit rates in Rwanda. The third paper investigates the causal relationships between the official and the black market exchange rates in the Burundian foreign exchange market.

The views expressed in this Review are those of the authors and the National Bank of Rwanda holds no responsibility whatsoever. Reprinting of any figures or statements contained herein is permitted on condition that proper citation and/or referencing is given to the National Bank of Rwanda's Economic Review.

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REVIEW OF MONETARY POLICY AND FINANCIAL SECTOR DEVELOPMENTS IN 2007 AND MONETARY GUIDELINE FOR 2008

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I INTRODUCTION

The year 2007 has just ended and it is time to assess the National Bank of Rwanda's monetary policy for the past year and consider new prospects for the ongoing one.

With technical and financial support from its development partners, the Government of Rwanda puts in place an economic program each year to ensure short term implementation of the medium-term program stated in the Economic Development and Poverty Reduction Strategy (EDPRS).

Monetary policy, which falls within the responsibilities of the National Bank of Rwanda is part of this program and has a particular role of creating an environment that is conducive for fostering production and investment through ensuring macroeconomic stability. The National Bank of Rwanda's action is geared towards controlling liquidity within the national economy and monitoring the financial system.

This monetary policy statement will give a broad outline of the Bank's 2007 monetary policy and the policy stance for 2008.

But before going further, allow me to make a short review of the national and international economic environment in which the Bank implemented its monetary policy.

II. OVERVIEW ON ECONOMIC ENVIRONMENT IN 2007 AND FORECASTS FOR 2008

II.1. International economic environment

According to the IMF's estimates, growth of the world economy remained strong during the year 2007. In real terms, the growth rate of the world economy is estimated at 5.2% mainly explained by good performances of the emerging economies. The Chinese economy experienced a growth rate of 10.9% while India and Russia also recorded a strong expansion. Economic growth also remained strong in other developing countries including low-income economies in Africa.

Inflation remained under control in most of the developed countries, but it accelerated significantly in many emerging and developing countries due to increase in energy and foodstuffs prices.

In the United States, underlying inflation stabilized at 2.3%. Throughout the year 2007, the overall inflation represented 2.7%, against 3.2% in 2006.

In Japan, in spite of four years of positive growth, the price level remained very low because of low wage level. In November 2007, inflation stood at 0.6%, against 0.3% in October, while it represented 0.4% when you exclude foodstuffs, against 0.1% in the same month.

Financial markets were characterized by volatility, which were aggravated by the crisis in the mortgage market in the United States, with repercussions on international financial markets.

In the face of such turbulences, the Federal Reserve significantly reduced the Fed Funds rate from 5.25% in December 2006 to 4.25% in December 2007. This easing of financing conditions, conducted to reduce the deterioration of financial markets, resulted in the weakening of the dollar against major foreign currencies. The spread between the reference rate and the three-month rate widened during this period. On annual average, the American three-month rates stood at 5.3% in 2007, against 5.19% the previous year.

In the Euro zone, the European central Bank, in its meeting of December 6, 2007 decided to maintain its main reference interest rate at 4% to stave off inflation pressures from strong growth in currency and credit,. The money market's three-month rates resumed their upward trend in December after two consecutive falls in November and October. While this rate had been 3.75% in January, it increased to 4.85% in December 2007. The same trend continued in terms of annual average as this rate increased from 3.08% to 4.28% between 2006 and 2007.

The Japanese Central Bank kept an accommodating monetary policy by maintaining its reference rate at 0.5% since February because of its fragile growth, strong sensitivity to financial crisis and lack of inflationary pressures. Thus, the average of the three-month deposit rate increased from 0.3% to 0.79% between 2006 and 2007.

In the commodity market, oil prices increased during most of the second half of 2007. By the end of the year, crude oil prices were already fluctuating around USD 95 per barrel in New York, which was almost 50% higher than that of the beginning of the year. The rise in oil prices was primarily due to the world demand pressure, on one hand, and to low production investments as well as continuous geopolitical tensions in oil-producing countries, on the other.

Although the world economic growth forecasts for 2007 were not perturbed, they are likely to be revised downwards for 2008 due to the crisis prevailing in financial markets, which are likely to cause a marked world economic downturn, the risk of inflationary pressures, volatility of oil markets as well the effect of the massive inflow of foreign currencies in emerging countries. According to the World Bank, the deepening crisis in the mortgage market in the United States and the fall of the dollar are likely to contribute to the slowdown of the world growth in 2008.

On average, growth of the world economy remained strong, with a rate estimated at more than 4%, supported by generally solid fundamentals and a strong expansion in emerging and developing countries.

II.2. National economic environment

The real growth of the Rwandan economy was estimated at 6.0% in 2007, against 5.5% in 2006. This was due to performances of the industrial sector, construction and services sectors, in spite of the decline in agricultural production as a result of bad climatic conditions.

In 2007, the agricultural sector added value was estimated to reduce by 1.8%, compared to the year 2006, following the fact that the season (2007B) was marked by a delay in the rainfall, which resulted in low harvests in several areas of the country. However, a poor performance in agriculture was compensated by good results in other sectors which were undoubtedly related to the progressive improvement in electricity supply and the consolidation of macro economic stability, which increased investors and consumers confidence.

Table 1: Real GDP growth (in %)

	2004	2005	2006	2007
Real GDP	**5,3**	**7,1**	**5,5**	**6,0**
Agriculture	**0,1**	**4,8**	**1,1**	**-1,2**
Manufacturing industry	**12,4**	**6,9**	**8,2**	**12,5**
Construction and public works	**19,1**	**7,7**	**5,2**	**15,2**
Services	**7,9**	**9,1**	**8,1**	**9,2**

Source : MINECOFIN

The increase in manufacturing added value was estimated at 12.5 % in 2007, against 8.2 % in 2006. Performances achieved by food industry, particularly by tea and beverages sub-sector, strongly contributed to this increase.

In the area of services, business climate significantly improved in 2007, compared to the previous year, particularly in general and retail trade, telecommunications as well as banking and insurance sectors. These factors explain the increase in the service sector added value, which was estimated at 9.2%, against 8.1% in 2006.

The construction sector continues to develop in a favourable economic environment, increasingly contributing to the dynamism of the national economy. The added value of this sector showed a strong growth of 5.2 and 15.2 %, respectively in 2006 and 2007. This performance is explained by major road infrastructure construction and rehabilitation projects as well as a significant dynamism that have been on going for ten years in the construction of commercial and residential buildings.

The mining sector, strongly stimulated by the firmness of the world ore prices, also recorded appreciable performances during the last two years. The rise in the added value in this sector was thus estimated to have increased in real terms from 26.6% in 2006 to about 40% in 2007.

The national economic situation in 2007 was marked by a significant increase in terms of trade, however, trade deficit worsened following more significant increase in imports (30.5%), in comparison with exports (19.2%). Compared to the previous year (14.2%), the increase in exports was primarily explained by the good performances of the mining sector, which brought in 40% of export earnings, thus exceeding coffee and tea.

The volume of coffee exports strongly fell by about 50% in 2007, compared to 2006. This poor performance can primarily be explained by poor rainfall at the end of the year 2006 and the beginning of 2007. This is normally a flowering period in which coffee-trees need much more rain. Tea exports were almost 20 000 tons in 2007, against 16.5 tons in 2006, which represents an increase of 17.5%. However,

in terms of value , exports slightly fell by 1.24%, compared to the year 2006, following the fall of 11.34% in average price on the international market.

Concerning the balance of payments, the current balance deficit widened in terms of both goods and service, compared to 2006. This situation primarily resulted from the increase in the value of imports and related costs, particularly transport and insurance costs.

However, the more significant inflow recorded in financial capital and transactions contributed to completely offset the current balance deficit and realise a positive balance of payments of USD 110.45 million, against USD 81.52 million in 2006. This inflow mainly came from budget supports and foreign loan disbursements to finance development projects, from the privatization of RWANDATEL Company (USD 100 million of which 50% were disbursed in 2007), as well as the recapitalization of the Rwandan banks whose minimum capital was to be increased from RWF 1.5 billion to RWF 5 billion from January 1, 2008.

III. MONETARY DEVELOPPEMENTS IN 2007

II.1. Inflation

In spite of a strong inflationary pressure observed in the first quarter as a result of the increase in excise duties on beverages and telecommunication as well as increase on , school fees and medical care tariffs, the year 2007 experienced a significant reduction in inflation rate, compared to the last two previous years.

Table 2: Main CPI developments (CPI; Base 2003= 100; changes in %)

Year		2006	2007			
Period	**Weighted**	**Dec**	**Mar**	**Jun**	**Sep**	**Dec**
FRESH PRODUCTS INDEX	**2 186**	**167.0**	**182.5**	**161.9**	**176.4**	**161.7**
Monthly changes		***2.8***	***0.9***	***-2.7***	***2.2***	***-7.3***
Year-to-year basis		***34.2***	***22.1***	***3.9***	***7.3***	***-3.2***
ENERGY INDEX	**761**	**225.1**	**225.3**	**228.**	**229.3**	**231.9**
Monthly changes		***-0.5***	***1.5***	***-0.9***	***-0.1***	***-0.2***
Year-to-year basis		***15.1***	***3.3***	***-0.4***	***0.8***	***3.0***
INDEX EXCLUDING FRESH PRODUCTS AND ENERGY (underlying inflation)	**7 053**	**120.5**	**129.4**	**129.8**	**131.4**	**133.3**
Monthly changes		***0.6***	***3.2***	***0.2***	***0.4***	***0.9***
Year-to-year basis		***6.1***	***10.5***	***10.0***	***9.7***	***10.6***
GENERAL INDEX	**10 000**	**137.0**	**146.4**	**143.2**	**147.1**	**146.0**
Monthly changes		***0.9***	***2.5***	***-0.5***	***0.7***	***-1.0***
Year-to-year basis		***12.1***	***12.0***	***7.3***	***8.0***	***6.6***

Source: NBR, Research Department.

Headline inflation represented 6.6% in December 2007, against 12.1% in the same month of 2006 in term of year-to-year basis, while on annual average it passed to 9.1% in December 2007, against 8.9% in December 2006. It should be recalled that the 2007 objective was to restrict inflation at 5%.

During the year 2007, inflation pressures were high only in the first quarter in which the cumulated average level was 6.7%, while for the rest of the year, prices fluctuated only slightly. During the second quarter, due to the seasonal effect of the season B harvest on prices of locally-produced foodstuffs, a 2.2% disinflation was recorded as a result of the significant fall in foodstuffs prices.

Underlying inflation was 10.6% in December 2007, against 6.1% in the same period of 2006. On annual average, it was reached 9.7%, compared to 4.0% in 2006. In the first quarter, this upward trend was exclusively explained by the increase in excise duties of beverages and telecommunication as well as increase in the water and healthcare tariff (KFH), and school fees. Indeed, except for the effects of these increases, underlying inflation was maintained at a low level during the rest of the year, with a cumulated rate of 3% between April and December 2007, a positive effect of the National Bank of Rwanda's monetary policy in 2007.

III.2. Exchange rate and foreign reserves management

For the fourth consecutive year, the RWF remained stable on the exchange market, one of the important factors behind the good performance of the Rwandan economy. The developments of the exchange rates of the RWF against major

international currencies maintained the same trend that had started at the beginning of the year 2004, with a slight but continuous appreciation of the FRW against the USD, the currency mostly used in the country's trade with the rest of the world. Thus, the RWF appreciated in nominal terms by 0.92% against the USD between December 2006 and December 2007.

However, in relation to the Euro and the British Pound (BP), the exchange rate of the RWF was rather marked by frequent fluctuations and depreciation. Between December 2006 and December 2007, the RWF depreciated against the BP and the Euro respectively by 2.59% and 8.95%. These fluctuations were related to the performances of these two currencies on international foreign exchange markets.

It should be recalled that the stability of the RWF is backed by a relative abundance of foreign currency inflows to the country's banking system, primarily coming from donor budget support to GOR , development projects, and private transfers and from the continuous improvement in the performances of the goods and service export receipts.

On the local exchange market, the year 2007 was characterized by a significant fast increase in foreign currency demand, compared to the previous years. This situation was primarily explained by the fast increasing domestic imports demand. It should be noted that in 2007, the National Bank of Rwanda increased the sale of exchange currencies to the private sector through the banking system, in order to sterilise excess liquidity injected into the system through a significant budgetary expenditure program. The commercial banks' foreign currency demand significantly exceeded forecasts.

Table 3: NBR's forign currency revenues and expenditure (in millions of USD)

	2006		2007	
		Estimates		Absolute changes
Description	**Results**		**Results**	**Real/Provisional**
Revenues	**448.04**	**485.16**	**655.89**	**170.73**
Of which: Budgetary supports	121.22	278.81	234.69	-44.12
Supports to projects	150.7	135.02	151.1	16.08
Expenditures	**415.3**	**483.73**	**549.34**	**65.61**
Of which: Sales to customers	**308.67**	**449.58**	**410.81**	**-38.77**
Government	109.94	167.73	137.01	-30.72
Commercial banks	137.05	196.45	235.72	39.27
Other customers	61.68	85.4	38.08	-47.32
NBR's gross reserves at the end of the period	**440.69**	**442.12**	**553.87**	**111.75**

Source: NBR, Department of International Operations

Lastly, in August 2007, in order to properly tailor our foreign exchange intervention to the changing market conditions, the Bank suspended the foreign currency auction sale system. In the current context where the domestic banking system has the capacity to satisfy all domestic exchange market's foreign currency demands, the BNR opted for a policy of selling foreign currencies to the banks on demand as opposed to scheduled auction days and at day's reference rate.

III.3. Monetary aggregates and interest rates

There was a significant difference between the increase in money supply, M2, (+31.25%) and that of the nominal GDP (+13%). This difference is explained by the fast monetization of the economy that took place in 2007, while maintaining inflation at a moderate level. Money supply increased by 31.25%, from RWF 285.6 billion to RWF 374.9 billion between December 2006 and December 2007, as a result of the accumulation of net external reserves (+23.4%) and a fast increase in credit to the private sector (+20.9%). On the other hand, over the same period, the net credit to Government dropped by 16.8%, due to the accumulation of its deposits in the banking system.

