

Comparison of Some Brazil and Mexico ADR Rotation Strategies

Natasya Liev, Sreeya Kotrakona, Puppala Saiteja and Eugene Pinsky*

Department of Computer Science, Metropolitan College, Boston University, Boston, MA ,USA

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*Corresponding author: Eugene Pinsky, Department of Computer Science, Metropolitan College, Boston University, Boston, MA, USA, E-mail: epinsky@bu.edu

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ABSTRACT

This study evaluates a median sector rotation strategy using American Depositary Receipts (ADRs) from Brazil and Mexico during 2014-2024, a period shaped by tariff shocks and policy uncertainty. Unlike momentum-driven approaches, the median strategy systematically avoids extreme sector performers, aiming to reduce volatility and drawdowns for retail investors. Portfolios were tested under five rebalancing frequencies—weekly to annual—using total returns, Sharpe ratios and maximum drawdowns as evaluation metrics. Results indicate that monthly and semi-annual rotations deliver favorable risk-adjusted performance, particularly during heightened market turbulence. The findings suggest that median-based allocation offers a pragmatic, accessible mechanism for individual investors to achieve stability and moderate growth without reliance on predictive models or advanced data infrastructure.

Keywords: Trading strategies, Momentum strategies, Median sector rotation, Emerging markets, ADRs, Portfolio rebalancing, Retail investors

1. Introduction

With pockets of war occurring along with looming threats of global markets closing, retail investors in emerging markets face growing challenges amid rising macroeconomic uncertainty, global trade tensions and volatile capital flows^{1,2}. In countries such as Brazil and Mexico, inflationary pressure, currency instability and shifting tariff regimes have introduced heightened risk exposure across equity markets^{3,4}. Traditional passive strategies, such as broad index investing, offer diversification but leave public investors fully exposed to systemic shocks as seen from the recent drastic drop of the S&P500 early 2025³. At the same time, most sophisticated factor-based or momentum-driven models remain out of reach for non-institutional investors due to their complexity and data demands^{5,6}.

This paper investigates the application of a median sector rotation strategy—a simple, rule-based method that reallocates capital to sectors with moderate recent performance—as a low complexity, risk-mitigating approach for the public. Building on prior work in the U.S., India and Japan⁷, we extend the strategy to Latin American markets, using U.S.-listed ADRs as sectoral proxies. ADRs offer exposure to Brazilian and Mexican equities through U.S. dollar-denominated instruments, reducing the impact of currency fluctuations and improving accessibility and liquidity for retail investors⁸.

Rather than targeting outperformance through predictive signals, the median strategy acts as a volatility filter by systematically avoiding the most extreme sector movement, acting as a conservative investment for retail investors⁹. Given

recent policy-related disruptions-such as U.S. tariff increases on major emerging market exports-the risk-mitigation properties of this strategy merit closer examination. This study assesses its performance across various rebalancing intervals, with a focus on risk-adjusted returns, drawdowns and volatility in the current market context.

2. Motivation and Context

In emerging markets like Brazil and Mexico, most investment decisions are influenced by a combination of policy uncertainty, currency pressure and trade-related shocks, often closely tied to the US market¹. These influences have contributed to uneven performance across sectors, with trade-heavy industries reacting sharply to changes in tariffs, inflation or capital flows. For both institutional and retail investors, this environment raises a practical concern: how to can you invest without taking on unnecessary risk in sectors most exposed to external disruptions².

Passive strategies, while easy to implement, offer little room to adjust for concentrated risks that emerge in unstable macro conditions. At the same time, active models often depend on forecasting tools or data infrastructure that most retail investors can't access or apply consistently. This leaves a gap between accessibility and adaptability that few strategies manage to bridge⁴.

