Effects of inflation (consumer price index) and other macroeconomic variables on bank deposits: Evidence from Pakistan

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16 May 2022

Effects of inflation (consumer price index) and other macroeconomic variables on bank deposits: Evidence from Pakistan

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Abstract:

Effect of inflation (CPI) and other macroeconomic variable on bank deposits is the empirical issue in many countries but in Pakistan there is no significant work have been done about this relationship. This paper investigates the effect of different macroeconomic variables on bank deposits in Pakistan by using time series data from 1960 to 2010.Least square method and multiple regression model was used to analyze the data. The results clearly indicate that there is a negative relationship between inflation and bank deposits. Other macroeconomic variable which includes broad money, deposit rates, GDP and per capita income have positive impact on bank deposits. It is concluded that by efficient fiscal and monetary policy we can manage this macroeconomic variable in order to increase bank deposits. Per capita income can be increase by different policies and by reducing unemployment. Banks can play a vital role with the help of Government in order to manage these macroeconomic variables by using different policies and step to minimize the effects of these variables.

Key words: Bank deposits, Inflation (Consumer Price Index), Per Capita Income, Broad Money, GDP, Deposit rate

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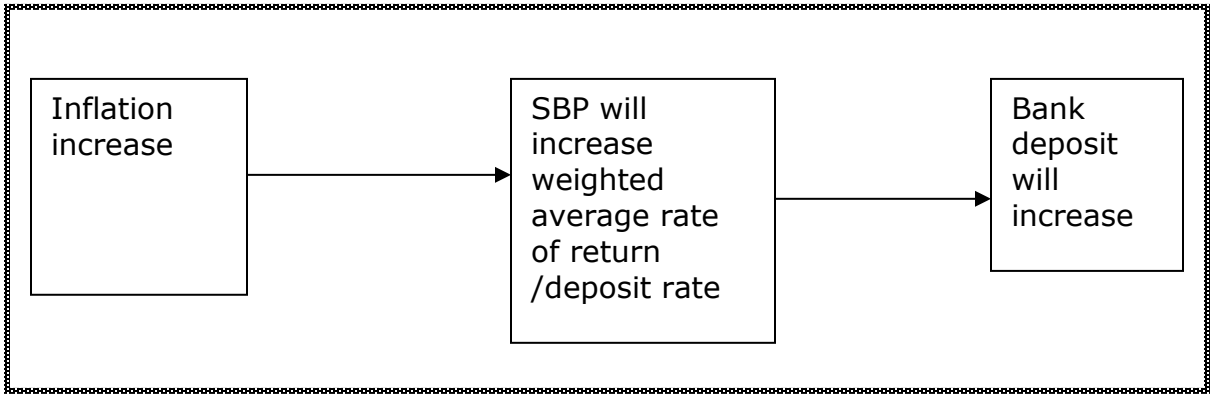
Chapter 1

Introduction:

Although inflation has a major impact on almost all areas and industries of a country and usually in all cases it is considered that inflation have a negative impact but in banking case it is consider that inflation has positive impact on banks profitability and Bank deposits because general consideration are that if inflation will increase then central bank will also maximize weighted average rate of return on deposit or in other words deposit rates. And because of increase in these deposit rate people will invest or deposit more in banks.

General consideration in Pakistan:



