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DEVELOPMENT AND VERIFICATION OF THE SPENDING RULE FOR THE NATIONAL FUND OF KAZAKHSTAN

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ABSTRACT

Purpose- The article examines the key factors affecting the use of the National Fund of Kazakhstan (NFK) in 2005-2017, as well as the development of more effective methods and actions to improve its performance in the future.
Methodology- The study has developed a functional model of transfers from it to the state budget (spending rule), which helps to explain the observed dynamics of its use. The model was examined by using dynamic panel estimation techniques. As result it was found that transfers from oil fund to the state budget are dependent on economic activity, non-oil budget deficit and inflation in the country. An econometric test confirmed the correctness of the assumptions about the factors used in the model.
Findings- A multivariate forecast was also made for NFK's assets for the period until the end of 2022. Upon the favorable scenario, the value of the assets of the oil fund will reach 57.5 billion US dollars at the end of 2022. If world oil prices fall from 68 to 50 US dollars per barrel and remain at this level, the oil fund's assets will be exhausted in 6-7 years. If oil prices fall to 30 US dollars, then the fund's oil assets will last only 5 years.
Conclusion- The principles of the formation and use of the NFK should be revised in order to ensure the long-term preservation of the fund's assets for future generations as originally planned.

Keywords: Sovereign wealth funds, oil fund, asset management, Kazakhstan
JEL Codes: D25, D53, D58

1.INTRODUCTION

The establishment of the National Fund of Kazakhstan (NFK) in 2000 created conditions for sustainable economic growth, as it allowed the withdrawal of surplus income associated with the rapid development and use of the country's oil and gas resources to external foreign accounts (President's Decree, 2000) that sharply reduced the risks of Dutch disease.

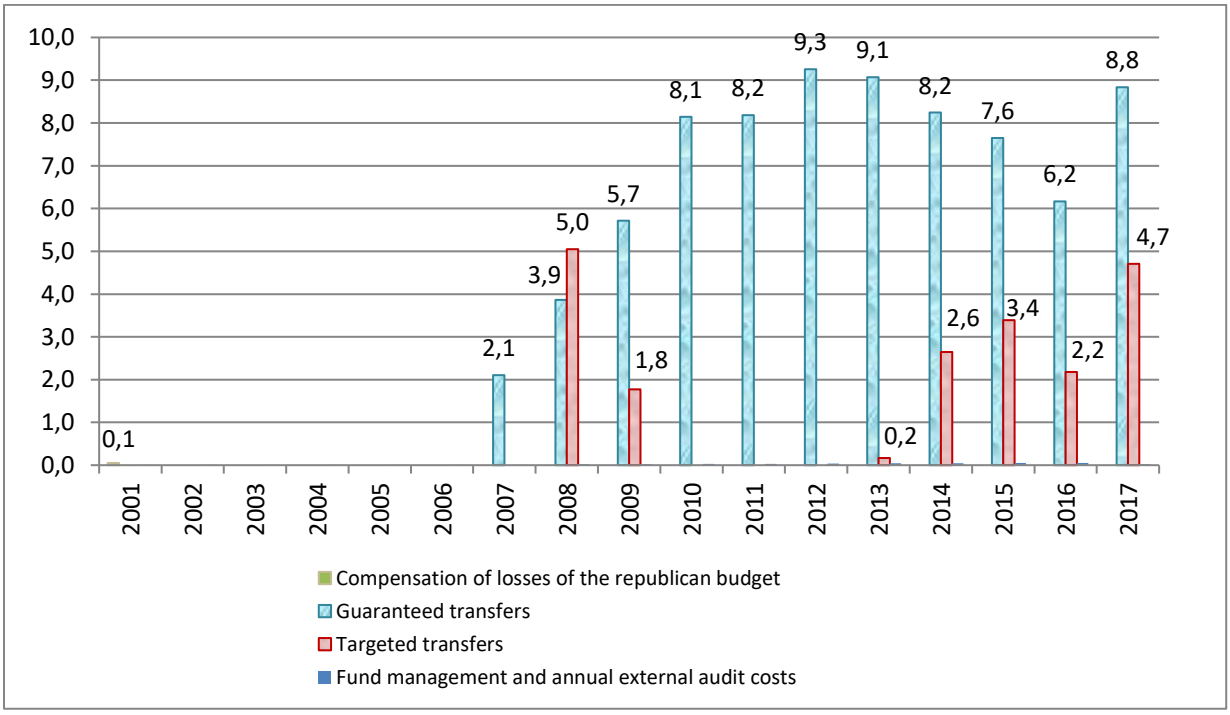
In 2005, the first concept for the accumulation and use of the NFK's assets for the medium term was adopted by the President's Decree (2005). It defined the basic principles and approaches for managing of the assets of the oil fund. As a result, the sterilization of excess foreign exchange inflows to the market was ensured due to the inflow of foreign exchange as a result of rising world oil prices and subsequent growth in oil production (Figure 2). This eased previous pressure on the tenge and ensured its stability during this time. In 2006, the government allowed NFK's assets to be invested in domestic bonds, as well as to transfer funds from it to the state budget in order to strengthen the stabilizing impact of the oil fund on the development of the economy (Government, 2004).

However, a sharp decline of world oil prices during the world crises in 2007-2008 and in 2014 led to a decrease in the value of NFK's assets in subsequent years. Due to the global economic crisis, transfers from the NFK also began to be used to conduct an active anti-crisis policy (Figure 1). However, these transfers continued to be actively used in subsequent years, after the global crisis had already passed.

