KILIAN EBUA ACHUO
TESTING THE VALIDITY OF THE FISHER HYPOTHESIS; THE LINK BETWEEN INTEREST RATES, INFLATION AND DEMAND/SUPPLY OF LOANABKE FUNDS
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Declaration

I hereby declare that all information, documents, analysis and results in this thesis have been collected and presented according to the academic rules and ethical guidelines of Institute of Graduate Studies, Near East University. I also declare that as required by these rules and conduct, I have fully cited and referenced information and data that are not original to this study.

KILIAN EBUA ACHUO

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Abstract

Testing the Validity of the Fisher Hypothesis: Link Between Interest Rates, Inflation, and Demand/Supply of Loanable Funds

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This study investigates whether the Chinese and American economies provide proof or evidence of the Fisher Hypothesis or effect. Real interest rates are based on the macroeconomic assumption that they are equal to the nominal interest rate, less inflation. Using time series data and econometric analysis for each country, the results show diverse evidence from each country. The adoption of the ARDL, ECM, Bound Test, and Regression as methods and estimation techniques was made possible by observing data or variables such as nominal interest, real interest, inflation between 1987 and 2020, the results from the ADF, PP stationary test, and the co integration outcome from Johansen, and the results from the ARDL, ECM, and PP unit root tests. The results of co-integration and integration analysis supported the existence of a partial Fisher effect on the real rate of interest for both countries. Real interest rates are fixed, and there is a long-run equilibrium between nominal and real interest rates. The parameter is estimated using the OLS method in an effort to test for the full Fisher effect or whether inflation has a negative impact on real interest on a 1:1 basis. The findings supported evidence of a negative relationship between inflation and real interest rates, resulting in the complete fisher effect for both the United States and China when real interest rate was used as the explanatory variable. In an attempt to capture the relationship between variables such as the real interest rate, domestic credit, and savings, the ARDL estimation results suggest that there is full evidence for both the McKinnon and Shaw hypothesis and the Global Savings Glutton hypothesis for both samples. In the same light, the estimation supports arguments relating to the fluctuations occurring in the IS-LM model.

Keywords: Fisher effect, interest rate, ARDL, Co integration, Inflation

ÖZET

Fisher Hipotezinin Geçerliliğinin Test Edilmesi: Faiz Oranları, Enflasyon ve Ödünç Verilebilir Fonların Talebi/Arzı Arasındaki Bağlantı

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Ocak, 2023 Sayfa,97

Bu çalışma, Çin ve Amerika ekonomilerinin Fisher Hipotezi veya etkisine dair kanıt veya kanıt sağlayıp sağlamadığını araştırmaktadır. Reel faiz oranları, nominal faiz oranı eksi enflasyona eşit oldukları şeklindeki makroekonomik varsayıma dayanmaktadır. Her ülke için zaman serisi verilerini ve ekonometrik analizleri kullanan sonuçlar, her ülkeden farklı kanıtlar gösteriyor. ARDL, ECM, Sınır Testi ve Regresyon'un yöntem ve tahmin teknikleri olarak benimsenmesi, 1987-2020 yılları arasındaki nominal faiz, reel faiz, enflasyon gibi veri veya değişkenlerin gözlemlenmesi, ADF, PP durağanlık testi sonuçları, ve Johansen'den gelen eş bütünleşme sonucu ve ARDL, ECM ve PP birim kök testlerinin sonuçları. Eş bütünleşme ve bütünleşme analizinin sonuçları, her iki ülke için de reel faiz oranı üzerinde kısmi bir Fisher etkisinin varlığını desteklemiştir. Reel faiz oranları sabittir ve nominal ve reel faiz oranları arasında uzun dönemli bir denge vardır. Parametre, Fisher etkisinin tam olup olmadığını veya enflasyonun reel faiz üzerinde 1:1 oranında olumsuz bir etkisinin olup olmadığını test etmek amacıyla OLS yöntemi kullanılarak tahmin edilir. Bulgular, enflasyon ve reel faiz oranları arasında negatif bir ilişkinin kanıtını destekledi ve bu, açıklayıcı değişken olarak reel faiz oranı kullanıldığında hem Amerika Birleşik Devletleri hem de Çin için tam balıkçı etkisine yol açtı. Reel faiz oranı, yurt içi kredi ve tasarruflar gibi değişkenler arasındaki ilişkiyi yakalama girişiminde, ARDL tahmin sonuçları, her iki örnek için hem McKinnon ve Shaw hipotezi hem de Küresel Tasarruf Oburluğu hipotezi için tam kanıt olduğunu göstermektedir. Aynı ışık altında, tahmin, IS-LM modelinde meydana gelen dalgalanmalara ilişkin argümanları desteklemektedir.

Anahtar Kelimeler: Fisher etkisi, faiz oranı, ARDL, Eş bütünleşme, Enflasyon

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Abbreviations

IRA:	Inflation Reduction Act
DC:	Domestic Credit
GMM:	Generalized Method of Moments
Y:	Income
ARDL:	Auto regression distribution lag
C:	Consumption
VAR:	Vector auto regression
T:	Tax
VECM:	Vector error correction model
G:	Government spending
ADF:	Augmented Dickey Full
SPB:	Public savings or government savings
PP:	Phillips Perrons
SPV:	Private savings
VRMs:	Variable-rate mortgages
ARMs:	Adjustable-rate mortgages
NinT:	Nominal interest rate
RinT:	Real interest rate
NatS:	National savings
Snats:	National savings

CHAPTER I
INTRODUCTION

1.1 Background

The actual and expected rate of inflation has had great impact on economic activities of the globe; private individual, firms, financial institute and the government have always strived to beat the effect of inflation with the means of setting regulations or economic policy decisions. It is true that in money transactions, no one wants to be the loser, every party will make sure that the decisions or terms taken during financial transaction are favorable whether in the long or short run. But however, when looking at the real effect of economic transactions there are often parties who tends to pay a greater cost. The rate of interest, expressed as a percentage of the amount lent, deposited, or borrowed, is the amount of fees that are due each period on loans, credit, and savings (called the principal sum). The principal, interest rate, frequency of borrowing, and length of time that the loan, deposit, or loan occurs affect the amount of interest that will be charged on the borrowed or borrowed amount. The cost of borrowing money through credit cards, mortgages, or student loans is, to put it simply, interest. When you borrow money, you typically have to repay it along with interest, which is typically calculated as a percentage of the loan amount.

Irving Fisher talked about the relationship of interest rate in the market (what the banks charges you and me) with that of the expected rate of inflation (inflationary premium). Interest rates have been decided by the national government or central bank for the past 200 years. For example, the key interest rate of the US Federal Reserve went from 0.25% to 19% between 1954 and 2008, and the key interest rate of the Bank of England went from 0.5% to 15% between 1989 and 2009. In turn, Interest rates in Germany from 90% in the 1920s to 2% in the 2000s. Zimbabwe's central bank raised interest rates by 800 percent in 2007 to curb hyperinflation. In the late 1970s and early 1980s, interest rates on payday loans were very high. This record was previously held by the US before 1800, the UK before 1700, and the Netherlands before 1600. There may have been classifications of savings accounts that might return roughly 25% or 50% annually prior to the development of the new capital markets.

In every financial transaction financial houses must avoid to be losers, in every function of the bank from accepting deposit to granting loans, the bank but be able to implement some sort of measure for them to be secure in the long run. Granting loans without taken in consideration what will be expected as inflation is a bad practice, every financial must have a prime rate and add up what they would expect to be the inflation, this will go a long way in securing the bank profit making objectives. The International Fisherman Effect (IFE), a currency exchange model that leverages the traditional Fisher effect, has been applied to financial markets and research. Since the idea is focused on the past, present and future risk-free value of the index, rather than the pure price, it is necessary to analyze and explain the current and future movements in the money price. For this model to work in its simplest form, it is assumed that the risk-free portion of capital can move freely between currency countries.

IFE was mostly used during monetary policy when interest rates made many adjustments and went upwards. Spot rate variations become more obvious with the introduction of computerized trading and retail arbitrage traders, which causes variances to be recognized earlier and causes trading to become too tight to be lucrative. IFE and other trade confirmation techniques, however, are subject to error. If the point predictions are erroneously assessed and followed, there may be a psychological benefit from trading even if there may be no empirical benefit in this situation. For example if a bank charges 6% on a loan and inflation rate is kicking at 11% it means the bank is doing very poorly in it financial transaction or in other words the bank is losing 5% of real interest because prices are destroying the value of money. So for the bank to stay in the path of profitability it would have to charge it interest rate of 6% plus 11%, thus they would be charging 17% on the loan. An interest rate that has not been prorated for inflation is referred to as a nominal interest rate. Take this as a case study. Consider a scenario where a person deposits $100 in a bank for a year, earns $10 in interest (pre-tax), and ends the year with a balance of $110 (pre-tax). The nominal interest rate in this instance is 10% annually (before taxes), irrespective of the inflation rate. The growth in the loan's real value plus interest, with inflation factored in, is the real interest rate. When borrowing, lending, depositing, or investing money, principal and interest payments are calculated in real

terms in relation to the purchasing power of the period $110 in the year-end account has the same purchasing power as $200 if inflation is 10%.

Another example we can say; to calculate interest rate, suppose the bank charges 12% for a short term loan of 16 months. This simple implies that for each month the borrower will be pay 0.75% every month until the loan or mortgage is been paid. The time value of money is a very important principle most financial institution underestimate, if financial houses give out money without considering the future time value of money it could referred to as a bad financial decision. Expected inflation must be involved in such financial transaction if not at the end of the transaction the bank might be losing money.

Inflation is generally referred to as the persistent price increase; studies have shown inflation above a particular threshold may have a impact on the lives of citizens. Of course the intrinsic value of a $100 bill in the 70s is not the same as that of today; higher inflation reduces the value of money and the purchasing power of individualsWith fisher effect, mortgage companies and banks are careful not to lose the opportunity of the value of money so the Adjustable Rate Mortgage (ARM). This was gotten right from the fisher effect, and it is expressed by the prime rate of the mortgage or loan plus the rate to take care of the value of money. Borrowers will not know the exact rate every month because the prime rate is the rate at the market that fluctuates in the market, With this rate lenders were been protected from the effect of inflation. But however choosing between the fixed of interest and adjustable rate is a matter whether or not current rate are high or low. The loan sector of the economic is tied to the demand of money which is explain as follows; Demand for borrowed money mostly stems from the demand for investments. Inputs utilized to create new capital assets, such as inventories, are referred to as investments. Interest rates determine how much it will cost to receive these funds for these ventures. An investor must weigh the interest rate against the anticipated return on investment before making a decision. The demand for borrowed money for investments is higher when interest rates are low and vice versa. This suggests that the demand for investment loans and interest rates are inversely related. People who wish to accumulate debt money in the form of free cash to quench their hunger for liquidity also create demand for them. The demand for loans for conservation purposes decreases as the interest rate increases. Local credit demand falls when interest rates

rise. The demand for debt securities increases with low interest rates and vice versa. Meanwhile supply curve of demand of loanable fund can be explained by; Banks are the main source of loanable money, hence savings are vital. Savings is the gap between one's income and one's outgoings. The amount of deposits varies with the interest rate because it is believed that income would remain constant. At higher interest rates, both individuals and corporations are more willing to save, and vice versa. When existing capital is exhausted as opposed to being replaced by new capital equipment, recovery occurs. Investment returns will be high when current interest rates give higher returns than current income. These higher borrowing rates will lead to a more robust recovery. The banking industry is another place to look for money that can be lent out. The banks offer loans to businesspeople by creating credit. The money that banks generate increases the amount of loanable funds.

In the loan market, investment and accumulation of wealth and debt are two main important concepts we must understand. Demand for borrowed money mostly stems from the demand for investments. Inputs utilized to create new capital assets, such as inventories, are referred to as investments. Interest rates determine how much it will cost to receive these funds for these ventures. An investor must weigh the interest rate against the anticipated return on investment before making a decision. The demand for borrowed money for investments is higher when interest rates are low and vice versa. This suggests that the demand for investment loans and interest rates are inversely related. People who wish to accumulate debt money in the form of free cash to quench their hunger for liquidity also create demand for them. Local credit demand falls when interest rates rise. The demand for debt securities increases with low interest rates and vice versa. Meanwhile supply curve of demand of loanable fund can be explained by;

For the case of Malaysia, Asari et al. (2011) employed the vector error correction model to explain the relationship between interest, inflation and the exchange rate. The results show that interest rates affect inflation using Granger causality. According to Granger test, the interest rate will affect the exchange rate. Regression analysis was utilized by Moroşan & Zubaş (2015) to Check the relationship between interest rates, exchange rates and inflation in Romania and see if there is a positive relationship between inflation and interest rates in the market. On the contrary, the author proved that there is a negative relationship between the interest rate and the exchange rate. (Awomuse & Alimi) with case study of Nigerian

example Based on the relationship between the interest rate and inflation, and adjusting the model by integrating vector errors, they confirm that the nominal interest rate and expected inflation move together in the long run, but not separately. Reconsidering the fisher effect or the case of UK, Gocer & Ongan (2020) the non-linear ARDL method assessed the link between interest rates and inflation. Between the first data period of 1995 to 2008 the study confirmed evidence of the fisher puzzle. Based on evidence from Pakistan, Zaman and Atif (2014) use co integration and causality to determine whether nominal interest rates and inflation are in equilibrium in the long run. Dreger (2010) (2010) attempted to address whether or not the nominal exchange rate regime had affect real interest rate parity. Using panel co integration techniques, the results show that RIP persists in the long run regardless of the nominal exchange rate regime. Creating and creating an equal balance of short-term real and nominal interest rates Lioui & Poncet (2004) confirmed that real interest is driven by both monetary and real factors. Chu, Pittman, & Yu (2005) investigate the presence of information risk of two interest rates in the money market. That is nominal interest rate in Treasury bond market and the real interest in the Treasury Inflation Protected Securities. It was discovered that, data travels unilaterally and with a one-day lag from the TIPS market to the market for government bonds. Traders with less information can demand higher profits due to the information risk brought on by the asymmetric flow of information.

Financial institutes or government during financial transactions tends to implement the fisher effect knowingly or unknowingly. (Fisher, 1930) Fisher, (1930), the fisher Hypothesis shows the long run positive relationship between nominal interest rate, real interest rate and expected rate of inflation. With relation to this, the real interest rate tells us how much the expected rate of inflation affects the nominal interest rate or the interest rate without the expected rate of inflation. With respect to our research, It is significant to note that the supply and demand for loanable money are related to the Fisher Effect. this means that participant in the loanable fund transaction tends to rely on the interest rate with reference to rate of inflation in the future for monetary operations, this is the most common practice in the case of payments bonds, loans, saving, mortgage, leasing and others. Nkeng (1960), who wrote about financial institutions in general, stated that they had done enough to sensitize their customers and that it would be better for customers to know what was required of them so that they could take full advantage of the benefits

offered to them. He suggested that the development of the country's agricultural sector would turn towards supporting economic development in general. The study of inflation and economic growth is undoubtedly one of the most studied areas in recent academic times, different schools of thought have different views on the subject; while Keynesians argue that inflation and economic growth have a positive relationship, classicists on the other hand argue that both variables are negatively related. Munir et al. (2009) examine the impact of inflation on the rate of economic growth in the period 1970-2005 in the Malaysian economy. Using the new annual data model and the internal autoregressive threshold (ART) proposed by Hansen (2000), they find the inflation threshold in Malaysia. The calculated threshold regression model also assumes 3.89%, i.e. a structural turning point of inflation. In addition, inflation will significantly reduce real GDP growth. (Munir, Awan, & Hussain, 2010) Confirm that, Savings have a favorable impact on private investment, real bank interest rates, bank loans to the private sector, and public investment are all long-term effects. Toan Ngoc Bui (2019) analyzed the impact of domestic credit on ASEAN countries' economic growth and proposed a nonlinear method. The outcome of the analysis depicts that domestic credit has an inverted U-shaped impact on economic growth when utilizing the GMM model of estimate..That is increase in domestic credit will boost the economic and will affect both on the supply and demand of the economy. The hold adopted a threshold for domestic credit to be 97.5%; this means that if domestic credit exceeds this limit it will have negative impact on the economy. Nuno Carlos Leitão (2012) analyzing the impact of domestic credit and inflation together with savings confirms that, credit excreted positive effect on economy growth in EU-27 mean while inflation hurts growth. Mohammad Salim et al (2018) argued whether or not domestic credit from banking sector influences economic growth for the case of Bangladesh from 1975-2016. After employing the ARDL econometric tool, the result showed that real domestic credit positive drives economic growth and it was discovered to be significantly high, on the other hand, increasing in lending rate decreases the real GDP of the Bangladesh economy. Adu et al (2013) also studies the long-term impact of growth on financial development in Ghana using ARDL models, where the ratio of GDP and private sector lending to GDP are important for output growth. However, when the study looked at money supply in the broadest sense (M2) no significant link was found between variables this aspect is worth because it almost impossible to get involved in

the money market without taken it to consideration the expected rate of inflation. There hasn't been enough research conducted in recent years to test if the fisher's effect holds in major economy, some of them revealed that the hypothesis of Irving fisher was true, and while just of few rejected the existence of the fisher effect others confirmed the existence of partial fisher effect. This research work greatly differs from other similar research in that, after testing if the hypothesis is valid for the two great nations, we will attempt to estimate the parameters of the fisher hypothesis with reference to economic wellbeing. For the case of USA and China, we will attempt to test if the fisher effect holds or not, attempt to estimate some of the parameters and explain possible policy implication or recommendation based on the result we will reveal.

1.2 Problem Statement

The fisher effect failed to consider a situation of the liquidity trap or a situation where real interest rate can be zero. Again there is an issue as to whether these parameters indeed affect the wellbeing of individuals with respect to the supply and demand of loanable funds. Some research found no evidence of the fisher effect while some found partial fisher effect. Another great issue that needs attention is that of if a loanable fund such as domestic credit actually helps the economy; however this will greatly depend on the use of the loans. In the market of loanable funds, there a problem of which interest rate to set on loan, financial houses are sometimes skeptical when setting the interest rare because of the uncertainty of expected inflation. The majority of economists concur that due to an excessive and sustained growth in the money supply, High inflation and inflation have a huge impact on the real economy. Low Cost Estimates Changes in actual demand for goods and services or adjustments in equipment can result in low or moderate prices, such as summer. Inflation has positive and negative effects on the economy. The negative effects include an increase in the ability to hold money, uncertainty about future inflation that can discourage savings and investment, and a slowdown if inflation rises too fast. House prices will increase in the future. The central bank will have more leeway to conduct monetary policy, which will reduce unemployment caused by erratic nominal wages and encourage lending and investment rather than cash hoarding. This will prevent the inefficiencies brought on by deflation. So in an attempt this

research work will try to open the picture of getting rate of interest on the basis of current and future inflation rates.

