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Estimating elasticity of interest rate and the volume of bank deposits

Mohammadreza Nemati [1,*], Sina Kheradyar [2], Behnam Gilaninia [3]

[1]Department of Accounting, Qaenat Branch, Islamic Azad University, Qaenat, Iran
[2]Department of Accounting, Rasht Branch, Islamic Azad University, Rasht, Iran
[3]Department of Accounting, Rudsar and Amlash Branch, Islamic Azad University, Rudsar and Amlash, Iran

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ABSTRACT

The main objective of the present research is to determine the interest rate elasticity based on the bank deposits' volume. Hence, the determinant of the interest rate elasticity included the rate of inflation and the bank's financial sources and the volume of bank deposits resulting from the keeping a part of people's income in various statements is for the future consumption in the country's banking system. Statistical community of the research includes the supervision of the Melli bank in the provinces during 6 years from the beginning of the year 88 until end of year 93. In order to explain the impact of bank interest, the inflation of the related province has been deducted and the average actual interest is negative. This means the average inflation rate has been higher than the average bank interest rate during the studied years. Finally the achieved was stretched about -0.009. That is, if the net inflation increases one percent, the Melli bank resources in different provinces decreases 0.09%. It also shows the actual results of the bank's interest, gross domestic product, the index housing and interest rate bonds has a meaningful relationship with the volume of bank deposits. As a result it seems, the factors affecting the rate of bank deposits affect bank deposits amount in terms of its maintainable.

1. Introduction

With regard to the formation of the private banks, if public banks nonetheless too many branches and possession of a great share of the possibilities are not able to compile specific strategies in competition with the private sectors, they will lose their shares gradually. In other word, the advantage of the governmental banks is not absolute and permanent regarding the number of banks and branches dispersion and after a limited period of time the managers of private banks will be able to minimize the existent opportunities for the state banks by capital raise, branches building purchase, the use of new advanced equipment, mechanization of the branches and connecting it to the Internet, electronic services, applying the competent, experienced and professional staff with high motivations. either bank's management neglect to this ratio endanger its activity continuation and in such situation even increase of market share is not led to an increase of the shareholders wealth and negative consequences of economic, social and political will be the result of these kind of actions.

Banks finance the major part of their resources from the place of their investors and on one hand the decision-making of individuals to determine the type of saving according to the Portfolio's theory depends on numerous factors such as the output of substitute assets of money (Ghorbani Gashti, 2014). In an optimum condition that the central bank to be able to control the money supply, the choice of money formation depends on people's preference. Considering that the bills and coins are one hundred percent convertible to visual deposits and assuming that the opposite is accurate, however, the decision of that person based on how much bill and coin and how much visual deposit keeps for a certain amounts of money such as decision-demand for kinds bank notes that naturally depends on the transaction needs of a person and convenience in his payments. Although, the dispensing of bills and coins and flow it requires expenses for the monetary authorities, it should be noted that using this instead of visual-deposits and with non-visual deposit is accompanied by costs and benefits for people too. In the case of constant costs and relative benefits keeping of all kinds of money, the share of bill and coin in money volume will be stable and on the condition of these factors changes, the ratio of the share profits is also the result of changes (Noferesti, 1999). To attract non-visual deposits (long-term), we can take action

* Corresponding Author.
Email Address: mohammad_reza_2020@yahoo.com (M. Nemati)

through creating economic motivations. For this matter, banks should pay logical interest to these deposits which are due to exploiting these sources according to the rate of inflation. Banks also can attempt to attract people's attention and attract more deposits by offering banking services or training. This service is required to be in order to increase the trust of people to banks and training them about banking services and advantages of keeping bank deposits instead of bill and also receiving facilitation deposits by investors. On the other hand, the efforts should be taken in order to have more exchanges carried out through visual deposits and banking system (Alipour et al., 2014).

The main issue of the present research is the rate of interest that has been announced by the Melli bank has not been effective to increase of attracting resources. In fact, in the present research we are attempting to answer this question that how much the interest rate of the Melli bank is effective on the change of people's assets basket formation? And how much is elasticity of attracting resources in comparison to the bank interests?

1.1. Thematic literature history

Many researches have been done regarding interest rate such as Majlesi and Habibi 2015; Eghtedarnasab and Dahmarde 2015; Vo et al., 2015.