A more pragmatic approach may be to sidestep the extremes. The median sector rotation strategy does this by reallocating capital to sectors that sit in the middle of recent performance rankings. It foregoes top performers and chronic underperformers. And instead, it aims to reduce overall volatility by focusing on more stable segments of the market (?). This can be particularly useful during periods when sector-level performance is driven more by policy headlines – as seen from Trump's recent introduction of tariffs – than by fundamentals.

The current backdrop adds weight to this idea. Since early 2025, new U.S. tariffs targeting Brazilian and Mexican exports-especially steel, agricultural products and manufactured goods-have triggered sharp market reactions³. These trade actions, alongside weakening local currencies and rising prices, have made returns more erratic and sector dispersion more pronounced. In this context, a basic rotation strategy that filters out the outliers may offer a degree of protection without requiring predictive models or high-frequency trading¹⁰.

To evaluate this, the study uses American Depositary Receipts (ADRs) as sector proxies. ADRs trade in U.S. dollars and offer retail investors simpler access to international equity exposure with fewer currency-related complications⁸. We test the median strategy across different rebalancing cycles and compare its outcomes with approaches that emphasize either the best- or worst performing sectors. The goal of our paper is to understand whether a structured yet simple method of investing using medians can provide a useful buffer in markets where volatility is becoming a constant.

This work contributes to the broader conversation about building accessible, data-driven investment frameworks that can adapt to instability without overcomplicating execution and providing accessibility for retail investors that do not have the resources to engage experts². It focuses on what can be done with basic return data-no forecasts, no proprietary inputs-so that individual investors have a clearer path forward in uncertain times.

3. Methodology

3.1. Sector selection and Data sources

To evaluate the effectiveness of the median sector rotation strategy in a Latin American context, we constructed investment portfolios using American Depositary Receipts (ADRs) representing key sectors from Brazil and Mexico - the only two countries that had enough ADR based on our threshold of more than 10 ADRs. ADRs were selected based on liquidity, sectoral representation and data availability on U.S. exchanges. This approach provides public investors with U.S. dollar denominated access to Latin American equities while minimizing friction from local brokerage access, currency volatility and data opacity (we forego including the cost of trading these ADR with the assumption that investors would absorb a similar fee in purchasing other investment products) (Table 1).

Table 1: List of Brazil ADRs.

Ticker	Name	Industry Sector
SID	Companhia Siderurgica Nacional	Steel/Basic materials
GGB	Gerdau S.A.	Steel/Basic Materials
SBS	Companhia de Saneamento Basico do Estado de Sao Paulo	Utilities
SUZ	Suzano, S.A.	Paper
VALE	Vale S.A.	Metals/Mining
PBR	Petroleo Brasileiro S.A. - Petrobras	Oil and Gas
ITUB	Itau Unibanco Holding S.A.	Banks
BAK	Braskem S.A.	Chemicals
BBD	Banco Bradesco S.A.	Banks

Table 2: List of Maxico ADRs.

Ticker	Name	Industry Sector
AMX	America Movil	Telecom
ASR	Grupo Aeroportuario del Sureste	Airports
CX	CEMEX	Building Materials
FMX	Fomento Economico Mexicano	Beverages
KOF	Coca-Cola FEMSA	Beverages
OMAB	Grupo Aeroportuario del Centro Norte	Airports
PAC	Grupo Aeroportuario del Pacífico	Airports
SIM	Grupo Simec	Steel
VLRS	Controladora Vuela Compania de Aviacion	Airlines

These sectors were grouped into broader economic categories using Global Industry Classification Standard (GICS) mappings. From each country, we selected between 7 to 10 ADRs representing distinct economic sectors to ensure a balance between coverage and data quality. Daily closing prices were collected from Yahoo Finance and other public financial APIs covering the ten-year period 2014-2024, a timeframe that includes both stable conditions and periods of macroeconomic disruption, including trade policy shocks and inflation surges.

3.2. Portfolio construction and Sector ranking

Following the methodology established in prior studies, sectors were ranked by total return over a fixed rebalance interval. For each period, sectors were categorized into the following portfolios:

- Winner Portfolio - Top 3 ADRs by return.
- Loser Portfolio - Bottom 3 ADRs by return.
- Median Portfolio - Middle 3 ADRs by return.

