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Assessing the Impacts of Public Private Partnership on Real Estate Investment Return in North Central Zone of the Nigerian Postal Service Real Estate

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Abstract: The import of Public Private Partnership in real estate investment is gaining space in the real estate sector and the Nigerian Postal Service real estate has key into partnership. The study therefore is aimed at evaluating the impact of Public Private Partnership in Nigeria postal service real estate investment returns in the North Central Zone by determining NIPOST Real Estate Investment return trend pre-PPP (2013-2012), determining the zone real estate investment return trend post-PPP (2014-2023) and comparing both periods to assess the impacts of PPP model on the returns. A total of eight (8) completed and operational PPP real estate in the North Central were assessed using purposive sampling. In doing this time series analysis (exponential function) was used in analyzing the Pre and Post real estate investment return trend, while T-test statistical analysis technique was used to compare the trend. The result revealed significant positive impact of PPP ($4.58175x10^8$) on NIPOST North Central Real Estate Investment Returns. The study further provides irrefutable quantitative evidence that PPP adoption generated substantially better financial outcomes for NIPOST North Central Real Estate Investment Returns, validating the partnership effectiveness. The study therefore recommends PPP to Ministries, Departments and agencies for optimizing real estate investment returns.

Keywords: *Impacts, Partnership, Investment, Returns and Real Estates.*

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I. INTRODUCTION

Public Private Partnership as it is known today started as a profit delivery method in the United States of America (USA) centuries back with no known date Lorman (2018). In the developing years of the United State of America, one challenging factor in the development process was transportation which lead towards the inaugural highway authorization, which brought entrepreneurs into the construction and maintenance of highways in the aftermath of the 1700s. Approximately 1702 saw the granting of several of the inaugural commercial agreements for constructing bridges, which led to one of the earliest instances of litigation concerning an anonymous partnership initiative. The implications of public-private collaborative interactions are illustrated by the challenges presented in the lawsuit Charles waterway Bridge V. the entrepreneurs of Warren's Railroad Bridge, et al., 36 U.S. 420 (1834), and these are presently evident, at minimum in a certain sense, in PPP agreements currently in effect Lorman (2018).

In 1640 the Massachusetts state in the United State awarded a Private Firm Harvard College the contract to run a ferry on the Charles River between Boston and Charlestown for 100years. In 1785 a private company – Charles river Bridge Company entered into a partnership with Massachusetts to build a bridge and collect tolls for 40years after which ownership of the bridge revert to the state. In the past twenty (20) years, public private partnership in the United State and increased substantially. The state of Califonia is the first to provide legislation in respect of PPP in 1989 while Virginia State came up with state legislation in 1995. By 2011 about 18 states in the US had brought up legislation on PPP. From the partnership, transportation is seen to be the focus of State Public Private Partnership in line with the state responsibility for provision of transport infrastructure.

However, According to the International Finance Corporation (2009), cooperation among the governmental and business communities dates back approximately 2,000 years to the reign of the Romans. Within the authority of the Roman troops, the enormous motorway extension was complemented by the development of a postal transportation scheme. For several (5) years, a commercial collaborator built and ran the power source postal terminals, and these were essentially micro settlements situated within substantial warehouses, fabrication facilities, accommodations, as well as army headquarters (World Bank 2009). The swift growth in urbanity, Industrialization and expansion in public works particularly railways, tramways, water supply by individual business owners as well signaled an era of prosperity of concession in Europe (World Bank 2009). There has been increase participation/adoption of public private partnership in both the developed and under-developed countries from the 1980s till date including consolidation in some form of PPP, while new market frontiers are noticeable in Asia and Africa. More developing countries and emerging economics including Brazil, China, India, Nigeria, South Africa and Hungary are embracing PPP with modified form and framework.

India, South Africa, China and Nigeria, have introduced PPP in infrastructural development and maintenance while initiative targeted at outsourcing management and maintenance of public facilities to private sectors are being developed and escorted in Asia, Africa and parts of Latin America. In Nigeria much emphasis is laid on PPP and infrastructural development aimed at providing social services thereby, fulfilling government social contract with the citizenry. However, due to paucity of funds MDAs cannot develop their real estate and are embracing PPP subtly, signaling Public Private Partnership in Real Estate Investment.

