AN ANALYSIS ON CHINA'S ECONOMICAL GROWTH PERSPECTIVES

Larisa Luchian (Mocanu), Irina Ionescu
PhD Students, Economics, Alexandru Ioan Cuza University of Iași, Romania
luchian_larisa@yahoo.com
Jarulzica@yahoo.com

Abstract: *The current paper aims to give an overview upon the evolution of the Chinese economical growth over the past two decades. By combining two types of analyses, the paper would also like to look on China's economical growth perspectives in the past two decades. Thus, in the first part of our study we illustrate the results of a descriptive, critical, subjective and qualitative analyses on the main macroeconomic indexes used in determining the economic performance of a country (GDP, GDP per capita, imports and exports). The second part of the paper consists of a quantitative analysis of China's economical growth, which combines the results of a time series econometric modulation for the GDP macroeconomic variable, and the resulted forecast based on the previously determined pattern. We based our study on a period of time dating from 1990 to 2014, suggesting that China registered a positive evolution both in terms of GDP and GDP per capita, as well as in terms of commercial exchanges, as a result of an economic reform gradually applied. Moreover, in order to determine China's position within the current hierarchy of power centers, the G7 states (USA, Japan, Great Britain, France, Germany, Canada and Italy) were also introduced in the analysis. In terms of GDP, the United States was an absolute global leader until 2014 when it was outrun by China. As for the quantitative analysis, the period of time taken into consideration was also between the first trimester of 1990 and the third trimester of 2014, the observed values having a trimestral frequency. The final part of the study shows the results of the GDP forecast based on the previously determined ARMA pattern, as well as the forecasts given by the main international organizations (IMF and OECD), claiming China's worldwide supremacy in terms of GDP, both on a short term (until 2020 - IMF), as well as on a long term and a very long term (until 2045, when Canada will swipe first places - OECD). The main conclusions which can be drawn by this study claim that, despite the slowing down of the GDP increase rate, China became a worldwide leader. Nonetheless, in order for China to keep its status, it must continue its ascending path from the past few decades and reorient to improve its global competitiveness and to ensure its economic sustainability.*

Keywords: economical growth, economic performances, Gross Domestic Product, Gross Domestic Product per capita, forecast.

JEL classification: C51; F63; N15

1. Introduction

Since the beginning of its economic reform in 1978, the Chinese economy envisioned remarcable growing rates. During the past three decades (1978 – 2007), China's annual increasing rate of GDP per capita rose, on average, with 8.6 percentage points annually (Ding and Knight, 2008). For a country of China's demographic dimensions, consisting of a fifth of the world's population, this represented an unexpected and without precedent progress.

The literature in the field offers a wide variety of studies and empirical analyses on China's economic performance, presenting different approaches of its economic increase. Thus, we identified three potential empirical approaches: the mathematical definition of the increase, the modulation of the structural increase, and the informal increase regression. Unlike the first two, the third approach allows introducing certain explanatory variables of the economical growth's fundaments, as well as the future determining factors. However, we did not encounter any explicit theoretical frame to coordinate the empirical studies regarding the economic performance of a country.

Ever since the classic ages, the economical growth patterns were of great interest for many renowned economists. Keynes's patterns, as well as their direct descending – the neo-keynessists – claim that, in order to maintain a stable economy, one requires the use of macroeconomic policies and the direct intervention of the state to ensure balance and stimulate the economic growth. On the opposite pole one encounters the neoclassical patterns, claiming that the steadiness of an economy will determine an implicit balance.

One of the most capitalized patterns of economic growth found in the empirical analyses is the neoclassic one developed by Solow-Swan (Moroianu, 2012). This pattern takes into consideration the increase of productivity, whereas the newly built capital is more valuable than the old one due to technological improvements. This economic growth pattern shows in which way the increase of the saving rate, the increase of population and technological progress can influence the economic performances of a country, in a given period of time.

Based on this particular growing pattern, authors such as Chen and Fleisher (1996), or Li (et al, 1998), illustrate that the rhythm of China's economical growth in the past three decades determined a different increase of GDP per capita rates, based on the country's regions. Thus, in geographical regions where the population's increase rate was lower, the GDP per capita increasing rate was bigger, and vice versa. This is why the increasing investments in physical and human capital represented the key of the country's economical growth and its external opening point.

Based on a co-integration Pedroni test of the Arellano-Bond estimator, Yao (2006) reviewed the impact of exports and foreign direct investments on the economic growing rate between 1978 and 2000. This establishes the existence of certain simultaneous relations between foreign direct investments and the GDP growing rate, as well as between exports and GDP, mentioning that the interaction of these three elements leads to a vicious circle, with positive outcomes regarding China's opening grade and economical growth. Thus, the results of his analysis indicate that both exports and foreign direct investments significantly contribute to improving China's economic performances.

