

Public and Private Partnership in Infrastructure Development in India

¹V.V. N. Reddy, ²S.M.Reddy

¹Department of management, Kavitha Memorial PG college, Khammam-507001.

²Department of Economics, Andhra University, Visakhapatnam-530003.

ABSTRACT: *It is well recognized that, with its present state of physical infrastructure, India will be hard-pressed to sustain 7 percent plus annual GDP growth and expected to 2 percent hike. Be it in power, roads, ports, airports, water, railways, urban facilities or even telecoms, the country's infrastructure needs are enormous. Efforts have also been made, over the years, to strengthen the policy and regulatory framework underpinning some of the key infrastructure sectors. Throughout the past decade, private investment in infrastructure has remained at well below the targeted 2 percent of GDP. Significant investment in physical infrastructure will also lead to employment generation, increased production efficiency, reduction in cost of doing business and improved standard of living. Infrastructure investment is expected to surge to 12.1% of GDP by FY20 from 7.0% of GDP in FY11. Rising demand for infrastructure facilities, given the rapid growth in urbanisation, bulging of the middle class and an increasing working-age population, would engender substantial increase in infrastructure investments during the current decade. While physical infrastructure is expected to play a vital role in maintaining the strong growth momentum during the current decade, improvement in social infrastructure (especially health and sanitation and education) will help the country to move toward inclusive growth. Social infrastructure mainly encompasses the health and education system. In recent years, efforts have been made by the Government of India (GoI) to step-up investment in infrastructure, and particularly to catalyze greater private investment. Over the years, financing of infrastructure projects has been considered the responsibility of the government. However, given budgetary constraints and other priorities, although public investment continues to account for a larger share in infrastructure financing, it has decelerated since the past few years. Moreover, GoI is making efforts to encourage private investments in infrastructure projects. As a result, the share of the private sector in infrastructure financing gradually increased from a mere 25.1% in FY05 to 32.7% in FY10 (E) and is expected to increase further to 45.2% in FY20. In this context this paper mainly focuses to provide an analytical abstract of sector-wise infrastructure developments in the country and the status of private participation and the PPP (Public and Private Partnership) in public infrastructure and contribution to economic growth.*

I. INTRODUCTION

Infrastructure means something which lies below or comes before (infra) the 'structure'. This has to be seen as opposite to the 'superstructure', which is built over and above the structure. The contrast is more striking because while the 'superstructure' is the end result, or, in some sense, the aim of economic development and growth process, the 'infrastructure' is the base or the necessary initial foundation on which the former is built. Thus, broadly speaking, 'infrastructure' can be seen as all those activities and services whose contribution to the economy is not the income generated within the sector itself but the sustenance and support that they provide to the income generation in the rest of the economy. The foremost reference to the concept of Infrastructure was by A.O. Hirschman. He differentiated between Direct Productive Activities (DPA) and Social Overhead Capital (SOC). SOC can be seen as infrastructure and is usually defined as comprising "those basic services without which primary, secondary and tertiary productive activities cannot function. David Aschauer, in 1990, provided a general purpose definition of infrastructure as a region's "public stock of social and economic overhead capital".

II. INFRASTRUCTURE AND ECONOMIC DEVELOPMENT

The seminal discussion on the relationship between infrastructure and economic development was put forward by Hirschman himself while he was discussing development strategies. He commented that "enlarged availability of electric power and of transportation facilities are essential preconditions for economic development practically everywhere. Hansen, by contrast, was more interested in the differential effect that such investments would have on different socio-economic regions. According to Hansen, the economic impact of infrastructure would be negligible. Benefits accruing from increased availability of infrastructural facilities would be highest in the Intermediate regions that do not suffer from congestion (associated pollution, shortages, etc.) but have access to quality raw materials, efficient labour and wide market. Paul Rosenstein-Rodan and R. Nurkse lent their voices to similar arguments in support of investment in Overhead Capital.

