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<b>AUTHORS</b>	Oleg Vasyurenko Ganna Azarenkova
<b>ARTICLE INFO</b>	Oleg Vasyurenko and Ganna Azarenkova (2004). Profitability of the Securities’ Portfolio of the Banks of Ukraine and The Structure of Their Regional Distribution (Evaluation Analysis And Methodological Notes). <i>Investment Management and Financial Innovations</i> , 1(2)
<b>RELEASED ON</b>	Tuesday, 14 December 2004
<b>JOURNAL</b>	"Investment Management and Financial Innovations"
<b>FOUNDER</b>	LLC “Consulting Publishing Company “Business Perspectives”



NUMBER OF REFERENCES

0



NUMBER OF FIGURES

0



NUMBER OF TABLES

0

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## **Profitability of the Securities' Portfolio of the Banks of Ukraine and The Structure of Their Regional Distribution (Evaluation Analysis and Methodological Notes)**

Oleg Vasyurenko<sup>1</sup>, Ganna Azarenkova<sup>2</sup>

### **Abstract**

The expedience of the study on a correlation between the profitability of securities' portfolio of banks and the structure of their regional distribution is substantiated. A corresponding econometric model is constructed. Endogenic and exogenic variables of the indicated model are determined. The nature of the influence of the regional distribution structure of securities' portfolio of banks on the corresponding component of their profitability is analyzed.

**Key words:** profitability, securities, structure of the market, territorial concentration, econometric model.

### **Introduction**

The circulation of securities is one of the monetary policy tools with which in one way or another the level of banking interest as well as the volume of funds supply and the development of investment climate in general is connected. Besides, raising funds on financial markets with the help of government bonds is a commonly acknowledged means of financing state budget deficit and dynamics of government bonds profitability (both the average level of profitability and the whole temporary structure) is one of the main indicators of the inner debt market development.

Although, despite such a great importance of the securities' circulation it is necessary to mark a low level of development of this segment of the financial market in Ukraine. Thus, according to the final figures of 2002 and current tendencies of 2003, this part of the financial market still remains practically outside the limits of the indices of the markets of foreign countries. Only 6% of securities are in circulation on the organized market. Besides, the volume of the domestic market of the corporate bonds makes only 0,35 % of the Gross Domestic Product, whereas in Russia – 0,74 %, in Poland – 1,8 %, in Estonia – 3,9 %, and in Denmark and the USA – up to 80 %. This, in its turn, creates definite problems in relation to an unsatisfactory saturation of the national industry with direct and portfolio investments, for, as the research in the 90s of the 20th century indicates, the share of borrowings by means of securities amounted to 70-75% of the total loan capitals (the rest – 25-30% – were banking credits). However, the characteristic feature of the financial sector development in Ukraine is dynamics of the banking system operation with the “progressing stagnation of the stock market”<sup>1</sup> in the background. That is, the construction of a model of assessing the securities' movement in the structure of the financial flows of the banks may be defined as the direction of the research. The latter is reflected in the change of the volumes and profitability of the securities' portfolio.

In doing so it also is expedient to take into consideration that the structural rearrangement of economy, dynamic increase of the aggregate product of the real sector of production demands constant raising of the additional financial resources. In the long run this determines the importance of the chosen subject of the research, that is confirmed by a number of corresponding papers.

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<sup>1</sup> Doctor of Sciences, Prof., Director of Kharkov Institute of banking, Ukrainian Academy of Banking, Ukraine.

<sup>2</sup> Candidate of Sciences in Economics, Kharkov Institute of banking, Ukrainian Academy of Banking, Ukraine.

### *Analysis of existing studies and definition of the purpose of the chosen direction of the research*

If we are to esteem the papers dealing with separate problems of the securities market functioning in Ukraine, in general, they can be divided into three large groups.

The first group deals with the analysis of the state and development of the stock market which is responsible for issuing capabilities of enterprises with different forms of ownership and activity.