Démurger (2001) evaluated the relation between the infrastructure's development rate and China's economical growth based on the method of smallest squares in two stages and on a fix effects pattern, concluding that reduced levels of transport and telecommunications infrastructural developments negatively impact China's economic performances.

Analyzing the impact of the financial sector's development on China's economical

growth between 1985 and 1999, Hao (2006) claims that loans' spread negatively affects the economical growth if they are not awarded based on commercial criteria. This idea is poached and polished by Guariglia and Poncet (2006), who demonstrated that financial distortions represented a hindrance in terms of the Chinese economical growth between 1989 and 2003. The side effects of these financial distortions gradually diminished as a result of the progressive reforms applied in the banking system ever since China became a full member of World Trade Organization, in 2001. The same authors consider that a significant role in reducing the negative effects of an adverse financial sector is offered to the foreign direct investments.

2. Macroeconomic indexes used in determining China's economical performances

In order to assay to determine China's economical performance in the past three decades, we opted for choosing a series of indexes such as GDP, GDP per capita, exports and imports, these four being the most suggestive in appreciating a country's economical growth.
Although we intended to capture the evolution of these indexes starting with the year of 1978, the period of time offering full available data is between 1999 and 2014. The data was processed from the World Bank's registers and has an annual frequency. Based on the data obtained we created a graph regarding the evolution of these two indicators between 1990 and 2014, by using Eviews 7.

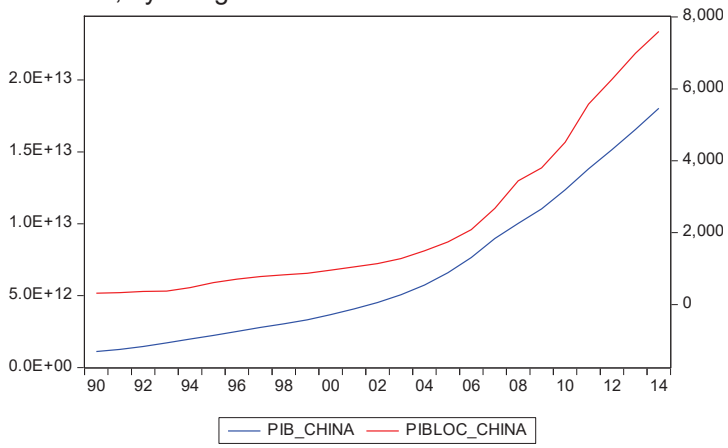


Figure 1. China's GDP and GDP per capita evolution between 1990 and 2014
Source: authors' representation in the Eviews program, based on data collected from World Bank Indicators

Figure 1 shows an ascendant evolution for China both in terms of GDP, as well as GDP per capita, between 1990 and 2014. Between 1990 and 2002 the growing rhythm is steady and somewhat reduced in comparison with the 2004 – 2014 period of time. This is due to gradually applying economical reforms. As of 2004, the economical growth rhythm increased, the trend being suggested by a growing ascent.

In order to bring into prominence China's economic evolution in comparison with other analyzed states (USA, Great Britain, France, Germany, Canada and Italy), the authors also capitalized on the data offered by World Bank, for the 1990 – 2014 period of time.