As of the end of 2009, the oil fund's assets reached 30.2 billion US dollars, of which 5.0 billion US dollars was allocated to domestic assets (to buy bonds of JSC "Sovereign Wealth Fund Samruk-Kazyna", National Holdings "KazAgro" and "Baiterek") and 25.2 billion US dollars were placed in foreign assets. For this reason, in order to prevent depletion of the oil fund, the size of the guaranteed transfer to the state budget was limited to one third of its assets at the end of the year.

The concept of the accumulation and use of the NFK's assets, adopted in 2010, has become the main and effective tool of the countercyclical policy of the state, which allowed ensuring a stable development of the Kazakhstan's economy (President's Decree, 2010). This concept provided for fixing guaranteed transfers to the republican budget in the amount of 8 billion US dollars annually and the possibility of adjusting it up or down to 15 per cent, depending on the economic situation. The concept provided for the growth of the assets of the oil fund to 73.2 billion US dollars at the end of 2014, or 2.3 times, as well as the implementation of the State Anti-Crisis Program for 2014-2015.

Figure 1: Using of the NFK in 2001-2017 (bln. USD)



In 2014, there was a sharp drop in the value of black gold after the decision of OPEC member countries to maintain the quota for oil production at 30 million barrels per day. The fast-growing production of shale in the US also contributed to the decline in prices. Within a few months, Brent oil has almost halved in price - from about 110 to about 60 US dollars per barrel. This dramatically increased the likelihood of oil fund assets being depleted.

The state authorities were aware of the risk of a rapid depletion of the assets of the NFK in the context of low oil prices and tried to solve this problem by adopting a new concept for its accumulation and use on December 8, 2016. It was supposed to prevent further reduction of the assets of the oil fund in the medium term, resume its accumulation in the long term and reduce the dependence of the state budget on oil from 46 per cent to 20 per cent in 2017-2030 (President's Decree, 2016). However, this concept, despite its relevance, turned out to be ineffective because it did not provide a reliable way to achieve the desired results.

In this regard, the purpose of this article is to determine the key factors affecting the use of assets of the oil fund, as well as the development of more effective methods and actions to improve its performance in the future. To do this, we have developed a functional model of transfers from the NFK to the state budget (spending rule), which allows to explain the observed dynamics, as well as to understand its changes in the future. The most significant factors in this model were found to be economic activity in the country, the non-oil budget deficit and inflation.

The model was verified by using the econometric technique. The least squares method (LS) was used as the basic method. The problem of autocorrelation was eliminated by using the first order autoregressive model, AR(1). Robustness was tested using the Generalized Method of Moments (GMM) and Generalized Linear Model (GLM), which helped to overcome the problem of autocorrelation and heteroscedasticity. The ARCH method was also used to validate the models as the data fluctuated slightly around the mean, showing periodic spikes in values.

As a result of our research, we build a model of transfers from the oil fund to the state budget. Testing showed high results of the model. It explains the official transfers from the oil fund to the state budget by 96-98 per cent .

In addition, the hypothesis of the sufficiency of NFK's assets was also tested. The calculations confirmed that under the optimal scenario, the value of assets of the NFK by the end of 2022 will reach 57.5 billion US dollars. If world oil prices fall from 68 to 50 US dollars per barrel and remain at this level, the oil fund's assets will be depleted in 6-7 years. If oil prices fall to 30 US dollars, the fund's oil assets will only last for 5 years.

This paper proceeds as follows. Second part provides a review of the literature. Third part discusses the data and the research methodology. Forth part describes the data and builds econometric models of official transfers, discusses and tests them for adequacy and correctness. Finally, last section summarizes the findings and gives recomendations for the country's authorities.

2. LITERATURE REVIEW

Harold Hotelling (1931) was the first author, who considered the management of non-renewable resources and determined the maximum rent from the exploitation of non-renewable and non-renewable resources that the state could receive by depleting the resources. Hotelling's rule predicts that owners of non-renewable resources will only produce a supply of their basic commodity if it can yield more than available financial instruments.

The Fiscal Affairs Department of the IMF (2007) analyzed the role of fiscal institutions in managing the oil revenue boom and concluded that many oil funds have relatively rigid operational rules for the deposit and withdrawal of resources. Many oil stabilization funds have or have had price- or revenue-contingent deposit and/or withdrawal rules (e.g., Algeria, Iran, Libya, Mexico, Russia, Trinidad and Tobago, and Venezuela). The most saving funds are revenue-share funds, where a pre-determined share of oil or total revenues is deposited in the fund (e.g., Equatorial Guinea, Gabon, and Kuwait). Only a number of funds (Norway and Timor-Leste) have the rules, where the operations of the Sovereign wealth funds (SWF) are linked directly to the non-oil budget deficit.

Alsweilem et al. (2015) conducted a comprehensive overview of the policies and institutional arrangements of leading SWF's in different countries such as Norway, Kuwait, Kazakhstan, Chile, and Abu Dhabi. The study identified the key policy levers around sovereign investment vehicles (savings rules, spending rules and investment models), along with aspects of and options for fund governance models. The study concludes that clear rules are essential to ensuring that the policies around resource-based SWF's are consistently pursued and applied, and that the government has to restrain its spending in boom periods as much as it allows maintaining a steady level of spending in bust periods.

The study of Irarrazabal and Ma (2018) investigates the optimal portfolio allocation of a commodity SWF with a long-term investment horizon in Norway, UAE and Chile. The study found that the optimal share of financial wealth invested in risky assets at every point in time is an increasing function of time to depletion, income to financial-wealth ratio and expected growth in commodity revenues.

