Orientation of the Fiscal Policy in Tunisia: Structural VAR Analysis

Wissem Khanfir[1]

Abstract

The objective of this paper is to indicate the orientation of fiscal policy in Tunisia, using the structural budget balance, during the period 1972-2014. For this purpose, we estimate a structural VAR model consisting of the fiscal deficit to current GDP ratio and the volume of economic activity represented by the real GDP. We estimate bivariate structural VAR in order to decompose fiscal deficit fluctuations into different disturbances.

Keywords: Fiscal policy, Structural budget balance, Structural VAR, Tunisia

JEL Classification: E62, C32

Introduction

The traditional indicators of fiscal policy analysis, such as fiscal and primary deficits are imperfect to assess the orientation of fiscal policy. An improvement of these indicators reflects either an improvement of the economic situation or a voluntary fiscal consolidation by the government. On the other hand, the deterioration of these indicators may be due to the economic environment or fiscal expansion.

The evolution of these indicators is determined not only by the fiscal policy, but also by the economic activity. The impact of the economic cycle on the fiscal deficit makes the assessment of fiscal policy difficult. Therefore, it is useful to estimate the sensitivity of fiscal balance to the economic activity, to deduce there from the fiscal balance excluding the effect of changes in the economic activity.

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To isolate the automatic stabilizers[2] contribution to fiscal deficit variations, the international organizations (OECD[3], IMF[4] and European Commission) calculated a cyclically adjusted budget balance, sometimes called structural budget balance[5]. These organizations defined it as the balance that would have been obtained when the economy is in a phase of full employment and the actual GDP is equal to the potential GDP. This indicator adjusts the overall fiscal deficit for the economic cycle. Consequently, it is calculated when the cyclical movements are eliminated. To distinguish between the strcutural and the cyclical components of the fiscal deficit, the international organizations must calcutate the potential output[6]. This is important for both the management of public finance and the conduct of macroeconomic policies (Duchene and Levy (2003).

The estimation of the structural budget balance, as an indicator of orientation of the fiscal policy, has been the subject of several empirical studies, such as the international organizations (IMF, OECD and the European Commission), mainly in the developed countries. However, there is almost no study that has used this indicator, in the developing countries, including Tunisia. More particularly, the authors used the fiscal balance to evaluate the fiscal policy in Tunisia (Ben Abdallah and Kechim (2010), Ben Taher et al. (2011) and Ben Slimane and Ben Taher (2013)).

In Tunisia and during the 1970s and 1980s, the evolution of public expenditures at a very fast rhythm than the revenues generated a fiscal deficit growing, which rose from 0,29% of the GDP in 1972 to 5,38% of the GDP in 1986 [7], showing the expansionist role of fiscal policy. The external debt went up from 30 % in 1970 to 35% of the GDP in 1980, to reach 58% in 1986 (Gabsi, 2004). This crisis required the intervention of the International Monetary Fund and the adoption of the Structural Adjustment Program in 1986. From 1986, the objective of the public authorities was the reduction of the fiscal imbalances and the control

[2] The automatic stabilizers are components of government budgets, affected by the macroeconomic situation, to smooth the business cycle. The size of automatic fiscal stabilisers is measured by the cyclical component of the budget balance (OECD, 1999).

[3] Organization for Economic Co-operation and Development

[4] International Monetary Fund

[5] Recently, Marcel (2013) has interpreted the structural budget balance as a permanent balance, a cyclically adjusted balance or a permanent balance.

[6] Bruno (2000) showed that the potential output is not directly observable. Following Ongena and Werner (1997) and Boccara, Bouthevillain, Coeure and Ayssartier (1997), there are two main methods that can be used to estimate the potential output: the first is the Hodrick-Prescott (HP) time-series filtering technique and the second is the production function.

[7] Data source is Tunisian Institute of Competitiveness and Quantitative Studies.

of the public finances. The fiscal deficit becomes 2,53% of the GDP in 1987, but during the 1990s, it rose again to reach 6,28% of the GDP in 1991[8].

The political and social phenomena that characterized the transitional period in Tunisia had negative consequences on the public finances. In fact, an unprecedented acceleration of the public spending rhythm generated an important fiscal deficit of 5% of the GDP and a public debt to the GDP ratio equal to 50,8% in 2014. However, it is not shown that these variations in the budget deficit come from discretionary fiscal policy or from fluctuations of the economic activity. In this Tunisian context, the question of the evaluation of fiscal policy arises.