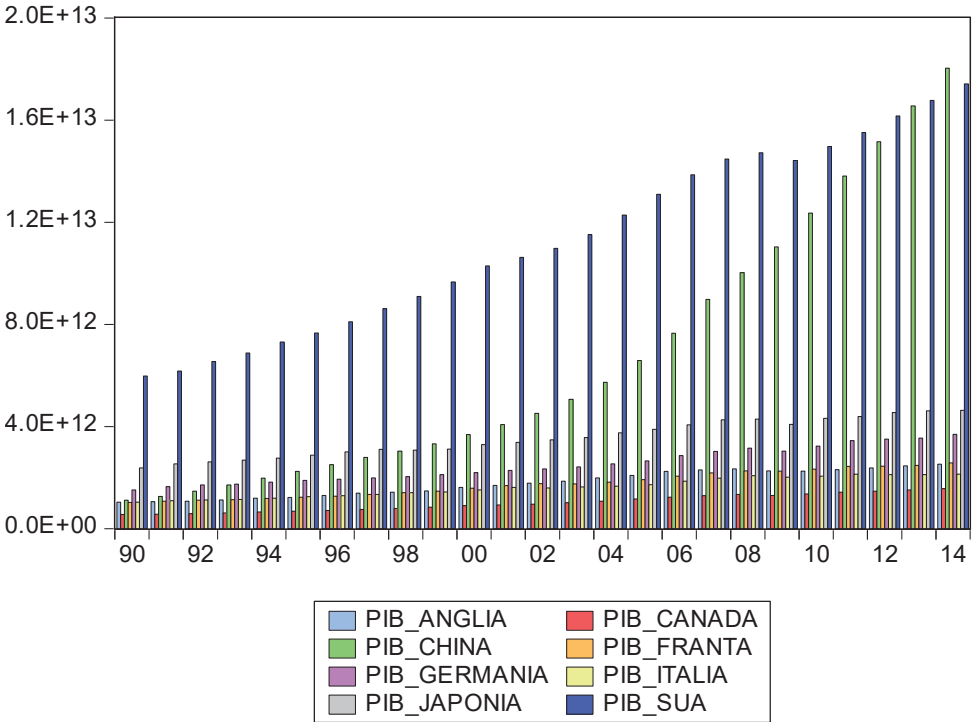


Figure 2. GDP evolution and G7 states, during 1990 – 2014
Source: authors' representation in the Eviews program, based on data collected from World Bank Indicators

The aforementioned representation stresses the major discrepancies between the United States and China on the one hand, and England, Germany, Japan, Canada, France and Italy, on the other hand. Judging by its GDP, the United States was an absolute worldwide leader until 2014. The following year brought China for the first time on the top of the international classification of states, based on their GDPs. Japan scored the second place after US, during 1990 – 1998, surpassed by China in 1999. Looking inside the old continent, Germany scored, throughout the analyzed period of time, the highest GDP rates, becoming an absolute European Union leader. Canada was G7's country which scored the lowest GDP values.

The following image illustrates the evolution of China's commercial trades, during 1990 – 2014.

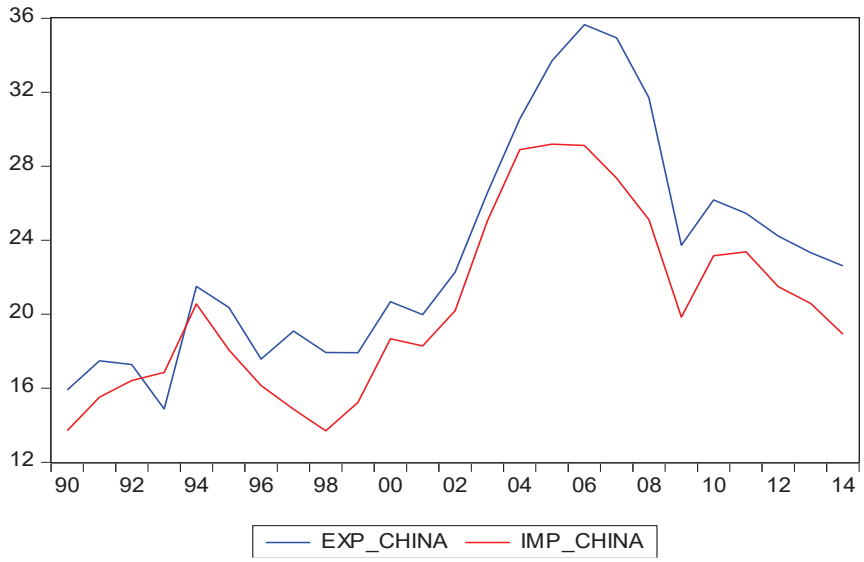


Figure 3. China's imports and exports evolution, during 1990 – 2014
Source: authors' representation in the Eviews program, based on data collected from World Bank Indicators

The third figure illustrates that, apart the period between 1992 and 1994, when the balance of commerce was adverse, China's exports outcome its imports, resulting in a glut in terms of the trading balance. The time between 2002 and 2007 is characterized by a remarkable increase, both in terms of exports, as well as of imports. 2008 is marked by a sudden drop of commercial trades, as a result of the worldwide financial crisis. Nevertheless, China's trade balance remains superfluous. After the 2008 mark, China's trade balance was fluctuant, with periods of increase and decrease.

3. A quantitative analysis on China's economical growth perspectives

The purpose of this section is to present the results of econometric modulation of the time series for the GDP macroeconomic variable, in terms of China's economy. Because this is an un-steady time series, we used several statistic tests in order to turn it into a stationary series. After applying the tests, this time series turned into a stationary one and 1st degree integrated. Thus, in order to determine the ARMA pattern, we used the Box-Jenkins procedure.

3.1. China's GDP modulation

In order to create a time series, we used the GDP macroeconomic variable, between the first trimester of 1990 and the third trimester of 2014. The values of this time series were observed using a similar, quarterly frequency. The GDP variable values are random, thus we can consider the GDP being a random variable. All in all we can admit that the GDP represents a stochastic process, and that the actual observed values between 1990 and 2014 represent particular accomplishments of the process.

3.1.1. Testing the GDP's steadiness

The graphic representation of China's GDP, presented in Table 1, indicates that the GDP presents a heaping tendency, with a lower inclination in the first part of the analyzed period of time, and an increasing inclination in the second part of the time period. After interpreting this graphic representation, one can affirm that the variable presents a determinist trend, thus it is not stationary or steady. In order to confirm the prediction in a graphic way, we appealed to a numeric analysis. We used the ADF and PP tests to test the steadiness of the GDP.