➢ *Real Estate Investment*

Buying, holding, managing, renting, and even selling properties over earnings are all considered forms of real estate investment. It's feasible actively, such as by flipping houses or managing rental properties, or passively, through Real Estate Investments Trusts (REITs). The core objective of real estate investment is to generate income or build long-term wealth through strategic decision-making and careful market analysis. According to Emele (2022), Funding within tangible assets is essential for a country's financial framework, and assessing how it does serves as a foundation for analyzing the market's current state as well as making decisions about investments beginning at any moment, whether during the investment, holdings, or business dimension. Real estate investments could be either direct or Third-party funding. Making investments indirectly within commercial property involves purchasing stock in an organization which owns an accumulation of revenue-generating properties, also referred to as a real estate investments trust (Udoudoh and Bassey, 2022). Investment grade, loans, along with blended REITs are somewhat among the various types of REITs. They are categorized according to the manner in which their respective positions securities are purchased as well as distributed, encompassing public exchanged REITs, publicly privately owned real estate investment trusts, along with privately owned REITs. (Federal Reserve, 2021). Investors invest in REITs by buying shares that are traded in the capital market just like other securities (stocks) in the exchange market. Income from REITs to investors is in form of dividend payment and from the value of the shares appreciation. Other types of indirect real estate investment include; mortgage-back securities (MBS) and exchange – traded funds (ETFs).

Direct real estate investment involves purchasing a physical property with the aim of generating income, benefiting from its appreciation in value, or both. The distinguishing characteristics of direct real estate investment is that the investor holds the title to the specific real estate and exercise direct authority over the management and decision making as concerns the subject property. Each of the following categories of Real Estate Investments can be made directly: homes, businesses, vacation Rentals and fixer – upper.

- *Residential Properties:*

The may comprise housing developments, triplexes, detached residences and multilevel residences. Real estate investors could rent the real estate investment out for income or outright sales for profit where there is capital value appreciation.

- *Economic Commercial Property:*

Businesses employ similar types of buildings purposes, including office spaces, shops, mall, industrial warehouses and hotels. The revenue generated from the lease of this real estate is the income to the investor.

- *Vacation Rentals:*

This is a purposes-built property specifically for tourist on a short-term basis. This direct real estate investment is most viable within the present of Tourist destination and could generate much income to the investor when decently managed.

- *Land:*

Investors can invest in an underdeveloped law in anticipation of long-term capital appreciation or were the land is sold at a value lower than the open market value. Moreso, were infrastructural development such as construction of roads, provision of basis amenities and social services are provided the value of bare land will automatically react to this development by way of capital appreciation.

- *Fixer-Uppers:*

This is a relatively new concept in direct real estate investment. This is concerned with purchasing a property that needs renovation. The investor will leverage on the depreciation factor to get a favourable purchase and thereafter renovate and improve the real estate. The improved property is now sold for a profit within a short time frame.

From the forgoing, it is evident that real estate investment is capital intensive, were equity finance may not just be enough to be invested. Therefore, alternative investment financing is germane to any real estate investor,

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including the Nigerian postal service. NIPOST, having seen the need for partnership in her real estate investment adopted an alternative approach in her real estate investment through the public private partnership.

➢ *Aim and Objective*

The aim of the study is to assess the impacts of Public Private Partnership in Real Estate Investment Returns in the North Central Zone of the Nigerian postal service real estate.

- To determine the NIPOST North Central Zone real estate investment returns trend Pre-PPP (2003-2012)
- To determine the NIPOST North Central Zone real estate investment returns trend Post PPP (2014-2023).
- To compare the return trend between the Pre-PPP and the Post-PPP of NIPOST North Central Real Estate Investment.

II. LITERATURE REVIEW

The research area public private partnership in real estate investment particularly real estate investment returns is relatively new and no much literature is available. Most of the existing literature have not really address public private partnership on real estate investment returns. For instance, Foasat *et.al* (2020) research on Public Private Partnership in Nigerian Teaching Hospitals: potential and challenges with the aim of determining the current operational status as well as explore potential benefits and challenges on the use of PPP model in radiology department of selected teaching hospitals within three(3) South Western State of Nigeria (Lagos, Ogun, and Oyo). The study which adopted qualitative method concluded that almost all radiological equipment can be acquired through PPP and that there was improved service delivery and residency training with PPP.

