Research Article

Effective Macroeconomic Model for GDP Analysis, Albanian Case

Alqi Naqellari

Vladimir Mici

Mediterranean University of Albania, Albania

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Abstract

The study aims to create a macroeconomic market model, through which to analyze nominal and real GDP, to analyze the impact of prices on GDP, create a model of aggregate demand curve, using price deflator, etc. It aims to calculate the Price Deflator and real GDP starting from 1990, as the first year of calculating the macroeconomic indicators of the Albanian economy. More detailed analysis is focused on the years 2000-2017. It has been proven that the deflator calculated by INSTAT is almost equal to the nominal GDP average of the price increase. This data was used to construct the market model with Albanian economy data, with Aggregate Price and real GDP. The new model of the aggregate market differs from the existing one. It expresses the nominal GDP curve as a listing of real GDP at and has a positive slope. This model enables a detailed analysis of nominal and real GDP can be used by anyone, and for any economy. It is recommended for the government and the Albanian institutions to apply this model, as it is effective. Statistical, econometric, analysis, synthesis, comparison, etc. methods were used in the analysis.

Keyword: *nominal GDP, real GDP, GDP deflator, inflation, economic growth, price effect, real GDP effect*

1. Introduction

Economic analysis of national accounts indicators so far in Albania is based on nominal and real data. Gross Domestic Product, National Income, Domestic Demand, Consumption Expenditures, Investment, etc., are given in ALL, EUR or USD. When they are calculated at the prices of the respective year they are called nominal. When calculated at last year's prices they are called real. The growth rate of these indicators is calculated based on the real indicator to eliminate the price effect. We cannot build a macroeconomic model through these indicators because we do not have a price deflator, but simply an inflation rate in percentage or a deflator of any indicator in percentage. These indicators cannot be placed on the Y-axis and real GDP on the X-axis to create the corresponding nominal curve. You need the Price deflator level. The new model calculates the Price deflator starting from year 1990. Initially this indicator was calculated, (in the Annual Central Bank Reports) but later there is no longer calculated. Through its calculation can be done very efficient analysis. The impact of prices on the growth of nominal GDP in absolute sum is calculated, the impact of real GDP in absolute sum. Through it we also look at the price trends, their relation to real and nominal GDP. In this model we don't have curve shifts, but we have a single curve. The concept of shifting seems to be mostly artificial rather than real, and not applicable. The model was applied to the Albanian economy data, extracting indicators that have never been calculated. This model enables the government, the Central Bank, various institutions and all researchers to make real and effective analyzes.

2. Reference Models of Analysis

The Central Bank and INSTAT do not calculate real GDP, in the classical sense, that calculates real GDP as nominal GDP divided by the Price deflator. Today GDP is calculated, first, at current prices, and then, at prices of the previous year. Thus, in year 2016, in the Albanian economy, GDP at current prices was 1475251 ALL million, while at the previous year prices was 1482387 ALL million. In 2015, the GDP Deflator was 0.56 and in 2016 it was -0.47. The question is: how much was real GDP and aggregate price in 2016? These questions cannot be answered. With this model we cannot set the Price deflator but we can set an index, the GDP Deflator itself. We can set the price only if the real GDP is expressed in units of goods and services. If the real GDP is expressed in units of goods, it is multiplied by the Price deflator and each intersection point of them gives a nominal GDP. By matching these points, we really create a concrete model. Can this model be realized? The answer is yes, this model can be realized. To argue this we start from the models studied in today's textbooks of microeconomics and macroeconomics, the individual market model and the quantity theory model.

2.1 The first model, the microeconomic model of the market for an individual good

Building some macroeconomic models in economy relies on microeconomic models. In the model of the individual market in microeconomics, on the X-axis is set the quantity of a given good or service and is denoted by the letter Q. This good or service is expressed in units of measure, kilogram, meter, piece, etc. On the Y axis is its price, which is denoted by the letter P. The price is expressed in cash per unit of good or service. In this pair of curves is constructed the demand curve that represents buyers and the supply curve that represents sellers or producers. The demand is created by listing two variables like quantity and price, where the price is taken as an independent variable and the quantity as a dependent variable. By matching the points that link the quantity demanded with certain price levels, is constructed the individual demand curve for a given good or service. The curve has a negative slope, which means that the lower the price, the higher the quantity demanded. The supply is created by listing the offered quantity and a determined price. Matching these points creates the supply curve with a positive slope. This means that the more the price increases, the higher the offered quantity.

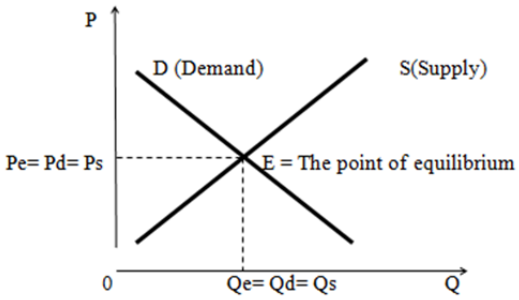

Fig. No.1: Theoretical model of the individual market for commodity X (microeconomics)

The intersection of the D and S curves is at point E. Point E is taken as the equilibrium point where the quantity demanded corresponds to the quantity offered for the same price level.

Why not applying this model of microeconomics to macroeconomics as well? Why not bringing the goods together in one unit? By assembling them into units we can then determine a real market model. For analysis effects, goods can also be differentiated into groups of goods. These differences will make the analysis more detailed and effective. Even the general analysis will become much more

realistic than the market analysis that is done today. Today, in Albania, there is no concrete economic model of aggregate market to analyze nominal GDP and real GDP.

2.2 The second model, the quantity theory model

Monetarist theory gives us one more opportunity to build the model into units of goods and services. The main formula of quantity money theory is

M * V = P * Y where

M = money supply, V = velocity of money, P = aggregate price and Y = real GDP. This formula is derived from the formula:

M * V = P * T where

M = money supply, V = velocity of money, P = aggregate price and T = number of transactions. The relation between transactions and currency is expressed by the following equation called the quantitative equation. M * V = P * T (Menkiŵ G. (1999).

Economists use today's version of the quantitative equation M * V = P * Y, where P * Y is assumed to be nominal GDP. The only reason is that it is difficult to measure the number of transactions carried out, and in this way P * T is replaced by the total production to solve this problem (Menkiŵ G. (1999). The question is if it would be easy to calculate the number of transactions, will this model be used? The answer is yes, and then we ask the question why not use the number of units of goods when we can calculate it? While in the case of T*P the transactions are summed, regardless the price of the goods, then why not summing also the units of the goods regardless of their price?

Speaking about the exchange equation, Lipsey states: 'Y is real national income, that is, the physical volume of production' and further the author considers transactions as the multiplication of the quantity of goods with its price (LIPSEY R. 1992). (In addition to the equation (MV = PQ), there is another version of the exchange equation. This alternative version focuses on total transactions (including intermediate sales) and not just the final payments included in the national product '(Ŵonacott P & Ŵonacott) R. 1982).