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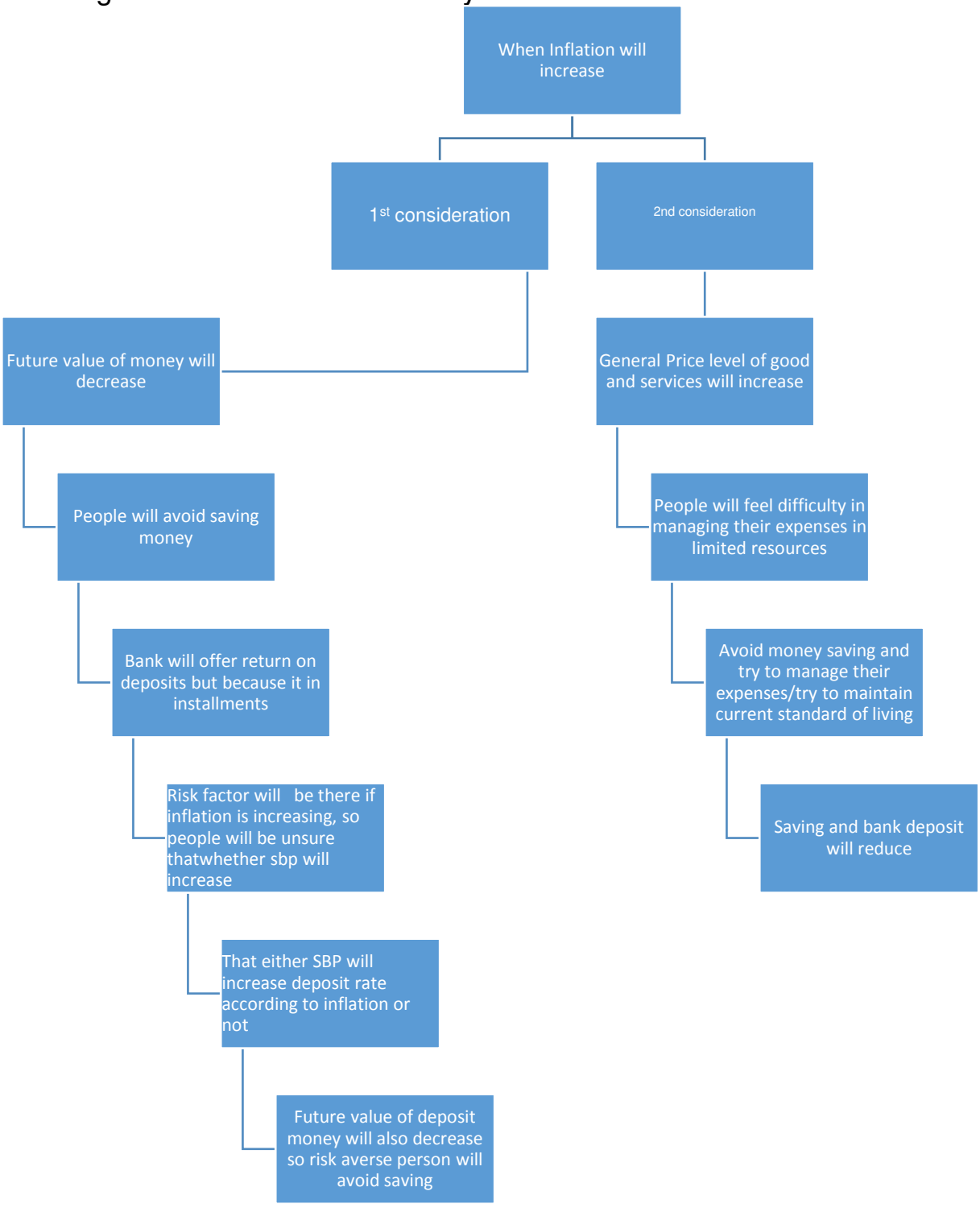
But according to my research study this all story seems to opposite. And if we recall different saving theories then it is also clear that when inflation increases then people hesitate to save money because by saving with the increase in inflation their money future value will reduces so they will just avoid saving. Although the bank will pay interest to the depositors with a fix rate witch is called require rate of return on deposits or deposit rate but it will provide in installments and risk factor will also there which is there is no confirmation that central bank surely adjust deposit rate with inflation and if there will be negative return with inflation increment then it will be total loss for depositor so a risk averse person will avoid saving in banks in this case of inflation. As concluded in this research report. And second general consideration that if inflation will increase then general price level of basic goods and services will also increases and people especially of developing countries will feel difficulty in managing their household and other expenses in limited resources because goods and services price will increase and money value will decrease. So they will avoid money saving in banks in order to manage their daily needs in limited resources.

According to this research and theory



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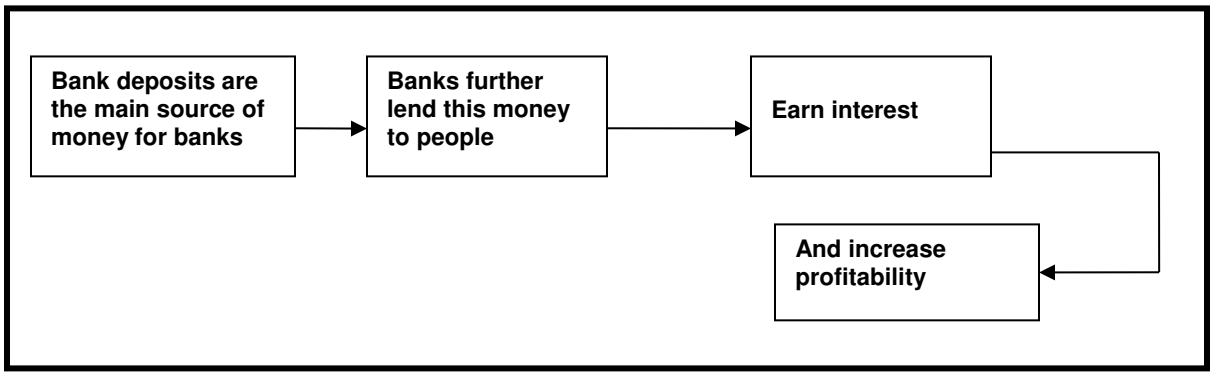
Bank deposits are main resource of money for banks and by collecting this money, bank further lend it to different industries or people and earn interest. So if deposits

in bank will decrease because of inflation increase then banks profitability will also reduces.



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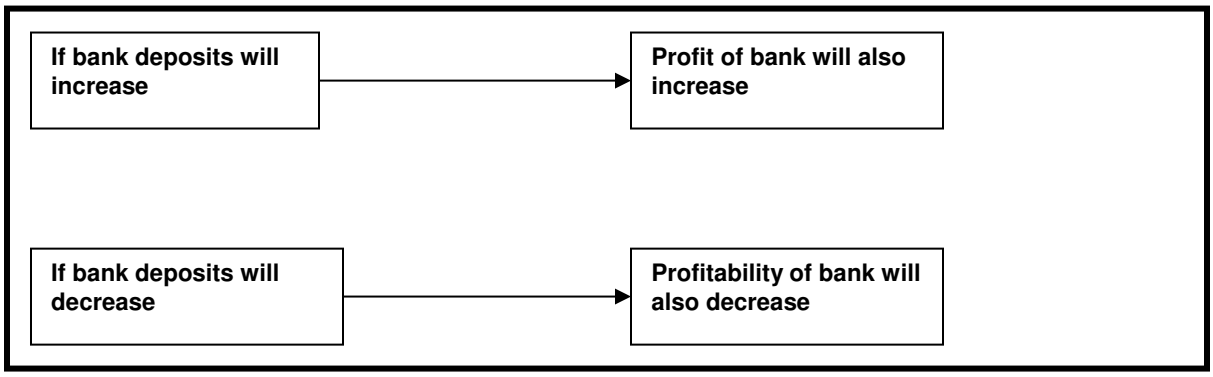

