

Does Portfolio Rebalancing Create Value in an Emerging Equity Market? Evidence from Alternative Rebalancing Rules in Nigeria.

Ofiero hor Ufuoma Earnest

University of Port Harcourt, Nigeria

ORCID: <https://orcid.org/0009-0002-7468-8082>

Abstract: An investor who sets a target mix of shares and safer assets must decide how often to restore it. This paper compares six rebalancing rules for a portfolio split equally between the Nigerian All-Share Index and twelve-month bank deposits: never rebalance (buy-and-hold), rebalance monthly, quarterly or annually, or rebalance only when the equity weight drifts more than 5 or 10 percentage points from target. Using monthly Central Bank of Nigeria data for February 2006 to December 2025 (239 months), annual rebalancing produced the highest compound growth (10.62 per cent a year, against 9.27 per cent for buy-and-hold), the smallest maximum drawdown (35.8 per cent against 44.9 per cent) and the highest Sharpe ratio. All rebalancing rules beat buy-and-hold, and the less frequent rules beat monthly rebalancing. Trading costs of up to 100 basis points per unit of weight traded barely change these rankings. The same pattern holds for 30/70 and 70/30 target mixes and for a lower-yielding savings-account safe asset, and annual rebalancing also delivered higher growth in eight of ten overlapping ten-year holding periods, although a smaller drawdown in only three. However, the advantage is not uniform over time: buy-and-hold did best in 2020–2025, when equities rose almost without interruption. A block bootstrap gives a 95 per cent interval of -0.6 to $+3.5$ percentage points a year for the advantage of annual rebalancing over buy-and-hold, so the gain is suggestive rather than statistically established. All strategies lost purchasing power after inflation. The evidence favours disciplined, infrequent rebalancing for Nigerian investors, mainly because it limits drift towards equities before crashes.

Keywords: portfolio rebalancing; asset allocation; buy-and-hold; transaction costs; emerging markets; Nigeria

JEL classification: G11; G12; G17

1. INTRODUCTION

Suppose a Nigerian investor decided in early 2006 to keep half of her savings in shares and half in bank deposits. By March 2008, after a two-year stock market boom, the shares would have made up 70 per cent of her portfolio if she had done nothing. A year later, after the index had lost about 70 per cent of its value, they would have been down to 43 per cent. By April 2020, after another decade of weak equity returns, they would have been just 22 per cent. Her portfolio would have drifted from an aggressive allocation at the worst possible moment to a very defensive one just before the market's strongest rally in a generation. The question this paper asks is whether she would have done better by periodically restoring her 50/50 target, and if so, how often she should have done it.

Rebalancing is one of the most common pieces of advice given to investors, but its value is not obvious. Perold and Sharpe (1988) show that a constant-mix strategy, which rebalances to fixed weights, performs better than buy-and-hold when markets fluctuate around a trend and worse when markets move persistently in one direction. Rebalancing sells the asset that has risen and buys the one that has fallen. If prices then reverse, the investor gains; if the trend continues, she loses. Booth and Fama (1992) and Willenbrock (2011) show that rebalancing a portfolio of volatile, imperfectly correlated assets can raise its compound growth rate above the weighted average of the assets' own growth rates, an effect often called the diversification return or volatility harvesting (Bouchey et al., 2012). Against these gains must be set the costs of trading, which favour less frequent rebalancing (Donohue & Yip, 2003).

The Nigerian market is a good place to study these trade-offs. Its equity index has been highly volatile, with a crash of about 70 per cent in 2008–2009, long periods of stagnation and a powerful rally in 2023–2025. Volatility in Nigerian equities is persistent and asymmetric (Emenike, 2010; Atoi, 2014). Deposits, the alternative asset, earn a steady nominal return that has barely varied with equity prices. These are the conditions under which the choice of rebalancing rule should matter most, yet there is little evidence on it for Nigeria.

This paper makes three contributions. First, it compares six transparent rules over twenty years of monthly data, up to and including the rally of 2023–2025. Second, it tests the robustness of the comparison to trading costs, to the target mix and to the sample period. Third, it assesses the statistical reliability of the differences with a block bootstrap and

reports inflation-adjusted and US dollar returns. The main finding is that infrequent rebalancing, especially once a year, produced better growth and smaller drawdowns than either buy-and-hold or frequent rebalancing, but that the advantage depends heavily on the 2008–2009 crash and is not statistically conclusive. Section 2 reviews the literature. Section 3 describes the data and Section 4 the method. Section 5 presents the results, Section 6 discusses them and Section 7 concludes.