Their version of 'Balanced Growth' calls for simultaneous investments in large number of activities to break the hurdle of indivisibilities, specially the lumpiness of social overhead capital. Munnell argues that there are few businesses that would not benefit from being well served by roads, railways, water-sewerage or telecommunications. This increased efficiency due to regional infrastructure is an important impact. According to Nelson, failure in providing such facilities largely reduces productivity of economic activities and depresses general living conditions. As a result, the process of Capital formation - both physical & human - suffers a setback, leading to shortages in the future. In fact, such lacuna in providing necessary infrastructure hinders the building of the 'structure' itself and holds back the economy - national or regional - within the (in) famous Low level Equilibrium Trap and prevents its take-off into self-sustained growth.

The role of infrastructure in fostering economic growth and enhancing public welfare is more pronounced in developing economies like India. Here, infrastructure projects and increase in Public Capital Outlay have a two-pronged effect on the development process. In Hirschman's words it has both "Backward and Forward Linkages". One hand, initiation of infrastructural projects creates demand for labour, land (in most cases) and other "heavy" capital goods like Cement, Iron & Steel, etc. On the other, completion of such projects opens up opportunities for a plethora of economic activities and creates a secondary level of employment creation and income generation. Thus, a new road is accompanied by expansion of transport services by local people; a new bridge facilitates trade & commerce, and a new power plant fosters small manufacturing units.

III. PPP IN INFRASTRUCTURE INVESTMENT

In recent years, efforts have been made by the Government of India (GoI) to step-up investment in infrastructure, and particularly to catalyze greater private investment. Over the years, financing of infrastructure projects has been considered the responsibility of the government. However, given budgetary constraints and other priorities, although public investment continues to account for a larger share in infrastructure financing, it has decelerated since the past few years. Moreover, GoI is making efforts to encourage private investments in infrastructure projects. As a result, the share of the private sector in infrastructure financing gradually increased from a mere 25.1% in FY05 to 32.7% in FY10 (E) and is expected to increase further to 45.2% in FY20. These collaborative ventures are built around the expertise and capacity of the project partners and are based on a contractual agreement, which ensures appropriate and mutually agreed allocation of resources, risks, and returns. This approach of developing and operating public utilities and infrastructure by the private sector under terms and conditions agreeable to both the government and the private sector is called PPP or P3 or Private Sector participation (PSP). Not all projects with private sector participation are PPP projects. Essentially, PPPs are those ventures in which the resources required by the project in totality, along with the accompanying risks and rewards/returns, are shared on the basis of a predetermined, agreed formula, which is formalized through a contract. PPPs are different from privatization. A PPP project is essentially based on a significant opportunity for the private sector to innovate in design, construction, service delivery, or use of an asset. To be viable, PPPs need to have clearly defined outputs, avenues for generating non-governmental revenue, and sufficient capacity in the private sector to successfully deliver project objectives.

IV. NEED FOR THE STUDY

In fact, at the time of our independence, the national government was unanimous in accepting that a much wider base of infrastructure was the 'sine qua non' of economic development of this country. The complete consensus obviated the need for any debate on this issue and it was taken for granted that infrastructure sector needed both large scale action and outlay. During the early years of Planning as much as 78% of Total Plan Outlay was devoted to infrastructure - Agriculture, Power, Irrigation, Transport & Communication, and Social Services like Education & Health. Thus, in the Indian planning level also, there seems to be a general agreement regarding the necessity and crucial role played by Infrastructure in the development process of the economy. This role is to be studied in detail. Nataraj's estimates suggest that this lack of adequate infrastructure reduces India's GDP growth by 1-2 per cent every year. Physical infrastructure has a direct impact on the growth and overall development of an economy. The goals of inclusive growth and 9 per cent growth in GDP can be achieved only if India's infrastructure deficit is overcome. Infrastructure development will also help create a better investment climate in India.

To develop infrastructure in the country, the government is expected to review issues of budgetary allocation, tariff policy, fiscal incentives, private sector participation, and public-private partnerships. This study would make an effort to study how important has been the role of infrastructure in promoting development in India - both at the national and the regional levels. In this context this paper mainly focuses to provide an analytical abstract of sector-wise infrastructure developments in the country and the status of private participation and the PPP (Public and Private Partnership) in public infrastructure and contribution to economic growth.