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Although I consider four other factors in this research report includes broad money, GDP, per capita income and deposit rates/weighted average rate of return on deposits, that also have major effect on bank deposit but there effects are obvious which is positive effect. But my main consideration was inflation because in general inflation is considered positive variable for banks but I find it negative for banks as well like all other sectors. So this research report will provide significant information to banks and they will better understand inflation impacts on bank deposits which are negative and was not considered before this in Pakistan.

1.1 Background

Bank deposits are consider the main source of bank income although bank pays some money to the depositors in the form of rate of return to depositors but by lending this money to the borrowers' bank also earn interest. So bank's deposits amount play a vital role to continue banks day by day operations. So banks should be aware with the factors or macroeconomic variable which affects on bank deposits, by knowing these variables banks can increase their bank deposits and bank's profitability. And in Pakistan inflation is consider positive effect on Pakistan

that is why this study is conducted to know the real effect of inflation and other variables on bank deposit.

1.2 Definition of terms

a) Bank deposits:
When a customer opens bank account and put money in it either in form of cash check or sent through a wire transfer is usually consider as bank deposit. In return bank pays some amount of interest in installments according to deposit rate of the bank to the customer.

b) Inflation:
If there is a continuous increase in prices of goods and services it is called inflation. The buying power of consumer will reduce because of inflation. And the value of money will also decrease. Inflation is measured by Consumer Price Index. Consumer Price Index is changes in cost of a basket of goods and services to the consumer. CPI can be fixed or change after an equal interval of time for example one year.

c) Broad money
The term broad money refers to the summation of all type of currency that exists outside the banks.
For example

- Demand deposits except of central government
- Time saving and foreign currency deposits by residents of country excluding government.
- Banks and checks e.g. traveler's checks
- Securities e.g. deposit certificates and commercial paper.

d) Deposit rate:
Deposit rates are actually the interest rate that a bank or financial institution pays to the deposit holders on the money that they have kept in their bank. These interest payments are made after an equal interval of time.

e) GDP (Gross Domestic Product)
The term GDP refer to the market value of all final goods and services which are being produced within the boundaries of a country in a given time period.

f) Per Capita Income:
It is average amount of money earned by a person in a certain area or a country. It is use to determine the standard of living within a country. It is measured by dividing country's national income by its total population.

$$\text{Per Capita Income} = \frac{\text{Country's national income}}{\text{Total population}}$$

1.3 Purpose of study

In Pakistan it is general consideration that inflation is positively related with bank deposits. And it is considered that if inflation will increase then state bank will

increase Deposit rate/weighted average rate of return and because of this increment people will attract to invest in the banks.
But this story is not true for all countries other factors also have to consider when dealing with bank deposits, which includes when inflation increases then future value of money decreases and because of this people, just avoid to save money either in the bank or in other place. Although interest is paid to depositor but it is in installments and that has very less value for the people instead of having the entire deposit amount. So in case of inflation mostly people prefer to invest in any other place in gold or in real estate. On the individual ends per capita income is also have significant impact on bank deposit. This was actually the purpose of my study to realize the banker and the Government that inflation can effects bank like all other sectors.

1.4 Significance of the study

Bank industry play a vital role in Pakistan economy .this research report will help to Government and bankers to find major effect of inflation and other macroeconomic variable includes broad money, deposit rates, GDP and per capita income on bank deposits and also provide policies how to control these variables in order to increase bank deposits. Because bank deposit is consider the main resource for a bank money that bank further lend to borrowers .So reduction in bank deposits will effect on banks profitability.

1.5 Scope and limitation of the study

This study is done by using time series data of Pakistan's banks total deposits from 1960 to 2010.So this study provides a significant results for Pakistani banks.
On the other hand the study is only limits till Pakistan but it is considered that other economies that are similar with Pakistan will present the same effects.

1.6 Statement of hypothesis

Null hypothesis

H_0 1 = broad money has no effect on bank deposits
H_0 2= Inflation (consumer price index) has no effect on bank deposits
H_0 3= Deposit rates has no effect on bank deposits
H_0 4= GDP has no effect on bank deposits
H_0 5= Per capita income has no effect on bank deposits

Alternative Hypothesis

H_1 1 = broad money has effect on bank deposits
H_1 2= Inflation (consumer price index) has effect on bank deposits
H_1 3= Deposit rates has effect on bank deposits
H_1 4= GDP has effect on bank deposits
H_1 5= Per capita income has effect on bank deposits

Chapter 2

Review of literature

2.1 Review of the theoretical literature

Classical economists were the first who determine the importance of saving and find different variables which have impact on saving. Smith (1776) state that "capital is increased by parsimony and diminished by prodigality and misconduct" Before 1936, according to the classical economist theory on the saving, saving and interest rates are negatively related with each other.
That's why if inflation (consumer price index) will increase then saving in banks will decrease which is the behavior exactly has been explained in this theory.
Keynes (1936) describe saving as, It is remaining part of income after all consumption expenses.