Enyia and Emelah (2003) considered the extent to which Public Private Partnership in Education can bring about attainment of sustainable development. The baseline theory was adopted for the study. The study concluded that Private institutions should come in and synergize with the private institutions to ensure that schools are competitive. Ulayi, Arikpo, Anthony and Tawo (2022) examined the extent to which public private partnership and collaboration in education contributes in the sustainable development of tertiary institutions in the areas of infrastructural and human development. The findings amongst others revealed that the attainment of any meaningful and sustainable development requires the genuine participation of the public, the organized private sectors, donor agencies, individuals as well as civil societies. Owotemu, Daniel and Hadija (2022) appraised the effect of Public Private Partnership on delivery of Affordable Housing in Nigeria. The survey research design was adopted. The study concluded that for Public Private Partnership to prosper and achieve stated objective, there must be established metrics for success, ability to quantify and tract accomplishments, spot and address emerging problems while also finding that there is significant impact of management contracts on delivery of affordable housing in Nigeria.

Izuwah (2019) researched on unlocking the potentials in the Housing market through Public Private Partnership (PPP) Investment. The study concluded by postulating the imperative of a combination of hybrid approaches to PPP delivery in housing market. Madu and Kenigua (2021), focused on the role of public private partnership in infrastructural development in Nigeria using the analytical/descriptive method. It findings revealed huge infrastructural deficit and the imperative of adopting PPP for infrastructural delivery. A number of studies have been conducted on PPP and housing delivery in Nigeria (Kadri, 2018, Mahahigam, 2011, Rana and Izuwah, 2018) which findings align with that of Madu *et al* (2021). Inspite of plethora of studies, there have been no significant study on public private partnership in real estate investment with focus on investment returns. For instance, Ahmed and Sipan (2020) considered critical success factors of public private partnerships for affordable housing provision in Nigeria. The findings revealed good governance, availability of financial markets, sound economic policies, consistency in monetary and commitment of public and private sectors as critical factors to successful public private partnership in providing avoidable housing. Closest literature on Public Private Partnerships in real estate Investment returns is that of Ibem and Adowo (2012) which centered on prospects of and challenges of Public-Private Partnership (PPPs) in housing provision in Ogun State South West Nigeria where it was found that attention of PPP has been on the provision of housing for high income earners while the challenges of insufficient members of housing unit and housing affordability has not been addressed. Prior research on public private partnership has much centered on infrastructure and Housing delivery which is more generally known as living space – construction and assigned usage of houses or buildings individually or collectively for the purpose of shelter. However, no much research has been carried out on public private partnership in real estate investment returns in Nigeria. The thrust of this study therefore is to fill the gap on PPP and real estate investment with special focus on investment returns as the baseline other than provision of social services. Findings of the research shall provide investment guide to Ministries, Departments and Agencies on alternate model other than public funding in unlocking the inert real estate investment potentials, realizing the highest and best use thereby contributing to the sustained growth of Nigeria Gross Domestic Product (GDP). Commendably, NIPOST is still engaging more private investors in her real estate investment, it will provide research result on performance measurement on the previous partnerships, highlighting the achievement with respect to the goals and providing lead way on arrears for improvement both to NIPOST and the different partners. Furthermore, the researcher is unaware of anyone who had provided a research-based awareness on the efficacy of PPP to Ministries, Departments and Agencies with vast number of moribund assets in Nigeria. If MDAs are to filling their real estate as a dependable and veritable source of income, the backbone of which is real estate investment, then the research is germane.

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III. MATERIALS AND METHODS

The north central Geopolitical region otherwise refers to as the middle belt is located centrally bounded in North-by-North East and North West and in the South-by-South East, South South and South West. The region covers of total land mass of 242,425km^2 including water bodies. It is made up of six (6) states namely Nassarawa, Benue, Kogi, Niger, Kwara, Plateau (NPC, 2018). The North central region is filled with predominantly minority ethnic groups of TIV, Nupe, Idoma, Nira, Gwari while there is spatial distribution of the majority ethnic group – Hausa and Yoruba some areas.

Major towns in the region includes Abuja, with a population of 3,840,000, Jos with a population of 1,286,400 Mina having a population of 513,000 Ilorin made 1,064,000, Lokoja with a population of 692,050, Makurdi having a total population of 433,700 and Lafia with a total population of 509,300 the predominant occupation in this region is farming while considerable commercial, manufacturing and transportation activities are also carried out.