1.3 Research Question

The main research questions include:

1. Is the any evidence of the Fisher effect?
2. What link exists between the forces in the loanable fund market?
3. What are the main determinants of the real rate of interest?

1.4 Objective of the Research

The main goals or objectives of the studies are;

1. To test whether or not the Fisher hypothesis is valid in China and USA
2. To estimate how much parameters of the fisher hypothesis (inflation) affects the supply and demand of loanable funds.
3. Explain the fluctuation in the real interest rate

1.5 Hypothesis

H0: Real interest rate, inflation and nominal rate of interest do not have long run relationship.

H1: Real interest rate, inflation and nominal rate of interest have long run relationship.

H0: The rates inflation does not affect Demand/Supply of Loanable Funds

H1: Inflation affects Demand/Supply of Loanable Funds

H0: Credit and Savings does not determines the real rate of interest

H1 Credit and Savings determines the real rate of interest

1.6 Significance/Contribution of the Study

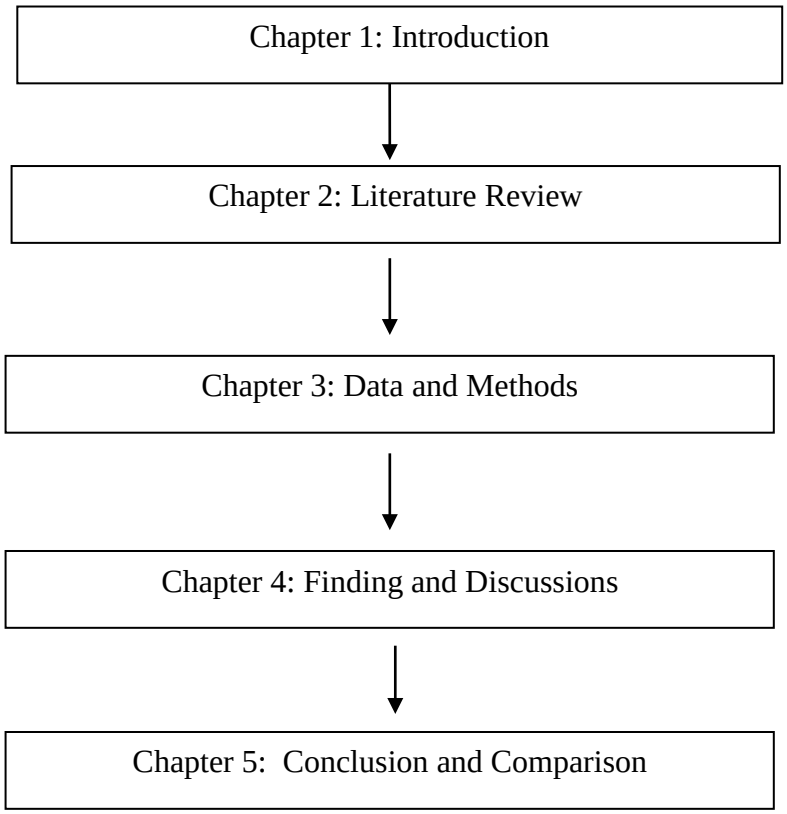
Given that the results have significant economic repercussions for both the US and Chinese monetary policy authorities, verifying the Fisher Hypothesis' viability are crucial. Even though the study adds up to the few exiting literature, the estimation part of the research will provide a vivid picture to policymakers on what has been happening in the money market and what possible changes is needed. For

the Lenders in the private sector, knowledge about the fisher hypothesis will aid them to understand whether or not they are actually being protected with the interest rate they set. This research will equally provide helps to borrowers in the money market, borrowers will be wise to choose which type of interest or mortgage rate will be best. The results of this research will aid for the consolidation of the fisher hypothesis. This thesis will equally contribute as a consolidation of existing macroeconomic theories such as the global saving glut and that of the interest liberalization.

1.7 Organization of the Study

The research is mainly organized in 5 sections. The introduction explains the background and practical example of the research, the second sections reviews relevant literature with respect to the study, theoretical framework, reviews some related macroeconomics theories and the conceptual framework. The third chapter explains the types of methods that will be used, describes and illustrate the data involved. Chapter four is regarded as the core of the study. Here we will express important findings and make relevant discussions with relations to the findings. The last part will include the total appraisal of the work, shortcoming and possible recommendations.

Figure 1: Organization of the Study



CHAPTER 2
REVIEW OF LITERATURE

2.1 Empirical Literature

Mishkin (1992) attempts to explain why there is sometimes more evidence for Fisher and others. The Fisher effect is only seen in models where inflation and interest rates are represented as fixed measures. Because when two eggs are moved, they interact with each other, creating an interesting relationship. This involved calculating the respective time series' univariate statistical features, specifically, inflation and interest rates. Using monthly data from January 1953 to December 1990 and Dickie Fuller and Phillips' unit root test, it was found that growth and profitability are at the unit root. A long-term Fisher effect was found and no short-term relationship was found between the two variables using a correlation test. The Fisher effect occurred as expected in the post-war period until October 1979, when the inflationary trend and interest rates peaked. During the preparation for the war and from October 1979 to September 1982, there was no Fisher effect because there was no weather indication. Lardic & Mignon (2003) tested the relationship between the interest rate and the expected inflation rate using correlation methods. The result from the study confirmed that the fisher effect is true for a greater part of the G7 nations. Within the concept of the IS-LM framework, Allen (1991) examined An analysis of the effect of the federal budget deficit on real and nominal interest rates over one year. The average real Treasury income tax rate is positive and significantly affected by various measures of the federal deficit and debt in the primary and differential measures, but not by the tax rate adjustment.

Dreger (2010) Attempted to answer the question whether or not the rate of real interest parity condition is being influenced by the nominal exchange rate regime. Using the panel integration technique, the results show that regardless of the nominal exchange rate regime, the RIP persists in the long run. Deriving and construction a general equilibrium for the short term nominal and real interest rate Lioui & Poncet (2004) confirmed that real interest is driven by both monetary and real factors. Chu, et al (2005) investigates the presence of information risk of two interest rates in the money market. That is nominal interest rate in Treasury bond market and the real interest in the Treasury Inflation Protected Securities. It was

discovered that, data travels unilaterally and with a one-day lag from the TIPS market to the market for government bonds. Traders with less information can demand higher profits due to the information risk brought on by the asymmetric flow of information. For the case of the Chinese economy, Jordan Shan and Qi Jianhong (2006) investigated whether financial development contributes to economic growth. The author asserted that financial development is the second driver of growth after the contribution of labour input, using the VAR system of estimation. Chen (2002) used the Co integration Test and BVAR as estimate methods to study the cause-effect relationship between savings, interest rates, and income in the Chinese economy from 1952 to 1999, he concluded that, it matters Build a well-developed financial institution - especially an independent financial institution Liberalization of central bank interest rates and sound financial conditions, mediation is important for efficient distribution Capital, and in returns helps create sustainable economic growth. Muhammad A khan (2007) in his long essay investigated the role of domestic financial in the growth of the economy for the case of Pakistan. As outcome, it was revealed that FDI positively affect economic growth in the long run and in the short run, it will be possible only if Pakistan's finance system attained a minimum level of development to enhance growth and a better financial system will not only bring inflow of FDI but also maximum benefits.

Nkeng (1960), who wrote about financial institutions in general, said they have done enough to sensitize their clients and it would be better for customers about what is required of them so that they can take full advantage of the benefits that are offered to them. He suggested that the development of the agricultural sector of the country will turn to support economic development generally. The study of inflation and economic growth is no doubt one of most studied area in recent academic, different school of thoughts holds different views on this area; while the Keynesians says inflation and economic growth has positive relationship the Classical on the other hand say both variables are negatively related. Munir et al (2009) the study of inflation impact on Economic growth rate for the period 1970-2005 in the Malaysian economy. They Use Application of a new annual data model and intrinsic autoregressive threshold (ART) Proposed by Hansen (2000), they find the inflation threshold found in Malaysia the Test view that, Economic expansion and inflation are related. The calculated threshold regression model also assumes as 3.89%, the structural turning point of inflation. On top of that, inflation will significantly reduce

growth Real GDP. In addition, there are statistically significant positive values the relationship between inflation and growth is below the threshold. In an empirical study of inflation and economic growth, Thanabalasingam Vinaiagathasan (2013) uses dynamic thresholds with panel data from 1980 to 2009 for 32 Asian countries (growth rate, average inflation, and logarithm of inflation). It was established that there is a non-linear relationship between inflation and economic growth. Inflation threshold was detected at 5.43% at 1% level of significant. This means, at this level, inflation hurts growth but has no significant effect below this level. In the study of inflation rate and construction cost Muhammad Ali Musarat et al (2020) used construction comparison views of ASEAN countries and even some developed world. With the point that construction has a multiplier impact on economic growth and development it was observed that the rate of inflation is neglected in during the initiation of major construction projects. This greatly affects the in run budgeting structure as more finance will be required to enhance to changing prices of building material and change wages. As recommendation a framework was proposed to view the relationship between inflation and construction industry. This will intend help in the scheduling and estimation of projects

When analyzing the effects of unemployment and underemployment on Iran's economic growth, Mehrnosh Mohseni and Faizolah Juzarian (2016) used the ARDL model to show the short- and long-term effects of these variables. These techniques have been found to be very useful, and empirical results show that inflation and unemployment affect growth in the long run. Celil Aydın et al (2016) discussion of inflation and economic growth used dynamic panel to analyze the situation in five Turkish republics (Azerbaijan, Turkmenistan, Kazakhstan, Uzbekistan, and Kyrgyzstan). The result of the study suggested a nonlinear relationship and the authors used inflation threshold for the interpretation. 7.9% inflation rate was the threshold. Anything above this threshold will have a negative effect on growth, while anything below it will have a positive effect on growth. Jagannath Behra (2014) found a positive relationship between inflation and economic growth using panel data from six Asian countries. This was from a classical point of view. Malaysia has a long-term relationship between inflation and growth rates, unlike the Maldives, Bhutan, India, Bangladesh and Sri Lanka. Same results were claimed for the case of Turkey Özcan Karahan and Olcay Çolak (2020) and the authors recommended that, The Turkish economy needs inflation control to support long-term economic growth.

As shown, politics rather than sacrifice to bear high inflation through the Keynesian approach. Therefore, it can be said that The Republic of Turkey's Central Bank (CBRT) still has an important justification Support financial inflation targeting (IT) policies pursued since 2001. Tung and Thanh (2015) Inflation Survey threshold and growth connections For Vietnam, with time time series data of 1986-2013the econometric method of generalized method of moments (GMM) At least two stages square (2 SLS) were implore, GDP per capita, CPI, trade openness, conditions general household investment, population growth, and inflation were considered the main variables of the studies the result showed that Inflation has exceeded 7%. Inflation negatively affects economic growth. Inflation rates in both industrialized and non-industrialized countries range from 2% to 17%. Spending below this threshold has no impact on economic growth, whereas spending above this threshold has some negative effects.

Toan Ngoc Bui (2019) analyzed the impact of domestic credit on ASEAN countries' economic growth and proposed a nonlinear method. The outcome from the analysis suggested that domestic loan has an inverted U-shaped impact on economic growth when utilizing the GMM model of estimate. That is increase in domestic credit will boost the economic and will affect both the supply and demand side of the economy. The hold adopted a threshold for domestic credit to be 97.5%, this means that if domestic credit exceed this limit it will have negative important on the economy. Nuno Carlos Leitão (2012) analysing the impact of domestic credit and inflation together with saving confirms that, credit excreted positive effect on economy growth in EU-27 mean while inflation and domestic hurts growth. Mohammad Salim et al (2018) argued whether or not domestic credit from banking sector influences economic growth for the case of Bangladesh from 1975-2016. After employing the ARDL econometric tool, the result showed that real domestic credit positive drives economic growth and it was discovered to be significantly high, on the other hand, increasing in lending rate decreases the real GDP of the Bangladesh economy. Adu et al (2013) also studies the long-term impact of growth on financial. Adu et al (2013) also studies the long-term impact of growth on financial development in Ghana using ARDL models, where the ratio of GDP and private sector lending to GDP are important for output growth. However, when the study looked at money supply in the broadest sense (M2) no significant link was found between variables Mohammad Salim et al (2018) argued whether or not domestic

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The larger part of this research integrated the loanable fund theory so it is vital to make empirical reviews linking interest rate and domestic credit from the financial sector. (Dawood, 2018) Add up to economic knowledge by examining the impact of money policy and foreign interest rate on bank loan. Using the VAR model the author confirmed that domestic credit is significantly influenced by foreign rate of interest and the policy decision of the bank of Indonesia. (Munir, Awan, & Hussain, 2010) Confirm that, Savings have a favorable impact on private investment, real bank interest rates, bank loans to the private sector, and public investment are all long-term effects. Toan Ngoc Bui (2019) analyzed the impact of domestic credit on ASEAN countries' economic growth and proposed a nonlinear method. The outcome of the analysis depicts that domestic credit has an inverted U-shaped impact on economic growth when utilizing the GMM model of estimate..That is increase in domestic credit will boost the economic and will affect both on the supply and demand of the economy. The hold adopted a threshold for domestic credit to be 97.5%; this means that if domestic credit exceeds this limit it will have negative impact on the economy. Nuno Carlos Leitão (2012) looked the impact of domestic credit and inflation together with savings confirms that, credit excreted positive effect on economy growth in EU-27 mean while inflation hurts growth. Adu et al (2013) also studies the long-term impact of growth on financial development in Ghana using ARDL models, where the ratio of GDP and private sector lending to GDP are important for output growth. However, when the study looked at money supply in the broadest sense (M2) no significant link was found between variables Mohammad Salim et al (2018) argued whether or not domestic credit from banking sector influences economic growth for the case of Bangladesh from 1975-2016. After employing the ARDL econometric tool, the result showed that real domestic credit positive drives economic growth and it was discovered to be significantly high, on the other hand, increasing in lending rate decreases the real GDP of the Bangladesh

economy. Using data from Pakistan, Zaman & Atif (2014) use the co integration and causality technique to support the long-term equilibrium relationship between the nominal interest rate and inflation. Dreger (2010) attempted to answer the question of whether the real interest parity requirement is affected by the nominal exchange rate regime. The panel integration technique's findings show that the RIP persists over time regardless of the regime of nominal exchange rates. Universal equilibrium for the formulation and derivation of short-term nominal and real interest rates According to Lioui & Poncet, both monetary and real variables drive real interest (2004). Chu, Pittman, and Yu analyze whether there is information risk for two interest rates in the money market (2005).

In the field of finance and economics scholars have made lots of research and findings related with the financial sector, some of their outcomes saw indicators of the financial sector as statistically useful when accounting for economic growth and while some see it as having secondary effect on the environment. In this part of our work, we will be visiting and reviewing writings based on foreign financial sector development (with direct investment, financial credit the main variable) to economic growth. Elena Raluca and Alina Pop (2015) made a study about the implication of credit actions on Romania's economic growth. With data from 2005 -2014 their main aim was to understand the relationship between the two variables. Thus as a result, they claimed that, credit was significant and greatly influenced the growth rate of GDP. Similarly to this study, Allen and Oura (2004) argue that the financial system plays an important role in understanding growth fluctuations. Entrepreneurs risking high profits can lead to both growth and crises within the organization. They argue that growth is not continuous and there is a period to stay with prosperity after crisis periods. The financial system can help improve the crisis through internal controls Activities of financial institutions and restrictions on international capital flows. Leitão (2012) evaluated the relationship between the credit given by domestic banks and economic growth and. The variables of credit, savings, inflation and bilateral trade have proven to be highly capable of explaining economic growth. And the outcome was the Confirmation of savings to support growth, inflation domestic credit are negatively bad and poor drivers to economy growth

Answering the question of whether or not in emerging markets financial growth is a vital influencer of economic growth, Data for 22 rising nations from 1980 to 2020 were utilized by Ha Minh Nguyen et al (2021). Their findings demonstrated

that financial development has a favourable impact on economic growth, hence the matter was resolved. The impact of regional financial development on business growth was examined by Tran, Walle, and Herwartz (2020) using a company-level database of more than 40,000 Vietnamese research companies. This result supports the hypothesis that economic growth has a significant effect on economic growth. Research by Nguyen, Brown, and Skully (2019) using the GMM estimation method shows that bonds and the stock market are important drivers of economic growth. Their research shows that the credit market has a positive effect on the economic growth of developing countries. In analyzing the contribution of the financial sector to economic growth, Sanjay Sehgal et 2012 al using data on economic growth and economic growth from 1990 to 2009 for 75 countries. Preliminary tests show a long-term relationship between economic growth and financial development. According to the results of the FWOLS and MWALD, commercial banks' lending and savings activities are crucial to economic growth. This result is true for both low-income and middle-income nations; therefore the financial sector's actions have a favourable impact on economic growth. (Levine, 1997) started that the financial system can perform five functions to improve transaction path to promotes long-term growth. These features are: enhanced risk reduction, access to information Investment and resource allocation, manager control and corporate governance implementation, savings mobilization and Facilitate participation. These features support investment and thus higher economic growth. The results showed that studies of panel data showed positive effect of financial depth on economic growth, taking into account other determinants of growth.

Yakubu and Affoi (2013) in their paper aimed to examine the impact of corporate debt on economic growth in Nigeria between 1992 and 2012. the impact of corporate debt on economic growth. Assessment of the role of commercial bank loans in the economy, its impact on the growth of the Nigerian economy, in terms of GDP. Was evaluated using commercial bank loan to the private sector? They discovered that the growth of Nigeria's economy is significantly influenced by commercial bank lending. As a result, the following suggestions have been made: Promoting and preserving a better, stronger credit culture; a strong, comprehensive framework should be in place to continue aiding in the financial performance of private credit and the recovery of Bank Credit Banks are obliged to share bad credit information with each other. Credit should be given to priority sectors like

manufacturing and agriculture. Hamidu and Musa (2006) A Case Study of Nigeria, Public Debt and Economic Development. The aim of the research was to find a connection between economic growth and national debt. The study used data on foreign debt, domestic debt and economic growth from 1970-2010. Relationships between variables were examined using simple least squares analysis. We also use the ADF method to check sector trends and the Causality test to see if GDP and Treasuries are strong. The causal test showed a bivariate relationship between national debt and GDP, but no relationship between national debt and GDP. In contrast, OLS analysis finds a positive relationship between national debt and economic growth and a negative relationship between household debt and economic growth. This study found that debt—domestic or foreign has no impact on economic expansion. Additionally, economic growth increased in tandem with domestic debt growth, but not with overseas debt growth. Aurang (2012) looked into how Pakistan's commercial banking industry affected the expansion of the nation's economy. The study's goal was to determine how Pakistan's commercial banking industry contributed to the country's economic expansion. The survey was done in ten banks between 1981 and 2010. Common least squares, Granger causality tests, the Advanced Dickey Fuller (ADF) test, and the Philip Perron unit root test were employed. Deposits, investments, advances, profitability, and interest income all had a significant beneficial effect on economic growth, according to the regression results. Granger discovered a two-way causal relationship between deposits, advances, and profitability, as well as economic growth, using his causality test. Banking operations, such as commercial bank advances, were found to have an impact on economic growth in the study.