S= I – C
Where I= Income
S=Saving and C=Consumption

Therefore according to this theory if **per capita income** or income will increase then saving will also increase and if **Broad money** will increase then ultimately Income of the people will also increase which will be the reason to maximize bank deposits.

Anyanwu and Oaikhenn(1995) divide saving determinants in to two parts/factors.

a) Quantitative factors: It includes income level, interest rate, inflation rate, inflation rate expectations and saving ease available to a person.
b) Non Quantitative factors: They are psychological factors which effects saving. It includes feelings for safety measures, desire for trust, habitual factor and socializing factors.

Theoretically if money supply will increase then cost of borrowing will decrease so people will borrow more and consumption will increase.
But in this study positive relationship between **money supply** and saving account is in accordance with the liquidity preference theory which states that increase in money supply means more money will be held for speculative motive.

These all saving theories are also true in the case of bank deposits. And the variables that have impact on bank deposits identified in this study are according to these theories and their relationships on the bank deposits are exactly same according to these theories in the case of Pakistan.

2.2 Review of the empirical literature:

Although there is many studies in literature related to saving behaviors and factors that effects saving but very few studies that present the determinants of bank deposits or the factors which effects particularly on bank deposits.

Haron and Azmi (2006) work on deposit determinants of commercial banks in Malaysia. They used co integration technique. They concluded that rate of profit of Islamic bank, rate of interest on deposits; Base lending rate, Kuala Lumpur Composite Index, Consumer Price Index, Money supply and Gross Domestic Product have significant impact on deposits. They further determined that return on deposit and inflation has negative impact on bank deposits. While composite index and money supply have positive impact on bank deposits.
But if we critically review this paper then they did not present their variable effect on deposits clearly and concisely at one place. We have to find there results from reading the entire paper thoroughly and because of this reader become confused.

Loayza and Shankar(2000) determine the relationship between saving and different factors in India. The factors include real interest rate, per capita income, The dependency ratio, financial development, The government saving rate and share of agriculture in gross domestic product (GDP). They used co integration approach. They concluded that there is positive effect of real interest rate, Per capita income and the share of agriculture in GDP on saving and there is negative effect of financial development, inflation and dependency ratio on saving.

Ozcan et al. (2003) determine the private saving behavior in Turkey and concluded that if we not consider Government saving then income level, financial depth and measures, inflation has positive effect on private saving.

Athukoral and Tsai (2003) determine the effect of population, disposable income growth, social security, ease of credit and financial reforms on saving. They concluded that inflation has negative impact on saving while rate of interest has positive effect on saving and all other variable described earlier also have significant effect on saving.

John et al. (2000) studied that there is negative relationship between inflation and financial development. And this is a strong negative correlation. Further more they determined that this is nonlinear relationship.
They use Banking data set of 97 countries for the period of 1960 to 1995 and stock market data set of 49 countries for the period of 1970 to 1995.They use least square method of regression and use CPI data as average inflation. They conclude that Bank lending activity, bank liability issues, size of stock market and liquidity has strong negative relationship with inflation.

Orji Anthony (2009) investigated the bank saving determinants and determine the effect of bank saving and bank credits on the growth of economy in Nigeria by

using data set from 1970 to 2006.In this study two models were used namely Distributor Lag-Error correction model(DL-ECM) and Distributed model. He concluded that there is positive impact of GDP per capita, Financial Deepening, Interest rate spread on the size of private domestic saving and negative impact of Real interest rate and inflation rate on the size of private domestic saving. They also concluded that there is positive relationship between the lagged value of total private saving, private sector credit, public sector credit, interest rate spread, exchange rates and economic growth.
They suggested that government should take step to reduce unemployment rate in Nigeria and try to increase saving in order to enhance economic growth in the country.

Hussein and Thirwall (1999) investigate the different in domestic saving ratio determinants of countries. They collected panel data of 62 countries from 1967-1995 and concluded that saving capacity can be determine by level of per capita income and income growth, but nonlinearly. The determinants of willingness to save include rate of interest, level of financial deepening and inflation. They concluded that inflation has a mild positive relationship with saving but quickly it change in to negative relationship. They investigate that government saving is a determinant for total saving. They concluded that ratio of tax revenue to GDP negatively influences the domestic saving ratio.

Shahbaz(2008) show in their study that economic growth and domestic saving have long-run robust relationship with each other. They used time series data of Pakistan using co-integration approach. They concluded that there is one way causality running from growth of economy to growth national saving.

Agarwal and Shoo (2009) investigate the saving determinants and direction of causality. They used time series data. They concluded that there is significant effect of GDP growth, dependency ratio, interest rate and bank density on total saving rate. And further they studied that public saving rate is significantly influences private saving rate. They find a bi-directional causality between growth and saving.

Chapter 3

3.1 Methodology

For this research paper time series data of Pakistan for the period of 1960 to 2010 was used. But because some data was missing after adjustment 1969 to 2000 data was used. The least square method for multiple regressions model is used for this study.

3.2 Research design and approach

Quantitative method is used for this study to see the relationship between independent variable which is log of bank deposits and dependent variables which are Inflation, Per capita Income, Deposit rate, GDP and Broad money. Under the quantitative method descriptive research approach is used to see what relationship between the explained variable exists in the Pakistan. In order to clearly present the descriptive research, descriptive statistics is used which can present the quantitative information in a manageable form.