As regards currency demand, average deposits and fiduciary currency respectively accounted for 82.4% and 17.6% of money supply over the period. In terms of contribution to monetary growth, deposits and fiduciary currency contributed by about 86.6% and 13.4%, respectively.

Table 4: Monetary aggregate developments at the end of the period (in billions of RWF, unless otherwise indicated)

	2006	2007		% Change	
		Progr	Results	Real/Progr	2007/2006
Net external assets	**284.7**	**266.4**	**351.5**	**85.1**	**23.4**
Net domestic assets	**0.9**	**46.0**	**23.4**	**-22.6**	**2485.5**
Domestic credit	93.4	136.4	115.8	-20.6	24.0
Net Credit to Government	-69.2	-54.0	-80.9	-26.9	16.8
Autonomous agencies	-2.0	-2.0	-1.3	0.7	-35.6
Public companies	2.4	2.5	1.8	-0.7	-26.8
Private sector	162.2	189.9	196.1	6.2	20.9
Other net items	-92.5	-90.4	-92.3	-1.9	-0.1
BROAD MONEY	**285.7**	**321.4**	**374.9**	**53.5**	**31.3**
Currency in circulation	**54.7**	**60.6**	**67.4**	**6.8**	**23.3**
Deposits	**231.0**	**251.8**	**307.5**	**55.7**	**33.1**
Of which: Sight deposits	103.1	126.0	160.6	34.6	55.7
Time deposits	69.0	80.8	78.3	-2.5	13.5
Currency deposits	58.8	45.0	68.6	23.6	16.6

Source: NBR, Research Department

The fact that the monetary expansion was coupled with a significant deposit growth and a moderate fiduciary currency growth represented a greater expansion of financial services, which made it possible to bring more households' financial assets into the banking system.

Nevertheless, one could observe a persistence of excess liquidity in the banking system throughout the year. Further to this situation, the interest rates on the money market experienced a significant fall during the year 2007, both the rate on Open Market Operations and the Treasury bills rates dropped by 2.1% between December 2006 and December 2007.

However, in spite of the fall in interest rates on the money market, banks's lending rates remained the same, fluctuating around 16%, while the discount rates dropped markedly, falling from 8.1% in December 2006 to 7.4% in December 2007.

Table 5: Interest rate developments (in %)

	2006	2007			
	Dec	Mar	Jun	Sep	Dec
Money market rate	7.4	8.7	5.6	5.5	5.3
Interbank market rate	7.4	7.9	6.6	5.2	6.0
Mopping up rate	12.5	12.5	12.5	12.5	12.5
Weighted treasury bills rate	8.1	9.6	7.0	6.6	6.0
Discount rate	8.1	7.9	7.7	7.4	7.4
Lending rate	16.4	16.0	16.0	15.8	16.1

Source : BNR, Monetary and Financial Markets Department.

III.4. Banking system liquidity management

The Rwandan banking system has been experiencing a situation of continuous excess liquidity since 2004. To align the bank's liquidity with monetary indicators such as defined in the annual monetary program, the NBR had to regularly intervene to sterilize excess liquidities by borrowing from the money market and selling currencies to the banks.

Sterilization resulted in a significant increase of 16.2% in the Central Bank's domestic debt to commercial banks, which increased from RWF 49.3 billion to RWF 57.3 billion between the end of 2006 and the end of 2007.

In spite of significant increase in the amount of foreign exchange that the NBR was able to sell to the banks, demand remained insufficient to absorb the banking system's excess liquidities mainly generated by financial inflow of increasing budgetary supports. To keep the monetary program on track, it is important to reinforce the economy's capacity to absorb growing inflows from scaling up of external assistance.

Table 6: Some of the NBR's financial indicators

Indicators	2004	2005	2006	2007
1. Official reserves (in millions of USD)	314.5	405.7	439.7	558.7
(in month ly NFGS* imports)	7.3	7.5	6.8	6.9
2. NBR's objective (planned 6 month NFGS imports)	277.5	344.8	364.5	488.6
3. Excess reserves (in millions of USD)	37.0	63.2	75.2	65.2
4. Nominal rise in the exchange rate of the RWF against the USD (in %)	2.4	2.4	0.7	0.9
5. NBR's domestic debt (in billions of RWF)	11.4	41.3	49.3	57.3
6. Resultants on exchange rate fluctuations (in billions of RWF)	-1.2	-4.2	-2.0	-1.0

*NFGS: Non factor goods and services

Source: NBR, Research Department

IV. FINANCIAL SYSTEM STABILITY

IV.1. Banking system

The restructuring process of the banking system that has been going on for a few years now has given satisfactory results; the soundness of the banks was much consolidated and all those in difficulties have recovered and consolidated their activities.

Regarding business performance, the total balance sheet for commercial banks grew by 43% from RWF 275.5 billion in December 2006 to RWF 393.7 billion in December 2007. This improvement in the banks' activities was due to the increase in credit distributed (+26.6%). The amount of gross credit increased from RWF 171.3 billion in December 2006 to RWF 224.8 billion in December 2007.

Table 7: Commercial banks' performance indicator developments (in %)

Indicators	Dec 2006	Dec 2007
Solvency ratio	13.7	16.3
Banks' equity capitals, total	25.9	39.9
NPL*/ Total credits	26.0	18.6
Net charges on NPLs/net charges on credits	19.0	14.3
Efficiency ratio	79.8	70.0

* NPL: Non performing loans

Source: NBR, Bank Supervision Department

At a consolidated level, banks' solvency markedly improved to 16.3% at the end of December 2007, against 13.7% at the end of December 2006. From the first quarter 2008, all the banks' current solvency ratio has been higher than the required 10%. In addition, all banks have been able to mobilise resources necessary to comply with the new minimum capital of RWF 5 billion set by the Central Bank.

Concerning the quality of the credit portfolio, even though the gross amount of Non performing loans (NPL) decreased from RWF 42.8 billion to RWF 42.0 billion between the end of December 2006 and December 2007, their share in the gross credit portfolio significantly improved, decreasing from 26.0% to 18.6 % during the same period. This rate becomes 14.3% at the end of 2007 if the suspended interest and bank charges are not considered.

Concerning the supervision of banks, the year 2007 was primarily concerned with solving the problems of one of the banks in difficulty, reorganizing the UBPR network, the privatization process of the country's biggest bank, installation of an automated reporting system for financial institutions, and adoption the new risk-based supervision approach for bank supervision.

IV.2. Legal and statutory framework reforms

To make the Rwandan banking supervision framework comply with the financial sector's development plan, international standards and best practices, several reforms were initiated by the NBR. A new banking law was adopted by Parliament, the relevant regulations to implement this law were elaborated, and a micro finance

law was approved by the Government of Rwanda and submitted for approval of Parliament. The regulation on writing off after six months or more, from the bank's balance sheets of loans declared unrecoverable was adopted.

Lastly, it is significant to stress that entry of regional and international banks in our financial system strengthened the national banking system's financial soundness and improved its competition and competitiveness for the benefit of our economy.

IV.3. Microfinance sector

The reorganization of the micro finance sector intensified during the year 2007. Periodic meetings between the NBR Management and the MFI managers, in the presence of Provincial Governors, and the Mayor of Kigali City and other local government authorities, enabled us to solve most of the problems of licensing of institutions that had with difficulties to comply with necessary statutory conditions. Important decisions were taken during these meetings, including a concerted reorganization of viable institutions and liquidation of those which were insolvent .

The minimum authorized capital of the MFIs that have adopted legal statutes of limited companies was increased from RWF 100 million to RWF 300 million, and the majority of those concerned with the issue took the necessary steps to mobilize the resources required on 31/12/2007. Those unable to comply are negotiating plans to merge with other MFIs, or to be absorbed by them.

The liquidation of the MFIs that were closed in 2006 continued in 2007. The liquidators signed a contract that enabled them to start the debt collection process with support from district-based collection commissions. The process of paying off the depositors also accelerated. In December 2007, an amount of 1.036 billion had already been given out to declared depositors. This amount accounted for 96% of the instalment of 50% that the Government was committed to compensate the depositors whose declaration were in conformity with the liquidators' records .

IV.4. Payment systems modernization

SIMTEL (Société Interbancaire de Monétique et Télécompensation), whose operations were inaugurated in February 2005, has signed a partnership agreement with a strategic partner, a German investment company that intends to avail its know-how and make significant investments in the modernization of the Rwandan payment system.

V. MONETARY POLICY AND FINANCIAL SECTOR DEVELOPPMENT IN 2008

Consolidation of our achievements as regards macroeconomic and financial stability will remain the major concern for the monetary policy and related activities to be implemented by the National Bank of Rwanda in 2008. Financial stability means moderate inflation (an objective of reducing inflation to 7% was set for the year 2008), a stable and predictable exchange rate, and a sound banking sector, including the microfinance sector. To maintain financial stability is an important prerequisite to stimulate private investment necessary for achieving the objective of economic growth rate of between 5.5% and 6.5% in accordance with Government's 2008 economic and financial program.

The monetary management in 2008 is faced with significant challenges which will likely exacerbate inflationary pressures. Most significant ones being the shock due to rise in oil prices, and the potential impact of the recent socio-political crisis in Kenya. These two external factors are coupled with internal factors, including an accelerated strong growth potential for credit distribution due to the recapitalization of the banks and micro finance institutions, as well as a significant increase in the 2008 public expenditure program, in relation to the 2007 achievements. However, we have other favourable factors that will offset the above-mentioned risks and we therefore view the year 2008 with optimism as regards the monetary program. These include;

- good prospects for agricultural production, following the Government's efforts to revive the rural economy;
- No new tax measures to increase taxes in 2008, in addition to no upward revision of public service charges, except for transport;
- comfortable level of exchange reserves to make it possible to ensure foreign exchange stability , while meeting the increase foreign exchange demand, resulting from a strong increase in credit to the private sector;
- considerable increase in capital expenditure within the Government budget, which will result in the rise in foreign currency component expenditure without expansionist effect on bank liquidity;
- recent launching of the capital market; and
- Effectiveness of our financial system to deal with the growth of external financial inflows.

In addition, implementation of the FSDP recommendation and action plan will continue to make good progress. These actions are aimed to strengthen the competitiveness and improve the effectiveness of the banking and micro finance system so as to improve access to financial services, develop the capital market to contribute towards financing long-term investments and reducing transaction costs associated with the payment systems by developing a more modern payment system.

V.1. Monetary and Exchange policy guidelines

A. Liquidity management and inflation control

To achieve the objective of reducing headline inflation to less than 7% all over the year 2008, the National Bank of Rwanda will pursue a strict monetary policy through a daily monitoring of the monetary base as an instrument to control money supply. This requires of us to continue to supervise the expansion of liquidity within the banking system and, in case of need, to intervene on the money market to maintain liquidity at the desired level. Taking into account the comfortable level of Government exchange reserves currently available at the NBR, sale of foreign exchange will remain the main instrument needed to regulate the liquidity within the Rwandan economy during 2008. This will result in a new moderate appreciation of the exchange rate of the RWF against the dollar. In addition, this will contribute to the inflation control.

The NBR's liquidity management mechanism will soon be reviewed. The current instruments (overnight operations, open market operations, sale of Treasury Bills) will be replaced by a new unique liquidity purchase and repurchase instrument, "REPO" (Repurchase Agreement). The current interest rate structure adopted by the NBR on the money market will be adapted to the operating mechanism of this new instrument. In addition, with the recent launching of the bond market, the NBR considers to reorganize the current outstanding Treasury bills stock in 2008 so as to transform a significant portion of this debt into medium- and long-term securities that will be listed on the capital market. This operation will enable long- term

sterilisation of excess & liquidity from the banking system, which will facilitate efficient money market operations.

This rationalization effort to manage the bank liquidity in a situation of increasing budgetary assistance will require reinforcing the coordination of the Treasury operations with the NBR interventions on the money market.

However, it is important to note that monetary measures alone are not enough to control inflation, which is dependent on many other factors beyond control of NBR like climatic conditions and oil prices. A consultative operational framework for all Government institutions in charge of economic and financial management remains necessary for coherence and effectiveness of the policy measures in order to deal with exogenous shocks.

B. Exchange policy

As regards foreign exchanges, the priority of the National Bank of Rwanda will be to maintain a stable and predictable exchange rate, and ensure that a significant volume of foreign exchange sales necessary to ensure a monetary equilibrium that is compatible with the requirement to maintain the country's macroeconomic stability. It is a challenge to the NBR to achieve these two objectives at the same time.

V.2. Financial sector developments

In 2008, the financial sector development prospects fall within the framework of the implementation of the Rwandan financial sector development plan whose scope covers the banking and micro finance sector reforms, the capital market development, the nonbanking financial service regulation and the modernization of the payment systems.

A. Banking sector reforms

During the last three years, the National Bank of Rwanda made significant progress in setting up a sound banking system. Today, almost all Rwandan banks are managed professionally, have attained a solid social capital base in conformity with international standards.

The actions to be implemented in the banking sector during the year 2008 are primarily aimed at consolidating the achievements in this field, and putting in place a legal and statutory framework in compliance with international banking supervision standards. The current framework will therefore be updated to harmonize the current texts with the international banking supervision standards. After the promulgation of the new banking law, the relevant regulations for its implementation will be updated. Risk-based bank supervision will be strengthened with particular attention to good governance at bank level. The current efforts to reorganize the banks' credit portfolio will be pursued to reduce the level of nonperforming loan to between 5% and 10% by the end of 2008.

To improve credit information on banks' borrowers; a factor identified as one of the weaknesses of the business environment in Rwanda - the NBR intends to mobilize various partners within the banking environment, including all banks and large micro finance institutions, to put in place a Credit Reference Bureau in Rwanda as soon as possible

B. Modernization of micro finance institutions

The two last years' experience showed us that the micro finance sector was a very fragile sector and that it must be supported, supervised and modernized.

After significant efforts to reorganize the financial situation of this sector's institutions in 2007, the year 2008 will focus, inter alia, on enacting a law governing micro finance activities and its implementing regulations, intensifying off-site inspections of approved MFIs, improving the quality of information provided by them, capacity building by training their directors and managers, and putting in place refinancing facilities for the MFIs that have attained secure management standards within the framework of financing the activities that have a significant impact on poverty reduction.