2. LITERATURE REVIEW

2.1 Rebalancing and the shape of returns

Markowitz (1952) treats portfolio choice as a single-period problem, so the question of rebalancing does not arise. In a multi-period world, an investor who chooses a target allocation must decide whether to maintain it. Perold and Sharpe (1988) compare buy-and-hold, constant-mix and portfolio-insurance strategies and show that they have different payoff profiles. Buy-and-hold has a linear payoff and does best when one asset trends strongly. Constant mix has a concave payoff: it sells into rises and buys into falls, so it does best when prices oscillate and worst when they trend. No strategy dominates in all market conditions, and the right choice depends on the investor's views about the market and her attitude to risk.

2.2 The diversification return

Booth and Fama (1992) show that the compound return of a rebalanced portfolio exceeds the weighted average of the compound returns of its components by an amount that depends on the variances and covariances of the assets. Fernholz and Shay (1982) derive a related result in their stochastic portfolio theory. Willenbrock (2011) clarifies that this diversification return comes from rebalancing, not from holding several assets as such. A buy-and-hold portfolio does not earn it. Bouchey et al. (2012) describe the effect as volatility harvesting and argue that it is largest when assets are volatile and weakly correlated. For a portfolio of Nigerian equities and deposits, which have a correlation close to zero and very different volatilities, the diversification return could be substantial.

2.3 Frequency and cost

The diversification return argues for rebalancing; trading costs argue for doing it rarely. Donohue and Yip (2003) show that the optimal rebalancing policy with transaction costs is a no-trade band around the target, within which the portfolio is allowed to drift. Masters (2003) proposes rebalancing bands based on each asset's volatility and the investor's tolerance for tracking error. Threshold rules of this kind rebalance only when the drift is large, so they trade less than calendar rules while still controlling risk. DeMiguel et al. (2009) show that simple rules, such as an equal-weight portfolio rebalanced periodically, are hard to beat with more sophisticated optimisation, because estimation error swamps the theoretical gains.

2.4 Nigerian context

Nigerian equity returns show volatility clustering, fat tails and leverage effects, with negative shocks raising future volatility more than positive ones (Emenike, 2010; Atoi, 2014). Omotor (2010) finds that Nigerian stocks may hedge against inflation over long periods. Deposit rates, by contrast, are administered and move slowly with monetary policy. This combination of a volatile, mean-reverting risky asset and a stable safe asset is the setting in which rebalancing theory predicts the largest gains.

2.5 Hypotheses

- H1: Periodic rebalancing produces a different compound growth rate and maximum drawdown from buy-and-hold.
- H2: The performance of rebalancing depends on its frequency.
- H3: Transaction costs reduce the advantage of high-turnover rules relative to low-turnover rules.

3. DATA

3.1 Sources

The equity leg is the All-Share Index of the Nigerian Exchange, from Table A.19.1 of the Central Bank of Nigeria (CBN) Statistical Bulletin 2024, Financial Sector (Central Bank of Nigeria, 2025), extended to December 2025 using Table A.12 of the CBN's fourth-quarter 2025 bulletin (Central Bank of Nigeria, 2026c). The two sources agree exactly for every overlapping month. The defensive leg uses the twelve-month deposit rate from the CBN money-market indicators (Central Bank of Nigeria, 2026b). Headline inflation (Central Bank of Nigeria, 2026a) and the official naira–US dollar rate are used to compute real and dollar returns.

3.2 Returns

The monthly equity return is the percentage change in the All-Share Index. The index excludes dividends. The monthly deposit return converts the previous month's annual twelve-month deposit rate into its monthly equivalent, $(1 + q_{t-1}/100)^{1/12} - 1$, so the rate is known at the start of the month. Both legs are stylised: the equity leg ignores dividends and fund costs, and the deposit leg assumes that funds can be rolled monthly at the twelve-month rate.