Table 1 State in North-Central Region of Nigeria, Capital, Population, Landmass and Density

S/N	STATE	CAPITAL	POPULATION	LAND MASS	POPULATION DENSITY
1.	PLATEAU	JOS	4,717,300	26,026	181.3/km^2
2.	KWARA	ILORIN	3,551,000	33,433	106.2
3.	NIGER	MINNA	6,783,300	70,955	95.60
4.	KOGI	LOKOJA	4,466,800	28,989	1541/km^2
5.	NASSARAWA	LIFIA	2,886,000	26,256	109.9/ km^2
6.	BENUE	MAKURD	6,141,300	30,783	199.5/ km^2
	FCT	ABUJA	3,840,000	7,620	402.6
	TOTAL		25,602,400	224,062	

Source: National Population Commission (Web), 2023.

However, despite the huge human population and land mass in the North Central region, provision of real estate is abnormally poor as the demand for real estate far exceed the supply. Moreso, NIPOST has several undeveloped lands in the Central Business District (CBD) of Abuja including a 3,000 square meter plot in Maitama, Abuja, several dysfunctional post offices in Lokoja and its environs, dilapidated staff quarters in Benue State. There are several undeveloped land in highbrow areas in Jos, Plateau State as well as Niger and Nasarawa States.

Sadly, these properties are allowed fallow while the demand is skyrocketing every moment. Workplace and client satisfaction a non- financial indicator in real estate Investment Performance measurement is rarely noticed as staff and Clients complains bitterly about quality of service and inhabitable working environment. Like NIPOST According to Spector (1997), the majority of companies disregard the working surroundings that surround their establishment, which has a negative impact on the productivity of workers. Employee fulfillment can additionally be impacted by various aspects of the workplace, including compensation, hours of work, worker independence, organizational framework, and management-employee relationship building (Lane et al. 2010). Chandrasekar (2011) noted that during an effort to boost profits, organizations must focus on creating an office atmosphere that increases workforce ability for becoming more successful. The problem of workplace satisfaction has be divided NIPOST thereby impacting negatively on her productivity. It is therefore pertinent to undertake an assessment of the impact of Public Private Partnership in the operational efficiency or otherwise of Real Estate Investment in the North Central.

Table 2 Completed and Operational PPP Project (Real Estates) in North Central Nigeria PPP sites on NIPOST Properties North Central

S/N	Location	State	Title of Project	Name of Developer	Approving Authority	Project Status
1.	Old (Burnt) Suleja Post Office	Nig Er	Development of a Commercial Complex	Babandoki Global Concept Limited	Postmaster-General/Ceo	Completed commissioned and Operational
2.	Jos Town Post Office Jos	Plateau	Development of a Commercial Complex	Sho Ventures Limited	Postmaster-General/Ceo	Completed And Operational
3.	Jos North Post Office, Jos	Plateau	Development Of Shopping Complex	El-Jamumac and Sons Ltd	Postmaster-General/Ceo	Completed commissioned And Operational
4.	Nipost Workshop, Murtala Muhammed Way, Jos	Plateau	Redevelopment & Lease of the Uncompleted Block B Office Complex	Sokowonci Technical Nig. Ltd	Postmaster-General/Ceo	Completed commissioned And Operational

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5.	Nipost Workshop, Murtala Muhammed Way, Jos	Plateau	Development Of Shops, Supermarkets & Warehouses	M/S I.G.I Global Investment Limited	Postmaster-General/Ceo	Completed commissioned And Operational
6.	Bida Old Post Office	Niger	Development Of Shopping Complex	M/S Edusoko & Sons Nig. Ltd	Postmaster-General/Ceo	Completed And Operational
7.	The Vacant Land Space at Old Suleja Post Office	Niger	Developmentt of a Commercial Complex	Babandoki Global Concept Limited	Postmaster-General/Ceo	Completed commissioned And Operational
8.	Lafia Post Office	Nassarawa	Redevelopment & Lease of the Uncompleted Block B Office Complex	Sokowonci Technical Nig. Ltd	Postmaster-General/Ceo	Completed commissioned And Operational

Source: Researcher (2024)

Table 2 is a compilation of NIPOST real estate under Public Private Partnership in the North Central. It comprises of eight numbered real estate which hitherto were either generating abysmal return or no returns at all. Table 3.1 shows at a glance the project location, title, name of developers, approving authority and the project status.