For these reasons, in this paper, we propose an estimation of the structural budget balance in Tunisia over the 1972-2014 period. Using a structural VAR[9] model, we estimated the temporary and permanent component of the fiscal deficit. This decomposition is interpreted in terms of temporary fiscal actions, which react to a temporary shock on the GDP, and permanent fiscal actions, reacting to a permanent shock on the GDP. The temporary component of fiscal deficit integrates automatic stabilizers measures, which have not a long-run effect on the GDP, and the permanent component integrates the fiscal rules and automatic stabilizers measures, which have not a long-run effect on the GDP.

1. Literature review

Blanchard (1990) were among the first to define the cyclically adjusted budget balance as an indicator of evaluating the orientation of fiscal policy. The author emphasized that this indicator must answer the following question: « What part is due to changes in the economic environment and what part is due to fiscal policy in the variation of fiscal deficit ? ». Consequently, the international organizations distinguish, in the evolution of public finance, which results from the deliberate actions of public authorities and from the economic activity.

The IMF and the OECD published an estimation of the structural budget balance using panel data for several countries. Various empirical studies calculated this indicator by using the OECD methodology (Muller and Price (1984a, b), Giorno et al. (1995), Suyker (1999) and Girouard and Andre (2005)) and the IMF methodology (Hagemann (1999) and Fedelino, Ivanova and Horton (2009)).

Unlike other studies that used panel data, some empirical works have used individual data from developed countries. Bouthevillain and Garcia (2000) applied the two-step and the structural VAR approaches for the 1980-1999 period, to estimate the structural budget balance for France. Following the two-step approach, the amelioration of fiscal deficit is due to the discretionary fiscal policy

[8] Data source is Central Bank of Tunisia

[9] Vector Auto-Regression model

in France during the 1990s. According to the structural VAR approach, the reduction of the structural budget deficit accompanied by a trough of the cycle of economic activity is late. Using a structural VAR approach, Bruno (2000) estimated the primary structural budget balance in Germany, Denmark, Spain, France, Italy and the United Kingdom. Empirical results showed that the orientation of the fiscal policy in Germany and Denmark seems to respect the fiscal rules. In France and Italy, it does not. While, in the United Kingdom and Spain, it occasionally does.

Recently, using the two-step method, Tlidi (2013) calculated the structural budget balance for the case of Morocco, from 1980 to 2011. He showed that the budget balance in the Moroccan economy is mainly structural and not influenced by the economic activity. Camelia (2014) determined the structural budget deficit in Romania, between 2000 and 2013, using the three steps adopted by Hagemann (1999). The author showed that this indicator is used in order to assess the sustainability of the fiscal policy, evaluate the effectiveness of the fiscal policy and determine the effects of the fiscal policy on the Romanian economy.

2. A structural VAR approach

In this paper, we estimated a structural VAR (SVAR) model, composed of the fiscal deficit to current GDP ratio and the volume of economic activity. This SVAR methodology presents a decomposition of fiscal deficit into temporary and permanent components. The temporary component of fiscal deficit has a short-run effect on the output, whereas, the permanent component has a long-run effect (Bruno, 2000).

2.1. Methodology

Bouthevillain and Garcia (2000) showed that the bivariate structural VAR model can decompose the fluctuations of the fiscal deficit to GDP ratio into different sources of disturbances: disruptions mainly from the economic activity, which have a long-term effect on GDP, and others from the fiscal policy, which have a short-term effect on GDP. These shocks are independent, so the cyclical and structural shares of the fiscal deficit are uncorrelated.