Silva and Costa (2019) focused on the analysis and comparison of the legal structures of the Norwegian Government Pension Fund and the Brazilian Pre-Salt Social Fund. They found that the success of the SWF depends largely on the rules governing the withdrawal and expenditure of resources, as well as on sound management and investment policies.

In recent years, serious studies have also appeared on the assessment of the use of oil fund in Kazakhstan. Azhgaliyeva (2014), using data of Kazakhstan from January 1994 to July 2013, found positive but statistically significant effect of produced oil on the real government expenditures. Kapparov (2015) found that targeted transfers from the oil fund to the state budget are used inefficiently, and the probability of increasing its assets to 180 billion US dollars by 2020, set by the government in the Concept for the Formation and Use of the NFK in 2010, seems low.

Shagiev and Kuanshaliev (2016) concluded that with an oil price of less than 30 US dollars, the oil fund's resources will be sufficient only for five years. They also noted discrepancies in assessments of the oil fund's assets between the National Bank (NBK) and the Ministry of Finance of Kazakhstan. This is due to the fact that reports on the fund's operations are published by the NBK in US dollars, while the accounting of these operations is carried out by the Ministry of Finance in the national currency. With a sharp change in the exchange rate of the tenge against the dollar, this leads to significant discrepancies in dollar estimates.

The researchers also noted the inefficient use of the oil fund, most of which, or 56 percent, was spent on current government needs in 2001-2015. According to Berik Otemurat, in the conditions of low oil prices and large contributions to the state budget, the oil fund will be enough for 6-7 years (Simon, 2017). Oshakbaev (2017) noted that the share of transfers in the revenue side of the republican budget increased from 33 percent in 2010 to 46 percent in 2017. Expectations to use the oil fund also led to cost inflation.

It is no accident, therefore, that the authorities of Kazakhstan will increase the volume of receipts to the NFK and stabilize the growth rate of budget expenditures in the coming years. In general, fiscal policy will be aimed at reducing the non-oil deficit to 5% by 2030, as well as increasing the assets of the NFK to $100 billion (Prime Minister, 2022b).

3. DATA AND METHODOLOGY

3.1. Data

The data on the industrial activity index taken from the Statistics Committee of the Ministry of National Economy of Kazakhstan. Such indicators as inflation, LIBOR and oil prices are received from the database of the World Bank.

The data on the state budget deficit, revenues and transfers of the NFK to the state budget are obtained from the database of the Ministry of Finance of Kazakhstan, and the data on the exchange rates of tenge to the US dollar and overdue loans are taken from the National Bank of Kazakhstan's database. The dataset covers monthly observations from January 2005 to February 2017 (144 observations).

3.2. Methodology

The expenditure policy of the NFK (spending rule) includes the transfers to the state budget. Transfers consist of guaranteed transfers and targeted transfers.

The guaranteed transfers are used to cover the annual deficit of the state budget, as well as the costs associated with the management of the oil fund and the conducting of its annual audit. The latter costs can be neglected since they are not high (no more than 1-2 percent of the total revenue of the oil fund). The guaranteed transfers usually have a fixed amount.

On the contrary, targeted transfers are of an investment nature and can vary greatly in size and timing, since they are used to finance countercyclical programs, socially significant programs, and strategic infrastructure projects (President's Decree, 2016).

In general, the amount of transfers can be defined as its level achieved in the previous year (T_{t-1}) plus the amount of money required for the implementation of investment projects in the current year. In turn, it depends on the accumulated size of oil fund (A_{t-1}) and the long-term profitability of its real investments (β):

$$T_t = \alpha \cdot T_{t-1} + \beta \cdot A_{t-1}, \quad (1)$$

where α and β are fixed parameters less than one.

The budget constraint on transfers (T), is that their amount should not exceed the receipts to the oil fund (R) from the oil sector at the cut-off price determined by the Guaranteed Transfer Law for the corresponding planning period (President's Decree, 2016):

$$T_t \leq R_t \quad (2)$$

For better understanding the long-term dynamics of oil fund, it is useful to derive steady-state conditions, in which resource revenues and the rate of return on oil fund are stable. The total amount of oil fund in the present time (A_t) will be the sum of oil find in the previous period of time plus total oil fund receipts (X_t) and minus transfers from the oil fund to the state budget (T_t) in the current period:

$$A_t = (1+i_t) A_{t-1} + \varphi \cdot \boldsymbol{X_t} - T_t, \quad (3)$$

where i_t is the return generated on the savings fund and φ is the rate of deduction from the total income of oil firms to the stabilization fund in the current period.

Equation 1 and 3 can be rewritten as following, where steady-state variables are expressed in small caps:

$$a = (1 + i) \cdot a + \varphi \cdot x - t \quad (4)$$

$$t = \alpha \cdot t + \beta \cdot a \quad (5)$$

And Equation (4) can be rewritten as:

$$x = (t - i \cdot a) / \varphi \quad (6)$$

Equation (5) can be rewritten as:

$$a = (1 - \alpha) \cdot t / \beta \quad (7)$$

In the steady state, the size of the oil fund relative to revenue is determined by the parameters of the spending rule, α and β, and the interest rate i:

$$a/x = (1 - \alpha) \cdot \varphi / [\beta - i \cdot (1 - \alpha)] \quad (8)$$

To determine the dynamics of the transfers to be received by the government in the steady state, we can again use Equations (6) and (7):

$x = t – i·(1– α) ·t/ (в·φ) =1/φ·(1– i·(1– α)/в)·t$

Hence, the transfer to the budget is expressed as follows:

$t = x·в·φ /[в – i·(1-α)]$ (9)

As follows from Equation (9), transfers from the oil fund are larger than transfers to it ($t > x$) given that, in addition to annual oil revenues, the government also receives the returns generated on the oil fund's assets. Thus, under the assumption that oil revenues and the rate of return on oil fund's assets are stable, the rules are sufficient to achieve not only the stabilization objective, but also a saving objective (Alsweilem *et al.*, 2015).

