



## Role of Export, Import and Gross Capital Formation in Iraq: A Granger Causality Approach

Ahmed Saddam Abdulsahib\*

Centre for Basrah and Arab Gulf Studies, University of Basrah, Iraq. \*Email: [ahmed.abdulsahib@uobasrah.edu.iq](mailto:ahmed.abdulsahib@uobasrah.edu.iq)

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### ABSTRACT

This study aims to investigate the link amongst cointegrated observations of export, import and gross capital formation (GCF) in Iraq over the period 2004-2021. This study assumes that the high reliance on the crude oil revenues cannot lead to enhance level of economic diversification and stability. However, the main objective of this paper is to empirically analyse the relationship between export, import and gross capital formation. For this purpose, the study employs a granger causality test. It revealed a considerable linkage between the variables examined, in which a long-run unidirectional causal relationship is existed from GCF to export and import, and also from export to import. Whereas the causal link from export and import to GCF is absent. This implies that the sound economic policy in Iraq is not engaged efficiently due to the modest level of GCF impact, in which there is a parallel relationship between export and import in general, where the major export revenues devoted for meeting the consuming needs over the period studied. The study recommended gross capital formation in Iraq ought to be increased and utilized in efficient way that lead to raise level of value added, where this could be achieved via enhancing level of export, particularly non-oil export. Accordingly, it also recommended to attracting domestic and foreign investors.

**Keywords:** Export, Import, GCF, VAR Model, Iraq

**JEL Classifications:** F10, F14, F43, L38, O11

### 1. INTRODUCTION

Iraq as most developing countries had launched the macroeconomic reforms since 1970s via engaging the rise of level of oil prices. This factor was an essential base for achieving sustainable economic growth, but all that were restricted by the first gulf war with Iran (1980-1988), followed by the second gulf war (1990-1991) and then the international sanction against Iraq (1991-2003) till the political change in April 2003 due to the American invasion to Iraq. All these periods did not lead the decision makers to follow a real developmental policy in Iraq. However, since 2004, policy makers in Iraq have considered the negative impact of the absence of economic policies for real development and diversification. And this has become a source of social and political pressures. Based on

that, the government has announced a number of industrial policies targeted accelerating economic growth and openness to other economies, which could be analysed based on the following table.

However, the study period has witnessed different political changes and also legislation of various laws and rules that can affect the economic life directly and indirectly. Therefore, the current study try to extrapolate the role of the new economic philosophy after 2003 in Iraq. It tries to find out whether this role is existed in practice or not? Based on that, the study adopted the period spanned from 2004 to 2021. The said period witnessed a relatively modest increase in GCF for the period from 2004 to 2006 (SESRIC 2021), which can explain a weak increase in the level of export, it rose from USD 72.8 Billion in 2004 to USD 80.79 Billion in

2021, and for import, has declined from 82.7 to 52.8 for the same period. Also, the level of GCF has witness a good progress over the period from 2007 to 2015, where it increased from USD 8 billion to USD 46 Billion, after that, it declined from USD 29.2 Billion in 2016 to USD 12.8 Billion in 2021, as shown in Table 1 below.

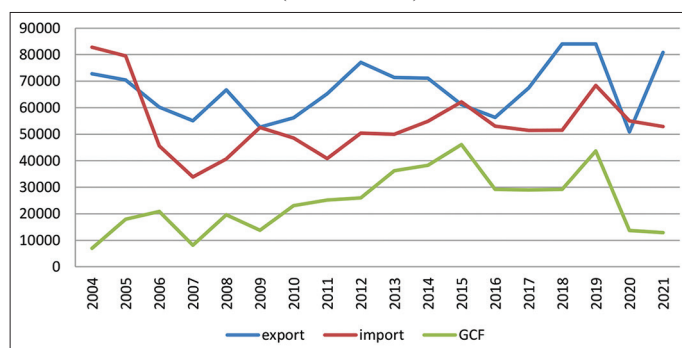
Overall, we note throughout the figure below the presence of a parallel trend between import and gross capital formation (GCF), particularly the period from 2007 to 2015. This obviously implies the positive relationship between the said variables, in other words, import has affected the level of GCF due to the economic openness in Iraq after 2003, and this also shows an increase in the level of capital goods imported over the period from 2007 to 2015. Furthermore, over the years from 2016 to 2018 the GCF has declined from USD 46.09 Billion to USD 29.19 Billion (SESRIC 2021), despite of the rise of export revenues during the same period, where this could be related to the economic plans and also the instability of political situation in Iraq and devoting the oil revenues toward financing cost of war against ISIS in Iraq.