Although the majority of papers of the above-mentioned group focuses on the analysis of the current tendencies and on the problems of analysis of the dynamics of the temporary structure of every kind of stock market tool probability. Probability level among short-term and long-term securities remains poorly investigated. Another group of papers is dedicated to the analysis of commercial banks activities with different kinds of securities. This group can be arbitrarily divided into two sub-groups, one of which analyses the current tendencies of functioning the banks on the stock market (for example, see the studies by T. Rudenko and O. Kustch, 2003), the other considers the models of stock markets in developed countries (V. Shapran, 2003). The third group is a theoretical generalization related to defining different approaches as to the analysis of securities' market.

From our point of view, in this case the definition of the influence of the market structure of the banks' regional division on the securities' circulation remains outside the limits of the study.

However, the analysis concerns the definition of interrelated influence of the market structure of division of the subjects of economic management and their separate economic indicators of western researchers as well as in the papers on manufacturing enterprises.

Besides, financial sector as well is characterized by expressed tendencies to operations' concentration. These tendencies have both geographical and institutional aspects. However, strengthening the positions of some enterprises on the financial services' market is not always accompanied by the growth of the territorial concentration of the corresponding banking operations.

But still the confirmation of the expedience of the chosen direction of the investigation is the existing concentration of the banking sector of Ukrainian economy, that is characterized by the existence of certain groups of the regions' division according to the volumes of the industrial production and the volumes of credit portfolios of banking institutions as of January 1, 2003 (Fig. 1<sup>1</sup>). In Figure 1 the city of Kyiv and Kyiv region are denoted by figure 1, Dnipropetrovsk region – by figure 2, Donetsk region – by 3; Sumy, Transcarpathian, Rivne, Kirovograd, Ternopil, Volyn and Chernivtsi regions – by 4; Lviv, Vinnytsya, Zhytomyr, Cherkasy, Odessa, Khmelnytsky, Mycholayiv, Ivano-Frankivsk, Chernigiv and Kherson region and the Autonomous Republic of the Crimea – by 5; Lugansk, Kharkiv, Zaporozhye and Poltava regions – by 6.

At the same time the analysis of the specific gravity of banks' investments into securities in accordance with their assets shows that it is possible to determine some other groups of regional division (Fig. 2)<sup>2</sup>.

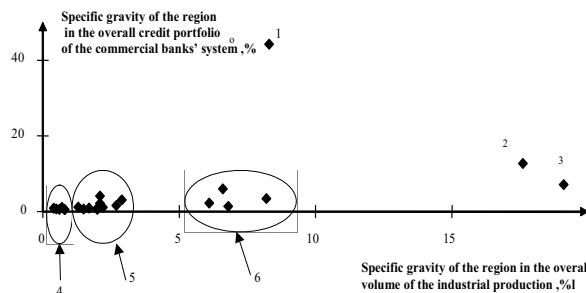


Fig. 1. Regional division of Ukraine according to the volumes of industrial production and the volumes of credit portfolios of banking institutions

<sup>1</sup> Calculated and built on the basis of the data from the sites [www.me.gov.ua](http://www.me.gov.ua), [www.bank.gov.ua](http://www.bank.gov.ua), [www.ukrstat.gov.ua](http://www.ukrstat.gov.ua)

<sup>2</sup> Calculated and built on the basis of the published banks' data as of January 1, 2003.

According to this characteristic it is possible to determine the following regional groupings (as an example):

- the first cluster (the level of specific gravity of banks' investments into securities in general in the region is not less than 10%) – Donetsk region and the Autonomous Republic of the Crimea;
- the second cluster (the level of specific gravity of banks' investments into securities in general, in the region is within the limits of 6% to 10%) – the city of Kyiv and Kyiv region, Zaporozhye region, Kharkiv region;
- the third cluster (the level of specific gravity of banks' investments into securities, in general, in the region is within the limits of 2% to 6%) – Dnipropetrovsk region, Lviv region, Poltava region;
- the fourth cluster (the level of specific gravity of banks' investments into securities, in general, in the region is less than 2%) – Volyn region, Transcarpathian region, Lugansk region, Ivano-Frankivsk region; Odessa region, Sumy region, Chernivtsi, Chernigiv region.