Table 1. Testing China's GDP steadiness, 1990 – 2014, using ADF and PP tests

	Constant pattern	Constant and trend pattern	Pattern without constant and trend
ADF	1,051242 (0,9957)	-0,956197 (0,9292)	0,931527 (0,9005)
Akaike	54.02948	**53.89190**	54.03411
Schwarz	54.17758	54.19034	**54.13285**
PP	9,641661 (1,0000)	1,712351 (1,0000)	16,53894 (1,0000)
Akaike	54.52832	**54.31915**	54.62711
Schwarz	54.62649	**54.46641**	54.67620

Source: Results obtained with the help of the Eviews program

Notes: 1). ADF - Augmented-Dickey Fuller, PP- Philips-Perron

2) The accepted values probability of the null hypothesis are presented between brackets

The bolded values represent the minimum values of the Akaike and Schwarz criteria. Within the ADF test, the Akaike criterion is minimum for the constant and trend pattern, which means that, both the constant and the parameter associated with the trend are of significant value. Thus, the GDP variable shows a determinist trend. The results obtained by using the ADF test were confirmed by the PP test, for which we obtained both criteria with minimum values for the trend and constant pattern.

The probabilities associated with stationary tests are higher than the presumed risk, thus the results of both tests, Augmented-Dickey Fuller and Philips-Perron, confirm the GDP's lack of steadiness due to the presence of the determinist trend.

3.1.2. Series steadiness

In order to exclude China's GDP determinist trend we took into consideration both the linear and the parabolic trends. We reckon that the parabolic trend was more suitable for our analysis. After eliminating the determinist trend, we took on a variable modulation by using the Box-Jenkins method. This modulation clings on the fact that a variable can be modulated based on its previous values.

3.1.3. Identifying the ARMA pattern

In order to identify the ARMA pattern, followed by stationary residues of the GDP variable, we used the values of the total and partial correlation functions, presented in Table 2 of the correlogram.

Table 2. Residue correlogram after eliminating the determinist trend

Sample: 1990 2014

Included observations: 25

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
. |****** |	. |****** |	1	0.796	0.796	17.806	0.000
. |**** |	***| . |	2	0.505	-0.350	25.279	0.000
. |* . |	. *| . |	3	0.211	-0.163	26.647	0.000
. *| . |	.**| . |	4	-0.070	-0.213	26.804	0.000
.**| . |	. *| . |	5	-0.313	-0.190	30.108	0.000
****| . |	. *| . |	6	-0.487	-0.156	38.545	0.000
****| . |	. *| . |	7	-0.589	-0.175	51.542	0.000
****| . |	. *| . |	8	-0.598	-0.108	65.751	0.000
****| . |	. | . |	9	-0.507	-0.040	76.608	0.000
***| . |	. | . |	10	-0.348	-0.048	82.049	0.000
. *| . |	. | . |	11	-0.151	-0.024	83.150	0.000
. | . |	. | . |	12	0.040	-0.053	83.235	0.000

Source: Results obtained using the Eviews program.

In order to identify the *p* and *q* orders of the ARMA process, we analyzed the values of total autocorrelation and partial autocorrelation functions in Table 2. The values seem significantly different from 0 if they are left outside the interval (-1.96*1/√n; 1.96*1/√n).

Because there are 25 registered values for China's GDP variable, the interval becomes (-0,392;0,392). Taking this into consideration, one can observe that the first two total autocorrelation functions are gathered withni the interval, determining the order of the MA process to be 2, while the first value of the partial autocorrelation function, within this interval, equals 1, determining the order of the AR process to equal 1.

The estimated final pattern for the GDP variable is presented below, in Table 3.

Table 3. Assessing China's GDP evolution pattern

Dependent Variable: PIB_CHINA
Method: Least Squares
Sample (adjusted): 1991 2014
Included observations: 24 after adjustments
Convergence achieved after 11 iterations
MA Backcast: 1989 1990

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.07E+12	6.16E+11	3.358625	0.0035
@TREND	-2.20E+11	9.32E+10	-2.360858	0.0297
@TREND^2	3.67E+10	3.11E+09	11.80460	0.0000
AR(1)	0.572534	0.191275	2.993250	0.0078
MA(1)	1.310383	0.207859	6.304205	0.0000
MA(2)	0.604054	0.208674	2.894725	0.0097

R-squared	0.999727	Mean dependent var	6.81E+12
Adjusted R-squared	0.999651	S.D. dependent var	5.20E+12
S.E. of regression	9.70E+10	Akaike info criterion	53.64710

Sum squared resid	1.70E+23	Schwarz criterion	53.94161
Log likelihood	-637.7652	Hannan-Quinn criter.	53.72523
F-statistic	13189.00	Durbin-Watson stat	2.028138
Prob(F-statistic)	0.000000		

Source: Results obtained using the Eviews program.