This paper undertakes precisely the duty to design a model that is as close as possible to the reality by building a model where the X axis will not set the number of transactions but the number of units of goods multiplied by the initial prices of the year when GDP was first calculated in Albania, where nominal GDP was equal to real GDP. By setting the number of units of goods and services each year multiplied by the base year price, no mistake is made, rather the model becomes effective. So, what we have is M * V = real GDP in units of goods * P, where P is the Price deflator. This model is almost identical to the original model, the difference is that we do not have a number of transactions with units of goods within the transaction, but we have the sum of the units of goods purchased through all the transactions, multiplied by the initial price, over a period of time, which in this case is one year. In the original theory, when talking about transactions, there is no limit placed on the price of goods, but on the contrary the transactions were summed, no matter what type of product the transaction represented.

This model is designed with data from the Albanian economy and is very effective. It can analyze and draw conclusions on costs, production and price level. It's a concrete model.

3. The Dynamics of Some Macroeconomic Indicators 1990-2016

In Albania, macroeconomic indicators have been calculated after 1990. By 1990 there are statistics of centralized system. In these statistics can be found: quantities of products by type, period prices, quantities of exports and imports, general production and production of goods, calculated by statistical methods of the time. Macroeconomic indicators such as nominal and real GDP, inflation rate and unemployment rate were not calculated. These indicators and others began to be calculated after 1990. After 1990 new laws on the financial system were adopted. In this context, a number of

laws were also adopted in the field of statistics. These laws were adapted to the European system of statistics. They continue to improve continuously as a function of economic development. The inflation rate was first calculated in 1993. This has also been the base year for a number of other macroeconomic indicators. In 1997, some changes were made to the banking system. In this year, the achievement and maintenance of price levels were also identified as the main objective of Central Bank. Over the years there have been changes in the calculation of GDP. This is the reason that between the Annual Reports and the Statistical Reports, produced over the years by the Bank of Albania, there are differences in the magnitude of macroeconomic indicators such as GDP, inflation rate, unemployment etc. These frequent changes create difficulties in performing accurate analyzes, increasing in this way the size of errors. This phenomenon has not been taken into account in the analysis of National Accounts indicators. The analysis of National Accounts indicators has taken into account the production of recent years of the time series of indicators produced by INSTAT (1996-2017). In dealing with these indicators we believe that the error in the calculation is minimized. In this way, the results will be more accurate and closer to reality. The calculations have begun since 1990 but have focused on more detailed analysis after 2000. The analysis is focused on the last 17 years where the economy has also been more consolidated. It is this year that many of the macroeconomic indicators are also converted into Euros. At the end of 2003 and the beginning of 2004, there were no state-owned banks in Albania. They were all with private capital, generally filial banks and foreign banks. Domestic banking capital was small. After 2000 the main currency in circulation was the Lek, the euro and the dollar. From 1990 to 1999 a number of coins from various countries circulated in Albania. For this reason, it was difficult to accurately calculate the macroeconomic indicators as well as the factors influencing them. Greek drachma, Italian lira, German mark, dollar, etc. have circulated in considerable quantities.

In calculating economic indicators, all these changes and continuous improvements have been taken into account. In this way, we think that the accuracy of the indicators gives the reality of the Albanian economy over the years. The paper calculates the Real GDP and the Price deflator of GDP. There are no indicators of real GDP by INSTAT (the Institute of Statistics of Albania) or the Bank of Albania (after 2001). This indicator is from 1990 to 2001. These data are in the Annual Report of the Bank of Albania 1995-2001. In table No.1 we provide the relevant data.

Table No.1: Nominal and real GDP(Ml/All), 1990-2001

Annual Report, 1995			Annual Report, 1996			Annual Report, 1998		
Years	GDP, at prices 90	Percentage of real GDP growth	GDP, at prices 90	Percentage of real GDP growth	GDP at Current Prices	GDP, at prices 90	GDP at Current Prices	Percentage of real GDP growth
1990	16.811,0		16813	-10,0	16813	16,813	16,813	-10
1991	12.156,0	-27,7	12105	-28,0	16404	12,105	16,404	-28
1992	10.974,0	-9,7	11235	-7,2	50697	x	x	x
1993	12.182,0	11,0	12309	9,6	125334	x	x	x
1994	13.086,0	7,4	13331	8,3	184396	x	x	x
1995	14.839,5	13,4	15106	13,3	229796	15,107	229,793	13.3
1996	x	x	17225	14,0	300806	16,478	280,998	9.1
1997	x	x	x	x	x	15,325	341,716	-7
1998	x	x	x	x	x	16,857	456,766	8
1999	x	x	x	x	x	x	x	x
2000	x	x	x	x	x	x	x	x

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Annual Report, 1999				Annual Report, 2001		
Years	GDP at Current Prices	GDP, at prices 90	Percentage of real GDP growth	GDP, at prices 90	Percentage of real GDP growth	GDP at Current Prices
1990	x	x	x	x	x	x
1991	x	x	x	x	x	x
1992	50697	x	-7.2	x	x	x
1993	125340	x	9.6	12309	9.6	125340
1994	187891	x	8.3	13331	8.3	187891
1995	224745	x	13.3	15107	13.3	224745
1996	280998	x	9.1	16478	9.1	280998
1997	341716	x	-7	15325	-7	341716
1998	460631	x	8	16556	8	460631
1999	506205	x	7.3	17764.6	7.3	506205
2000	x	x	x	19150.2	7.8	539210

Source: Bank of Albania and IMF estimates. Annual Reports, 1993, 1994, 1995, 1996, 1998, 1999, 2001.

INSTAT calculates GDP Deflator as the difference between the nominal GDP growth rate minus the real GDP growth rate. In fact, with this indicator we get the percentage of nominal GDP that increases as the result of prices increase. This INSTAT indicator cannot be used in the AD-AS market model because it does not represent an Aggregate Price. This indicator cannot build the aggregate demand curve AD. This Deflator should be explained to users; why it is calculated, what kind of interest does it have in the economy, what expresses compared to the CPI and the inflation rate, etc.

The calculation of the Price deflator in this paper is done using theoretical formulas. Theoretically, Price deflator and GDP Deflator are calculated by the formulas:

$P_{deflatorit} = P_{agregat} = \frac{PBB_{nominal}}{PBB_{real}}$ and GDP Deflator $D = \frac{PBB_n}{PBB_r} * 100$.