Let us consider a simple numerical example. The initial amount of investment for each group is set at \$100. The trading strategy for annual rebalancing is to look at previous years sorted returns and invest in winners, median and losers. Suppose that the 2014 returns of ADRs in increasing order are as follows:

$\underbrace{\text{BBD} > \text{ITUB} > \text{SUZ}}_{\text{Winners}} > \underbrace{\text{BAK} > \text{SBS} > \text{VALE}}_{\text{Median}} > \underbrace{\text{PBR} > \text{GGB} > \text{SID}}_{\text{Losers}}$

For 2015, the “Winners” strategy is to invest equally in (BBB, ITUB, SUZ). The “Median” strategy would be to invest equally in (BAK, SBS, VALE) stocks. Finally, the “Losers” strategy would be to invest equally in (PBR, GGB, SID) stocks.

3.3. Rebalancing frequencies

To assess how timing influences strategy performance, we tested five rebalancing intervals:

- Weekly
- Monthly
- Quarterly
- Semi-Annual
- Annual

This design allows us to evaluate whether the median strategy’s advantages hold under both high frequency and low-frequency reallocation regimes.

3.4. Performance evaluation metrics

We evaluated each strategy using both absolute and risk-adjusted metrics:

- **Final portfolio value:** Ending value after compounding returns.
- Annual Return.
- **Annual volatility:** Standard deviation of returns.
- **Tracking error:** Difference from benchmark B&H performance.
- **Maximum drawdown (MDD):** Largest observed peak-to-trough decline.
- **Sharpe ratio:** Risk-adjusted return.

All metrics were computed using Python and the empirical library (Package). Returns were calculated in U.S. dollars, consistent with the ADR pricing convention and dividends were excluded to preserve comparability across listings.

3.5. Key assumptions and Limitations

- **Transaction costs:** As mentioned, we assumed that purchasing other investment product will have a similar transaction cost hence in this paper we assume that the transaction cost is irrelevant.
- **Survivorship bias:** We mitigated this by using ADRs that had remained continuously listed through the 2014–2024 window.
- **Sector drift:** Given the ADR format, the sector classifications should remain stable; however, we recognize the limitation of not capturing smaller or non-U.S.-listed regional players.

4. Results and Findings (Mexico ADR Sector Rotation)

4.1. Performance by rebalancing frequency

The rotation strategy performance exhibits noticeable

variation depending on the rebalancing frequency, as highlighted by the cumulative cash values and maximum drawdown (MDD) metrics.

Cumulative Cash Values The cumulative terminal values (in units of initial capital) demonstrate that the choice of rebalancing frequency strongly influences portfolio growth potential. As shown in **(Table 3)** annual rebalancing yields moderate results, with the Winners portfolio growing to 193 and the Median and Losers portfolios reaching 233 and 248 respectively, all outperforming the Buy-and-Hold baseline of 101.

Increasing the rebalancing frequency to Semi-Annual and Quarterly notably improves performance for some groups; for example, the Median portfolio achieves its highest terminal value of 345 under Semi-Annual rebalancing, while the Losers portfolio peaks at 432 under Quarterly rebalancing. Monthly rebalancing provides the highest growth for the Winners portfolio (319), suggesting that adapting portfolio weights more frequently can better capture momentum effects.

Interestingly, the Losers portfolio does not uniformly decline but occasionally achieves strong growth (e.g., 432 at Quarterly), indicating potential profit opportunities even among previously underperforming ETFs if rebalancing is frequent enough.

Weekly rebalancing results in respectable but not always superior cumulative values compared to Monthly or Quarterly, hinting at possible diminishing returns.

Maximum Drawdown (MDD) The MDD analysis reveals the downside risk accompanying each rebalancing frequency. Lower (less negative) MDD values indicate better capital preservation.

