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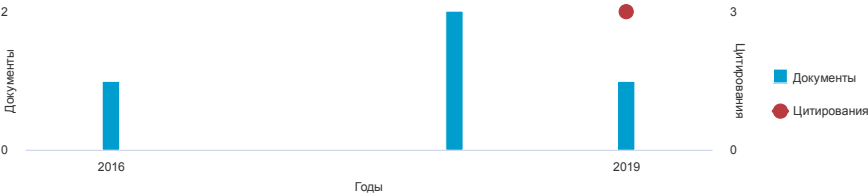
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## ANALYSIS OF THE OIL, PRICE AND CURRENCY FACTOR OF ECONOMIC GROWTH IN AZERBAIJAN

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*Received 10 October 2018; accepted 15 January 2019; published 30 March 2019*

**Abstract.** The article examines the main macroeconomic indicators of the Azerbaijani economy, including GDP, GNI, CPI, exchange rate, fixed assets, investments, etc. Using statistical data of 2000–2016, the main factors influencing oil production and dependence on oil prices are determined, and econometric equations (models) are established and evaluated. In addition, the same macroeconomic indicators, combined with oil production factors and oil prices, created a complex regression equation that reflects the dependence of manat on the dollar and the CPI. Meanwhile, all the data were compared both with the previous year, and with the base year (2000=100). the statistical significance of the regression and correlation parameters in the models was calculated using the EViews 9, PASW Statistics 18 and Gretl software packages for each parameter (Sig.  $p < 0.001$ ,  $p < 0.01$ ,  $p < 0.05$ ) for each parameter. An economic interpretation of obtained results is provided.

**Keywords:** CPI, GDP, GNI, exchange rate, econometric models

**Reference** to this paper should be made as follows: Feriyanto, N.; Muafi; Dityawarman, E. A. 2019. Regional spillover effect to Gross Regional Development Product (GRDP) in The Special Region of Yogyakarta, Indonesia, *Entrepreneurship and Sustainability Issues* 6(3): 1335-1353. [http://doi.org/10.9770/jesi.2019.6.3\(20\)](http://doi.org/10.9770/jesi.2019.6.3(20))

**JEL Classifications:** E01, E31, O11

### 1. Introduction

In general, as in the whole world, the calculation of macroeconomic indicators in Azerbaijan and the identifying factors that influence them are of great importance, and significance of this research is emphasized. The key issue is find out how the economic development of the state, estimated by Gross Domestic Product (GDP), Gross National Income (GNI), Consumer Price Index (CPI), exchange rate, volume of investments, etc. depends from accurately selected and properly assessed impacting factors. At this time, many tools of economic, statistical and

econometric analysis can be used. The economic development of the world economy and its position in the world economy are determined by goods, services and resources that have a definite and relative advantage over the world market. From this point of view, Azerbaijan exports to the world market a hydrocarbon (oil and oil products), its richest natural resource. Naturally, its economy depends on market positions, market supply and world market prices for these products. As in these countries, the exchange rate of the national currency of Azerbaijan's manat depends on the world cost of these resources and the volume of production in Azerbaijan.

## 2.1. Literature review

Classic theories claim the economic development of any country has been influenced by physical and human capital (Solow 1956; Romer 1986; Lucas 1988). Besides those basic drivers of development, economic development is affected by array of other factors, such as institutional, legal, demographic, geographical, social and economic and political factors (e.g. Barro, 1999, 2003; Sachs and Warner, 1997; Burnside and Dollar, 2000, Easterly and Wetzel, 1989; Barro, 1990; Barro and Sala-i-Martin, 1992; Tvaronavičienė, Razminienė 2017; Mishenin et al., 2018; Mishenin et al., 2018; Kiseľáková et al., 2018).

Some strand of scientists researched dependence of economic increase on currency rate in developing countries. Thus, Dollar (1992) studied macroeconomic stability and economic increase in 95 developing countries during 1976–1985, Fischer (1992) studied stability and economic increase in Sahara region of Africa and Latin America and Caribbean basins, Anyanwu (2014) studied several factors including inflation, price of agrarian product and analyses of oil price factors influencing economic increase in Africa during 1996–2010 and China during 1984–2010. Mundell (1963) and Tobin (1965) concluded that high inflation led to a decline in investment and capital inflows and low economic growth, and Fisher (1991) concluded that a theoretical framework would require long – term macroeconomic stability to improve the viability of economic growth.

## 2.2. Influence of currency rate to macroeconomic indicators

By De Grauwe and Schnabl (2008) the impact of the economic growth rates of the fixed exchange rate in 18 states of Southeast and Central Europe in 1994–2004 was examined with the help of the Dollar (1992), Easterly and Levin (1997), De Grauwe and Schnabl (2008) examined the relationship between economic growth and the exchange rate. After the World War II, many countries in the world have initially introduced a more aggressive economic policy to increase the real GDP (Crafts, 2000). Mlambo and Oshikoya reviewed macroeconomic developments in Africa in terms of real GDP growth and the real exchange rate. Many economists studied macroeconomic indicators, e.g. inflation in GDP (Dunis and Triantafyllidis 2003, Wadhwani, 1986), the exchange rate (Goudie and Meeks, 1991). Ismikhan M. (2003) used inflation to determine the index of macroeconomic instability in Turkey, the ratio of external debt to GDP, the rate of budget deficit to GDP and the exchange rate. At the same time, Sánchez-Robles (2006) concluded that one of the factors causing macroeconomic instability in Spain in 1962 – 1995 is inflation. Kaneko and Lee (1995) outlined 8 factors among the factors affecting stock markets between the US and Japan, including oil prices, inflation and exchange rate fluctuations.

International financial shocks or crises depend on the exchange rate of economic systems and macroeconomic indicators (Dornbusch, 1976, Frankel, 1979, Bilson, 1981, Fama, 1984, Olivei, 2002, Campa and Goldberg, 2005, Cunado and De Gracia, 2005, Gehrke and Yao, 2013, Chang and Su, 2014, Gehrke and Yaob, 2014, Audzei and Brázdik, 2015). At the same time, when analyzing the effect of exchange rate fluctuations (Blomberg et al., 2005), it was concluded that in economic systems with a huge manufacturing industry, there are some changes in the exchange rate and the choice of currency.

Faia and Iliopoulos (2010) reviewed exchange rate relations and noted that an optimal fiscal policy requires a stable exchange rate to move from fixed rates. Parveen et al. (2012) reported that inflation is a key factor affecting

the exchange rate, while Macdonald and Ricci (2004) found that real commodity prices rose 1% due to an increase of about 0, 5% of the real exchange rate. Khan et al. (1996) stressed the importance of the exchange rate in determining inflation growth. Choudhri and Khan (2002), Hyder and Shah (2005), Feenstra (1989); Olivey (2002) and Kampa and Goldberg (2005) studied the relationship between inflation and exchange rate both at the exchange rate and at the exchange rate.

### **2.3. Oil price and economic increase**

Adebiyi et al (2009) determined the relationship between the oil price shock and the real exchange rate, Ghosh et al. (2010) determined the price of oil on the stock market. Hamilton (1983), one of the first scientists who studied dependence on oil price shocks and macroeconomic indicators, studied the economic cycle from 1948 to 1981. Mork, (1989), Pierre (1989) analyzed the positive and negative aspects of oil price fluctuations, Chaudhuri and Daniel (1998) noted that oil prices have a different effect on the US dollar exchange rate, Li Nee and Raati (1995) study 1944–1982 impact of the shock of oil prices on the US economy, in other words, GDP, and concluded that there is a correlation between them.