In this way we get the Aggregate Price or Price deflator. At this price the real GDP is multiplied and is obtained the nominal GDP. When building the Aggregate Demand curve, on the X axis is set the real GDP and on the Y axis is set the D / P, Aggregate Price or Price deflator. These two meet on the curve. It is at this point that we have nominal GDP calculated as a multiplication of the price deflator with real GDP. By getting the relation between Price-Quantity for each listing we obtain the Aggregate Demand curve, AD. This Price Deflator can be easily used in the Aggregate Market model AD-AS. The GDP deflator is calculated by the formula:$D = \frac{GDP_{nominal}}{GDP_{real}} * 100$. The ratio of nGDP to rGDP without being multiplied by 100 gives an index, which is called the Price deflator. It is exactly this number that multiplies real GDP to calculate nominal GDP. Dozens of other authors have used this formula. Here are mentioned some of them. "A price index used to convert an economic time series in current dollars into a constant dollar series of a prior period". (Shim J & Siegel J1995). "GDP Deflator. A price index used to correct the value of money of all goods and services entering in the Gross Domestic Product, as prices change. This enables changes to be isolated in the real production of goods and services in the economy." (Pearce D.1992). "GDP deflator. The factor by which the value of GDP at current prices can be reduced (deflated) in GDP in terms of base year prices". (A Dictionary of Finance and Banking, 2008). "The GNP deflator price is the price index calculated from the ratio of nominal GNP to real GNP" (Orley M. Amos, Jr. (1987). In this analysis, real GDP is calculated at fixed prices of year 1990. Keeping this price level, its increase can easily be considered as an increase in real GDP or the units that composes it. In this way, by dividing nominal GDP by real GDP (which is in millions at 90 prices), we obtain the deflator price. So GDP is not simply the amount of goods and services multiplied by the deflator price but the initial quantity of output multiplied by the initial prices. Exactly this amount is taken as real GDP. In 1990, nominal GDP was equal to real GDP, GDPn = GDPr = 16,813 billion ALL. This is the basis of real GDP growth, of nominal GDP growth.

Table no. 2: Summary table. GDP in million ALL. The data in this table were used in the calculation of real GDP, Deflator, etc.

	GDP deflator	Intermediate consumption at current prices, ml / All	GDP at current market prices, ml / All	GDP at market prices with previous year prices, ml / Al	Production at current prices, ml / All
1996		219,745.00	334,359.00		532,562.00
1997	11.24	216,462.00	331,324.00	297,833.00	521,176.00
1998	6.73	276,057.00	384,848.00	360,578.00	615,211.00
1999	2.1	329,228.00	443,594.00	434,458.00	725,310.00
2000	5.65	384,926.00	501,199.00	474,407.00	827,052.00
2001	3.81	436,673.00	563,449.00	542,765.00	940,366.00
2002	3.65	477,940.00	610,494.00	589,010.00	1,020,717.00
2003	5.2	502,062.00	677,738.00	644,246.00	1,098,100.00
2004	3.15	576,170.00	737,656.00	715,113.00	1,223,709.00
2005	3.31	632,921.00	804,163.00	778,422.00	1,336,415.00
2006	2.48	693,748.00	872,735.00	851,630.00	1,449,012.00
2007	4.39	788,788.00	965,528.00	924,953.00	1,630,087.00
2008	4.12	929,196.00	1,080,676.00	1,037,943.00	1,866,114.00
2009	2.42	995,600.00	1,143,936.00	1,116,925.00	1,985,396.00
2010	4.49	961,616.00	1,239,645.00	1,186,341.00	2,039,101.00
2011	2.31	1,059,012.00	1,300,624.00	1,271,199.00	2,190,133.00
2012	1.04	1,036,563.00	1,332,811.00	1,319,057.00	2,191,310.00
2013	0.29	1,068,582.00	1,350,053.00	1,346,166.00	2,246,280.00
2014	1.55	1,034,701.00	1,395,305.00	1,374,009.00	2,252,545.00
2015	0.56	1,075,036.00	1,434,307.00	1,426,263.00	2,334,762.00
2016	-0.63	1,110,280.00	1,472,479.00	1,481,854.00	2,401,484.00
2017	1.47	1,148,798.00	1,551,281.00	1,528,744.00	2,503,924.00

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	Real GDP growth,%	Net tax on current prices, ml / All	Net tax on products at previous year's prices, ml / All	Gross Value Added at Current Prices, ml / All	Gross Value Added at previous year's prices, ml / All
1996		21,542.00		312,817.00	
1997	-10.9	26,610.00	16,948.00	304,714.00	280,885.00
1998	8.83	45,694.00	29,933.00	339,154.00	330,645.00
1999	12.89	47,512.00	46,828.00	396,082.00	387,630.00
2000	6.95	59,072.00	54,820.00	442,127.00	419,587.00
2001	8.29	59,756.00	60,727.00	503,693.00	482,038.00
2002	4.54	67,717.00	63,804.00	542,778.00	525,206.00
2003	5.53	81,699.00	76,356.00	596,038.00	567,890.00
2004	5.51	90,117.00	84,076.00	647,539.00	631,037.00
2005	5.53	100,669.00	97,095.00	703,494.00	681,327.00
2006	5.9	117,470.00	106,886.00	755,265.00	744,743.00
2007	5.98	124,228.00	125,460.00	841,299.00	799,493.00
2008	7.5	143,759.00	144,949.00	936,917.00	892,994.00
2009	3.35	154,140.00	145,312.00	989,796.00	971,613.00
2010	3.71	162,160.00	159,429.00	1,077,485.00	1,026,912.00
2011	2.55	169,503.00	159,527.00	1,131,121.00	1,111,672.00
2012	1.42	178,064.00	176,231.00	1,154,747.00	1,142,826.00
2013	1	172,354.00	178,392.00	1,177,698.00	1,167,774.00
2014	1.77	177,461.00	171,208.00	1,217,843.00	1,202,801.00
2015	2.22	174,580.00	180,718.00	1,259,726.00	1,245,545.00
2016	3.31	181,276.00	181,934.00	1,291,203.00	1,299,920.00
2017	3.82	196,155.00	187,455.00	1,355,126.00	1,341,289.00

Source: INSTAT

- Calculation of real GDP has been done since 1990. For 1990-1999 real GDP is referred to the Bank of Albania Annual Reports. From 1996 to 2017 nominal GDP is obtained from INSTAT series. They are shown in the respective tables. The original series are shown in the table above (No. 1 and 2).
- The Deflator Price Calculation is as the ratio of nominal GDP to real GDP. It is calculated in ALL (ALL).

We consider the data to be real and representative because the INSTAT calculated Deflator is approximately equal to the Percentage of increase of Nominal GDP from the Deflator Price. The calculations in the material are done by taking into account the percentage of real GDP growth and nominal GDP published by INSTAT.