V. OBJECTIVE

The objectives of the present study to examine the investment pattern in infrastructure and Public and Private Partnership in infrastructure development in general and analyses the relationship between infrastructure development and economic growth in particular.

VI. METHODOLOGY

The present study based on the secondary data, collected from the different sources like department of economic affairs reports, GOI and Statistical Appendix: Economic Survey 2013-14. Majority of literature collected from the existing growth theories and empirical studies. In analyzing the data, various statistical tools have been applied. Mean, standard deviation, coefficient of variation, CV, CAGR and exponential growth rate have been applied for assessing investment pattern. Regression analysis has been applied to study relationship between infrastructure development and economic growth.

VII. RESULTS AND DISCUSSION

Mean number of projects have no more difference between all projects (30) and PPP projects (27) that only 3 for year. This is evident that the PPP in infrastructure projects have equal share in the case of number projects during the time period. In the case of cost of projects same state noticed and have invest more or less equal. But standard deviation is high in PPP projects in case of cost of projects and low in number projects. In all projects category the highest annual growth rate recorded in financial year of 2005-06 in the case of number of projects and in cost of projects in 1996-97. For PPP projects maximum growth noticed in 2004-05 in the case of number of projects and 2007-08 for cost of projects. Growth scenario of infrastructure projects in terms of number of projects and cost of projects during 1995-96 to 2012-13, it is evident from table – 1 that the cost of projects for both all infrastructure projects and PPP projects registered a higher growth rate when compared to the growth in the number of Projects. The growth scenario was showing same result for both compound annual growth rate and Exponential growth rate for both all infrastructure projects and PPP projects. The coefficient of variation shows have more inequalities in PPP projects with respective number of projects and total cost of projects compared to all projects. The status wise distribution of Infrastructure Projects was presented in table-2 & table-5. The analysis provides that maximum share from both the all infrastructure projects and PPP projects belong to Under Construction category followed by completed status in all projects category, operation status in PPP Projects. As evident from sector wise distribution from table-3&6, highest share recorded in transport sector for both all infrastructure projects and PPP infrastructure projects in number of projects followed by energy sector and social and commercial infrastructure respectively. For the cost of projects same results noticed in both categories of all infrastructure projects and PPP infrastructure projects.

Maximum number of projects going in Roads and bridges sub-sector followed Railway track, tunnel, viaducts, bridges Electricity generation (grid) Ports (excluding captive) the case of number of projects. The same sub-sectors were noticed with same order to invest in the all projects category. The majority share of investment was recorded in Roads and bridges sub-sector followed by ports and airports. Highest number of projects were noticed in Roads and bridges followed by ports. The same state for both cost of projects category and number of projects category was noted in the case of PPP infrastructure projects. As evident from above transport sector have been investing more funds in all projects and PPP projects also.

VIII. REGRESSION RESULT

Regression analysis has been applied to study relationship between infrastructure development and economic growth. Dependent variables for the purpose of study are Gross Domestic Product and Gross Capital Formation. Total cost of PPP Projects and Total Cost of All Projects have been taken as independent variables. The study have taken data for three years covering time period from 1995-96 to 2012-13.

There is an expected positive relationship between Gross Domestic Product and Total cost of PPP Projects and Total Cost of All Projects and same sign for Gross Capital Formation expected.

H₁: There is a positive relationship between Gross Domestic Product and investment in infrastructure projects.

H₂: There is a positive relationship between Gross Capital Formation and investment in infrastructure projects.

With this hypothetical frame work the study framed regression equations to see the impact of various predictors on the Economic Growth in terms of Gross Domestic Product and Gross Capital Formation.

$$\ln(Y_1) = \alpha + \beta \ln(X_1) + \beta \ln(X_2) + \mu \text{-----Equation (1)}$$

$$\ln(Y_2) = \alpha + \beta \ln(X_1) + \beta \ln(X_2) + \mu \text{-----Equation (2)}$$

Where

Y_1 = Gross Domestic Product (Dependent variable)

Y_2 = Gross Capital Formation (Dependent variable)

α = Intercept

β = Slope of the regression equation

X_1 = Total cost of PPP Projects (Independent variable)

X_2 = Total Cost of All Projects (Independent variable)

μ = Error term

The regression coefficients of independent variable estimated through regression analysis together with their coefficient of multiple determinations (R^2) are presented in belowtable.