Hamilton (2008) argues that rising oil prices are more important than its fall. In addition, Imenez – Rodriguez and Sanchez (2005) investigated the impact of oil price shocks on real economic activity in the euro zone's industrial area and found that price increases exerted a stronger impact on GDP than the fall in prices, L'oeillet and Licheron (2008). We studied oil prices and inflation in the eurozone in 1970 and 2007. Hedayeh and David (2007) examined the impact of oil prices on US GDP in 1986–2006 and said that consumption, investment and government spending had a positive relationship with oil prices. Yu Xin (2007), examining the impact of rising oil prices and macroeconomic changes on a real product in Germany, concluded that such high prices did not have a negative impact on product volumes.

Moreover, Löschel and Ulrich (2009) concluded that the change in oil prices between 1973 and 2008 affected the German labor market and led to an increase in unemployment. In most research in which change of oil price in industrialized countries was studied, it was concluded that GDP growth rate and salary was decreasing during the oil crisis, which leads to inflation. However, the results of Blanchard and Gali (2008) were completely opposite, which meant that Japan's GDP did not decrease with the impact of oil price shock, but rather increased and could not find the reason. Tian (2010) also studied the impact of oil prices on Japan's GDP in 1984–2007.

Francois and Mignon (2008) drew attention to the relationship between oil prices and macroeconomic performance in the three OECD countries, oil importing countries and oil exporting countries.

Nagy and Al-Awadi, Mohammad (2001) concluded that, as a major oil exporter between 1984 and 1988, the impact of oil prices on Kuwait's economy was highly dependent on oil and key macroeconomic indicators. Philip and Akiney (2006) published articles in Nigeria during the period 1970–2003 at real oil prices, the consumer price index, the real exchange rate, the five – step model reflecting real GDP, the real exchange rate of fluctuations in prices on oil and investigated the impact on money supply, inflation and said that, along with oil prices, the impact of money supply and the real exchange rate on its influence also affects economic activity. Oil prices have concluded that the impact on inflation and production is low. Marcel (2011) noted that the change in oil prices in Indonesia between 1990–2008 and 1998–2008 was heavily dependent on the impact of consumption and investment in the public sector, and Afia (2008) found that oil prices in Pakistan have a non – linear impact on production.

Katsuya (2008) studied the impact of oil prices and monetary and credit shocks on the level of real GDP and inflation in Russia in 1997–2007. He also noted that the impact of monetary shocks on the economy is stronger than the shock of oil prices. This contradicts the report of Hamilton and Henry (2004). The situation in Iran was

somewhat different. According to Mohammad and Gunther (2008), Iran's main revenues are oil exports, its price fluctuations are strong in the economy, macroeconomic indicators and GDP. That is, the positive impact of rising oil prices on the economy has a negative impact.

Turning to one of the industrialized countries, Hilde (2009) found that Norway's economy responded to higher oil prices with an increase in aggregate wealth and aggregate demand. Moreover, the impact of oil price fluctuations on the economy of South Korea and macroeconomic indicators that are gradually developing and in accordance with the developed economy of the IMF were analyzed by Rumi et al., (2010). Considering the impact of oil prices on the economy and the strategic importance of these changes, he observed his influence on industrial production and interest rates and came to the conclusion that the stock market is more likely to be affected, but only to quickly adjust the balance.

Determining the impact of oil price fluctuations on China's economic activity and macroeconomic performance in recent years, Jing He (2005) found that, based on an analysis of macroeconomic indicators for 1999–2004, as oil prices depend on China's price system and, in general, price of imported oil product of economic system, the higher price is, the more negative influence is to it and economic activity.

Though it is noted that many economists reported on the impact of the above oil prices on many macroeconomic indicators in their work, but the impact of these prices on the exchange rate (Cunado and De Gracia, 2005), oil prices and exchange rates were clearly contradictory. Hutchison (1993), Hamilton (2008), Inenez – Rodriguez and Sanchez (2005) investigated the impact of oil prices on the exchange rate for the economy. Chaudhuri and Daniel (1998), Amano and Norden (1998), Rautava (2007), Akram (2007), Dawson (2007), Al–Mulli et al. (2010), Ito (2010), Ghosh (2011) studied the relationship between exchange rates and oil prices in individual countries and concluded that there was a close relationship between them.

### **3. Results**

#### **3.1. Macroeconomic review**

GDP in the period of oil boom 2014 reached to its high level. In that year it reached to 59014.1 million manat and increased by 27.7 times compared to 1995, 12.5 times compared to 2000, 4.7 times compared to 2005, 1.3 times compared to 2010. This indicator in dollars was as following: increased by 31.2 times compared to 1995, 14.3 times compared to 2000, 5.7 times compared to 2005, 1.5 times compared to 2010, 75234.7 million dollars. For certain reasons GDP in manat decreased by 7.9% compared to 2014 in 2015 and increased by 2 % compared to 2014 in 2016. However, this indicator was different in dollars: it decreased by 30.6 % compared to 2014 in 2015 and by 49.8 % compared to 2014 in 2016 (Fig.1).

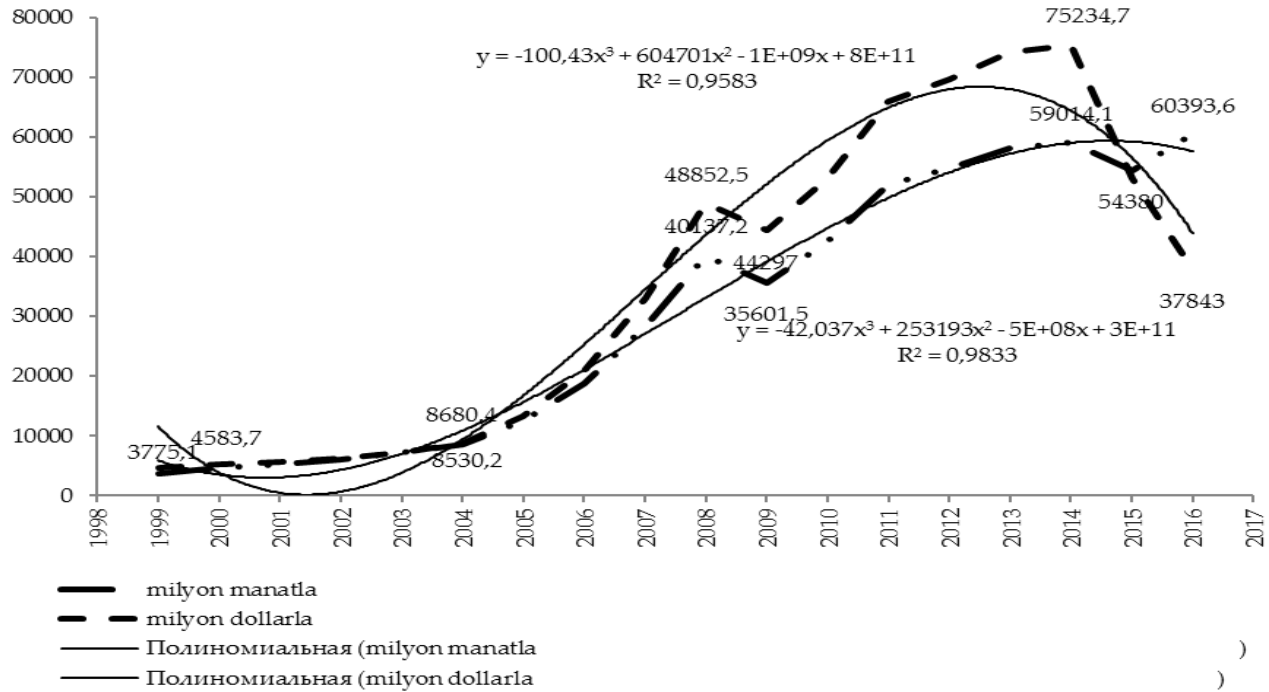


Fig.1. Dynamics of gross domestic product, in manats and dollars

As far as we know GDP increased by 5.1% in 2012 compared to previous, 6.2% in 2013 compared to previous, 1.4 % in 2014 compared to previous, decreased by 7.9 % in 2015 compared to previous and increased by 11.1% in 2016 compared to previous.