Karimi (2006) in an article under the title of "Survey of how to equip commercial banks' resources with affectivity of monetary policies" has examined the effects of monetary policy as the central bank's instruments (interest rate of deposits, the interest rate of the deposit facilities, the ratio of debt to banks and the central bank) on the resources of commercial banks. The results of this study showed that the rate of deposits and liabilities of banks to the central bank with the deposits of commercial banks have an inverse relationship whereas the legal interest rate of facilities and deposits' ratio have direct relationship. The gross internal produce and population were also positive role in increasing the deposits of commercial banks. Eventually, inflation in all estimates has had a negative effect on of attracting resources of commercial banks except the pattern of influence of deposits interest rate.

Abounoori and Sepanloo (2006) have done some researches in this area. They state that the result of their research in this way that in recent years following legislation of making banking deposit interest rate logical (reducing this rate) and the lack of efficiency and the development of alternative markets, banking system in groups, identifying the relationship between two macro-economic variables, the rate of inflation and the deposit interest rate is important. Their study meanwhile the use co-repletion patterns and error correction enable us distinguish between long-term and short-term fluctuations, shows a positive and significant relationship between long-term nominal interest rate and the rate of inflation. In other word, the rate of inflation is the reason of the same direction changes in the nominal interest rate or the same deposit interest rate. In addition, with a casual study of Tehran Sepah bank branches the has been shown that there is a converse relationship between the inflation rate and the types of deposits and a direct relationship with the growth of national income.

Kim et al. (2007) in an article under the title of "Bank Deposit Interest Rates and Geographic Division in Japan's Banking Industry's" has estimated the passing of the market interest rate to the deposit interest rates to answer this question whether the market of deposit has divided in terms of Japan's geographical division? The exceptional feature of this research is to use the monthly deposit interest rates 106 banks from March 1999 to March 2010. According to the results of a theory about banking model of excellent banks, the long-term rates of banks have been estimated using the panel data co-integration method. The results show that there is a significant and negative relationship between the concentration of the regional market and (through-pass) that this matter indicates the geographical market division.

Alipour et al. (2014) in an article under the title of "Factors Affecting the Absorption of Bank Deposit (a casual study of the new economy on the bank of the selected provinces)" plans to identify the most important factors in attracting deposits from individuals the in Eghtesad Novin Bank and determining stretch measure of either one of the identified factors. Therefore, using the data from 4 provinces of Gilan, Mazandaran, Golestan and Qazvin during 2005 to 2011, the impact of the factors such as granting some facilities, the interest of shareholders, granted awards and increase the number of ATM on resources absorption has been investigated. By forming a function of linear logarithm and its estimate was specified by data panel method that profit of shareholders, facilities and granted awards have positive and significant impact on increase of bank's resources that out of this the profits of shareholders has had the most impact with the coefficient 2.93, whereas increasing the number of ATM has not had a significant effect on increasing people's deposits in the mentioned bank.

2. Research hypotheses

H_1: There is a significant relationship between the interest rate of the Melli Bank and attract resources.
H_2: There is a significant relationship between interest rate participation papers and attract resources.
H_3: There is a significant relationship between the inflation rate and attract resources.
H_4: There is a significant relationship between GDP of domestic capita and attract resources.
H_5: There is a significant relationship between national price index growth and attract resources.

3. The method of data collection

The method of data collection in this research is a library method in which the necessary information from the articles, research reports, and internal and particularly external thesis has been used. Besides, the information related to the variables of the research have been collected from the informational banks of Melli bank, the central bank's site and Iran's statistics center.

4. The research territory

The scientific research is required to have specific limitation and inclusion as possible. Because, specifying a logical and correct limit will enhance scientific accuracy and value of the scientific research. This limitation specifies that how the researcher has done the research in terms the thematic, location and temporal and to what extent has been able to keep the relevant variables under control. On the other hand, to avoid waste of time, manpower and related costs, specifying research limits is essential. Therefore, according to the mentioned subjects, the current territory of this study can be considered from three perspectives:

Temporal Territory of Research: Temporal territory consists in 6 years from the beginning of the year 88 to the end of the year 93.

Location Territory of Research: The research territory includes supervision branches of Melli bank.