3.1 Determination of GDP Deflator Price (Aggregate Price)

To calculate the Deflator Price we use the formula described above. Knowing the percentage of real GDP growth, starting from the base year, we calculate real GDP for each year, until 2017. For 2018 there is no data on nominal GDP, while in the Statistical Reports is given its real growth. For this reason, we will focus on the analysis until 2017. After calculating real GDP, divide nominal GDP by real GDP and obtain the GDP Deflator Price or the Aggregate Price.With the data of tables Nr. 1 and 2 we calculate the GDP Deflator Price.

Table No.3: Nominal and real GDP dynamics, Deflator Price dynamics calculated (1990-2017). GDP is in millions / lek. Deflator is expressed in lek and not in percentage

	GDP (current prices, million All)	Percentage of real GDP growth	Real GDP, units	***Deflator Price, All***		GDP (current prices, million All)	Percentage of real GDP growth	Real GDP, units	***Deflator Price, All***
1990	16,813.00	-10	16,813.00	***1.00***	2004	737,656.00	5.51	25,654.11	***28.75***
1991	16,404.00	-28	12,105.00	***1.36***	2005	804,163.00	5.53	27,072.78	***29.70***
1992	50,697.00	-7.2	11,235.00	***4.51***	2006	872,735.00	5.9	28,670.08	***30.44***
1993	125,340.00	9.6	12,309.00	***10.18***	2007	965,528.00	5.98	30,384.55	***31.78***
1994	187,891.00	8.3	13,331.00	***14.09***	2008	1,080,676.00	7.5	32,663.39	***33.09***
1995	224,745.00	13.3	15,107.00	***14.88***	2009	1,143,936.00	3.35	33,757.61	***33.89***
1996	334,359.00	9.1	16,478	***20.29***	2010	1,239,645.00	3.71	35,010.02	***35.41***
1997	331,324.00	-7	15,325	***21.62***	2011	1,300,624.00	2.55	35,902.77	***36.23***
1998	384,848.00	10	16,857	***22.83***	2012	1,332,811.00	1.42	36,412.59	***36.60***
1999	443,594.00	12.9	19,029.87	***23.31***	2013	1,350,053.00	1	36,776.72	***36.71***
2000	501,199.00	6.95	20,352.44	***24.63***	2014	1,395,305.00	1.77	37,427.67	***37.28***
2001	563,449.00	8.29	22,039.66	***25.57***	2015	1,434,307.00	2.22	38,258.56	***37.49***
2002	610,494.00	4.54	23,040.26	***26.50***	2016	1,475,251.00	3.31	39,524.92	***37.31***
2003	677,738.00	5.53	24,314.39	***27.87***	2017	1,551,281.00	3.82	41,034.77	***37.80***

Source: Bank of Albania, INSTAT and author's calculations (real GDP and D/P).

The above data shows that all three major macroeconomic indicators have increased. It is very important to note that real GDP has a high growth rate.

The deflator price did not have any growth, there was no worrying growth for the economy. The deflator price has risen from 24.63 ALL in 2000 to 37.8 ALL in 2017 or by 153.4%. This is important for the Albanian economy. The Albanian economy is generally a consumer economy, with low exports and high imports. The export-import ratio in 2017 was 27% (979.1 / 3,621.2 = 27%) from 36% in 2010. The CPI and GDP Deflator are not the same in Albania because the types of goods and services that the CPI calculates are import goods. Therefore Deflator analysis is of particular importance. It is the most realistic indicator of the state of the domestic economy, GDP.

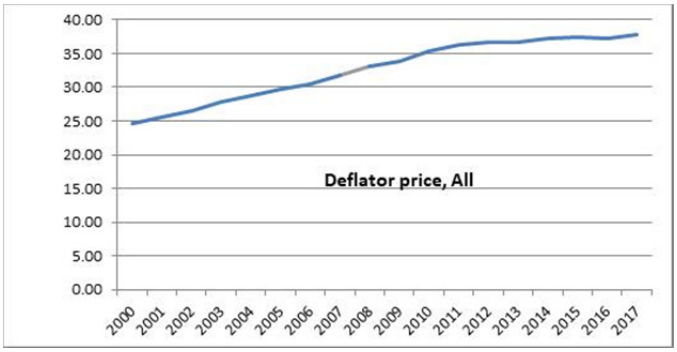

Fig. No. 2: Price aggregate in all
Source: Authors

GDP real (based on 1990 prices) has increased from 20,352.44 mil / all (2000) to 41,034.77 mil/ all or 201.62% (2017). Taking into account the prices of the previous year it has increased only 78.8%.

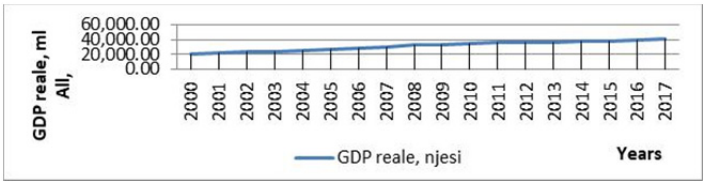

Fig. No.3: Real GDP dynamics 2000-2016 in mld / all
Source: Authors

The nominal GDP from 2000 (501,199.00 mil, All) in 2017 (1,551,281.00 mil, All) has increased by approximately 309.5%. Excluding the years 2009-2013 in the other years there were higher rates of economic growth. These data are also reflected in the relevant figures.

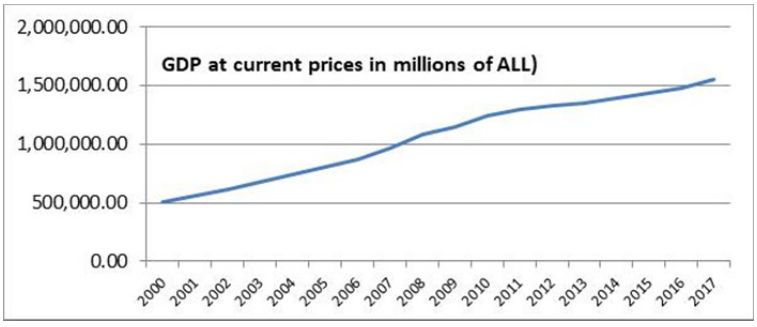

Fig.No.4: Nominal GDP dynamic
Source: Authors

Nominal GDP has a steeper slope because this indicator reflects real GDP growth and the increase of aggregate price levels.

3.2 *Calculating the Percentage of Impact of Real GDP and ΔD / P on nominal GDP*

From the data of Tables 4 and 5 we can also calculate some other economic indicators. These indicators serve to measure the impact of real GDP growth and deflator price growth on nominal GDP. Through these indicators, the government, the relevant ministries, the Central Bank and other institutions can make economic analyzes of the past and future. All of this data can be put together in a figure, which gives us the opportunity to build both quadrants of the real GDP and aggregate price. They create the possibility of constructing a real GDP curve and a nominal GDP curve. This is set for long periods of previous years. Through them we get the opportunity to see their tendency in the years ahead. The model can also analyze the effect of nominal GDP growth on real GDP, the effect of price changes on nominal GDP, etc.