The first return is for February 2006 and the last for December 2025, giving 239 months. Over this period the equity index returned 9.91 per cent a year with an annualised volatility of 25.6 per cent, while the deposit leg returned 8.54 per cent a year with almost no volatility. The correlation between monthly equity and deposit returns was -0.05 .

4. METHOD

4.1 Rebalancing rules

All portfolios start at 50 per cent equity in February 2006. Six rules are compared:

1. **Buy-and-hold:** no rebalancing; weights drift with relative returns.
2. **Monthly:** restore 50/50 at the start of every month.
3. **Quarterly:** restore 50/50 at the start of January, April, July and October.
4. **Annual:** restore 50/50 at the start of January.
5. **5-point band:** restore 50/50 at the start of a month only if the drifted equity weight is outside 45–55 per cent.
6. **10-point band:** the same, with a 40–60 per cent band.

Let w_t be the equity weight after any rebalancing at the start of month t , and r_t^E and r_t^D the equity and deposit returns. Gross portfolio growth is

$$G_t = w_t (1 + r_t^E) + (1 - w_t)(1 + r_t^D),$$

and, without rebalancing, the weight at the start of the next month is $\tilde{w}_{t+1} = w_t (1 + r_t^E)/G_t$. Turnover is the absolute change in the equity weight at a rebalancing, $|w_t - \tilde{w}_t|$, which is the fraction of the portfolio moved from one asset to the other. Every rule uses only the weights and returns observed up to the end of the previous month.

4.2 Costs, robustness and inference

To test H3, gross growth is multiplied by $(1 - c \times \text{turnover})$ with a cost c of 0, 25, 50 or 100 basis points per unit of weight traded. Robustness is checked by repeating the comparison for target equity weights of 30 and 70 per cent and for three sub-periods (2006–2012, 2013–2019 and 2020–2025), with each sub-period starting at the target weight. Performance is measured by the compound annual growth rate (CAGR), annualised volatility, maximum drawdown, Sharpe ratio (with the deposit return as the risk-free rate), and real and US dollar CAGR. The statistical reliability of each rule's advantage over buy-and-hold is assessed with a paired moving-block bootstrap of monthly returns using twelve-month blocks and 2,000 replications. This bootstrap measures sampling variability in the CAGR gap for the realised strategy returns; it does not re-simulate the weight paths.

5. RESULTS

5.1 Main comparison

Table 1 reports the results. Annual rebalancing produced the highest CAGR (10.62 per cent), the smallest maximum drawdown (35.8 per cent) and the highest Sharpe ratio (0.22). It turned ₦100 into ₦747, compared with ₦584 for buy-and-hold. Every rebalancing rule beat buy-and-hold on growth, drawdown and risk-adjusted return, so H1 is supported. The three infrequent rules (quarterly, annual and the 5-point band) all beat monthly rebalancing, and the two band rules finished close to annual rebalancing. H2 is supported: frequency matters, and more is not better.

Table 1 Performance of six rebalancing rules for a 50/50 equity–deposit portfolio, February 2006 – December 2025

Rule	CAGR (%)	Volatility (%)	Max drawdown (%)	Sharpe	Terminal ₦ per ₦100	Real CAGR (%)	US\$ CAGR (%)	Average equity weight
Buy-and-hold	9.27	11.43	−44.90	0.12	584	−4.26	−3.19	0.42
Monthly	10.10	12.79	−39.35	0.17	679	−3.53	−2.45	0.50
Quarterly	10.35	12.84	−37.90	0.19	711	−3.31	−2.23	0.50
Annual	10.62	12.45	−35.82	0.22	747	−3.07	−1.98	0.50
5-point band	10.56	12.82	−38.11	0.21	739	−3.13	−2.04	0.50
10-point band	10.43	13.06	−39.47	0.20	721	−3.24	−2.16	0.50

Note. 239 months. Equity = All-Share Index price return; deposit = twelve-month deposit rate converted to a monthly rate. All rules start at 50 per cent equity. Sharpe ratio uses the deposit return as the risk-free rate. Real returns deflate by the monthly equivalent of year-on-year inflation; US dollar returns adjust for the official exchange rate. Buy-and-hold had the lowest volatility, but this is misleading. Its average equity weight was only 0.42, because the weight drifted down for most of the sample. Its low volatility reflects less exposure to equities on average, not better risk control. Its drawdown was the largest of all the rules, because its equity weight had drifted up to 70 per cent by March 2008, just as the crash began.