Regression Result

Variables	Equation (1)		Equation (2)	
	β	Sig.	β	Sig.
Constant	12.910 (16.994)	0.000	11.116 (11.680)	.000
Total cost of PPP Projects	0.055 (0.530)	0.604	0.081 (0.621)	.544
Total Cost of All Projects	0.167* (1.824)	0.088	0.205* (1.784)	.095
Observations	18		18	
R	0.58		0.58	
R^2	0.349		0.356	
Adjusted R^2	0.263		0.270	
F-value	4.028		4.142	

Source: Appendix – 1

*Significant at 10 per cent level.

Note: The figures given in parentheses indicate t-values.

From **equation (1)**, find that 35% of variation in the dependent variable was explained by all the variables taken together 1995-96 to 2012-13. And the value of Multiple Coefficient of Correlation is 0.58 (i.e. there is 58% correlation between gross domestic product and Total cost of PPP Projects & Total Cost of All Projects). For the overall significance of the model, Analysis of Variance (ANOVA) or F-Test approach is used. The value of the F-Statistic is 4.028 significant at 5% level of Significance. So, using the Multiple Regression is statistically significant.

Let's discuss the regression coefficients of the model now. Regression shows the β Coefficients of the regression equation-1, their respective level of significance. Cost of All Projects coefficient is significant even at lower than 10% level. The value of the β is 0.167 shows positive impact of the investment in infrastructure on the GDP growth in India during the period of 1995-96 to 2012-13. The investment in PPP projects (β Coefficients=0.055) indicating positive impact on economic growth during the study period but not statistically significant.

From **equation (2)**, find that 37% of variation in the dependent variable was explained by all the variables taken together 1995-96 to 2012-13. And the value of Multiple Coefficient of Correlation is 0.58 (i.e. there is 58% correlation between gross capital formation and Total cost of PPP Projects & Total Cost of All Projects). The value of the F-Statistic is 4.142 significant at 5% level of Significance. So, using the Multiple Regression model is statistically significant.

Cost of All Projects coefficient is significant even at lower than 10% level. The value of the β is 0.205 shows positive impact of the investment in infrastructure on the capital formation in India during the period of 1995-96 to 2012-13. The investment in PPP projects (β Coefficients=0.081) indicating positive impact on economic growth during the study period but not statistically significant. Therefore, the estimated results of the model demonstrate that same state for both equation that there is a strong positive impact of the investment in infrastructure on the economic growth in terms of gross domestic product and gross capital formation.

IX. CONCLUSION

The current study shows a positive growth in investment in PPP infrastructure projects but have unequal distribution during the period of 1995-96 to 2012-13. Estimated results of the model demonstrate that same state for both equation that there is a positive impact of the investment in infrastructure on the economic growth in terms of gross domestic product and gross capital formation. Investment PPP infrastructure projects also showing positive impact on growth but not significant. Estimates suggest that there e growth in investment PPP infrastructure projects positiv bun not adequate to achieve needs of India's GDP growth. The goals of inclusive growth and 9 per cent growth in GDP can be achieved only if India's infrastructure deficit is overcome. Infrastructure development will also help create a better investment climate in India. Accordingly, there is a need of not only good policies but also the implementation of these policies as well as the proper monitoring to promote Public and Private Partnership in Infrastructure Development projects is necessary.