Table No.4: Data on the impact of real GDP and D/P change on nominal GDP

	Nominal GDP, mil All	The share of real GDP in nominal GDP, mil All	Price impact on nominal GDP, mil All	Proportion of real GDP to nominal GDP	Percentage of nominal GDP growth by price	GDP deflator according to INSTAT
2000	501,199.00	474,415.45	26,783.55	94.66	5.34	5.65
2001	563,449.00	542,748.40	20,700.60	96.33	3.67	3.81
2002	610,494.00	589,029.58	21,464.42	96.48	3.52	3.65
2003	677,738.00	644,254.32	33,483.68	95.06	4.94	5.2
2004	737,656.00	715,081.36	22,574.64	96.94	3.06	3.15
2005	804,163.00	778,448.38	25,714.62	96.80	3.20	3.31
2006	872,735.00	851,608.62	21,126.38	97.58	2.42	2.48
2007	965,528.00	924,924.55	40,603.45	95.79	4.21	4.39
2008	1,080,676.00	1,037,942.60	42,733.40	96.05	3.95	4.12
2009	1,143,936.00	1,116,878.65	27,057.35	97.63	2.37	2.42
2010	1,239,645.00	1,186,376.03	53,268.97	95.70	4.30	4.49
2011	1,300,624.00	1,271,255.95	29,368.05	97.74	2.26	2.31
2012	1,332,811.00	1,319,092.86	13,718.14	98.97	1.03	1.04
2013	1,350,053.00	1,346,139.11	3,913.89	99.71	0.29	0.29
2014	1,395,305.00	1,373,948.94	21,356.06	98.47	1.53	1.55
2015	1,434,307.00	1,426,280.77	8,026.23	99.44	0.56	0.56
2016	1,475,251.00	1,482,356.28	-7,105.28	100.48	-0.48	-0.47
2017	1,551,281.00	1,531,605.59	19,675.41	98.73	1.27	1.47

Source: Authors calculations

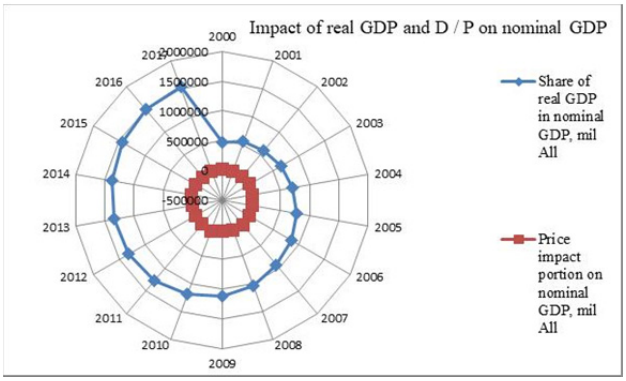

Fig. 5: Impact of real GDP and D/P on nominal GDP
Source: Authors

Data and figures show the impact of real GDP and Price Deflator on the size of nominal GDP. The price dynamics curve is almost in the form of a circle. The impact of price (D / P) has been decreasing as the impact of real GDP has increased. This is a positive trend, because it shows that the price level is not a problem for the Albanian economy. Inflation did not have a worrying effect on the purchasing power of money; consequently it did not have any negative impact on lowering the consumer welfare index.

3.3 *Comparison of the INSTAT Deflator with the Deflators calculated in the study*

For the accuracy of the constructed model it is necessary to compare the calculated data with the INSTAT data. By comparing them we see how original and true is the model that we build. If the differences between these two indicators are small then we can say that the model is applicable. In this way, it can be used by various institutions and persons performing economic analysis in the field of macroeconomic indicators. Table 5 presents the data between the difference of nominal GDP growth with real GDP, deflator according to INSTAT and the percentage of impact of increase of deflator price on nominal GDP.

Table No.5: Data on Deflators and Impact D / P on Nominal GDP (The data in the table are in percentage. Indicators are calculated on the basis of the data in Table Nr. 3 and 4.)

	Nominal GDP growth, in %, (1)	Real GDP growth at %, (2)	Deflator as a Difference 1-2	Deflator according to INSTAT	Percentage of impact of D/P growth on GDP
2000	12.99	6.95	6.04	5.65	5.34
2001	12.42	8.29	4.13	3.81	3.67
2002	8.35	4.54	3.81	3.65	3.52
2003	11.01	5.53	5.48	5.2	4.94
2004	8.84	5.51	3.33	3.15	3.06
2005	9.02	5.53	3.49	3.31	3.20
2006	8.53	5.9	2.63	2.48	2.42
2007	10.63	5.98	4.65	4.39	4.21
2008	11.9	7.5	4.43	4.12	3.95
2009	5.9	3.35	2.50	2.42	2.37
2010	8.4	3.71	4.66	4.49	4.30
2011	4.9	2.55	2.37	2.31	2.26
2012	2.5	1.42	1.05	1.04	1.03
2013	1.3	1	0.29	0.29	0.29
2014	3.4	1.77	1.58	1.55	1.53
2015	2.8	2.22	0.58	0.56	0.56
2016	2.85	3.35	-0.50	-0.47	-0.48
2017	5.15	3.82	1.33	1.47	1.27

Source: Author's calculation

The table shows that the difference between them is very small, almost negligible. In the last 5 years it is almost equal. With these results, the error is very small, so we can deepen the analysis of macroeconomic indicators. The calculations are shown graphically.

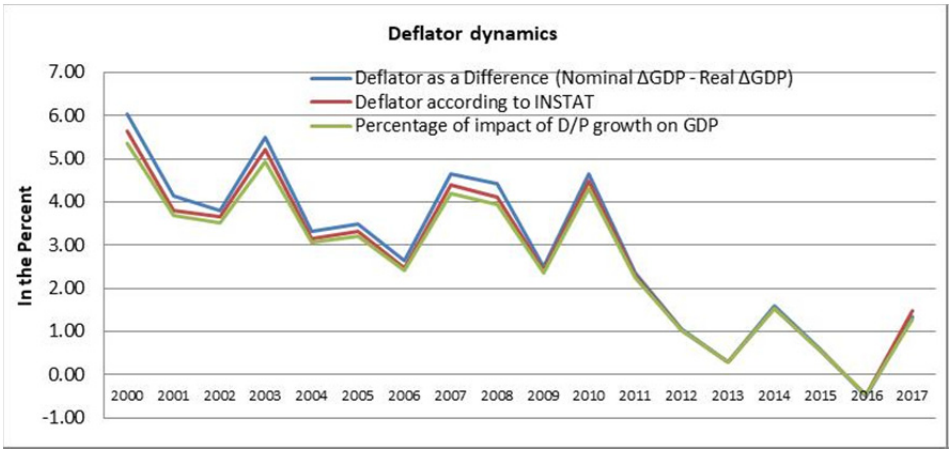

Fig. No.6: Deflator dynamics
Source: Authors

Considering the above calculations, the validity of the realized indicators, we think we can use them in constructing curves in an aggregate market.