- *Instrument for Data Collection*

Questionnaire was used as the major instrument for data collection. The questionnaire was designed having different headings to illicit useful information to aid the researcher achieved the aim and objectives of the research. The questionnaire contained sections on annual returns on subject property pre-PPP (2003-2012), annual returns on subject property post-PPP (2014-2023), how the financial indicators are affected by the adoption of PPP, the non-financial indicators and PPP variables (availability of funds expertise and efficient resource management) and the relationships between the public private partnership variables and real estate investment returns indicators financial and non-financial indicators).

- *Data Collection Techniques*

The questionnaire written in clear and unambiguous English were administered by hand to the respondents at the corporate headquarters while the Head of Estate and the two (2) deputies were administered and collated through database created. All questionnaire administered in the corporate Headquarters were filled and returned while seventy-two (72) out of the seventy-eight (78) questionnaires sent to all the state offices in the zone were returned. A total of one hundred and one (101) questionnaire were completed and returned.

- *Technique of Data Analysis*

The study which involved scale of measurement through the use of questionnaire in finding out the trend, dispersion and comparing the trend between periods. In doing this standard deviation was need to measure the dispersion amongst variables and time series analysis (exponential function) used in analyzing the real estate investment return trend in NIPOST. T-test statistical analysis technique was used to compare the pre and Post PPP return trend while the statistical package for social science (SPSS) was used as a statistical program.

IV. DISCUSSION OF RESULT

The North Central returns were analyzed from the following – 14,975,000 (2003); 14,975,000 (2004); 50,000,000 (2006); 22,200,000 (2007); 19,550,000 (2008); 20,950,000 (2009); 21,700,000 (2010); 25,100,000 (2011) and 28,450,000.

Table 1 Real Estate Investment Returns Trend of Pre-PPP (2003-2012) (North-Central)

	x	**y**	**Log y**	**x.log y**	x^2
2003	1	14,975,000	7.18	7.18	1
2004	2	14,975,000	7.18	14.35	4
2005	3	50,000,000	7.70	23.10	9
2006	4	21,550,000	7.33	29.33	16
2007	5	22,200,000	7.35	36.73	25
2008	6	19,550,000	7.29	43.75	36
2009	7	20,950,000	7.32	51.25	49
2010	8	21,700,000	7.34	58.69	64
2011	9	25,100,000	7.40	66.60	81
2012	10	28,450,000	7.45	74.54	100
∑	55		73.53	405.51	385

Source: Researcher's Computation (2025)

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Using analysis from Table 1 and inputting into the formula - $b = \frac{n\sum x.\log y - \sum x \sum \log y}{n.x^2 - (x)^2}$

$b = \frac{10x405.51 - 55x73.53}{10x385 - 3025}$ $b =$ 0.01 b = Anti-log of 0.01 = 1.02

$a = \frac{\sum \log y - b\sum x}{n}$ $a = \frac{73.53-(0.55)}{10}$ $a = 5.93$

a = Anti-log of 5.93 = 851,138.04. So, the exponential function becomes:

$$y. = ab^x + e$$

$y. = 851{,}138.04(1.02)^x + e$ as shown in Table 1

Table 2 Exponential Function of Real Estate Investment Returns Trend of Pre-PPP (2003-2012) (North Central)

Y	x	a	b	b^x	a*(b^x)
2003	1	851,138.04	1.02	1.02	868,160.80
2004	2	851,138.04	1.02	1.04	885,524.02
2005	3	851,138.04	1.02	1.06	903,234.50
2006	4	851,138.04	1.02	1.08	921,299.19
2007	5	851,138.04	1.02	1.10	939,725.17
2008	6	851,138.04	1.02	1.13	958,519.67
2009	7	851,138.04	1.02	1.15	997,243.87
2010	8	851,138.04	1.02	1.17	997,243.87
2011	9	851,138.04	1.02	1.20	1,017,188.75
2012	10	851,138.04	1.02	1.22	1,037,532.52

Source: Researcher's Computation (2025)