**Table 1: Export, Import and Gross Capital Formation in Iraq, 2004 – 2021 (USD)**

Year	Export	Import	GCF
2004	72809874948	82762890222	6946068613
2005	70406211011	79535150609	17938708044
2006	60236988593	45584522906	20882920785
2007	55104992310	33847086262	8111391364
2008	66679858871	40710444600	19609061493
2009	52676179880	52525315598	13785980772
2010	56173635645	48568950791	23085432979
2011	65282225028	40790886826	25195003351
2012	77069792406	50389328425	25977777171
2013	71415159217	49958213358	36220536152
2014	71130387488	54872013205	38294884540
2015	61142814964	62141028595	46090258800
2016	56309038163	53046702949	29199488767
2017	67465178287	51449858035	29012498207
2018	84071305596	51509192869	29197462493
2019	84077756782	68359417461	43669812034
2020	50853894902	54984830652	13726072594
2021	80795950091	52865091586	12881263602

Source: SESRIC, Database of Statistical, Economic and Social Research and Training Centre for Islamic Countries

**Figure 1: Trend of export, import and GCF in Iraq, 2004-2021 (Million USD)**



Source: By the author based on database of SESRIC, Database of Statistical, Economic and Social Research and Training Centre for Islamic Countries (<http://www.sesric.org/baseind-step5.php>)

Accordingly, we note that the economic policy in Iraq has not exploited the surplus of oil returns in improving level of investment expenditure and attracting foreign and local investors in order to engage the gross capital formation in diversifying the economy and creating job opportunities.

Furthermore, a high level of export explains that the major revenues, particularly oil revenues are mainly engaged in turn to import various consuming goods, as well as services, in which the weak level of GCF over the duration from 2019 to 2021 reflects the impact of the world economic slowdown due to COVID-19 pandemic in addition to the high reliance on foreign markets and the big disruption of non-oil sectors in Iraq over the period studied, where the level of GCF is declined to slower levels than that of the levels over the period of international scansions, from 1991 to 2003.

This statement, however, is questionable, and therefore our study comes to empirically investigate to what extent foreign trade and gross capital formation are related? And what is the causal relationship between them? The study is based on a hypothesis assumes a strong correlation between the variables studied.

However, this study try to contribute to the literature related by employs system of equations of VAR granger causality model in order to empirically examine the association among export, import and gross capital formation in Iraq over the period spanned from 2004 to 2021. The reason of selection of the study period is based on the economic transform that occurred after the political change in Iraq in 2003, so in this case here we try to explore to what extent that the new policies have affected the Iraqi economy?

Generally, the level of export and import in Iraq has increased considerably over the period studied. This, as well known, is due to the high reliance on oil export revenues and weakness share of non-oil sectors to GDP. Hence, in order to achieve the objective of this study, it will be structured in the following main four sections; the first section will include the introduction and background of the study, while the second tackles the related literature review including the research gap and contribution of the current study. Third sections is specified for the methodology, it started with data, variables and limitation of the study. This section also indicated to the result of unit root test, model specification and cointegration test and then result analysis and discussion. Lastly, recommendation and policy implication are written in the fourth section of this study, it indicated also the potential future researches which could be linked with the current study and present new contributions.

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## 2. LITERATURE REVIEW

Many studies have tackled the association between export and import via analysing their impact on gross capital formation (GCF) using different methods for many countries and cases. These studies focused on this area of research usually found a strong relationship between export and growth of domestic product resulted from GCF.

In this respect (Voivodas, 1973) revealed that the capital link is the intermediate link between export and domestic growth. Through that we note that a country export ought to be geared toward the capital, and this cannot be achieved without devoting the export revenues in importing capital goods that generate economic growth. However, (Sun, 1998) asserted that reinforcement the level of local production must be targeted, as well as, attracting foreign investors for non-oil sectors maybe would be an ideal option to enhancing level of capital formation and reduce level of imported goods accordingly. Also, the capital formation in an economy plays a key role as a source of growth, where the availability of physical capital works with labour (Bruton, 1998).