3.4 Construction of the Nominal GDP Curve from Real GDP and Deflator Price, according to the calculations

With the new model we can analyze the relation between nominal GDP and real GDP. We put the 2010-2017 data in axes. On the X axis we put nominal GDP in mil / all; on the Y axis we put D / P (aggregate price) in all. Data Table No.7.

By combining the aggregate prices with the nominal GDP we obtain the nominal GDP curve. In this way we have a nominal GDP curve that at each point expresses the nominal GDP associated with a given aggregate price.

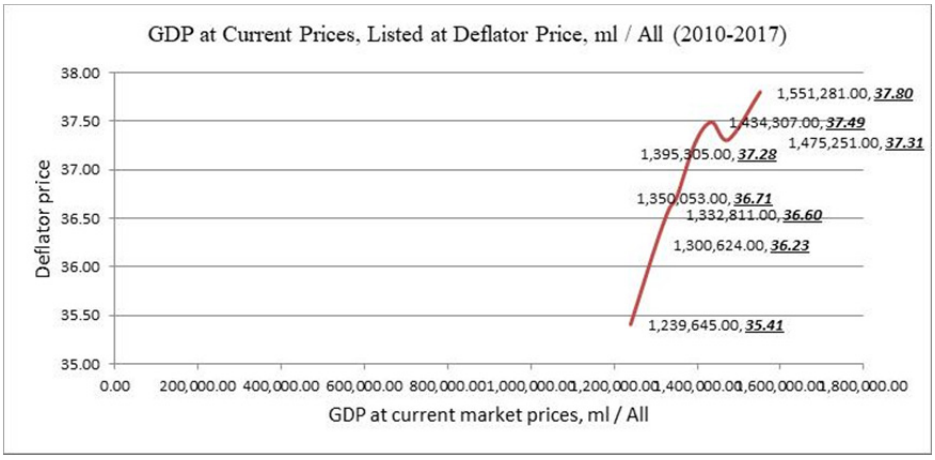

Fig. No.7: Nominal GDP curve
Source: Author

The curve in Figure 7 is the nominal GDP curve with the data of the Albanian economy. Here we see its position regarding the level of aggregate prices. Only in this way we can see and study this dynamic. By linking nominal GDP to inflation levels, it is not efficient and it is impossible to create such a curve. We will analyze more in details the curve created by real GDP and the deflator price. How it is built and what it shows. In the analysis we will take only the data from 2010 to 2017. As will these years be analyzed, we can realize the dynamics of all other years, past or future.

Table No.6: Data on Nominal and Real GDP, All million. D/P at All

	Nominal GDP	Real GDP	D/P		Nominal GDP	Real GDP	D/P
2010	1,239,645.00	35,010.02	35.41	2014	1,395,305.00	37,427.67	37.28
2011	1,300,624.00	35,902.77	36.23	2015	1,434,307.00	38,258.56	37.49
2012	1,332,811.00	36,412.59	36.6	2016	1,475,251.00	39,540.22	37.31
2013	1,350,053.00	36,776.72	36.71	2017	1,551,281.00	41,050.66	37.79

Source: Bank of Albania, Authors

Fig.No.8: Nominal GDP. Built as a real GDP listing with Deflator Price. ml / All (2010-2017)
Source: Author

The above model is the original model of nominal GDP (according to existing theory) formed by multiplying the aggregate price by real GDP.

At the point A we have Aggregate Expenditure that is formed by multiplying real GDP 35,010.0 ml / All with aggregate price of 35.41 All,

In point B we have Aggregate Expenditure that is formed by multiplying real GDP 35,902.8 ml / All with Aggregate Price 36.23 All.-

In point C we have Aggregate Expenditure that is formed by multiplying real GDP 36,412..6 ml / All with aggregate price 36.6 All and so on for all points, D, E, F, G and H. By matching them we get the Nominal GDP Curve. In this way, we also construct the domestic demand curve, or the aggregate demand.

The calculated data build the GDP Curve with the corresponding function. We can also build it as demand curve, supply curve, etc. The nominal GDP curve is constructed from the nominal GDP / D / P listing.

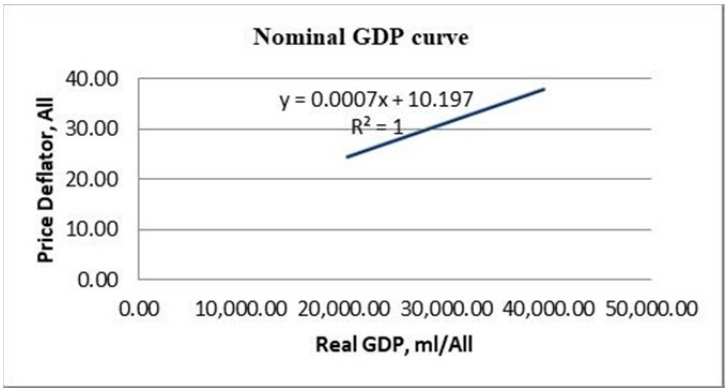

Fig. No.9: Aggregate market with Albanian economy data. Nominal GDP Curve with Deflator Prices in the Albanian Economy 2000-2016
Source: Authors

The function shows that the relation between real GDP and deflator price is very strong. The correlation coefficient between nominal GDP and this price is above 0.99. We can use this curve and method to construct the consumption, investment, domestic demand curve, nominal GDP, real GDP etc.

Through the Demand Function we construct below the theoretical GDP Curve.

The function of GDP curve is: Y = 0.0007X + 10.197. The coefficient 0.0007 is the sloope. Marginal Replacement Rate or Opportunity Cost that indicates7 tenths thousand of a unit of real GDP, 10,197, is a independent variable.

Table No.7: Theoretical construction of the curve

Opportunity Cost	X(GDP reale)	KP*X	Vp	Theoretical Price
0.0007	20,352.44	14.24671015	10.197	24.44
0.0007	22,039.66	15.42776243	10.197	25.62
0.0007	23,040.26	16.12818284	10.197	26.33
0.0007	24,314.39	17.02007135	10.197	27.22
0.0007	25,654.11	17.95787728	10.197	28.15
0.0007	27,072.78	18.9509479	10.197	29.15
0.0007	28,670.08	20.06905382	10.197	30.27
0.0007	30,384.55	21.26918324	10.197	31.47
0.0007	32,663.39	22.86437198	10.197	33.06
0.0007	33,757.61	23.63032845	10.197	33.83
0.0007	35,010.02	24.50701363	10.197	34.70
0.0007	35,902.77	25.13194248	10.197	35.33
0.0007	36,412.59	25.48881606	10.197	35.69
0.0007	36,776.72	25.74370422	10.197	35.94
0.0007	37,427.67	26.19936779	10.197	36.40
0.0007	38,258.56	26.78099375	10.197	36.98
0.0007	39,540.22	27.67815704	10.197	37.88

Source: Author's calculations

Based on the table data we construct the corresponding curve.