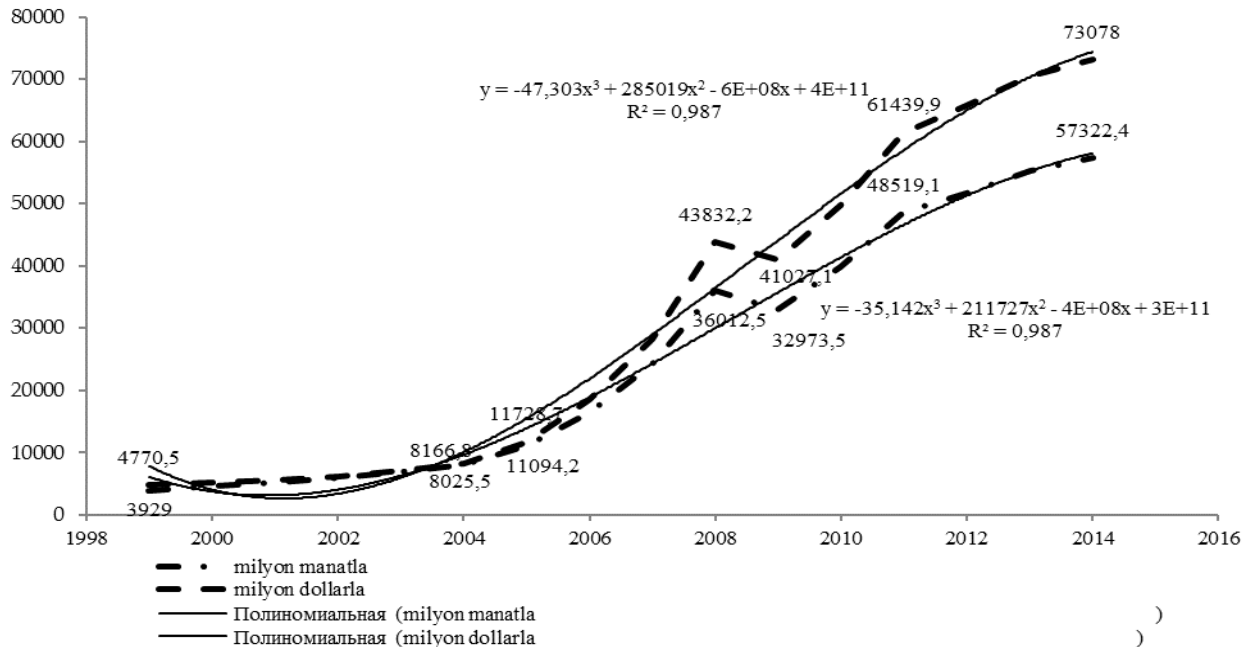


Fig.2. Dynamics of gross domestic income, in manat and dollars



If we take a look at indicators of gross domestic income last 15 years it is clear that salary of employees reached to 10965.0 million manat in 2015, it was 22.7 times as much as in 1995, 10.7 times as much as in 2000, 3.9 times as much as in 2005, 1.6 times as much as in 2010, 1.0 times as much as in 2014.

However, decrease in rate of exchange of local manat 2 times caused to decrease in amount of salary of employees, production and import taxes, salary of the rest world, the whole composition of gross domestic income except of production of main funds by 1.2–20.1% in 2015 (Fig.2).

Let's have a look at the economic operation account of the rest world. As this operation is related to oil export and world price of oil the maximal indicator of the study 2011 was recorded. Export of goods and service in foreign trade account of goods and service reached to 29388.3 million manat in 2011, it was 42.3 times as much as in 1995, 15.5 times as much as in 2000, 3.7 times as much as in 2005, 1.2 times as much as in 2010, but decreased by 2.5% in 2012, 5.1% in 2013, 13.2% in 2014, 30.01% compared to 2015, foreign trade balance reached to 16846.4 million manat in 2011 (in 1995 import was 446.5 million manat more than export), it was 199.1 times as much as in 2000, 13.3 times as much as in 2005, 1.17 times as much as in 2010, however, decreased by 11.1% in 2012, 23.5% in 2013, 40.3% in 2014, 90.03% in 2015 compared to 2011. The reason for decrease in the balance was the increase in the import of goods and service in a row.

Analyzing the socio – economic situation in the country, it is obvious that the trend towards GDP growth slowed down the rapid growth in 2011. But actual final consumer spending continued to grow in the aggregate. Almost 61.2% of actual final consumption expenditure and gross crop in 2012 increased by 12.3% compared to 2011 due to GDP and net exports growth of 38.8%, and in 2013, 60.3% of the growth rate of 14.4% compared to 19.9% in 2014 due to GDP growth and 39.7% of net exports, compared with 9.2% in 2014, GDP growth was 80.1%, and net exports decreased by 6.6% in 2015 to 100.0% of net exports. Considering the dynamics of GDP growth, it can be argued that the decline in GDP since 1987 slowed in 1995–1996. The 1987–1989 level was at the level of 2005–2006 with the level of 1990–1991. In 2005, the level of 1992 reached its level in 2003, from 1993 to 2001, to the level of 1994, and since 1998 this growth has been sustainable (Table 1).

**Table 1.** Dynamics of gross domestic product

	1995	1998	2001	2003	2005	2006
1987					100	100
1988					100	100
1989					100	100
1990					100	
1991					100	
1992				100		
1993			100			
1994		100				
1995	100					

Deposits of the population also continued to grow during the period of economic development. But for some reason, this growth has been observed in recent years with fluctuations. Thus, in 2014 compared to 2013, 32.5% of growth was 12.5% in foreign currency and 67.5% in national currency. In 2015, an increase of 31.7% compared with 2014 was due to an increase in deposits in foreign currency. 56.7% growth in 2.9 times in foreign currency offset the decline in savings in the national currency, and 43.3% led to an increase in overall economy of the population. The decrease of 21.7% in 2016 compared to 2015 was due to a decrease in savings in foreign currency. A significant increase in deposits in national currency allowed covering 4.7% of deposits in foreign currency. The above – mentioned price remains for oil, as our economy is oriented to export of raw materials, and manat is directly connected with the psychological factor.



Investments from all sources (including foreign investments) in 2009 amounted to 21.5% in national currency, 19.7% in US dollars, 21.9% of foreign investments in manat, 20.2% in US dollars, 21.1% %, a decrease of 19.5% in US dollars, 8.5% in national currency in 2015, 30.0% in US dollars, an increase in foreign investment by 19.9% in US dollars, 8.5% in dollars, domestic investment decline of 29.8% and a decrease in the dollar rate by 45.5% is due to a sharp drop in oil prices by 2–3 times. The increase in manat in 2016 and in 2015 may be due to a change in the exchange rate.