5.2 How the weights drifted

Figure 2 shows how far the buy-and-hold portfolio wandered from its target. The equity weight rose to 0.70 in March 2008, fell to 0.43 by March 2009, sank to 0.32 by the end of 2016 and reached a low of 0.22 in April 2020. It then recovered with the rally of 2023–2025, ending at 0.54. The annual rule was allowed to drift only within each calendar year, and its weight stayed between 0.34 and 0.60. The 10-point band kept the weight between 0.41 and 0.60.

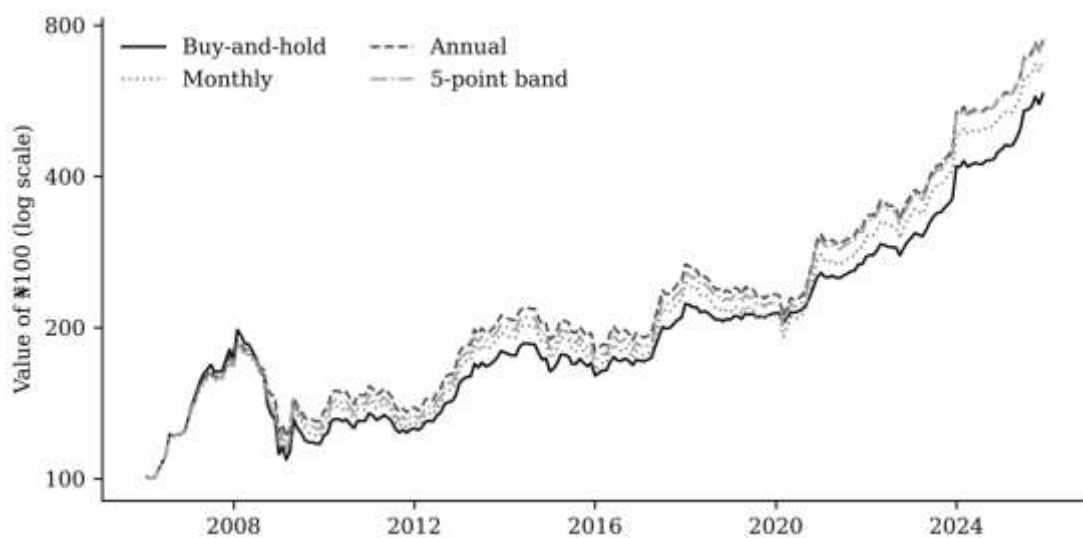


Figure 1. Value of ₦100 invested in February 2006 under four rebalancing rules (log scale), to December 2025. Source: author's calculations from Central Bank of Nigeria data.



Figure 2. Equity weight under buy-and-hold, annual rebalancing and a 10-point band, February 2006 – December 2025. The horizontal line marks the 50 per cent target. Source: author's calculations.

The drift explains most of the difference in outcomes. Buy-and-hold was most heavily invested in equities at the 2008 peak and least invested at the 2020 trough. Rebalancing reversed both mistakes: it trimmed equities during the 2006–2007 boom, added to them during the 2008–2009 crash and again during the weak years of 2016–2020, and so held

more equity going into the 2023–2025 rally. Figure 1 shows that the rebalanced portfolios fell less in 2008–2009 and recovered faster.

5.3 Trading costs

Table 2 reports the effect of trading costs. The rules differ greatly in how much they trade. Monthly rebalancing moved 15.4 per cent of the portfolio between assets each year, on average, and rebalanced in 238 of 239 months. Annual rebalancing moved 6.6 per cent a year in 19 rebalancings, and the 10-point band moved only 4.6 per cent a year in 8 rebalancings. Even at 100 basis points per unit traded, which is high for a liquid portfolio, the annual rule's CAGR falls only from 10.62 to 10.55 per cent and the monthly rule's from 10.10 to 9.93 per cent. The ranking is unchanged. H3 is supported in that costs penalise the high-turnover rule most, but the effect is small relative to the differences between rules.