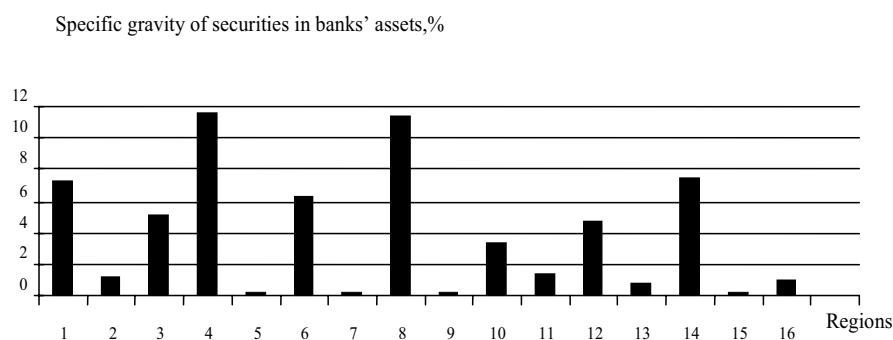


Fig. 2. Specific gravity of securities in banks' asserts according to the regional grouping.

1 – the city of Kyiv and Kyiv region; 2 – Volyn region; 3 – Dnipropetrovsk region; 4 – Donetsk region; 5 – Transcarpathian region; 6 – Zaporozhye region; 7 – Ivano -Frankivsk region; 8 – AR of the Crimea; 9 – Lugansk region; 10 – Lviv region; 11 – Odessa region; 12 – Poltava region; 13 – Sumy region; 14 – Kharkiv region; 15 – Chernivtsy region; 16 – Chernigiv region.

Therefore there crops up a question whether the territorial banks' division influences their certain economic indicators, namely, proceeding from the direction of the chosen study, the profitability of the banks securities' portfolio.

The basis of this question is also the improvement of the ways of development of the banking sector of economy of Ukraine and giving recommendations as to the formation of the banks securities' portfolio.

Thus, the analysis of correlation of banks' securities portfolio and their corresponding territorial division may be defined as the main task of this paper.

#### ***Input data, methods of research, model specification and their results***

The foundation of this study are data published concerning the development of certain banks, which are grouped according to the territorial characteristic of the headquarters registration. Certainly, that kind of grouping only gives the ground for some conclusions. However, notwithstanding this, the above-mentioned grouping is used widely enough in corresponding studies. The complexity of solving the given task runs into the absence of sufficiently extended statistical base as to this problem, the latter is being periodically corrected and changed into the bargain. Nevertheless, the corresponding data can be obtained on the basis of analysis of financial indicators of banks' activity

and financial reports that are available for the general public on the sites of those banks. Especially that may concern such an indicator as profitability of banks' securities. However, in profit and loss statements banks show definite data pertaining to the operations with securities, long-term investments in associated companies, subsidiaries and other investments. Profitability for government internal loan bonds can be calculated on the basis of the data that are made available when citing this instrument<sup>1</sup>. Therefore, data obtained on the basis of this information can be considered as a certain evaluation that is trustworthy enough. This statement is related to the fact that further on we operate not with absolute values but with their reliable indicators —specific gravity of the securities' portfolio for a certain region. We should specifically underline that in general it is expedient to define further results as estimative ones. But they are of a certain scientific value as methodological problems of conducting that kind of research are examined concurrently. Besides, this study may be the first step in the direction substantiated at the beginning of the article. Moreover, it should be added that if other researchers obtain new results then they should first of all compare them and a more substantial conclusion should be drawn after the corresponding data available on the NBU site.

At the same time in order to lessen fallacy as to overall evaluation calculations a corresponding economical analysis was done within a limited period of time, a large number of banking activity indicators from operating banking institutions was taken into account. These data constitute 3 periods of time: as of January 1, 2003, April 1, 2003 and July 1, 2003 and cover 155 banks. Selection of a short period of time is also stipulated by the wish to level the impact of outer factors mainly of subjective character as well, which also add certain errors into calculations. Besides, it is important to determine the given task during the period when there are no drastic changes in the operation of both stock and banking segments of the financial market. The methodological basis of the research is a cross-selection multiple regression that allows to evaluate the relation between the examined variables even at the short time intervals.