Credit investments into the economy also rapidly increased by 2015. Thus, reaching to 21730.4 million manat in 2015, it increased by 46.6 times, 15.1 times in 2005, 2.3 times in 2010, reaching to 5279.3 million manat in 2000 short – term credits increased by 15.7 times in 2000, 5.8 times in 2005, 2.1 times in 2010, and reaching to 16433 in 2015 long – term credits increased by 126.5 times in 2000, 31.1 times in 2005, 2.5 times in 2010. However, the decrease in 2016 occurred. Credit investments decreased by 25.5%, short – term credit by 35.5%, long – term credit by 21.1%. 25.5 decrease in gross credit investment is due to decrease in short – term credits 65.5% and long – term credits 34.5%.

**Table 2.** Major capital investments in the oil and non – oil sector

	Gross		including:					
	thousand manat	Net weigh, in percent	Oil sector			Non – oil sector		
			thousand manat	Compared to previous year, in percent	Net weigh, in percent	thousand manat	Compared to previous year, in percent	Net weigh, in percent
2000	967821.1	100.0	501907.9	100.0	51.9	465913.2	100.0	48.1
2001	1170820.3	100.0	686551.4	136.8	58.7	484268.9	103.9	41.3
2002	2106976.7	100.0	1448392.4	210.0	68.8	658584.3	136.0	31.2
2003	3786366.7	100.0	2771092.1	191.3	73.2	1015274.6	154.2	26.8
2004	4922755.9	100.0	3708138.4	133.8	75.3	1214617.5	119.6	24.7
2005	5769876.3	100.0	3756167.6	101.3	65.2	2013708.7	165.8	34.8
2006	6234483.7	100.0	3408512.5	90.7	54.7	2825971.2	140.3	45.3
2007	7471189.9	100.0	3529865.3	103.6	47.2	3941324.6	139.5	52.8
2008	9944153.8	100.0	2922414.7	82.0	29.4	7021739.1	176.4	70.6
2009	7724944.8	100.0	2058349.8	74.0	26.6	5666595.0	84.8	73.4
2010	9905665.8	100.0	2958491.7	135.9	29.9	6947174.1	115.9	70.1
2011	12799061.3	100.0	3070236.0	102.2	24.0	9728825.3	138.0	76.0
2012	15407274.4	100.0	3854477.8	123.6	25.0	11552796.6	116.9	75.0
2013	17850815.7	100.0	5094617.8	131.3	28.5	12756197.9	109.7	71.5
2014	17618601.1	100.0	5959403.1	116.5	33.8	11659198.0	91.0	66.2
2015	15957028.2	100.0	7137136.8	117.5	44.7	8819891.4	74.2	55.3

Gross foreign investments in 2016 increased by 10,9 times compared to 2000, by 2.1 times compared to 2005, by 2.1 times compared to 2010, financial credits in 2016 increased by 8.3 times compared to 2000, by 3.1 times compared to 2005, decreased by 35.5% compared to 2010, investment to oil industry in 2016 increased by 10,3 times compared to 2000, by 1.5 times compared to 2005, 1.9 times compared to 2010, investment to invested joint and foreign enterprises in 2016 increased by 14.5 times compared to 2000, 7.5 times compared to 2005, 2.9% times compared to 2010, other investments increased by 3.9 times compared to 2005 and decreased by 49.8% compared to 2010. But since 2012, these investments began to decline.

Despite the foregoing, it can be said that the experience of developed foreign countries proves that only market principles for regulating socio – economic processes can not guarantee a high level of prosperity for all its participants. As it turns out, the income of various groups of the population in market systems depends on their production factors, their availability, supply and demand for these factors. This is a fair market regulation.

However, in terms of social justice, the crisis of the market system of social and economic regulation was hidden here.

### 3.2. Econometric analysis

**Table 3.** Econometric models

	const	Oil production	Oil price	R <sup>2</sup>	F	P – (F)	DW
CPI	87.1000*** (9.256)	0.091453 (1.095)	0.088111 (1.663)	0.271259	F(2. 14) 2.605612	2.605612	1.068926
CPI	95.3948*** (16.969)		0.102683* (1.990)	0.208792	F(1. 15) 3.958342	0.065192	0.065192
Initial Income	64.9131*** (3.693)	0.205753* (1.795)	0.205753* (2.079)	0.417973	F(2. 14) 5.026923	0.022626	1.055547
GDP– manat	0.450192 (0.029)	0.458485*** (5.322)	0.637411*** (4.695)	0.827483	F(2. 14) 33.57580	4.55e – 06	1.531993
GDP – dollar	–45.3233** (–2.326)	0.825662*** (4.776)	0.676960*** (6.171)	0.852302	F(2. 14) 40.39411	1.53e – 06	1.158197
GDP – euro	–29.9933 (–1.509)	0.492114*** (4.399)	0.847824*** (4.809)	0.801909	F(2. 14) 28.33738	0.000012	1.273352
GDP Per Person – manat	1.04739 (0.070)	0.625909*** (4.731)	0.451904*** (5.383)	0.830243	F(2. 14) 34.23549	4.06e – 06	1.536565
GDP Per Person – dollar	–44.1788** (–2.314)	0.811864*** (4.792)	0.667779*** (6.212)	0.853646	F(2. 14) 40.82931	1.44e – 06	1.44e – 06
GDP Per Person – Euro	–29.0593 (–1.494)	0.833912*** (4.832)	0.485200*** (4.431)	0.803803	F(2. 14) 28.67842	0.000011	1.273989
1\$= manat	151.107*** (6.095)	–0.158234 (–0.719)	–0.280494* (–2.011)	0.287158	F(2. 14) 2.819854	2.819854	0.868080
1\$= manat	136.755*** (9.445)		–0.305707** (–2.301)	0.260804	F(1. 15) 5.292331	0.036189	0.952086
1euro= manat	134.601*** (4.988)	–0.204283 (–0.853)	–0.0683822 (–0.451)	0.078906	F(2. 14) 0.599657	0.562508	1.038975
1euro= manat	130.262*** (5.311)	–0.231351 (–1.026)		0.065572	F(1. 15) 1.052609	0.321169	0.921756
1euro= manat	116.072*** (7.312)		–0.100933*** (–0.6928)	0.031004	F(1. 15) 0.479934	0.499038	1.141232
GNI – manat	9.34766 (0.529)	0.548435*** (3.583)	0.457368*** (4.629)	0.772716	F(2. 13) 22.09863	0.000066	1.554170
GNI – dollar	–22.3066 (–1.082)	0.690792*** (3.867)	0.608516*** (5.278)	0.808995	F(2. 13) 27.53051	0.000021	1.286427
GNI – euro	–6.24940 (–0.308)	0.712763*** (4.059)	0.418564*** (3.693)	0.750158	F(2. 13) 19.51643	0.000122	1.388989
GNI Per Person – manat	9.86068 (0.573)	0.537954*** (3.607)	0.450640*** (4.681)	0.775964	F(2. 13) 22.51317	0.000060	1.564009
GNI Per Person – dollar	–21.4052 (–1.063)	0.678497*** (3.889)	0.599980*** (5.327)	0.811422	F(2. 13) 27.96852	0.000020	1.291411
GNI Per Person – euro	–5.56714 (–0.282)	0.700429*** (4.093)	0.412317*** (3.733)	0.753667	F(2. 13) 19.88709	0.000111	1.404250
Funds	91.2378*** (13.949)	0.0897165 (1.545)	0.111723*** (3.032)	0.515071	F(2. 14) 7.435106	0.006306	1.964528
Funds	99.3752** (24.47)		0.126019* (3.380)	0.432408	F(1. 15) 11.42745	0.004120	1.881101
Investments	111.998** (2.634)	–0.471343** (–1.250)	0.561874 (2.348)	0.299214	F(2. 14) 2.988782	0.083004	1.032906
Investments	69.2464** (2.694)		0.486770* (2.063)	0.221043	F(1. 15) 4.256510	0.056855	0.977720

Note: 1. (t – stat); 2. \* p<0.05; \*\* p<0.01; \*\*\* p<0.001.