The equation for the assessed regression pattern is:

$$PIB_t = 2,07 \cdot 10^{12} - 2,2 \cdot 10^{11} t + 3,67 \cdot 10^{10} t^2 + 0,572 \cdot PIB_{t-1} + 1,31 e_{t-1} + 0,604 e_{t-2}$$

According to the aforementioned equation, one can tell that the Gross Domestic Product presents a parabolic trend, while its annual values are influenced by the values obtained in the previous year and by the ones obtained two years ago, as well as by the unforeseen events or presumptuous shocks appeared in the previous year (mentioned in the equation through the residual variable estimated with a delay).
The obtained pattern explains, with a 99,972% probability, the variation of the GDP variable.

3.1.4. Testing the specific hypothesis for the regression pattern

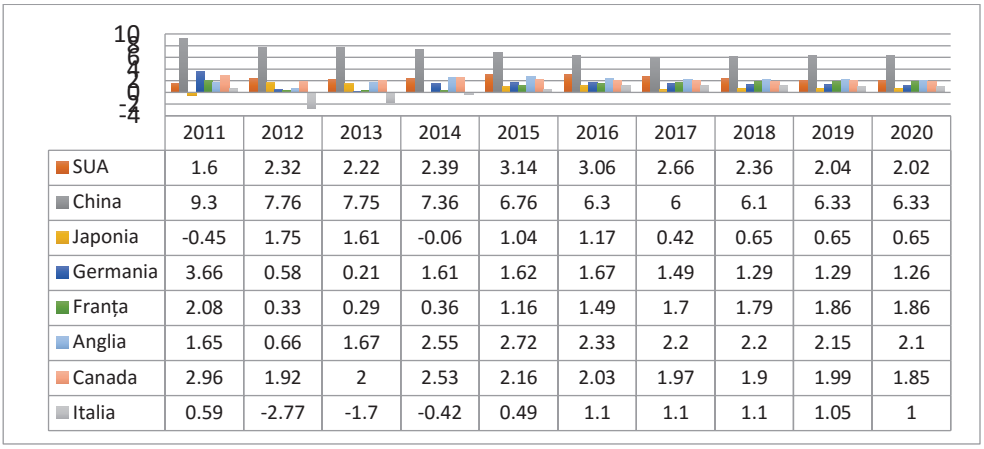
The hypothesis specific for the regression pattern (error normality, the zero average error, lack of error correlation and homoscedastiticity of errors) are respected and presented in Annex 1.

3.2. China's Gross Domestic Product Forecast

Forecasting the Gross Domestic Product for the biggest economical powers became the main preoccupation of some of the most important international organizations (World Bank, International Monetary Fund, United Nations, OECD, etc.)

The forecasted periods of time vary from one international institution to another, ranging between 2007 and 2017 (World Bank), 2011 and 2020 (IMF), 2009 – 2016 (United Nations), 2008 – 2016 (European Commission) and 2007 – 2016 (OECD). Long term forecasting covers the time period between 2008 and 2060 and is attributed to OECD.

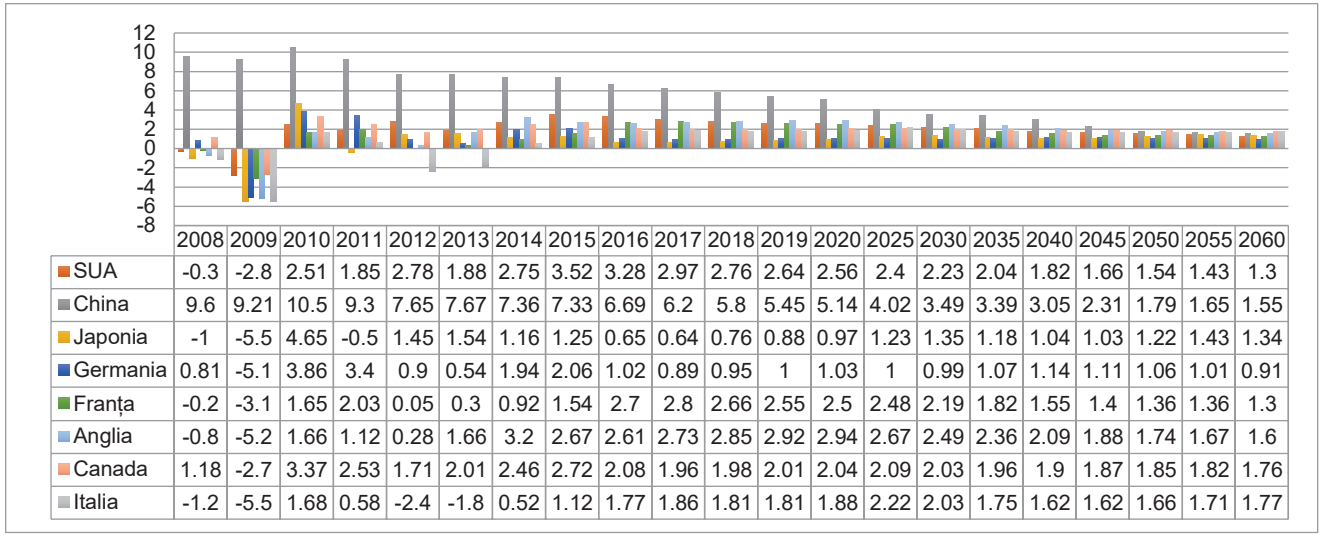
The selected countries for a comparative analysis are China and the G7 countries. Because the prognosticated figures of all the aforementioned international organizations are close, in order to graphically represent the annual growing rate of the GDP, the criterion taken into consideration was the covered timetable. Thus, the International Monetary Fund also takes into consideration the year 2020.