From Table 2, when x was 1, y is 868,160.80; when x is 2, y is 885,524.02; when x is 3, y is 903,234.50; when x is 4, y is 921,299.19; when 5, y is 939,725.17; when x is 6, y is 958,519.67; when x is 7, y is 997,243.87; when x is 8, y is 997,243.87; when x is 9, y is 1,017,188.75 and when x is 10, y is 1,037,532.52. The data depicts a relationship between 'x' and 'y', where 'y' generally increases as 'x' increases, suggesting a positive correlation. The magnitude of 'y' is quite large, indicating a significant scale. The increments in 'y' are not uniform; the rate of change appears to fluctuate, though it remains positive. Notably, the 'y' value remains constant between x=7 and x=8, suggesting a plateau or a temporary stagnation in growth at that point. After x=8, the 'y' value resumes its upward trend. The overall trend indicates a non-linear relationship, potentially exhibiting exponential or polynomial growth, although the plateau at x=7 and x=8 indicates a more complex relationship than a simple linear or pure exponential one. The fluctuating rate of change signifies volatility (increased investment risk). This is a key economic indicator or policy environment which increases the risk associated with the NIPOST real estate investment in the North Central. The temporary plateau suggest little or no growth in the key performance indicators (KPIS) which may be a result of operational bottlenecks, market saturation and lag effects in NIPOST real estate investment. The situation in the returns of North Central NIPOST real estate actually called for targeted intervention such as PPP to reignite growth and improve the rate of change in performance.

This is further shown in Figure 1.

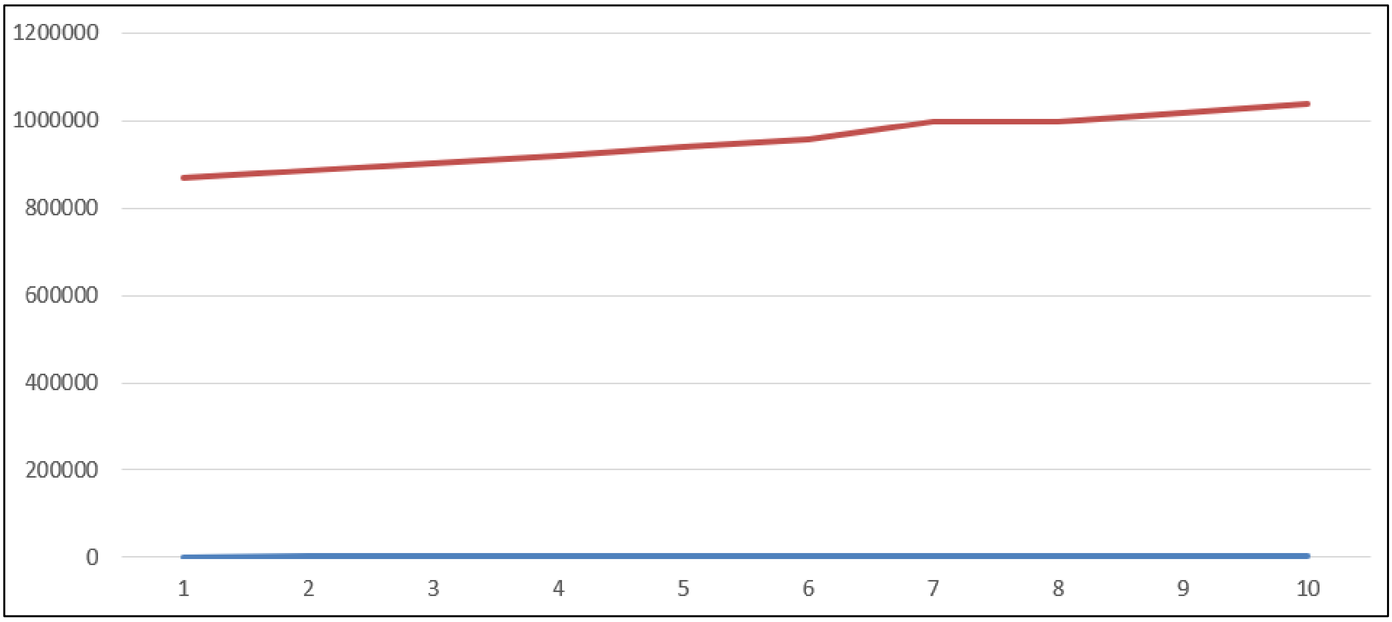

Fig 1 Real Estate Investment Returns Trend of Pre-PPP (2003-2012) (North Central)
Source: Researcher's Computation (2025)

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The north central returns were analyzed from the following – 11,150,000 (2014), 11,150,000 (2015), 11,150,000 (2016), 44,000,000 (2017), 73,500,000 (2018), 193,000,000 (2019), 82,500,000 (2020), 92,500,000 (2021), 93,000,000 (2022) and 95,500,000 (2023).