For the case of the Chinese economy, Jordan Shan and Qi Jianhong (2006) investigated whether financial development contributes to economic growth. The author asserted that financial development is the second driver of growth after the contribution of labor input, using the VAR system of estimation. Chen (2002) used the Cointergration Test and BVAR as estimate methods to study the cause-effect relationship between savings, interest rates, and income in the Chinese economy from 1952 to 1999, he concluded that, it matters Build a well-developed financial institution - especially an independent financial institution Liberalization of central bank interest rates and sound financial conditions, mediation is important for efficient distribution Capital, and in returns helps create sustainable economic

growth. Toan Ngoc Bui (2019) examined the effect of domestic credit on the economic growth of ASEAN nations and offered a nonlinear approach. When using the GMM model of estimation, the analysis's findings showed that domestic credit has an inverted U-shaped impact on economic growth. The expansion of domestic credit will stimulate the economy and have an impact on both the supply and demand sides. The Hold set a domestic credit barrier of 97.5%, which indicates that if domestic credit exceeds this level, it will have a detrimental impact on the economy. Muhammad A khan (2007) in his long essay investigated the role of domestic financial in the economic growth of Pakistan. As outcome, it was revealed that FDI positively affect economic growth in the long run and in the short run, it will be possible only if Pakistan's finance system attained a minimum level of development to enhance growth and a better financial system will not only bring inflow of FDI but also maximum benefits. Nkeng (1960), who wrote about financial institutions in general, said no they have done enough to sensitize their clients and it would be better for customers about what is required of them so that they can take full advantage of the benefits that are offered to them. He suggested that the development of the agricultural sector of the country will turn to support economic development generally. The ARDL models used by Adu et al. (2013) to study the long-term effects of growth on financial development in Ghana highlight the significance of the GDP to private sector lending ratio for output growth. However, no statistically significant correlation between the variables was observed when the analysis examined the money supply in its broadest sense (M2). Credit has a positive influence on economic growth in the EU-27, according to Nuno Carlos Leito's examination of the effects of domestic credit, inflation, and saving together in 2012, whereas inflation and domestic factors have a negative impact. Mohammad Salim et al (2018) argued whether or not domestic credit from banking sector influences economic growth for the case of Bangladesh from 1975-2016. After employing the ARDL econometric tool, the result showed that real domestic credit positive drives economic growth and it was discovered to be significantly high, on the other hand, increasing in lending rate decreases the real GDP of the Bangladesh economy.

Table 1: Summary of Empirical Review

Author	Objective and Country	Methods	Results
Panapouloua & Pantelidis (2016)	Examining the hypothesis of the fisher effect for 19 OECD Countries	Cointergration Analysis	Evidence for the Fisher effect is seen in all nations except Ireland and Switzerland, where interest rates change individually with inflation.
Caporale & Gil-Ala~na, (2019)	Examining the hypothesis of the fisher effect for G-7 countries using The integration methods	Fractional integration and Co integration Model	No complete proof of the fisher effect, however there is a strong correlation between nominal interest rates and inflation.
Anari & Kolari (2019)	Looking at the Fisher puzzle together with the Wicksell effect for Canada, France, UK	Recursive equation approach	The results supports that the Fisher effect are taken into accounts in the Wicksell effect
Incekara, Demez, & Ustaoglu (2012)	To find how applicable the fisher hypothesis is on the Turkish economy: Cointegration analysis	VAR and Cointergration	The Fisher Effect holds true for the Turkish economy over the long term.
Yaya (2015)	For African countries, the author examine the long and short run applicability of the fisher hypothesis	Cointergration Bound Test	There is no evidence of a fisher effect in the other seven African countries, but in Kenya there is a partial relationship between the absolute effect of fisher and nominal interest and inflation.
(Jareño &	Preliminary study of the	OLS	Found that changes in the

Tolentino,)	fisher hypothesis on the Spanish economy	Regression	nominal interest rate and changes in the projected inflation rate are positively and significantly correlated.
Hamori (2008)	A simple method to test the Fisher effect	Generalized Methods of Moments	long-term government i Corporate bonds and short-term interest rates, in descending order, carry higher risks and higher returns
Ucak, Ozturk, & Aslan (2014)	Investigating the fisher hypothesis for selected EU member countries	Case-wise Bootstrap Approach	The outcomes demonstrate that, in the event of a structural failure, the Fisher effect is tax-free.
Benazića (2013)	Empirical analysis of the Fisher Hypother on the economy of Croatia	Vector Error Correction Model	According to the findings, Croatia is only likely to experience the "full" Fisher effect in the long run.
Cai (2018.)	Testing the Fisher Effect in the US	Quantile Unit root and Qunantile co integration	Real interest rate is stationary, with the higher quantile showing the full fisher effect and the lower quantile showing the fisher riddle.
Choudhry (2006)	Evidence from Belgium, France, and Germany in the inverted Fisher effect cointegration analysis	Cointergration and Regression	Fixed interest rates and co-integration of the interest rate and inflation are only available in Germany.
Güriş, Güriş, & Ün (2016)	Interest rates, fisher effect and economic growth development in turkey	Auto regression distribution lag co	Fisher effect valid for the economy of turkey.

		integration threshold.	
Toyoshima & Hamori (2011)	Fisher effect panel cointegration analysis with US, UK, and Japanese data	Panel co integration Test	The results showed that fisher effect is valid for the observed period.
Westerlund (2008)	Fisher effect panel cointegration analysis 20 OECD	Panel co integration	The fisher hypothesis cannot be rejected.
Jensen (2009)	The Long-Run Fisher Effect: Can It Be Tested?	Integration	High persistent inflation but integrated, but parameter significant less than one.
Jareño & Tolentino (2013)	The Fisher Effect: a comparative analysis in Europe	OLS Regression	The volatility of the anticipated inflation rate and the nominal interest rate in Europe has a positive and significant relationship.

2.2 Loanable fund Theory

D.H. Robertson proponent of the term "money lent" in borrowed money rate theory or the loanable fund theory referred to what Marshall refers to as "liquidation of capital" or "management of capital." This is the market interest rate theory. This method uses the word "rate of interest" to refer to all borrowing, including credit in the form of loans, bonds, and savings accounts. By include solely investment rates; this hypothesis expands the traditional theory. Because the banking system is set up to generate loans out of thin air, the overall amount of money in the economy may exceed individual savings. The main source of credit is demand deposits. Loans are also available to those who have an unused cash balance and want to keep the money they have borrowed to cover their liquidity needs. There are four main sources of credit: savings, savings accounts, deposits and bank loans. A great source of savings. According to the trend, the equilibrium interest rate creates a balance between the supply and demand for credit. In other words, the equilibrium interest rate is the midpoint where the money supply and demand curves intersect.

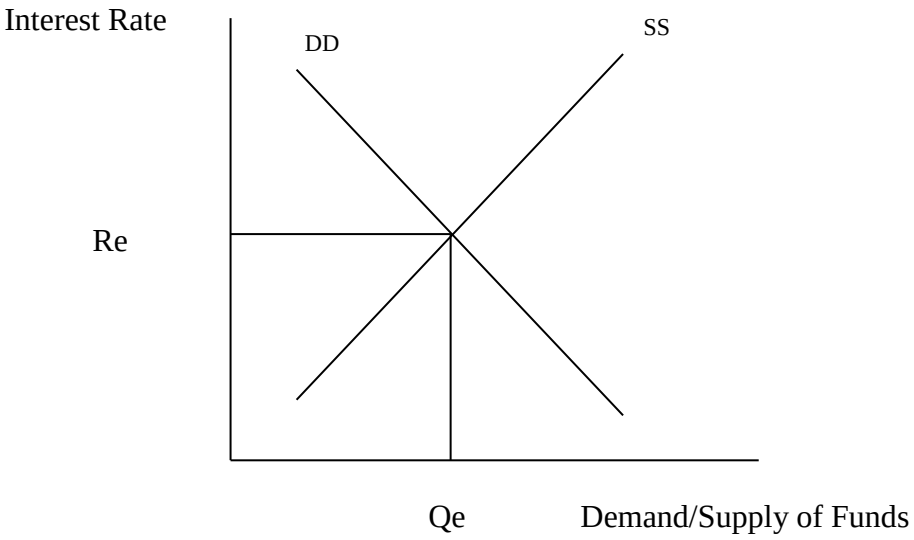


Figure 2: Loan market equilibrium

According to loan capital theory, the equilibrium interest rate balances the supply and demand for debt capital. In other words, the cost of debt capital is the demand for debt capital to cover the interest balance. The debt fund concept does not adequately meet the needs of borrowers. And the application for a loan is explained

Investments: Demand for borrowed money mostly stems from the demand for investments. Inputs utilized to create new capital assets, such as inventories, are referred to as investments. Interest rates determine how much it will cost to receive these funds for these ventures. An investor must weigh the interest rate against the anticipated return on investment before making a decision. The demand for borrowed money for investments is higher when interest rates are low and vice versa. This suggests that the demand for investment loans and interest rates are inversely related.

Accumulation (N): People who wish to accumulate debt money in the form of free cash to quench their hunger for liquidity also create demand for them. The demand for loans for conservation purposes decreases as the interest rate increases. The demand for debt securities for conservation will increase with low interest rates, and vice versa. Meanwhile the supply curve of demand of loanable fund can be explained by;

Banks are the main source of loanable money, hence savings are vital. The difference between income and expenses is what is known as savings. The amount of deposits varies with the interest rate because it is believed that income would remain constant. At higher interest rates, both individuals and corporations are more willing to save, and vice versa. Recovery takes happen when current capital is used up rather than being replaced by new capital equipment. When current interest rates offer higher returns than current income, investment returns will be high. A stronger recovery will result from these increased interest rates. Another source of the availability of loanable money is the banking sector. Through the creation of credit, the banks provide loans to businessmen. The amount of loanable funds is increased by the money that banks create.

2.3 Theoretical analysis of the Fisher Hypothesis

The Fisher effect, an economic theory developed by Irving Fisher, explains how growth and nominal and real rates interact. The nominal interest rate less anticipated inflation equals the real interest rate, which is calculated using the Fisher function. Real interest rates decline when inflation picks up unless nominal interest rates increase to keep pace with inflation. The real interest rate can be calculated using the Fisher equation by deducting the nominal interest rate from anticipated inflation. The equation includes consideration for each price in the list. Every time we go to the bank, we can feel the Fisher effect, because deposit interest is compound interest. For example, if the nominal interest rate is 4% and the expected inflation rate is 3%, the value of the savings fund will increase by 1%. In order for saving to grow faster than purchasing power, real interest rates must be low. The nominal interest rate serves as a proxy for the investment's financial return. A nominal interest rate of 10%, for instance, means that people will get an additional 10% interest on their bank savings each year. Real interest rates, as opposed to nominal interest rates, take purchasing power into account. In the fisher effect, interest is provided at a nominal real rate that accounts for currency growth over time in order to pay back a specific sum of money or money due to creditors. Real interest is a sum of money that represents how much the purchasing power of borrowed money has increased over time. There is more to the Fisher Effect than an equation. It demonstrates how the money supply and inflation rate interact to influence each other. For instance, the nominal interest rate will rise by the same amount of 10

percentage points in the same economy if the inflation rate in a nation rises by 10 percentage points as a result of a change in the central bank's monetary policy. Given that the real interest rate is determined by inflation and the nominal interest rate, we may conclude that changes in the money supply will not have an impact on it. But it accurately captures alterations in the nominal interest rate. Another example is For example if a bank charges 6% on a loan and inflation rate is kicking at 11% it means the bank is doing very poorly in it financial transaction or in other words the bank is losing 5% of real interest because prices are destroying the value of money. So for the bank to stay in the path of profitability it would have to charge it interest rate of 6% plus 11%, thus they would be charging 17% on the loan. With fisher effect, mortgage companies and banks are careful not to lose the opportunity of the value of money so the Adjustable Rate Mortgage (ARM). This was gotten right from the fisher effect, and it is expressed by the prime rate of the mortgage or loan plus the rate to take care of the value of money. Borrowers will not know the exact rate every month because the prime rate is the rate at the market that fluctuates in the market, With this rate lenders were been protected from the effect of inflation. But however choosing between the fixed of interest and adjustable rate is a matter whether or not current rate are high or low.

The International Fisherman Effect (IFE), a currency exchange model that leverages the traditional Fisher effect, has been applied to financial markets and research. Since the idea is focused on the past, present and future risk-free value of the index, rather than the pure price, it is necessary to analyze and explain the current and future movements in the money price. For this model to work in its simplest form, it is assumed that the risk-free portion of capital can move freely between currency countries. IFE was mostly used during monetary policy when interest rates made many adjustments and went upwards. Spot rate variations become more obvious with the introduction of computerized trading and retail arbitrage traders, which causes variances to be recognized earlier and causes trading to become too tight to be lucrative. IFE and other trade confirmation techniques, however, are subject to error. If the point predictions are erroneously assessed and followed, there may be a psychological benefit from trading even if there may be no empirical benefit in this situation.

We make NinT to represent the nominal interest rate in accordance with Fisher's theory. Consequently, the Fisher equation may be written as

RinT= NinT - INFe……...….. (1)

Here, RinT stands for the real interest rate, and INFe for anticipated inflation. We utilize real inflation as a replacement since the predicted inflation rate is unavailable. The expected inflation rate could be represented as follows when rational expectations are present.

INFe=INF + ϵ……..... (2)

Where INF is the readily available actual inflation rate and ϵ is a stationary series with a zero mean. Consequently, the equation (1) may be changed to look like this.

RinT= NinT- Π - ϵ……... (3)

The Fisher Effects are apparent when the nominal interest rate and inflation rate are co integrated by a co integration vector (1,-1). However, we frequently evaluate the subsequent regression in practice.

RinT= α - βΠ - μ……. (4)

Or

NinT= α + βΠ - μ…… (5)

When RinT and INF are co integrated with =1, the entire Fisher Effects are still valid in this case. If 1, Fisher (1930) suggests that monetary illusion might be to blame. Additionally, Mundell (1963) suggests that the coefficient will be less than one because of the negative connection between the nominal interest rate and inflation

rate. Additionally, one method for examining the Fisher Effects is to perform a unit root test on the stationary nature of the real interest rate in equation (3).

2.4 The Global Saving Glut Hypothesis

The 1998 Asian financial crisis served as the impetus for this theory's development. Bernanke suggested that a number of international variables contributed to the low real interest rates in 2005. Fast-growing emerging market economies started to run current account surpluses to better maintain their currencies in the event of upcoming financial storms, which was one important aspect. Moving from current account deficits to surpluses translates into an increase in national saving in terms of national income accounting. For instance, China's household saving rate increased from 31% in 1998 to little over 42% in 2010. Although China's capital controls restrict the transfer of domestic saving to other nations, more emerging market economies—whether in Asia, South America, or Eastern Europe have expanded saving flows to established economies like the United States? In this instance, U.S. assets provided higher risk-adjusted returns than did domestic assets, according to Bernanke. The amount of savings available for U.S. investment expanded due to the increased global saving from emerging markets that flowed into the country. As a result, an increase in the amount of savings coming from outside would result in an increase in domestic savings, which would be indicated by a rightward shift in the saving schedule. This would reduce the U.S. real interest rate, all else being equal. Lower interest rates would reduce the cost for businesses to invest, increasing their willingness to accept projects with considerably lower returns. Therefore, a rise in investment would be the end effect of an influx of foreign savings.

2.5 IS/LM Brief Review

The IS-LM paradigm developed by Hicks has been used by economists for generations to analyze the consequences of monetary and fiscal policies. The IS curve in the graph below depicts the ratio of interest rates to real GDP that represents the level of spending in an economy. Due to the poor investment response, higher interest rates are linked to lower levels of GDP. The LM curve illustrates the money market by showing various interest rates and GNP levels. For a given quantity of money, higher GDP levels necessitate higher interest rates. According to IS, increases in government spending cause the IS curve to move to the right. The

relative slope of the two curves determines the rise's height; if the LM curve is flat and the IS curve is steep, the rise is considerable; otherwise, it is tiny. The LM curve moves to the right, or to LM, when the money supply rises. One more time, the effect on GDP is determined by the relative slope of the two processes. Monetary policy is powerful when the IS curve is flat and the LM is flat, steep

2.6 Conceptual Framework

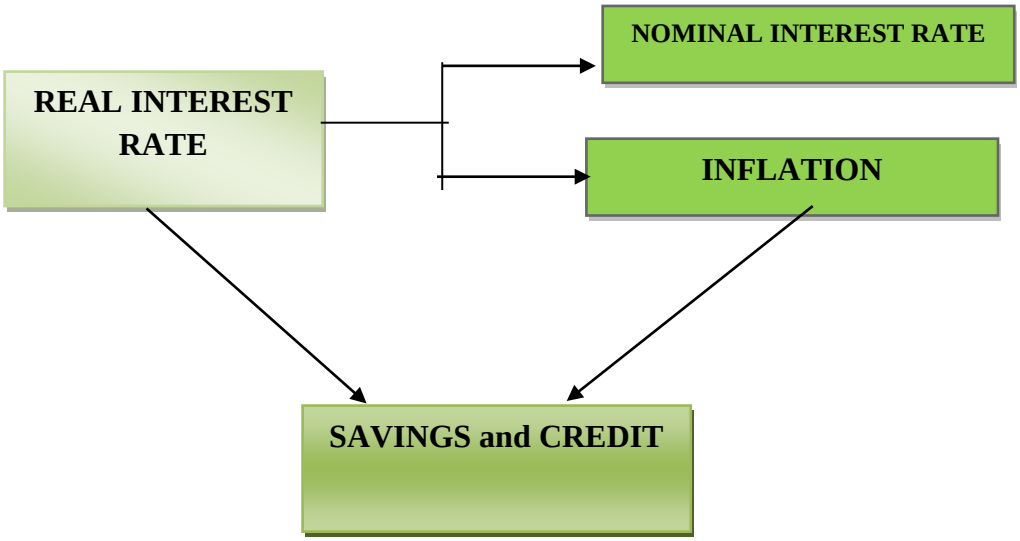


Figure 3: Conceptual Framework

CHAPTER 3
METHODS and DATA

3.1 Data

The Study employs annually time series data from the world development index for the case of China and USA. Variables involved are real and nominal rate of interest, inflation rate, National savings and domestic credit. For each country, secondary data was observed from the year 1987 to early years 2020.