From formula 9, the following conclusions about the current oil fund's expenditure policy (spending rules) of the NFK can be drawn:

- The growth rate of total oil fund receipts *(x)* will directly increase the growth rate of the transfers.
- An increase in the long-term profitability of the real investments *(в)* will reduce the growth rate of transfers.
- The growth of the rate of deduction from the total income of oil firms to the stabilization fund *(φ)* will increase the transfers' growth rates.
- The growth of the yield on savings fund (*i)* will increase the growth rate of transfers.
- The growing dependence of the current transfers on the transfer of the previous year *(α)* will reduces the growth rate of the transfers.

The parameters *α* and *b* can be chosen so as to achieve a satisfactory degree of stability in transfers to the government to achieve the stabilization objective; *i* should correspond to the expected long-term return of the savings fund, and *φ* can be chosen to assure the accumulation of an endowment, achieving the saving objective, without jeopardizing the stabilization objective. In turn, the real return on investment *(b)* depends on a number of macroeconomic factors, such as the growth rate of economic activity in Kazakhstan, calculated using the industrial production index as a proxy variable *(IPI)*, the return on investment in foreign assets *(LIBOR)* as a proxy variable, the rate of deduction from the total income of oil companies to the stabilization fund *(φ)*, as well as the inflation rate (INF), the share of overdue loans in total bank loans *(NPL)* and the size of the non-oil deficit in percent of GDP *(D):*

$$\overset{+}{} \quad \overset{+}{} \quad \overset{+}{} \quad \overset{-}{} \quad \overset{-}{} \quad \overset{-}{}$$

$b= f (IPI, LIBOR, φ, INF, NPL, D)$ (10)

If the growth rates of economic activity in Kazakhstan *(IPI)*, the increase in the return on investment in foreign assets *(LIBOR)* and the deduction rate of oil firms to the stabilization fund *(φ)* positively affect the size of the real return on investment, then the growth of inflation *(INF)*, share of non-performing loans in bank loan portfolios *(NPL),* as well as the non-oil deficit in percent of GDP *(D)* reduce it (Equestion 10).

The growth of economic activity *(IPI)* increases the return on investment, as the growth of the economy usually leads to an increase in the return on investment. The growth of return on foreign assets *(LIBOR)* increases the real return on investment in foreign assets. The growth of the rate of deduction from the total income of oil companies to the stabilization fund *(φ)* also increases the assets of the oil fund and its transfers to the state budget.

However, inflation *(INF)* lowers the real return on investment as the nominal return is reduced by the amount of inflation. An increase in the share of problem loans in banks' portfolios (*NPL)* reduces the return on investment, as it increases the need for provisions. The growth of the non-oil budget deficit *(D)* reduces the return on investment due to the crowding out effect of the state budget on investments.

Since there is no information about the rate of deduction from the total income of oil firms to the stabilization fund, the model of expected transfers from oil fund to the state budget can be represented as:

$$\overset{+}{} \quad \overset{+}{} \quad \overset{-}{} \quad \overset{-}{} \quad \overset{+}{} \quad \overset{-}{} \quad \overset{+}{}$$

$T_t = f [T_{t-1}, IPI_t, INF_t, NPL_t, LIBOR_t, D_t, A_t]$ (11)

The methodology for calculating the model variables is presented in Table. 1

Some factors as the transfers from oil fund in the previous period (T_{t-1}), industrial production index (IPI_t), the rate of return on foreign assets $(LIBOR_t)$, and accumulated assets in the oil fund (A_t) in the present time have positive impact on the expenditures of the NFK's assets.

A factor such as an increase in the size of the transfer in the previous period leads to a high probability that the transfer in the current period will be at the same level. The growth of economic activity, as it supports economic growth, increases the size of the transfer from the oil fund. The growth of LIBOR increases the revenues of the oil fund, and hence the transfers from the oil fund to the state budget. An increase in the size of NFK's assets also increases the likelihood of an increase in the size of transfers.

At the same time, the growth of inflation *(INF_t)*, non-payments *(NPL_t)*, and the growth of the non-oil budget deficit *(D_t)* may lead to a reduction in the volume of transfers. Rising inflation reduces transfers, as the allocation of funds from the oil fund to the state budget increases the money supply, and this is fraught with a further increase in inflation. The growth of non-payments in the economy will also lead to a decrease in the size of transfers, as the risks of their non-return increase. In addition, the growth of the non-oil budget deficit reduces transfers, as it increases the risks associated with the preservation of oil assets.