As shown in **(Figure 2)** Annual and Semi-Annual frequencies produce generally lower drawdowns for the Winners portfolio (around -0.60 to -0.68), reflecting a balance between return and risk. The Median and Losers portfolios experience slightly larger drawdowns, especially under higher frequencies like Quarterly and Weekly, where MDD ranges from -0.62 to -0.77.

The Buy-and-Hold strategy, despite its relatively low returns, displays the smallest drawdown (-0.57), demonstrating its conservative risk profile.

The results underscore the classic trade-off: more frequent rebalancing can enhance returns by exploiting changing market momentum but may increase volatility and susceptibility to deeper drawdowns.

Summary: the cash values and MDDs across different rebalancing intervals illustrate clear performance and risk trade-offs. Monthly and Quarterly rebalancing frequencies appear to offer favorable combinations of growth and control over downside risk for Winner's portfolios, while less frequent rebalancing such as Annual or Semi-Annual may appeal to investors prioritizing lower volatility. These findings can guide practitioners in calibrating rotation strategies to their risk tolerance and market outlook.

4.2. Performance by rebalancing frequency: Mexico portfolio

The rotation strategy applied to Mexican ETFs demonstrates significant variation in performance and risk across different portfolio rebalancing frequencies, as seen through cumulative cash values and maximum drawdown (MDD) statistics.

Cumulative Cash Values The terminal portfolio values indicate that rebalancing frequency has a marked impact on portfolio growth potential. As shown in Table 4 Annual rebalancing delivers modest growth, with the Winners portfolio reaching 157 and the Median and Losers portfolios at 142 and 362 respectively, all exceeding the baseline Buy-and-Hold value of 100.

Semi-Annual rebalancing markedly boosts the Median portfolio's terminal value to 429, reflecting that less frequent but regular adjustments can sometimes better capture medium-term momentum. Quarterly rebalancing also improves the Winners portfolio (206), while Monthly rebalancing produces the most substantial growth in the Winners group (325), confirming that more frequent portfolio updates can intensify returns by exploiting recent performance trends.

Notably, the Losers portfolio shows strong terminal values under Annual (362) and Weekly (461) rebalancing, which suggests unique market behaviors or opportunities for reversal strategies among underperforming Mexican ETFs.

Weekly rebalancing results are mixed, showing high returns for the Losers group but significantly lower performance for Winners (69), indicating potential risks or inefficiencies associated with very short-term rotation.

Maximum Drawdown (MDD) The MDD values highlight the downside risks inherent in each rebalancing frequency. As shown

in Figure 4 Monthly rebalancing exhibits the lowest drawdown for Winners (-0.51), combining high returns with strong capital preservation. Annual and Semi-Annual frequencies offer moderate drawdowns for Winners (-0.72 and -0.59 respectively), suggesting a balance between gain and volatility.

Median portfolios experience their lowest drawdowns around -0.48 annually and -0.55 with weekly adjustments, showing relative stability in moderate performers. Losers suffer larger drawdowns in most cases, particularly under Semi-Annual and Weekly rebalancing (-0.70 and -0.68), revealing increased risk in frequently rotated underperformers.

The Buy-and-Hold approach, while generating the least returns, maintains a stable and moderate drawdown (-0.54), underscoring its conservative nature.

Summary: The Mexico portfolio results underscore the trade-offs between return enhancement and risk control inherent in choosing a rotation frequency. Monthly rebalancing excels in delivering superior growth with the lowest drawdowns for Winners, whereas Semi-Annual rebalancing significantly benefits Median portfolios. Annual and Weekly frequencies display divergent results particularly for Losers, highlighting market-specific effects (**Figure 1**). These insights assist investors in tailoring rebalancing strategies according to their risk tolerance and desire for return maximization in the Mexican ETF market (**Tables 3 and 4**).