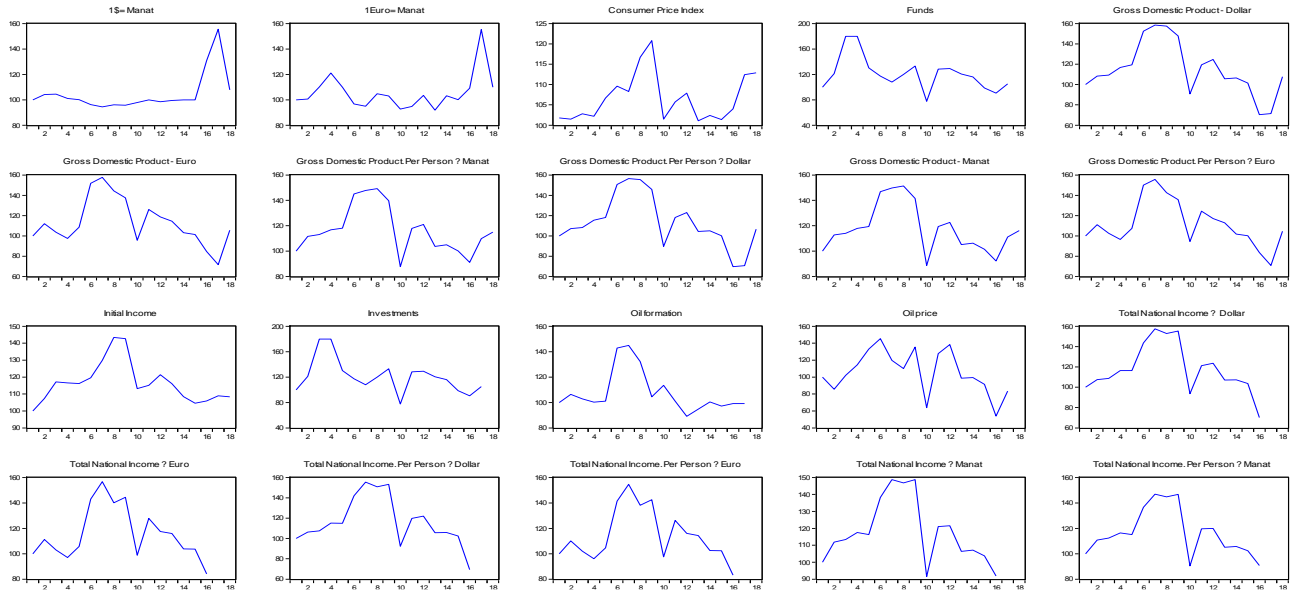


Fig.3. Index of macroeconomical indicators (compared to previous year)

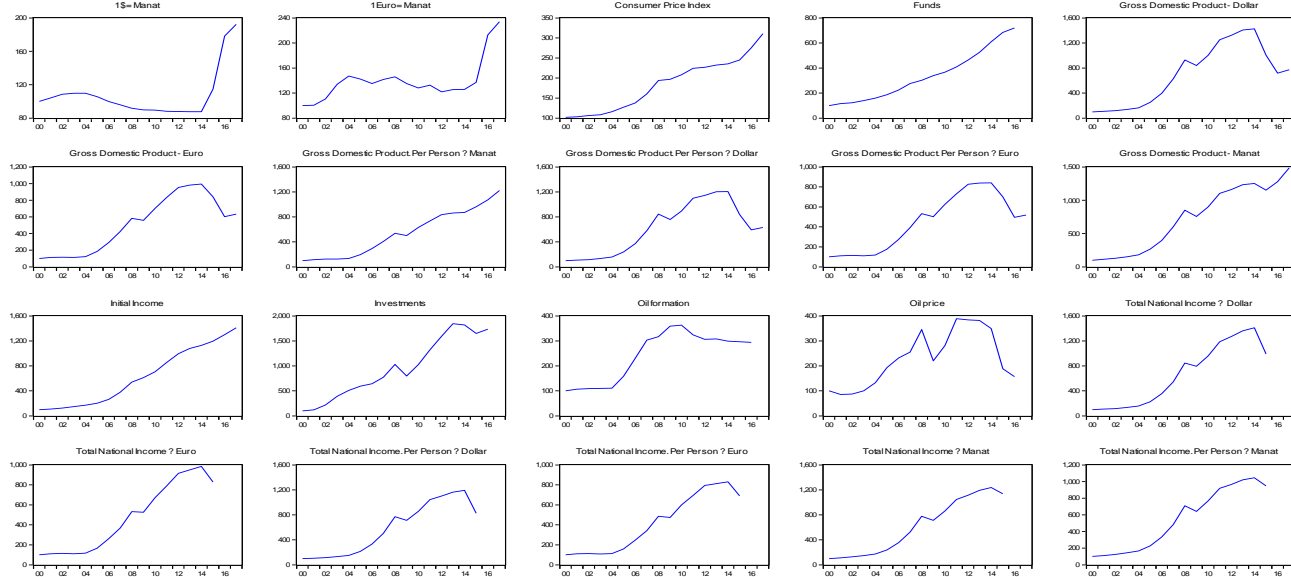


Fig. 4. Index of macroeconomical indicators (compared to base year 2000=100)

Let's look through econometric model established in order to determine dependence of main macroeconomic indicators on oil formation and oil price (Fig.3.). Compared with previous years, models show that the model has economic sense and is statistically significant, which reflects the dependence of gross domestic product on oil and gas prices, oil prices and oil production. These models also fluctuated  $0.80191 < R^2 < 0.85230$ . Coefficients  $p < 0.05$ ;  $p < 0.01$ ;  $p < 0.001$ . It can be attributed only to the level of GDP per capita, either in dollars or in euros. Thus, here also  $0.80383 < R^2 < 0.85366$  and the coefficients  $p < 0.05$ ;  $p < 0.01$ ;  $p < 0.001$ . Then the models of dependence on gross national income, both in manats, and in dollars and euros, depend on oil prices and oil production. It is true that  $R^2$  is slightly lower and  $0.750158 < R^2 < 0.808995$ . However, there were statistically significant indicators of oil and