Large micro finance institutions will be encouraged to adopt the statutes of "micro finance banks" that will enable them to fully participate in the National Payment System. Those showing satisfactory performances in the area of governance, consolidation of their equity capitals, positive operational profits, and able to

produce reliable accounting and management information will be integrated into the national payment system through partnership agreements with commercial banks.

C. Nonbanking financial sector regulation

Concerning the supervision of the financial system, the Bank's mandate was extended to include supervision of Nonbanking Financial Institutions (Pension Funds, Insurance Companies, etc). To fulfil this new mission, the National Bank of Rwanda will develop the legal and regulatory framework for the functioning and supervision of Nonbanking Financial Institutions.

A law governing the organization of insurance industry was submitted for Government's approval. In 2008, two laws intended to respectively regulate the Private Pension Funds and the Unit Trusts will be adopted to support the development of the contractual savings industry as well as long-term investment instruments. In order to ensure financial soundness in this sector, financial and management audit for these institutions is planned in 2008.

D. Capital market developments

Within the framework of the capital market development, the first issue of two–year government bonds took place on January 17 and 31, 2008, for two respective amounts of RWF 5 billion and RWF 4 billion. The results indicated a good opportunity to issue bonds with long duration in order to deal with the current state of excess liquidities the banking system. The Bank will pursue this program in collaboration with the Capital Market Advisory Council whose Executive

Secretariat is already operational. An annual schedule for subsequent issues with various maturity periods will very soon be published.

Due to the bond issue program with different maturity periods during the year 2008, a yield to maturity curve will be drawn by the private operators to inline with the capital market developments.

Since the capital market will bring together more actors, savers and investors, competitiveness in the financial system is expected to improve and reduce the current spread between the lending and deposit rates in the banking system.

E. Payment system modernisation

The National Payment Council will be in place this year. This body will be in charge of implementing the National Payment System Strategy. Our short-term objective is to equip Rwanda with an effective and secure payment system, and reduce transaction costs of services.

To this end, the 2008 action plan for the modernization of the payment system will focus on two important components aimed at putting in place a Real Time Gross Settlement and introducing an Automated Clearing House.

It is also envisaged to promote the use of bank cards on a large scale for both nationals and visitors through a SIMTEL Company network.

MONETARY TRANSMISSION MECHANISMS IN RWANDA

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Summary

This study assesses the ability of monetary policy in Rwanda to influence production and the price level. Based on the estimation of a VAR (2) model, the following important conclusions can be drawn.

As in most developing countries, the transmission mechanisms for monetary policy in Rwanda are found to be through monetary aggregates and the exchange rate. No significant effect is found through the interest rate channel. Shocks to the monetary aggregates and to the exchange rate have significant effects on prices, but not on real activity.

Another channel for monetary transmission in Rwanda tested and found to be significant is through credit to the private sector. The results indicate that an increase in the volume of credit to the private sector leads to an increase in real activity but not in the price level; the implication is that credit increases to the private sector are not inflationary. Such credit appears to finance production (aggregate supply) rather than consumption (demand). These results support the idea that monetary policy actions in Rwanda which facilitate private sector credit can help to manage inflationary pressures.

The results support the policy of monetary targeting as followed by the National Bank of Rwanda, because there exist a relationship between the money supply and inflation. However, the implementation of this policy depends on an additional important element, the existence of a tight relationship between the monetary base and the money supply. The National Bank of Rwanda must also continue to

intervene in the exchange market with the objective of managing banking sector liquidity. It must also keep in mind the stability of the FRW, because the results confirm that depreciation will pose an inflationary threat.

I. INTRODUCTION

Transmission mechanisms of monetary policy has been a subject of different researches over a number of years in developed economies (see for example Taylor (1995), Bernake and Gertler (1995); Christiano at al (1996,1999), Lutkpohl and Molters (2003), but very little is known about that issue in developing countries.
However, with the deregulation of financial markets and monetary policy more oriented towards market based operations in developing countries, especially in Sub-Saharan Africa, there has been an increased interest in understanding how economies respond to monetary shocks (see for example Smal and Jager (2001) and Mahadeva and Smidhova (2000).

This article is a contribution to this growing literature. It evaluates the capacity of the monetary policy in Rwanda to impact production and price. In this regard, the paper tries to identify potential channels for the transmission of monetary policy based on the indirect instruments since 1995. The design and conduct of monetary policy critically depends on a proper assessment and understanding of the effects of policy changes and shocks on relevant macroeconomic variables and their timing. The analysis of different transmission channels helps to describe their specific characteristics, such as their relative dominance, importance, and their propagating policy effects. Before to assessing whether monetary policy shocks have an impact on output and price, we first provide a qualitative assessment with respect to the effectiveness of individual channels for the transmission of monetary policy in Rwanda.

The empirical results indicate that the capability of monetary policy in Rwanda to influence economic activity and inflation is still limited as in other developing countries, with low levels of economic monetization. The monetary aggregate channel is important in monetary transmission mechanism in Rwanda. There is also some evidence of a pass through, but not very important. This means that the exchange rate channel has a limited impact on price.

The paper is organized as follows: section two presents an overview of monetary policy transmission channels literature. Section three discusses the channels of monetary transmission and their limits in Rwanda; section four presents the estimated impulse response functions showing the dynamic effects of unanticipated policy or exogenous shocks. Finally, the last section summarizes the main findings and offers some broad policy considerations.

II. THEORETICAL AND EMPIRICAL FRAMEWORK ON MONETARY POLICY TRANSMISSION MECHANISMS

II.1 Theoretical literature review

On the basis of the contributions of the monetarists, the long-term neutrality of the monetary policy is recognized, at least on the theoretical level. This means that in the long run, monetary policy does not have real impact; only nominal variables are affected. On this subject, one can refer for example to Christiano and al (1997) for the United States; Kim and Roubini (2000) for the G7 countries other than the United States; Peersman and Smets (2003) for the Euro zone.

However, monetary policy influences economic activity in the short and medium term through the change in the interest rate or money supply, based on price rigidities, and/ income and liquidity effects.. The transmission mechanisms of monetary policy are the channels through which monetary policy affects the aggregate demand and prices via the decisions of households and financial intermediaries to invest or consume. Six transmission channels of monetary policy are distinguished in the literature. These are the interest rate channel, the credit channel, the balance sheet channel, the assets prices, the exchange rate and expectations.

In the industrialized countries with developed financial market, the interest rate channel is the most important, whereas the exchange rate is generally dominating in the emerging or transition economies (Coricelli, Egert, MacDonald, 2005). This channel is particularly important in small open economies with a flexible exchange

rate regime. The effectiveness of the exchange rate is due to the fact that it does not affect only the aggregate demand but also the aggregate supply through the price pattern (Juks, 2004). Those channels are largely ineffective in the developing countries characterized by a low level of financial intermediation and a weak development of the financial market.

Let us recall that in the traditional Keynes view, a rise of nominal interest rate reduces the money supply and increases the real interest rate, by reducing the aggregate supply and finally the level of the prices. In a country with a flexible exchange rate regime, the rise of interest rate involves an appreciation of the real exchange rate, induced by capital inflows attracted by a better remuneration. The exchange rate channel amplifies the restrictive effect then, by decreasing net exports. At the end, the credit channel transmits monetary tightening by the means of the rise of the lending rate, but also of the reduction of the volume of new credit and the deterioration of the net situation of the borrowers.

The effect of credit channel would be tributary of supply of bank loans (Bernanke and Blinder, 1992) is at the origin of an abundant literature. From this literature, it comes out that two principal transmission channels of the monetary policy are closely related to the fluctuations of the credit market: the credit channel itself and the balance sheet channel (Kuttner, 2002; Mishkin, 2004). In the first case, the monetary policy affects the supply of bank loans which influences the real sector by the change of behavior of the investors, especially the small and medium enterprises (Mishkin, 2004). It should be noted here that it is the volume of bank loans and not the prices, which is adjusted in response to an action of the monetary policy. The effectiveness of this channel, thus, depends on number of the customers

of the credit and the importance of the impact of the monetary policy on the bank credit offer.

In the second case, the monetary policy affects the real sector through the channel of the balance sheet by modifying the financial statements of the companies. The effect of this channel is explained by the fact that the credit terms (especially foreign bonds) depend on the financial capacity of refunding of the borrowers. Thus, all fluctuations which can act on the quality of the balance sheet the companies due to the actions of monetary policy will affect their investments and their spending decisions (Bernanke, 1995). It should be noted that this channel of the balance sheet amplifies the effects of the monetary policy on the interest rate and the prices of the other assets. Indeed, the shock on the interest rate does not affect only the asset prices (welfare effect) but also the cash-flow (cash flow, income effect). That is reflected on the credit-worthiness of the companies. Let us specify that the importance of the effects of the channel of the assessments on the real activities is stronger when the debts are negotiable (Kuttner, 2002). Empirically, several studies test the impact of the credit channel without distinguishing the balance sheet channel credit itself (Valderrama, 2001).

II.2 Empirical literature review

Recent studies discuss transmission mechanisms of monetary policy in various countries. To stress the importance of the structure and the nature of the various economies (differences and diversity of the financial markets, the role of the banking sector, the history of inflation...) in the process of monetary transmission, studies are classified according to principal groups of countries. It arises from the

empirical literature on the transmission mechanisms of monetary policy that in the developed countries, the interest and exchange rates channels are most important; the effectiveness of the credit channel varies from one country to another.

Coudert and Mojon (1995) analyzed empirically by modeling VAR, the transmission mechanisms in 4 countries of the euro zone: Germany, France, Italy and the United Kingdom. Their model comprises the following variables: long interest rate, money supply, credit, exchange rate, price and production over the period 1976-1993. Simulations of shock of monetary policy show that a change in interest rate has varied effects from one country to another. The recessive effect is observed in France, in Italy and in the United Kingdom, it is not very significant in Germany.

Angeloni et al. (2002) analyzed 12 countries of the Euro zone (Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal and Spain). The results of this study, based on VAR model confirm that the rise of the short-term interest rate temporarily reduces the production. The prices follow slowly with a rise of inflation the first year and a fall over the following years. The interest and exchange rates channels are present in almost all the countries; the role of the credit channel varies from one country to another.

Loayza (2002) presents an empirical study starting from a VAR model on Australia, Canada and the United Kingdom. The study confirms that the interest and exchange rates channels are effective in all these countries. Morsink (2000), by an analysis of quarterly macroeconomic data of Japan has following results: 67% of the direct impact of the shocks of the interest rate on the aggregate demand pass by the bank

credit and 67% of change of the aggregate demand come from the private investment. The monetary shocks and the fluctuations of the bank balance sheet influence the real economy; the balance sheet channel dominating the other monetary channels. As mentioned in the following studies, the situation of the emerging countries is different from that of the developed countries.

Hericourt and Matei (2005) propose an empirical evaluation of the transmission mechanisms of the monetary policy in 8 central and eastern European countries (Czech Republic, Hungary, Poland, Slovak Republic, Estonia, Lithuania, Latvia and Slovenia) based on VAR models. The study made over the period (1995-2004) for the countries having maintained a fixed exchange rate regime shows the significant impact of the monetary aggregates on the real economy. The countries with a flexible exchange regime during the same period have heterogeneous behavior profiles. In Czech Republic, the interest and exchange rates channels are particularly active. On the other hand the quantitative channel (variation of the monetary aggregate M2) and the credit channel appear ineffective to impact the real economy.

In the case of Estonia, of Lithuania and Slovak Republic, the quantitative channel seems to be important with a strong impact of M2 on the other variables. In a general way, one can note the difficulties of the interest rate to impose itself like principal channel of monetary policy in these various countries.

Several authors analyzed the monetary transmission mechanisms in the emerging countries of Asia, in particular Brazil, Chile, Colombia, Korea, Mexico, Peru and

Vietnam. These studies use VAR model and conclude with the fact that the interest and exchange rates channels were most important in these countries.

For the specific case of Korea, the study undertaken by the central Bank of Korea (1998) on the credit channel confirms that the monetary contraction reduces the volume of credit granted by the small banks. This affects more small and medium enterprises which are dependent on the banking sector loans. In this country, the credit channel is as effective as that of the interest rate. The study specifies that the development of financial markets will reduce the effectiveness of the credit channel in favour of the exchange rate channel via the foreign capital inflows.

Hung (2007) presents an empirical analysis of the monetary transmission mechanisms for Vietnam. The results show that the shock on the interest rate affects production, GDP decreases from the 1st quarter until the 3rd quarter. A positive shock on M2 decreases the interest rate and increases GDP. The domestic credit is also sensitive to this shock and the real effective exchange rate is appreciated. The author concluded that the real effective exchange rate and M2 are the two important sources of the shocks on the GDP.

The African economies, specifically sub-Saharan Africa have their characteristics, as the few studies stipulate. Cheng (2006) studied the impact of a shock of the monetary policy on production and prices for Kenya. Its research shows that a monetary shock has a very significant impact on production (GDP) and inflation. The shock of the interest rate has short-term effects on the nominal exchange rate and prices. These effects on production are not significant.

The evidence from Kenya is derived from a VAR analysis and simulations carried out on the Bank's macroeconomic model. The results show that monetary policy in

Kenya significantly influences inflation through the interest rate, exchange rate and credit channels. Monetary policy transmission through the reserve money (operating target) to money supply (intermediate target) is not entirely efficient because the policy signal released as a shock to reserve money is lost in the sense that change in reserve money is not fully reflected in the corresponding change in the intermediate target. Monetary policy transmission mechanism lag in Kenya is 13 to 19 months when monetary policy is measured in terms of REPO interest rate shock. If reserve money is used, instead, the transmission lag is longer, 23 to 36 months (Maturu, 2007).

Mutoti (2006) examines the transmission of monetary policy in Zambian post-liberalized economy. Using a cointegrated structural VAR model, it is suggested that the impact of money supply shocks on Zambia's output is little and temporary. Output volatility is mainly associated with the aggregate supply and IS shocks, the latter is more pronounced in the short run. Money supply shocks also hardly explain Zambia's consumer price inflation. He adopted a well-known macroeconomic model for a small open economy under flexible exchange rates, the Mundell-Fleming-Durnbush model (widely used in empirical analyses). The results show that in Zambia and in the short run, consumer price and by implication CPI inflation is mainly on account of aggregate supply, money demand and exchange rate shocks. At longer horizons, it is mainly underlined by aggregate supply shocks and modestly by foreign price shocks. Also the results indicate that in Zambia monetary policy is mainly transmitted through interest rate and exchange channels. Monetary policy transmission mechanism lag in Zambia is 12 to 24 months.