Table 1: The Method of Calculating Variables for the Model

Sign	Name	Calculation method
T	Official transfers from oil fund	The value of total transfers from the oil fund to the state budget in terr of US dollars at current prices, billion dollars
IPI	Industrial production index	The growth rate of industrial production over the same period last year is a proxy of the economic activity in Kazakhstan, %
INF	Retail price inflation	Monthly on an annualized basis compared with the same period last year,%
NPL	Share of overdue loans	The share of overdue loans (more than 90 days) in the loan portfolio of the banking sector, %
LIBOR	London interbank offered rate	Proxy to assess the attractiveness of the use of the oil fund's means as investments in foreign assets,%
D	Non-oil budget deficit	The primary budget deficit plus receipts from oil fund, billion dollars
A	Assets of oil fund	The accumulated assets of the oil fund, billion dollars

Note: This table includes methods of variables calculations. The first column concludes the sign of each indicator, the second column contains the variable names, and the third column shows the calculation method for each variable.

In accordance with Equation 11, a time regression model of official transfers from the NFK to the budget (spending rule) was built:

$$T_t = \propto + \beta_1 IPI_t + \beta_2 INF_t + \beta_3 NPL_t + \beta_4 LIBOR_t + \beta_5 D_t + \beta_6 A_t + \varepsilon_t \quad (12)$$

where *IPI* denotes the industrial activity in Kazakhstan*, INF* represents inflation, *NPL* is the share of overdue loans, *LIBOR* is a proxy variable for the interest rates on stabilization fund, *D* means the non-oil budget deficit, and *A* determines the accumulated assets of the oil fund. The variable ε_t denotes error term. The subscript *t* represents time dimensions.

4. FINDINGS AND DISCUSSIONS

4.1. Preliminary Analysis of the model

The description of statistics on the variables is given in Table 2.

Analysis of the correlation matrix (Table 3) shows the negative impact of the inflation rate *(INF)*, the interest rates on stabilization fund *(LIBOR)*, and non-oil budget deficit *(D)*, on the value of official transfers from the oil fund to the republican budget *(T)*.

The changes in industrial activity in Kazakhstan *(IPI)*, the share of overdue loans *(NPL)*, and total assets of oil fund *(A)* have a positive impact on such transfers. Almost all variables show the correct sign, with the exception of overdue loans, which do not show the theoretically expected result.

Multicollinearity between explanatory variables is not observed since all variables are independent. However, the high correlation is observed between transfers and non-oil budget deficit (98 percent), LIBOR and overdue loans (81 percent), as well as LIBOR and assets of the oil fund (65 percent).

Table 2: Description of Variables Used

	T	IPI	INF	NPL	LIBOR	BD	A
Mean	4.990	0.301	9.479	24.256	1.628	-6.931	47.637
Median	4.476	-0.200	7.442	29.700	1.038	-6.342	45.103

Maximum	11.557	16.600	83.734	39.716	5.426	0.402	89.290
Minimum	0.034	-18.700	-1.193	0.000	0.534	-17.933	5.235
Std. Dev.	3.354	6.804	11.133	11.831	1.397	4.578	23.661
Skewness	0.137	-0.168	4.303	-0.462	1.666	-0.299	0.111
Kurtosis	1.670	3.419	25.104	1.642	4.537	1.963	1.625
Jarque-Bera	9.532	1.494	2906.980	13.944	69.541	7.406	10.018
Probability	0.009	0.474	0.000	0.001	0.000	0.025	0.007
Sum	618.816	37.300	1175.373	3007.745	201.933	-859.410	5907.024
Sum Sq. Dev.	1384.053	5694.670	15246.080	17216.330	240.082	2577.740	68861.630

Note: This table reports the mean, median, maximum and minimum values, standard deviation of the predictor variables, Skewness, Kurtosis, Jarque-Bera and its Probability, Sum of residues, Sum of Squared Deviation. T is transfers from the oil fund to the state budget, IPI is production activity in Kazakhstan, INF is the inflation index, defined as the consumer price index, NPL is the share of overdue loans in the total volume of bank loans, LIBOR is the percentage yield of the savings part of the oil fund, D is a non-oil budget deficit and A is the accumulated assets in the oil fund. Results are computed from Econometric Views, Version 7.2.

Table 3: Matrix of Correlations between Model Variables

	T	IPI	INF	NPL	LIBOR	D	A
T	1.000000	0.217687	-0.140772	0.335700	-0.447714	-0.979476	0.349844
IPI	0.217687	1.000000	0.099565	0.044532	-0.008141	-0.194881	-0.013696
INF	-0.140772	0.099565	1.000000	-0.308471	0.253026	0.105186	-0.180677
NPL	0.335700	0.044532	-0.308471	1.000000	-0.814569	-0.329289	0.391166
LIBOR	-0.447714	-0.008141	0.253026	-0.814569	1.000000	0.432012	-0.654539
D	-0.979476	-0.194881	0.105186	-0.329289	0.432012	1.000000	-0.336568
A	0.349844	-0.013696	-0.180677	0.391166	-0.654539	-0.336568	1.000000

Note: This table reports unconditional correlations. All variables are as defined in Tables 1 and 2.

4.2. Models of Official Transfers from the NFK to the Budget

Based on monthly data set, we built a basic model of the impact of various factors on expenses of the NFK in US dollars (Table 4, Model 0). The shorter observation series from February 2007 to February 2017 (123 observations) are due to the presence of short NPL data series.