Table 2- Variables

Variables	Abbreviations	Units of measurement
Real Interest Rate	RinT	%
Inflation rate	INFL Or Π	%
Nominal interest rate	NinT	%
Domestic credit(loan) to private sector	DCPS	% GDP
National Savings	NatS	Billion/trillion $

On the basis of theatrical framework and empirical survey, we took in to consideration the theses set of variables. Following from following Jareño & Tolentino, Islam & Goyal, (2017) and Cai (2018) we choose the variables of the fisher effect. Theory holds that savings and credit both supply and demand of loanable funds. The main reason to the selection and comparism of these countries, USA and China are on of the highest countries with domestic credit. So it is important for us to confirm in theory whether or loan market somehow follows the basic principles of loanable transaction. The term "real interest rate," sometimes known as the "inflation-adjusted rate," refers to the rate that reflects the fund's true cost. In short, this interest rate provides the borrower or investor with information about the real income when considering the cost of living. When the real rate of inflation is unknown or unexpected, this interest rate is calculated. As a result, the rise is equal to the difference between the real and the rate. Nominal interest or the interest paid or transferred to the borrower or investor, is the interest rate that banks, mortgage lenders, and leasing businesses charge on loans and advances. Therefore, if

you borrow $100 at 6%, you can anticipate paying interest of $6. Interest rates increased due to inflation. The interest rate is how much you pay each time you borrow, deposit or borrow (which is just called the principal). The use of a loan or a loan has taken into account the principal amount, interest, term and duration of the loan, deposit or loan.

To calculate interest rate, suppose the bank charges 12% for a short term loan of 16 months. This simple implies that for each month the borrower will be pay 0.75% every month until the loan or mortgage is been paid. The time value of money is a very important principle most financial institution underestimate, if financial houses give out money without considering the future time value of money it could referred to as a bad financial decision. Expected inflation must be involved in such financial transaction if not at the end of the transaction the bank might be losing money. Inflation is generally referred to as the persistent price increase; studies have shown inflation above a particular threshold may have an impact on the lives of citizens. Of course the intrinsic value of a $100 bill in the 70s is not the same as that of today; higher inflation reduces the value of money and the purchasing power of individuals. Domestic saving is defined as the financial resources provided by financial institutions to the individuals. These resources can be loan, mortgage, trade crediting and purchase of securities. From the basic macroeconomics principle, we can define national savings as the summation of both government and private savings. Saving is a function of one's income and consumption:

$$Spv = Y - C - T$$

$$Spb = T - G$$

$$Snats = Spv + Spb = (Y - C - T) - (T - G)$$

Y; income

C; consumption

T; Tax

G; government spending

Spb; Public savings or government savings

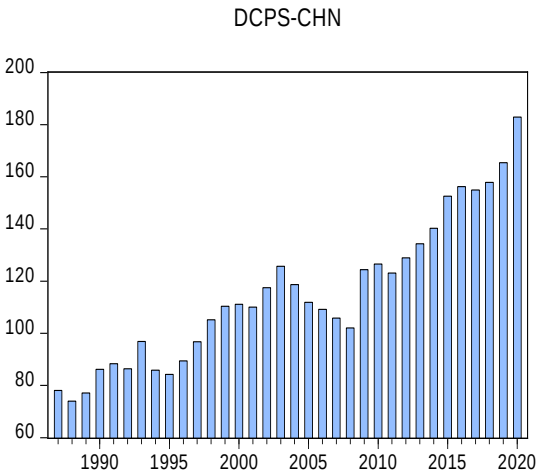
Spv; Private savings

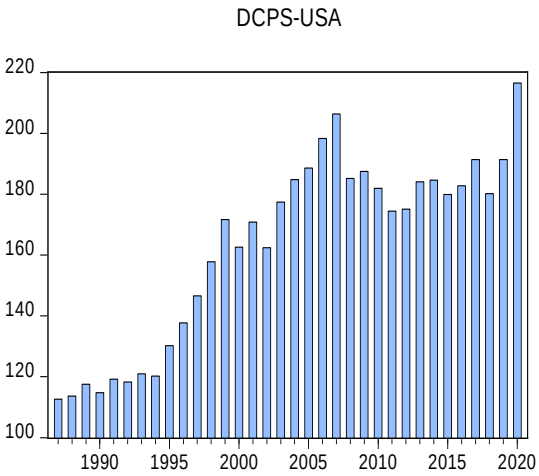
Snats; National savings

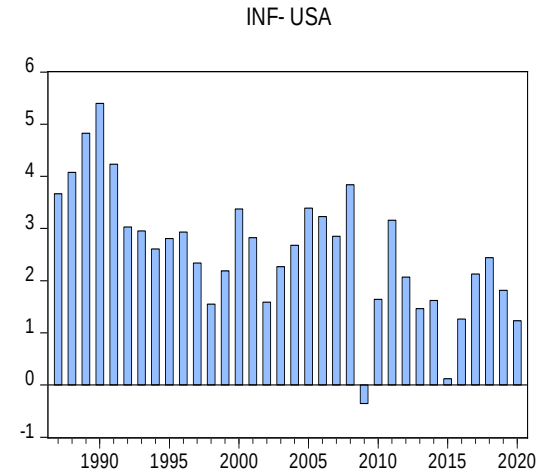
Private Savings is generally influences by the magnitude of deposable income, this is income after tax and government is greatly affect by it total spending on the economy. So in our study we consider that national saving will represent the supply of loan funds domestic credit will stand as the proxy of demand of loan funds. Another way to compute the national savings is by subtracting total consumption from the economy's national income. That is

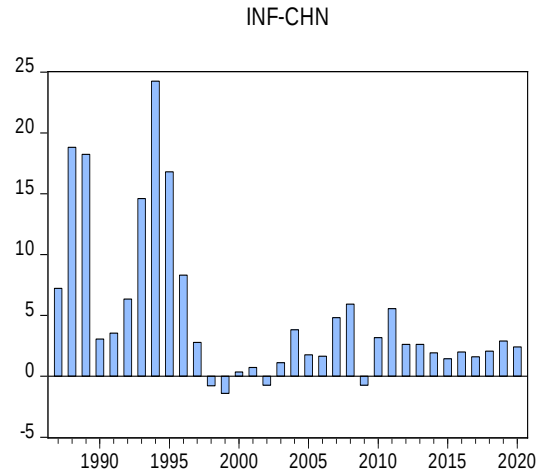
$$NATS = GDP - C$$

3.1.1 Time Series Graphs









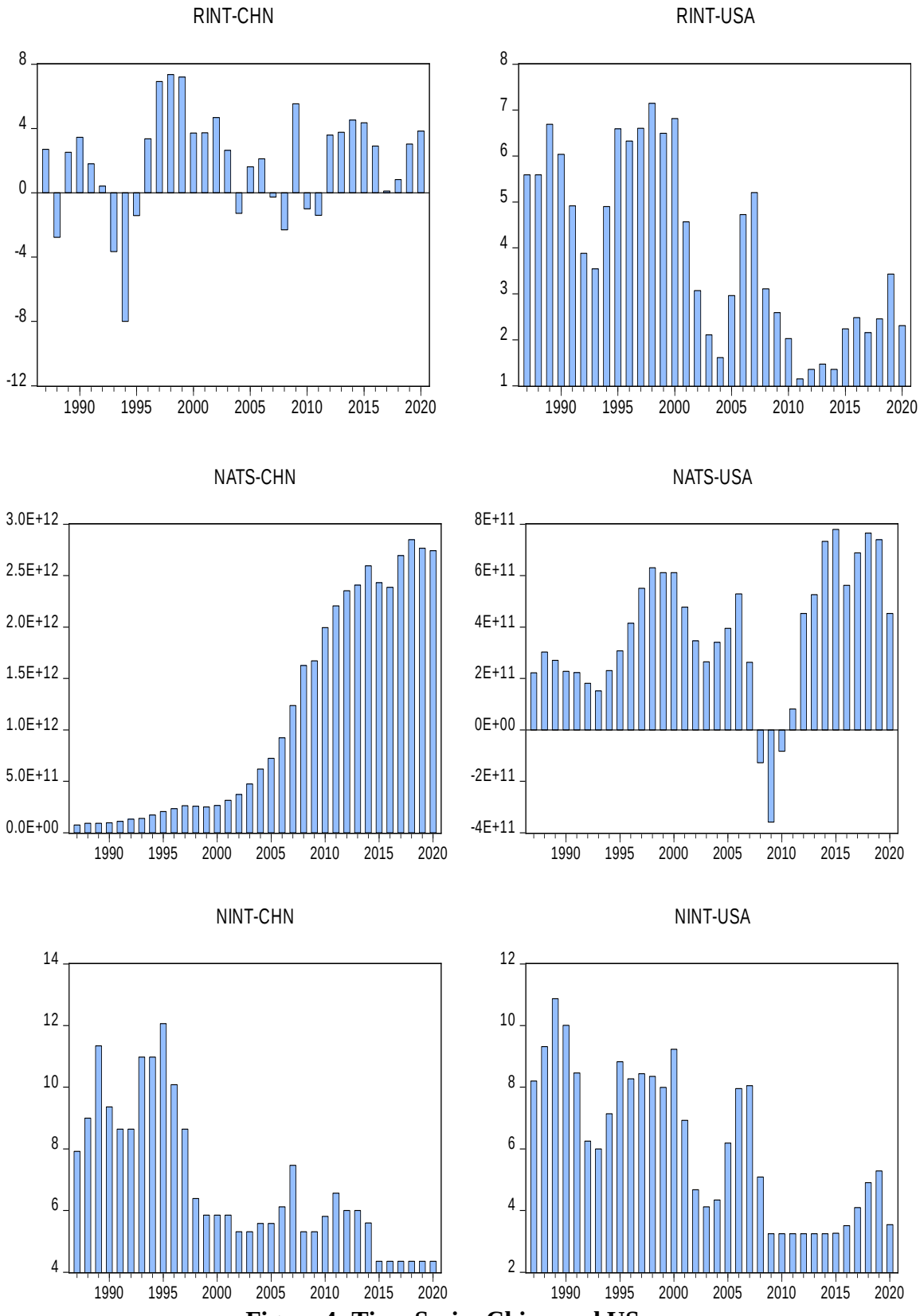


Figure 4: Time Series China and US

Table 3: Descriptive statistics CHINA

Measures	DCPS	INF	NATS	NINT	RINT
Mean	115.2340	4.967043	1.11E+12	6.871765	1.899035
Median	110.7532	2.703758	5.47E+11	5.925000	2.669195
Maximum	182.8681	24.25699	2.85E+12	12.06000	7.356478
Minimum	73.98362	-1.401473	7.48E+10	4.350000	-7.989744
Std. Dev.	27.91360	6.259950	1.06E+12	2.283199	3.311078
Skewness	0.552687	1.682441	0.496082	0.825527	-0.747755
Kurtosis	2.551831	4.907839	1.515261	2.491971	3.753147
Jarque-Bera	2.015504	21.19657	4.517525	4.227433	3.972018
Probability	0.365039	0.000025	0.104480	0.120788	0.137242
Sum	3917.958	168.8795	3.78E+13	233.6400	64.56719
Sum Sq. Dev.	25712.59	1293.170	3.68E+25	172.0289	361.7867

Table 4: Descriptive stats USA

Measures	DCPS	INF	NATS	NINT	RINT
Mean	163.1566	2.566119	3.75E+11	6.141765	3.926961
Median	174.7674	2.642339	3.71E+11	6.094583	3.489003
Maximum	216.5589	5.397956	7.80E+11	10.87333	7.148178
Minimum	112.6191	-0.355546	-3.59E+11	3.250000	1.148425
Std. Dev.	30.93586	1.207639	2.64E+11	2.397844	1.939869
Skewness	-0.439103	-0.039479	-0.613815	0.189905	0.209907
Kurtosis	1.872253	3.362060	3.338951	1.664079	1.607764
Jarque-Bera	2.894334	0.194539	2.297780	2.732665	2.995633
Probability	0.235236	0.907311	0.316988	0.255041	0.223618
Sum	5547.323	87.24805	1.28E+13	208.8200	133.5167
Sum Sq. Dev.	31581.91	48.12695	2.30E+24	189.7387	124.1821
Observations	34	34	34	34	34

The descriptive is carried out on the collected data. This describes the measure of central tendency, measure of dispersion and measure of normality. The time series graph portrays how the variables have been changing over time. Considering comparative analysis, statistics shows that over the period of observation the national savings for both countries are greatly different with China recording about $1.1trillion on average and USA about $375 billion on average.. National savings is primarily gotten by the summation of private and government savings or from subtracting total consumption from the gross domestic output, the magnitude of national savings is greatly affected the size of the government expenditure, the total money generated from taxes and citizen's income. Despite the fact individual do save money, but so as they take credit from banks. The statistic takes in to consideration the description of the total domestic credit to private sector. The total domestic credit is expressed as a percentage of the total output. Over the observed period, statistic describes that China share of domestic credit as percentage of GDP is above 100%, recording on average about 115% and USA recording on average about 163%. This confirms to us even though the economy of China saves more, the US financial department lends more money to private sector as follows from the period of observation. The pattern of the inflation rate in both cases tends to follow almost the same trend. Both countries over the period of observation have witness deflation (negative inflation). Over the observed period, the average level of inflation in both countries is seen to be far different, with almost 5% and 2.5% for China and USA respectively. In as much there have negation inflation; statistic shows that there has been negative real interest rate only for china. Real interest rate for the case of China has had much fluctuation as compared to that of USA. Inflation and the real interest rate there variables with the highest trend of fluctuations over the observed period. Both maximum and minimum levels of inflation rate in both countries are really not the same. Even though both cases recorded deflation over the years, China recorded a deflation of 0.7% and 0.5% for that of USA. With average of 2.2% inflation for USA has risen to about 4.6% with these periods.

With respect to the measures of dispersion and normality, we observed that, the variable real interest rate for china deviates more than nominal and inflation rates for the two countries. For the case of China all variables except RinT are observed to have a right tail distribution because value of skweness > 0 while for the case of USA, NATS. DCPS and INFL is observed to have left tail distribution. Majority of

the variables for the case of both countries are seen to be Mesokurtic with kurtosis values closer to 3. RinT for China is seen to have a platykurtic distribution, and NATS has a Platykurtic distribution. At 5% level of significant, the Jarque Bera stats show that errors are normally distributed for all variables for case of China and USA.

3.2 Methods

The research employs quantitative analysis with the help of econometric modeling in relationship with economic inferences. Co integration, causality and regression are the main method of the analysis and estimation. Pre and post analysis test and diagnosis such as Johannes co integration, augmented dickey fuller unit root test, serial correlation, multicollinearity and leanrity will be the core of the econometric modeling. Depending the outcome of the Unit root and co integration test the research will choose the generalize method of moments, the ordinary least square and the auto regression distribution lag as method or estimation. It is important to understand the loan market individual and not as a group thus individual analysis will be carried out for each country and not as panel data.

3.2.1 Augmented Dickey fuller Unit Root:

To avoid spurious regression results, it is very important to study the order of the stationarity. To test for unit roots, we use the Dickey matrix extended from Fuller (1979) with the following definition:

$$Yt = \beta Yt - 1 + \mu t \quad \text{----------EQ6}$$

If $\beta = 1$ it means there is unit root problem or the series is not stationary but if $\beta < 1$we can conclude the series is stationary. In the above equation we cannot directly test the hypothesis that $\beta = 1$with the use of T- test because this will be biased. So we subtract Yt-1 from both side of the equation

$$Yt - Yt - 1 = \beta Yt - 1 - Yt - 1 + \mu t \quad \text{----------EQ7}$$

$$= (\beta - 1)\, Yt - 1 + \mu t$$

$$\Delta Y = \Theta Yt - 1 + \mu t \quad \text{----------EQ8}$$

Where Θ is the same as $(\beta-1)$ so for each time series the hypothesis are

The ADF is also efficient because it allows for serially correlated error term μ_t

$$\Delta Y = \beta 1 + \beta 2t + \Theta Yt - 1 + \Sigma \alpha i \, \Delta Yt - 1 + \mu t$$ ----------EQ9

3.2.2Phillips Perron Unit root test

A multiple root test was created by Phillips and Perron in 1988 and quickly gained popularity in the study of economic time series. The way serial correlation and error covariance are handled in the Phillips-Perron (PP) test and the ADF test are two significant areas of distinction. The ADF test uses standardized auto regression to estimate the ARMA method of the regression error of the test, whereas the PP test ignores serial correlation in the regression test

$$.\Delta Yt = \beta oXt + \pi Yt - 1 + Ut$$

Where ut is heteroskedastic and I(0). Any serial correlation and heteroskedasticity in the test regression's errors are taken into account by the PP tests.

3.2.3 Co integration and Causality

After ensuring the present and absent of unit root in the time series analysis, it is vital to ensure that variables have long run or short run relationship or equilibrium relationship. For this research we will employ the Engle granger co integration test and the granger causality test.

$$Y\,t = \beta 1 + \beta 2Xt + \mu t$$ ----------EQ10

Where Y and X are integrated at order 1, suppose we now subject the error term to unit root testing

$$\mu t = Y\,t - \beta 1 - \beta 2Xt$$ ----------EQ11

And discover that the error term is integrated that order (0) then it can be said there is co integration within variable. ***β2*** is the co integration parameter and it is said that if variables are set to be co integrated, then they can be use and interpreted for long run analysis. In establishing causality, we must make sure that the underlining variables are stationary. Cointegration is what happens when two or more series are not

constant but their linear combination is. Testing for cointegration is necessary to establish whether one is empirically modeling significant relationships. Her research focuses on the enduring correlations between several variables.