REFERENCES

- [1]. Aschauer, David A. (1989), "Is Public Expenditure Productive?", *Journal of Monetary Economics*, Vol.23, No. 1, pp: 177-200.
- [2]. GOI, (2006), "Facilitating Public-Private Partnership for Accelerated Infrastructure Development in India", *Department of Economic Affairs*, Workshop Report, December 2006.
- [3]. Hansen, N. (1965), "The Structure and Determinants of Local Public Investment Expenditure", *Review of Economics and Statistics*, vol. 47, pp:150-162.
- [4]. Hirschman, A.O. (1958), *The Strategy of Economic Development*, Yale University Press, New Haven.
- [5]. Munnell Alicia H. (1992), "Infrastructure Investment and Economic Growth", *Journal of Economic Perspective* Vol. 6, No. 4, pp:189-198.
- [6]. Nataraj, G. (2014), "Infrastructure Challenges in India: The Role of Public-Private Partnerships", ORF occasional paper-49, *Observer Research Foundation*, February 2014
- [7]. Nelson, R. R. (1956), "A theory of the low level equilibrium trap in underdeveloped economies", *The American Economic Review*, pp: 894-908.
- [8]. Nurkse, R. (1953), *Problems of Capital Formation in Underdeveloped Countries*, Oxford, University Press.
- [9]. Rosenstein Rodan, P. (1943), "Problems of Industrialisation of Eastern and South Eastern Europe", *The Economic Journal*, pp:202-211.
- [10]. World Bank, (2006), "Financing Infrastructure: Addressing Constraints and Challenges", India, *Finance and Private Sector Development Unit South Asia Region*, June 2006

Table-1 Year Wise Infrastructure Projects

Financial Year	Number of Projects	Annual Growth	Total Project Cost (in RsCrore)	Annual Growth	Number of PPP Projects	Annual Growth	PPP Project Cost in (in RsCrore)	Annual Growth
1995-1996	6		1,113.18		6		1035.00	
1996-1997	1	-83.33	23.99	-97.845	6	0.00	1669.00	61.26
1997-1998	11	1000.00	1,869.73	7693.789	12	100.00	6422.00	284.78
1998-1999	9	-18.18	9,873.19	428.054	8	-33.33	871.00	-86.44
1999-2000	14	55.56	1,943.09	-80.320	10	25.00	1234.00	41.68
2000-2001	17	21.43	3,987.69	105.224	25	150.00	5247.00	325.20
2001-2002	31	82.35	17,789.74	346.116	38	52.00	18665.00	255.73
2002-2003	31	0.00	18,612.16	4.623	24	-36.84	13449.00	-27.95
2003-2004	33	6.45	4,501.50	-75.814	20	-16.67	8719.00	-35.17
2004-2005	25	-24.24	18,257.59	305.589	59	195.00	25604.00	193.66
2005-2006	93	272.00	46,782.03	156.233	66	11.86	39033.80	52.45
2006-2007	56	-39.78	22,153.71	-52.645	36	-45.45	11553.00	-70.40
2007-2008	39	-30.36	41,084.23	85.451	51	41.67	75697.06	555.22
2008-2009	57	46.15	49,387.37	20.210	36	-29.41	21704.62	-71.33
2009-2010	47	-17.54	34,750.67	-29.637	61	69.44	52987.68	144.13
2010-2011	51	8.51	35,554.36	2.313	15	-75.41	12609.42	-76.20
2011-2012	16	-68.63	13,192.92	-62.894	3	-80.00	3561.00	-71.76
2012-2013	10	-37.50	2,639.00	-79.997	1	-66.67	2639.00	-25.89
Total	547		323,516.15		478		302803.58	
Mean	30.39		17973.12		26.50		16816.70	
Std. Dev.	23.59		16773.40		21.38		20421.89	
CV	0.78		0.93		0.81		1.21	
CAGR	2.88		14.72		-9.47		5.34	
Exponential growth	11.60		21.90		0.05		13.2	

Table-2 Status Wise Infrastructure Projects----- As on 2015

Status	Number of Projects	Percentage to total	Total Project Cost (in RsCrore)	Percentage to total
Completed	713	29.78	172,602.46	12.33
Operation	256	10.69	71,203.89	5.09
Under Construction	1159	48.41	1,036,745.41	74.07
Terminated	69	2.88	28,650.53	2.05
Others	197	8.23	90,432.88	6.46
Total	2394	100.00	1,399,635.17	100.00