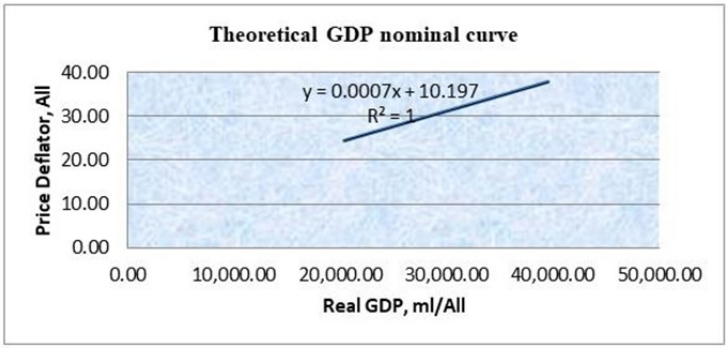

Fig. 10: Theoretical GDP nominal curve
Source: Authors

The theoretical aggregate demand curve (nominal GDP) is the same as the actual curve with the data of the Albanian economy.

In this way this curve has all the features of an aggregate supply curve.

What is the main feature of this curve? The curve has positive slope. This means that real and nominal GDP growth has been associated with an increase in aggregate price levels.

The domestic demand curve can be constructed just like the nominal GDP curve. We built the GDP curve because this is the equilibrium curve which is calculated both through income and expenditure. The domestic demand curve is simply a demand curve which is calculated only through expenditure.

4. What Analysis Can We Make with This New Model?

How can we use this original model of the Albanian economy?
We take the data of two years to analyze the role of aggregate price and real GDP in nominal GDP growth. The model for 2010-2011 and 2012 will be.

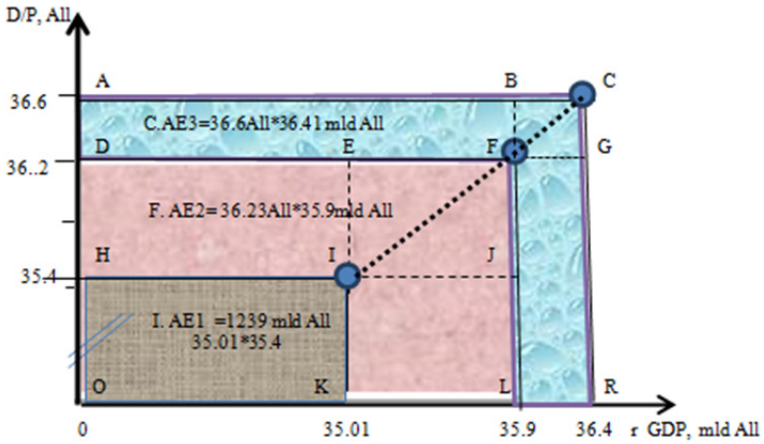

Fig. No.11: Model of GDP analysis
Source: Authors

On the X-axis we set the aggregate price or the price deflator D / P in ALL. On the Y axis we have set real GDP in billion ALL. At their intersection we have Aggregate Expenses AE. This point falls on the Aggregate Demand curve. Matching AE points gives us the Aggregate Demand curve because in every AE we have GDPr * D / P.

For 2010, real GDP was 35.01 billion and D / P was 35.4 All. They intersect at point I which is nominal GDP = real GDP * D / P (35.4 * 35.01 = 1239 billion ALL).

For 2011, there is an increase in nominal GDP. This increase was due to real GDP and D / P growth. Real GDP has increased with the quadrant IJKL = ΔGDPr (35.9-35.01) * D / Po 35.4 = Or GDP r is 35.9 * 35.4 = 1271.2 billion. Price increased with quadrant DFJH = ΔD / P, (36.2-35.4) * GDPr, 35.9.mld = 29.5. The total is 1271.2 + 29.4 = 1300.6 mil. Real GDP increased by 97.74% and price by 2.26%.

For 2012, there is nominal GDP growth. This is due to the real GDP growth with the area of the quadrant FGLR. Thus real GDP is the area of the quadrant DGRO with 36.2 * 36.4 = 1319.0 billion. Price impact is (36.6-36.2) * 36.4 = 13.7 mil. The total is 1319+ 13.7 = 1332.8 mil. Real GDP was affected by 98.97% and price by 1.03%.

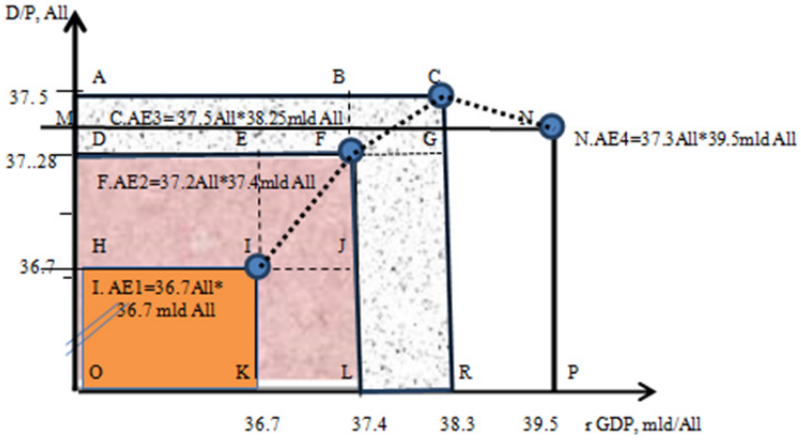

Fig. No. 12: GDP analysis model for 2013-2014, 2015 and 2016
Source: Authors

For 2013, nominal GDP is given by the surface of the HIKO quadrant = 1350.0 billion. Real GDP growth by 1346 billion and D / P growth by 3.9 billion have impacted. Real GDP growth has contributed by 99.71% while price contributed by 0.29%.

For 2014, nominal GDP is given by the area of DFLO = 37.4 * 37.28 = 1395 billion All. Real GDP growth by 1373 billion and price by 21.3 billion have impacted. Real GDP growth contributed by 98.47% while price contributed by 1.53%.

For 2015, nominal GDP is given by the surface of the ACRO quadrant. The real GDP impact is given by the area of DGRO = 37.28 * 38.3 = 1426.3 billion all. Price has an impact of 8.02 billion All (37.49-37.28) * 38.3. Real GDP growth contributed by 99.44% while D / P growth contributed by 0.56%.