Thematic Territory of Research: The impact of stretch of interest rate is on the volume of bank deposit.

5. Research hypotheses test methodology

Research activities in terms of the nature are divided into three groups: the fundamental research, application and developing. Fundamental researches include genuine and original probe in order to enhance the scientific knowledge and better understanding of natural, human, social and cultural phenomenon.

Application research is called to any genuine investigating in order to obtain new scientific and technical knowledge that new applications are considered for it.

Researches of development (experimental development) is said to any regular activities based on existing knowledge gained from the research and the experience in order to produce material, production, stuffs, tools, processes and new procedures or is applied to improve them.

The current research is a type of application research. There are several methods in the field of practical research that the most significant methods are as follows: historical, descriptive, association eminently (Pasravidadi) and laboratory (Khaki, 2010).

This study is based on purpose from application type. And in terms of the nature is one of the descriptive research types (survey). The used methodology in the research is a type of after-event and the previous information has been used. In the cases which the investigation of relationship between a dependent variable and several independent variables are considered, the purpose of the researcher is using historical data, the parameters (the parameters) to the independent variable (a variable) are estimated and act out to predict by presenting the model. In other word this research is a descriptive research in which seeking to describe the relationships between variables (dependent and independent) using statistical tests. After the formulation of the model, the coefficients of independent variables and the measure of the influence on the dependent variables using least ordinary squares regression method and estimations (EGLS) will be specified.

6. Research model

In the present study we seek to explain effective factors on the increase of deposit share of Iran Melli bank in the market. Econometrics model based on money demand pattern 'the theory of Milton Friedman' and literature related to the savings of individuals have been estimated which are as follows: considering that elasticity of resources absorption comparing to the interest rate in the bank is considered. The Cobb-Douglas's function has been selected to explain the model which is as follows:

$$SOURCE_{it} = \beta_0 INT_{it}^{\beta_1} BOND_{it}^{\beta_2} INF_{it}^{\beta_3} HOU_{it}^{\beta_4} GDP_{it}^{\beta_5} U_{it}$$

Source: Banking sources
Int: Interest rate
Bond: Interest rate participation papers
Inf: Inflation
Hou: National price index
GDP: GDP as a proxy for income and wealth
β: it is a parameter indicating elasticity
t: 6-year period, 2009 to 2014
i: Sections to which the national supervisory banks

This model using annual data of the Melli bank branches of five provinces' affairs departments (Gilan, Mazandaran, Qazvin, Ardabil and Alborz) have been estimating for years 2009 to 2014 like balanced panel data model. Regarding the scale of variables' measure of bank resources and gross domestic product with real interest rates, the index of housing price and bonds has vivid difference. So, to obtain the actual parameters, the logarithm is taken from the above variables. Therefore, the final research model is as follows:

$$\begin{aligned} \log SOU_{it} = {} & \beta_0 + \beta_1 \log INT_{it} + \beta_2 \log BOND_{it} \\ & + \beta_3 \log INF_{it} + \beta_4 \log HOU_{it} \\ & + \beta_5 \log GDP_{it} + U_{it} \end{aligned}$$

7. Descriptive statistics

This research with the subject of interest rate elasticity estimate has been accomplished by comparing to the volume of bank deposits. The statistical community is Iran Melli bank. The amounts corresponding to the central index and the

dispersion resulting of the descriptive statistics variables are as follows (Table 1):

Index of Market Share: The amounts of deposits volume in the Melli bank branches have had increasing flow. So that the averages of 7,017,400 million Rials has deposited in the year 2009 while this figure has been increased to the number 19,533,400 million Rials in the year 2014.

Real Interest Rate: The highest real interest rate of Melli bank was with number 7.68 in years 2014, whereas the lowest amount equals -17.72 percent in the year 2010. The real interest rate for the selected provinces and the casual study over six years equal the average of -4.00 and it was 11.03 with the deviation criterion. In addition, according to the estimated probability for statistics for Jarque-Bera's census the mentioned variables are follows the normal distribution.

Internal gross production: The average of gross domestic production has had increasing flow during the years 2010 to 2014. So that the maximum amount was with the number 70990.2 million Rials in 2014 and the lowest was with the number 42531.2 in years 2009.