Based on the method of identification of shocks implemented by Blanchard and Quah (1989), we estimated the following structural VAR model:

$$A(L)\, X_t = \varepsilon_t \quad (1)$$

X_t represents the vector of the variables to be estimated. It contains the Log of the real GDP and the fiscal deficit to the GDP ratio. ε_t is the vector of canonical disturbances, which satisfies the following properties :

$$E(\varepsilon_t) = 0 \text{ and } E(\varepsilon_t\, \varepsilon_t') = \Sigma = \begin{pmatrix} \sigma_{11} & \sigma_{12} \\ \sigma_{21} & \sigma_{22} \end{pmatrix}$$

The impulse response functions of disturbances are obtained through the following moving average representation:

(2) $$X_t = C(L)\varepsilon_t = A(L)^{-1}\varepsilon_t$$

With $C(L) = A(L)^{-1}$ and $C(0) = I_n$. C_{ij}, element of row i and colomn j, describes the effect of a shock of a variable j on variable i.

Hence, we assume the following reduced-form of the SVAR model:

(3) $$X_t = B_1X_{t-1} + B_2X_{t-2} + \cdots + B_pX_{t-p} + PU_t$$

With U_t the structural disturbances. The transition from the VAR form to the structural form is to express the relationship between the disturbances ε_t of the VAR model and the structural disturbances U_t. The identification needs to determinate the elements of matrix P, which links the two residuals, such as:

$PP' = \sum$ and $\varepsilon_t = PU_t$

With $\sum$ the covariance matrix of canonical disturbances ε_t.

The moving average representation of the reduced-form of the SVAR model is the following:

(4) $$X_t = C(L)\varepsilon_t = C(L)\ P\ U_t = R(L)U_t$$

It is possible to separate the supply disturbances from the demand ones because U_t are independent. Note that $E(U_t, U_t') = I$

Since our structural VAR model includes two variables, matrix P contains 4 elements to determine P_{ij}. The $PP' = \sum$ eqaulity provides 3 restrictions because $\sum$ is symmetric. Matrix P includes short and long-run restrictions. The short-run restrictions impose that some elements of the matrix P be set to zero, where $P_{ij} = 0$ means that the U_j shock has no short-run effect on the variable i. On the contrary, the long-run restrictions impose that some elements of the matrix $C(1)P$ be set to zero, and $[C(1)P]_{ij} = 0$, means that the U_j shock has no long-run effect on the variable i. The Cholesky decomposition is set to $P_{12} = 0$.

Theoretically, Blanchard and Quah (1989) identified the supply disturbance, which is the only disturbance having a permanent effect on the output, and supposed that the demand disturbance having a temporary effect on the output. Therefore, it is the permanent or temporary character of their impact that identifies the disturbances as supply or demand.

One of the possible applications of the SVAR methodology is to determine the respective contributions of each of the structural disturbances to the fluctuations of the economic activity. Bouthevillain and Garcia (2000) defined the structural component of the fiscal deficit as the accumulation of fiscal shocks and the cyclical component as the accumulation of the activity shocks throughout the studied period.

2.2. Estimation and empirical results

We estimated a structural VAR model composed of the Log of the real GDP[10] and the fiscal deficit to the current GDP ratio. We used annual data[11] during the 1972-2014 period. The usual unit root tests (ADF)[12] informed us that the Log of the real GDP and the fiscal deficit to the current GDP ratio are stationary in first difference $[I(1)]$ (table 1).

Table 1

Unit root tests (ADF)

Variables	ADF test statistic	Critical values (1%)
FD	-3.3	-3.59
D(FD)	-7.7	-3.6
LGDP	-1.41	-3.59
D(LGDP)	-7.04	-3.6

According to the Johansen's Methodology (1988), the co-integration test showed that there is no co-integration relationship between these two variables (Appendix 1). According to the selection criteria (LR test statistic), we estimated a 3 lag structural VAR model (Appendix 2). We postulated the structural VAR representation in the first difference, where the expression of the vector X_t is the following:

$$X_t = \begin{pmatrix} \Delta \text{Log(GDP)} \\ \Delta \text{Fiscal deficit /GDP} \end{pmatrix}$$

2.2.1. Impulse response functions

The impulse response functions, which are deduced from the structural VAR model, consist in representing the impact of the fiscal policy and activity shocks on the economic activity[13]. These are presented in Appendix 3.

We showed that the supply shock has a positive and significant effect in the GDP in the short-run. However, in the long-run, the reaction of the output to a supply shock is not significant. Furthermore, a supply shock has a non significant effect on the fiscal deficit. Concerning the fiscal shocks, they have a negative and non significant effect on the GDP in the short-run, but their effects on the fiscal deficit are more significant. More precisely, the initial effect of a fiscal policy shock

[10] Real GDP = GDP at constant price 2010

[11] Data sources are Word Development Indicators, Tunisian Institute of Competitiveness and Quantitative Studies, National Institute of Statistics of Tunisia and Central Bank of Tunisia.