Table 3: Brazil: Comparison of Strategies Final Balances for Different Rotation Frequencies.

Strategy	ROTATION FREQUENCY				
	Annual	Semi-Annual	Quarterly	Monthly	Weekly
Winners	193	257	277	319	253
Median	233	345	97	248	187
Losers	248	137	432	146	247
Buy & Hold		101			

Table 4: Mexico: Comparison of Strategies Final Balances for Different Rotation Frequencies.

Strategy	ROTATION FREQUENCY				
	Annual	Semi-Annual	Quarterly	Monthly	Weekly
Winners	157	186	206	325	69
Median	142	429	204	170	265
Losers	362	86	201	143	461
Buy & Hold		100			

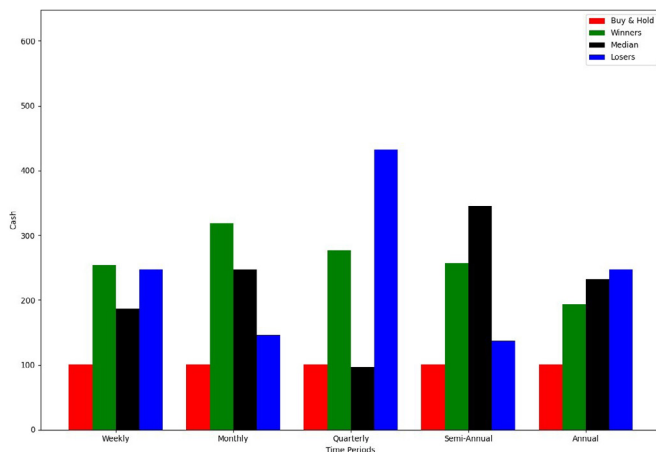


Figure 1: Brazil Comparing cash across various strategies and frequencies.

5. Conclusion

The median sector rotation strategy provides a robust, low-complexity approach to navigating volatile emerging markets impacted by policy shocks. Monthly and semi-annual rebalancing optimize the balance between returns and risk. By avoiding extremes, this method offers retail investors (**Figures 2-6**).

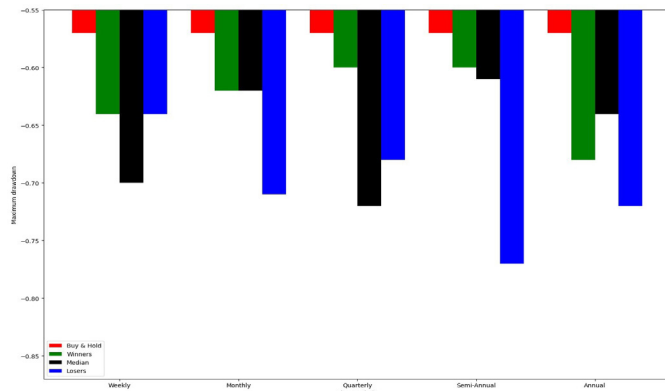


Figure 2: Brazil Comparing maxdrawdowns across various strategies and frequencies.

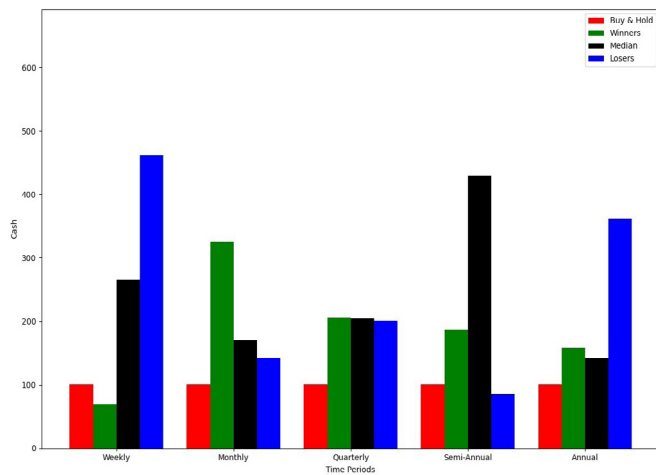


Figure 3: Mexico Comparing cash across various strategies and frequencies.