After texting the long run relationship between variables the causality check from Granger 1969 shows whether or not variable cause effect one another in the short run. It on other it shows the bidirectional or the unidirectional flow of causality in any analysis. Given that $\sigma 2\ (X/\ U - Y) > \sigma 2\ (X/U)$, there is a two way relationship between X and Y

3.2.4 Auto Regressive Distribution Lag (ARDL)

Latent variable values are used as explanatory variables in this model together with current values and regression models. Instead of the VAR model which is mainly design for endogenous variables, the ARDL model is design for both exogenous and endogenous variables. This model is best and should used in the case when variables are integrated and order 0 and 1 only. Supposed variables are integrated at seconds, using this model will portray spurious results. From the results of the bound test, we can make decision whether or not specify for the long and short run regression. If variables are co integration then it approved to run the long run ARDL which the same as the error correction model. One of the advantages of the ARDL model is that, results obtained are said to be unbiased. The model is generally specify as

$$Yt = Yo\iota + \sum_{\iota=1}^{P} \delta Yt - 1 + \sum_{\iota=0}^{q} \beta\iota\, Xt - 1 + \ \mathrm{E}\iota t \text{ ----------EQ12}$$

Y and X are dependent and explanatory variables respectively integrated at I(0) or I(1), δ and β are the coeffiecients, p,q is the optimal lag order and Eit is the error term which is serially uncorrelated. With respect to our variables we specify for the bound test as;

$$\Delta \mathrm{RINT}\tau = \alpha o\iota + \mathrm{b}11\mathrm{RINT}\tau - \iota + \mathrm{b}21\mathrm{INFLA}\tau - \iota + \mathrm{b}31\mathrm{NATS}\tau - \iota +$$
$$\mathrm{b}41\mathrm{DCPS}\tau - \iota + \sum_{\iota=1}^{\mathrm{P}} \alpha 1\iota\, \Delta \mathrm{RINT}\tau - 1 + \sum_{\iota=1}^{\mathrm{q}} \alpha 2\iota\, \Delta \mathrm{INFLA}\tau - 1 +$$
$$\sum_{\iota=1}^{\mathrm{q}} \alpha 3\iota\, \Delta \mathrm{NATS}\tau - 1 + \sum_{\iota=1}^{\mathrm{q}} \alpha 4\iota\, \Delta \mathrm{DCPS}\tau - 1 + \mathrm{E}\iota\mathrm{t} \text{ ----------EQ13}$$

$$\Delta NATS\tau = \alpha o\iota + b1NATS\tau + b21INFLA\tau - \iota + \sum_{\iota=1}^{p} \alpha 3\iota\, \Delta NATS\tau - 1 \sum_{\iota=1}^{q} \alpha 2\iota\, \Delta INFLA\tau - 1 + E\iota t$$ ----------EQ14

$$\Delta DCPS\tau = \alpha o\iota + b1NATS\tau + b21INFLA\tau - \iota + \sum_{\iota=1}^{p} \alpha 3\iota\, \Delta DCPS\tau - 1 \sum_{\iota=1}^{q} \alpha 2\iota\, \Delta INFLA\tau - 1 + E\iota t$$ ----------EQ15

If no Cointergration the short run model can be specified as

$$\Delta RINT\tau = \alpha o\iota + \sum_{\iota=1}^{P} \alpha 1\iota\, \Delta RINT\tau - 1 + \sum_{\iota=1}^{q} \alpha 2\iota\, \Delta INFLA\tau - 1 + \sum_{\iota=1}^{q} \alpha 3\iota\, \Delta NATS\tau - 1 + \sum_{\iota=1}^{q} \alpha 4\iota\, \Delta DCPS\tau - 1 + E\iota t$$ ----------EQ16

$$\Delta NATS\tau = \alpha o\iota \sum_{\iota=1}^{p} \alpha 3\iota\, \Delta NATS\tau - 1 \sum_{\iota=1}^{q} \alpha 2\iota\, \Delta INFLA\tau - 1 + E\iota t$$ ----------EQ17

$$\Delta DCPS\tau = \alpha o\iota \sum_{\iota=1}^{p} \alpha 3\iota\, \Delta DCPS\tau - 1 \sum_{\iota=1}^{q} \alpha 2\iota\, \Delta INFLA\tau - 1 + E\iota t$$ ----------EQ18

If there is cointergration, we can specify as follow adding the error correction model in it

$$\Delta RINT\tau = \alpha o\iota + \sum_{\iota=1}^{P} \alpha 1\iota\, \Delta RINT\tau - 1 + \sum_{\iota=1}^{q} \alpha 2\iota\, \Delta INFLA\tau - 1 + \sum_{\iota=1}^{q} \alpha 3\iota\, \Delta NATS\tau - 1 + \sum_{\iota=1}^{q} \alpha 4\iota\, \Delta DCPS\tau - 1 + \lambda ECT\tau - 1 + E\iota t$$ ----------EQ19

$$\Delta NATS\tau = \alpha o\iota \sum_{\iota=1}^{p} \alpha 3\iota\, \Delta NATS\tau - 1 \sum_{\iota=1}^{q} \alpha 2\iota\, \Delta INFLA\tau - 1 + \lambda ECT\tau - 1 + E\iota t$$--EQ20

$$\Delta DCPS\tau = \alpha o\iota \sum_{\iota=1}^{p} \alpha 3\iota\, \Delta DCPS\tau - 1 \sum_{\iota=1}^{q} \alpha 2\iota\, \Delta INFLA\tau - 1 + \lambda ECT\tau - 1 + E\iota t$$ ----EQ21

3.2.5 Economic and Econometric Model

Real interest rate = nominal interest rate − expected Inflation rate

Real interest rate = Inflation rate + National savings + Domestic credit

From the theoretical analysis above we can come up with a general econometric model to show the relationship between interest and inflation.

i: $\mathrm{RinT} = \alpha + \beta\mathrm{ININT} + \beta 2\mathrm{NFLA} + e$ ----------EQ23

ii: $\mathrm{DCPS} = \alpha + \beta 1\ \mathrm{INFL} + e$ ----------EQ24

iii: $\mathrm{NATS} = \alpha + \beta 1\ \mathrm{INFL} + e$ ----------EQ25

iv: $\mathrm{RINT} = \alpha + \beta 1\ \mathrm{INFL} + \beta 2\ \mathrm{NATS} + \beta 2\ \mathrm{DCPS} +$ ----------EQ26

From the economic equation and theoretical framework we formulated our economics model. The first (i) equation describes the fisher equation in simple terms. We explained how inflation affects the profit margin in a market where there is a positive correlation between real and false profits, but a negative correlation between inflation and real profits. The second and third parts describe how the volatility of the Fisher effect affects credit and capital markets. We from the theoretical framework we understand real interest covers for both savings and credit, it is the adjusted interest rate after inflation, so it has both parameters of inflation and nominal rate of interest. The slope coefficient will explain the how much is here effect and the sign of the slope coefficient will explain the direction of relationship.

CHAPTER 4
RESULTS AND DISCUSSION

4.1 Introduction

This part of the research work entails empirical results from all methods of analysis. First we have pre analysis test results, estimation results and post analysis test results, the pre analysis test result involves the traditional unit root test (ADF and PP) and the co integration test such as johansen and ARDL bound test. These two co integration test are used in different instances given the estimation method and techniques involve. To test for the full fisher effect we adopted the ordinary least square method of estimation while the ARDL estimation technique is used to uncover the link and causal effect of inflation on loanable fund market and to model the determinants of the real interest rate. The post analysis test is that which portrays the level of stability and specification of variables in the model. Such test involves the Ramsey reset, CUSUM and CUSUM of Square test. To make a good comparison between the cases we individually analyze for each country.

4.2 Analysis for CHINA

Table 5: ADF Unit Root

Variables	Levels	Prob. Value	1st diff	Prob. Value
DCPS	0.813878	0.9928	-4.833115	0.0005***
NinT	-1.183134	0.6698	-5.268689	0.0001***
NATS	0.784805	0.9922	-3.722886	0.0084***
RinT	-3.275128	0.0244***		
INF	-1.956902	0.0494*		

Intercept (***), None (*), Trend and Intercept (**)

Table 6: Phillips Perron Unit Root

Variables	Levels	Prob. Value	1st diff	Prob. Value
DCPS	3.627629	0.9998	-4.753265	0.0006***
NinT	-1.129098	0.6924	-6.457799	0.0000***
NatS	0.415669	0.9807	-3.654744	0.0100***
RinT	-3.322336	0.0218***		
INFL	-3.322336	0.0826*	-6.125607	0.0000***

Intercept (***), None (*), Trend and Intercept (**)

According to Cai (2018) another way of viewing the fisher evidence is by the stationarity test, before conducting the Quantile unit root Test the author confirmed stationarity with the standard ADF and PP for real interest rate. The results from Unit root test shows the integration levels of variables for both ADF and PP test are same. Real interest and inflation rate are integrated at order zero (0), or in other words have no unit root problems. Nominal interest National savings and domestic credit are all stable at first difference. Thus we have a mixture I(0) and I(1). From the theoretical analysis we can conclude that there is partial fisher hypothesis for the case of china; this is primarily because real interest rate is stationary.

Table 7: Johansen Co integration Test

Series: RinT, INFL,NinT

HNCE(s)	Trace Statistic	0.05CriticalValue	Prob. Value
None	48.79936	29.79707	0.0001***
At most 1	16.64607	15.49471	0.0334***
At most 2	1.057424	3.841466	0.3038

The co integration analysis between inflation, real and nominal interest rate will explain and support the verdict of the fisher hypothesis. Meanwhile the results of the co integration for all variables will help us choose a model for our estimation. As seen above in table 7, the result from the Johansen Cointergration test shows that at levels none all variables of the fisher hypothesis are co integrated. This suggests that there is a long run equilibrium relation amongst all variables and they can be used for long run analysis, estimation and predictions. Following our theoretical analysis it is right for us to say that given real interest rate is stationary or have no unit root problems and coupled with the result that inflation, real and nominal interest rate are co integrated, there is partial Fisher effect at this level.

With this set of co integration and unit root results together with the diagnostic results that will be shown below, we can comfortably conduct the estimation using the Ordinary Least Squares (OLS) Technique.

4.2.1 Testing the Fisher Hypothesis

In order to examine whether real interest and inflation move in opposite direction we adopt the OLS following (Jareño & Tolentino) and (Islam & Goyal, 2017)

$$\text{RinT} = 0.727179\text{NINT} - 0.591874\ \text{INFLA} \text{ ----------EQ27}$$

According to our theoretical framework, the Fisher Effects exist when the inflation rate, nominal interest rate, and real interest rate are cointegrated with a co integration vector under the premise of rational expectations (1,-1). To verify the complete fisher effect, we have tested practically in the regression above. When RinT and INF are co-integrated with the slope coefficient's absolute value of 1, the full Fisher Effects are still valid. From the estimate in table 8, we observe that the slope coefficient is 0.6 which is closer to one. This means that, there is evidence of full Fisher effect in China. From the result in table 8, the estimation confirms that there is a negative significant relationship between inflation and the real interest rate. This means lenders will be hurts as the rate of inflation continues to goes up, the purchasing power of the lending will fall this is line with the traditional consequences of inflation. In magnitude, the estimate suggests that, ceteris paribus, lenders purchasing power will fall by approx 0.6% if inflation increases by 1%. The positive link between the nominal interest and the real interest is equally confirmed by our estimate, this means that lenders will feel better of as the nominal terms on loans increases. That is if the price they will charge on loan on paperwork is high, it will improve their purchasing power and conver them when inflation hit within the given threshold. Kindly remember that the nominal interest is what is been seen on the paperwork of any lending transaction, so this means that lender will feel more better in real terms if the interest rate on the paperwork increases. Increases in the interest rate by nominal term are another way of securing for the unexpected rate of inflation in the future.

4.2.2 Impact of Inflation on Supply and demand of Loanable fund

Taking national saving and domestic credit as the dependent variable we estimate another regression model to aid our understanding the direct of inflation in the loanable market. Because we could not find any uniform long run relationship between inflation, domestic credit and national savings we limited our estimation for the short run and try to make comparison. Taking National savings and domestic credit as the explained variable we investigate the relationship between the supply/ demand of loanable funds and inflation rate. Given the level of integration of National savings, inflation rate and interest rates (mixture of I(0) and I(1)) it is best for us to estimate using the Auto regression distribution Lag. The ARDL results in primarily shows the short run estimate, given the that variable across the sample are not uniformly co integrated in the long run, we limit our estimation only in the short run as seen in table 9 and 10.

In Basic econometric, the slope or coefficient of the regression tells how much the dependent variable will change if the independent variable increase by a unit or %. The results from table 9 above show a typical example of a semi-log econometric model for the short run estimate mean while from table 10 we witness a typical example of an elasticity model. The sign of the variables in the regression somehow confirms to the macroeconomics theory and similar to the results of (Odhiambo 2012). No doubt inflation above a particular threshold has negative or positive impact on the demand and supply of loanable funds. In short run the level of national savings and domestic credit are hurt by the inflation level. Saving is a function of disposable income and consumption. It is general accepted that the main determinant of consumption is price, so increase in the price level will reduce private disposable income and as a multiplier effect will greatly reduce the marginal propensity to save. Thus this will cause a drop in the savings recorded both from the private and public sector of the economy. The estimation claims that, from the given observe period domestic credit will fall by 0.73% if inflation rises by 1% ceteris paribus. We can argue this through the lending rate policy; this means actual or expected inflation rate is positively related to the banking lending rate. As inflation rise the bank will increase the lending rate because this policy will act as protections for them to secure a favourable real terms in the future. So this policy of increase lending rate will discourage borrowers because the cost of price of loan will go up. This is in line with the traditional theory of economic that as prices increases demand

will fall. Thus increase in inflation reduces demand for loan as explained via the lending rate. In our third model, we investigate the impact of inflation on the savings rate.

According to our calculations, the national savings rate and inflation are related. When national income is taken into account, it is implied that inflation will lower real income as well as overall income. Income and consumption levels influence savings. Both the price level and the level of income have a significant impact on the marginal consumption rate. As a result, rising inflation or rising consumption lowers the amount of income left over after consumption, which lowers the saving rate.

Table 9: Short run ARDL

Dependent V: Nats Selected Model: ARDL (1, 1)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INF	-1.08E09	3.80E09	-0.284561	0.7779
C	7.09E10	4.22E10	1.678268	0.1037

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Table 10: Short run ARDL

Dependent V: DCPS Selected Model: ARDL (1, 1)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INF	-0.739315	0.249232	-2.966373	0.0060
C	1.911942	7.098936	0.269328	0.7896

$DCPS = 1.911942 - 0.739315INFL$ ----------EQ28

$NatS = 7.09\text{E}10 - 1.08\text{E}09INFL$ ----------EQ29

4.2.3 Link between Real interest Rates, Domestic credit and National savings

Following the research of (Ibenyenwa, Clem, S, & Stanley, 2020) and (Odhiambo 2012) we estimate the link between partial fisher effect, McKinnon and Shaw hypothesis and the global Saving Glut hypothesis in the capital market structure using the ARDL model. Our research differs from that of others because we capture all three hypotheses in one econometric equation

It is best for us to estimate using the Auto regression distribution Lag given the level of integration of all variables (combination of I(0) and I(1)). The short run estimate is principally shown by the ARDL in tables 9 and 12, but if co-integration of the variables is shown using the bound test, it is authorized for us to estimate the long run estimate using the error correction model (ECM). Table 11's F statistics are higher than the I(0) AND I(1) constraint. In other words, the variables can be utilized to estimate and anticipate long- and short-run equilibrium relationships, which validate the co-integration between variables taken into consideration. The outcome of the error-correcting term demonstrates that the return toto long run equilibrium is at the speed of 0.010228%

Table 11: Bound Test

Test Statistic	Value	Signif.	I(0)	I(1)
F-statistic	8.628184	10%	2.37	3.2
K	3	5%	2.79	3.67
		2.5%	3.15	4.08
		1%	3.65	4.66

Our fourth model captures the partial fisher effect, the McKinnon and Shaw and hypothesis and the Global Saving Glut hypothesis. From our theoretical framework, we understand that the relationship between credit growth and the real interest rate is due to McKinnon and Shaw's rate liberalization, and capital market imbalances are caused by excessive bailouts. In the short run, our calculations show that borrowers will suffer more when inflation raises, a negative relationship between real interest rates and inflation. From the above short-term calculation (Table 12), the calculation correctly states that a lower real interest rate is associated with a higher savings rate. For the case of China economy which clearly limits the out flow of capital, the investment opportunity in the country will attract a lot of capital inflow in the form

saving. There will rightward shift of the curve and reduce the real interest rate. Again we can equally argue this from the receiver of funds view. In this view bank or financial house will make or gain less if they have much savings that is much interest on savings. The results we found in the short run pertaining to the GSG hypothesis is in line with the review of (Crews, Kliesen, & Waller, 2016). In an attempt to support the argument on financial liberalization, the results claim that the is a positive relationship between the actual interest rate after inflation and domestic credit contradicting the traditional view between credit and real interest, This result is in line with Lugo (2003) Based on his findings, which defy the conventional wisdom that private investment and real interest rates have a negative connection, real interest rates have a net positive impact on private investment.

However, the research on financial liberalization supports higher interest rates due to what was seen in developing economies at the time, and it was possible that there would be a negative correlation between investment and interest rates. Based on the argument the real interest is not the interest that is charge on loan, the nominal rate is that which the bank put on the paperwork of every loan transaction, after inflation what the banks or lenders gets is the real interest, so we can again argue that what the bank or lender is left with as profit should be positively related with magnitude of credit given out. In the long run we found out that increase saving will no longer hurt the real interest rate, given the availability of investment opportunities, excess savings will be competed by investment. So as inflow of savings become move, so as investment will increase thus the lender of funds or of the bank will have no worries about their intrinsic terms.

Table 12: Short run ARDL and ECM

Dependent V: RinT Selected Model: ARDL (1, 1, 1, 1)

Variable	Coefficient	Std. Error	t-Statistic	Prob. Value
D(INF)	-0.484971	0.055803	-8.690793	0.0000
D(NATS)	-7.74E-12	1.85E-12	-4.184597	0.0003
D(DCPS)	0.053237	0.036010	1.478370	0.1518
CointEq(-1)*	-0.801408	0.113287	-7.074141	0.0000

Table 13: long run ARDL

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
INF	-0.359471	0.090747	-3.961223	0.0005
NATS	7.88E-13	9.28E-13	0.848913	0.4040
DCPS	-0.049222	0.038809	-1.268295	0.2164
C	8.913475	4.048436	2.201708	0.0371

$RINT = -0.484971\text{INF} - 7.74\text{E}12NATS + 0.053237DCPS$ ----------EQ30

$RINT = -0.359471\text{INF} + 7.88\text{E}13NATS - 0.049222DCPS$ ----------EQ31

4.2.4 Diagnostic Test

From the assumptions of multiple regressions we know that a good regression analysis most be free from autocorrelation or serial correlation, free from heteroskedasticity that is variables must be homoskedastic, errors must be evenly distributed that's whether it's a normal distribution or not, there must be linear and variables from the model must be stable. Firstly the concept of linear or the assumption of linearity says that the equation or model most is linear in parameters that are the relationship between the explained and the explanatory variables must be seen and given by a linear parameter or coefficient. Secondly there should be zero conditional mean that is the expected value of a regressor and the error term must be zero. For variables to be homoskedastic we mean the variance of the error term with respect to the regressor must be fixed. Just like in any other scientific Research, it is vital to conduct a diagnostic test.