[12] Augmented Dickey-Fuller test

[13] Remember that Blanchard and Quah (1989) defined the shocks derived from the economic activity as supply disturbances, and the shocks derived from the fiscal policy as demand disturbances.

is significantly positive, showing a restrictive fiscal policy (last curve at the bottom right of Appendix 3). Consequently, the structural shocks of fiscal policy have an autonomous effect on Tunisia, explaining only the dynamics of the fiscal deficit and having a little influence on the GDP.

2.2.2. Forecast error variance decomposition

The relative importance of the contribution of the two shocks to the variance of each endogenous variable can be deduced by decomposing the forecast error variance. The results are shown in Appendix 4.

Concerning the forecast error variance decomposition of GDP, the variance of the GDP is dominated by a supply shock. The contribution of the demand shock to the variance of GDP is very low. In the short-run, the variance of the GDP is 100 percent due to the supply shock. In the long-run, 95 percent of the GDP variance is dominated by a supply shock.

Concerning the forecast error variance decomposition of fiscal deficit, it is explained by a fiscal policy shock. The contribution of the supply shock to the evolution of the fiscal deficit is very low. In the long-run, 82 percent of the variance of the fiscal deficit is explained by fiscal policy shocks.

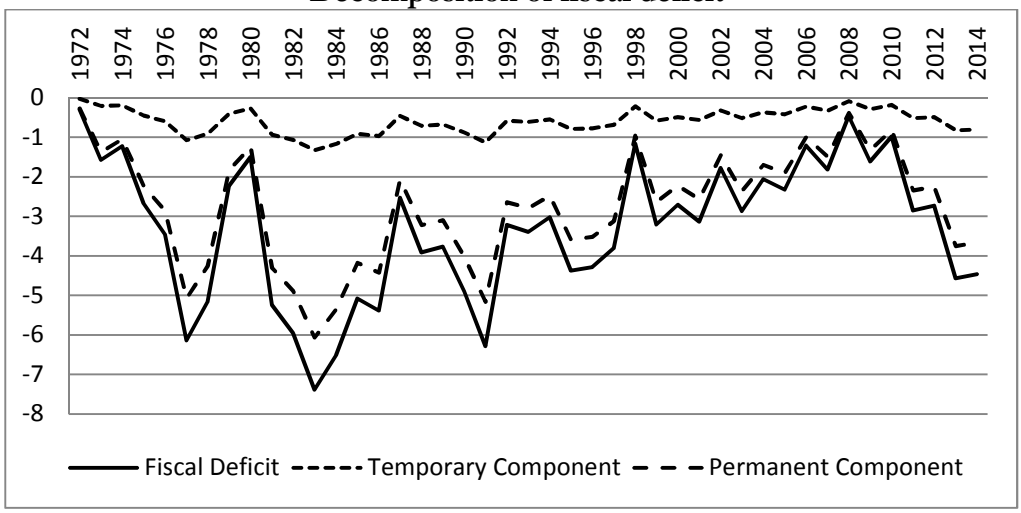
We showed that the fiscal policy shock contributes to a large part of the deterioration of the public finance in Tunsia. Moreover, we found that a fiscal policy shock on the GDP has less impact than a supply-side shock on the fiscal deficit to the GDP ratio.

2.2.3. Orientation of the fiscal policy in Tunisia

Over the 1972-2014 period, we showed that the temporary component of the fiscal deficit is almost constant, whereas the permanent component is variable and represents an important part of the fiscal deficit. The permanent component is very close to the fiscal deficit, which explains that the contribution of automatic stabilizers is very low for the improvement of the fiscal position. On the other hand, we observed that the shocks that cause the fluctuations in the fiscal deficit are permanent in nature. Consequently, the orientation of the fiscal policy in Tunisia does not seem to respect the fiscal rules, but it evolves with the economic cycle. Therefore, fiscal policy is temporary (figure 1).

Figure 1

Decomposition of fiscal deficit



Source: Author's compilation using Eviews 8.