Furthermore, (Awokuse, 2007) investigated the influence of foreign trade on growth, the study proved that trade stimulates economic growth.

(Adhikary, 2010) stated that the capital formation is linked to FDI in a positive relationship, and FDI lead policies and ensure higher degree of economic growth. Meaning that, the trade is a key factor in activating other economic sectors via reinforcement of investment, particularly foreign investment as a good manner for improving level of capital formation. (Awokuse, 2008) re-examined the linkage between trade and economic growth, the study found that import lead growth and there is an inverse casual association from gross domestic product (GDP) to export and import, which means a diversified economy can reduce level of import where this basically yielded from existing of the capital that affect in catalysing local economic activities and then improve level of production and growth. Furthermore, (Rajni, 2013) explored the presence of a bidirectional causal relationship between gross capital formation, and export and import. (Thurayia, 2004) found that growth rate in total export had an evident impact on economic growth in Saudi Arabia while it had a modest influence in Sudan. Moreover, (Rani and Kumar, 2019) found a unidirectional association between trade openness and economic growth in India and Brazil, while in china it was a bidirectional relationship for the said variables. (Meyer and Sanusi, 2019) conducted an empirical study, it found a long-run relationship between economic growth, local investment and employment. And in order to test the impact of foreign trade on growth (Fatima et al., 2020) found a crucial indirect link between trade openness and GDP progress. Furthermore, (Abbas et al., 2020) asserted that gross fixed capital formation lead to increase level of economic growth in the belt and road countries.

Besides, (Topcu et al., 2020) stated that the effect of gross capital formation on GDP is linked with the national income and its impact on the decision making policies, where this study tries to show that economic policies and efficient utilization of income could motivate level of economic growth. However, other studies such as (Zaman et al., 2021) revealed that gross capital formation and FDI affect positively on economic growth and does not between IT exports and trade openness. (Aslan and Altinoz, 2021) asserted the presence of a positive influence from natural resources and globalization toward economic growth, whereas the negative effect between capital formation and growth is existed in various countries located in Asia, Europe and America. Also, (Nguyen

et al., 2021) empirically proved that exports with other variables lead to enhance level of economic growth, the study indicated that FDI inflows is an important factor that maintain growth and economic activities in Vietnam.

In addition, (Ntamwiza and Masengesho, 2022) shows the presence of a positive link between capital formation and FDI lead to accelerate level of economic growth in Rwanda, in which capital formation has remarkable role in the economy. And (Wani, 2022) indicated a negative relationship between trade openness and economic growth in India and suggested to improve level of human and physical capital formation in order to empower the economy. In addition, (Islam and Biswas, 2023) examined the relationship between foreign grants and progress of gross fixed capital formation in Bangladesh, they found that both variables have positive relationship. Moreover, (Istaiteyeh et al., 2023) showed that GDP and gross capital formation have a positive relationship in the short-run in Jordan over the period spanned from 1976 to 2021.

From the literature above, we note that most studies that conducted in different countries by using various empirical methods proved that the robust link between export, import and gross capital formation is existed. Several studies have linked the relationship of the said variables with external variables such as FDI and foreign grants, while others have focused on internal factors like national income and decision making policies that could accelerate level of foreign trade and growth alike. All that confirms the importance of these factors for diversification which defined by (Romer, 1990) as a production factor via empowering manufacturing sector and local investment represented by improving level of gross capital formation alongside to policies tried to activate role of trade and gross capital formation. Hence, this can raise non-oil export and reduces the high reliance on extractive industries.

However, Iraq as a rentier economy, the non-oil sectors are became too weak especially after 2003 because the absence of investment policies in these sectors, in which the major economic efforts devoted to increase level of extractive sector capacity. As a result of that, it is highly important to increase level of capital goods as an indicator that can incentivise the domestic investment and improve the contribution of non-oil GDP in Iraq as a significant policy to mitigate the impact of world economic fluctuations on the local economy due to instability of oil market prices. Accordingly, the current study tries to set an assessment to the economic diversification policies in Iraq over the duration from 2004 to 2021 via testing the relationship between import, export and gross fixed capital formation.