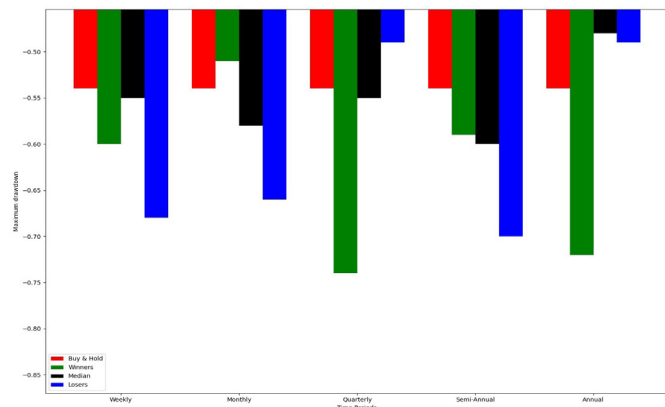


Figure 4: Mexico Comparing maxdrawdowns across various strategies and frequencies.

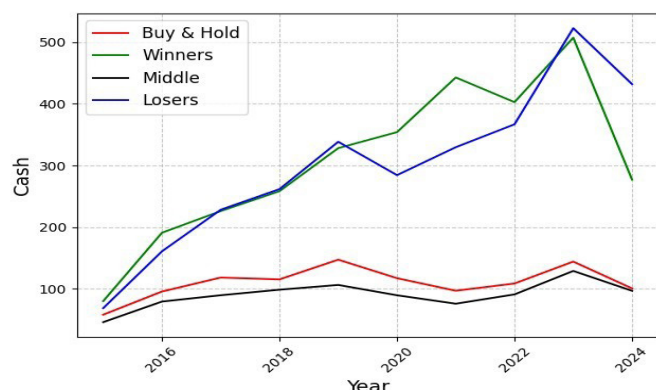


Figure 5: Brazil's best investment strategy.

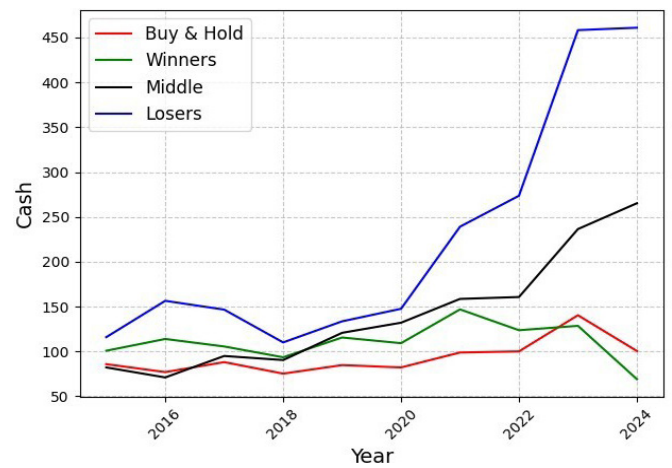


Figure 6: Mexico's best investment strategy.

A practical alternative to active forecasting models, enhancing stability without sacrificing growth potential during periods of heightened uncertainty, such as those triggered by recent U.S. tariffs on Latin American exports.

6. Acknowledgements

6.1. Conflict of interest

We declare that there are no conflicts of interest regarding the publication of this paper.

6.2. Author contributions

All the authors contributed equally to the effort.

6.3. Funding

This research was conducted without any external funding. All aspects of the study, including design, data collection, analysis and interpretation, were carried out using the resources available within the authors' institution.

6.4. Data Availability (including Appendices)

All the relevant data, Python code for analysis, detailed annual tables and graphs are available via: https://github.com/traders2025/Rotation_Strategy_Brazil_Mexico/tree/main

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