III. LIMITS OF TRANSMISSION MECHANISM OF MONETARY POLICY IN RWANDA

As mentioned, the operation of monetary transmission channels varies across countries due to differences in the extent of financial intermediation, size, concentration and health of banking system, the development of capital markets and structural economic conditions (Checetti 1999). According to Créel and Levasseur (2005), the link between the monetary policy instruments under the control of central bank (short-term interest rate, reserve requirements) and the variables that drive the conditions in the non financial sector (loan and deposit rates, asset prices, exchange rate) is determined by the importance and structure of the financial system. In the other hand, the link between financial conditions and spending or investment decisions among households and firms is determined by the macro economic environment as well as structural features of the economy (for example, degree of monetization , cash based payments system, size of the informal sector, openness of the economy, and the inflows of private and official financing resources).

In Rwanda, as in other developing countries, the effectiveness of monetary transmission channel can be constrained by a number of factors. In general, those factors are the weak transmission of policy interest rates to market interest rates, weak sensitivity of spending and investment decisions to the availability and cost of credit. In this section, we identify the main impediments to some monetary transmission channels in Rwanda (interest rate channel, bank lending channel and exchange rate channel).

III.1. Interest rate channel

The traditional Keynesian view postulates that monetary policy can influence the real interest rate on credit by setting nominal short term interest rates. Owing to price rigidities, nominal interest rate changes lead to corresponding real interest rate changes, which have an impact on investment and consumer decisions of economic agents. According to this, the interest rate channel works through the effect of real interest rate developments on aggregate demand. In the case of Rwanda, the aggregate demand reacts slightly to variation of lending interest rate. The interest rate elasticities of GDP and credit demand are low (-0.17 and -0.4 respectively). This situation is due to the low levels of monetization (M2/GDP) and financial intermediation (total bank assets, deposit and credit to GDP).

Over the period 2003-2006, ratios M2/GDP and credit/GDP varies respectively from 16.4% and 17.5%, and from 9.5% and 10.2% (table 1). The weak level of competition of bank system in Rwanda can also explain the low interest rates sensitivity of demand deposits, credit demand and the spread of interest rate which varied between 6% and 9%, over the period 1995-2006.

Table 1 : Some financial sector indicators

Indicators	**2003**	**2004**	**2005**	**2006**
M2/GDP en %	17.54	16.45	16.40	17.53
Bank credit to private sector/GDPB(%)	10.18	9.45	9.84	9.94
Real deposit rate	-2.6	-2.7	-0.5	-0.7
Bank deposit/ GDP(%)	13.97	13.04	12.77	14.18
Bank asset/GDP(%)	21.19	24.67	24.61	26.23

Source : NBR, Research department

III.2. Bank lending channel

This channel works via the influence of monetary policy on the supply of bank loans. In other words, the impact is on the quantity rather than the price of credit. A contractionary monetary policy reduces bank reserves and therefore limits banks' ability to supply loans. Consequently, this lead to a fall in investment by bank dependent borrowers and possibly in consumer spending. However, the high excess reserves can make commercial banks in Rwanda indifferent to restrictive policy measures and limiting the effectiveness of credit channel.

This situation may also reflect the weak relationship between Rwandan economic agents and the banking system in the financing of their activities, in the context of the structure of the economy, the term of available financing, and the importance of the non-bank and informal financial sectors (UBPR, microfinance institutions…). Notably, agriculture, which contributes more than 40% to GDP, accounts of about 3% of total credit volume. With respect to bank deposits, more are in the form of notice (44.6% in 2006) than in term of deposits (29.8%). This situation leads banks to grant more short-term than long-term credits, and such a market cannot satisfy the needs of many borrowers.

The growing importance of the non-bank and informal financial sector is demonstrated by its contribution to the financing of the economy. In 2006, the financing of this sector represented 29.6% of total credit. This constitutes an important limit on the effectiveness of the credit and interest rate channels. Nonetheless, the upward trend of credit demand by the private sector observed for

several years, stemming from the dynamism of the Rwandan economy, is evidence of the contribution of the credit channel in recent years.

III.3 The Exchange Rate Channel

Monetary policy can influence the exchange rate through interest rates or by intervention in the exchange market. Movements in the exchange rate affect aggregate demand and prices through its influence on the price of imported goods, the costs of production and investment (through primary materials and imported equipment), on net imports, and on the balance sheets of corporations, especially in the case of a high rate of "dollarisation". One may conclude that the exchange rate between the Rwandan franc and the US dollar affects inflation and aggregate demand in Rwanda.

The average share of imports in GDP is 15% over the sample period and it displays a rising trend between 2002 and 2006, moving between 10 and 27%. In addition, imported products have a significant weight (30.44%) in the basket of goods and services sampled in the calculation of the consumer price index. It is worth noting, however, that these imports are found in different parts of the basket, so that the impact of changes in their prices on the consumer price index may be muted.

The nominal exchange rate between the Frw and the US dollar seems to be determined by the demand for imports and intervention on the exchange market. The demand for imports registered a sustained upward trend between 1995 and 2006, as shown in the following charts. This demand grew more than 400% between 1995 and 2006, and 118.5%between 2004 and 2006. In addition, these

charts show a certain correlation between the percentage changes of the exchange rate and the CPI, which can be considered an indication of the impact of the exchange rate on inflation in Rwanda.

IV. EMPIRICAL ANALYSIS

IV.1. Specification, data and choice of variables

We use a VAR analysis to examine the relationships between monetary policy variables and both output and prices in Rwanda. We first present results of Granger causality tests before estimating a reduce form VAR and identify monetary policy shocks through assumptions about variable ordering. VAR analysis has been used extensively to examine the effect of monetary policy on output and prices. The VAR methodology, a dynamic system of equations in which the current level of each variable depends on lagged values of that variable and of all other variables involved in the system, places minimal restrictions on description of how monetary shocks affect the economy. In this analysis it is useful to discriminate the transmission from instrument directly under the central bank's control to financial conditions and the impact of financial conditions on firms' and household's spending decisions (Christiano at al, 1999).

An unrestricted used VAR is represented by[1]

$$Y_t = A(L)Y_{t-1} + B(L)Z_t + \varepsilon_t \qquad (1)$$

Where Y_t is a vector of endogenous variables and Z_t a vector of exogenous variables. Y_t consists of real GDP (y), price 2001, the Consumer Price Index CPI, nominal exchange rate (tch)[2], monetary aggregates(or total credit) and interest rate on bank loans[3]. The vector Z_t consists of oil price and international price. Given that the

1 See annex 1for detail about specification of VAR model for Rwanda
2 Using the nominal exchange rate opposed to real effective exchange rate makes it easier to distinguish the exchange rate channel from others channels.
3 In absence of data of short term interest rate, we use interest on bank loans. This choice is important to examine more closely the interest rate and credit channels.

Rwandan economy doesn't have an impact on the global economy, these variables are treated as exogenous. A(L) corresponds to matrices of coefficients to be estimated, with lag lengths determined on basis of Schwatz and AIC criteria. Those criteria suggest that the number of lag is p=2. ε_t is a vector of innovations that may be contemporaneously correlated but are uncorrelated with their own lagged values with the right hand side variables. All data are expressed in natural logs, with exception of interest rate. The estimation is conducted on quarterly data from 1994 to 2006.

We adopt the following order of endogenous variables[4]:

$$Y_t = \left[y_t, p_t, td_t, m_t, tch_t \right] \qquad (2)$$

This ordering of variables is appropriate for a developed economy, with price relatively flexible. The monetary aggregate is ordered after the interest rate and before the exchange rate to reflect the degree of endogeneity of the policy variables to current economic conditions. We assume that in short run, shocks to the policy variables have no contemporaneous impact on output and prices due to the real sector's sluggish reaction to monetary and exchange rate shocks.

To characterize relationships between output, prices and policy related variables, stationarity properties of the data are important. The Augmented Dickey-Fuller (ADF) and KPSS tests show that all variables are I (1)[5]. As in most VAR models of the monetary transmission mechanism, we do not perform an explicit analysis of the economy's long-run behavior, because monetary transmission mechanism is a short-run phenomenon. Using the estimated VAR, we can analyze short-term

4 The results are robust to alternative orderings.
5 The detailed results are available from authors upon request.

dynamics based on variance decomposition and impulse response over the short to medium term (Favero, 2001).

IV.2. Granger causality tests

The results of Granger causality test suggest that monetary aggregates and exchange rate have a significant Granger effect on price and not on output. We also find that interest rate does not Granger cause output and price at 5% significance level.

Table 2 : Granger causality test

Hypothèses (H_0)	probabilité	Conclusion
m1 ne cause pas y à la Granger	0.4828	H_0 est acceptée
tch ne cause pas y à la granger	0.8150	H_0 est acceptée
m2 ne cause pas y à la Granger	0.5090	H_0 est acceptée
td ne cause pas y à la Granger	0.32	H_0 est acceptée
m1 ne cause pas p à la granger	0.0299	H_0 est rejetée
tch ne cause pas p à la Granger	0.0047	H_0 est rejetée
m2 ne cause pas p à la Granger	0.0357	H_0 est rejetée
td ne cause pas p à la Granger	0.99	H_0 est acceptée

IV.3. Impulse responses

Estimates from the VAR are described in figures 1 to 6 (appendix 2), the dotted lines represent 95 percent confidence intervals. The vertical axis shows the deviation from the baseline level of the target variable in response to change in the shock variables of one standard deviation, the horizontal axis presents the number of quarter s elapsed after the shock.

The figure1 examines the effect on both output and price, of a one standard deviation shock to the interest rate, and show that the effect is not statistically significant. This means that the interest rate channel remains very weak in Rwanda, as in many others developed countries.

The estimated effects of a shock to M2 on price are positive, statistically significant. The effects are modest, appear after 12 months and remind significant for almost 9 months. The impact of an aggregate supply shock on output has the expected sign but not significant and short lived, a common finding for economies with low monetization levels and consistent with the concept of neutrality of money. This result is consistent with the view that the primary role of monetary policy should be to control inflation, and it should leave the task of maximizing output to other elements of policy mix, notably to fiscal and structural policies. The results of the VAR model with the narrow monetary aggregate M1 suggest that there is not a significant difference in terms of the impact on output and prices for M2 one standard deviation shock, except the persistence of a M1 shock on the price level.

To further examine the role of monetary aggregates, we decompose M1 into currency in circulation and domestic demand. Figure 3 highlights the persistence of currency in circulation shock on the price level: the impact is marked after 6 months, statistically significant and long lived (24 months).

To further examine the role of credit to private sector in transmission of monetary policy in Rwanda, we replace monetary aggregates with total credit to the economy (bank loans) in the initial model. Over the all period of study, we find that there is not a significant link between bank loans and both GDP and price level. However, over the period from 2000 to 2006, we find that loans are an important conduit for the monetary transmission mechanism. The impact of bank loans shock has the expected sign, increasing output and reducing consumer price (figure 4). But the response of consumer price, to a change in volume of credit to private sector is statistically insignificant. This result can be interpreted as follow: the bank loans in Rwanda have financed productive activities rather than consumption.

We finally estimate the impacts on GDP and price of changes in exchange rate in Rwanda and the results suggest a modest pass through (figure 6). An appreciation of Rwandan franc results in a modest increase of CPI after almost 3 months and loses statistical significance after 3 months. This result does not mean that allowing some exchange rate fluctuation would necessarily have strong effects repercussions, since monetary and fiscal policies could adjust to limit the pass-trough.

IV.4. Variance decomposition

The objective here is to determine the share of fluctuations in GDP and CPI that are caused by different shocks. We then calculate variance decompositions at forecast horizons of 1 to 10 quarters (tables 1 and 2, in appendix 3). In each table, the second column shows the forecast error of variance for each forecast horizon. The remaining columns present the percentage of variance due to each shock.

The results indicate that, within 10 quarters, fluctuations in output are due essentially to it own innovations (93.7%), contribution of authors variables are marginal (table 1). This confirms the results of impulse responses analysis which show that impact on GDP from monetary policy shocks is very weak. On the other hand innovations to M2 account for over 34% of the fluctuation in CPI while the contribution of exchange rate is not important (table 2).

Summary and policy considerations

This is the first study which analyses the capacity of monetary policy in Rwanda to affect output and price. The results of a VAR(2) estimation show that shocks to domestic monetary aggregate significantly affect price, but appear to have no major impact on output. This result could be partly explained by the low level of monetization and structure of economy in Rwanda.

The reaction of CPI to a shock on currency in circulation is rapid (after 6 months), stronger and long lived (24 months) than to a shock to M2.

The results show also that bank loans are important in the monetary transmission mechanism in Rwanda. Over the recent period (2000-2007), shock to volume of credit to private sector affects significantly GDP and not CPI. This means that bank loans finance productive activities than consumption.

We can consider that the National Bank of Rwanda monetary aggregate targeting policy is appropriate, because this study suggests a close relationship between money aggregate and inflation. In this monetary policy framework, the supply of the monetary aggregate is kept on a predetermined growth path, based on the monetarist quantitative theory of money, which states that inflation arises from the growth in money. However, the effectiveness of this monetary policy depends on the stability of money multipliers, on the relationship between money and price and on money demand relationship. This issue of stability will be examined in another study.

As in many transition economies, the interest rate channel remains weak in Rwanda and exchange rate channel appears to impact price, even if the pass through is not important. The National Bank of Rwanda should therefore continue to intervene in the exchange market in the context of the management of bank liquidity, keeping in mind the stability of the Frw, because a significant depreciation would pose an inflationary risk.

APPENDIX 1: VAR model for Rwanda

To specify this model, we assume that the Rwandan economy can be described by the following structural form equation:

$$D(L)Y_t = C(L)Z_t + \varepsilon_t \quad (1)$$

Where D(L) is a nxn matrix polynomial in the lag operator;

C(L) is a nxk matrix polynomial in the lag operator;

Y_t is a nx1 vector of endogenous Rwandan variables;

Z_t is a kx1 vector of exogenous foreign variables;

ε_t is a nx1 vector of structural disturbances.