As an endogenic variable of the final econometric model according to equation (5) we chose the specific gravity of the profitability of banks securities' portfolio. The importance of the chosen endogenic variable is determined by the bifurcational value of securities' circulation in the formation of banks' revenue. That can be determined, for instance, in the course of examining the econometric model of dependence of a commercial bank's revenue on the volumes of the following structural assets parts of the bank: high liquidity assets, credit portfolio and securities:

$$Y = \beta_0 + \beta_1 \cdot X_1 + \beta_2 \cdot X_2 + \beta_3 \cdot X_3, \quad (1)$$

where  $Y$  is commercial bank's revenue;  $X_1$  is the volume of high liquidity assets;  $X_2$  is the volume of credit portfolio;  $X_3$  is securities' volume in the structure of the bank's assets;  $\beta_1, \beta_2, \beta_3, \beta_4$  are multiple regression indices of the econometric model according to equation (1) shown in Fig.1 (here and further on in the brackets  $t$ -statistics is shown for every index that points out to the significance of the exogenic variable at the confidence level of probability = 95%. The most statistically important variables are underlined).

Table 1

Parameters of econometric model of dependence of commercial bank's revenue on the volumes of some structural parts of its assets (as of January 1, 2003)

Determination index	$\beta_0$	$\beta_1$	$\beta_2$	$\beta_3$
0,98	-5130,25 (-2,38)	-0,06 (-1,31)	0,23 (40,95)	0,20 (7,62)

That is from the data analysis of Table 1 it can be stated with a high level of confidence that the volume of commercial bank's securities influences positively the formation of its revenue. At the same time the data analysis of Table 1 testifies that the most important is the change of  $X_2$ . That is, the

<sup>1</sup> www.minfin.gov.ua, www.pfts.com.

obtained result can be interpreted as follows: in the given time period the influence of the specific gravity of the bank securities' portfolio on their profitability is insufficient. However, there arises a problem of how to activate that constituent of the banking activity and involve it into the general process of increasing the stock market's significance. Moreover, further examination of variable  $X_3$  conditions its statistical significance according to the model (when there is no multicollinearity between exogenic variables) which points out to a certain influence as to the formation of the banks' revenue.

In conformity with the above-mentioned, of no less importance is the question what securities influence commercial bank's revenue more. To solve this task an econometric model was formed;

$$Y' = \beta'_0 + \beta'_1 \cdot X'_1 + \beta'_2 \cdot X'_2 + \beta'_3 \cdot X'_3 + \beta'_4 \cdot X'_4 + \beta'_5 \cdot X'_5 + \beta'_6 \cdot X'_6, \quad (2)$$

where  $Y'_1$  is commercial bank's revenue;  $X'_1$  is funds and balance at the NBU;  $X'_2$  is Treasury bills and other securities that are refinanced by the NBU;  $X'_3$  is funds at the other banks;  $X'_4$  is securities for sale;  $X'_5$  is credits and clients' debt;  $X'_6$  is investment securities;  $\beta'_0, \beta'_1, \beta'_2, \beta'_3, \beta'_4, \beta'_5, \beta'_6$  are indices of the multiple regression, that are given in Tables 2 and 3.

Table 2

Parameters of econometric model according to equation 2 (data given as of April 1, 2003)

Determination index	$\beta'_0$	$\beta'_1$	$\beta'_2$	$\beta'_3$	$\beta'_4$	$\beta'_5$	$\beta'_6$
0,982	-118,159 (-0,335)	0,118 (10,981)	-0,011 (-1,797)	-0,011 (-2,981)	0,066 (2,939)	0,022 (11,883)	0,060 (2,021)
0,973	-573,883 (-0,672)	0,094 (4,204)	0,033 (1,926)	0,005 (0,605)	-0,032 (-0,787)	0,060 (15,797)	0,086 (3,500)

As can be seen from Table 2 the influence of different structural parts of securities' portfolio on the bank's revenue at different time intervals is not the same. Besides, data in Table 2 somewhat differ between themselves and from those in Table 1. An explanation for this is, first of all, a change of assets' structure at some banks that can be seen, for example, by such indicator as Treasury bills and other securities that are refinanced by the NBU in the first group of banks (Table 3).