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3.3 Population and sample:

This study is conducted by using quantitative data of Pakistan. The entire population was used under consideration by using secondary data.

3.4 Type of data and sources:

Secondary data of each variable have been use for this study. It was time series annual base data of Pakistan for all variables. Data was collected from various sources like World Bank, IMF, SBP and Indexmundi.

3.5 Data analysis procedure:

I used Multiple Regression analysis technique to see the effect of inflation, broad money, deposit rate, per capita income and GDP on the bank deposit using secondary data. Least square method is used for this study because it is simple to use. Econometric views software was used for this all process. The purpose of using this software was easy availability and user friendly.

Chapter 4

4.1 Modeling frame work

We can estimate equation showing the effect of different macroeconomic variables on bank deposits as follows:

$$\text{Log (Bank Deposit)} = \beta_o + \beta_1 bm + \beta_2 cpi + \beta_3 dr + \beta_4 gdp + \beta_5 pci + U_t$$

Where

Log (Bank deposit) =A percent change in bank deposit (in local currency)

bm =Broad money(%age of gdp)
inf = Consumer price index as a proxy for Inflation (2005=100)
dr =Deposit rate or weighted average rate of return on deposits
gdp =GDP (Gross Domestic Product)(in local currency)
pci =Per Capita Income(current international $)
β_o=Constant
U_t= Error term/Residuals

Expected values

$\beta_1>0$
Broad money has positive effect on log (Bank deposits)

$\beta_2<0$
Consumer Price Index (used as a proxy of inflation) has negative effect on log (Bank deposits)

$\beta_3>0$
Deposit rates has positive effect on log (Bank deposits)

$\beta_4>0$
GDP (Gross Domestic Product) has positive effect on log (Bank deposits)

$\beta_5>0$
Per Capita Income has positive effect on log (Bank deposits)

4.2 Analysis/Estimation Result

In order to see the effect of above explained variable on the bank deposit, least square method was used using Pakistan time series data of each variable. The regression result for this study is tabulated here.

Regression output

Dependent Variable: LOG(BANKDEPOSIT)				
Method: Least Squares				
Date: 11/07/12 Time: 04:41				
Sample (adjusted): 1969 2000				
Included observations: 32 after adjustments				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	**28.80131**	**0.158036**	**182.2448**	**0.0000**
BM	**0.021617**	**0.002983**	**7.246189**	**0.0000**
CPI	**-0.017671**	**0.004902**	**-3.604694**	**0.0013**
DR	**0.036046**	**0.010096**	**3.570505**	**0.0014**

GDP	3.78E-13	5.67E-14	6.669009	0.0000
PCI	0.000845	0.000170	4.982225	0.0000
R-squared	0.991764	Mean dependent var		31.52262
Adjusted R-squared	0.990181	S.D. dependent var		0.573276
S.E. of regression	0.056807	Akaike info criterion		-2.730945
Sum squared resid	0.083904	Schwarz criterion		-2.456119
Log likelihood	49.69512	F-statistic		626.2094
Durbin-Watson stat	1.473457	Prob(F-statistic)		0.000000

Interpretation of regression results:

Although the data was used from 1960 to 2010 but because some data was missing that is why after adjustment 1969 to 2000 data is used. The main results of this regression output are interpreted under.

1. **R^2** :

Coefficient of Determination it describes the overall fit of the estimated model. This explain total variation in dependent variable which is log of bank deposit because of variation in independent variables that are broad money, consumer price index (as a proxy of inflation),GDP, deposit rate and per capita income. And in above table it is 99% variation in log of bank deposits are because of our explained variable which shows that explained variable are sufficient to describe the determinants of bank deposits.

2. **The t- test**:

This test determines that variables are significant or not in order to determine the dependent variable which is log of bank deposits. It is calculated by coefficient divided by standard error and it should be more than 2 either with positive or negative signs. And in above table t-test for all variables is more than 2 that's why it shows that all variables are significant to explain the determinants of log (bank deposits).

3. **Probabilities or p values:**

It measures the coefficient accuracy and it should be less than 0.05 to be significant for a variable's regression coefficient. Its mean 95% chances are to reject the null hypothesis which shows there is no effect of explained variable on Log of bank deposits. And in this model's results p values for all the variables are less than 0.05 which shows that we will reject null hypothesis and accept alternative hypothesis.

4. **The F-test**:

This test measures the overall significance of regression model.

5. **Probability of F statistics:**

It is p value for the regression model as a whole. It should be less than 0.05(5%) to be a model significant. And for this study it is 0.0000 which shows that model is significant as a whole.

From above described regression result it is clear that the relationship between bank deposit and other variable describe in model will be as under:

- **Broad money and Bank deposits:**

If there will be one unit increase (e.g. broad money %age of GDP) in broad money then there will be **0.021617**% increase in bank deposits. Because we consider log of bank deposits which mean %age, keeping all other factor constant in the model.

- **Consumer Price Index (used as a proxy of Inflation) and Bank deposits:**

If there will be one unit increase in CPI then -**0.017671**% decrease in bank deposits. Because we consider log of bank deposits which mean %age, keeping all other factor constant in the model.

- **Deposit rate and Bank deposits:**

If there will be one unit increase in deposit rate then there will be **0.036046**% increase in bank deposits. Because we consider log of bank deposits which mean %age, keeping all other factor constant in the model.