Let E be the contemporaneous coefficient matrix in structural form and F (L) the coefficient matrix in D(L) without contemporaneous coefficient.

That is,

$$D(L) = E + F(L) \quad (2)$$

The structural form equation can be re written as follow:

$$\left[E + F(L)\right]Y_t = C(L)Z_t + \varepsilon_t \quad (3)$$

This imply that

$$Y_t = -E^{-1}F(L)Y_t + E^{-1}C(L)Z_t + E^{-1}\varepsilon_t \quad (4)$$

Or

$$Y_t = A(L)Y_t + B(L)Z_t + \mu_t \quad (5)$$

Where $A(L) = -E_{-1}F(L)$ and $B(L) = E^{-1}C(L)$ (6)

$\mu_t = E^{-1}\varepsilon_t$ or $\varepsilon_t = E\mu_t$

The covariance matrix of ε_t is then

$$\Sigma = E^{-1}\Lambda E^{-1} \tag{7}$$

$\Lambda = Var(\varepsilon_t)$, which is a diagonal matrix.

To estimate E and Λ, we have first to estimate Σ by the maximum likelihood estimation for example. To achieve identification, we need to impose n(n+1)/2 restrictions, because the right hand side of (7) contains n(n+1) free parameters, while the left hand side contains only n(n+1)/2 parameters. To have a unit diagonal elements of E, we need n(n-1)/2 additional restrictions, which should be motivated by economic theory.

In this paper, Y_t consists of constant GDP (y), price 2001, the Consumer Price Index CPI, nominal exchange rate (tch), monetary aggregates(or total credit) and interest rate on bank loans. The vector Z_t consists of oil price and international price, which is calculated based on Rwanda's main imports.

APPENDIX 2

Figure 1 : Response of GDP and CPI to one standard deviation interest rate change

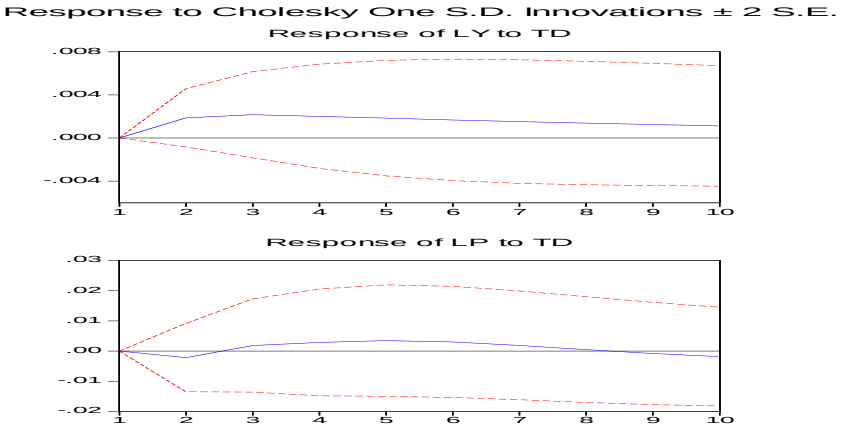


Figure 2 : Response of GDP and CPI to one standard deviation M2 change

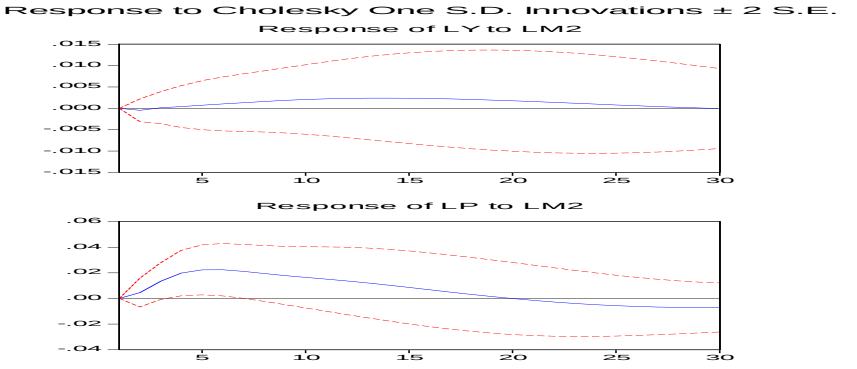


Figure 3 : Response of GDP and CPI to one standard deviation currency in circulation change

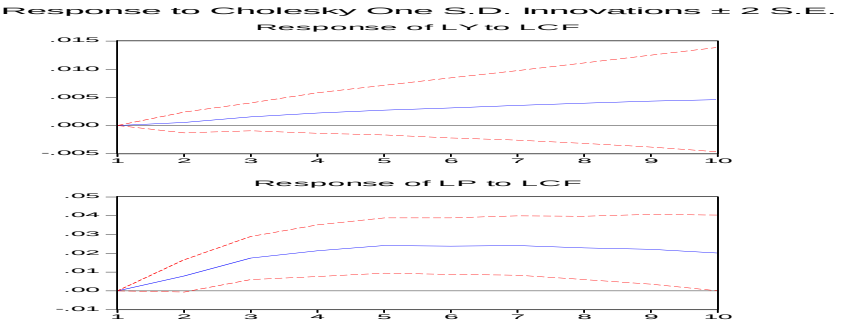


Figure 4 : Response of GDP and CPI to one standard deviation bank loans change

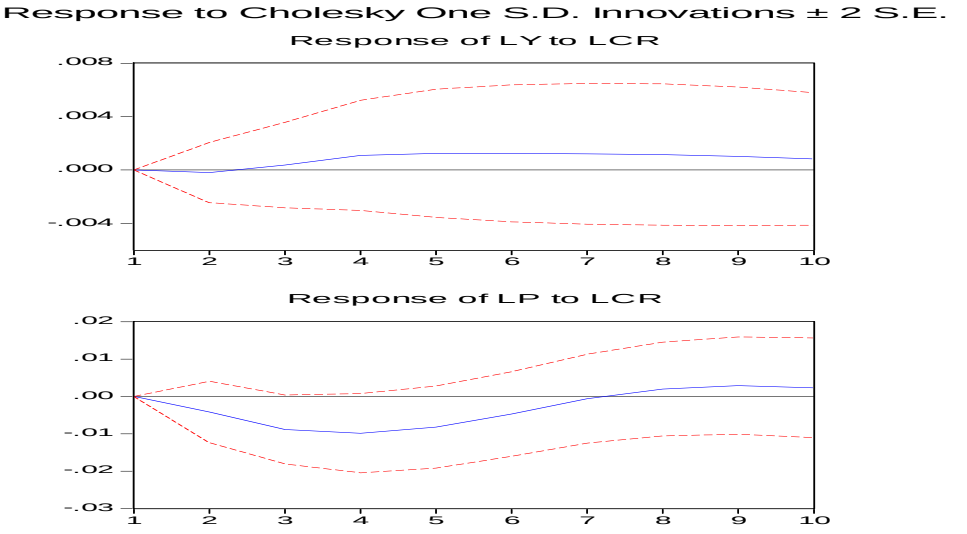


Figure 5 : Response of GDP and CPI to one standard deviation interest rate change over 2000-2006

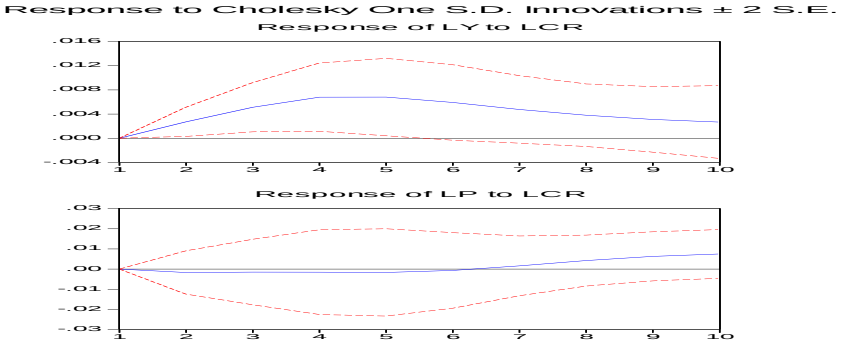
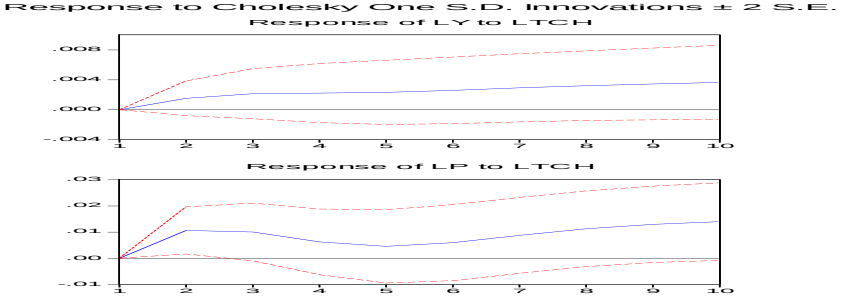


Figure 6 : Response of GDP and CPI to one standard deviation exchange rate change



APPENDIX 3

Table 1 : Variance decomposition of GDP

Période	S.E.	LY	LP	TD	M2	TCH
1	0.008052	100.0000	0.000000	0.000000	0.000000	0.000000
2	0.013681	98.31481	0.354269	1.149639	0.169319	0.011967
3	0.017924	97.82708	0.535787	1.483594	0.142815	0.010724
4	0.021372	97.49366	0.609729	1.678706	0.205950	0.011954
5	0.024244	97.15211	0.581576	1.821119	0.426174	0.019019
6	0.026705	96.77422	0.507856	1.940188	0.743246	0.034488
7	0.028865	96.26379	0.435450	2.050701	1.188243	0.061817
8	0.030803	95.58943	0.389629	2.160695	1.757753	0.102490
9	0.032578	94.72817	0.376995	2.273272	2.464210	0.157356
10	0.034233	93.68365	0.394010	2.389169	3.306596	0.226573

Table 2 : Variance decomposition of CPI

Période	S.E.	LY	LP	TD	M2	TCH
1	0.034066	1.050453	98.94955	0.000000	0.000000	0.000000
2	0.052792	1.224541	97.56810	0.298494	0.209485	0.699376
3	0.063641	1.316021	95.63781	0.253597	1.811512	0.981056
4	0.070458	1.508599	91.58018	0.558642	5.339736	1.012839
5	0.075547	1.879291	85.71088	1.229562	10.21142	0.968846
6	0.080158	2.366937	78.91593	2.070343	15.73868	0.908108
7	0.084675	2.890244	72.19670	2.880408	21.17308	0.859575
8	0.089170	3.370316	66.07872	3.550380	26.15878	0.841808
9	0.093627	3.764051	60.73639	4.054610	30.57500	0.869945
10	0.098036	4.060063	56.13485	4.410556	34.44084	0.953686

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DETERMINANTS OF BANKING INTEREST RATE SPREADS IN RWANDA

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Abstract

There is a concern that in many low-income countries, especially in Sub-Saharan Africa, banking systems seem to be weak and that can be a major threat to economic growth. It's in this view that this paper analyses the determinants of spread between lending and deposit rates in Rwandan banking sector from 2001 to 2007.

Compared to some industrialised countries and other east African countries, the interest rate spread in Rwanda is high with an upward trend. Though the concerned six commercial banks in Rwanda differ in size, know-how, organisation as well as management, their spreads are very close and each one converges towards the average spread of the banking system.

Econometric tools have been used to estimate an intermediation model to assess which factors influence the spread between lending and deposit rates in Rwandan banking system. A quarterly panel data has been used relating to specific variables of each bank, concentration in banking system and macroeconomic environment.

The results revealed that lack of competition and risk aversion are the major determinants of the interest rate spread in the Rwandan banking system.

I. INTRODUCTION

The issue of determinants of interest rates is still a subject of several researches and this disturbs investors as well as depositors. In countries with high interest rate spread, the impact of monetary policy measures on the credit is limited. High and persistent spread can be a serious impediment to expansion and development of financial intermediation by discouraging potential savers with low returns on deposits and potential investors with reduced feasible investment opportunities.

Usually, higher level of spread between lending rate and deposit rate is attributed to high overhead costs, financial taxation (reserve requirement ratio), high level of non performing loans, lack of competition in banking system and very high inflation. In developing countries, banking system is dominated by a few commercial banks and for depositors the higher level of interest rate spread is interpreted as banks' tendency to maximise profits in an oligopolistic market.

As in most developing countries, the expected decline in interest rate spreads has not materialised in Rwanda, after a long period of financial liberalisation. There is agreement among economists that the removal of financial repression, in form of interest rate controls, imposition of credit ceilings and credit rationing will facilitate economic development and growth (paradigm of MCKinnon-Shaw). This will occur as bank deposits increase through real interest rate increases and by increasing the efficiency of the bank system.

In general, arguments advanced for the failure of interest rate to decline in developing countries, in the context of financial liberalisation are the lack of

changes in the structure of banking systems(characterised by a low competitiveness level, a strong concentration), high reserve requirements ratio, risk aversion for banks, high operational costs, macroeconomic instability and political environment in general.

There has been no study in Rwanda on real causes of interest rates spread. This paper attempts to fill this gap by identifying the main determinants of interest rate spread. This study is important because the issue of high interest rate spread has been pointed out in recent report in the financial sector assessment program (FSAP) by the institutions of Bretton Woods (IMF&WB, May 2005)6.

For carrying out well this analysis, we use the simple model of banking intermediation recently used in IMF working paper for Latin America countries (Gaston Gelos, February 2006), and for the study in Ghana by Franklin and Martin (2005), in Malawi by Chirwa and Malachila (2004), in the Fiji islands by Jayaraman and Rjesh (2003), in Colombia by Barajas, Steiner and Salazar (1999), and in 8 countries of Eastern Caribbean Currency Union (ECCU) by Randall (1998).

This study is structured as following: the second section provides a brief literature review on interest rate spread, the third section presents the recent developments in the Rwandan financial sector and the fourth section deals with the descriptive analysis of the spread. Empirical analysis is presented in the fifth section before presenting some conclusions.

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6 IMF&WB, Rwanda Financial Sector Assessment Programme, May 2005, p.39

II. LITERATURE REVIEW

A consensus seems to emerge from theoretical and empirical literature on the determinants of interest rate spread in the developing countries. These factors are related to macroeconomic environment, structure and development of the financial system.