For this econometric analysis this tests are to screen or detect the behavior of the variables used in the analysis. The LM rest is used to detect if variables are serially correlated, Breusch Pegan Godfrey test is used to screen for Hetoroskedasticity, the Ramsey Rest test is used to detect if variables are linear or specified well and the variance inflation factor is used to test for multicolineariy. As from our results, we observe that the Prob. Values of the diagnostics is greater than the 5% significant level thus we can accept the null hypothesis. As a result we can say that, variables are NOT serially correlated, variables are Homoskedastic (NO heteroskedasticity) and there is linearity pattern with variables or variables are well specified. For the multicollinearity Test, given that the centered VIF is less than 5 or

between 1 and 5, we conclude that, there is no multicollinearity. The conclusion of the analysis for china confirms that variables used for the analysis are stable over the observed period. From the CUSUM and CUSUM of square diagram in figure 5 and 6, we can confirm that the blue line is in-between the two red lines.

Table 14: Diagnostic Test

Test	T-stats or F stats	Prob. value
Serial correlation LM test	0.298094	0.5246
Heteroskedasticity Test: Breusch-Pagan-Godfrey	3.548029	0.3146
Ramsey RESET Test	0.173571	0.6800

Table 15: Variance inflation Factor

Variable	Centered Variance Inflation factor
NATS	4.797779
INF	1.563064
DCPS	5.940030
C	NA

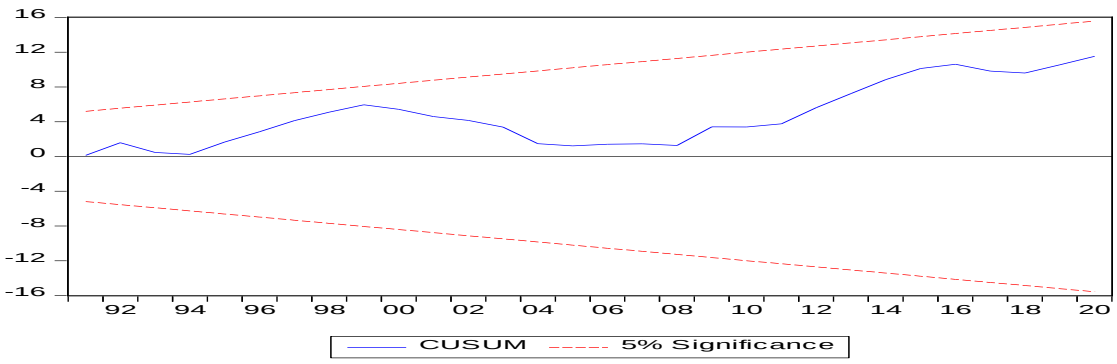

Figure 5 CUSUM Test

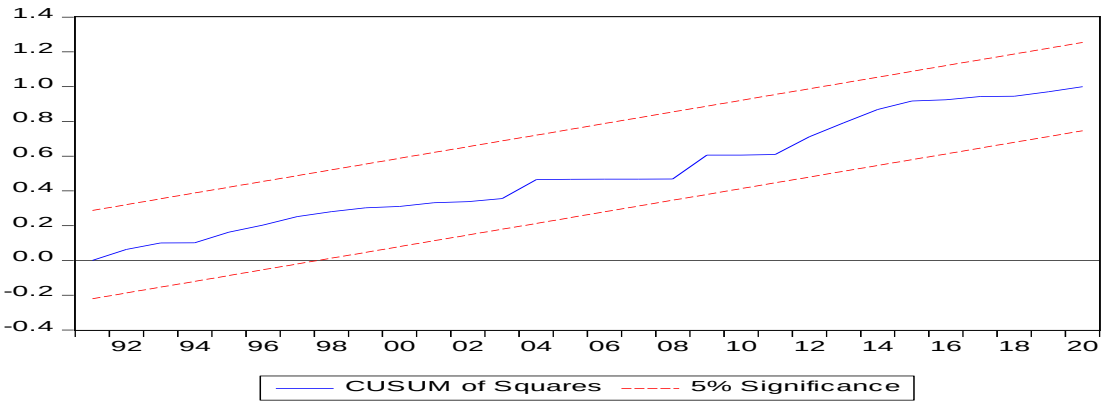

Figure 6 CUSUM of square Test

4.3 FOR THE CASE OF USA

Table 16: Augmented Dickey fuller Unit root Test

Variables	Levels	Prob. Value	1st diff	Prob. Value
DCPS	-0.738806	0.8229	-5.131245	0.0019***
RinT	-3.582826	0.0474**	-3.969781	0.0045***
NinT	-5.398736	0.0006**	-5.124770	0.0006***
INFL	-4.254079	0.0102**		
NatS	-3.026935	0.0430**	-3.402336	0.0183***

Intercept (***), None (*), Trend and Intercept (**)

Table 17: Phillips Perrons Unit root test

Variables	Levels	Prob. Value	1st diff	Prob. Value
DCPS	-0.710786	0.8303	-5.276953	0.0001***
RinT	-1.727224	0.4087	-3.674931	0.0095***
NinT	-1.217794	0.6548	-4.474575	0.0012***
INFL	-4.131110	0.0137**		
NatS	-2.202781	0.2091	-2.970680	0.0042*

Intercept (***), None (*), Trend and Intercept (**)

Following from explanations from the analysis of China the results from Unit root test shows the integration levels of variables for both ADF and PP test are same. Inflation rate are integrated at order zero (0), or in other words have no unit root problems. All other variables are integrated at first differences (1).

Table 18: Johansen Cointergration Test

Series: RinT, INFL and NinT

Hypothesized No. of CE(s)	Trace Statistic	0.05 Critical Value	Prob.**
None *	36.24151	29.79707	0.0079
At most 1	14.89986	15.49471	0.0613
At most 2	3.505706	3.841466	0.0612

Just as conducted for the case of China, the result from the Johansen Cointergration test for USA shows that at levels none, variables of the fisher hypothesis are co integrated. This means there is a long run relationship between all variables and they can be used for long run analysis, estimation and predictions. Following our theoretical analysis it is right for us to say that given real interest rate is stationary and coupled with the result that, inflation, real and nominal interest rate are co integrated, there is partial Fisher effect at this level. To confirm if there is full fisher effect for USA it is vital to conduct and estimate in a regression. This will help us to know the magnitude of the slope coefficient of inflation.

4.3.1 Testing the Fisher Hypothesis

In order to examine whether real interest and inflation move in opposite direction we adopt the OLS following (Jareño & Tolentino) and (Islam & Goyal, 2017)

$RinT = 0.982683\text{Nint} - 0.611248INFLA$ ----------EQ31

Drawing from the theoretical framework we said that, under the assumption of rational expectations, the Fisher Effects exist when the inflation rate, nominal and real interest rate are co integrated with co integration vector (1,-1). However, we have practically tested in above the regression to confirm the full fisher effect. Here, the full Fisher Effects hold when ***RinT*** and ***Π*** are co integrated with the absolute value of the slope coefficient ***β***=1. From the estimate we observe that the slope coefficient is 0.6 which is closer to one. This means that, there is evidence of full Fisher effect in China. From the result in table 8, the estimation confirms that there is a negative significant relationship between inflation and the real interest rate. This means lenders will be hurts as the rate of inflation continues to goes up, the purchasing power of the lending will fall this is line with the traditional consequences of inflation. In magnitude, the estimate suggests that, ceteris paribus, lenders purchasing power will fall by approx 0.6% if inflation increases by 1%. The positive link between the nominal interest and the real interest is equally confirmed by our estimate, this means that lenders will feel better of as the nominal terms on loans increases. Kindly remember that the nominal interest is what is been seen on

the paperwork of any lending transaction, so this means that lender will feel more better in real terms if the interest rate on the paperwork increases. Increases in the interest rate by nominal term are another way of securing for the unexpected rate of inflation in the future. In comparison, we can say that the magnitude of change that will occur in the real interest rate as a result of changes in inflation will be approx 0.6% for both countries. Meaning the movement between inflation and interest rate is almost in the same direction for the case of China and USA.

4.3.2 Impact of Inflation on Supply and demand of Loanable fund

Taking national saving and domestic credit as the dependent variable we estimate another regression model to aid our understanding the direct of inflation in the loanable market. Because we could not find any uniform long run relationship between inflation, domestic credit and national savings we limited our estimation for the short run and try to make comparison

Table 20: Short run ARDL

Dependent V: Nats Selected Model: ARDL (1, 1)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INF	1.65E+10	2.76E+10	0.597259	0.5550
C	1.51E+11	8.99E+10	1.678868	0.1039

Table 21: Short run ARDL

Dependent V: DCPS Selected Model: ARDL (1, 1)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INF	-2.632875	1.474743	-1.785310	0.0843
C	24.88943	12.06761	2.062498	0.0479

$DCPS = 5.579483 - 2.632875INFL$ ----------EQ32

$NatS = 1.51E11 + 1.65E10INFL$ ----------EQ33

Taking National savings and domestic credit as the explained variable we investigate the relationship between the supply/ demand of loanable funds and inflation rate.

Given the level of integration of National savings, inflation rate and interest rates (mixture of I(0) and I(1)) it is best for us to estimate using the Auto regression distribution Lag. The ARDL results in primarily shows the short run estimate, given the that variable across the sample are not uniformly co integrated in the long run, we limit our estimation only in the short run as seen in table 9 and 10.

In Basic econometric, the slope or coefficient of the regression tells how much the dependent variable will change if the independent variable increase by a unit or %. The results from table 23above show a typical example of a semi-log econometric model for the short run estimate mean while from table 24 we witness a typical example of an elasticity model. No doubt inflation above a particular threshold has negative or positive impact on the demand and supply of loanable funds. In short run the level of national savings is not hurt by the inflation level. This is contrary with the economic view that Saving is a function of disposable income and consumption., It is general accepted that the main determinant of consumption is price, so increase in the price level will reduce private disposable income and as a multiplier effect will greatly reduce the marginal propensity to save. Thus this will cause a drop in the savings recorded both from the private and public sector of the economy.. The reason for such a contrary results might be linked to the money illusion concept. This simply means citizens have the tendency to view their wealth in the nominal cash they hold and not in the real or intrinsic terms. That is people in the economy will not consider the fact that inflation will affect their purchasing power. They don't care about inflation, they view that if for example they have $1000 their real wealth is expressed in what they nominally have and not with what the $1000 can buy.

4.3.3 Link between Real interest Rates, Domestic credit and National savings

Following the research of (Ibenyenwa, Clem, S, & Stanley, 2020) and (Odhiambo 2012) we estimate the link between partial fisher effect, McKinnon and Shaw hypothesis and the global Saving Glut hypothesis in the capital market structure using the ARDL model. Our research differs from that of others because we capture all three hypotheses in one econometric equation

It is best for us to estimate using the Auto regression distribution Lag given the level of integration of all variables (combination of I(0) and I(1)). The short run estimate is principally shown by the ARDL in tables 9 and 12, but if co-integration

of the variables is shown using the bound test, it is authorized for us to estimate the long run estimate using the error correction model (ECM). Table 11's F statistics are higher than the I(0) AND I(1) constraint. In other words, the variables can be utilized to estimate and anticipate long- and short-run equilibrium relationships, which validate the co-integration between variables taken into consideration. The outcome of the error-correcting term demonstrates that the return to long run equilibrium is at the speed of 0.006286%

Table 22: Bound Test

Test Statistic	Value	Signif.	I(0)	I(1)
F-statistic	3.860002	10%	2.37	3.2
K	3	5%	2.79	3.67
		2.5%	3.15	4.08
		1%	3.65	4.66

Our fourth model captures the partial fisher effect, the McKinnon and Shaw and hypothesis and the Global Saving Glut hypothesis. From our theoretical framework we understand the relation between credit growth and the rate of real interest is explained by the interest rate liberalization of McKinnon and Shaw, disequilibrium in the capital market is explained by the Global saving glut. In the short run, our estimate claims that the lenders will be significant hurt as inflation goes up that is a significant negative relationship between real interest and the inflation rate. From the above estimate in short run (table 23) and long run (table 24) the estimate equally confirms that low real interest is significantly associated with excess savings in the long run. For the case of USA economy the investment opportunity in the country will attract a lot of capital inflow in the form saving. This will traditional shift the curve to the right and reduce the real interest rate. Again we can equally argue this from the receiver of funds view. In this view bank or financial house will make or gain less if they have much savings that is much interest on savings. The results we found in the short pertaining to the GSG hypothesis is in line with the review of (Crews, Kliesen, & Waller, 2016). In an attempt to support the argument on financial liberalization, the results claim that in the short run, there is a positive relationship between the actual interest rate after inflation and domestic credit contradicting the traditional view between credit and real interest, This result is in line with Lugo

(2003) Based on his findings, which defy the conventional wisdom that private investment and real interest rates have a negative connection, real interest rates have a net positive impact on private investment.

However, the research on financial liberalization supports higher interest rates due to what was seen in developing economies at the time, and it was possible that there would be a negative correlation between investment and interest rates but however this results are quite different in the long run because the cahracteristics of the US economy is different from that of the developimg economies . Based on the negative relationship between credit growth and the real interest rate in the long run, we can argue that in the long run most individual take bank credit to finish household consumption and not long-term investment so the substitution of household consumption over long term investment will reduce the level of investment in the economy and those the real interest rate will fall. This means lower investment will shift the marginal efficiency of capital curve (investment curve) backward and thus reduce the real interest rate. This is still line with the Global saving glut framework

Table 23: Short run ARDL

Dependent V: RinT Selected Model: ARDL (1, 1, 1, 1)

Variable	Coefficient	Std. Error	t-Statistic	Prob. Value
D(INF)	-0.006286	0.134637	-0.046686	0.9633
D(DCPS)	0.017870	0.014466	1.235294	0.2326
D(NATS)	9.95E-13	9.28E-13	1.072020	0.2979
CointEq(-1)*	-0.500864	0.103126	-4.856841	0.0001

Table 24: long run ARDL

Dependent V: RinT Selected Model: ARDL (1, 1, 1, 1)

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
INF	-0.428080	0.453567	-0.943807	0.3578
DCPS	-0.036702	0.013086	-2.804662	0.0117
NATS	-2.20E-12	1.68E-12	-1.309245	0.2069
C	10.23978	2.885537	3.548656	0.0023

$$RINT = -0.006286\text{INF} + 9.95\text{E}13NATS + 0.017870DCPS \text{ ----------EQ34}$$

$$RINT = -0.428080\text{INF} - 2.20\text{E}12NATS - 0.036702DCPS \text{ ----------EQ34}$$

4.3.4 Diagnostic Test

From the assumptions of multiple regressions we know that a good regression analysis most be free from autocorrelation or serial correlation, free from heteroskedasticity that is variables must be homoskedastic, errors must be evenly distributed that's whether it's a normal distribution or not, there must be linear and variables from the model must be stable. Firstly the concept of linear or the assumption of linearity says that the equation or model most is linear in parameter that is the relationship between the explained and the explanatory variables must be seen and given by a linear parameter or coefficient. Secondly there should be zero conditional mean that is the expected value of a regressor and the error term must be zero. For variables to be homoskedastic we mean the variance of the error term with respect to the regressor must be fixed. As from our results in Table 27 and 28, we observe that the Prob. Values of the diagnostics is greater than the 5% for Heteroskedasticity Test and Serial correlation thus we can accept the null hypothesis. As a result we can say that, variables are NOT serially correlated, variables are Homoskedastic (NO heteroskedasticity). Ramsey reset is a test for stability diagnostic, it tells us if variable in the regression are well specified or stable. For this case we can reject the null hypothesis thus variables are not well specified. For the multicollinearity Test, the results shows that the variables of real and nominal interest rate causes multicollinearity, this is because the CVIF is greater than 5. For the multicollinearity Test, given that the centered VIF is less than 5 or between 1 and 5, we conclude that, there is no multicollinearity. The conclusion of the analysis for china confirms that variables used for the analysis are stable over the observed period. From the CUSUM and CUSUM of square diagram in figure 7 and 8, we can confirm that the blue line is in-between the two red lines.