### 3. METHODOLOGY

#### 3.1. Data, Variables and Limitations

The study uses a cointegrated VAR approach which involves 16 observations after the adjustment for the period 2004-2021 ( $t = 1 \dots 18$ ). The variables used in the model are; export, import and gross capital formation (GCF). However, the main cause of using this model is to empirically analyse the causality between export and import, and GCF in Iraq in order to find out the magnitude the

most important variable that can lead for more efficiency during the duration of study. Also testing the relationship among the variables above could be considered as an assessment for the physical policy in Iraq, where all economic plans targeted to diversify the economy and reduce level of imports gradually. Accordingly, the presence of positive relationship between import and exports will prove that the economic plans toward diversification have not achieved in practice. This, however, will be analysed deeply based on the result of the model estimated. Therefore, the study will examine GCF as an agent of domestic investments in order to measure the impact of additions to the fixed assets and net changes in the inventories in Iraq. In other words, testing this variable will be feasible to find out to what extent the total expenditure on GCF has achieved the economic goals to expand the size of real GDP and then diversify the economy.

In addition, analysing export variable (ex) can clearly determine the income surpluses growth over the period of study, and in turn measuring the impact of export revenues on the local economy via analysing its relation to the commodity imports. Hence, a high level of imported goods state the case of increased level of consumption. This implies that the revenues achieved, particularly oil revenues, does not lead to improve GCF level, where this indicate the case of failure of decision makers and economic policies.

However, most of prior researches have focused on GDP instead of GCF. Therefore the current paper tries to assess the efforts of policymakers in Iraq on enhancing level of output.

Finally, this study has faced two specific major limitations, the first one represented by its reliance on the official secondary data, these raw data sometimes subject to biases that may affect the model examined, where there was no possibility to obtain primary data due to the restrictions of Iraqi institutions and bureaucracy. The second is the time limitation, where the current study is conducted based on a scientific plan for the academic year, 2022-2023, so this paper ought to be done and submitted to the centre for Basrah and Arab Gulf Studies within the said academic year.

### 3.2. Unit Root Test

The unit root test has been conducted prior to causality model, as an essential test, particularly ADF test to ensure the stationary of data used and avoid spurious regression (Lall and Wangwe, 1998). However, the results obtained proves that the model is valid to be regressed and economically is meaningful. We found that the probability of all tests in Table 2 were statistically significant at 1 percent levels. The results illustrated that the data are stationary.

### 3.3. Model Specification

The initial model is written in equation 1 below:

$$GCF = f(\text{export}, \text{import}) \quad (1)$$

Where:

*GCF*: Gross Capital Formation in Iraq.

*Export*: commodity export of Iraq.

*Import*: commodity import to Iraq. All variables used are measured in million USD.

By using the logarithmic econometric model, equation (1) will be written as follows:

$$\log GCF = \alpha_0 + \beta_1 \log(\text{export}) + \beta_2 \log(\text{import}) + U_t \quad (2)$$

The technique is based on the Vector Autoregressive (VAR) model, that is contains full system of equations, where each variable tested is used as a dependant and independent variable, hence the VAR equations could be specified as follows:

$$\text{Log}(GCF) = a_0 + B_{1t} \text{Log}(\text{export}) + B_{2t} \text{Log}(\text{import}) + U_{it} \quad (3)$$

$$\text{Log}(\text{Export}) = a_1 + B_{3t} \text{Log}(GCF) + B_{4t} \text{Log}(\text{import}) + U_{it} \quad (4)$$

$$\text{Log}(\text{Import}) = a_2 + B_{5t} \text{Log}(GCF) + B_{6t} \text{Log}(\text{export}) + U_{it} \quad (5)$$

Where:

$a_0$  is the intercept term,  $\beta_1, \beta_2, \beta_3, \beta_4, \beta_5$  and  $\beta_6$  are coefficients and assumed that its values more than zero ( $\beta_1$  to  $\beta_6 > 0$ ).  $U_t$  is the random variable. The subscripts "t" refers to the dating of variables in time periods spanned from 2004 to 2021.

### 3.4. Cointegration Test

The Johansen test for cointegration is regressed to determine the presence of a long-run relationship between the variables of study. Table 3 below shows that the model is statistically significance at 0.01 level.