- **GDP(Gross Domestic Product) and Bank deposits:**

If there will be one unit increase in GDP then there will be **3.78E-13**% increase in bank deposits. Because we consider log of bank deposits which mean %age, keeping all other factor constant in the model.

- **Per Capita Income and Bank deposits:**

If there will be one unit increase in Per Capita Income then there will be **0.000845**% increase in bank deposits. Because we consider log of bank deposits which mean %age, keeping all other factor constant in the model.

Descriptive statistics (individual samples):

	LOG(BANKDEPOSIT)	BM	CPI	DR	GDP	PCI
Mean	31.35901	42.90196	41.50980	4.966601	2.37E+12	1563.438
Median	31.50599	43.00000	23.00000	5.390000	1.96E+12	1480.000
Maximum	32.95859	51.00000	181.0000	10.66000	6.00E+12	2880.000
Minimum	29.34759	34.00000	4.000000	0.950000	4.45E+11	630.0000
Std. Dev.	0.995724	3.863961	43.95560	2.463337	1.63E+12	635.8262
Skewness	-0.332663	0.003715	1.368143	-0.001734	0.655313	0.606231
Kurtosis	2.206757	2.509391	4.245321	2.152675	2.282701	2.356245
Jarque-Bera	2.277771	0.511600	19.20594	1.525688	4.743551	2.512643
Probability	0.320176	0.774297	0.000068	0.466338	0.093315	0.284699
Sum	1599.310	2188.000	2117.000	253.2967	1.21E+14	50030.00
Sum Sq. Dev.	49.57334	746.5098	96604.75	303.4014	1.34E+26	12532522
Observations	51	51	51	51	51	32

Interpretation of Descriptive statistics:

"All of the statistics are calculated using observations in the current sample.
Mean is the average value of the series, obtained by adding up the series and dividing by the number of observations.
Median is the middle value (or average of the two middle values) of the series when the values are ordered from the smallest to the largest. The median is a robust measure of the center of the distribution that is less sensitive to outliers than the mean.
Max and **Min** are the maximum and minimum values of the series in the current sample.
Std. Dev. (standard deviation) is a measure of dispersion or spread in the series.
Skewness is a measure of asymmetry of the distribution of the series around its mean.
Kurtosis measures the peaked ness or flatness of the distribution of the series.
Jarque-Bera is a test statistic for testing whether the series is normally distributed. The test statistic measures the difference of the Skewness and kurtosis of the series with those from the normal distribution. Under the null hypothesis of a normal distribution, the Jarque-Bera statistic is distributed as with 2 degrees of freedom.
The reported **Probability** is the probability that a Jarque-Bera statistic exceeds (in absolute value) the observed value under the null—a small probability value leads to the rejection of the null hypothesis of a normal distribution." *Using Econometrics, A Practical Guide* (fourth edition), by A. H. Studenmund

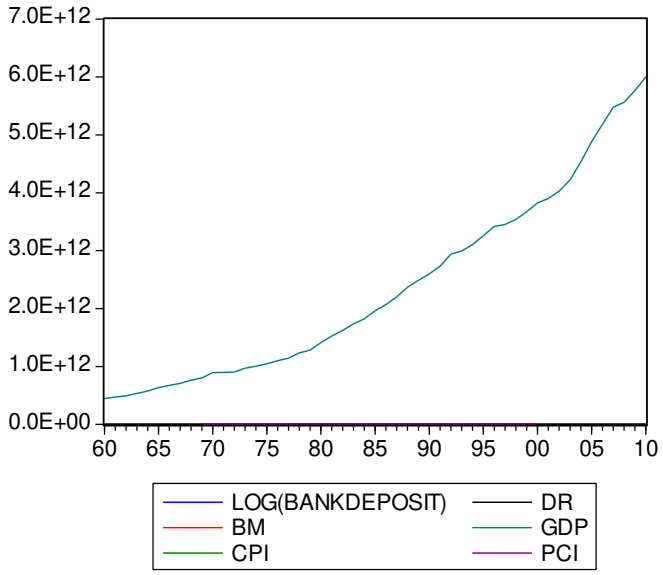
Correlation matrix

	LOG(BANKDEPOSIT)	BM	CPI	DR	GDP	PCI
LOG(BANKDEPOSIT)	1	0.299060198960514	0.932561596348098	0.475630551774787	0.978226344717438	0.960053023036893
BM	0.299060198960514	1	-0.239636548449824	-0.246364969404799	0.21426843076313	0.220719785439876
CPI	0.932561596348098	0.239636548449824	1	0.240531431855172	0.966015393172235	0.991325152463409
DR	-0.475630551774787	-0.246364969404799	0.240531431855172	1	0.402560304761728	0.324936572164099
GDP	0.978226344717438	0.21426843076313	0.966015393172235	0.402560304761728	1	0.976598968491475
PCI	0.960053023036893	0.220719785439876	0.991325152463409	0.324936572164099	0.976598968491475	1

Interpretation of Correlation Matrix:

In the above table correlation matrix shows the individual effect not only of each independent factor with each other but also with dependent variable that is bank deposit. From the regression results it is clear that all other factors except inflation have positive effect on bank deposits. But when we see on correlation results of individual correlation between variables then it shows that inflation has positive relationship with bank deposit. What this shows? Now question arises that either our relationship between inflation and bank deposit is wrong in model. The simple answer is no. Because although there is positive relationship exist between inflation and bank deposits in Pakistan but it is only possible when there is no other factors are present. But in the real world we can not deny the presence of other factors or mediators. And further more that correlation matrix just show the associations of relationship between two variables so the true results are regression result which are being present in the presence of other factors and in real life we can not deny the presence of other factors.