In Colombia where the banking structure is primarily composed of foreign banks or foreign shareholding, the research by Barajas, Steiner and Salazar (1998 and 1999) identifies the following factors as the most important determinants of interest rate spread: financial taxation which contributed (28.07%), resources costs whose contribution (36.69%) and quality of loans (volume of non performing loans) which contributed (35.24%).

The studies by Chand (2002) and Asian Development Bank (2001) for the Fiji islands, show that the interest rate spread is explained by the absence of competition in banking system, the small size of banks which does not enable them to operate with economies of scale, the high fixed and operational costs, the significant level of non performing loans, bank nets profits and high transport costs of funds. For Chand, the fact that a great number of borrowers in Fiji islands do not have sufficient guarantees contributes to increase the spread since these borrowers are themselves penalised by high interest rates. The excess liquidity which results from a surplus of funds for banks and in absence of deposits mobilisation explains the low level of lending rate and thus a high level of interest rate spread.

The study of Chirwa and Malachila (IMF, 2004) shows that the high level of the interest rates spread in the banking system of Malawi is caused by monopolistic

behaviour of some banks, high reserves requirements, high discount and inflation rates. A similar empirical study to Malawi was made in Ghana by Franklin and Martin (2005). This study pointed out that the market share in banking system explains the overall behaviour of banks and expressed the absence of perfect competition in the banking system of Ghana. Moreover, high operational costs dominated mainly by wages and bank net profits contribute to increase the spread. The study also showed that the level of bank liquidities, taxation and inflation rates influence significantly the spread even if their influence is weak compared to those of operational costs and market share.

A recent study by Gaston Gelos (IMF, February 2006), examined the issue of interest rate spread in 85 countries including 14 Latin America countries. The results showed that there is no significant difference between the Latin America countries and other developing countries with regard to the factors like inflation and bank profit taxation. However, a very particular behaviour has been observed for other factors such as bank inefficiency resulting from weak competition in banking system and very high reserves requirements. Moreover, the weak support of the legal framework in the region contributes to widen intermediation costs.

Brock and Rojas-Suarez (2000) analysed interest rate spread for a group of five Latin America countries: Argentina, Bolivia, Colombia, Chile and Peru. They identified important causes like: capital ratio, cost ratio, liquidity ratio, non performing loans, interest rate volatility and inflation level.

For Brazilian case, the research of T.S. Afanasieff, P. M. V Lhacer and M. I Nakane (1999) bearing on a monthly panel dataset of 142 banks concluded with a downward trend of the spread from February 1997 to November 2000 due to a stable macroeconomic environment and to the legal priority given to the reduction of interest rate margins.

Demirgüç-Kunt and Huizinga (1999) analysed the determinants of interest rate margins for 80 countries from 1988 to 1995. Their study showed that the major determinants were stockholders' equity ratio, bank size, operational costs ratio, inflation rate and non-interest assets ratio.

III. STRUCTURE OF THE RWANDAN BANKING SECTOR

As in many other developing countries, the Rwandan financial sector remains underdeveloped, despite important reforms carried out these last years. Those reforms began since March 1995 in a very difficult post war context, where first actions consisted in rehabilitation and re-energization of the banking system, in revision of certain banking acts and in reorganization and recapitalisation of certain banks with financial problems. It should be noted that great achievements were accomplished these last years in the improvement of banking system soundness. They related to primarily the increase of commercial bank activities, improvement of their solvency and profitability as well as reforms of legal and regulatory framework.

With the technical assistance of Bretton Woods's institutions, the National Bank of Rwanda adopted laws and acts according to international standards, in particular the Basle agreements on capital adequacy. The current Rwandan banking industry is built on a regulatory and supervisory framework whose construction was strongly inspired by international standards and practices. Since, the monetary authority endeavoured to clean up the banking system in order to make it more powerful and coherent with the overall objectives of the economic liberalisation programme of the country. In this context, NBR relied on interest rate determination mechanism by market forces, which was to allow a favourable environment for a sustainable development of credit market in particular and for investments increase and growth rate in general.

Barriers to new banks were removed and banks were allowed to open new branches according to new regulatory dispositions set up by the central bank within the banking law framework. These reforms have to make it possible to push up the financial intermediation level, promotion of competition, effectiveness and stability of banking system.

The changes operated in the Rwandan banking structure during the period 2000-2006 have not yet affected significantly the bank intermediation function in Rwandan economy. The ratios of broad money (M2) on GDP and credit to private sector on GDP did not change significantly much over the period. The first ratio varied between 17.62% and 19.67% over the period, from 2000 to 2006. The second ratio fluctuated between 9.45% and 10.94% over the same period.

Table 1: Financial deepening indicators (in %)

	2000	2001	2002	2003	2004	2005	2006
M2 / GDP7	17.66	17.62	18.47	18.64	18.13	18.49	19.67
Credit to private sector / GDP	10.48	10.31	10.94	10.18	9.45	9.84	9.94
Loans / GDP	10.58	10.98	11.43	10.67	9.71	10.24	10.47
Deposits/ GDP	14.32	14.14	16.88	13.97	13.04	12.77	14.18
Loans/ Deposits	73.94	77.04	73.96	73.53	60.38	61.07	59.02

Source : NBR, Research Department, 2006

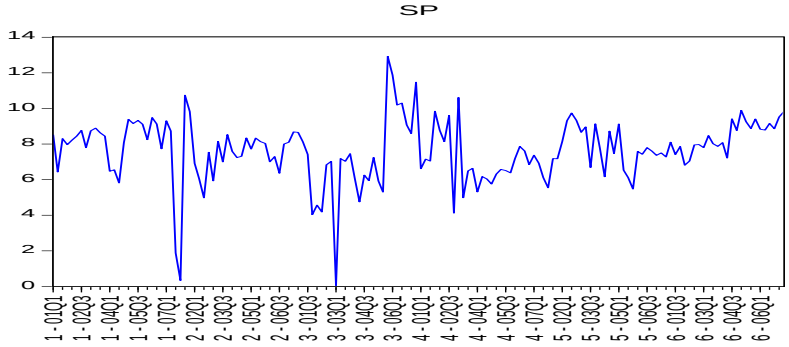
However, note that credit to private sector increased over all the period. This can be interpreted as a process of extension of banking services in the economy able to stimulate economic growth. Actually, the Rwandan banking system is very limited composed by 7 commercial banks and is dominated by 3 among them which occupy 74.2% of deposits market between 2000 and the first quarter of 2007. The leader of them occupies 32.5% of the total deposits of the banking system, the second 22.3% and the third 19.4%.

7 inclusion of UBPR in M2 since 2003

IV. DESCRIPTIVE ANALYSIS OF THE INTEREST RATE SPREAD

Economically, interest rate spread amplitude is a measure of efficiency level of a banking system8. The graphic below indicates an upward trend of the spread, which is an indicator of weak improvement of efficiency in Rwandan banking system.

Graph 1: Interest rate spread development



The bank by bank analysis shows that banks with a great market share on deposits market and in the total assets do not have necessarily small interest rate spreads. This can be an indicator of a weak competition in Rwandan banking system. The upward trend of spread observed since 2004 can be explained by a fall in lending rate, consequence of excess liquidity in Rwandan banking system. Indeed, for 12 months deposits, the lending rate was 10.32% in 2001 and fell to 9.03% in 2006. This rate was 8.59% in 2001 for one month deposits and fell to 6.42% in 2006. During the same period, the lending rate slightly dropped, passing from 16.83% to 16.22% for short-term loans and from 14.51% to 12.36% for long-term loans.

8 The efficiency degree of a financial system is measured by the inverse of interest rate spreads

Panel data econometrics offers a good framework of convergence analysis of interest rate spreads between banks, via unit root tests. The most used test is that of Im, Pesaram and Shim (2002), without imposing a priori homogeneity between banks, but rather to test it. The results of this test show that spread differences between banks and temporal average spread of all the banking system are reduced by time. It is the same for all the banking system. This means that even if spreads are different from one bank to another, they tend however to approach the average spread of the banking system. That is an indicator of homogeneous behaviour between the six Rwandan commercial banks in terms of interest rate spread.

Table 2: IPS test for interest rate spread

Banks	Model with intercept only
Bank 1	-6.89*
Bank 2	-5.69*
Bank 3	-4.62*
Bank 4	-8.5*
Bank 5	-4.5*
Bank 6	-7.5*
All the system	IPS =-9.39 (0.000)*

*** significant at 5% with 0 lag**

In East African Community, Rwanda presents the lowest interest rate spread but it is the only country whose spread posts an upward trend. In 2000, Kenya had the highest spread of 14.2% followed by Tanzania with 14.19%. In 2006, it was Uganda which took the first rank with a spread of 9.61%. The downward trend observed in the other countries is explained by a strong fall in lending rates.

Table 3: Annual interest rate spread in percentage between 2001 and 2006

Countries	Lending rate		Deposit rate		Spread	
	2001	**2006**	**2001**	**2006**	**2001**	**2006**
East african countries						
Rwanda	16.58	16.12	9.84	8.07	6.74	8.05
Uganda	22.66	18.70	8.47	9.09	14.19	9.61
Tanzania	20.26	15.41	4.81	6.57	15.45	8.84
Burundi	16.82	17.09	----	----	----	----
Kenya	19.67	13.64	6.64	5.14	13.03	8.50
Other african countries						
South Africa	13.77	11.17	9.37	7.14	4.40	4.03
Ghana	30.85	8.89	17.21	6.13	13.64	2.76
Cameroon	20.67	15.33	5.00	4.33	15.67	11.00
Zambia	46.23	23.15	23.41	10.33	22.82	12.82
Some industrialised countries						
Canada	5.81	5.81	2.25	1.83	3.56	3.98
Australia	8.66	9.41	3.20	3.95	5.46	5.46
United States of America	6.92	7.96	3.69	5.15	3.23	2.81
Japan	1.969	1.665	0.057	0.683	1.912	0.982

Source : International Financial Statistics, September 2007

As shown in table 2 in appendix, the correlation analysis reveals that the interest rate spread is much correlated with the total assets and HHI9 (Herfindahl-Hirschmann index); and at some level with an indicator of concentration measure in the banking system. The causality test also corroborates these results, because interest rate spread is caused by those two variables at the significance level of 5%, as shown in table 1 in appendix.

9 Specific measurement of market concentration, that is of the extent to which a small number of firms account for a large proportion of output. The HHI is used as one possible indicator of market power or competition among firms. It measures market concentration by adding the squares of the market shares of all firms in the industry. The higher the HHI for a specific market, the more output is concentrated within a small number of firms. In general terms, with an HHI below 1000 the market concentration can be characterized as low, between 1000 and 1800 as moderate and above 1800 as high.

V. EMPIRICAL ANALYSIS

In addition to the descriptive analysis, this study also estimates the determinants of interest rates spreads through an econometric model.

V.1. Methodology and description of variables

We followed the approach developed by Martinez Peria and Mody (2004), in which interest rate spread is hypothesised to be a function of bank-specific variables, bank industry-specific variables, and the macroeconomic environment. We used quarterly panel data from six commercial banks (BK, BCR, ECOBANK, BANCOR, COGEBANQUE and FINABANK) from the first quarter of 2001 to the second quarter of 2007 to estimate the following equation:

$$SP_{it} = \beta_0 + \beta_1 \log NPL_{it} + \beta_2 \log CH_{it} + \beta_3 \log SIZE_{it} + \beta_4 MSH_{it} + \beta_5 HHI_t + \beta_6 INF_t + \varepsilon_{it}$$

i= 1, …, 6 (number of banks) ;

t= from first quarter of 2001 to the second quarter of 2007.

We have noted by SP the spread, which is the dependent variable calculated as the difference between lending rate and deposit rate;

NPL refers to the quality of loans measured as the logarithm of provisions for doubtful debts. We expect a positive relationship between this variable and the spread, reflecting the argument that banks tend to push the cost of nonperforming loans to customers;

CH refers to overhead costs supported by a bank. We used this variable to capture cross-bank differences in the organisation and operation of the bank. If banks incur

high overhead costs in the process of providing their services as intermediaries, they are likely to increase their interest rate spread;

SIZE refers to the bank size measured as the logarithm of total asset of a bank balance sheet. Size may be an important determinant of spread if there are economies of scale in banking system;

MSH refers to the deposit market share measured as the ratio of individual banks' deposits to total banking system deposits as an indicator to test the efficient market hypothesis or existence of economies of scale. If economies of scale are important, then we should expect spreads to fall with increasing market shares. On the other hand, the existence of monopoly power would cause interest rate spreads to widen. To the extent that market shares get translated into market power, banks with higher market shares may be able to charge high spreads. Therefore, a bank that dominates the banking system may enjoy higher spreads than a smaller bank, after controlling for bank size-related economies of scale;

IHH: Herfindahl-Hirschmann index to measure market concentration. The significance of this variable notes an absence of competition in the banking system;

INF refers to inflation measured by the logarithm of consumer price index, given that the level of bank spreads can be affected by the macroeconomic environment in which banks operate. This variable can affect spreads if monetary shocks are not considered in the same way when fixing deposit and lending rates or if the adjustment occurs at different speeds;

ε is the white noise error term which contains all other factors able to influence the spread but which were not taken into account in this model.

The choice of the study period is justified by the availability of data for all the variables used especially for COGEBANQUE and BANCOR which opened in 1999.

V.2. Estimation and empirical results

Different assumptions enabled us to estimate three types of models in order to identify correctly an econometric model adapted for the Rwandan banking system.

The first model assumes that there is a perfect homogeneity between all six commercial banks. All coefficients to be estimated are the same.

The second model supposes individual fixed effects thus a partial homogeneity between banks. All coefficients to be estimated are the same except the intercept. Each bank has his proper intercept which characterises the individual effects. This means that besides some similarities we can observe between banks, there are some individual characteristics for each of them.

The last type of the model assumes individual random effects. There are some random shocks which are significant in the explanation of the endogenous variable and have affected certain banks and not others at precise periods, for example the reorganization and the recapitalisation of FINABANK and BCR which took place in 2004. All coefficients to be estimated are the same except the intercept which notes the presence of these random shocks.