oil production.  $p < 0.05$ ;  $p < 0.01$ ;  $p < 0.001$ . Such a case can be attributed to the models of the price of oil and oil dependence of the gross national income, both in manats, in dollars and in euros per capita. These models also have economic and statistical significance. These models are slightly lower than the gross domestic product  $R^2$ , which ranges from  $0.75367 < R^2 < 0.81142$ . In these models, the coefficients of oil and oil production are statistically significant  $p < 0.05$ ;  $p < 0.01$ ;  $p < 0.001$ . In the primary population income model is  $p < 0.05$ ;  $p < 0.01$ ;  $p < 0.001$  and  $R^2 = 0.417973$ . There is no doubt about the economic significance and statistical significance of the CPI, neither key assets, nor investment models for oil prices, and dependence on oil production. In these models are responded  $p < 0.05$ ;  $p < 0.01$   $p < 0.001$  in separately. From this point of view, a less important factor was removed from the model. Here  $R^2$  is very low. Thus, the models indicated the dependence of oils and oil prices on fixed assets were  $0.43241 < R^2 < 0.51507$ . It is slightly more difficult to look at oil prices and oil dependence models. Here,  $p < 0.001$  condition is not satisfied at all,  $p < 0.05$  and  $p < 0.01$  are satisfied individually. From this point of view, a less important factor was removed from the model. Here  $R^2$  is very low. Thus, the models for the dependence of prices on oil and base oils were  $0.22211 < R^2 < 0.29921$ . CPI depends on oil prices and  $p < 0.001$  for fixed quantities. The condition  $p < 0.01$  is not satisfied in full.  $p < 0.05$  is satisfied once. In these models,  $R^2$  is very small ( $0.20879 < R^2 < 0.22712$ ). US dollar and euro exchange rates in US dollars are based on oil prices and oil production dependence models at  $p < 0.001$  for a fixed amount, but only once in the price of oil. The condition  $p < 0.01$  is separated. Although the dependence models at the exchange rate of the dollar are  $0.26081 < R^2 < 0.22815$ , the exchange rate of the manat for the euro cannot be related to oil prices and dependence on oil production (Table 3). But this is not so. Like all macroeconomic indicators, the manat exchange rate for both the dollar and the euro depends on oil prices and oil production (perhaps even more). Simply, the Central Bank for a long time maintained a stable exchange rate (with intervention) in the foreign exchange market and did not allow its natural fluctuations.

**Table 4.** Econometric models

	const	Oil production	Oil price	$R^2$	F	P – (F)	DW
CPI	54.2635	0.503687**	0.003379***	0.733257	F(2. 14)	0.000096	0.321708
	(2.544)	(3.820)	(0.028)		19.24246		
CPI	54.3283**	0.506622***		0.733241	F(1. 15)	0.000012	0.325824
	(2.651)	(6.421)			41.23062		
CPI	93.9612***		0.360844***	0.455238	F(1. 15)	0.002967	0.324536
	(3.653)		(3.540)		12.53495		
Initial Income	-215.168	3.13447**	0.187865	0.579048	F(2. 14)	0.002342	0.171695
	(-1.095)	(2.582)	(0.1712)		9.628989		
Initial Income	31.8735		2.41239***	0.378671	F(1. 15)	0.008553	0.249111
	(0.1583)		(3.024)		9.141782		
Initial Income	-211.568	3.29764***		0.578167	F(1. 15)	0.000395	0.185893
	(-1.120)	(4.534)			20.55913		
GDP– manat	-300.037*	3.20807	0.923614***	0.762184	F(2. 14)	0.000043	0.217255
	(-1.895)	(3.278)	(1.044)		22.43457		
GDP – manat	-47.1958		3.20037***	0.579630	F(1. 15)	0.000385	0.279188
	(-0.2658)		(4.548)		20.68286		
GDP – dollar	-387.070***	2.03706**	2.58616***	0.875995	F(2. 14)	4.51e – 07	0.300526
	(-3.179)	(2.707)	(3.802)		49.44934		
GDP – euro	-224.647*	1.62956**	1.45817**	0.804074	F(2. 14)	0.000011	0.280384
	(-2.128)	(2.497)	(2.472)		28.72775		
GDP. Per Person – manat	-162.168	2.60868**	0.149399	0.644596	F(2. 14)	0.000716	0.219318
	(-1.142)	(2.971)	(0.188)				
GDP Per Person – manat	-159.306	2.73844***		0.643697	F(1. 15)	0.000107	0.240612
	(-1.166)	(5.206)			27.09897		
GDP Per Person – manat	43.4333		2.00077***	0.420523	F(1. 15)	0.004866	0.272945
	(0.2838)		(3.299)		10.88539		
GDP Per Person – dollar	-319.654***	1.72431***	2.25587***	0.903144	F(2. 14)	8.00e – 08	0.346882
	(-3.500)	(3.055)	(4.421)		65.27235		

GDP Per Person – euro	–179.106** (–2.218)	1.35766** (2.719)	1.28188** (2.840)	0.837073	F(2. 14) 35.96395	3.05e – 06	0.318880
1\$= manat	115.992*** (9.666)	0.116276 (1.568)	–0.179910** (–2.683)	0.362403	F(2. 14) 3.978730	0.042837	1.103503
1\$= manat	125.156*** (11.40)		–0.0973893** (–2.239)	0.250487	F(1. 15) 5.012998	0.040741	0.758334
1\$= manat	112.545*** (7.935)	–0.0399842 (–0.0399842)		0.034500	F(1. 15) 0.535994	0.475382	0.677388
1euro= manat	116.523*** (7.677)	0.191266* (2.039)	–0.125600 (–1.481)	0.230495	F(2. 14) 2.096752	0.159765	1.151248
1euro= manat	114.117*** (7.278)	0.0821770 (1.361)		0.109935	F(1. 15) 1.852693	0.193570	0.844181
1euro= manat	131.598*** (9.024)		9.024 (0.1755)	0.002049	F(1. 15) 0.030798	0.863039	0.732499
GNI– manat	–290.006* (–2.124)	1.95956* (2.087)	1.89195** (2.220)	0.804881	F(2. 13)	0.000024	0.218510
GNI – dollar	–368.914** (–2.732)	1.67995* (1.810)	2.70574*** (3.210)	0.849483	F(2. 13) 36.68444	4.51e – 06	0.252552
GNI – euro	–213.863* (–1.889)	1.27320 (1.636)	1.64701** (2.331)	0.778206	F(2. 13) 22.80646	0.000056	0.231568
GNI – euro	–133.994 (–1.240)		2.60310*** (6.192)	0.732545	F(2. 13) 38.34517	0.000023	0.552521
GNI – euro	–186.766 (–1.445)	2.77334*** (5.524)		0.685526	F(1. 14) 30.51884	0.000075	0.333312
GNI Per Person – manat	–233.325** (–2.221)	1.70445** (2.360)	1.60006** (2.440)	0.836653	F(2. 13) 33.29268	7.68e – 06	0.227865
GNI Per Person – dollar	–303.657** (–2.917)	1.48977* (2.082)	2.28671*** (3.519)	0.875268	F(2. 13) 45.61154	1.33e – 06	0.262250
GNI Per Person – euro	–169.699* (–1.915)	1.10746* (1.818)	1.38988** (2.513)	0.806937	F(2. 13) 27.16769	0.000023	0.237129
Funds	–10.2660 (–0.105)	1.64310** (2.714)	–0.207976 (–0.380)	0.523013	F(2. 14) 7.675438	0.005618	0.175287
Funds	–14.2506 (–14.2506)	1.46246*** (4.016)		0.518094	F(1. 15) 16.12638	0.001123	0.150809
Funds	119.234 (1.168)		0.958125 (2.368)	0.272147	F(1. 15) 5.608564	0.031732	0.234996
Investments	–201.559 (–0.7695)	3.01110* (1.860)	1.86882 (1.277)	0.621462	F(2. 14) 11.49219	0.001114	0.190778
Investments	–165.754 (–0.6235)	4.63425*** (4.527)		0.577383	F(1. 15) 20.49312	0.000401	0.359331
Investments	35.7590 (0.1449)		4.00579*** (4.096)	0.527958	F(1. 15) 16.77684	0.000954	0.213196

Note: 1.(t – stat); 2. \*p<0.05; \*\*p<0.01; \*\*\*p<0.001;

The base year 2000 was adopted, and the main macroeconomic indicators, oil production and oil prices dependence for determining established econometric models (Fig. 4.). It is clear that the gross domestic product in currency, dollar and euro and oil price growth and oil production in reflects the model's interdependence with some variables have a certain economic meaning and are statistically significant. In these models fluctuated  $0.579630 < R^2 < 0.875995$ . The sums were calculated for individual models at  $p < 0.05$ ;  $p < 0.01$ ;  $p < 0.001$ . This is especially noticeable in the models of the dollar and euro. It can be attributed only to the level of GDP per capita, either in dollars or in euros. Thus, here also  $0.42052 < R^2 < 0.90314$  and the coefficients  $p < 0.05$ ;  $p < 0.01$ ; conditions  $p < 0.001$  are satisfied individually, and the strongest dependence is observed in the dollar model (Table 4).