Table 4: Models of Impact of Various Factors on Transfers from the Oil Fund to the State Budget

	Model 0	Model 1		Model 2		Model 3		Model 4
	LS	LS	GMM	LS	GMM	LS	GMM	GLM
T(-1)	-0.021	-0.046*	-0.028***	-0.043	-0.028			
IPI	0.0164*	0.012*	0.011**	0.009**	0.006*			0.016**
INF	-0.012**	-0.006	-0.006**	-0.006*	-0.007**			-0.013***
NPL	0.001	0.008	0.004					
LIBOR	-0.131	-0.176	-0.100					
D	-0.713***	-0.706***	-0.709*	-0.707***	-0.715***	-0.707***	-0.708***	-0.698***
A	0.001	0.002	0.004					
C	0.692	0.685	0.072	0.363	0.188	0.123	0.201	
AR(1)		0.655***	0.637*	0.669***	0.637***	0.645***	0.652***	
Obs.	123	123	123	144	144	144	144	144
Adjusted R-sq.	0.960	0.976	0.975	0.981	0.976	0.980	0.975	
S.E. of regression	0.667	0.517	0.520	0.485	0.515	0.498	0.499	
Log likelihood	-120.55	-87.86		-96.95		-103.01		-137.34
F-statistic	494.53	614.66		1444.6		3456.73		
Akaike info criterion	2.090	1.588		1.430		1.462		1.936
Schwarz criterion	2.273	1.672		1.553		1.524		2.018
Durbin-Watson stat	0.749	1.858	1.863	1.878	1.870	1.922	1.927	

J-statistic	9.335	7.731	4.145	
Pearson statistic				56.08

Notes: This table reports the dynamic panel estimation – oil fund's receipts regression using the LS, GMM and GLM estimators. The bottom of the table reports the number of observations, Adjusted R-squared, Standard Errors of regression, Log likelihood, F-statistic, Akaike info criterion, Schwarz criterion, Durbin-Watson statistics, J-statistic, and Pearson statistic. Finally, the statistical significance is defined as *** p< 0.01, ** p < 0.05, * p <0.1.

The variables the non-oil budget deficit *(D)* and inflation *(INF)* proved to be significant indicators in the model. The rest of the indicators showed low statistical significance. The high coefficient of determination (96 percent) is due to the presence of problems of autocorrelation and heteroscedasticity.

Residual autocorrelation was eliminated by using the first-order AR(1) autoregressive model. As can be seen from Model 1, LS, its statistical parameters have improved dramatically.

This is evidenced by the increase in the adjusted R-squared from 96 percent to 97.6 percent, the F-statistics from 494.5 to 614.7 and the Durbin-Watson statistics from 0.749 to 1.858, as well as a decrease in the standard errors of the regression from 0.667 to 0.517 and some improving the coefficients of determination of the model. Some of them, such as transfers in the previous period *(T(-1))* and economic activity in Kazakhstan *(IPI)* along with the non-oil budget deficit *(D)* began to show a significance at the 1 percent level. However, other variables showed low statistical significance.

The generalized method of moments (Model 1, GMM) was used to check the robustness of the calculations, which also showed an improvement in the results compared to the basic model. In this case, the coefficient of determination was 97.5, the Durbin-Watson statistics was 1.863, and the standard errors of the regression was 0.520, which was not significantly different from Model 1, LS.

At the same time, the inflation indicator *(INF)* became significant with a 5 percent standard error, and the indicators such as transfers in the previous period *(T(-1))* and economic activity in Kazakhstan *(IPI)* became statistically significant at the 5 percent and 10 percent levels, respectively.

The second model excluded variables such as overdue loans *(NPL)* and the interest rates on stabilization fund *(LIBOR)*, which were of low statistical significance (Model 2, LS) and didn't show the right signs. This action led to an improvement in the quality of the model compared to the model (Model 1, LS), namely, an increase in the coefficient of determination from 97.6 up to 98.1 percent, F-statistics from 614.66 up to 1444.6 and a decrease in standard errors of regression from 0.517 to 0.485.

The statistics of some variables, such as inflation *(INF)* and constant *(C)*, improved markedly and became significant at the 1 percent level. At the same time, only the significance of economic activity in Kazakhstan *(IPI)* has deteriorated slightly and began to show the significance at the 5 percent level. The coefficients for the other explanatory variables remained at the same level.

To test the robustness of the calculations, we used the GMM method, which showed approximately the same results (Model 2, GMM). The adjusted R-squared showed an explanatory power of 97.6 percent, standard errors of regression were 0.515. The significance of the coefficients remains the same. Only the significance of the inflation *(INF)* slightly decreased to the 5 percent level, and transfers in the previous period *(T(-1))* ceased to be significant.

The third model (Model 3, LS) also excludes such variables as transfers in the previous period *(T(-1))*, inflation *(INF)* and manufacturing activity in Kazakhstan *(IPI)*. This led to an improvement the model, which was evidenced by the growth of the F-statistic to 3456.7, while maintaining the determination of the model at 98 percent. The magnitude and significance of the remaining coefficients of the model for the explanatory variables remained the same.

The model statistics and the significance of the model coefficients did not practically change when using the GMM method (Model 3, GMM), which indicates the correctness of the model specifications. To check the robustness of the model's specification, was also used a Generalized linear model (Model 4, GLM), which eliminates the problem of autocorrelation and heteroscedasticity when weighing residues (Plokhotnikov, 2010). In this model, the non-oil budget deficit *(D)* and retail price inflation *(INF)*, as well as industrial activity *(IPI)* appeared to be significant variables.

The analysis of the models allows drawing the following conclusions about the factors affecting the transfer from the oil fund to the state budget for the period under consideration:

- The size of the non-oil budget deficit *(D)* and inflation *(INF)* are negative, but statistically significant.
- Kazakhstan's industrial activity *(IPI)* is positive and statistically significant.
- The total accumulated assets of the oil fund *(T(-1))* and interest rates on stabilization fund *(LIBOR)* are negative, while statistically insignificant.