	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
SUA	1.6	2.32	2.22	2.39	3.14	3.06	2.66	2.36	2.04	2.02
China	9.3	7.76	7.75	7.36	6.76	6.3	6	6.1	6.33	6.33
Japonia	-0.45	1.75	1.61	-0.06	1.04	1.17	0.42	0.65	0.65	0.65
Germania	3.66	0.58	0.21	1.61	1.62	1.67	1.49	1.29	1.29	1.26
Franța	2.08	0.33	0.29	0.36	1.16	1.49	1.7	1.79	1.86	1.86
Anglia	1.65	0.66	1.67	2.55	2.72	2.33	2.2	2.2	2.15	2.1
Canada	2.96	1.92	2	2.53	2.16	2.03	1.97	1.9	1.99	1.85
Italia	0.59	-2.77	-1.7	-0.42	0.49	1.1	1.1	1.1	1.05	1

Figure 4. China's annual growing GDP rate forecast in comparison with the G7 countries (IMF).
Source: Authors' representation, based on IMF data (Annex 2).

According to IMF, the annual growing rate of China's GDP will continue to drop until 6.33% in 2020. However, the country will remain the leading country worldwide. The second position will be occupied by the United States, but its values are up to three times smaller (2.02% in 2020).
The long term forecast offered by OECD is graphically represented in the following figure:



	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2025	2030	2035	2040	2045	2050	2055	2060
SUA	-0.3	-2.8	2.51	1.85	2.78	1.88	2.75	3.52	3.28	2.97	2.76	2.64	2.56	2.4	2.23	2.04	1.82	1.66	1.54	1.43	1.3
China	9.6	9.21	10.5	9.3	7.65	7.67	7.36	7.33	6.69	6.2	5.8	5.45	5.14	4.02	3.49	3.39	3.05	2.31	1.79	1.65	1.55
Japonia	-1	-5.5	4.65	-0.5	1.45	1.54	1.16	1.25	0.65	0.64	0.76	0.88	0.97	1.23	1.35	1.18	1.04	1.03	1.22	1.43	1.34
Germania	0.81	-5.1	3.86	3.4	0.9	0.54	1.94	2.06	1.02	0.89	0.95	1	1.03	1	0.99	1.07	1.14	1.11	1.06	1.01	0.91
Franța	-0.2	-3.1	1.65	2.03	0.05	0.3	0.92	1.54	2.7	2.8	2.66	2.55	2.5	2.48	2.19	1.82	1.55	1.4	1.36	1.36	1.3
Anglia	-0.8	-5.2	1.66	1.12	0.28	1.66	3.2	2.67	2.61	2.73	2.85	2.92	2.94	2.67	2.49	2.36	2.09	1.88	1.74	1.67	1.6
Canada	1.18	-2.7	3.37	2.53	1.71	2.01	2.46	2.72	2.08	1.96	1.98	2.01	2.04	2.09	2.03	1.96	1.9	1.87	1.85	1.82	1.76
Italia	-1.2	-5.5	1.68	0.58	-2.4	-1.8	0.52	1.12	1.77	1.86	1.81	1.81	1.88	2.22	2.03	1.75	1.62	1.62	1.66	1.71	1.77

Figure 5. Comparative forecast of the GDP's growing rate between China and the G7 countries on long term (year 2060)
Source: Authors' representation, based on OECD published data (Annex 2).

The OECD forecast refers to a very long period of time, respectively the following five decades. The data used to come up with this forecast illustrates the fact that 2014 marks the beginning of a downfall for China's GDP growing rate, trend which will continue throughout the forecasted timetable.