Then the models of dependence on gross national income, both in manats, and in dollars and euros, depend on oil prices and oil production. It is true that the  $R^2$  limit for these models is somewhat lower, but the upper limit is

somewhat lower and is  $0.68553 < R^2 < 0.84948$ . However, there were statistically significant indicators of oil and oil production.  $p < 0.05$ ;  $p < 0.01$ ; conditions  $p < 0.001$  are satisfied on both models on some models and on some models separately. Such a case can be attributed to the models of the price of oil and oil dependence of the gross national income, both in manats, in dollars and in euros per capita. These models also have significant and statistical significance. The upper limit of  $R^2$  for these models is slightly higher than the growth model for gross domestic product and is  $0.806937 < R^2 < 0.875268$ . In these models, the coefficients of oil and oil production are statistically significant  $p < 0.05$ ;  $p < 0.01$ ;  $p < 0.001$ . On the models of dependence of CPI oil prices and oil production  $p < 0.05$ ;  $p < 0.01$   $p < 0.001$  and  $0.45552 < R^2 < 0.73326$ . For population incomes,  $p < 0.05$ ;  $p < 0.01$ ; conditions  $p < 0.001$  were satisfied on both models on some models and on some models separately and amounted to  $0.37867 < R^2 < 0.57905$ . The models of dependence on the basic prices for oil and natural gas and oil prices also have economic meaning and statistical significance. Thus, in the models of the main fund,  $p < 0.05$ ; the terms  $p < 0.01$   $p < 0.001$  are satisfied separately. On this point less, significant factor was removed from the model.  $R^2$  is rather low here. Thus, in the model on dependence of main funds on oil price and oil production was nearly  $0.27215 < R^2 < 0.52301$ . It is observed a bit better situation in the model on dependence of volume of investment on oil price and oil production. Here  $p < 0.05$ ;  $p < 0.01$ ; and  $p < 0.001$  conditions were satisfied separately. On this point, less significant model was removed from the factor.  $R^2$  is rather in normal level. It was between  $0.523013 < R^2 < 0.621462$ . In the model on dependence of dollar rate and euro rate to manat on oil price and oil production  $p < 0.001$  condition is responded to constant quantity.  $p < 0.05$  and  $p < 0.01$  are satisfied separately. In the model on dependence of manat rate to dollar is  $0.03450 < R^2 < 0.362403$ , to euro is  $0.00205 < R^2 < 0.23049$  (Table 4). Consequently, these models also show that the manat does not depend on the dollar and the euro's exchange rate on oil prices and dependence on oil production. In fact, as we have already seen, this is not so. Like all macroeconomic indicators, the manat exchange rate for both the dollar and the euro depends on oil prices and oil production (perhaps even more). Simply, the Central Bank for a long time maintained a stable exchange rate (with intervention) in the foreign exchange market and did not allow its natural fluctuations.

**Table 5.** Comparative to the previous year

	const	Consumer Price Index	1\$= manat	Oil production	Oil price	$R^2$	F	P – (F)	DW
Initial Income	-47.5030	1.6575***	-0.237386*	0.07987	0.04348	0.777502	F(4, 12)	0.000687	1.411902
	(-1.512)	(4.394)	(-1.805)	(0.684)	(0.569)		10.48325		
GDP– Manat	-105.595***	1.13132***	0.05577	0.54534***	0.36262***	0.923659	F(4, 12)	1.29e – 06	1.742967
	(-3.589)	(3.202)	(0.4528)	(4.988)	(5.070)		36.29756		
GDP – dolaar	-72.6404	1.10451*	-0.511778**	0.620103***	0.544644***	0.916310	F(4, 12)	2.23e – 06	1.556988
	(-1.713)	(2.170)	(-2.883)	(3.936)	(5.284)		32.84644		
GDP Per Person – manat	-101.969***	1.08882***	0.0607734	0.538748***	0.360123***	0.924411	F(4, 12)	1.22e – 06	1.719496
	(-3.545)	(3.153)	(0.505)	(5.041)	(5.151)		36.68820		
GDP Per Person – Dollar	-69.3647	1.06253*	-0.500449**	0.612458***	0.539937***	0.916307	F(4, 12)	2.23e – 06	1.534090
	(-1.662)	(2.120)	(-2.864)	(3.949)	(5.322)		32.84523		
GNI – manat	-129.538***	1.49903***	0.124326	0.411032***	0.292460***	0.906896	F(4, 11)	0.000013	2.197112
	(-3.116)	(3.851)	(0.517)	(3.417)	(3.642)		26.78688		
GNI – dollar	-132.305**	1.56792**	-0.179092	0.503294**	0.446029***	0.894021	F(4, 11)	0.000026	1.902860
	(-2.343)	(2.966)	(-0.548)	(3.081)	(4.089)		23.19862		
GNI Per Person – manat	-126.124***	1.45418***	0.131599	0.406219***	0.290310***	0.907858	F(4, 11)	0.000012	2.191801
	(-3.107)	(3.826)	(0.561)	(3.459)	(3.702)		27.09518		
GNI Per Person – dollar	-128.822**	1.52166**	-0.167989	0.497355**	0.442098***	0.894228	F(4, 11)	0.000025	1.887957
	(-2.323)	(2.930)	(-0.523)	(3.100)	(4.127)		23.24943		
Funds	131.547***	-0.461149**	-0.001065	0.131672**	0.152283 ***	0.729490	F(4, 12)	0.002107	2.676491
	(9.309)	(-2.718)	(-0.018)	(2.508)	(4.433)		8.090152		
Investments	158.301	-1.54914	0.658443	-0.195161	0.743396**	0.410142	F(4, 12)	0.145770	1.236891
	(1.404)	(-1.145)	(1.395)	(-0.466)	(2.713)		2.085967		

Note: 1. (t – stat); 2. \* $p < 0.05$ ; \*\* $p < 0.01$ ; \*\*\* $p < 0.001$ .