Table 2 Turnover and compound annual growth under different trading costs

Rule	Annual turnover	Number of rebalancings	CAGR, 0 bp (%)	25 bp (%)	50 bp (%)	100 bp (%)
Buy-and-hold	0.000	0	9.27	9.27	9.27	9.27
Monthly	0.154	238	10.10	10.05	10.01	9.93
Quarterly	0.107	79	10.35	10.32	10.29	10.23
Annual	0.066	19	10.62	10.61	10.59	10.55
5-point band	0.084	25	10.56	10.54	10.52	10.47
10-point band	0.046	8	10.43	10.42	10.41	10.38

Note. Turnover is the average annual fraction of portfolio value moved between equities and deposits. The cost is charged per unit of weight traded.

5.4 Other target mixes

Table 3 repeats the comparison for target equity weights of 30 and 70 per cent. The pattern is the same. Annual rebalancing beats monthly rebalancing, which beats buy-and-hold, on both growth and drawdown. The gain from annual rebalancing over buy-and-hold is about 1.1 percentage points a year for the 30/70 portfolio, 1.4 points for the 50/50 portfolio and 1.2 points for the 70/30 portfolio. With a 30 per cent target, annual rebalancing cut the maximum drawdown from 28.3 to 18.1 per cent.

Table 3 Rebalancing results for different target equity weights

Target equity weight	Rule	CAGR (%)	Volatility (%)	Max drawdown (%)
30%	Buy-and-hold	8.99	6.86	–28.29
30%	Monthly	9.68	7.68	–21.53
30%	Annual	10.10	7.44	–18.12
50%	Buy-and-hold	9.27	11.43	–44.90
50%	Monthly	10.10	12.79	–39.35
50%	Annual	10.62	12.45	–35.82
70%	Buy-and-hold	9.53	16.40	–56.91
70%	Monthly	10.24	17.92	–53.65
70%	Annual	10.71	17.57	–51.09

5.5 Sub-periods

Table 4 shows that the advantage of rebalancing was not constant over time. In 2006–2012, which contains the boom and the crash, annual rebalancing beat buy-and-hold by 2.0 percentage points a year and reduced the maximum drawdown by about nine points. In 2013–2019, a period of weak and choppy equity returns, the three rules were close together. In 2020–2025, buy-and-hold was the best rule by about three points a year. Equities rose almost continuously from 2020 onwards, and a portfolio that let the winning asset grow did better than one that kept selling it. This is the trending market in which Perold and Sharpe (1988) predict that constant-mix strategies will lag.

Table 4 Compound annual growth and maximum drawdown by sub-period (%)

Rule	CAGR 2006–2012	CAGR 2013–2019	CAGR 2020–2025	Max DD 2006–2012	Max DD 2013–2019	Max DD 2020–2025
Buy-and-hold	5.65	4.65	24.47	–44.90	–19.24	–9.95
Monthly	6.57	4.49	21.49	–39.35	–18.62	–9.82
Annual	7.68	4.82	21.53	–35.82	–17.99	–9.64

Note. Each sub-period starts at 50 per cent equity. 2006–2012 begins in February 2006.

5.6 Statistical reliability

The bootstrap results urge caution. The average advantage of annual rebalancing over buy-and-hold in the bootstrap is 1.4 percentage points a year, but the 95 per cent interval runs from –0.6 to +3.5 points. For monthly rebalancing the interval is –1.0 to +2.9 points, and for the 5-point band –0.6 to +3.5 points. In each case zero lies inside the interval. The point estimates favour rebalancing, but twenty years of monthly data dominated by one crash and one rally are not enough to establish the advantage statistically.

5.7 Real and dollar returns

The nominal gains disappear after inflation. Real CAGRs ranged from –4.3 per cent for buy-and-hold to –3.1 per cent for annual rebalancing, and US dollar CAGRs from –3.2 to –2.0 per cent. Rebalancing reduced the real loss by about 1.2 percentage points a year, but no rule preserved purchasing power.

5.8 Different start dates and a savings-account safe asset

The results so far depend on a single starting date, February 2006. Table 5 instead looks at ten overlapping ten-year holding periods, starting each January from 2007 to 2016. Annual rebalancing produced a higher CAGR than buy-and-hold in eight of the ten periods, by between 0.3 and 0.9 percentage points a year; the exceptions were the periods starting in 2008, just after the market peak, and in 2016, when equities rose steadily for most of the decade. Its maximum drawdown, however, was smaller in only three of the ten periods. Over a ten-year horizon that does not start at a market peak, rebalancing mainly adds growth rather than reducing the worst loss.