The estimation procedure is by generalised least squares estimation, using cross-sectional weighting of balanced panel and White heteroskedasticty-consistent standard error and covariance technique, where observations of each bank constitute a cross-section. Fixed and random effects are allowed through the inclusion of dummy variables. Comparing fixed effects model and random effects model, the Hausman test enabled us to choose fixed effects model because the P-value of Wald statistics is higher than 5%. Comparing the pooled model and the individual fixed effects model, the Breush-Pagan test enabled us to choose between these two models. The P-value of the Lagrange multiplier statistics equals to 0.0384 and lower than 5%, which enabled us to choose the model without effects (pooled model). The table below presents the estimated pooled model where insignificant terms are excluded.

Table 4: Estimation results of pooled model

Variables	Coefficients	T-stat
intercept	-25.26	-8.81*
Log(PA)	2.04	6.36*
Log(TA)	0.92	3.16*
PRT	9.93	3.33*
IHH	0.0024	5.47*
R^2	82.59%	
Durbin Watson stat	2.94	
F-stat	179.14	

*** significant variables at 5%**

Deposits market share, quality of loans, bank size and a high concentration in Rwandan banking sector are the main determinants explaining variation in ex-post interest rate spread.

Those results indicate that a change of 1% in deposit market share induces 9.93% increase in spread, implying that large banks have the propensity to broaden spread. This is due to the existence of market power, where banks potentially use monopoly power in setting their lending and deposit rates. Alternatively, this can be due to diseconomies of scale within the sector. This result is supported by the positive impact of the variable "size", on the interest rate spread where larger banks tend to widen the spread between the lending rate and deposit rate. A change of 1% in the size of bank increases the spread of 0.92%.

The risk of non-refunding, partial refunding or delay refunding of granted loans is an important determinant of lending rate by commercial banks. An increase of 1% of doubtful debts provisions increases the spread of 2.04%.

Herfindahl-Hirschmann index is significantly positive at 5%. This indicates that there is no competition in Rwandan banking structure. The concentration in the bank system can lead in certain circumstances to a monopolistic behaviour. Borrowers with weak incomes and insufficient guarantees are considered as “price taker” without possibilities of negotiating the price of loans. This result confirms the absence of competition revealed by the convergence of interest rates spreads towards the average spread of all the banking system. This situation is also revealed by a high value of HHI higher than 2000 over all the period of study. Note that when the HHI is higher than 1800, the concentration is high.

Conclusion and recommendations

In this paper, we analysed ex-post the determinants of the spread between lending rate and deposit rate in the Rwandan banking environment from January 2001 to June 2007. Interest rate spreads remain generally high compared to other countries. Econometric results provide evidence of the important role that bank-specific characteristics and market structure play in explaining the variation of interest rates spreads. Two elements are the major determinants of the spread: weak of competition in the banking environment and risk aversion of banks.

To promote competition in the banking sector, there should be always market transparency in deposits and loans market. Improving information on both sides of the market, that is, information about borrowers for banks and information about banks for depositors, is likely to contribute to a more competitive banking market and declining market segmentation. Depositors and borrowers should have access to various information which would guide them in their decisions, such as lending and deposit rates of each bank, loans conditions, bank fees, commissions and charges, etc. The banks should regularly provide to the public necessary and precise information, and in comprehensible terms what would allow deposits market and credit market to be regulated by market forces. This information could be published in local newspapers or on bank Internet websites in order to be at the disposal not only of local public but also of foreign investors. In same way, the NBR could also regularly publish non-confidential reports on banking supervision. Empirical evidence from other countries suggest that information sharing through credit reporting is associated with better access to credit, higher levels of lending in relation to GDP as well as lower loan default rate (Fuentes and Maquieria, 1999; Galindo and Miller, 2001; and Jappelli and Pagano, 2003).

The empirical findings highlight the importance of bank size for realising economies of scale. Rwandan banking sector is weak by international comparison, which indicates that there is still room for consolidation, cost rationalisation, and technological progress. In this respect, a competition policy that fosters bank growth and cost rationalisation, for example through mergers and acquisitions or the entry of international banks, can help to reduce lending rates and interest rates spreads. A successful competition policy should aim at increasing market transparency and create a level playing field for all market participants.

In order to reduce the level of non performing loans and enhance competitiveness, the establishment of credit bureau can be useful. Those credit bureaus are companies that provide consumer credit information on individual borrowers. This helps lenders assess credit worthiness, the ability to pay back a loan, and can affect the interest rate applied to loans. In contrast to findings from other developing countries, inflation as macroeconomic variable does not have an influence on interest rate spread.

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APPENDIX

Appendix 1 : Granger causality

Null hypothesis	Number of observations	F-Statistic	P-value
NPL doesn't cause SP	24	0.86580	0.4367
SIZE doesn't cause SP	24	3.94175	0.0370
MSH doesn't cause SP	24	0.86646	0.4364
HHI doesn't cause SP	24	4.09412	0.0332
INF doesn't cause SP	24	0.15652	0.8562
CH doesn't cause SP	24	1.18992	0.3259

Appendix 2: Correlation matrix

	SP	NPL	SIZE	MSH	HHI	INF	CH
SP	1,00	0,49	0,87	-0,22	-0,73	0,15	0,26
NPL	0,49	1,00	0,36	-0,14	-0,61	-0,08	-0,05
SIZE	0,87	0,36	1,00	-0,24	-0,82	0,16	0,30
MSH	-0,22	-0,14	-0,24	1,00	0,02	0,26	-0,15
HHI	-0,73	-0,61	-0,82	0,02	1,00	-0,27	-0,17
INF	0,15	-0,08	0,16	0,26	-0,27	1,00	0,28
CH	0,26	-0,05	0,30	-0,15	-0,17	0,28	1,00

Appendix 3: Hausman test

This test is used to discriminate between random effects and fixed effects. In a fixed effects model all parameters to be estimated are the same for all banks except the intercept (β_{0i}). In a random effects model all parameters to be estimated for all banks are the same except the intercept which has two components, the common component to all banks and the individual random shock $(\beta_{0i} = \beta_0 + u_i)$. We admit

that all co-variances and expectations for random terms are null while their variances are not null ($E\left(\varepsilon_{it}^2\right)=\sigma_\varepsilon^2$ and $E\left(u_i^2\right)=\sigma_u^2$).

Hausman test hypotheses are:

$H_0 : \text{cov}\left(x_{kit}, u_i\right)=0$ (presence of random effects)

$H_1 : \text{cov}\left(x_{kit}, u_i\right)\neq 0$ (presence of fixed effects)

x_k refers to each exogenous variable of the model.

Those hypotheses enable us to build the Wald statistics as follows:

$$Wald=\left(\hat{\beta}_w-\hat{\beta}_{mcg}\right)'\left[V\left(\hat{\beta}_w\right)-V\left(\hat{\beta}_{mcg}\right)\right]^{-1}\left(\hat{\beta}_w-\hat{\beta}_{mcg}\right)$$

$\hat{\beta}_w$ is a *within* estimator which is an equivalent to an ordinary least squared estimator applied to the fixed effects model, while $\hat{\beta}_{mcg}$ is a generalised least squares estimator applied to random effects model. Under null hypothesis, the Wald statistics follows asymptotically the khi-2 distribution with *k* (number of exogenous variables in the model) degrees of freedom. We accept the null hypothesis of presence of random effects if the Wald statistics is lower than the value read in Khi-2 distribution statistic table.

Appendix 4: Breush-Pagan test

This test enables to choose between model without effects (pooled model) and random effects model. We must to test if the variance of the random shock is null or not.

Breush-Pagan test hypotheses are:

$H_0 : \sigma_u^2=0$

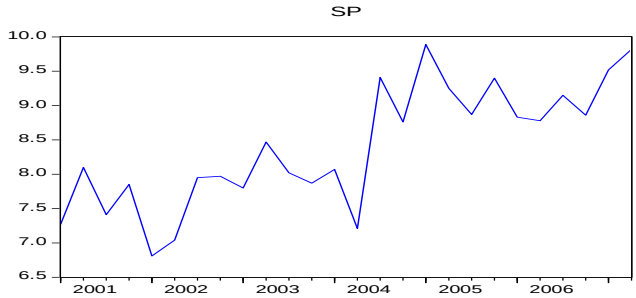
$H_1 : \sigma_u^2\neq 0$

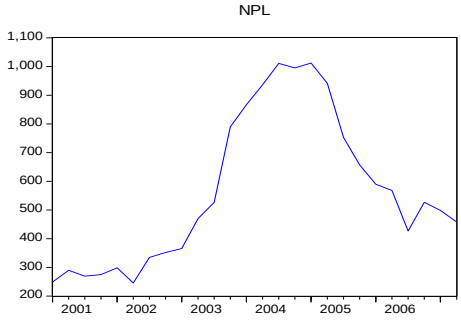
Those hypotheses permit to build LM (Lagrange multiplier) statistics as follows:

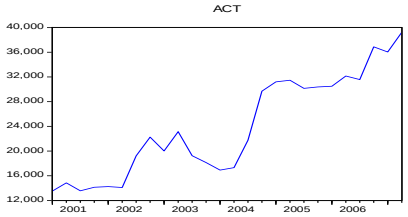
$$LM = \frac{NT}{2(T-1)}\left[\frac{\sum_i\left(\sum_t e_{it}\right)^2}{\sum_i\sum_t e_{it}^2} - 1\right]^2$$

Under null hypothesis, the LM statistics follows Khi-2 distribution with one degree of freedom. We accept null hypothesis if the LM statistics is lower than the value read in Khi-2 distribution statistic table.

Appendix 5: Evolution of different variables






ACT
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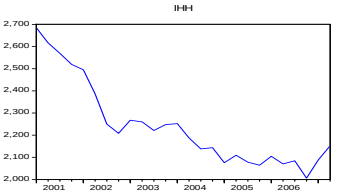
IHH
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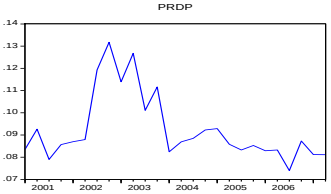
PRDP
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2001
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2003
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SHOULD AUTHORITIES USE THE INFORMATION PROVIDED BY THE BLACK MARKET RATES IN DECIDING THE LEVEL OF THE OFFICIAL EXCHANGE RATE? AN EVALUATION OF THE INTRODUCTION OF WEEKLY FOREIGN EXCHANGE AUCTIONS IN BURUNDI.

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The findings, interpretations and conclusions expressed in this paper are entirely those of the author and do not necessarily represent the views of the African Development Bank, its Executive Directors, or the countries they represent. I would like to thank participants to the conference on "Les Etats Génénaux de l'Economie Burundaise" and an anonymous referee for their valuable comments and suggestions. The usual caveat applies.

Abstract

This paper has attempted to investigate the causal and long term relationships between the official and the black market exchange rate in the Burundian foreign exchange market employing Granger causality tests. The analysis uses both annual from 1990 through 2000 and weekly data from July 2000 to April 2003. The analysis indicates the absence of co-integration between the two variables. From 1990 through 2000 black market rates seem to have unilaterally caused the official rates, while from July 2000 through April 2003, Granger causality appears to run from the official rate to the black market rate. The last finding indicates the enhanced capacity of the monetary authorities to set the official rate independently and the inability of black market dealers to lead foreign exchange rate movements. It however seems that changes in the official rate are anticipated as much as ten weeks ahead. The capability of the official market to lead the black market in the second sub-period indicates the successful attempts by the central bank to utilize the exchange rate policy to raise the credibility of its economic policy. It is this unification effort that has reduced the parallel market premium from 56.8% in July 2000 to less that 20 % in August 2003 and less than 10% in November 2007. The results of this paper may be useful for policy makers interested in using the black market exchange rate as an indicator of market trends and as a guide for setting the official exchange rate.

I. INTRODUCTION

The foreign exchange market in Burundi has been characterized by strict government restrictions on capital outflows. This led to the development of black markets for foreign currency. These restrictions induce domestic residents to seek alternative sources of foreign currency. Since demand for foreign currency normally exceeds supply, suppliers are able to charge a higher price than the official rate. A strong black market thus emerged, which was fueled by the needs of importers to obtain foreign exchange. As a result, the difference between the black market (or parallel) exchange rate and the official rate also known as the black-market premium reached a peak of 56.5 per cent in July 2000.

The presence of these parallel markets where both individuals and institutions can participate raises questions concerning the nature of the relationship between the two markets. The purpose of this paper is to investigate the causal relationship between the Burundian official and black markets for the U.S. dollar, which is the currency of Burundi's major trading partners. To this end, hypotheses concerning the direction of causality are developed using Dornbusch's et al. [1983] and Olgun's [1984] models of black market exchange rate determination in conjunction with the Central Bank of Burundi's policy for managing the country's official rates.

The rest of the paper is organized as follows. In the next section, we briefly review the impact of the instauration of the weekly auction for foreign exchange in Burundi. In section 3, we present our choice of methodology and the hypotheses that are tested by them, and our choice of sample and data sources.

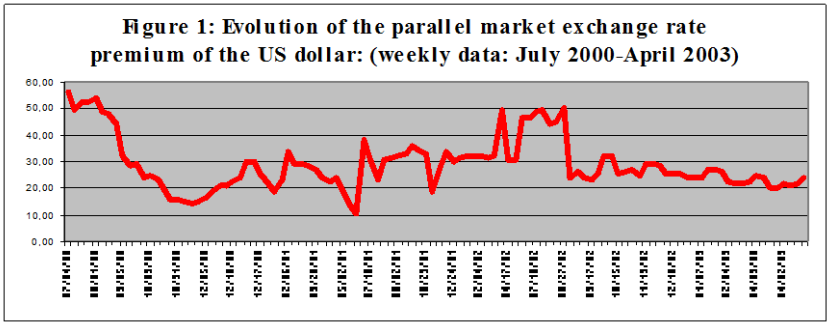
In section 4 we test for a long run relationship between the parallel and official exchange rates using stationarity and cointegration analysis; and for the direction of causation between the two rates using Granger causality analysis. Our concluding remarks are presented in section 5.

II. THE IMPACT OF THE INSTAURATION OF A WEEKLY AUCTION FOR FOREIGN EXCHANGE

In July 2002, the Burundian benefited from an Emergency and Recovery Credit from the World Bank aimed at reforming and liberalizing the foreign exchange market. The government began to remove some of the more stringent controls and to relax some others. At about the same time, it launched a weekly auction of foreign exchange and forex bureaux began providing daily quotes of official exchange rates.