Table 3 Real Estate Investment Returns Trend of Post-PPP (2014-2023) (North-Central)

	X	y	Log y	x.log y	x^2
2014	1	11,150,000	7.05	7.05	1
2015	2	11,150,000	7.05	14.09	4
2016	3	11,150,000	7.05	21.14	9
2017	4	44,000,000	7.64	30.57	16
2018	5	73,500,000	7.87	39.33	25
2019	6	193,000,000	8.29	49.71	36
2020	7	82,500,000	7.92	55.42	49
2021	8	92,500,000	7.97	63.73	64
2022	9	93,000,000	7.97	71.72	81
2023	10	95,500,000	7.98	79.80	100
∑	55		76.77	432.56	385

Source: Researcher's Computation (2025)

Using analysis from Table 4.34 and inputting into the formula - $b = \frac{n\sum x.\log y - \sum x \sum \log y}{n.x^2 - (x)^2}$

$b = \frac{10x432.56-55x76.77}{10x385-3025}$ $b =$ 0.11 b = Anti-log of 0.11 = 12.88

$a = \frac{\sum \log y - b\sum x}{n}$ $a = \frac{76.77-(0.11)}{10}$ $a = 7.07$

a = Anti-log of 7.07 = 11,748,975.55. So, the exponential function becomes:

$$y. = ab^x + e$$

$y. = 11{,}748{,}975.55(12.88)^x + e$ as shown in Table 3

Table 4: Exponential Function of Real Estate Investment Returns Trend of Post-PPP (2014-2023) (North Central)

Y	x	a	b	b^x	a*(b^x)
2014	1	11,748,976.55	12.88	12.88	151326817.96
2015	2	11,748,976.55	12.88	165.89	1949089415.38
2016	3	11,748,976.55	12.88	2136.72	25104271670.05
2017	4	11,748,976.55	12.88	27520.95	323343019110.21
2018	5	11,748,976.55	12.88	354469.86	4164658086139.45
2019	6	11,748,976.55	12.88	4565571.81	53640796149476.10
2020	7	11,748,976.55	12.88	58804564.93	8898707692739650.00
2021	8	11,748,976.55	12.88	757402796.31	8898707692739650.00
2022	9	11,748,976.55	12.88	9755348016.46	114615355082487000.00
2023	10	11,748,976.55	12.88	125648882452.02	1476245773462430000.00

Source: Researcher's Computation (2025)

From Table 3 5, when x was 1, y is 151,326,817.96; when x is 2, y is 1,949,089,415.38; when x is 3, y is 25,104,271,670.05; when x is 4, y is 323,343,019,110.21; when 5, y is 4,164,658,086,139.45; when x is 6, y is 53,640,796,149,476.10; when x is 7, y is 88,98,707,692,739,650.00; when x is 8, y is 8,898,707,692,739,650.00; when x is 9, y is 114,615,355,082,487,000.00 and when x is 10, y is 1,476,245,773,462,430,000.00. The data reveals an explosive, non-linear growth pattern between variables x and y. As x increments linearly from 1 to 10, y experiences a rapid, accelerating increase. Initially, y is in the hundreds of millions, but it quickly escalates into billions, then tens of billions, and subsequently, hundreds of billions. By the time x reaches 6, y enters the tens of trillions, and continues its exponential climb, reaching quadrillions by x=10. The magnitude of the change indicates a potential exponential or factorial relationship between x and y, suggesting that a small change in x results in a dramatically larger change in y. This rapid growth suggests a phenomenon where the rate of increase itself is increasing, leading to extremely large values of y as x progresses.

This is further shown in Figure 2.