Table 5 Ten-year holding periods: buy-and-hold against annual rebalancing (50/50 target)

Start	Buy-and-hold CAGR (%)	Annual CAGR (%)	Buy-and-hold max DD (%)	Annual max DD (%)
Jan 2007	3.97	4.60	–40.1	–35.8
Jan 2008	3.63	3.45	–30.5	–35.8
Jan 2009	4.73	5.02	–16.8	–18.0
Jan 2010	5.50	5.96	–21.0	–18.0
Jan 2011	6.52	7.36	–19.5	–21.2
Jan 2012	7.79	8.66	–22.5	–21.2
Jan 2013	7.14	7.92	–19.2	–21.2
Jan 2014	7.22	7.96	–14.5	–21.2
Jan 2015	10.15	10.83	–14.3	–21.2
Jan 2016	14.54	14.38	–19.5	–21.2

Note. Each period lasts 120 months and starts at 50 per cent equity. Drawdowns are measured within each period.

The second check replaces the twelve-month deposit rate with the savings deposit rate, which most retail investors actually earn. With this lower-yielding safe asset, buy-and-hold grows at 7.56 per cent a year, monthly rebalancing at 7.49 per cent and annual rebalancing at 7.98 per cent, with maximum drawdowns of 49.5, 42.3 and 39.8 per cent. Annual rebalancing remains the best rule, and its drawdown advantage is larger than in the main results, because a buy-and-hold portfolio with a low-yielding safe asset drifts even further towards equities in a boom.

6. DISCUSSION

The results fit the theory well. Rebalancing helps when markets oscillate and hurts when they trend. Over 2006–2025 as a whole, the Nigerian market oscillated violently, booming, crashing, stagnating and booming again. A buy-and-hold investor drifted into equities at the top of the first boom and out of them at the bottom of the long stagnation, and paid for both. Rebalancing to a fixed mix avoided these errors. In the trending market of 2020–2025, however, rebalancing repeatedly sold the rising asset, and buy-and-hold came out ahead.

The superiority of infrequent rebalancing has two sources. The first is cost, but Table 2 shows that this is a minor factor at realistic cost levels. The second, more important, source is momentum in the short run combined with reversal in the long run. Monthly rebalancing sells equities after every rise, even when the rise continues for several months. Annual rebalancing lets short-run trends run within the year and corrects only the cumulative drift, which captures the long-run reversal without fighting short-run momentum. The band rules work in a similar way, trading only when drift becomes large. This pattern is consistent with the persistence of volatility in Nigerian equities documented by Emenike (2010) and Atoi (2014), and with the general view that no-trade bands are the efficient form of rebalancing (Donohue & Yip, 2003; Masters, 2003).

The diversification return also contributes. The equity and deposit legs returned 9.91 and 8.54 per cent a year respectively, yet the rebalanced 50/50 portfolios returned between 10.1 and 10.6 per cent, more than either component. This is the volatility-harvesting effect described by Booth and Fama (1992) and Bouchev et al. (2012), and it is large in Nigeria because equities are so volatile and almost uncorrelated with deposits.

6.1 Implications

For Nigerian investors and fund managers, the results support a simple rule: choose a target mix and restore it once a year, or whenever the equity weight moves more than about five points from target. This is cheap, easy to explain and, over the last twenty years, would have reduced the worst drawdown by about a fifth and added more than a percentage point a year to growth. Investors should understand, however, that rebalancing will lag in strongly trending markets such as 2020–2025, and that the evidence for its advantage, while consistent, is not statistically conclusive. Pension fund administrators, whose investment rules already set limits on asset-class weights, may find the band approach a natural fit.

6.2 Limitations

The equity series is a price index without dividends, and dividends are an important part of Nigerian equity returns. The deposit leg is a stylised accrual at the twelve-month rate. Taxes, fund fees and market impact are ignored, although the cost analysis suggests that reasonable costs would not change the conclusions. The analysis covers one market, one pair of assets and one twenty-year history containing a single great crash. The bootstrap resamples realised strategy returns rather than re-simulating the strategies on resampled asset returns, so it understates some forms of uncertainty. Finally, all returns are nominal or converted with an approximation to monthly inflation. Extending the analysis to dividend-inclusive returns, Treasury bills and inflation-linked assets would be valuable.