Housing price index: the maximum amount of housing index was with the number 17.58 in the year 2014 and the minimum amount of it was with the number of 7.14 percent for the year 2013. On average housing price index for selected provinces and over 6 years of study equals 13.42 and 4.85 with deviation criterion. Besides, according to the estimated probability of Jarque Bera's test statistics the mentioned variables follows the normal distribution.

The bonds profit rate: The average of bonds interest rate has come during the studied years. As it is observed, the highest interest rate was with the number 22 percent in the year 2014 while the lowest amount was with the number 15 percent in 2009.

Table 1: Descriptive statistics of variables (million Rials)

Variables	Mean	Middle	Maximum	Minimum	Standard deviation	Skewness	Elongation	Jrque-Bera	
								P	
volume of deposits	126825000	10201500	41153000	2399000	9534915	1.288	4.257	10.281	0.0058
Real interest rate	-4.00	-0.85	14.00	-25.20	11.03	-0.50	2.14	2.15	0.33
GDP	59865.97	60893.5	81736.0	32258.0	13973.76	-0.144	2.061	1.206	0.339
House Price Index	13.42	13.75	23.80	3.40	4.85	-0.12	2.67	0.20	0.90
Participation interest rate	0.191	0.20	0.22	0.15	0.02	-0.78	2.66	3.20	0.20

8. Variables association investigation

According to the Table 2 the results can be drawn that there is link between the Source (Bank sources) and INT (bank interest rate) and there is also a 0.127association between the ratio of Source (bank sources) and INF (inflation).

Table 2: Results of correlation between independent and dependent variables

Dependent Variable	Independent Variable	Source	Int	Bond	Inf	Hou	GDP
Source	correlation	1	---	---	---	---	---
	Probability	-					
Int	correlation	-0.16	1	---	---	---	---
	Probability	0.02	-				
Bond	correlation	-0.004	0.003	1	---	---	---
	Probability	0.41	0.43	-			
Inf	correlation	0.127	-0.006	-0.003	1	---	---
	Probability	0.02	0.676	0.08	-		
Hou	correlation	-0.07	0.06	0.42	-0.0009	1	---
	Probability	0.91	0.13	0.059	0.48	-	
GDP	correlation	-0.14	-0.11	0.010	-0.004	-0.001	1
	Probability	0.006	0.004	0.859	0.654	0.598	-

8.1. Unit root test

As it was noted, one of the ways of avoiding a false regression is assurance of data stability. Thus, before estimating the model, attributes of the statistical panel data are investigated in terms of a unit root existence or stability.

The results of the unit root test for the model's variables is as following table and as it is observed, all research variables are at the level of stability (Table 3).

8.2. Integration test

The concept of economic co-integration is it, when two or more time series temporal based on subjective foundation are linked together to form a balance long-term relationship, although these temporal series may have a random process (unstable), but they follow each other during the

time. In way that the difference between them is with the stability (stable).

Therefore, there is a kind of balance long-term relationship between these two variables. In this case the estimate of regression relationship can be quite meaningful (i.e. not mendacious). But if two variables are not co-addition, it is possible get away from each other more and more during the time and there will not be a balance long-term relationship between them.

Table 3: The unit root test LLC (the intercept and process)

Test Results	P-Value	Test Statistics	Variables
Stationary at zero level	0.00	-17.40	SOURCE
Stationary at zero level	0.00	-87.05	GDP
Stationary at zero level	0.00	-2.63	HUS
Stationary at zero level	0.00	-19.27	NET
Stationary at zero level	0.00	-4.23	BOND

Therefore, the co-integration test seems necessary for the data. The results of this research for the current research panel have been presented in the tables below. According to the both ADF and PP test method and the probability of zero corresponds to them, the lack of co-integration zero hypothesis between the variables of the both panels is rejected and these results show that variables in both panels form a balance long-term relation (Table 4).

Table 4: The results of the integration

Test Method	P-Value	Null Hypothesis	Test Results
Group PP-Statistic	(0.00) -4.92	Lack of integration	Reject the null hypothesis
Group ADF-Statistic	(0.00) -5.24	Lack of integration	Reject the null hypothesis

8.3. Self-correlation test and variance dissimilarity

At the time of existence of a problem and disregarding it, although estimates are compatible. The defect of this presumption cause a problem called dissimilarity of variances. Considering, the vacuum component in the variance equals to dependent variance, the problem of variable dissimilarity to variance inequality, the dependent variable is referred to different periods. Assuming with increase or decrease of independent variable, the variable dependent variance (residuum) will not change in this study White examination has been used to investigate variance dissimilarity that the either conclusion of them has been presented in the table underneath (Table 5).