Now let's look at the macroeconomic indicators of the past year, the consumer price index, the US dollar rate, the price of oil and dependence on oil production. In the model of population dependencies, only CPI ( $p < 0.001$ ) and \$ 1/pounds ( $p < 0.05$ ) were statistically significant, and  $R^2 = 0.777502$ . The gross domestic product – only 1 US dollar/manat in the manat model is statistically insignificant, and the other three factors are statistically significant ( $p < 0.001$ ) and  $R^2 = 0.777502$ . The group of the domestic product is the consumer price index in the dollar model ( $p < 0.05$ ) ( $p < 0.01$ ), the price of oil ( $p < 0.001$ ) and oil production ( $p < 0.001$ ) are statistically significant, and  $R^2 = 0.91631$ . The gross domestic product – \$ per man for manat – is statistically unimportant and statistically significant ( $p < 0.001$ ) and  $R^2 = 0.92441$ . Gross domestic product – dollar CPI ( $p < 0.05$ ) and other remaining factors are statistically significant ( $p < 0.001$ ) and  $R^2 = 0.916307$ . The gross national income – \$1/manat in the manat model is statistically insignificant, other factors are statistically significant ( $p < 0.001$ ) and  $R^2 = 0.90689$ . Gross national income – \$1/manat in the dollar model is statistically insignificant, the CPI and oil production ( $p < 0.05$ ) and the oil price ( $p < 0.001$ ) are statistically significant, and  $R^2 = 0.889402$ . \$1/manat for gross national income per person is statistically insignificant, other factors are statistically significant ( $p < 0.001$ ) and  $R^2 = 0.90786$ . The gross national income per person – US \$1/manat in the dollar model is statistically insignificant, other remaining factors are statistically significant ( $p < 0.01$ ) and  $R^2 = 0.90786$ . In the basic fund model, 1 dollar/manat is statistically insignificant, the price of oil ( $p < 0.001$ ) and other remaining factors are statistically significant ( $p < 0.05$ ) and  $R^2 = 0.72949$ . However, in the investment model, the price of oil ( $p < 0.01$ ) is statistically significant, and the remaining factors are statistically insignificant and  $R^2 = 0.41014$  (Table 5).

**Table 6.** Comparative to the base year

	const	Consumer Price Index	1\$= manat	Oil production	Oil price	$R^2$	F	P – (F)	DW
Initial Income	-515.948***	9.69261***	-1.93244***	-1.37796***	-0.087602	0.992180	F(4. 12)	1.59e – 12	1.590599
	(-7.736)	(23.56)	(-3.343)	(-5.388)	(-0.4938)		380.63		
GDP – Manat	-589.271***	7.71646***	-1.11127**	-0.466062**	0.757964***	0.997031	F(4. 12)	4.78e – 15	1.561538
	(-13.37)	(28.39)	(-2.909)	(-2.758)	(6.466)		1007.385		
GDP – dolaar	-140.727	6.09753***	-4.95366***	-0.0867180	1.94338***	0.987365	F(4. 12)	2.82e – 11	1.479640
	(-1.454)	(10.21)	(-5.903)	(-0.2336)	(7.546)		234.434		
GDP Per Person – Manat	-434.659***	6.84571***	-0.849454*	-0.676938***	0.019575	0.991728	F(4. 12)	2.23e – 12	1.606077
	(-8.051)	(20.56)	(-1.815)	(-3.270)	(0.1363)		359.6716		
GDP Per Person – Dollar	-98.5821	4.49488***	-3.99044***	0.223534	1.73948***	0.988659	F(4. 12)	1.48e – 11	1.420330
	(-1.266)	(9.362)	(-5.914)	(0.7488)	(8.399)		261.5154		
GNI – manat	-562.252***	8.23475***	-1.44718**	-0.746694***	0.605155***	0.996329	F(4. 11)	2.62e – 13	1.811459
	(-7.136)	(23.02)	(-2.383)	(-3.895)	(4.357)		746.4331		
GNI – dollar	-339.455*	7.39100***	-3.66295**	-0.620078	1.55281***	0.987608	F(4. 11)	2.09e – 10	1.980804
	(-2.082)	(9.989)	(-2.915)	(-1.563)	(5.404)		219.1612		
GNI Per Person – manat	-441.752***	6.34234***	-1.12544**	-0.379296**	0.608989***	0.997334	F(4. 11)	4.51e – 14	1.821887
	(-7.823)	(24.74)	(-2.586)	(-2.761)	(6.118)		1028.787		
GNI Per Person – dollar	-252.466*	5.61047***	-3.02943**	-0.242597	1.41175***	0.988590	F(4. 11)	1.33e – 10	1.843876
	(-1.906)	(9.331)	(-2.967)	(-0.7527)	(6.046)		238.2718		
Funds	-216.841***	4.52272***	-0.333358	-0.571175**	-0.265129	0.963964	F(4. 12)	1.49e – 08	1.032966
	(-3.233)	(10.93)	(-0.5734)	(-2.221)	(-1.486)		80.25022		
Investments	-875.857***	11.5090***	0.427209	-2.86754***	1.88358***	0.962509	F(4. 12)	1.88e – 08	1.295014
	(-4.265)	(9.087)	(0.2400)	(-3.641)	(3.448)		77.01888		

Note: 1.(t – stat); 2. \* $p < 0.05$ ; \*\* $p < 0.01$ ; \*\*\* $p < 0.001$ .

Considering the base year 2000, let's look at the latest models, macroeconomic indicators in comparison with this, the consumer price index, the US dollar rate, oil prices and dependence on oil production. In the population dependence model, only statistical indicators are statistically significant for all factors: CPI, US dollar exchange rate, oil prices and oil production ( $p < 0.001$ ), and  $R^2 = 0.992180$ . Gross domestic product is statistically significant, only 1 US dollar ( $p < 0.01$ ) and the remaining three factors ( $p < 0.001$ ) in GDP and  $R^2 = 0.99703$ . Gross domestic product – but dollar oil production is statistically unimportant, the other three factors ( $p < 0.001$ ) are statistically



significant and  $R^2=0.93737$ . Gross domestic product – price per person – the price of oil was statistically insignificant, provided  $p<0.05$  and other factors ( $p<0.001$ ) and  $R^2=0.99172$ . In gross domestic product, oil production is statistically unimportant, and the remaining factors are statistically significant ( $p<0.001$ ) and  $R^2=0.98865$ . Gross national income was statistically significant with the condition \$ 1/pound ( $p<0.01$ ) and other factors ( $p<0.001$ ) and  $R^2=0.99632$ . Gross national income – dollar oil production was statistically insignificant, provided  $p<0.01$  the remaining statistical indicators were statistically significant ( $p<0.001$ ) and  $R^2=0.97606$ . The gross national income per capita was US \$1/manat, and oil production was statistically significant ( $p<0.001$ ) and  $R^2=0.99733$ . Gross national income per dollar oil production is statistically unimportant, from \$1/barrel ( $p<0.01$ ) and other factors ( $p<0.001$ ) and  $R^2=0.98859$ . it is statistically significant with the condition for oil production ( $p<0.01$ ), CPI factor ( $p<0.001$ ) and  $R^2=0.96396$ . In the investment model, \$ 1/manat is statistically insignificant, while the other statistical values are statistically significant ( $p<0.001$ ) and  $R^2=0.96251$  (Table 6).

#### 4. Conclusions

It is well known that from the economic and ecological analysis it is clear that at high oil production levels and high oil prices, economic growth and economic growth have reached the highest level. At that time, the exchange rate of the manat was relatively stable (approximately for 10 years it remained at the level of 1 dollar = 0.8 manat). This also created some difficulties in the study. Despite the fact that the exchange rate is a key factor, it was chosen because of its statistical significance in models that affect the dynamics of a number of macroeconomic indicators. Naturally, if there were no hard, and not strict, measures to maintain the exchange rate of manat in the state, and manat moves in a slightly free and regulated mode of navigation, then as a result of the fall in oil prices in 2014–2015, and the indicators obtained as a result of the analysis will be important in future forecasts. The final conclusion is that macroeconomic indicators and the world market are subject to this law, because in the law of demand there are life and economy, as well as the basic law of microeconomics. In this regard, the use of oil revenues for various sectors of the economy in order to maintain a constant exchange rate, it is necessary to slightly reduce the foreign exchange market and further improve the policy of soft exchange.

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