Tabelul 4. China's GDP registered values and theoretical values (forecasted)

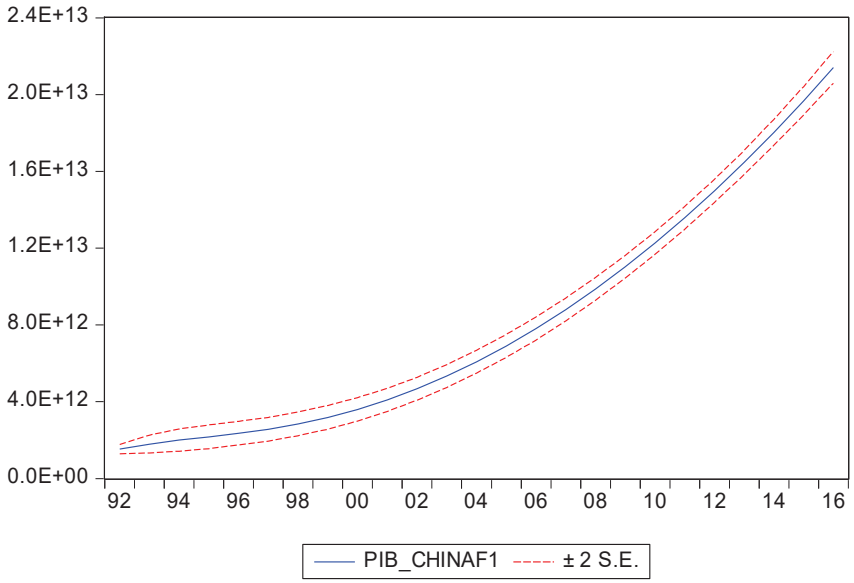
	GDP_CHINA	GDP_CHINAF
1990	1.112456E+12	-
1991	1.256018E+12	1.24140E+12
1992	1.468051E+12	1.37594E+12
1993	1.712460E+12	1.51045E+12
1994	1.977626E+12	1.64532E+12
1995	2.240825E+12	1.81179E+12
1996	2.508188E+12	2.02773E+12
1997	2.786506E+12	2.30339E+12
1998	3.037959E+12	2.64464E+12
1999	3.319428E+12	3.05481E+12
2000	3.681134E+12	3.53585E+12
2001	4.077459E+12	4.08885E+12
2002	4.516421E+12	4.71444E+12
2003	5.068050E+12	5.41297E+12
2004	5.732086E+12	6.18466E+12
2005	6.588191E+12	7.02963E+12
2006	7.652204E+12	7.94794E+12
2007	8.970991E+12	8.93963E+12
2008	1.002721E+13	1.00047E+13
2009	1.103626E+13	1.11432E+13
2010	1.235873E+13	1.23552E+13
2011	1.381026E+13	1.36405E+13
2012	1.514773E+13	1.49993E+13
2013	1.655471E+13	1.64315E+13
2014	1.803093E+13	1.79372E+13
2015	-	**1.95162E+13**
2016	-	**2.11688E+13**

Source: results obtained using the Eviews program

Note: GDP_CHINA represents the registered values for the GDP, while GDP_CHINAF represents the forecasted values based on the previously estimated pattern.

Since the process followed by China contains of a year gap, we could not find the values for the 1989 in order to determine, based on the pattern built, the values for the year 1990.

Thus, if China's GDP would evolve in similar conditions as the previous ones, it is estimated that, by the end of 2016, it will reach a total of $1.95162*10^{13}$ million Yuan, while the values estimated for 2017 would reach a staggering $2.11688*10^{13}$ million Yuan.



Forecast: PIB_CHINAF1	
Actual: PIB_CHINA	
Forecast sample: 1990 2016	
Adjusted sample: 1992 2016	
Included observations: 23	
Root Mean Squared Error	1.67E+11
Mean Absolute Error	1.39E+11
Mean Abs. Percent Error	3.022832
Theil Inequality Coefficient	0.009645
Bias Proportion	0.007789
Variance Proportion	0.034675
Covariance Proportion	0.957536

Figure 6. Punctual forecast and through an estimated trust interval of China's GDP
Source: Results obtained using the Eviews program

The sixth figure presents the registered and forecasted values of China's IPI. Since the identified pattern explains in a high proportion the evolution of the variable, one can notice that the registered values, as well as the forecasted ones are highly close one to another on the graph (Figure 7).