For 2016, Nominal GDP is given by the area of the MNPO quadrant. The real GDP impact is given by the surface of the MNPO quadrilateral. This is a special case because the price has impacted negatively by -7.1 billion and real GDP by 1482.3 billion. Real GDP made a contribution of 100.48% while price contributed -0.48%.

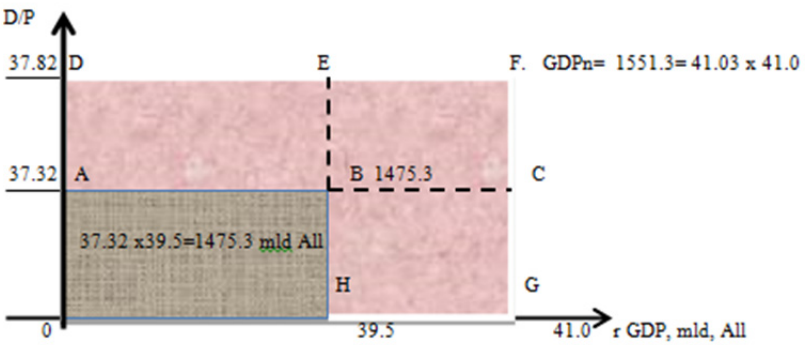

Fig. No. 13: GDP Analysis for 2017.
Source: Authors

For 2017 real GDP impact is rectangle ACG0 = 41.0 x37.32 = 1530.1, price effect is given by rectangle ACFD = (37.82-37.32) x41 = 19.68. From real GDP it increased by 98.73% and from Price it increased by 1.27%. This indicates that the price has not had any major role in the growth of nominal GDP.

In Figure 13 the combination of IF and C points gives us nominal GDP for these three years. In Figure 12 we match the IFCN points and create the nominal GDP curve. With this method we also analyzed year 2017 and every other year.

With the above data we also build a summary figure that reflects the dynamics of real GDP and aggregate price in nominal GDP.

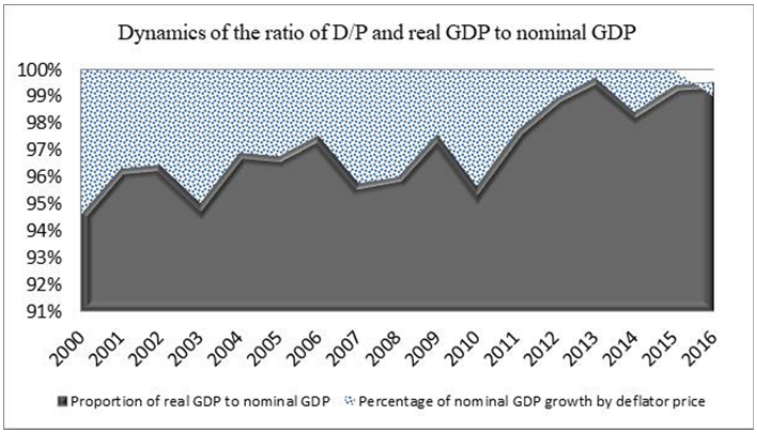

Fig. No.14: Dynamics of real GDP share and aggregate price in nominal GDP
Source: Authors

The data show that in particular years the price level had impact. In recent years, the increase in price levels has had little impact.

The above analysis serve to the State Institutions, the Central Bank, and any other stakeholders. They should draw the relevant conclusions, so that the conclusions drawn are based on real analysis, with data from the Albanian economy.

We emphasize here that just as the nominal GDP curve was constructed, all other deflator price-related curves, such as the domestic demand curve, the consumption curve, the investment

curve, are constructed.

Theoretically this analysis is interpreted as:

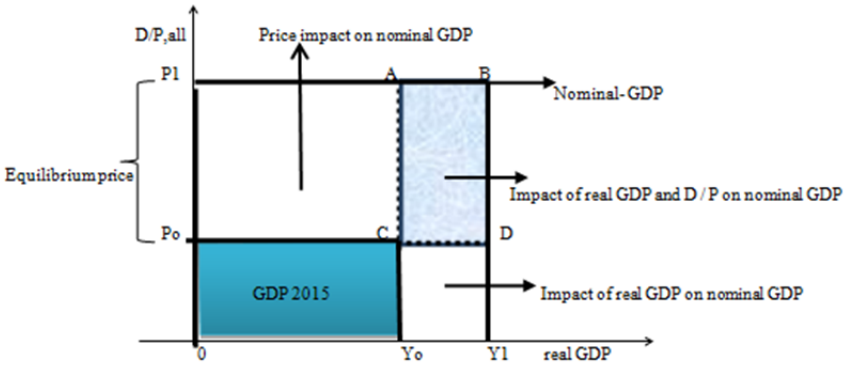

Fig. No.15: Model of real and nominal GDP analysis
Source: Authors

The PoCYoo quadrant gives the nominal GDP of the year, let's assume 2016. Yo gives real GDP per unit and D / P gives the price in lek. For 2017 the P1BY10 quadrant gives nominal GDP. The nominal GDP of 2017 is driven by the increase in real GDP, given by the CDY1Yo quadrant, and by the increase in the Aggregate Price given by the P1ACPo quadrant. The ABDC quadrant is part of the nominal GDP that is created by increasing prices and real GDP. Its analysis is interesting because this quadrant is influenced by both variables. The form shows which of them has the priority the aggregate price or real GDP. This is a summary model where nominal and real GDP are set.

Data and analysis of the model show that the model is functional and can be applied without any problems. It can be switched to the new model AD and AS, where both curves are positive slopes.

5. Conclusions

This study opens up a new field for macroeconomic analysis. It is not claimed that this problem has been exhausted; on the contrary it is the first time we have attempted to argue the real relation between nominal GDP with the other two variables, real GDP and Deflator Price. Deflator Price calculated from 1990 to 2017 at All. Real GDP calculation is accurate and effective, because the following are taken into account: real GDP growth in percentage, nominal GDP and P / D in All since the first year of analysis, 1990. This logic has been extended to 2017. The model is accurate because the deflator calculated by INSTAT is equal to the percentage impact of prices on nominal GDP. The analysis in the model is done in quadrants generated by the Deflator Price with real GDP. This link creates the possibility of impacting both on nominal GDP. It is the first time to calculate real GDP since 1990, as well as the first time of a market model created with data on the Albanian economy.

6. Recommendations

We recommend the government and research institutions to apply this model because it is simple and effective. Construct all curves of national accounting indicators such as; Gross Domestic Product, National Income, Value Added, Domestic Demand, Consumption Expenditures etc. It determines the impact of price and real GDP on nominal GDP. What effects do they have on the economy, etc. Through it one can build the real and nominal cost and production curve. The model enables scholars to further these ideas, to analyze and supplement them with other thoughts, in the interest

of economics. Today more applicable practical models are needed; no non-applicable theoretical models are needed. This model helps to revise the existing IS-LM model as well.

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