Conclusion

This paper helps to clarify the orientation of fiscal policy in Tunisia between 1972 and 2014. As we have pointed out, the automatic stabilizers appear in the permanent and temporary components of the fiscal deficit. The fiscal rules are an element of the permanent component of the fiscal deficit.

In this paper, we have estimated the temporary and the permanent components of the fiscal policy using a structural VAR model. The utilization of this approach does not require to measure the potential output to estimate the temporary component.

The empirical results showed that the permanent component of the fiscal deficit was variable during the 1972-2014 period. Thereby, the orientation of the fiscal policy in Tunisia does not seem to respect the fiscal rules, but it evolves with the economic activity.

However, this structural VAR methodology has also some limits. The use of a fiscal deficit indicator implies that its various components, revenue and expenditure, react in an equivalent way to a shock of activity. In fact, a shock of revenue or expenditure does not necessarily have the same impact on the economic activity.

Therefore, several improvement extensions can be applied to the econometric analysis. It consists in decomposing the fiscal deficit into revenue and expenditure. For this reason, it would be relevant to use the structural VAR model with three variables, namely ; the ratio of the revenue to the GDP, expenditure to

the GDP ratio and the real GDP, as the case of Biau and Girard (2005), Ben Abedallah and Kechim (2010), Ben Taher et al. (2011), and Ben Slimane and Ben Taher (2013). The application of this three-variable model will allow an in-depth analysis of the specificities of the fiscal policy.

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Appendix

Appendix 1: Cointegration test

Series: LGDP FD
Lags interval (in first differences): 1 to 3

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None	0.196305	8.522868	11.22480	0.1437
At most 1	0.094837	3.885956	4.129906	0.0578

Max-eigenvalue test indicates no cointegration at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

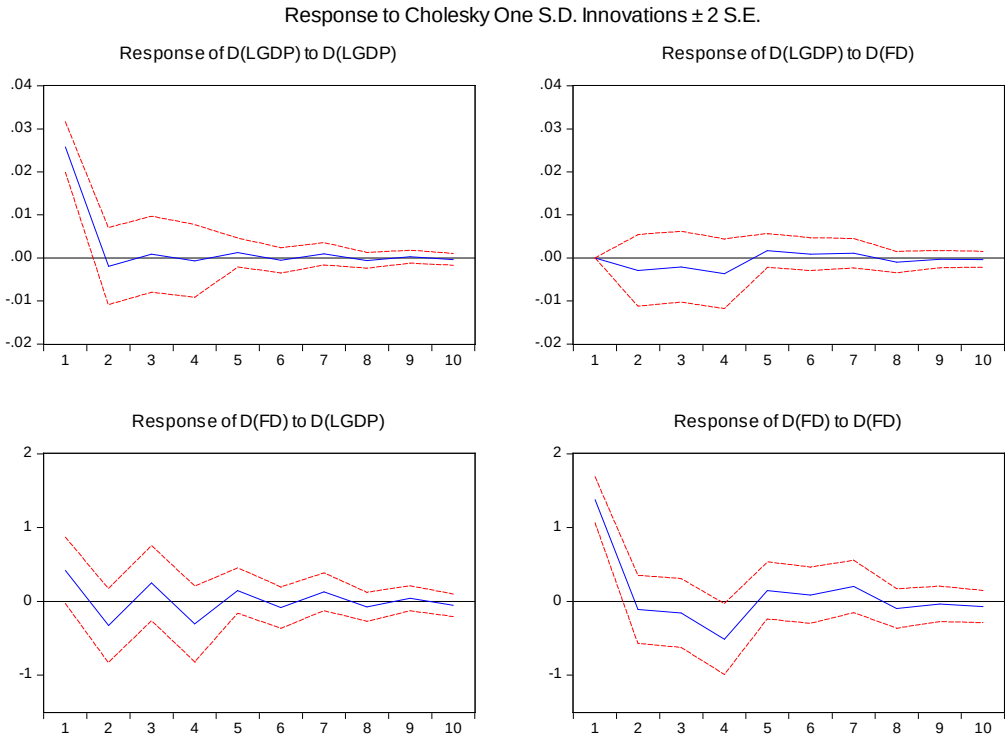
Appendix 2: Model selection criteria

Endogenous variables: LGDP FD
Exogenous variables: C

Lag	LogL	LR
0	-93.90084	NA
1	29.32409	227.4922
2	30.12345	1.393750
3	36.75598	10.88416*
4	38.08723	2.048073