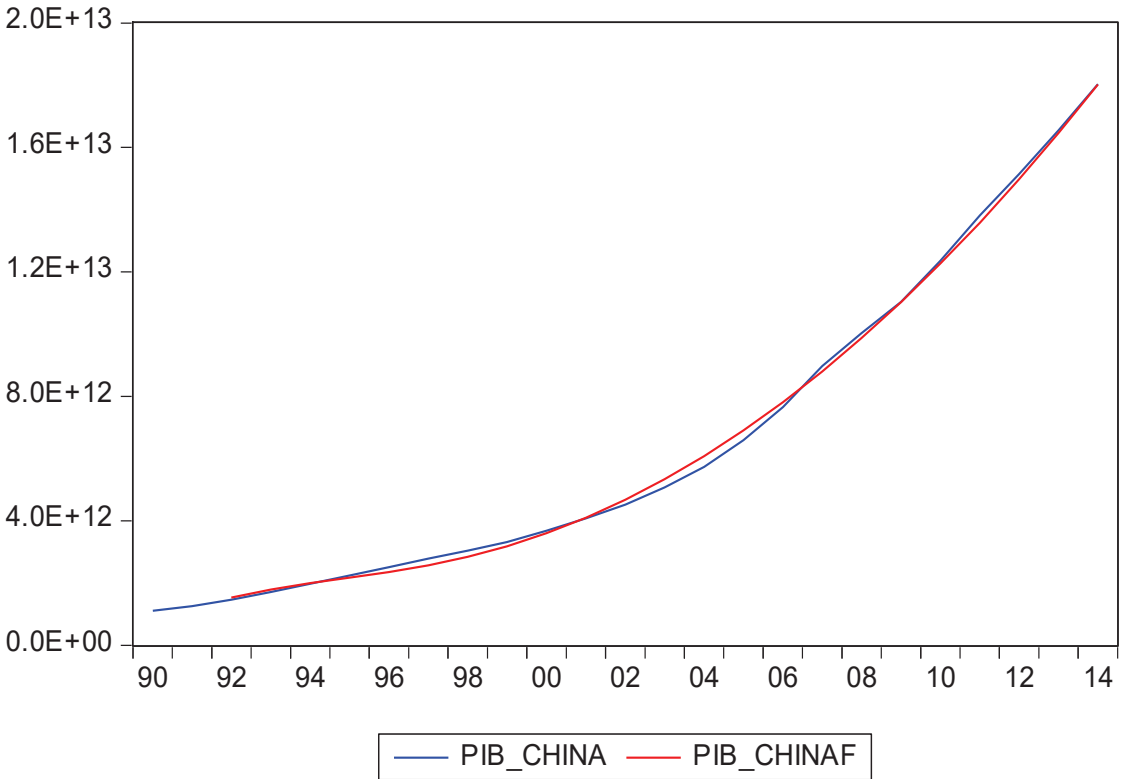


Figure 7. Graphic representation of registered and theoretical (forecasted) values of China's GDP
Source: results obtained using the Eviews program
Note: *PIB_CHINA* equals GDP_CHINA, while *PIB_CHINAF* equals GDP_CHINAF

4. Conclusions

The quantitative analysis of China's economical growth perspectives show the results of the country's GDP modulation, as well as the results of a forecast statistical analysis through which it was followed the highlight of the possible evolutions of this indicator's economical growth.

The resulted regression pattern suggests that China's GDP presents a parabolic trend, while its annual values are highly influenced by the values registered in the previous year, as well as the ones registered two years before and the possible unexpected events that could occur in the following year. Forecasting the GDP values for 2016 and 2017 were possible based on the estimated pattern. The finding values highlight a continuous economic growth, even though on a smaller scale than the one registered in the previous decade. Since the identified regression pattern explains the evolution of the GDP, the forecasted values closely follow the registered ones.

References

Chen, J., Fleisher, B.M., (1996), „Regional Income Inequality and Economic Growth in China", *Journal of Comparative Economics,* Vol 22, pp. 141-164.

Démurger, S., (2001), "Infrastructure Development and Economic Growth: An Explanation for Regional Disparities in China", *Journal of Comparative Economics,*Vol. *29*, pp. 95-117.

Ding, S., Knight, J., (2008), "Why has China Grown so Fast? The Role of Structural Change", *Discussion paper series,* Vol. 415.

Guariglia, A., Poncet, S., (2006), "Could Financial Distortions be No Impediment to Economic Growth After All? Evidence from China", *The University of Nottingham China and the World Economy Research Paper,* Nr. 36.

Hao, C., (2006), "Development of Financial Intermediation and Economic Growth: The Chinese Experience", *China Economic Review,* Vol. 17, pp. 347-362.

Li, H., Liu, Z. N., Rebelo, I. (1998), "Testing the Neoclassical Theory of Economic Growth: Evidence from Chinese Provinces", *Economics of Planning ,* Vol. 31, pp. 117-132.

Moroianu, N., Moroianu, D., (2012), „Modele ale creșterii economice și relevanța acestora", *Economie teoretică și aplicată,* Vol. 19, Nr. 6, pp.118-126.

Yao, S., (2006), "On Economic Growth, FDI and Exports in China", *Applied Economics ,* Vol. 38, pp. 339-51.