Table 5: The results of autocorrelation and heteroscedasticity

Description	P	F
A hypothesis (autocorrelation test results)	0.76	5.117
A hypothesis (variance heterogeneity test results)	0.20	8.55

According to the test's results it can be stated that presumption of zero based on lack of data self-association has been approved. Thus, it can be expressed that there is no self-correlation problem between variables in hypotheses test. On the other hand, based on the table above and F censuses and a meaningful level has been estimated, zero assumption in relationship with variance dissimilarity test is not refuted for the investigated theory. Therefore, it can be stated that variable variances is equal for the theories.

9. Model's estimation

Firstly, to determine existence or lack of existence of latitude from the era are separately as presented for each province in three seasons, has studied Limer's test and we choose between mass data and non-mass data (fixed effects or accidental effects) in which H0 theory is latitude equality from the eras (combination method) against H1 hypothesis, latitude dissimilarity from the eras (panel method).

$$\begin{cases} H_0: \ \alpha_0 = \alpha_1 = \cdots = \alpha_n = \alpha \\ H_1: \ \alpha_i \neq \alpha_j \end{cases}$$

$$F_{(n-1,nt-n-k)} = \frac{(RSS_R - RSS_{UR})/(n-1)}{RSS_{UR}/(nt-n-k)}$$

If the computed F is bigger than the table of F with freedom grade (n-1), (nt-n-k), Hypothesis zero will be refuted and thus the limited regression will not valid and latitude from different eras should be considered. In this study likeliness test has been used to do this test. In E-views software if the software's output probability is less than 0.05 after doing Redundant Fixed Effects-Likelihood Ratio test, panel method is approved at the level of over 95%. But, if it is more than 0.05, the combination method is accepted (Table 6).

Table 6: The first model LM test output

Effects Test	Statistic	d.f	Prob.
Cross-section F	148.57	4,21	0.00
Cross-section Chi-square	101.32	4	0.00

As it is observed, panel data method is accepted. Now this inquiry is come up that distinction in

latitude from the temporary units eras is effectively accidental? Hasman's test is used to choose fixed effects pattern $E\left(\frac{U_{it}}{X_{it}}\right) = 0$ and against accidental effect pattern of $E\left(\frac{U_{it}}{X_{it}}\right) \neq 0$. Statistic of this test is Chi-2 with the freedom grade against many independent variables;

$\begin{cases} H_0: \ Random\ Effect \\ H_1: \text{ Fixed Effect} \end{cases}$

If we use the Hasman's test in E-views 6 software and obtained probability is less than 0.05, the pattern of fixed effects is approved at the level of over 95%. But, if it is more than 0.05, the accidental effect pattern is accepted (Table 7).

Regarding Hasman's test result, the fixed effect pattern is accepted. These test results have been presented in tables below (Table 8).

Thus the regression is estimated with the fixed effect pattern and the estimate results are as follows (Table 9):

Table 7: Hausman test output

Test Summary	Chi-Sq. Statistic	d.f	Prob
Cross-section random	175.42	4	0.00

Table 8: Choose a suitable model for the panel test

Test Method	P-Value	Hypothesis	Choose a model
LM Test	(0.00) 148.75	H0: The hybrid model is better. H1: Models with random effects or fixed is better.	Models with random effects or fixed
Hausman Test	(0.00) 175.42	H0: Models with random effects is better. H1: Models fixed is better.	Models fixed

Table 9: Model output

Variables	FIXED		
	Coefficient	t	Prob
C	24.78	1.49	0.00
NET	-0.009	-2.736	0.01
HUS	-0.013	-2.213	0.03
LOG(GDP)	0.641	3.966	0.00
BOND	-7.878	-4.337	0.00
$\overline{R}^2 = 0.18$	$R^2 = 0.18$		
F=184.30	Prob=0.00		
$D.W = 2.3$			

As it is observe from the estimate output, all the independent variables have a significant relation with dependent variables. So that the internal gross income has a positive relationship and housing price index, real interest rate and the bonds interest rate has a negative relationship with Melli bank sources.