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)

Appendix 3: Impulse response functions



Appendix 4: Forecast error variance decomposition

Variance Decomposition of D(LGDP):			
Period	S.E.	D(LGDP)	D(FD)
1	0.025808	100.0000	0.000000
2	0.026042	98.75683	1.243171
3	0.026138	98.13264	1.867357
4	0.026406	96.22543	3.774568
5	0.026490	95.82813	4.171868
6	0.026510	95.73049	4.269512
7	0.026547	95.58002	4.419984
8	0.026572	95.45006	4.549940
9	0.026575	95.43815	4.561851
10	0.026580	95.42186	4.578140
11	0.026586	95.38860	4.611402
12	0.026586	95.38777	4.612228
13	0.026587	95.38653	4.613474
14	0.026588	95.37905	4.620953
15	0.026588	95.37906	4.620936
16	0.026589	95.37901	4.620991
17	0.026589	95.37750	4.622495

18	0.026589	95.37750	4.622505
19	0.026589	95.37750	4.622502
20	0.026589	95.37722	4.622778
21	0.026589	95.37721	4.622793
22	0.026589	95.37721	4.622792
23	0.026589	95.37716	4.622839
24	0.026589	95.37715	4.622846
25	0.026589	95.37715	4.622846
26	0.026589	95.37715	4.622853
27	0.026589	95.37714	4.622856
28	0.026589	95.37714	4.622856
29	0.026589	95.37714	4.622857
30	0.026589	95.37714	4.622858
31	0.026589	95.37714	4.622858
32	0.026589	95.37714	4.622858
33	0.026589	95.37714	4.622858
34	0.026589	95.37714	4.622858
35	0.026589	95.37714	4.622858
36	0.026589	95.37714	4.622858
37	0.026589	95.37714	4.622858
38	0.026589	95.37714	4.622858
39	0.026589	95.37714	4.622858
40	0.026589	95.37714	4.622858
41	0.026589	95.37714	4.622858
42	0.026589	95.37714	4.622858
43	0.026589	95.37714	4.622858
Variance Decomposition of D(FD):			
Period	S.E.	D(LGDP)	D(FD)
1	1.438876	8.525759	91.47424
2	1.479831	12.95078	87.04922
3	1.508722	15.11751	84.88249
4	1.623314	16.70034	83.29966
5	1.636195	17.21036	82.78964
6	1.640572	17.40433	82.59567
7	1.657795	17.65379	82.34621
8	1.662484	17.76702	82.23298
9	1.663367	17.80714	82.19286
10	1.665925	17.86646	82.13354
11	1.667311	17.88926	82.11074
12	1.667465	17.89859	82.10141
13	1.667831	17.91161	82.08839
14	1.668187	17.91645	82.08355
15	1.668215	17.91879	82.08121
16	1.668267	17.92149	82.07851
17	1.668349	17.92256	82.07744
18	1.668355	17.92314	82.07686
19	1.668362	17.92368	82.07632
20	1.668380	17.92392	82.07608
21	1.668381	17.92406	82.07594
22	1.668383	17.92416	82.07584
23	1.668386	17.92422	82.07578

24	1.668387	17.92425	82.07575
25	1.668387	17.92427	82.07573
26	1.668387	17.92429	82.07571
27	1.668388	17.92429	82.07571
28	1.668388	17.92430	82.07570
29	1.668388	17.92430	82.07570
30	1.668388	17.92430	82.07570
31	1.668388	17.92430	82.07570
32	1.668388	17.92430	82.07570
33	1.668388	17.92430	82.07570
34	1.668388	17.92430	82.07570
35	1.668388	17.92430	82.07570
36	1.668388	17.92430	82.07570
37	1.668388	17.92430	82.07570
38	1.668388	17.92430	82.07570
39	1.668388	17.92430	82.07570
40	1.668388	17.92430	82.07570
41	1.668388	17.92430	82.07570
42	1.668388	17.92430	82.07570
43	1.668388	17.92430	82.07570