Table-3 Sector Wise Infrastructure Projects---As on 2015

Sector	Number of Projects	Percentage to Total	Total Project Cost (in RsCrore)	Percentage to Total
Communication	3	0.13	0	0.00
Energy	420	17.52	512541.78	36.62
Social and Commercial Infrastructure	168	7.01	92,527.92	6.61
Transport	1745	72.80	787,261.62	56.25
Water Sanitation	61	2.54	7303.85	0.52
total	2397	100.00	1399635.17	100.00

Table- 4 Sub-Sector Wise Infrastructure Projects-----As on 2015

Sector	Sub-Sector	Number of Projects	Percentage to Total	Total Project Cost (in RsCrore)	Percentage to Total
Communication	Communication	3	100.00	0.00	0.00
	Telecommunication towers	0	0.00	0.00	0.00
	Total	3	100.00	0.00	0.00
Energy	City gas distribution	1	0.24	0	0.00
	Electricity generation (grid)	197	46.90	408,587.59	79.72
	Electricity transmission	87	20.71	56,250.59	10.97
	Gas pipelines	38	9.05	21,524.00	4.20
	Oil pipelines	43	10.24	6,709.50	1.31
	Oil/ gas LNG storage	28	6.67	10,991.00	2.14
	Renewable energy (grid)	26	6.19	8,479.10	1.65
	Total	420	100.00	512541.78	100.00
Social and Commercial Infrastructure	Cold Chain	3	1.786	0	0.000
	Common infrastructure for industrial parks, SEZ	88	52.381	85,559.37	92.469
	Education	18	10.714	1,375.79	1.487
	Health Care	9	5.357	771.2	0.833
	Tourism	50	29.762	4,821.56	5.211
	Total	168	100.000	92,527.92	100.000
Transport	Airports	65	3.72	27,685.56	3.52
	Inland waterways	5	0.29	0	0.00
	Ports (excluding captive)	109	6.25	88,732.27	11.27
	Railway track, tunnel, viaducts, bridges	543	31.12	222,614.15	28.28
	Roads and bridges	977	55.99	432,328.11	54.92
	Urban public transport (except rolling stock)	46	2.64	15,901.53	2.02
	Total	1745	100.00	787,261.62	100.00
Water Sanitation	Irrigation (dams, channels, embankments, etc.)	0	0.00	0	0.00
	Sewage collection, treatment and disposal system	8	13.11	519.31	7.11
	Solid waste management	32	52.46	1,957.15	26.80
	Storm water drainage system	0	0.00	0	0.00
	Water supply pipeline	6	9.84	1,461.83	20.01
	Water treatment plants	15	24.59	3,365.56	46.08
Total	61	100.00	7303.85	100.00	

Table-5 Status Wise Infrastructure PPP Projects ----- As on 2015

Status	Number of Projects	Percentage to Total	Total Project Cost (in RsCrore)	Percentage to Total	Mean of Total Project Cost
Completed	8	1.7	4083.00	1.3	510.37
Operation	176	36.8	48601.00	16.1	276.14
Others	35	7.3	10169.00	3.4	290.54
Terminated	5	1.0	1194.00	0.4	238.80
Under Construction	254	53.1	238756.58	78.8	939.98
Total	478	100.0	302803.58	100.0	633.48

Table-6 Sector Wise Infrastructure PPP Projects ----- As on 2015

Sector	Number of Projects	Percentage to Total	Total Project Cost (in RsCrore)	Percentage to Total	Mean of Total Project Cost
Energy	40	8.4	19400.00	6.4	485.00
Social and Commercial Infrastructure	47	9.8	7262.00	2.4	154.510
Transport	360	75.3	271658.58	89.7	754.60
Water Sanitation	31	6.5	4483.00	1.5	144.61
Total	478	100.0	302803.58	100.0	633.480