However, Table 3 above proves that the data used are cointegrated. Therefore, the study model would be valid and meaningful. This is an evidence that the variables involved in the regression equations will move together in the long-run (Engle and Granger, 1987). Therefore, the regression result is valid to be analysed based on the long-run link between the variables tested.

## 4. RESULTS ANALYSIS AND DISCUSSION

Table 4 below illustrates the causality associated among the variables of the study. The result of model estimated revealed a bidirectional granger causal relationship running from gross capital formation to export and import. This result, however, is consisted with what was discussed in the literature review, where (Rajni, 2013) has reached to similar finding. Accordingly, we can say that gross capital formation is a significant factor in enhancing level of economic activities in Iraq, as it contributed to increasing level of exported oil and other related goods. This implies that the increase of level of GCF is an important agent to diversify level of export, and the major determinant for that is the economic policy that can devote investment allocations of the public budget to increase level of export which are majorly oil export. In other words, the economic policy has facilitated the investment climate to the oil companies that can contribute in empowering the economy. This statement could be easily realized due to the high share of oil export revenues to GDP in Iraq. However, the empirical results depict that the causality from import to export is not significant,

**Table 2: Group unit root test for the variables of study**

Group unit root test: Summary				
Series: EXPORT, IMPORT, GCF				
Sample: 2004-2021				
Exogenous variables: Individual effects				
Automatic selection of maximum lags				
Automatic lag length selection based on SIC: 0				
Newey-West automatic bandwidth selection and Bartlett kernel				
Balanced observations for each test				
Method	Statistic	P**	Cross-sections	Observation
Null: Unit root (assumes common unit root process)				
Levin, Lin and Chu t*	-3.05762	0.0011	3	51
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-statistics	-2.78576	0.0027	3	51
ADF - Fisher's Chi-square	17.9433	0.0064	3	51
PP - Fisher's Chi-square	17.9929	0.0062	3	51

\*\*Probabilities for Fisher's tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality. Source: By the authors based on Eviews software

**Table 3: Johansen trace test result for cointegration**

Sample (adjusted): 2006-2021				
Included observations: 16 after adjustments				
Trend assumption: Linear deterministic trend				
Series: Export import GCF				
Lags interval (in first differences): 1-1				
Unrestricted Cointegration rank test (trace)				
Hypothesized		Trace	0.05	P**
Number of CE (s)	Eigenvalue	Statistic	Critical value	
None*	0.832468	38.50716	29.79707	0.0039
At most 1	0.334940	9.921855	15.49471	0.2868
At most 2	0.191227	3.395797	3.841466	0.0654
Trace test indicates 1 cointegrating eqn (s) at the 0.05 level				
*Rejection of the hypothesis at the 0.05 level				
**MacKinnon-Haug-Michelis (1999) P values				
Unrestricted cointegration rank test (maximum eigenvalue)				
Hypothesized		Max-eigen	0.05	P**
Number of CE (s)	Eigen value	Statistic	Critical value	
None *	0.832468	28.58530	21.13162	0.0037
At most 1	0.334940	6.526058	14.26460	0.5466
At most 2	0.191227	3.395797	3.841466	0.0654
Max-eigenvalue test indicates 1 cointegrating eqn (s) at the 0.05 level				
*Rejection of the hypothesis at the 0.05 level				

\*\*MacKinnon-Haug-Michelis (1999) P values. Source: By the authors based on Eviews software

it proves that the import in Iraq does not lead to rising of level of non-oil production due to the dominating of oil export as a main exported goods in Iraq during the period 2004-2021. In other words, the Iraqi import is highly linked to export revenues as the main proportion returns to be engaged for meeting the import needs of various kinds of consuming goods.

Also, this result could explain an efficient use of the available capital, in which the capital formation did not to be geared to increasing the level of value-added due to unemployed capital goods.