Table 25: Diagnostic Test

Test	T-stats or F stats	Prob. value
Serial correlation LM test	1.916305	0.3836
Heteroskedasticity Test: Breusch-Pagan-Godfrey	5.785069	0.8873
Ramsey RESET Test	1.627585	0.2192

Table 26: Multicollinearity Test

Variable	Centered Variance Inflation factor
INF	1.509035
NATS	1.064049
DCPS	1.542255
C	NA

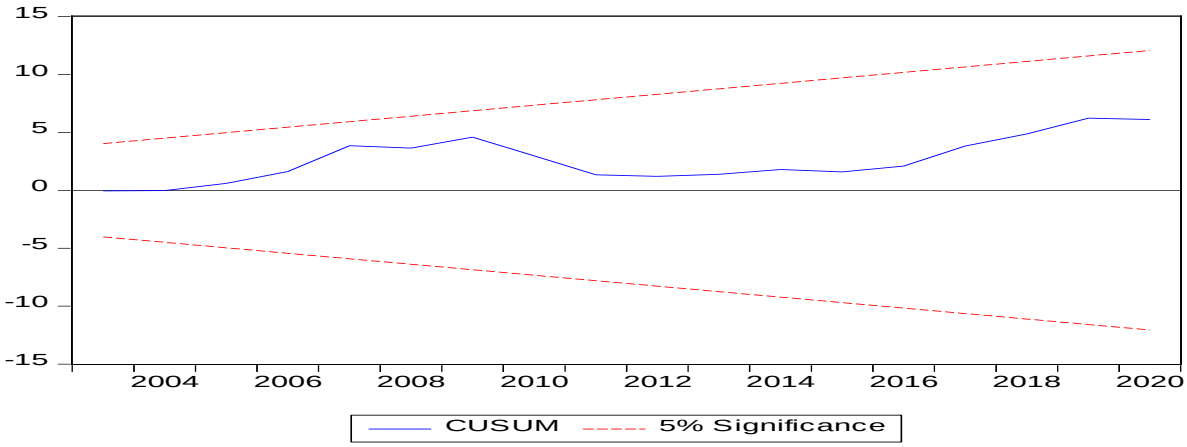

Figure 7: Cusum Test

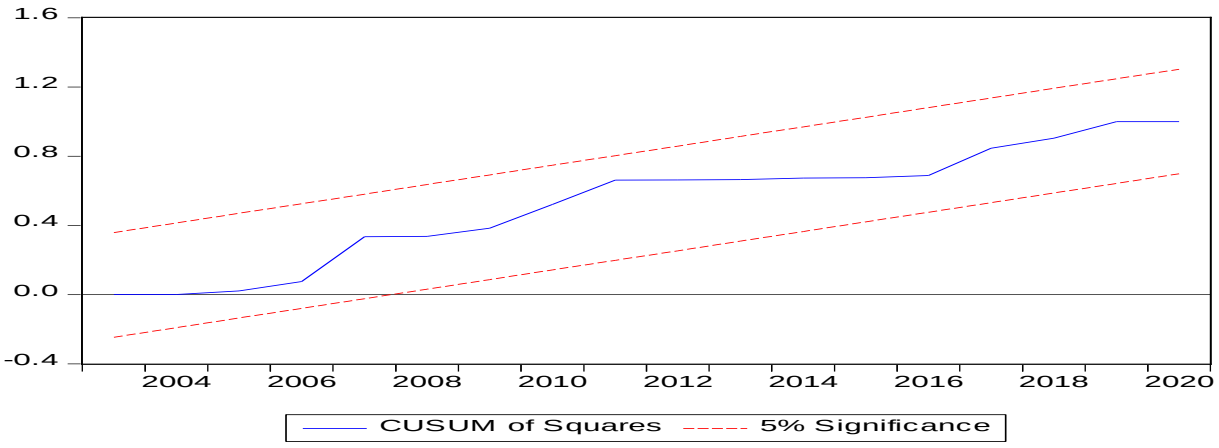

Figure 8: CUSUM of Square Test

CHAPTER 5
CONCLUSION and RECCOMENDATIONS

5.1 Summary

In every financial transaction financial houses must avoid to be losers, in every function of the bank from accepting deposit to granting loans, the bank but be able to implement some sort of measure for them to be secure in the long run. Granting loans without taken in consideration what will be expected as inflation is a bad practice, every financial must have a prime rate and add up what they would expect to be the inflation, this will go a long way in securing the bank profit making objectives. First we start by finding the evidence of the fisher effect, the second and third model estimated the effect of inflation on both credit growth and savings levels for each sample the we concluded by capturing partial effect, Global saving Glut and the McKinnon and Shaw hypothesis. This study comes in to looks into whether USA and China support the Fisher hypothesis in other words if financial houses are wise enough. This idea is based on the historical movement of real interest rates and inflation as well as the long-term relationship between nominal and expected prices. Any change in inflation is likely to be reflected in a change in nominal value because this is a politically significant issue. Otherwise, the real interest rate is unaffected by monetary policy. Financial fraud is indicated if the Fisher estimate is inaccurate or the ratio is less than 1. This means people to consider their wealth as the current value of asset and money NOT as the real value when inflation has been adjusted. Using accessible data set from the World development Index the study primarily implemented fully econometric analysis such as unit root, co integration regression model and estimation together with diagnostic test.

This study studies and examines whether there is evidence of the fisher effect in the US and Chinese economies. It is based on the macroeconomics premise that the real interest rate is equal to the nominal interest rate minus inflation. Using time series data and econometric analysis for each country, the results portray distinct evidences from each country. Observing data or variables such as Nominal interest, real interest, inflation between 1987 -2020, the results from the ADF, PP Unit root and Johansen co integration test, made it possible for the adoption of the ARDL, ECM, Bound Test, OLS as methods and estimation techniques. The outcomes from the co integration and integration analysis confirmed evidence of partial fisher effect for both countries that are real interest rate, Inflation and nominal interest have a long

run equilibrium relationship and real interest is stationary. In an attempt to test for full fisher effect or if inflation negatively affects real interest on a 1-1 basis, the OLS method is used to estimate the parameter. For both the US and China, using real interest as the explained variable, the results confirmed evidence of negative relationship between inflation and real interest rate thus full fisher effect. In a bid to capture the linkage between variables of the real Interest rate, domestic credit and savings the outcome confirmed from the ARDL estimation suggest that are full evidences of the McKinnon and Shaw hypothesis and that of the Global saving glut hypothesis for both sample

The primordial step for every analysis is to find out whether or not variables used for the study are stationary and co integrated. From the results is it shown that for each country case, all variables are stationary and co integrated? The results from the Phillips Perrons, Dickey fuller unit root and Johansen co integration make it possible for the adoption of three models as regression estimate. Taken China as the first case the real interest is seen to be stationary at levels, this is a good sign to confirm there is partial level of the fisher hypothesis (Cai, 2018.). Positive correlation between nominal interest rate and inflation, as well as cointegration of inflation, real interest rates, and nominal interest rates, are additional findings demonstrating China's partial Fisher effect. However, the results of least squares line regression for China showed that the hunter-gatherer lifestyle was complete. When the nominal interest rate and inflation both rise by 1%, the real interest rate will decrease in the case of inflation and rise in the case of the nominal interest rate, according to the sign of the regression coefficients. Approximately the same demonstrating the entire Fisher effect, from the estimate we observe that the slope coefficient is 0.6 which is closer to one. This means that, there is evidence of full Fisher effect in China. From the result in table 8, the estimation confirms that there is a negative significant relationship between inflation and the real interest rate. This means lenders will be hurts as the rate of inflation continues to goes up, the purchasing power of the lending will fall this is line with the traditional consequences of inflation. In magnitude, the estimate suggests that, ceteris paribus, lenders purchasing power will fall by approx 0.6% if inflation increases by 1%. The positive link between the nominal interest and the real interest is equally confirmed by our estimate, this means that lenders will feel better of as the nominal terms on loans increases. Kindly remember that the nominal interest is what is been seen on

the paperwork of any lending transaction, so this means that lender will feel more better in real terms if the interest rate on the paperwork increases. Increases in the interest rate by nominal term are another way of securing for the unexpected rate of inflation in the future.

To test for the linkage of inflation, supply and demand of loan funds or the development in the financial department of china the result of the stationarity test only made it possible for the adoption of ARDL long run bond test. At the significant levels of 5% the results confirmed no co integration between all variables thus we estimated just the short run effect of inflation on credit growth and the savings level. Taking inflation rate as a function of domestic credit and saving levels, the short run results from the regression claims that the bank rate on loans and saving levels are inversely rated to the rate of inflation. In an attempt to capture framework of partial fisher effect, McKinnon and Shaw together with the Global saving glut effect we discovered that our result are somehow in line with all this economic theories.

Just like the case of China, the first step to analyze data in for the case of USA is to find out whether or not variables used for the study are stationary and co integrated. From the results is it shown that for each country case, all variables are stationary and co integrated? The results from the Phillips Perrons, Dickey fuller unit root and Johansen co integration make it possible for the adoption of three models as regression estimate. The real interest is seen to be stationary at first order this confirm there is partial level of the fisher hypothesis (Cai, 2018.). Another outcome showing the partial fisher effect for the case of USA is; the co integration of inflation, real and nominal rate of interest. For USA full fisher was confirmed from the results of the OLS regression. Considering the real interest rate as the regressand, the slope coefficient of inflation moves in opposite direction with the real interest, demand and supply of loan funds the result of the stationarity and bound test made it possible for the adoption of ARDL model and method of estimation for short run. However we when taken the supply of loanable fund and credit growth as dependent variables the result from the ARDL bound test could not confirm long run relationship within variables in the model. The results from the estimator claims that everything remains constant domestic credit from banks will fall if inflation rises by in the short run. These results for USA are in not line with the result of (K.A, D, & B., 2017) for South Africa In an attempt to debate the financial liberalization; the results assert a short-term positive relationship between real lending after inflation

and the value of the house, which is contrary to the norm. The real difference is that this happened on the battlefield. Lugo (2003) According to his research, which contradicts the conventional wisdom that private money and real interests have a negative effect, the real interest rate has a positive effect on private investment. However, the research on financial aid liberalization is of great interest because of what was seen in developing economies at that time, and it is possible that a negative relationship between investment and money is made. due to the fact that the US economy differs from that of industrialized nations. Since bank loans are used to support household spending more frequently than long-term investments, it can be assumed that both the amount of investment in the economy and the real interest rate will rise. This implies that a decrease in investment will result in a decrease in investment utilization and a decrease in the real interest rate. It fits with the idea of having the biggest collection in the world.

Table 27: Comparison

Models	USA Results	China Results
Fisher Effect	Evidence of Fisher Effect	Evidence of Fisher Effect
Impact of Inflation on Supply of Loanable funds(SR)	+ inflation	- Inflation
Impact of inflation on demand of Loanable funds(SR)	-Inflation	-Inflation
McKinnon and Shaw	Only applicable in the short term	Only applicable in the short term
Global Saving Glut	Only applicable in the long term	Only applicable in the short term

It is observed that we found evidence of the fisher effect for both countries, this means that inflation and real interest rate will move in opposite direction, nominal interest rate and real interest rate will move in the same direction. To confirm the impact inflation will have in the loanable fund market, we observe that inflation will have a significant negative impact on the demand for loan for both countries. This

means that investment will reduce as the marginal rate of inflation rise, people will be discourage to take loans as the rate of inflation increases. On the supply side of loan, different results were discovered for both countries. While it is observe that inflation will deteriorate the level of savings in China, contrary views are observed of the case of USA. In China the results confirms that as the rate of inflation increase, the level of savings will drop, higher price will compete away greater part of actual income and disposal income personal savings will be hurt. But for the case of USA, inflation does not necessary negatively affects savings; this is in line with the concept of money illusion. Except for the contrary views found for the case of USA (money illusion) the results are in line with the work of (Premik & Stanisławska, 2017), (Panhwar, Channar, & Ali, 2016), (Boyd, Levine, & Smith, 2001), (Odhiambo, 2012)

Money and physical capital are fundamentally complementary, according to McKinnon. In other words, financial stability and material investments are complimentary, not interchangeable. According to the McKinnon-Shaw model, raising real interest rates will encourage savings and investment while fostering economic growth through credit growth. From the results we confirm that the McKinnon and Shaw Hypothesis is valid only in the short run for both countries, but in the long run the results support the argument of the neo structuralism(real interest liberalization will not improve investment) . However, the basis of the hypothesis is true only for developing nations and in the short run we confirm the McKinnon and Shaw Hypothesis while in the long run the results that of the neo structuralism views. This is true because the critiques of the McKinnon and Shaw Effect by the Neo Structuralism view which examines the consequences of incorporating unregulated credit markets into the original MacKinnon-Shaw models and discovers that interest rate liberalization may have the opposite effect from what was expected, rather than promoting output growth. The short run and long run results are in line with (Maswana, 2004) and (Kilindo, 2002)

5.3 Recommendations

From the outcome of NO full fisher effect evidence for the case USA, it is vital for financial institution to continue the implementation of the adjustable rate of interest on credit, loans and mortgage. Variable-rate mortgages (VRMs) commonly referred to as adjustable-rate mortgages (ARMs), feature an interest rate that may

fluctuate on a regular basis based on changes in the appropriate financial index linked to the loan. Generally speaking, if the index rate rises or falls, your monthly payments will too. The length of the interest rate's fixed period and the frequency of subsequent interest rate adjustments are typically used to identify ARM loans. In a 5y/6m ARM, for instance, the 5y represents the initial 5-year period during which the interest rate is set and the 6m indicates that the interest rate is subject to adjustment going forward once every six months.

The central and federal Government should continue and enforce the interest rate stabilization policy. The government or the central bank can implement a stabilization policy to ensure sustainable economic growth with low price fluctuations. It is necessary to monitor the business cycle and make the necessary adjustments in fiscal and monetary policy to adjust to changes in demand or supply in order to maintain policy stability. Within the framework of the IS-LM, high interest rate caused by money supply shocks can be adjusted with a government fiscal policy. The two main government fiscal policies are that of tax and government spending. To solve higher interest rate caused by shocks from money supply the movement should reduce government spending. In this case national savings will increase.

For the U.S. federal government, passing the 2022 stimulus package is an important way to stabilize the economy. The IRA 2022 is a major federal law in the United States that seeks to reduce drug costs, reduce budget deficits, increase domestic energy production, and support renewable energy sources to reduce inflation. It also approves $738 billion in savings and $391 billion in energy and climate change spending, $238 billion in deficit reduction, three years of support for the Affordable Care Act, lower drug costs and tax reform. The government needs to implement credit policy when domestic credit may not respond appropriately to the economy due to credit risk and default. A credit policy is a set of rules that governs how your business extends credit to consumers and collects delinquent accounts. If you bill a customer for services and start the business before the customer pays you, you are legally working on credit even if you don't have a formal credit policy.

In an attempt to mitigate the rates of interest on loans we recommend that the government of both countries should do as follows; When making changes to current loan agreements, lenders offer borrowers comparable payment schedules in accordance with the decision on the effective interest rate of banks and credit unions,

service agreements with borrowers, and the outcomes of simulations in accordance with the decision on the information that consumers should be given before engaging in a banking transaction. In order for consumers to clearly understand the introduced change in their contractual obligations, the terms of the existing credit agreement and the terms providing for the change of the agreement should be applied in accordance with the points of this Recommendation. The value of the mortgaged property is determined on the basis of the last assessment they made in accordance with the decision to classify deposits and off-balance sheet operations, without calculating and charging consumers commissions related to the modification. For existing credit agreements or any other fees related to the modification of the contractual relationship, such as early payment fees. They produce or expand the offer of loans with a fixed rate in order to make it more feasible to hedging interest risks for these loans and to guarantee that there is no penalty for early repayment of the loan when contracts for such loans are reached.

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APPENDIX
Tables from EVIEWS

FOR CHINA

	DCPS_CHN	INF_CHN	NINT_CHN	RINT_CHN	NATS_CHN
Mean	115.2340	4.967043	6.871765	1.899035	1.11E+12
Median	110.7532	2.703758	5.925000	2.669195	5.47E+11
Maximum	182.8681	24.25699	12.06000	7.356478	2.85E+12
Minimum	73.98362	-1.401473	4.350000	-7.989744	7.48E+10
Std. Dev.	27.91360	6.259950	2.283199	3.311078	1.06E+12
Skewness	0.552687	1.682441	0.825527	-0.747755	0.496082
Kurtosis	2.551831	4.907839	2.491971	3.753147	1.515261
Jarque-Bera	2.015504	21.19657	4.227433	3.972018	4.517525
Probability	0.365039	0.000025	0.120788	0.137242	0.104480
Sum	3917.958	168.8795	233.6400	64.56719	3.78E+13
Sum Sq. Dev.	25712.59	1293.170	172.0289	361.7867	3.68E+25
Observations	34	34	34	34	34

Date: 12/21/22 Time: 23:22
Sample (adjusted): 1989 2020
Included observations: 32 after adjustments
Trend assumption: Linear deterministic trend
Series: RINT_CHN INF_CHN NINT_CHN
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.633879	48.79936	29.79707	0.0001
At most 1 *	0.385622	16.64607	15.49471	0.0334
At most 2	0.032505	1.057424	3.841466	0.3038

Dependent Variable: RINT_CHN
Method: Least Squares
Date: 12/21/22 Time: 23:23
Sample: 1987 2020
Included observations: 34

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INF_CHN	-0.591874	0.098088	-6.034126	0.0000
NINT_CHN	0.727179	0.268932	2.703952	0.0110

ARDL Error Correction Regression
Dependent Variable: D(DCPS_CHN)
Selected Model: ARDL(1, 1)
Case 2: Restricted Constant and No Trend
Date: 12/21/22 Time: 23:24
Sample: 1987 2020
Included observations: 33

ECM Regression
Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(INF_CHN)	-0.739315	0.221679	-3.335065	0.0023

Dependent Variable: NATS_CHN
Method: ARDL
Date: 12/21/22 Time: 23:25
Sample (adjusted): 1988 2020
Included observations: 33 after adjustments
Maximum dependent lags: 1 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (1 lag, automatic): INF_CHN
Fixed regressors: C
Number of models evalulated: 2
Selected Model: ARDL(1, 0)

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
NATS_CHN(-1)	1.014397	0.023347	43.44805	0.0000
INF_CHN	-1.08E+09	3.80E+09	-0.284561	0.7779

Dependent Variable: RINT_CHN
Method: ARDL
Date: 12/21/22 Time: 23:27
Sample (adjusted): 1988 2020
Included observations: 33 after adjustments
Maximum dependent lags: 1 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (1 lag, automatic): NATS_CHN INF_CHN DCPS_CHN

Fixed regressors: C
Number of models evalulated: 8
Selected Model: ARDL(1, 1, 1, 1)

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
RINT_CHN(-1)	0.198592	0.141662	1.401871	0.1732
NATS_CHN	-7.74E-12	2.92E-12	-2.647015	0.0139
NATS_CHN(-1)	8.37E-12	3.24E-12	2.584305	0.0160
INF_CHN	-0.484971	0.074154	-6.540017	0.0000
INF_CHN(-1)	0.196888	0.088895	2.214848	0.0361
DCPS_CHN	0.053237	0.061263	0.868982	0.3931
DCPS_CHN(-1)	-0.092684	0.055170	-1.679950	0.1054
C	7.143331	3.358394	2.127008	0.0435

R-squared	0.831325	Mean dependent var	1.874756
Adjusted R-squared	0.784096	S.D. dependent var	3.359340
S.E. of regression	1.560932	Akaike info criterion	3.935660
Sum squared resid	60.91275	Schwarz criterion	4.298450
Log likelihood	-56.93840	Hannan-Quinn criter.	4.057728
F-statistic	17.60203	Durbin-Watson stat	1.829940
Prob(F-statistic)	0.000000		

*Note: p-values and any subsequent tests do not account for model selection.

ARDL Error Correction Regression
Dependent Variable: D(RINT_CHN)
Selected Model: ARDL(1, 1, 1, 1)
Case 2: Restricted Constant and No Trend
Date: 12/21/22 Time: 23:27
Sample: 1987 2020
Included observations: 33

ECM Regression
Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(NATS_CHN)	-7.74E-12	1.85E-12	-4.184597	0.0003
D(INF_CHN)	-0.484971	0.055803	-8.690793	0.0000
D(DCPS_CHN)	0.053237	0.036010	1.478370	0.1518
CointEq(-1)*	-0.801408	0.113287	-7.074141	0.0000

R-squared	0.837320	Mean dependent var	0.034528
Adjusted R-squared	0.820491	S.D. dependent var	3.420675
S.E. of regression	1.449289	Akaike info criterion	3.693236
Sum squared resid	60.91275	Schwarz criterion	3.874631
Log likelihood	-56.93840	Hannan-Quinn criter.	3.754270
Durbin-Watson stat	1.829940		

* p-value incompatible with t-Bounds distribution.