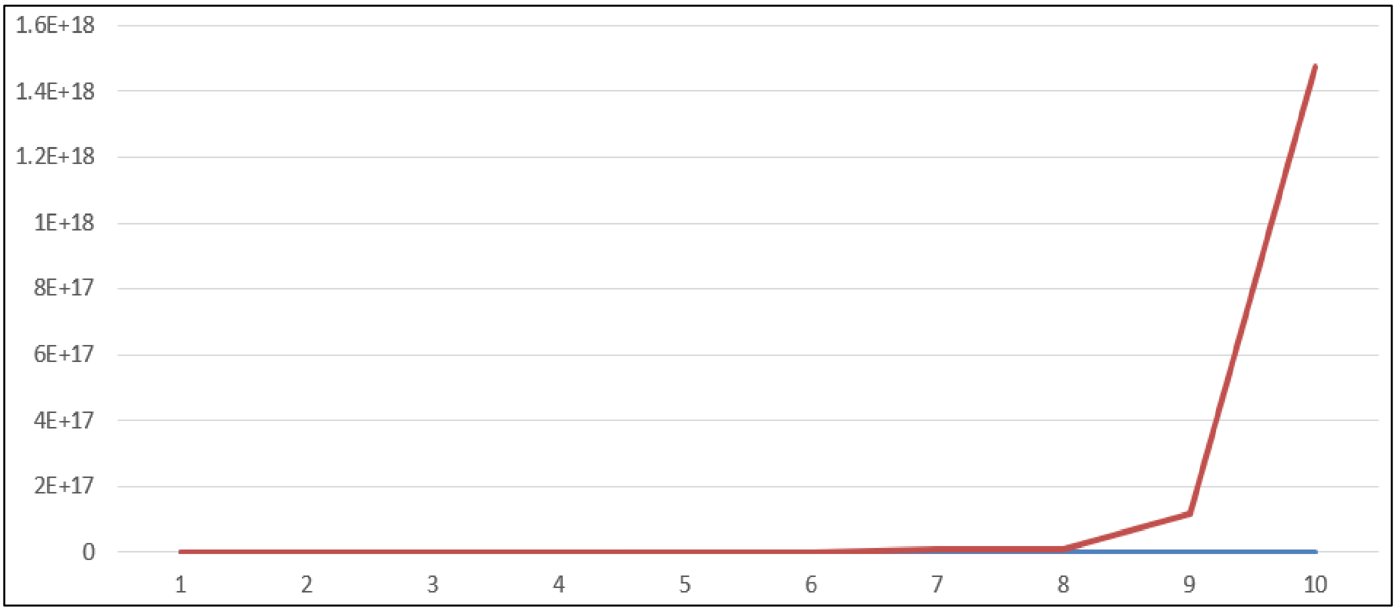

Fig 2 Real Estate Investment Returns Trend of Post-PPP (2014-2023) (North Central)
Source: Researcher's Computation (2025)

V. CONCLUSION

The exponential growth analysis of Pre-PPP investments revealed an inverse relationship between asset size and growth rate, with smaller properties (₦512,861) achieving 12% growth compared to larger assets (₦9.5 million) at just 2% indicting that NIPOST's Pre-PPP strategy favoured higher-risk, higher-return investments in smaller properties. Post-PPP implementation showed dramatic improvements in growth rates (up to 26% in some assets) compared to Pre-PPP performance, conclusively demonstrating that the PPP model successfully enhanced NIPOST's real estate investment returns, though with varying degrees of success across different asset classes. The extremely statistically significant difference between Pre-PPP ₦196,625,000.00 and Post –PPP ₦654,800,000.00 (p = 4.58175 x 10^8) performance provides irrefutable quantitative evidence that PPP adoption generated substantially better financial outcomes for NIPOST's real estate investments, validating the partnership model's effectiveness, as significantly impacting the NIPOST Real Estate Investment Returns positively in the North Central Zone.

RECOMMENDATIONS

Performance in real estate investments are both quantitative and qualitative and should adopt financial and financial indicators in evaluating performance of PPP in real estate investment returns. Also performance appraisal of PPP in real estate investment returns in NIPOST and similar MDA's should be evaluated for a reasonable period not less than ten years before the implementation of PPP and ten years Post PPP to be able to ascertain the actual performance of PPP. Particularly it is recommended that Ministries, Departments, and Agencies with underutilized real estate should adopt the public private partnership model in order to achieve maximally, the real estate investment returns.

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