7. CONCLUSION

Over 2006–2025, a Nigerian investor who rebalanced a 50/50 equity–deposit portfolio once a year would have earned 10.6 per cent a year, compared with 9.3 per cent from buy-and-hold, and would have suffered a maximum drawdown of 36 per cent rather than 45 per cent. All rebalancing rules beat buy-and-hold, infrequent rules beat monthly rebalancing, and the results hold under trading costs and for other target mixes. The advantage came mainly from avoiding drift towards equities before the 2008–2009 crash and away from them before the 2023–2025 rally. It was not present in the trending market of 2020–2025, and it is not statistically conclusive. No rule protected investors from losing purchasing power. Disciplined, infrequent rebalancing is good practice for Nigerian portfolios, but it is a way of managing risk, not a source of guaranteed extra return.

REFERENCES

- [1]. Atoi, N. V. (2014). Testing volatility in Nigeria stock market using GARCH models. *CBN Journal of Applied Statistics*, 5(2), 65–93. <https://doi.org/10.33429/2476-8472.1117>
- [2]. Booth, D. G., & Fama, E. F. (1992). Diversification returns and asset contributions. *Financial Analysts Journal*, 48(3), 26–32.
- [3]. Bouchev, P., Nemtchinov, V., Paulsen, A., & Stein, D. M. (2012). Volatility harvesting: Why does diversifying and rebalancing create portfolio growth? *Journal of Wealth Management*, 15(2), 26–35.
- [4]. Central Bank of Nigeria. (2025). *Statistical bulletin 2024: Financial sector*. Central Bank of Nigeria.
- [5]. Central Bank of Nigeria. (2026a). *Inflation rates* [Data set]. <https://www.cbn.gov.ng/rates/index.html>
- [6]. Central Bank of Nigeria. (2026b). *Money market indicators* [Data set]. <https://www.cbn.gov.ng/rates/index.html>
- [7]. Central Bank of Nigeria. (2026c). *Statistical bulletin: Fourth quarter 2025*. Central Bank of Nigeria.
- [8]. DeMiguel, V., Garlappi, L., & Uppal, R. (2009). Optimal versus naive diversification: How inefficient is the 1/N portfolio strategy? *Review of Financial Studies*, 22(5), 1915–1953. <https://doi.org/10.1093/rfs/hhm075>
- [9]. Donohue, C., & Yip, K. (2003). Optimal portfolio rebalancing with transaction costs. *Journal of Portfolio Management*, 29(4), 49–63.

- [10]. Emenike, K. O. (2010). *Modelling stock returns volatility in Nigeria using GARCH models* (MPRA Paper No. 22723). Munich Personal RePEc Archive. <https://mpra.ub.uni-muenchen.de/22723/>
- [11]. Fernholz, R., & Shay, B. (1982). Stochastic portfolio theory and stock market equilibrium. *Journal of Finance*, 37(2), 615–624.
- [12]. Markowitz, H. (1952). Portfolio selection. *Journal of Finance*, 7(1), 77–91. <https://doi.org/10.1111/j.1540-6261.1952.tb01525.x>
- [13]. Masters, S. J. (2003). Rebalancing. *Journal of Portfolio Management*, 29(3), 52–57.
- [14]. Omotor, D. G. (2010). Relationship between inflation and stock market returns: Evidence from Nigeria. *CBN Journal of Applied Statistics*, 1(1), 1–15. <https://doi.org/10.33429/2476-8472.1064>
- [15]. Perold, A. F., & Sharpe, W. F. (1988). Dynamic strategies for asset allocation. *Financial Analysts Journal*, 44(1), 16–27. <https://doi.org/10.2469/faj.v44.n1.16>
- [16]. Willenbrock, S. (2011). Diversification return, portfolio rebalancing, and the commodity return puzzle. *Financial Analysts Journal*, 67(4), 42–49. <https://doi.org/10.2469/faj.v67.n4.1>