- The amount of the total accumulated assets in the oil fund and overdue loans *(NPL)* are positive, while statistically insignificant. NPL shows an incorrect sign, but 'it does not matter, since it was statically insignificant.

Improving economic activity in Kazakhstan *(IPI)* led to an increase in official transfers from the oil fund to the republican budget, while an increase in the non-oil budget deficit *(D)* and inflation *(INF)* led to a decrease in these transfers. This is explained by the fact that the improvement in economic activity creates favorable conditions for the further growth of the national economy, while the growth of the budget deficit and inflation can pose a real threat to the sustainability of the oil fund designated for future generations.

In general, the regression coefficients for explanatory variables in all models were fairly stable, despite different methods and number of variables used. The coefficients of determination remain high in all models. Models explain transfers from the oil fund to the state budget by 96-98 percent. This fact indicates that the models consider all the significant factors affecting such transfers for the considered period of time.

4.3. Calculation of Time for the Complete Exhaustion of the Oil Fund's Assets

Data on the total amount of transfers from the oil fund to the state budget for the forecast period (Table 5) are taken from the Law "On the Guaranteed Transfer from the NFK (Ministry of Finance, 2017).

The directed taxes, investment income, and administrative expenses for the forecast period are assumed at the expected level of 2017.

Oil production in Kazakhstan expected to reach 87 million tons in 2018 (Reuters, 2018) and 89 million tons in 2022 (Ministry of National Economy, 2018). The breakdown into guaranteed and targeted transfers was made on the basis of the proportions between them that existed in 2017.

Table 5: The Total Amount of Transfers from Oil Fund to State Budget for the Forecast Period

Names	Units	Fact	Forecast				
		2017	2018	2019	2020	2021	2022
Transfers	Trillion tenge	4.42	2.6	2.3	2.0	2.0	2.0
- guaranteed	Trillion tenge	2.88	1.7	1.5	1.3	1.3	1.3
- targeted	Trillion tenge	1.54	0.9	0.8	0.7	0.7	0.7
Transfers	Billions US dollars	7.15	6.33	5.50	5.50	5.50	7.15
- guaranteed	Billions US dollars	4.67	4.13	3.59	3.59	3.59	4.67
- targeted	Billions US dollars	2.49	2.20	1.91	1.91	1.91	2.49

Note: Data on transfers for 2018–2020 are taken from the Ministry of Finance of Kazakhstan (2018). As the average exchange rate for the forecast period is used the rate of 363.5 tenge to the US dollar, and as the average annual OPEC crude oil price is used 68.31 U.S. dollars per barrel.

According to all these assumptions, the value of the assets of the oil fund during the forecast period will not decrease significantly and will reach 57.5 billion US dollars by the end of 2022 (Table 6).

Table 6: The Forecast of the NFK's Assets (billions US dollars)

	Fact				Est.		Forecasts			
	2001	2005	2009	2013	2017	2018	2019	2020	2021	2022
National fund assets, total:	1.2	8.1	24.4	70.8	61.5	60.4	59.0	58.5	58.0	57.5
Income, total:	1.3	2.9	15.5	25.9	6.2	6.1	5.0	5.1	5.1	5.1
- Direct taxes	0.7	2.6	9.2	22.0	6.1	5.0	5.0	5.1	5.1	5.1
- Investment income	0.0	0.3	6.2	3.6	0.0	0.0	0.0	0.0	0.0	0.0
Use, total:	0.0	0.0	7.5	9.2	13.6	7.2	6.4	5.6	5.6	5.6
- guaranteed transfers	0.0	0.0	5.7	9.0	8.8	4.7	4.1	3.6	3.6	3.6
- targeted transfers	0.0	0.0	1.8	0.2	4.7	2.5	2.2	1.9	1.9	1.9
- administrative expenses	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1

Note: Data on receipts of the oil fund for 2018-2020 were obtained on the assumption that oil prices for oil remain at the current level and that no other types of revenues are received other than direct oil taxes. Data on transfers for 2018–2020 are taken from the Ministry of Finance of Kazakhstan (2018).

However, if an unfavorable scenario is realized and by assuming that the size of the oil fund's receipts and expenditures remains large at the level of 2017, the assets of the oil fund can be completely exhausted within 7-8 years. If, in addition, world oil prices will fall from 68 to 50 US dollars per barrel, the assets of oil fund will be exhausted in 6-7 years. If world oil prices drop to 30 US dollars, then the oil fund's assets will last only five years.

These results coincide with the calculations of Berik Otemurat, who, in conditions of low oil prices and large transfers to the state budget, suggested that the assets of the NFK would last only 6-7 years (Simon, 2017). This is also consistent with the calculations of Shaginov and Kuanshaliev (2016), which concluded that an NFK with a world oil price of 30 US dollars would be sufficient only for five years.

4.4. Discussions of the Models of Official Transfers

The model of transfers from the oil fund to the state budget built by us includes all relevant factors. This is evidenced by high coefficient of determination of models' about 96-98 percent.

The observed positive impact of economic activity in Kazakhstan (IPI) on the volume of transfers from the oil fund to the budget, as well as high value of the regression coefficient for such a variable indicates that the government is actively using transfers from the NFK to improve the situation in the economy. However, this active anti-cyclical policy of the oil fund is carried out only to certain limits. In the face of a growing non-oil budget deficit the government of the country avoided pursuing an active counter-cyclical policy, as it exposes the assets of the oil fund to the risk of rapid depletion. This hypothesis is confirmed by the negative impact of the growth of non-oil budget deficit (D) on the transfers from the oil fund to budget and the high significance of the coefficient by this variable (Table 10). Rising inflation also leads to a decrease in official transfers from the oil fund to the state budget, since these transfers may increase the risk of its unpredictable acceleration due to the growth of the money supply.