Burundi citizens were permitted to own foreign exchange and to have foreign currency denominated accounts with banks operating within the country. The proceeds of the loan improved the supply of the auction market and resulted in a substantial convergence of exchange rates of major currencies on the official and parallel markets.

The role of the official exchange rate increased tremendously and the difference between the black market and the official rate narrowed significantly (Figure 1).



The ability of the central bank to implement an efficient exchange rate policy was enhanced, through the acquisition of foreign exchange reserves that were used to stabilize the burundian franc against the US dollar. More specifically, the official exchange rate helped the central bank to effectively participate in the foreign exchange market in order to curb the inflationary pressures that again developed in the domestic economy.

As a result, the exchange rate differential of the US dollar narrowed from 56.5 per cent in July 2000 when the auction market began to 24.2 per cent in late December 2003 and less than 10% today. It is also expected to decline with the regular holding of foreign exchange auction.

Combined, these changes had a three-fold effect. First, the changes resulted in a truly black market becoming an essentially free black market. Second, the Central Bank of Burundi became able to implement more effectively its economic policies, particularly those concerned with the balance of payments. Third, commercial banks legally became able to participate in the official markets and the participation of forex bureaux in the black markets was no more prohibited. As a by-product of these changes, daily black market exchange rate quotations became available in forex bureaux.

After the depreciation of the Burundi Franc in August 2002 by 16.5 percent (in foreign currency terms), the Central Bank raised its refinancing rate from 14 percent to 15.5 percent and continued its shifting from an artificially enforced exchange rate policy to a more flexible exchange rate policy by liberalizing the foreign exchange market.

The central bank influenced the exchange rate in the domestic foreign exchange market by selling foreign reserves for burundian francs. This reduced the growth of the money supply, whose previous growth had had an inflationary impact on the economy. This intervention policy was efficiently exercised through the auction system initiated by the participation of the central bank, the commercial banks, and the private sector. For instance, the demand for foreign exchange by the private sector could be met by cash interventions through the commercial banking system. At the same time, the exchange rate policy maintained a relatively stable price level for imported goods, resulting in lower inflation due to a decreasing impact of imported inflation on domestic inflation.

III. TESTED HYPOTHESES, METHODOLOGY, CHOICE OF SAMPLE, AND DATA SOURCES

The theoretical framework underlying our empirical analysis is one of monetary approach to exchange rate determination. A framework in which expansionary fiscal and monetary policy mixes, as in monetized budget deficits; in the presence of foreign exchange controls render the fixed official exchange rate overvalued and, hence, raise the black market premium. This paper tests the causality between changes in the black market exchange rate and changes in the official exchange rate in the Burundian foreign exchange market. This causal relationship (statistically cause) is largely based on the ability of participants in the black market to anticipate changes in the official rate. Confirmation of this hypothesis, according to Gupta [1981], would be an indication of market efficiency.

Methodology

Our empirical strategy for testing our hypothesis is as follows. First, we test for stationarity and integration of the two exchange rate series because this is a precondition for cointegration analysis. Second, having established stationarity and integration, we examine the long-run relationship between the two rates by testing for cointegration of the two series. Third, we study the direction of causality between the two rates by Granger causality test.

Theoretically the direction of causation between the two rates is indeterminate. If central banks possess appropriate information regarding the state of the economy

and incorporate this information in setting the official rate, then the official rate Granger causes the parallel rate. On the other hand, when exchange rate policy is endogenous such as when central banks follow a "premium rule" for setting the official rate, then the line of causation is reversed.

As pointed out by Booth and Mustafa (1991), the existence of cointegration is inconsistent with the efficient market hypothesis, which implies that past information on the exchange rate cannot be exploited to forecast future values: a feedback from one market to the other would constitute evidence of weak-form informational inefficiency in the black market.

Data

The empirical analysis is carried out using weekly data for both the official exchange rate (tcho) and the black market exchange rate (tchp) from July 2000 through April 2003 and annual data for both exchange rates from 1970 through 2000. Both exchange rates are defined as units of the Burundian franc per U.S. dollar. Data were made available by the Studies and Statistics Department of the Central Bank of Burundi.

IV. COINTEGRATION AND CAUSALITY ANALYSIS

In this section we study the interrelationship between the parallel and official exchange rates in our sample by testing for a long-run relationship between the two rates using stationarity and cointegration analysis and for the direction of causation between the two rates using Granger causality analysis. Our uses of the concepts of stationarity, cointegration, and Granger causality in this study are presented below along with the respective results.

The drawback to using non-stationary parallel and official exchange rates series in our case would be that the presence of deterministic time trends in the two rates could lead us to misinterpret what is essentially a co-movement of the two rates over time for a deeper relationship between them. There are a number of methods used to test for stationarity and the presence of unit roots. The methods used here are the Augmented Dickey Fuller test (ADF), the Phillips-Perron test (PP) and the Kwiatkowski- Phillips, Schmidt - Shin (KPSS) test.

The results are reported in Table 1. The hypothesis of a unit root was not rejected for both series in levels at the 5 percent significance level and over the two periods. When first differences were used, unit root nonstationarity was rejected for both series and over the two periods. However, both the first period under study involves a small number of observations, which might make the unit root results invalid. Shiller and Perron [1985] argue that the power of the Phillips-Perron tests depends

on the span of the data rather than on the number of observations. Therefore, in order to test the robustness of the integration results, KPSS unit root tests, developed by Kwiatkowski et al. [1992], have been also examined, and are reported in Table 1. The test examines the null hypothesis of stationarity and it takes into account serial correlation by using a Bartlett window.

Table 1:

Tests of stationnarity

Variables	ADF		PP		KPSS	
	Constant	Constant & Trend	Constant	Constant & Trend	Constant	Constant & Trend
Log (tchp)	-0.699	-3.242	-0.699	-3.242	0.770	0.216
△Log (tcho)	-8.447	-8.830	-8.447	-8.830	0.418	0.090
Log (tchp)	-0.642	-1.703	-0.642	-1.703	0.612	0.214
△Log (tcho)	-8.014	-8.064	-8.010	-8.060	0.157	0.047

Given that the variables are integrated of order one, I(1), it is necessary to determine whether there exists a stable and non-spurious (cointegrated) relationship among the regressors in level form in each of the relevant specifications. The necessity arises because applying first differences to the logarithms of the variables in question leads to a loss of information regarding the long-run properties of the estimated model; i.e., a model evaluated in difference form is misspecified because it does not have a long-run solution. In order to preserve this important information the cointegration method first proposed by Johansen [1988] and Johansen and Juselius [1990] was employed.

The Johansen method was chosen over the one originally proposed by Engle and Granger [1987] because it is capable of determining the number of cointegrating vectors for any given number of non-stationary series (of the same order), its application is appropriate in the presence of more than two variables, and more important, Johansen [1988] has shown that the likelihood ratio tests used in this procedure (unlike the DF and ADF tests) have well-defined limiting distributions.

Next, we examine first whether official and parallel market rates are cointegrated. The results for these tests are reported in Table 2. The evidence is quite clear. We find no cointegration between official and parallel rates for the US dollar and the Burundian franc. Therefore, we do not include the ECM term in the VAR. The cointegration tests confirm that the absence of a long-run relationship between the parallel market and the official exchange rates, and that therefore the black market can be characterized as efficient.

Tableau 2
Test for Co-integration between official and parallel exchange
(July 2000-April 2003)[11]

Null	Alternative	$\lambda - trace$	$\lambda - \max$	$\lambda - trace$ 5% CV	$\lambda - \max$ 5% CV
r=0	r=1	11.355	11.192	15.41	14.07
$r \leq 1$	r=2	0.163	0.163	3.76	3.76

On the basis of these findings, we can conclude that black market and official exchange rates are not linked in the long run (which casts evidence on their informational efficiency).

Short-Run (Granger) Causality Tests

To test the hypothesis that the black market rates for the dollar anticipate their corresponding official rates, Granger-causality procedures are used. The focus of these procedures is to test whether the errors of forecasts of a variable using past observations can be reduced by using past, present, and future observations of another variable. Key references for this technique are Feige and Pearce [1979], Caves and Feige [1980], and Geweke et al. [1983]. In addition, Furstenberg [1985] presents a theoretical discussion of this type of causality.

We apply the concept of Granger causality by positing the following. Let tchp and tcho represent the transformed stationary values of our parallel and official

11 The critical values for this test are based on MacKinnon-Haug-Michelis (1999).

exchange rates respectively. If lagged values of tchp helps to predict tcho in the presence of lagged values of tcho, then the parallel rate tchp is said to Granger cause the official rate tcho. Thus, in the autoregressive system.

$$\Delta tchp_t = \sum_{k=1}^{m1} \alpha_{1i} \Delta tchp_{t-k} + \sum_{k=1}^{m2} \beta_{1j} \Delta tcho_{t-k} + u_{1t} \qquad (1)$$

$$\Delta tcho_t = \sum_{k=1}^{n1} \alpha_{2t} \Delta tcho_{t-k} + \sum_{j=1}^{n2} \beta_{2j} \Delta tchp_{t-k} + u_{2t} \qquad (2)$$

Tables 3 (a) and Table 3 (b) reports the results of the Granger causality tests. In the first sub-period, standard F tests reveal that changes in the black market rate do Granger-cause changes in the official rate. In other words, (tchp) does have information content for (tcho), implying that the black market rate could be used as an indicator to predict future movements in the official rate. By contrast, in the second sub-period, the official rate appears not to Granger-cause the black market rate, it is the behavior of the official rate which seems to cause the behavior of the black market rate. The statistical specification of the Granger causality results is supported by absence of serial correlation (LM test), absence of functional misspecification (RESET test), homoskedasticity (HE test), and absence of ARCH effects.

Table 3a

Granger Causality Tests: (weekly data)

July 2000-April 2004 (probabilities in parentheses)[12]

Granger Bivariate Model			
tchp → tcho	Lags (m,n)	F-Values	**Causality**
tcho → tchp	(2, 2)	6.6458 *(0.002)*	**Yes**
tchp → tcho	(2, 2)	0.3124 (0.733)	no

12 Given the small number of observations, only two lags were utilized in the estimation of the VECM. The values of the Wald exogeneity test for the variables are reported above the values of the respective probabilities (indicated in italics). The Wald coefficient follows a Chi-Square with two degrees of freedom. The significance levels are indicated by *(1%), ** (5%) and *** (10%).

Table 3b

Granger Causality Test (annual data): 1970-2000

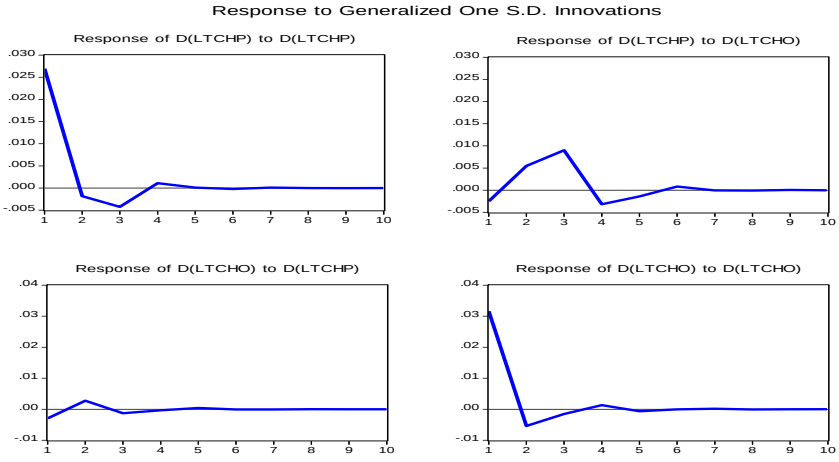
(probabilities in parentheses)

Granger Bivariate Model			
tchp → tcho	Lags (m,n)	F-Values	**Causality**
tcho → tchp	(1, 1)	0.750 *(0.484)*	non
tchp → tcho	(1, 1)	8.135 *(0.002)*	**yes**

We also analyze the short-run dynamic adjustment between the two types of exchange to external shocks by estimating impulse response functions. These show that both the official and the black market exchange rates are not highly persistent processes. In general, the speed of response to a unit standard deviation shock seems to be higher for the black market exchange rate compared to the official one.

Figure 2 shows impulse responses to a unit standard deviation shock to either exchange rate. The empirical results appear to confirm the positive significant impact of the official exchange rate on the black market exchange rate.

Figure 2: Impulse responses to a unit standard deviation shock to either exchange rate.



On the whole, we observe that after four weeks for the official exchange rate and seven weeks for the parallel exchange rate, the effects of shocks have died away, which is consistent with the long-run full adjustment implied by the portfolio balance models. It would appear, therefore, that the long-run black-market premium is constant, or, at least, that deviations from the long-run equilibrium are not long-lived, with the random walk characterizing these processes.

Cross correlations

Finally, cross correlations between $\Delta tchp_t$ and $\Delta tcho_t$ were estimated for weekly exchange rates series. Cross correlations R ($\Delta tchp_t$ and $\Delta tcho_{t+k}$) for lags 0 to 36 were computed. The statistical significance of nonnegative lags was examined to see if the movements in the official rate are predicted (or anticipated) by the black market rate. In only two instances were the coefficients significant at the 0.5 level. The non significant coefficient at lag zero suggests that the black market does not respond immediately to changes in the official rate. The significance at some lags other than zero suggests that changes in the official rate may be, from time to time, anticipated. For instance, the black market anticipates changes in the official rate seven to ten weeks before.

V. CONCLUSION

This paper has attempted to investigate the relationship between the official and the black market rate. From 1970 through 2000 black market rates seem to have unilaterally caused the official rates, while July 2000 through April 2003 Granger-- causality appears to run from the official rate to the black market rate. The last finding indicates the enhanced capacity of the monetary authorities to set the official rate independently and the inability of black market dealers to lead foreign exchange rate movements. The capability of the official market to lead the black market in the second period indicates the successful attempts by the central bank to utilize the exchange rate policy to raise the credibility of its economic policy [Pinto, 1991]. The results of this paper may be useful for policy makers interested in using the black market exchange rates as indicators of market trends and as guide to setting the official exchange rate.

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