R2 =0.98 and R2=0.98 explains high explanation of independent variables. That means more than 98 percent of the independent variables are justifiable by dependent variable changes. The amount of the statistic is more than its measure in the table and despite the probability = 0.00, total regression is meaningful in terms of statistic.

Considering the statistic amount of Watson's camera that has no egregious difference with the number two as well as due to the nature of the data panel method and short studied years, it can claim the lack of self-correlation of error sentences. Finally, regressions for five provinces are as follows (Table 10).

According to the results it can be stated that the most important macro-factors that affect the amount of the bank deposit are bank interest rates and inflation. Because provides the interest rates of non-business income with very low risk. Therefore, theoretical expectation is over the positive effect of mentioned variable. On the other hand, the existence of high inflation in the country has caused decrease of real income of individuals. This matter causes reductions of national saving and consequently decreases of physical and non-physical assets such as bank deposits. Therefore, in the present research to explain the real impact of interest rates, initially inflation rate was subtracted out of nominal in order to obtain the real interest rates.

Table 10: Regressions for five provinces

Alborz	OG(SOURCE) =25.16 - 0.009*NET+ 0.64*LOG(GDP) - 7.87*BOND - 0.013*HUS
Ardabil	OG(SOURCE) =23.76 - 0.009*NET+ 0.64*LOG(GDP) - 7.87*BOND - 0.013*HUS
Qazvin	OG(SOURCE) =24.22 - 0.009*NET+ 0.64*LOG(GDP) - 7.87*BOND - 0.013*HUS
Gilan	OG(SOURCE) =24.96 - 0.009*NET+ 0.64*LOG(GDP) - 7.87*BOND - 0.013*HUS
Mazandaran	OG(SOURCE) =25.79 - 0.009*NET+ 0.64*LOG(GDP) - 7.87*BOND - 0.013*HUS

According to the results of the descriptive statistics, it was clarified that the average inflation rate has been more than bank interest rate during the studied years. Based on estimates of the model, it was determined that the real interest rates have negative and significant impact on increasing of bank deposits volume. According to the obtained

coefficient, interest rate elasticity is less than 1 comparing to the volume of the bank deposits. This means that Melli bank should surge its interest rate notably in order to be able to increase its sources in a way to overtake community's inflation rate. The internal gross production has also a positive and significant with the size depositing amount. This means with an increase of income capitation, people tend to invest in banks. On the other side, bonds interest are the other investigated variables which is the substitute of bank interest in the present model. The other variables in the present investigation, the housing price index in urban areas. Take into consideration that real estate markets has been always a confident and profitable market in the country, so, the researcher has registered the growth of housing prices as a surrogate variable into the model. The results of the estimates represent negative and significant relationship with the amount of the deposit. In fact, people prefer to invest in the housing market to get more interest with the increase of housing prices instead of depositing.

The estimated model, the latitude amount of the five provinces' ears of the country is statistically different. These differences may be due to economic, social and cultural particular features of the country's provinces should be considered to develop the bank's market share.

10. Suggestions based on hypothesis test

With due attention to the amount of absorbed sources elasticity is low comparing to the interest rate, it is suggested, the bank consider the inflation rate in their policies, especially when the community is with downturn, banks should attempt to collect the small capitals with an increase of bank interest rate, and lead them to produce. Moreover, in cases which a definite benefit is declared by the central bank, the Melli bank should attempt to attract sources by the others incentive tools such as; granting facilities, advertising, electronic banking etc.

The housing price index and bonds profit are as a surrogate variable for bank deposits. In fact people tend to buy real estate with the growth of housing prices rather than depositing in banks. Hence, it is suggested that banks consider housing price index to rate deposit rate. It is also suggested the government to have a paler presence in the largest private sector that is housing so as to have housing price determined by the offer and demand mechanism and economic factors passersby such as banks to be able to have a more precise anticipation of the housing price index growth situation.

Considering that the internal gross production of the capitation and in other word, people's income capitation has a significant relationship with the amount of deposit volume in different provinces, therefore, it is suggested to assist in income capitation rise by investing in production projects and appropriate with provinces' potential.

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