In addition, it was found that the growth of accumulated assets in the previous year leads to an increase in transfers from the oil fund to the state budget, while the growth of interest rates on the stabilization fund (LIBOR) negatively affects such transfers. If the first effect is consistent with our theoretical expectations, then the second effect is not.

In our opinion, the negative impact of interest rates on the stabilization fund may be due to the non-systematic withdrawal of the fund's interest income by the state for the implementation of some current state goals. This can also be supported by information that part of the oil fund's revenues was spent on the purchase of shares in state-owned market companies, and part of them on long-term and very cheap (0.01 percent per annum) financing of the state fund Samruk-Kazyna (Shagiyev and Bukeeva, 2014).

Contrary to our expectations, the increase in NPLs had a positive effect on transfers to the budget from the oil fund, i.e. the government was interested in helping insolvent banks. Perhaps this is due to the fact that all large banks, some of which experienced significant financial difficulties during the analyzed period of time, belong to officials from the ruling elite of the country, who do not refuse to use their powers of authority to save them from insolvency at the expense of the state, even if it is contrary to the fundamental interests of society.

In general, the improvement in internal economic activity leads to an increase in the value of transfers from the oil fund to the state budget, while an increase in the non-oil budget deficit and inflation resulted in a reduction of such transfers.

We have also tested the hypothesis about the adequacy of the NFK's assets. Our calculations confirmed that when executing the transfers approved by the Ministry of Finance of Kazakhstan, maintaining the directed taxes, investment income, and administrative expenses, current rate of the tenge to the US dollar, world oil prices and domestic oil production for the forecast period at the level of 2017, the value of the assets of the oil fund will reach 57.5 billion US dollars at the end of 2022. Upon the occurrence of an unfavorable scenario, when the size of oil fund's receipts and expenditures remains at the level of 2017, the assets of the oil fund can be completely exhausted within 7-8 years. If, in addition, world oil prices fall from 68 to 50 US dollars per barrel and remain at this level, the oil fund's assets will be exhausted in 6-7 years. If oil prices fall to 30 US dollars, then the fund's oil assets will last only 5 years.

5. CONCLUSION AND IMPLICATIONS

As follows from the previous section, if the authorities of the country want the assets of the NFK to be not only preserved, but multiplied for future generations, then it is very important to revise the rules for its formation and use.

Firstly, the NFK should be fully accountable to parliament and should be based on the use of clear and stable fiscal rules for deposits and withdrawals from the oil fund. This will significantly increase the efficiency of accumulation and use of oil fund's assets. Currently, such facts as "the frequent changes to these rules, the remaining scope for the manipulation of the key variables in the rules, the possibility of large withdrawals, and the lack of independence of the management council mean that the political leadership, particularly the President and senior ministers, still have a high degree of control and discretionary power over the fund." (Alsweilem *et al*., 2015, p. 84).

Secondly, the activities of oil fund have to be fully transparent. High transparency will also make it difficult to misuse and inefficient use of oil fund assets. This transparency is currently lacking. Moreover, from 2017, the state has ceased to publish

monthly and quarterly reports on the activities of the NFK. This enables the government to manage the fund's assets at its own discretion, but poses a threat to the safety of the oil fund's assets in the long term.

Thirdly, in order to reduce the amount of transfers from the oil fund to the state budget and ensure the rapid accumulation of its assets, it is necessary to revise the principles for spending the assets of the NFK. Currently, the country uses both 'guaranteed transfers' and 'targeted transfers'. If the first ones have a fixed predetermined volume and are used for strictly defined purposes, then second ones can be used at the request of the state at any time and for any purpose, which is not always economically justified. For example, "one-off withdrawals, called 'targeted transfers', were also permitted and indeed authorized in 2008-2009 in order to finance Samruk-Kazyna, a state development fund, and KazMunaiGas, the national oil company. Targeted transfers totaled approximately $7 billion" (Alsweilem *et al.*, 2015, p. 85).

Fourth, the use of passive management based on index-based management instead of active management based on the use of investment companies can significantly reduce the cost of managing fund assets. Such management will cost many times less, while maintaining an acceptable level of management quality (Wilson, 2006).

Fifth, the concept of an oil fund should be completely revised. This is due to the fact that most likely the price of oil in the future decade will be 65 US dollars per barrel, which is associated with the successful development of a green economy in the world (EBRD, 2018). But this means that in the coming years, if the government doesn't do anything significant to increase the efficiency of use of the fund's assets, future generations may be nothing left.

Therefore, it is no coincidence that Kazakhstan has revised the fiscal rule for formation of the budget for 2023–2025 fiscal years and beyond and subsequent years, which has two key components (NBK, 2021). The first one sets the limit for guaranteed transfers from the NFK at a level not exceeding its revenues from the oil sector at the cut-off price. The second one establishes a direct limit on the growth rate of government spending at the level of long-term economic growth.

As conceived by the developers of the new rule, it will reduce the dependence of the public finance on the oil cycle and thereby ensure the safety of the fund's assets for future generations. It is expected that the application of the new rules will contribute to the recovery of foreign exchange assets of the NFK from $55.8 in 2022 (Trend.az, 2022) to $66.7 billion in 2023, with a further increase to $78.8 - 93.2 billion in 2024 – 2025" (Prime Minister, 2022a).

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