Table-7 Sub-Sector Wise Infrastructure PPP Projects----As on 2015

Sub-Sector	Number of Projects	Percentage to Total	Total Project Cost (in RsCrore)	Percentage to Total	Mean of Total Project Cost
Airports	4	0.8	18808.00	6.2	4702.00
Common infrastructure for industrial parks, SEZ	22	4.6	4848.00	1.6	220.36
Education	1	0.2	100.00	0.0	100.00
Electricity generation (grid)	37	7.7	19400.00	6.4	524.32
Electricity transmission	3	0.6	.00	0.0	.00
Health Care	5	1.0	242.00	0.1	48.40
Ports (excluding captive)	41	8.6	60363.80	19.9	1472.28
Railway track, tunnel, viaducts, bridges	3	0.6	975.00	0.3	325.00
Roads and bridges	293	61.3	189045.78	62.4	645.20
Sewage collection, treatment and disposal system	3	0.6	157.00	0.1	52.33
Solid waste management	22	4.6	1740.00	0.6	79.09
Tourism	19	4.0	2072.00	0.7	109.05
Urban public transport (except rolling stock)	19	4.0	2466.00	0.8	129.78
Water supply pipeline	2	0.4	1101.00	0.4	550.50
Water treatment plants	4	0.8	1485.00	0.5	371.25
Total	478	100.0	302803.58	100.0	633.48

Appendix – 1 Data set for regression								
<i>(In crores)</i>								
Year	GDP In market prices	Gross capital formation	Total cost of PPPS	Total Project Cost in All	GDP In market prices	Gross capital formation	Total cost of PPPS	Total Project Cost in All
	(Y ₁)	(Y ₂)	(X ₁)	(X ₅)	Ln(Y ₁)	Ln (Y ₂)	Ln (X ₁)	Ln (X ₅)
1996	1,045,590	258,561	1035.00	1,113.18	13.8600919	12.4628869	6.9421567	7.0149761
1997	1,226,725	310,045	1669.00	23.99	14.0198586	12.6444727	7.4199799	3.1776371
1998	1,419,277	336,125	6422.00	1,869.73	14.1656581	12.7252384	8.7674849	7.5335493
1999	1,572,394	402,092	871.00	9,873.19	14.2681099	12.9044362	6.7696420	9.1975783
2000	1,803,378	436,521	1234.00	1,943.09	14.4051721	12.9865918	7.1180162	7.5720348
2001	2,023,130	538,834	5247.00	3,987.69	14.5201564	13.1971628	8.5654118	8.2909674
2002	2,177,413	528,299	18665.00	17,789.74	14.5936480	13.1774177	9.8344054	9.7863772
2003	2,355,845	571,146	13449.00	18,612.16	14.6724100	13.2554001	9.5066600	9.8315704
2004	2,536,327	627,743	8719.00	4,501.50	14.7462275	13.3498861	9.0732598	8.4121660
2005	2,841,503	762,416	25604.00	18,257.59	14.8598437	13.5442476	10.1505039	9.8123362
2006	3,242,209	1,064,041	39033.80	46,782.03	14.9917654	13.8775845	10.5721832	10.7532544
2007	3,693,369	1,279,754	11553.00	22,153.71	15.1220496	14.0621784	9.3547004	10.0057603
2008	4,294,706	1,531,433	75697.06	41,084.23	15.2728937	14.2417145	11.2344946	10.6233796
2009	4,987,090	1,900,762	21704.62	49,387.37	15.4223631	14.4577654	9.9852804	10.8074500
2010	5,630,063	1,931,380	52987.68	34,750.67	15.5436312	14.4737453	10.8778147	10.4559541
2011	6,477,827	2,363,132	12609.42	35,554.36	15.6838957	14.6754984	9.4421994	10.4788181
2012	7,784,115	2,841,457	3561.00	13,192.92	15.8675957	14.8598275	8.1777967	9.4874356
2013	9,009,722	3,200,633	2639.00	2,639.00	16.0138148	14.9788592	7.8781553	7.8781553
Total	10,113,281	3,521,399	302803.58	323,516.15	16.1293601	15.0743689	12.6208396	12.6870043