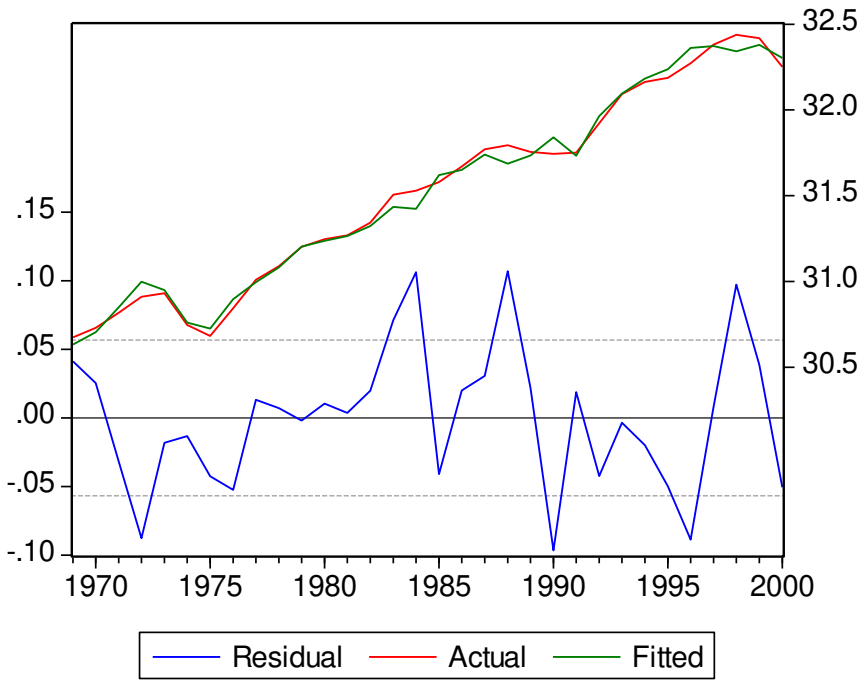
Line Graph:



The line graph shows the each variable amount trend with respect to time. All variables amounts are increasing with time frame but there is some decreasing trend but these are for very short period of time but over all factors are increasing in long run. Although bank deposits percentage is also increasing but this is cumulative effect of all factors affecting on bank deposits. But if government and banks will take some step to reduce inflation or will try to overcome on inflation by different policies or tactics then we can expect a significant increase in percentage of bank deposit. Because when we see the individual trends of factor with time frame then we see that the year in which inflation rose rapidly the bank deposit reduce rapidly in those years but for short term period. Broad money also has most

of individual fluctuation among all explained factors with different time. The individual effect of each variable with respect to time is shown individually which is in appendix.

Actual fitted graph:



The actual, fitted residual graph shows the actual line of bank deposit with time trend. Fitted line shows our estimated portion, this line shows the ability of our describe model in defining the bank deposits percentage. The residual line shows the error term or part of bank deposits that our model could not explain.

Chapter 5

5.1 Conclusion

From the regression results and theoretical analysis it is clear that all other factors except inflation have positive impact on bank deposits. Just inflation has negative impact because during inflation people will try to maintain their cost of living, and avoid saving because of money future value declining factor during inflation. So we can say that people's psychological and habitual factors also have impact on bank deposits percentage in Pakistan. All theories that I have discuss in this paper support it and this is also present in Pakistan but in generally banks and Government just think that inflation is good sign for banks development because during inflation deposit rate will increase by state bank and because of this high rate people will save more. But this entire story seems opposite in this research paper.

5.2 Policy implication

Government and banks should try to control all above discuss factors .They should try to reduce inflation by increasing exports and other fiscal and monetary techniques. Government should decrease unemployment in order to increase per capita income. For this purpose government and banks should produce the job opportunities that inversely increase per capita income that has direct positive relationship with bank deposits. Government should try to increase its GDP by producing investment opportunities in the boundaries of the country and by increasing exports to other countries this will ultimately reduce the inflation also.

Direction for further Research

This study is conducted for Pakistan but in future we can do research for determining different factors effects on bank deposits for any other country or by using Panel data we can conclude the results for the entire world with different group of countries including developed, developing or underdeveloped countries. One more possibility is to divide countries into different groups on the basis of inflation that is high inflation, moderate and low inflation rate countries and we can see the different financial and macroeconomics factors effects on bank deposits that are the main source of bank financing and banks are backbone for economic growth of a country. Further research can be done by using other statistical techniques other than least square method. This study opens many ways for research on bank deposits particularly because in this side very less work has been done.