Furthermore, the table above illustrates the absence of association from export and import toward GCF, this depicts that foreign trade does not lead to raise the level of gross capital formation, where the

result obtained is not statistically significant, and the relationship is a unidirectional from GCF toward export and import as stated formerly. This implies that the Iraqi import has not influenced on the economy in raising level of investment and stimulates non-oil sectors. However, the key reason of that is the state of disruption faced by the Iraqi economy resulted from the absence of a sound economic policy, in which the priority for investment expenditure was not taken into consideration, where this could be clearly noted in Figure 1 that represents a fluctuated curve; the data shows that there is no incremental increase in the level of GCF which proves the absence of an economic strategy that can lead to reducing level of disruption via enhancing level of non-oil GDP.

Hence, the major reason of that is the modest level of investment allocations in the public budgets over the period of study;

**Table 4: Vector autoregressive granger causality test results**

VAR granger causality/block exogeneity wald tests

Sample: 2004-2021			
Included observations: 16			
Dependent variable: Export			
Excluded	Chi-square	df	P
GCF	8.134582	2	0.0171
Import	0.703843	2	0.7033
All	10.08678	4	0.0390
Dependent variable: GCF			
Excluded	Chi-square	df	P
Export	2.580792	2	0.2752
Import	0.324781	2	0.8501
All	4.047726	4	0.3996
Dependent variable: Import			
Excluded	Chi-square	df	P
Export	5.745783	2	0.0565
GCF	7.439753	2	0.0242
All	12.75325	4	0.0125

Source: By the authors based on Eviews software. VAR: Vector autoregressive, GCF: Gross capital formation

2004-2021. It ranged between 10 and 15% of GDP, and this cannot meet the economic requirements to expand level of economy and increase level of economic growth for non-oil sectors, particularly for manufacturing and agrarian sectors. Accordingly, we can say that the export revenues has not geared for a remarkable increase of GCF as far as it was devoted for meeting the current expenditure of the economy. Based on that, we can say that there is a high need to adopt an economic strategy that focus on engaging the surplus of exported goods to be exploited in reinforcement level of gross capital formation, as a key factor of non-oil production that can mitigate the high level contribution of oil to GDP in Iraq, and then reduce influence of revenues of oil market fluctuations.

## 5. CONCLUSION AND POLICY RECOMMENDATION

In this study, the linkage amongst gross capital formation, export and import in Iraq has been examined using VAR granger causality. The data engaged are analysed to specify the stationarity of time series, in which the Augmented Dickey Fuller unit root test and other tests show that all variables studied are stationary and statistically valid. Also, cointegration test indicates that the variables examined are integrated, and a long run equilibrium relationship among them is existed. However, the result of the model adopted lead to the conclusion that GCF significantly influences both export and import. The result evidently supports the bidirectional causation from export to import in Iraq over the period studied, 2004 to 2021. This result confirm that the Iraqi export revenues are devoted majorly to fulfil the requirements of economy and based on that we can say that the increased level of GCF particularly from 2006 to 2016 does not lead to enhancing level of local production, in other words there is no efficient use to the economic equations. Also, this means there are unemployed resources over the period

studied, this statement could be related the absence of a sound economic policy.

For policy implication, and based on the result obtained, it is suggested that more attention should be paid for the gross capital formation in Iraq, where its increase could lead to enhance level of export, particularly non-oil export. And to achieve this target, the study recommends to adopt active policies of diversification of non-oil export commodities via attracting local and foreign investors. However, stimulating investors is an important policy that can activate the weak role of private sector in Iraq and then improve level of non-oil sectors. However, the significance of this policy embodied in its role for achieving the economic stability and creating job opportunities. This means activating the aggregate actual demand on the macroeconomic level, and this in turn catalyse investors for more investment allocations that cause additional expansion to the size of economy.

Finally, and for future research, this paper can be expanded by raising the discussion on the sectorial level, via analysing the value-added growth for non-oil sectors in Iraq and compare the growth of physical capital imports for example with the growth level of the main commodity sectors, particularly agriculture and industrial sectors. This can measure the impact of commodity imports on the local economy and analyse level the importance of GCF and its linkage with imports, and then their impact on economic diversification. Furthermore, this paper itself could be expanded by adding foreign direct investment (FDI) as an additional variable to the model adopted in order to test which variable has robust impact on the economic growth in Iraq. However, this suggestion can avail an assessment to the economic policies, and then pinpoint exactly what are the policies requested for activating suitable factors that lead to stimulate the economic activities and reduce share of crude oil export to GDP.

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