Table 3

Change dynamics of Treasury bills and other securities' volumes that are refinanced by the NBU (thousand hryvnias)

Name of the bank	Value as of April 1, 2003	Value as of July 1, 2003	Absolute changer before the preceeding period
PRIVATBANK	0	0	0
AVAL	187314	123647	-63667
PROMINVESTBANK	49803	49812	9
OSHCHADBANK	1287425	1213798	-73627
UKREKSIMBANK	168111	203893	35782
UKRSOTSBANK	418053	396442	-21611
UKRSIBBANK	5815	5707	-108
NADRA	26431	31435	5004
RAIFFEISENBANK UKRAINE	0	4948	4948
PERSHY UKRAINSKY MIZHNARODNY BANK	114413	109860	-4553

As can be seen from Table 3 the majority of banks had a decrease of volumes of Treasury bills and other securities refinanced by the NBU. Moreover, the sum total value of this change over the presented group of banks is different as well.

By the way, this tendency is inherent to the whole system of commercial banks over the analyzed period of time.

Another explanation of the data discrepancy in the upper and lower rows of Table 2 is that the second part is built on the data that generalize quarterly changes whereas in the first one includes annual ones. However, there is no special statistical error in it for general tendencies, according to econometric model 1 and 2, coincide. But still substantial significance of defined remarks from the point of view of building the model of profitability correlation and the corresponding territorial division of securities' market is taking into consideration the structure of bank securities' portfolio, the latter being introduced into the final econometric model that is given below.

On the basis of the above said the author thinks that it is expedient to include into the examination the value of the concentration of the above mentioned components of commercial banks' securities portfolio (namely, the volumes of these components) in the aspect of their territorial grouping. The foundation for these calculations is the application of Gerfindal – Hirshman index:

$$G_i = \sum_j s_{ij}^2 \cdot 1000, \quad (3)$$

where  $G_i$  is the value of Gerfindal-Hirshman index for  $I$  – the territorial grouping of banks;  $s_{ij}$  is specific gravity of operations with a certain kind of securities from the general volume of operations with securities of this kind over the whole system of commercial banks of  $j$ -banking institution that is located on  $j$ -territory. According to this principle it is also possible to calculate other parameters of banking activity as to the banks' territorial grouping.

The defined concentration may be endogenic in relation to the profitability of the securities' portfolio. Therefore, with the aim to avoid the corresponding error the value of volume's concentration of the components of the banks securities' portfolio is calculated on the basis of the preceding period, i.e. as of April 1, 2003. Other value of the final econometric model according to equation (5) is calculated as of July 1, 2003.

In addition we introduced in the final model indices of specific gravity of bank securities' portfolio in the composition of its total assets according to the territorial division of the banks and specific gravity of their own debt's securities in the structure of bank's liabilities according to their territorial division.

Another endogenic variable of the model is the indicator of the relation of the bank securities' portfolio size to its liabilities. This indicator was introduced in order to take into account the potential liquidity of portfolio's securities. At that the high value of this indicator testifies to the sufficient liquidity reserve as secondary reserves. But if the loan component in liabilities is large that may result in losses. On the other hand, low investments in securities, government securities among them, greatly decrease bank's maneuverability in relation to liquidity support and competitiveness for very profitable loans.

Nevertheless, it is expedient to introduce the index of the so-called territorial dispersion into the general model in order to avoid overevaluation of concentration indices. At the same time it is worthwhile to note that theoretically uniform division of financial resources over the regions would correspond to equal provision of GDP with credits in all the regions. However, on the other hand, there exist factors lessening the concentration stimuli, particularly asymmetry of information between the lender and the borrower, issuer and buyer of securities. That is why, from the author's point of view, it is more expedient to introduce the territorial dispersion that takes into account the correlation of regional banks' volume of securities and the corresponding volume of credits given:

$$DISP = 1 - ABS\left(\frac{VP - VK}{2}\right), \quad (4)$$

where  $DISP$  is an index of territorial dispersion;  $VP$  — specific gravity of the regional banks securities' portfolio in their general volume over the system of commercial banks;  $VK$  — specific gravity of regional banks' credit portfolio in their general volume over the system of commercial banks;  $ABS(\dots)$  — absolute value. The essence of this indicator is as follows; if  $DISP \rightarrow 1$ , then there is no influence of the banks of one region upon other regions in the sphere of securities' circula-

tion and granting loans. Otherwise one can speak of the regional concentration and the influence of some regions upon the others, i.e., this indicator takes into account certain divisional asymmetry of the financial resources in order to eliminate the influence of regional inequality.