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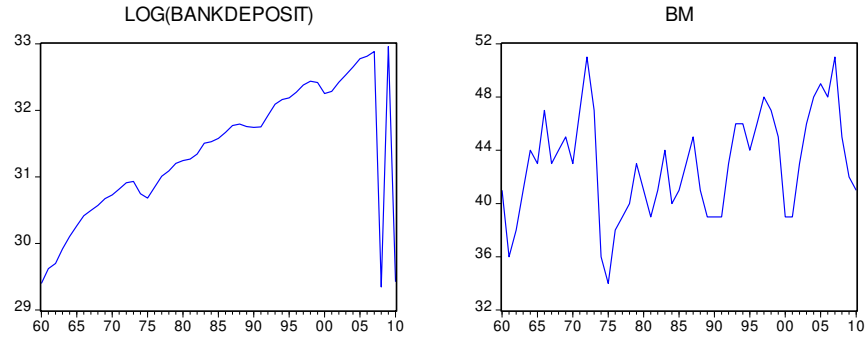
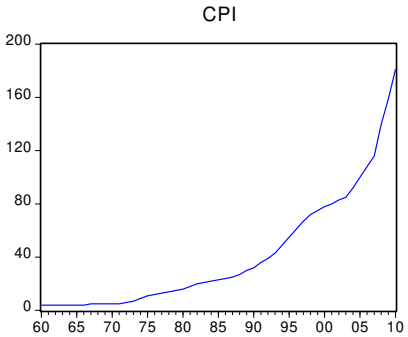
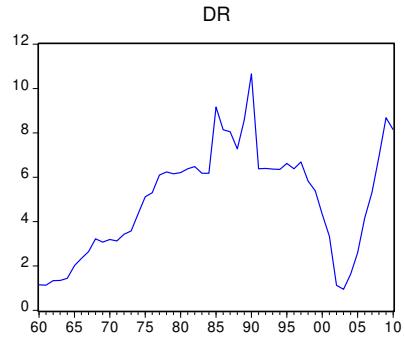
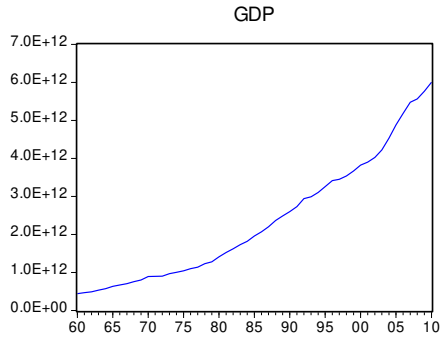
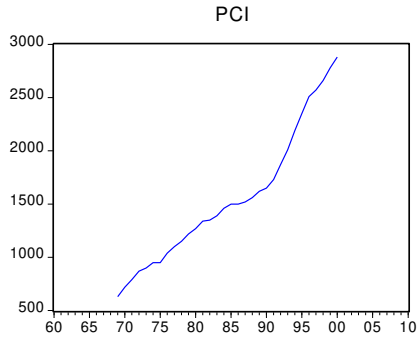
Appendix
Multiple Graphs











Actual fitted residual table:

obs	Actual	Fitted	Residual	Residual Plot
1969	30.6739995050794	30.6327855063068	0.041213998772574	| . | *. |
1970	30.7298287962667	30.7044011398199	0.025427656446790	| . | * . |
1971	30.8172621726188	30.8490747601806	-0.031812587561723	| . * | . |

1972	30.9114284453883	30.9990435066191	-0.087615061230748	| * . | . |
1973	30.9317755007234	30.9498564415785	-0.018080940855157	| . * | . |
1974	30.7463569891284	30.759707095821	-0.013350106692651	| . * | . |
1975	30.6822637794101	30.724879012102	-0.042615232691934	| .* | . |
1976	30.8441725879069	30.8966125310782	-0.052439943171294	| * | . |
1977	31.0097410962738	30.9965182761543	0.013222820119444	| . |* . |
1978	31.0896757556612	31.082572467725	0.007103287936171	| . |* . |
1979	31.2016996345781	31.2035799561458	-0.001880321567657	| . * . |
1980	31.2465849761818	31.2362634991256	0.010321477056186	| . |* . |
1981	31.268959845074	31.2652943038167	0.003665541257277	| . * . |
1982	31.3427353603884	31.3229521665231	0.019783193865285	| . | * . |
1983	31.5059858684001	31.4347724661288	0.071213402271235	| . | . * |
1984	31.5292879374236	31.4230127238449	0.106275213578682	| . | . *|
1985	31.5796093888559	31.6205162190813	-0.040906830225399	| .* | . |
1986	31.6700203256037	31.6501240550503	0.019896270553401	| . | * . |
1987	31.770429861849	31.7398380578974	0.030591803951611	| . | * . |
1988	31.794428324981	31.6875927646132	0.106835560367781	| . | . *|

1989	31.7556507538086	31.7337300466592	0.021920707149389 2	| . |* . |
1990	31.7438520801251	31.8403102706245	-0.096458190499406 6	|* . | . |
1991	31.7514654303369	31.7326993675782	0.018766062758690 8	| . |* . |
1992	31.9222911873315	31.9647506776224	-0.042459490290898 6	| .* | . |
1993	32.0920830279114	32.0956773598761	-0.003594331964694 5	| . * . |
1994	32.1634281174382	32.1833188935602	-0.019890776122040 8	| . *| . |
1995	32.1873644370737	32.2372489168136	-0.049884479739904 3	| * | . |
1996	32.2720409548103	32.3607272100126	-0.088686255202241 6	| * . | . |
1997	32.3810965167002	32.3729144070759	0.008182109624299 99	| . |* . |
1998	32.4384543652515	32.3412742046 96	0.097180160555529 1	| . | . *|
1999	32.4182544920035	32.3795510563 14	0.038703435689430 2	| . | *. |
2000	32.2516019456161	32.3022300997539	-0.050628154137806 6	| * | . |