F-Bounds Test — Null Hypothesis: No levels relationship

Test Statistic	Value	Signif.	I(0)	I(1)
F-statistic	8.628184	10%	2.37	3.2
k	3	5%	2.79	3.67
		2.5%	3.15	4.08
		1%	3.65	4.66

ARDL Long Run Form and Bounds Test
Dependent Variable: D(RINT_CHN)
Selected Model: ARDL(1, 1, 1, 1)
Case 2: Restricted Constant and No Trend
Date: 12/21/22 Time: 23:27
Sample: 1987 2020
Included observations: 33

Conditional Error Correction Regression

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	7.143331	3.358394	2.127008	0.0435
RINT_CHN(-1)*	-0.801408	0.141662	-5.657183	0.0000
NATS_CHN(-1)	6.31E-13	7.19E-13	0.877695	0.3885
INF_CHN(-1)	-0.288083	0.099683	-2.889986	0.0079
DCPS_CHN(-1)	-0.039447	0.030636	-1.287601	0.2097
D(NATS_CHN)	-7.74E-12	2.92E-12	-2.647015	0.0139
D(INF_CHN)	-0.484971	0.074154	-6.540017	0.0000
D(DCPS_CHN)	0.053237	0.061263	0.868982	0.3931

* p-value incompatible with t-Bounds distribution.

Levels Equation
Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
NATS_CHN	7.88E-13	9.28E-13	0.848913	0.4040
INF_CHN	-0.359471	0.090747	-3.961223	0.0005
DCPS_CHN	-0.049222	0.038809	-1.268295	0.2164
C	8.913475	4.048436	2.201708	0.0371

EC = RINT_CHN - (0.0000*NATS_CHN -0.3595*INF_CHN -0.0492 *DCPS_CHN + 8.9135)

F-Bounds Test — Null Hypothesis: No levels relationship

Test Statistic	Value	Signif.	I(0)	I(1)
			Asymptotic: n=1000	
F-statistic	8.628184	10%	2.37	3.2
k	3	5%	2.79	3.67
		2.5%	3.15	4.08
		1%	3.65	4.66
			Finite Sample: n=35	
Actual Sample Size	33			
		10%	2.618	3.532
		5%	3.164	4.194
		1%	4.428	5.816
			Finite Sample: n=30	
		10%	2.676	3.586
		5%	3.272	4.306
		1%	4.614	5.966

Null Hypothesis: D(DCPS_CHN) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=8)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.833115	0.0005
Test critical values:	1% level	-3.653730	
	5% level	-2.957110	
	10% level	-2.617434	

Null Hypothesis: INF_CHN has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=8)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-1.956902	0.0494

Test critical values:	1% level	-2.636901
	5% level	-1.951332
	10% level	-1.610747

Null Hypothesis: D(NATS_CHN) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=8)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.722886	0.0084
Test critical values:	1% level	-3.653730	
	5% level	-2.957110	
	10% level	-2.617434	

Null Hypothesis: D(NINT_CHN) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=8)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.268689	0.0001
Test critical values:	1% level	-3.653730	
	5% level	-2.957110	
	10% level	-2.617434	

Null Hypothesis: RINT_CHN has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=8)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.275128	0.0244
Test critical values:	1% level	-3.646342	
	5% level	-2.954021	
	10% level	-2.615817	

FOR USA

	DCPS_USA	INF__USA	NATS_USA	NINT_USA	RINT_USA
Mean	163.1566	2.566119	3.75E+11	6.141765	3.926961
Median	174.7674	2.642339	3.71E+11	6.094583	3.489003
Maximum	216.5589	5.397956	7.80E+11	10.87333	7.148178
Minimum	112.6191	-0.355546	-3.59E+11	3.250000	1.148425
Std. Dev.	30.93586	1.207639	2.64E+11	2.397844	1.939869
Skewness	-0.439103	-0.039479	-0.613815	0.189905	0.209907
Kurtosis	1.872253	3.362060	3.338951	1.664079	1.607764
Jarque-Bera	2.894334	0.194539	2.297780	2.732665	2.995633
Probability	0.235236	0.907311	0.316988	0.255041	0.223618

Sum	5547.323	87.24805	1.28E+13	208.8200	133.5167
Sum Sq. Dev.	31581.91	48.12695	2.30E+24	189.7387	124.1821
Observations	34	34	34	34	34

Dependent Variable: RINT_USA
Method: Least Squares
Date: 12/21/22 Time: 23:32
Sample: 1987 2020
Included observations: 34

Variable	Coefficient	Std. Error	t-Statistic	Prob.
NINT_USA	0.982683	0.039904	24.62609	0.0000
INF__USA	-0.611248	0.079232	-7.714638	0.0000

Date: 12/21/22 Time: 23:32
Sample (adjusted): 1989 2020
Included observations: 32 after adjustments
Trend assumption: Linear deterministic trend
Series: RINT_USA NINT_USA INF__USA
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.486716	36.24151	29.79707	0.0079
At most 1	0.299574	14.89986	15.49471	0.0613
At most 2	0.103766	3.505706	3.841466	0.0612

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.486716	21.34165	21.13162	0.0467
At most 1	0.299574	11.39415	14.26460	0.1355
At most 2	0.103766	3.505706	3.841466	0.0612

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):

RINT_USA	NINT_USA	INF__USA
3.490137	-4.069536	3.802298
-2.065852	2.105854	-0.708395
1.738144	-1.261450	0.769142

Unrestricted Adjustment Coefficients (alpha):

D(RINT_USA)	0.235077	-0.081411	-0.270048
D(NINT_USA)	0.074760	-0.360537	-0.287483
D(INF__USA)	-0.575905	-0.287825	-0.018030

1 Cointegrating Equation(s): Log likelihood -80.78764

Normalized cointegrating coefficients (standard error in parentheses)

RINT_USA	NINT_USA	INF__USA
1.000000	-1.166011	1.089441
	(0.03927)	(0.08561)

Adjustment coefficients (standard error in parentheses)

D(RINT_USA)	0.820452
	(0.59442)
D(NINT_USA)	0.260924
	(0.74682)
D(INF__USA)	-2.009989
	(0.53289)

2 Cointegrating Equation(s): Log likelihood -75.09057

Normalized cointegrating coefficients (standard error in parentheses)

RINT_USA	NINT_USA	INF__USA
1.000000	0.000000	-4.846351
		(1.14818)
0.000000	1.000000	-5.090684
		(1.00094)

Adjustment coefficients (standard error in parentheses)

D(RINT_USA)	0.988634	-1.128095
	(0.68782)	(0.77709)
D(NINT_USA)	1.005739	-1.063477
	(0.82095)	(0.92751)
D(INF__USA)	-1.415385	1.737551
	(0.57706)	(0.65195)

Dependent Variable: NATS_USA
Method: ARDL
Date: 12/21/22 Time: 23:41
Sample (adjusted): 1988 2020
Included observations: 33 after adjustments
Maximum dependent lags: 1 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (1 lag, automatic): INF__USA
Fixed regressors: C
Number of models evalulated: 2
Selected Model: ARDL(1, 1)

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
NATS_USA(-1)	0.791288	0.105613	7.492340	0.0000
INF__USA	1.65E+10	2.76E+10	0.597259	0.5550
INF__USA(-1)	-4.14E+10	2.78E+10	-1.488303	0.1475
C	1.51E+11	8.99E+10	1.678868	0.1039

R-squared	0.688014	Mean dependent var	3.80E+11
Adjusted R-squared	0.655740	S.D. dependent var	2.67E+11

S.E. of regression	1.56E+11	Akaike info criterion	54.50361
Sum squared resid	7.10E+23	Schwarz criterion	54.68500
Log likelihood	-895.3096	Hannan-Quinn criter.	54.56464
F-statistic	21.31765	Durbin-Watson stat	1.247153

Dependent Variable: DCPS_USA
Method: ARDL
Date: 12/21/22 Time: 23:44
Sample (adjusted): 1988 2020
Included observations: 33 after adjustments
Maximum dependent lags: 1 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (1 lag, automatic): INF__USA
Fixed regressors: C
Number of models evalulated: 2
Selected Model: ARDL(1, 0)

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
DCPS_USA(-1)	0.906703	0.059664	15.19677	0.0000
INF__USA	-2.632875	1.474743	-1.785310	0.0843
C	24.88943	12.06761	2.062498	0.0479

R-squared	0.921471	Mean dependent var	164.6880
Adjusted R-squared	0.916236	S.D. dependent var	30.07827
S.E. of regression	8.705277	Akaike info criterion	7.252244
Sum squared resid	2273.456	Schwarz criterion	7.388290
Log likelihood	-116.6620	Hannan-Quinn criter.	7.298019
F-statistic	176.0119	Durbin-Watson stat	1.742602

Dependent Variable: NATS_USA
Method: ARDL
Date: 12/21/22 Time: 23:41
Sample (adjusted): 1988 2020
Included observations: 33 after adjustments
Maximum dependent lags: 1 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (1 lag, automatic): INF__USA
Fixed regressors: C
Number of models evalulated: 2
Selected Model: ARDL(1, 1)

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
NATS_USA(-1)	0.791288	0.105613	7.492340	0.0000
INF__USA	1.65E+10	2.76E+10	0.597259	0.5550
INF__USA(-1)	-4.14E+10	2.78E+10	-1.488303	0.1475
C	1.51E+11	8.99E+10	1.678868	0.1039

R-squared	0.688014	Mean dependent var	3.80E+11
Adjusted R-squared	0.655740	S.D. dependent var	2.67E+11
S.E. of regression	1.56E+11	Akaike info criterion	54.50361
Sum squared resid	7.10E+23	Schwarz criterion	54.68500
Log likelihood	-895.3096	Hannan-Quinn criter.	54.56464
F-statistic	21.31765	Durbin-Watson stat	1.247153

ARDL Error Correction Regression
Dependent Variable: D(RINT_USA)
Selected Model: ARDL(1, 2, 1, 4)
Case 2: Restricted Constant and No Trend
Date: 12/21/22 Time: 23:57

Sample: 1987 2020
Included observations: 30

ECM Regression
Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(NATS_USA)	9.95E-13	9.28E-13	1.072020	0.2979
D(NATS_USA(-1))	2.19E-12	1.01E-12	2.167825	0.0438
D(INF__USA)	-0.006286	0.134637	-0.046686	0.9633
D(DCPS_USA)	0.017870	0.014466	1.235294	0.2326
D(DCPS_USA(-1))	0.044697	0.021226	2.105761	0.0495
D(DCPS_USA(-2))	0.096054	0.022402	4.287768	0.0004
D(DCPS_USA(-3))	0.082185	0.024508	3.353415	0.0035
CointEq(-1)*	-0.500864	0.103126	-4.856841	0.0001

R-squared	0.646769	Mean dependent var	-0.124289
Adjusted R-squared	0.534377	S.D. dependent var	1.023197
S.E. of regression	0.698194	Akaike info criterion	2.342539
Sum squared resid	10.72445	Schwarz criterion	2.716192
Log likelihood	-27.13809	Hannan-Quinn criter.	2.462074
Durbin-Watson stat	1.638288		

* p-value incompatible with t-Bounds distribution.

F-Bounds Test — Null Hypothesis: No levels relationship

Test Statistic	Value	Signif.	I(0)	I(1)
F-statistic	3.860002	10%	2.37	3.2
k	3	5%	2.79	3.67
		2.5%	3.15	4.08
		1%	3.65	4.66

ARDL Error Correction Regression
Dependent Variable: D(RINT_USA)
Selected Model: ARDL(1, 2, 1, 4)
Case 2: Restricted Constant and No Trend
Date: 12/21/22 Time: 23:57
Sample: 1987 2020
Included observations: 30

ECM Regression
Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(NATS_USA)	9.95E-13	9.28E-13	1.072020	0.2979
D(NATS_USA(-1))	2.19E-12	1.01E-12	2.167825	0.0438
D(INF__USA)	-0.006286	0.134637	-0.046686	0.9633
D(DCPS_USA)	0.017870	0.014466	1.235294	0.2326
D(DCPS_USA(-1))	0.044697	0.021226	2.105761	0.0495
D(DCPS_USA(-2))	0.096054	0.022402	4.287768	0.0004
D(DCPS_USA(-3))	0.082185	0.024508	3.353415	0.0035
CointEq(-1)*	-0.500864	0.103126	-4.856841	0.0001

R-squared	0.646769	Mean dependent var	-0.124289

Adjusted R-squared	0.534377	S.D. dependent var	1.023197
S.E. of regression	0.698194	Akaike info criterion	2.342539
Sum squared resid	10.72445	Schwarz criterion	2.716192
Log likelihood	-27.13809	Hannan-Quinn criter.	2.462074
Durbin-Watson stat	1.638288		

* p-value incompatible with t-Bounds distribution.

F-Bounds Test — Null Hypothesis: No levels relationship

Test Statistic	Value	Signif.	I(0)	I(1)
F-statistic	3.860002	10%	2.37	3.2
k	3	5%	2.79	3.67
		2.5%	3.15	4.08
		1%	3.65	4.66

Dependent Variable: RINT_USA
Method: ARDL
Date: 12/21/22 Time: 23:58
Sample (adjusted): 1991 2020
Included observations: 30 after adjustments
Maximum dependent lags: 1 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (4 lags, automatic): NATS_USA INF__USA DCPS_USA
Fixed regressors: C
Number of models evalulated: 125
Selected Model: ARDL(1, 2, 1, 4)

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
RINT_USA(-1)	0.499136	0.138253	3.610318	0.0020
NATS_USA	9.95E-13	1.22E-12	0.817259	0.4245
NATS_USA(-1)	9.64E-14	1.82E-12	0.053112	0.9582
NATS_USA(-2)	-2.19E-12	1.28E-12	-1.711687	0.1041
INF__USA	-0.006286	0.201568	-0.031184	0.9755
INF__USA(-1)	-0.208124	0.182892	-1.137963	0.2701
DCPS_USA	0.017870	0.017655	1.012185	0.3249
DCPS_USA(-1)	0.008444	0.026320	0.320837	0.7520
DCPS_USA(-2)	0.051357	0.026832	1.914061	0.0716
DCPS_USA(-3)	-0.013869	0.029989	-0.462471	0.6493
DCPS_USA(-4)	-0.082185	0.028327	-2.901309	0.0095
C	5.128740	1.980570	2.589527	0.0185

R-squared	0.897173	Mean dependent var	3.653454
Adjusted R-squared	0.834334	S.D. dependent var	1.896419
S.E. of regression	0.771883	Akaike info criterion	2.609206
Sum squared resid	10.72445	Schwarz criterion	3.169685
Log likelihood	-27.13809	Hannan-Quinn criter.	2.788508
F-statistic	14.27734	Durbin-Watson stat	1.638288
Prob(F-statistic)	0.000001		

*Note: p-values and any subsequent tests do not account for model selection.

ARDL Long Run Form and Bounds Test
Dependent Variable: D(RINT_USA)
Selected Model: ARDL(1, 2, 1, 4)
Case 2: Restricted Constant and No Trend
Date: 12/21/22 Time: 23:58
Sample: 1987 2020
Included observations: 30

Conditional Error Correction Regression

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	5.128740	1.980570	2.589527	0.0185
RINT_USA(-1)*	-0.500864	0.138253	-3.622821	0.0019
NATS_USA(-1)	-1.10E-12	8.53E-13	-1.288767	0.2138
INF__USA(-1)	-0.214410	0.217490	-0.985836	0.3373
DCPS_USA(-1)	-0.018383	0.008362	-2.198415	0.0412
D(NATS_USA)	9.95E-13	1.22E-12	0.817259	0.4245
D(NATS_USA(-1))	2.19E-12	1.28E-12	1.711687	0.1041
D(INF__USA)	-0.006286	0.201568	-0.031184	0.9755
D(DCPS_USA)	0.017870	0.017655	1.012185	0.3249
D(DCPS_USA(-1))	0.044697	0.024626	1.814983	0.0862
D(DCPS_USA(-2))	0.096054	0.026469	3.628966	0.0019
D(DCPS_USA(-3))	0.082185	0.028327	2.901309	0.0095

* p-value incompatible with t-Bounds distribution.

Levels Equation
Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
NATS_USA	-2.20E-12	1.68E-12	-1.309245	0.2069
INF__USA	-0.428080	0.453567	-0.943807	0.3578
DCPS_USA	-0.036702	0.013086	-2.804662	0.0117
C	10.23978	2.885537	3.548656	0.0023

EC = RINT_USA - (-0.0000*NATS_USA -0.4281*INF__USA -0.0367 *DCPS_USA + 10.2398)

F-Bounds Test — Null Hypothesis: No levels relationship

Test Statistic	Value	Signif.	I(0)	I(1)
			Asymptotic: n=1000	
F-statistic	3.860002	10%	2.37	3.2
k	3	5%	2.79	3.67
		2.5%	3.15	4.08
		1%	3.65	4.66
			Finite Sample: n=30	
Actual Sample Size	30			
		10%	2.676	3.586
		5%	3.272	4.306
		1%	4.614	5.966

Null Hypothesis: D(DCPS_USA) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=8)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.281211	0.0001
Test critical values:	1% level	-3.653730	
	5% level	-2.957110	
	10% level	-2.617434	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: INF__USA has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=8)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.254079	0.0102
Test critical values:	1% level	-4.262735	
	5% level	-3.552973	
	10% level	-3.209642	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: NATS_USA has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=8)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.026935	0.0430
Test critical values:	1% level	-3.653730	
	5% level	-2.957110	
	10% level	-2.617434	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: NINT_USA has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 1 (Automatic - based on SIC, maxlag=8)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.398736	0.0006
Test critical values:	1% level	-4.273277	
	5% level	-3.557759	
	10% level	-3.212361	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: RINT_USA has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 1 (Automatic - based on SIC, maxlag=8)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.582826	0.0474
Test critical values:	1% level	-4.273277	
	5% level	-3.557759	
	10% level	-3.212361	

Table 8: OLS Regression
Explained Variables: RinT

Variables	Coeff	Std. Error	T Stats	Prob. Value
NINT	0.727179	0.268932	2.703952	0.0110
INF	-0.591874	0.098088	-6.034126	0.0000

Table 19: OLS Regression
Dependent Variable: RinT

Variable	Coefficient	Std. Error	t-Statistic	Prob. Value
INF	-0.611248	0.079232	-7.714638	0.0000
NINT	0.982683	0.039904	24.62609	0.0000

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Dear Kilian Ebua Achuo

Your project **"TESTING THE VALIDITY OF THE FISHER HYPOTHESIS: link Between Nominal interest rates, real interest rate, Inflation, and Demand/supply of loanable Funds"** has been evaluated. Since only secondary data will be used the project does not need to go through the ethics committee. You can start your research on the condition that you will use only secondary data.

Prof. Dr. Aşkın KİRAZ

The Coordinator of the Scientific Research Ethics Committee