Thus, all in all the final econometric model may be defined as follows:

$$D = \lambda_0 + \sum_{i=1}^3 \lambda_i \cdot K_i + \lambda_4 \cdot K_4 + \lambda_5 \cdot K_5 + \lambda_6 \cdot K_6 + \lambda_7 \cdot K_7, \quad (5)$$

where  $D$  is specific gravity of the banks securities' portfolio (estimative value);  $K_1$  – index of volume concentration of Treasury bills and other securities refinanced by the NBU according to the territorial characteristics;  $K_2$  – index of volume concentration of securities for sale according to the territorial characteristics;  $K_3$  – index of volume concentration of investment securities;  $K_4$  – index of specific gravity of bank securities' portfolio in the composition of its total assets according to the territorial division of banks;  $K_5$  – indicator of correlation of the volume of securities' portfolio owned by the bank to its liabilities;  $K_6$  – index of territorial dispersion;  $K_7$  – specific gravity of bank's debt securities in the structure of bank's liabilities according to their territorial division;  $\lambda_0, \lambda_1, \lambda_2, \lambda_3, \lambda_4, \lambda_5, \lambda_6$ , are the corresponding regression indices shown in Table 4. At this let us note that the corresponding indices  $K_1, K_2, K_3, K_4, K_5, K_6, K_7$  are calculated with the help of Gerfindal – Hirshman index (see equation 3, where parameter  $s_{ij}$  is variable in relation to defining the given indices).

Table 4

Parameters of econometric model according to equation 5

Determination index	$\lambda_0$	$\lambda_1$	$\lambda_2$	$\lambda_3$	$\lambda_4$	$\lambda_5$	$\lambda_6$	$\lambda_7$
0,87	3,86 (4,36)	-0,01 (-0,08)	-1,03 (-2,32)	0,54 (2,63)	-4,90 (-2,97)	4,27 (3,66)	-0,94 (-0,66)	-1,34 (-0,65)

Confirmation of the model adequacy built according to equation 5 is the reflection of correlation between variables' value which are observed and foreseen at the confidence level of probability equal to 95% (Fig.3).

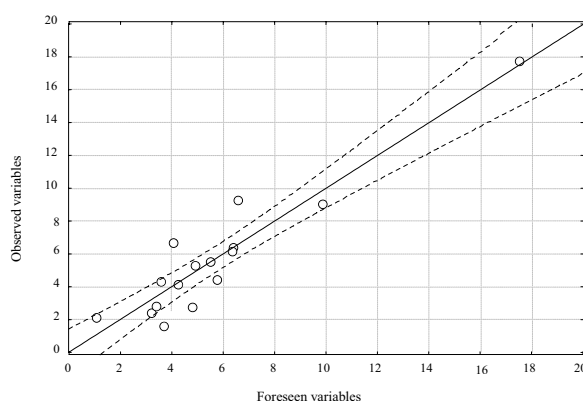


Fig. 3. Graph of variables observed and foreseen

As can be seen in Figure 3 the straight unbroken line at its turn to the horizontal state crosses broken lines. This is an illustration of a relation between the chosen variable of the model according to formula 5 and corresponding factors. I.E. Figure 3 testifies that the suggested econometric model according to formula 5 explains correlation between the profitability of banks securities' portfolio and chosen invariable model parameters from the point of view of territorial banks' concentration for the regions of the larger part of Ukraine.



## Conclusions

On the basis of analysis of the obtained assessment data it can be noted that territorial concentration of securities' portfolio influences the corresponding component of banks' profitability. But the fact that we take into account the quality component of banks securities' portfolio interferes with adopting this conclusion finally.

A certain error in the built model is introduced by the application of assessment of the specific gravity of securities portfolio profitability. Therefore, it is extremely important to continue this study both on the basis of officially available data on the NBU site and proceeding from the ideas of other researchers. In addition, from our point of view, the problems raised in this paper concerning building the suggested and similar models will be useful and enhance more precise definition pertaining to the raised problem.

However, notwithstanding this, one can assert that territorial concentration of banks does not always influence positively the profitability of their securities' portfolio. Thus, it should be noted that in their activity with securities it is expedient for the banks to raise the effectiveness of managing the corresponding portfolio and pay more attention to forming their structure and quality of securities for sale.

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